The Potential of Agroforestry for Peacebuilding
the case of Jonglei, South Sudan

by

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THE POTENTIAL OF AGROFORESTRY FOR PEACEBUILDING
THE CASE OF JONGLEI, SOUTH SUDAN

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University of Guelph, 2012

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Dr. Helen H. Odame

This thesis is an investigation of the potential of agroforestry technologies as means of increasing access to households’ food security, socioeconomic stability and peacebuilding in Jonglei state, South Sudan. The study utilized qualitative research methods, involving 31 key informant interviews, 100 semi-structured interviews, two focus groups discussions and six farmers’ group discussions, farm field visits, and participant’s observations. Findings indicated the majority of the local farmers in Jonglie are widows. These widows are mainly the household heads with large numbers or orphans. This study revealed that these widows are supporting their rural communities through adoption of agroforestry systems and technologies to increase access to food and income security for the poor communities to rebuild their livelihoods asset base to enhance socioeconomic stability and peacebuilding. The study recommended that farmers adopt improved fallow, fodder bank and biomass transfer agroforestry technologies as the most suitable systems for smallholders’ farmers in Jonglie.
ACKNOWLEDGEMENTS

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<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>ADRA</td>
<td>Adventist Development and Relief Agency</td>
</tr>
<tr>
<td>ANLA</td>
<td>Annual Needs and Livelihoods Assessment</td>
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<tr>
<td>ANLA</td>
<td>Annual Needs and Livelihoods Assessment</td>
</tr>
<tr>
<td>AYAD</td>
<td>Adventists Youth Association for Development</td>
</tr>
<tr>
<td>CBO</td>
<td>Community Based Organization</td>
</tr>
<tr>
<td>CIDA</td>
<td>Canadian International Development Agency</td>
</tr>
<tr>
<td>CLiMIS</td>
<td>Crops and Livestock Marketing Information System</td>
</tr>
<tr>
<td>CPA</td>
<td>Comprehensive Peace Agreement</td>
</tr>
<tr>
<td>D&amp;D</td>
<td>Diagnosis &amp; Design</td>
</tr>
<tr>
<td>DANIDA</td>
<td>Danish International Development Agency</td>
</tr>
<tr>
<td>ECHO</td>
<td>European Commission Humanitarian Organization</td>
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<tr>
<td>EU</td>
<td>European Union</td>
</tr>
<tr>
<td>FAO</td>
<td>Food and Agriculture Organization</td>
</tr>
<tr>
<td>FGD</td>
<td>Focus Group Discussion</td>
</tr>
<tr>
<td>GoS</td>
<td>Government of Sudan</td>
</tr>
<tr>
<td>GoSS</td>
<td>Government of South Sudan</td>
</tr>
<tr>
<td>HSBA</td>
<td>Human Security Baseline Assessment</td>
</tr>
<tr>
<td>ICG</td>
<td>International Crisis Group</td>
</tr>
<tr>
<td>ICRAF</td>
<td>International Council for Research in Agroforestry</td>
</tr>
<tr>
<td>ICT</td>
<td>Information and Communications Technology</td>
</tr>
<tr>
<td>IDPs</td>
<td>Internally Displaced Persons</td>
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<tr>
<td>INGO</td>
<td>International Nongovernmental Organization</td>
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WFP  World Food Program
WHO  World Health Organization
CHAPTER ONE
INTRODUCTION TO THE STUDY

1.0 Introduction

This study investigates the relevance and significance of agroforestry systems and technologies as a means for food security and peacebuilding. Additionally, this study sought to examine the role of agroforestry in supporting post-conflict environmental rehabilitation, livelihood diversification, and socioeconomic development. A proper understanding of these concepts might potentially lead to social transformation and peacebuilding, in the context of intertribal/intra-tribal conflict of Jonglei, South Sudan. This study will also recommend policies and interventions that will guide international donors, NGOs and the government of South Sudan as well as the local communities to create an enabling environment through empirical research of how agroforestry could be a viable, environmentally sound as a sustainable strategy for access to food security that will lead to the reduction of the extreme poverty, conflict and lead to peacebuilding in Jonglei state of South Sudan. Furthermore, this study aims to inform and influence the overall post conflict recovery, rehabilitation, food security and peacebuilding strategies of the Adventist Development and Relief Agency (ADRA/South Sudan), the NGOs and Government of South Sudan as well as United Nation’s Agencies and International nongovernmental organization.

The results are also meant to influence and inform future policies and strategies of the government of South Sudan and non-government organizations that are active in the field of poverty alleviation, increase access to food security for the resource poor farmers and communities under the compound and daunting threats and stress of food insecurity due to the impact of extreme conflict and environmental degradation. Agroforestry
presents both distinctive opportunities and unique challenges in the post conflict situation of South Sudan. This is because of the potentiality and role that forests and agroforestry can contributes in poverty alleviation, sustainable development and environmental preservation for the benefit of the impoverished and resourced poor rural community in the Jonglei State, South Sudan. Certainly, agroforestry systems and technologies are important and effective contributors to household food security, diversification of livelihoods strategies, socioeconomic transformation that will lead to peacebuilding (UNEP, 2007, World Bank, 2004, FAO, 2002).

1.1 Study Background

South Sudan has been devastated by civil war and regional contention for most of the past fifty years, since it became independent on January 1, 1956; Sudan has been the venue of Africa’s longest running civil war that has lasted for more than fifty years and the last leg of this conflict lasted for more than two decades (UNMIS, 2011). However, this deadly war has been fought between the government of Sudan (GoS) and the former rebel’s movement, the South Sudan People’s Movement/Army (SPLA/M). This conflict has claimed more than 2.5 million lives as well as forcing more than four million others to flee from their native habitat in Southern to live as internally displaced (IDPs) or refugees (UNMIS, 2011.) Jonglei state is the largest of ten states in South Sudan, with a total area of 120,000 square kilometres and it is a home to 1.3 million inhabitants (SSCS, 2011). Consequently, these (IDPs) have been compelled by the conflict to choose between two terrible situations, either to seek refugee’s status and live in appalling conditions in makeshift internally displaced camps around major cities in Northern Sudan, or move to camps established by International nongovernmental aid organization behind the lines of
War in South Sudan. Additionally, hundreds of thousands fled South Sudan and moved to neighbouring countries such as Ethiopia, Uganda and Kenya; others sought refuge in many countries around the Globe (UNMIS, 2011).

The root causes of South Sudan conflict are attributed to lack of development and inequitable national wealth and power sharing between the minority ruling elite in the center and the majority at the peripheries. Thus, utilization of agroforestry systems and technologies as an appropriate means for management of natural resources is pivotal in post conflict reconstruction of South Sudan in order to provide access to sustainable food security, socioeconomic bond and environmental conservation (Nair, 1993).

This long and brutal civil war in South Sudan that had raged for twenty one years (1983-2005) effectively came to a peaceful ending in 2005, when the two parties to the conflict signed the comprehensive peace Agreement (CPA). This agreement was signed between the Government of Sudan (GOS) and the Sudan People's Liberation Movement/Army (SPLM/A) in Naivasha, Kenya on the 9th, January 2005. For the most part, the comprehensive peace agreement has not only restored peace and tranquility to South Sudan, but was espoused in order to transform South Sudan political and socio-economic landscape, with the help and support of the international donor agencies and countries (Ministry of foreign Affairs, Norway, 2008). This support is in line with the post conflict reconstruction, recovery and development efforts pledged by the international community in order to support and consolidate the peace process in Soudan. Furthermore, this support is to realize the spirt, goals and objectives of the Millennium Development Goals. Given the fact that the government of Sudan is a party and signatory to both the Comprehensive Peace Agreement (CPA) and the September 2000 Millennium Development Goals (MDGS). Particularly, the first objective that aims at eradication of the
global extreme poverty and hunger by 2015, given that the rate of prevalence of poverty in South Sudan is estimated to be 90% of the total population (UNDP 2010). Thus, the government of South Sudan in partnership with the International community is committed to the achievement of the objectives of the Millennium Development Goals through the implementation of the post conflict development plans enshrined in the Interim Constitution of the Republic of South Sudan. However, all eight objectives and of the Millennium Development goals are closely interrelated, thus achieving one goal leads and hasten the achievement of the other goals.

Figure 1.1: Map of Jonglei state indicating tribal composition and research sites visited.
Source: Crises Group (2009)

Key: Nile/Sobat Rivers livelihood’s zone
Pastoral livelihood zone
Communities visited for research
1.2 Problem Statement

The protracted civil war in South Sudan has created a situation of extreme poverty among most of the rural population. This war has not only destroyed lives and livelihoods, but has completely shattered and devastated the local environment as well as the limited infrastructure that were left in South Sudan at the end of the British colonial administration. Destroying the environment was part of a wider plan of destruction during the Sudanese civil war. The outcome have been deforestation, poisoned wells, and degraded landscape of most of the rural areas and destruction of the dilapidated infrastructure built before the civil war. After the war ended in 2005, with the signing of peace agreement, the landscape was left completely desolate without even a single paved road or a flourishing woodlot, despite the enormous unutilized natural resources available in South Sudan, that includes fertile arable land in addition to immense water sources (Ministry of Agriculture South Sudan, 2007).

Agroforestry technologies are land use farming systems that combines deliberate cultivation of trees and shrubs, growing crops and rising of animals on the same farm, or in sequences, in order to achieve maximum interaction between the components of these farming systems for the benefits of the farmers and the local environment. Furthermore, agroforestry practices provides a variety of benefits and services to rural communities, where trees may provide food, fodder, fuel wood, and logs for shelter and improves soil fertility for crop production (Nair, 1993, Rocheleau et al., 1988).

Consequently, the successful implementation of agroforestry technologies to effectively address basic human needs (food, shelter, fuel wood, fodder, raising livestock) and environmental sustainability in the context availability of vast natural resources in Jonglei state, South Sudan is feasible. Therefore, this research aims to investigate the role
of agroforestry in supporting environmental rehabilitation, livelihood development and peacebuilding in the tribal conflict-stricken areas of Jonglei State, South Sudan. Jonglei State is the largest of ten states in South Sudan (See the map); with a total area of 120,000 square kilometers and it is a home to 1.3 million inhabitants, who are made up of the Nomadic agro-pastoralist ethnic groups of Dinka, Nuer and Murle. These three tribes are known to be warlike, and for their bravery and viciousness during times of tribal wars and cattle raids. These tribes are also known to own very large herds of cattle on which their lives are centred. They breed and use them for paying dowries in marriages and every aspect of their socio-economic lives. Cattle supply meat, milk and blood that provide the groups with food security. They also barter them for food commodities and other goods. During the war, Jonglei’s people had to flee for their lives to Kenya and Uganda as refugees as well as other relatively peaceful areas of Sudan. However, after the cessation of hostilities and the return of peace to the region, many Internally Displaced peoples (IDP’s) have started to return home slowly, but the conditions are still very poor and turbulent, due to the eruption of inter-tribal conflict in the region. The causes of inter-tribal/intra-tribal conflict in Jonglei state are attributed to cattle rustling, food insecurity and proliferation of small arms amongst the tribes and rural communities (Garfield, 2007, Arnold and Alden 2007).

Thus, former combatants and many of the disgruntled young people who have only learnt the culture of war during their lifetime that they have spent as Child Soldiers, found themselves without education and means of livelihood became involved in the conflicts and resorted to armed violence as means of making a living. This problem was aggravated by the easiness of acquiring arms and ammunitions from local armed dealers as well because of the spillover from the collapsed armies in the neighbouring countries such as
Congo and Central African Republic.

Agroforestry involves the co-management of crop, tree, animal and human needs within a smallholder farming system. Agroforestry is practiced traditionally and has been promoted since the 1980s as a sustainable land use option, especially relevant to agro-ecological zones in sub-Saharan Africa (World Agroforestry Centre, 2010). Agroforestry can provide a comprehensive systematic approach to addressing the pressing basic human needs of food security for human, fodder for livestock as well as the provision of physical environmental rehabilitation and income generation, which will likely be reinvested in livestock as this is the main means of local social security. According to the international community, including The Canadian International Development Agency (CIDA 2010) as well as other international aid organizations operating in South Sudan, supports the perspective that ways out of poverty are needed in order to prevent the fragile new emerging state of South Sudan from relapsing back to civil war, which may throw the entire region into a renewed deadly conflict, if food insecurity and eradication of poverty, peacebuilding program are not addressed by the Government of South and its international development partners (World vision, 2011, CIDA 2010).

1.3 Research Goal and Objectives

The overall objective of this research is to examine the nexus between peacebuilding and agroforestry among natural resource-dependent communities in Jonglei State. The research will involve the identification of appropriate technologies and the adaptation of such technologies for smallholder agro-pastoralists farmers who live under the threatening context of ethnic conflict and armed violence on one hand, while on the other hand; local communities are offered support from the international community for food security,
economic recovery, social transformation and peacebuilding.

The specific research goals are to:

1. Determine the relevance of agroforestry as means of sustainable land use for peacebuilding, conflict management and conflict transformation.

2. Identify cases and examples of agroforestry technologies that address the need for poverty reduction within the context of existing or potential armed conflicts.

3. Identify silvo-agro-pastoralism interventions that would support women’s roles
**Methods and Data Sources Used to Achieve the Research Objectives**

<table>
<thead>
<tr>
<th>Research objectives</th>
<th>Research Questions</th>
<th>Data Collection</th>
<th>Data Source</th>
</tr>
</thead>
</table>
| 1. To determine the relevance of agroforestry technologies as means of conflict prevention, conflict transformation and peacebuilding. | 1. Which agroforestry technologies can potentially contribute to peacebuilding in the context of extreme poverty and tribal conflicts in Jonglei State of South Sudan? | A. Farmers Groups discussion groups.  
B. Semi-structured interviews.  
C. Participant observation  
D. Documents analysis. | A. Farmers group discussions women Farmers groups meetings.  
B. Focus groups meetings.  
C. Key Informant’s interviews.  
D. Farms Visits.  
E. Gender- disaggregated data, South Sudan livelihoods and food security serves, Annual Need Assessment survey for Jonglei State |
| 2. To identify cases and examples of agroforestry technologies that address the need for poverty reduction within the context of existing or potential armed conflicts. | 2. How can agroforestry programmes be devised to contribute to conflict transformation in the context of post war situation in Jonglei State South Sudan? | A. community discussion groups.  
B. Semi-structured interviews.  
C. Participant observation  
D. Documents analysis. | . Community meetings, women Farmers groups meetings.  
B. Focus groups meetings.  
C. Key Informant’s interviews.  
D. Farms Visits.  
E. Gender- disaggregated data, South Sudan livelihoods and food security serves, Annual Need Assessment survey for Jonglei State |
| 3. Identify silvo-agro-pastoralism interventions that would support women’s role in food security, peacebuilding and recovery in armed conflict situation. | 3. How does agroforestry benefit rural women in post war situations and contribute to women’s role in peacebuilding? | A. community discussion groups.  
B. Semi-structured interviews.  
C. Participant observation  
D. Documents analysis. | . Community meetings, women Farmers groups meetings.  
B. Focus groups meetings.  
C. Key Informant’s interviews.  
D. Farms Visits.  
E. Gender- disaggregated data, South Sudan livelihoods and food security serves, Annual Need Assessment survey for Jonglei State |

### 1.4 Gender issues

Most victims of armed conflicts and violence in developing countries such as South Sudan are women, children and the elderly. This research addresses and incorporates gender issues as they relate to food security, livelihoods, and catering for households needs of the rural communities. Furthermore, gender issues are ignored in a patronage and
patriarchal culture like South Sudan. Equally, this inquiry investigates the contribution of agroforestry in consolidating the socioeconomic role of women in peacebuilding in the post conflict situation in Jonglei. Given that agroforestry has an inherent social dimension for bringing women together in order to collectively build their social capital and consolidate their interdependence through farming strategy. Consequently, building social capital would strengthen these women’s coping mechanisms in order to mitigate the impact of poverty, food insecurity as well as offsetting social marginalization.

Furthermore, this research investigates the reason for social exclusion of women in pastoral societies such as the case of Jonglei, South Sudan. Notably, South Sudan needs and livelihood assessment in Jonglei State indicates that the ratio of female-headed households is 52 percent, while male-headed households account for 48 percent. Based on this finding, women represent the main providers for households’ food security in Jonglei state (WFP 2011).

1.5 Significance

This study is significant to undertake because of the interest it has generated with the officials of the government of South Sudan, especially policy makers, INGOs as well as the local communities visited. The emergence of South Sudan as a new country with its immense post conflict food security and socioeconomic challenges necessitates scaling up the impact of research on strategies based on natural resources management, ecosystem development such as agroforestry. The International community is very concerned about the possibility of further conflict arising in South Sudan if the current peace agreement and the new state of South Sudan fail to meet the livelihood needs of the impoverished population in South Sudan. Therefore, it is my assumption that the results of this research
will provide many international and local stakeholders with new insights, information and possibilities on how to use agroforestry as one means of providing adequate access to food security, preventing conflict and foster dialogue, peacebuilding and socioeconomic transformation in post conflict, fragile context situation of South Sudan.

1.6 Thesis Overview

This thesis is organized into seven chapters. Chapter two provides a review of current and relevant literature on the connections of food insecurity and conflict in the post-war fragile state, including the causes of environmental scarcity and armed conflict. This chapter also presents the current literature on food security and peacebuilding and the relevance of agroforestry technologies as means of peacebuilding. The chapter concludes with the conceptual from work that guided and informed this study. Chapter three provides the methodological and epistemological approach to the study, including its application on the case study. This chapter describes the use of diverse qualitative data collection and analysis methods, as well as the research limitations.

Chapter four highlights the context of the research including the information background of the study. This chapter also explores the socioeconomic context, the war and the hydrology of the new country of South Sudan. This chapter also looked at the forestry policy framework that supports agroforestry as a sound land use system that supports the livelihoods of the current generation with compromising the rights of the next generations. Chapter five presents the findings of the study. This chapter explores the underlying causes of the inter-ethnic violence and the connection of food insecurity, environmental degradation as the drivers of conflict. This chapter also examines the potential of agroforestry technologies and systems as means of access to foods security,
socioeconomic stability and peacebuilding. The findings are constructed in response to the research objectives.

Chapter Six discusses the findings presented in chapter five using the modified conceptual lens. The new conceptual framework was necessary in order to incorporate the new institutions and instruments of peace or conflict in the changing and dynamic landscape of the inter-ethnic conflicts in South Sudan. The new conceptual framework incorporates the key factors of agroforestry systems as means of peacebuilding. The modified conceptual framework is then used to discuss the findings as they relate to the literatures presented in chapter two.

Chapter Seven presents the final summary, the conclusion of the study and a set of recommendation for several international as well as bilateral, South Sudan government and the local communities. The final part identifies areas for future research.
CHAPTER TWO
LITRATURE REVIEW AND CONCEPTUAL FRAMEWORK

2.0 Introduction

In order to establish the significance of this study, a review of literature covering relevant topics is undertaken. The first part gives an overview of conflict in relation to food insecurity and competition for natural resources. The second part discusses the potential of agroforestry systems as a natural capital that can be exploited as a means to social and economic development, social stability and peacebuilding. The third part, discusses the conceptual framework that guided this study including the relationship between institutions, agents (perpetrators of armed conflict) and instruments that foster war. Lastly, the chapter ends with a brief summary.

2.1 Conflict in Relation to Food Insecurity and Competition for Natural Resources

Undoubtedly, persistent conflict represents a great threat to access and availability of sufficient food for rural tribal communities. Particularly, those communities caught up in post conflict interethnic-conflicts such as the situation in South Sudan. However, in an environment of conflict, food security deteriorates placing a huge demand on food. In this case, food aid may provide a temporary solution. If food aid is not available or sufficient, desperately hungry people may use any means to access food, including violence (Maxwell & Burns, 2008; Development Initiative, 2003). Similarly, competition for key natural resources may also leads to violent conflict. For example, if the demand for natural resources exceeds supply, tension may develop between the competing user groups. In this case, if these key renewable natural resources such as cropland, water points and pastures can no longer be sufficient to meet the needs and demand of the user groups who may be entirely
dependent on them for survival, thus high competition may develop between these different user groups. In any case, this high competition maybe due to population growth or due to a sudden increase in the local population because of high return of war IDPs with large herds of livestock, such as the case in Jonglei state (Péclard, 2009; Pantulaino, et al., 2008). Consequently, demand for key natural resources may lead to high competition over their use. However, in normal situations, competition over key natural resources may not trigger violence (UNEP, 2010). Conversely, in specific context there may be other exacerbating factors exist such as socioeconomic disparities, ethnic tensions, poverty and chronic food insecurity and high proliferation of small arms. These above mentioned factors may induce tension that in the end may trigger armed conflict between those competing communities (UNEP, 2010; FAO, 2010). On the other hand, if key renewable natural resources becomes degraded due to man-made or natural and environmental hazards which often leads to significant decrease in the supply of these natural resources. As a result, different user groups may be forced into direct competition over dwindling key natural resources, which may ignite dispute and lead to conflict (ibid). Equally, access to renewable natural resources may be restricted by owners who may intend to limit the use of such resource to their own group. Thus, others who may direly need to use them may feel deprived to the extent they may resort to violence in order to gain access to these natural resources (Homer-Dixon, 1994; UNEP, 2007; UNEP, 2010). For the most part, the role of agroforestry can never be under-estimated, particularly in post conflict recovery and peacebuilding processes in the context of communities affected by conflict over scarce and declining natural resources. In this case, up-scaling agroforestry systems can play a crucial role in creating, expanding and providing poor rural communities with access to and use of these renewable natural resources in a sustainable manner (Hambly, 2011).
Globally, hunger and food insecurity are recognized as some of the major underlying causes of current and past conflicts. Evidently, countries around the world that are affected with acute and chronic food insecurity have been faced with social unrests and political instability (WB, 2011).

Historically, war and conflict between human beings due to hunger has existed for as long as the humanity itself (Lederach, 1997). Regrettably, conflict and war have continued to increasingly devastate human life and the environment. Undoubtedly, intra and inter-state wars as well as inter-tribal conflicts contribute to profound economic and social devastation in courtiers relying entirely on agriculture as their main sources of economic development (WB, 2011). According to recent post conflict development literature, civil wars in the post cold war era are said to be increasing in intensities, frequencies, and in the numbers of their casualties. Consequently, this has contributed to a lack of trust, animosity and most of all poverty (de Soysa & Gleditsch, 1999; Gleditsch, et al, 2002; Berdal & Malone, 2000). This is particularly more salient in developing countries, where in spite of the end of the cold war, conflicts have intensified. Notwithstanding, these countries mainly depend on primary products including agriculture as the mainstay of their economic activities and development (Gleditsch et al, 2002). According to Save the Children, (2010), there have been more than 120 wars and civil conflicts that have taken place in developing countries. Five of these wars have resulted in the loss of more than five million people (de Soysa & Gleditsch, 1999).

Violent conflict always disrupts development. Moreover, it can extend beyond international borders; reduce economic growth and prosperity within nations as well as across entire regions (de Soysa & Gledisch, 1999; Messer & Cohen 2004). The North-South Sudan civil conflict, in addition to immediate cost on lives, property and the local
environment, there appears to be long term negative socioeconomic consequences on the entire population particularly in the rural areas (Global Security, 2011). For example, several generations have been unable to attend school, and suffer from lack access to basic health services while poverty levels have been on the increase (Collier & Sambanis, 2005). As reported by the recent UNDP-World Bank mission, Sudan in general is today one of the poorest nations in the world, despite the enormous natural resources it has. For instance, about 75% of the population in the North and 90% in the South are estimated to be living below the poverty line and are dependent on less than a dollar to meet their daily needs (UNDP/Sudan, 2011; Nour, 2010; JAM, 2005; Johnson, 2003).

FAO (2002) argues that civil conflict is a major root cause of food insecurity. Conflict often destroys food production system as it ultimately leads to massive displacement, given that farmers and farm workers flee to safety. In the worst case scenario, it results in loss of lives. Subsequently food insecurity stalls overall economic activities. Similarly, given that rural livelihoods are largely dependent on productive assets such as land, pastures, water point and livestock, their scarcity and subsequent competition over food and natural resources may often lead to violence. In most cases, the ensuing conflict often forces farmers to abandon their productive land to relocate to unproductive and marginal land, hence leads to reduced food production, severe food insecurity that often triggers and intensifies conflict. This is exacerbated by conditions of stress and shock due to hunger and depravation (FAO, 2002).

Equally, whereas the direct consequence of conflict on food security is measurable and quantifiable, the indirect impact of food insecurity in relation to conflict is only estimated (Messer & Cohen, 2006). Nonetheless, empirical evidence indicates that the impact of conflict on food insecurity is often reported to occur simultaneously, and in most
cases, in the same location and are frequently caused by common sets of the same risk factors and incidences (FAO, 2002). In such cases however, commonly documented risk factors includes environmental degradation, natural resource scarcity, lack of access to adequate water and pastures, population stresses, as well as lack of employment and economic opportunities (FAO, 2002). Messer et al (2001) argues that there is an adverse “reciprocal effect” between violent conflict and food insecurity. As such, conflict is considered to be a direct cause of hunger, while hunger can often lead conflict. There is an obvious interplay between food insecurity and conflict. Violence leads to a situation of chronic poverty and extreme food insecurity (Messer et al, 2001).

This research adopts the concept of food security as defined by FAO, (2010). In this context, “Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life” (FAO, 2010:8). This definition incorporates three, distinctive and important constituents that are cardinal in achieving food security: first “physical”, “economic/social” and “availability” (of food to all people at all times, including locally produced food and food aid); second, “access” (to sufficient and suitable (quality) of food in order to fulfill nutritious and dietary needs); and finally, “utilization” (of suitable food that provides enough energy and meet essential nutrition of the people) (FAO, 2006). Similarly, household food security also embraces the same FAO concepts which are applied at the household and family level given that individuals within the households are the main units of analysis in the context of food security. Arguably, food insecurity is the condition of uncertainty in as far as access to adequate supply of physical, social-economic, sufficient, safe and nutritious food is concerned (FAO, 2010).

In spite of the availability of sufficient food supply in the world today, FAO (2009)
has estimated that more than a billion people worldwide are hungry due to various underlying reasons including climate change, low-income, economic crises, poverty and conflict over limited and scarce natural resources. These aforementioned reasons are basically the main underlying causes of the recurring cycle of armed conflicts and civil wars in developing countries. This in turn causes extreme poverty which contributes to perpetual food insecurity (Keen & Lee, 2006; Korf & Bauer, 2002). Similarly, FAO (2009), media center has indicated that for the most part, those who are affected by hunger are the resource poor smallholder farmers who live in developing countries in Africa and South East Asia. In order to reinforce the global nature of poverty and food insecurity that may likely pose a threat to human existence and dignity as well as potentially jeopardise world peace, the World Heads of State and Governments gathered in Rome in November 1996 in a global summit organized jointly by FAO and the World Food Program (WFP). The main objective was to propose a global approach to address and mitigate the impeding global food insecurity with a structured global plan of action. As a result, the Rome Declaration was issued and the main agenda was to eradicate hunger by 50 percent by 2015. Additionally, the World Food Summit resolved to support plans and programs that will ensure a joint global and collective effort to mobilize resources at the local, state and international levels. Ultimately, this would support individuals and households achieve the FAO/ WFP set objectives in realizing access to food security, particularly those most affected by famine, conflict, socio-economic inequalities and environmental degradation (FAO, 1996). Regrettably, it appears that despite the World Food Plan of Action, nothing much has changed. For example the protracted armed conflict has created a situation of high levels of chronic food insecurity in countries such as South Sudan, in spite of its immense natural resources it has recently become one of the major food aid recipients in
Korf and Bauer (2002) asserted that food insecurity can induce armed conflict and armed conflict exacerbates food insecurity. Consequently, when countries or communities get involved in wars and armed conflicts, their ability to produce enough food is significantly reduced. However, based on recent literature on the trends of global conflicts, most conflicts in developing countries often affect rural and outlying areas. They disrupt food production, impede the harvesting process, destroy food reserves in addition to disrupting transportation of food supplies to local markets. Humanitarian relief efforts intended to mitigate the aftermath of conflict is also affected. In addition, armed conflicts destroy farm capital as well as the social fabric. Consequently, chronic poverty, food insecurity and unemployment, especially among youth lead to dissatisfaction hence, creating a rich recruiting ground for young people to join the rebel forces, taking them away from farming activities. This step further constrains the economic activities necessary for household food security. Moreover, due to social disparities and lack of livelihood opportunities, ethnic tensions and political grievances may often occur within poor communities such as those of South Sudan, where poverty and food insecurity are fuelling extreme intertribal conflict (ICG, 2009; SSCCSE, 2010; Schmerus & Allen, 2010; WFP, 211).

Empirical data and literature on civil war suggests that young people, if actively engaged in socioeconomic activities, can be effective agents of peacebuilding and social stability in post conflict reconstruction (Munve, 2008; WRC, 2010). In any case, when the youth are excluded and marginalized, they are vulnerable and tend to join armed rebellion and engage in civil wars. For example, the youth, through the White Army armed group in Jonglei were actively involved in cattle rustling as a means of survival due to economic
marginalization and social exclusion (Arnold & Alden, 2007; HSBA, 2007). From the civil conflict standpoint, youth “grievances” and “greed” combined with state fragility and lack of alternative sources of descent livelihoods and opportunities, motivates them to engage in armed conflict. Equally, if the opportunity cost of engaging in armed conflict is lesser than engaging in other activities then armed conflict is the preferred option. It is also apparent that youth in areas where their populations are high are more likely to engage in armed conflict (Collier & Hoeffler, 2004).

The impact of civil war often leads to breakdown of law and order and results in gross human rights violation. In addition, it also affects economic growth, thus exacerbates poverty and in turn creates situations of anarchy that triggers cycles of violence (Collier, 2003; Collier & Hoeffler, 2002; Walton, 2010). The impact of armed conflict on access to food security often lasts long after the violence has subsided. During conflict, many assets were destroyed, people killed or maimed, populations displaced, the environment damaged, health, education and social services are disrupted. Additionally, even when peace is restored, there is always the increased fear of landmines which are often left in agricultural fields. This often deters people from returning and engaging in productive activities given that they kill and cripple people. For example, UNEP, (2007) found out that vast areas of arable land in Jonglei that were use as mine fields during the civil war are still not yet demined. Thus, exposing farmers and livestock to great risk, while keeping them away from fertile land that could have been used for food crops production or grazing livestock.

Access to food security is essential for human survival as well as physical security. Dowswell et al. (2004) emphasized that regardless of where and when it occurs, hunger jeopardizes peace everywhere. Therefore, in order to maintain a peaceful world, it is
imperative to address conflict in relation to food insecurity. Nonetheless, the relationship between food insecurity and armed conflict is quite complex. Whereas, if the means of income and opportunities for survival are insufficient and limited, opportunity cost for joining armed conflict becomes low, therefore, the incentives of engaging in armed conflict are high, individuals often resort to the latter (Dowsell et al., 2004; Collier & Hoefller, 1998). Furthermore, and conflicts have been strongly linked to prevalence of chronic poverty. It is also widely documented that chronic poverty and deprivation are indicators of violence and armed conflict given that low per capita income induces violence.

Similarly, and based on longitudinal studies on the nexuses of conflict and poverty, scarcity in water supplies, limited pastures and underdevelopment are some of the major causes of most armed conflicts (Collier & Samhanis, 2005; Justino, 2006; Stewart, 2002).

The devastating impact of civil conflicts on agriculture, food security and human situation are well researched and documented. However, the mechanism and the direct consequences in which food insecurity triggers conflict is relatively less investigated and understood. This is mainly attributed to the complexity associated with the root causes and the underlying causes of civil conflicts as well as their changing nature and dynamics (Messer & Cohen 2006, Messer & Cohen, 2004). For example, recent hypothesis on the causes of civil war has disregarded the connection between the agricultural sector (the main source of employment for most of the people in rural areas and also a source of funding for civil wars, arms procurement, paying rebel combatants) and political leadership (Messer & Cohen, 2004). In addition, there is also adequate literature that addresses the role of ethnic competition over natural resources including food, land, grazing pastures and water points in contributing to conflict (Walton, 2011; USAID, 2005). Brinkerhoff, (2007) has conceptualized a strong link between state fragility, lack of capacity and violent civil conflict. He
further notes that when capacities of a poor state emerging from a long civil war has been severely eroded, they lack the needed capacities and are unable to gain sufficient legitimacy to maintain their citizens confidence and trust. Additionally, fragile states are overly prone to extreme ethnic, religious and societal division. Similarly, if communities in such fragile states suffer from the legacies of civil conflicts, they often lack the capacity to cooperate, are unable to reconcile, and built mutual trust. In addition, when the capacity deficits become extreme, fragile states move toward failure, collapse, crisis and conflict. Against this background, Sudan has constantly ranked in the top list of Worlds most fragile, weak and failed states (The Fund for Peace, 2011).

Although, some of the major civil wars in developing countries particularly in Africa have now ended with peaceful settlements, there is increasing evidence that indicates growing sporadic break down of post conflict reconstruction. For example, in the Democratic Republic of Congo (DRC) and in Sudan, killing of civilians and displacing others continues with impunity (Messer & Cohen 2004). Inevitably, rural areas are the most affected by violent conflict. The under study situation is often exacerbated by lack infrastructure, institutional capacities and severs state fragility and weakness, which makes it difficult to engage effectively with post-conflict reconstruction and rehabilitation efforts. In order to mitigate conflict, it is generally suggested by development that building rural agricultural capacities as well as rural basic infrastructures in war-ravaged communities as a way of settling post conflict, may perhaps utilize abundant labour intensive activities, which also require less capital investment (McLoughlin, 2011; Messer & Cohen, 2004). The importance role of agriculture is increasingly recognized as the most appropriate means of supporting livelihoods of the rural population within the context of reconstruction following civil war in South Sudan (Addison, 2005).
Similarly, the potential of agriculture to ensure food security and expand natural resources has also been recognized by many international (Nafzifer, Stewart & Vayrynen, 2000). Furthermore, given that former combatants, returnees from refugees’ camps and internally displaced people lack the necessary vocational skills, subsistence agriculture including traditional methods of raising livestock are considered. These are basic, practical and peaceful alternatives to military employment (Messer & Cohen, 2004). Notably, project and program designed to create and improve local livelihoods, economic recovery, growth and food security requires the availability of land, water, credit and crop improvement technologies and stable local markets. It is strongly believed that agriculture raises incomes and employment, reduces tensions that contribute to violence, guarantees revenues for government and most importantly distributes wealth equitably (Addison, 2005). Therefore, agriculture is critical to countries rebuilding from war as it supports strategies for peacebuilding. Additionally, adoption of innovative land use systems such as agroforestry systems can potentially increase desperately need revenues that enables governments to provide social amenities, hence increase socioeconomic and improve the living standards of its people.

Nonetheless, as seen in previous context, agricultural activities can also create competition over limited resources and can sometimes trigger unnecessary conflict between different ethnic groups. Against this background, USAID (2009) found out that with high numbers of returning IDPs and refugees to South Sudan after the peace agreement and specifically to rural areas in Jonglei State, competition over limited agricultural resources between differ ethic groups is causing conflict.
2.2 Food Insecurity as a Source of Conflict in South Sudan

Subsistence farming and livestock herding, with some variation at the local levels, especially in the rural areas (Goss, 2010), dominate South Sudan economy and rural livelihoods. WFP (2007) notes that approximately 85 percent of households cultivate land while around 65 percent own cattle. Currently, 53 percent of household food consumption in South Sudan is derived from local production. The local food and livestock market system provides 32 percent and is considered as the second most important food source. Also, barter trading contributes 5 percent, gifts 4 percent and borrowing 3 percent (WFP, 2007a). Many of those who are not actively involved in farming are those returning from refugee camps and who were displaced by conflict, security or natural hazards thus have no immediate access to land. These categories of people are considered vulnerable and entirely dependent on food aid as well as entitled to development programs provided by NGOs in S. South (Oxfam, 2011; Maxwell Burns, 2008).

Similarly, FAO (2010) argues that the destructive nature of decades of civil war, the compound effect of underdevelopment, socioeconomic and political marginalization has further exacerbated the situation. This protracted civil war in South Sudan has eroded state capacity leaving it fragile and ineffective in mitigating issues pertinent to post conflict reconstruction. Moreover, this challenges translates into loss of economic activities, migration of a significant population in addition to lack of basic infrastructure such as roads, marketing structures and acute erosion of livelihood options of most people in rural areas in South Sudan. Consequently, due to the complexity and high levels of extreme and chronic poverty, South Sudan faces what FAO (2010) describes as “one of the worst humanitarian crises and food insecurity in the World”. Furthermore, this humanitarian crisis has rendered an estimated 1.5 million of the South Sudan population, mostly IDPs and re-
turnees entirely depend on humanitarian assistance and food aid (FAO, 2010). Similarly, SSCCSE, (2010) noted that the unparalleled poverty and food insecurity situation in South Sudan is further exacerbated by several unfavourable risk structural and proximate factors. For example, persistent natural and manmade disasters including droughts and floods and impacts of climate change (livestock overgrazing, slash-and-burn farming systems and bush burning grazing system).

Within the context of this acute humanitarian and food insecurity crises, South Sudan 2009 National households’ survey revealed that rates and levels of hunger and undernourishment as measured by the prevalence of food deprivation, indicate that an average of 47 percent of the population of South Sudan are severely undernourished (SSCCSE, 2010). In comparison to FAO’s severity of undernourishment scale, this figure is considered alarmingly high. From these findings, South Sudan appears to be lagging far behind in achieving the Millennium Development Goal (MDG) threshold in relation to eradication of hungry people by 2015 by half (FAO, 2009; FAO, 2010; UN, 2011). Additionally, undernourishment rates in South Sudan have consistently been reported to be more than twice the highest reported rates from elsewhere in Sub-Saharan Africa (UNICEF, 2011). Further, UNICEF (2011) noted that prevalence of malnutrition in preschool children in post conflict situation of S Sudan are extraordinarily high, recorded at 22 percent. These rates have been consistently and substantially higher than the World Health Organization (WHO) cut-off for nutrition emergencies of 15 percent.

Notwithstanding the current widespread food insecurity challenges, South Sudan is immensely endowed with natural resources. 95 percent of the population depends on most of these resources for survival. If well managed, these abundant natural resources could potentially support South Sudan’s sustainable economic development. Given its favorable
agro-ecology, improved and renewable natural resources creating agricultural methods, such as agroforestry systems would facilitate improved food security for the population and peacebuilding (FAO, 2011; WFP, 2011, Glover & Lawrence, 2010, University of Peace, 2004). The peace agreement and gradual return of IDPs, the support of NGOs has fostered the steady growth of the agricultural sector in South Sudan (WFP, 2008; FAO, 2010b; WFP, 2011). Significant technical and financial support from the UN agencies as well as other international NGOs has also contributed to growth of the agricultural sector. The Government of South Sudan has also made a significant contribution towards revitalizing this very important sector. However, in spite of these advances in the agricultural sector, many parts of S. South are still emerging from the acute humanitarian crises caused by the long civil war (USAID, 2009; Oxfam, 2011).

The connection between food insecurity and competition over natural resources and intertribal conflict in Jonglei state has been long and recently well recorded and recognized (Evans-Pritchard, 1940; Evans-Pritchard et al, 1972; WFP/SC.UK, 2000; ICG, 2009; FAO, 2011, WFP, 2010). For example, these types of ethnic-conflicts have been recorded in the early and original ethnographic literature of renowned Ethnographers such as Evans-Pritchard. Concerning this point, Evans-Pritchard et al, (1972) notes that most of the agropastoralist tribal groups in Jonglei area depends entirely on cattle herding as the main sources of their food and livelihoods security. During times of environmental scarcity and famine, these tribal groups in Jonglei area (Nuer, Dinka and Murle) resort to high intensity cattle raiding as a means of survival. During these series of raids and retaliatory raids, significant numbers of cattle are pillage from each tribe, as raided cattle constitute the main sources of food and wealth for them (Evans-Pritchard, 1940; Evans-Pritchard et at, 1972).

Conversely, owing to the increasingly difficult terrain in South Sudan and the effect
of the impending security risks due scorched-earth war tactics associated with the protracted civil war, recent development literature about the intertribal conflict has been limited. Additionally, during the civil war the central government of Sudan restricted the free movement of independent foreign scholars and aid workers from entering South Sudan. Given these scenarios, there is a great gap in the current development and conflict literature about South Sudan (Deng, 1998; Pantuliano et al, 2009) However, after the peace agreement in 2005 the situation has greatly improved. Consequently, the restriction on the movement of the international development agencies, aid workers and scholars has recently been permitted in South Sudan, albeit the severe lack of basic infrastructures such as roads and ongoing conflict (Pantuliano, et al., 2008; EU, 2011). Furthermore, this current limited available development literature is mainly “grey literature”, includes reports and analysis from international donor agencies such as CIDA and DANIDA, UN agencies and NGOs (Pantuliano, et al., 2008: p, 1). Subsequently, this current grey literature has recognized and suggested a close interrelation between conflict, food insecurity and natural resources management as the main underlying causes of intertribal conflict in Jonglei state (Ibid). For example, (Catley et al. 2005) has conceptualize that the main causes that underlie intertribal armed conflict in Jonglei state are indeed connected with persistent food insecurity, repeated environmental shocks such as persistent droughts, recurrent floods, crop pests and animal disease epidemics, and seasonal disparities in food availability and accessibility. On the same note (WFP, 2009; WFP, 2010), has noted the nexus between food insecurity, natural resources management and intertribal conflict in relation to environmental hazards due persistent drought in Jonglei state.

In the wider range of ethnic-conflict in Jonglei (WFP, 2009), found out that food insecurity and natural resources scarcity are the main drivers of conflict. For example, most
of the intertribal conflict recorded in 2009 in Jonglei took place during the hunger season, when the food production was at its lowest state (see table 10). Thus, these findings seem to suggest that there is indeed a strong correlation between food insecurity, scarcity of pasture and water point and inter-tribal conflicts. Conversely, this finding seems to be inconsistent with other findings in the literature that suggests that there indeed no obvious connection between natural resources and conflict (Varisco, 2010). However, other essential exacerbating factors underpin the natural resources conflict nexus. These conflict-exacerbating factors include political, economic and social factors in the country or specific characteristic inherent to the location in which the inter-ethnic conflict is taking place. For example, factors such as availability of lootable outlying resources, lack of government control over its territory, undiversified economy and internal breakdown in social fabric and cohesions (Varisco, 2010). These conflict-exacerbating factors do indeed exist in South Sudan and Jonglei state. Evidently (USAID, 2011), reported that Jonglei state is one of the most food insecure regions of South Sudan. In addition, Jonglei is the least developed regions on the face of the world. With the highest reported intertribal conflict in South Sudan in 2009 that surpasses the total numbers of people killed during the same time during the ongoing crises conflict in Darfur (ICG, 2009; Rolandson, 2009).

FAO (2008) highlighted that a typical year for a pastoral tribes in Jonglei in characterized by transhumance practices. Within this pastoral system in Jonglei, human and livestock often move from the wet-season grazing areas near the villages in the central Savan-nah to the dry-season pastures in search for better grazing lands and water in the lowlands tiocs (swampy areas in Dinka). The seasonal movement of herders with their livestock usually commences just after the harvest of main food crops approximately at the beginning of November each year. For example, the Nuer tribe moves from the north eastern
part of Jonglei to the western part towards the toics near the River Nile at the Bor Dinkalands (FAO, 2008). Generally, during above or normal rainy seasons milking cows and small livestock remains in the wet-season villages to provide children, women and the elderly with their food needs. However, during poor wet-seasons grazing period when rains are scanty or below the normal average, with poor wet-season pastures, most members of villages in the tribal areas of Jonglei moves with all their livestock to the tiocs at the climax of the dry season (WFP &SC/UK, 2000; ICG, 2009 FAO, 2009).

Consequently, when large numbers of livestock move with their herders to common dry-season pastures and due to over-grazing as different tribes foster their self-interests, these shared limited pastures become quickly depleted. Therefore, the ensuing “tragedy of the commons” as conceptualize by Garrett Hardin (1968) triggers high intensity intertribal conflicts (FAO, 2010). High competition over limited grazing pastures leads to the onset of intertribal-armed conflict, due to high tribal competition over dwindling natural pastures, which is exacerbated by complex and hostile tribal relations and dynamics. However, the relationship between different pastoral and agro-pastoral in tribes in Jonglei has been historically defined with hatred. This strained relationship has often led to armed conflict due to of high proliferation of small arms and weapons within different tribes caused by the legacy of the civil war (Catley et al, 2005; FAO; Abate, 2006; Maxwell&burns, 2008; Pantulaino, et al., 2008). Owing to the legacy of the long civil war and the onset of severe intertribal conflict, the humanitarian condition in Jonglie has rapidly deteriorated leading to a severe and protracted humanitarian crisis. This protracted humanitarian crisis in Jonglei has recently been defined as a “complex emergency” (FAO, 2008, p: 14). When these types of complex emergencies exists in a country, they are usually associated with a profound breakdown of state and traditional authority and governance that could have arrested
such conflict and facilitated conflict prevention and fosters peacebuilding. However, owing to excessive internal shocks due conflict, which usually requires an international intervention beyond the mandate or capacity of a single NGO or a UN agency (FAO, 2008). Consequently, the complex emergency situation in Jonglei has required the involvement and close collaboration of the government of South Sudan, local communities, several UN agencies and international aid organizations (WFP, 2010). As part of this collective action, a joint need assessment involving several South Sudan government departments, UN agencies and NGOs found out that Jonglei state was the most food insecure among the ten states of South Sudan in 2009. This food insecurity is attributed to seasonal scanty and erratic rains, persistent drought, and environmental scarcity. Furthermore, findings from this joint assessment team revealed that approximately a total of 754,000 people out of the total population of 1.3m in Jonglei state were food insecure (WFP, 2010 p: 33). However, these high rates of food insecurity in this state correlates with the high incidences of unparalleled cattle raids and intertribal conflicts that were reported during the hunger period in 2009 (WFP, 2010; ICG, 2009).

2.3 The Potential of Agroforestry to Improve Food Security, Violence Prevention and Peacebuilding

The connection between scarcity of renewable key natural resource and onset of conflict has been well studied and well documented. Against this backdrop, the scarcity of key natural resources such as water, agricultural land and pastures either due to population pressures, climate change, manmade land degradation and overgrazing often leads to food insecurity and hunger for the source-poor rural population in Africa (Kennedy, 2011). In many ways, “environmental scarcity” induces competition which causes severe depletion
of renewable key natural resources. However, due to the slow rates in which renewable natural resources regenerate itself, their scarcity often leads to violence between the user groups. For example, there are evidence in the literature which link competition over scarce renewable natural resources to the Rwanda genocide, the inter-communal violence in South Africa, and the genocide in Darfur as well as the deadly civil war in South Sudan (Homer-Dixon & Percivital, 1994; UOP, 2004; Theisen, 2008). Equally, it is imperative to understand the complex connection between key natural resources scarcity and conflict in relation to the process of conflict prevention and peacebuilding. Consequently, it is also vital to address the root causes of conflict due natural resources scarcity in order to foster viable solutions as part of natural resources management and peacebuilding efforts aim to augment and solidify peace (Varisco, 2010; Ratner, et al., 2010).

However, the relevance of agriculture to peacebuilding is less explored and is still evolving. In the broader sense, the relevance of agroforestry development as means of peacebuilding lies in its potential to provide a renewable and sustainable natural resources base to support the poor subsistence farmers in the developing nations. Thus, providing these conflict-prone rural communities with renewable and sustainable natural resources can support access to food security for human and provides fodder for livestock and as a result, the overall impact reduces conflict and fosters peacebuilding. However, the concept of “peacebuilding” entered into common use in 1992 when Boutros Boutros-Ghali, the former United Nations Secretary-General, coined his Agenda for Peace. Initially, peacebuilding was designed as a process that follows after peacemaking and peacekeeping. It was also meant to address short-term needs after conflict has subsided. At that time, peacebuilding efforts were associated with capacity building, reconciliation, and societal transformation. Since then, peacebuilding has evolved over time and is now perceive as an
umbrella concept that espouses more comprehensive, long-term and broader approach to conflict prevention and peacebuilding. Within this new approach, priorities are now given to post-conflict reconstruction process, conflict prevention, capacity development, and socioeconomic transformation that involve actors from the local, national and international levels (OECD, 2010). This latest approach to peacebuilding has now shifted to become an agenda for peace through development (Tschirgi, 2004; OECD, 2010). Against this background, agroforestry is recognize in the development literature as a dynamic and holistic ecologically based, renewable natural resources management system, which encompass and incorporates trees/shrubs and livestock in farmland and rangeland.

Additionally, this system diversifies and maintains sustainable food production for increased social, economic and environmental benefits for various land users (Garrity, et.al. 2006).

For the most part, what makes agroforestry systems to be quite relevant for peacebuilding, is its potentials to increase and sustain food security, enhances economic development and provides employment and generate income to most unemployed rural people, especially women and youth groups (Buck et al., 1998; Kidd & Pimental, 1992).

The World Bank, (2004), estimates that approximately 1.4 billion people around the World are currently practicing agroforestry systems as their mainstay. These are communities living in rural areas in many developing nations. They depend on their agroforestry farming system in order to meet their food and nutritional security, increase their income and to build their livelihoods asset base. In addition, agroforestry can support sustainable food security, conserves and expands renewable natural base for livestock as well as conserves the local environment (Garrity, et.al. 2006). Similarly, agroforestry has been recently proposed as the most appropriate system that can mitigate the effect of
environmental change and supports conflict prevention and peacebuilding in Darfur, Sudan, where the impact of extreme environmental change is causing interethnic conflict and severe humanitarian crises (University for Peace, 2006; Elsiddig, 2010).

In spite of the remarkable progress in agricultural development, poor farmers in the rural areas in Africa are still faced with acute and high levels of food insecurity due to land degradation as a result of overgrazing, growing populations, excessive land use, anthropogenesis and natural hazards (Sanchez, et al., 2009). This situation is often exacerbated by lack of farm credit, unavailability of agricultural inputs including improved seeds as well as technical support. Additionally, commercial fertilizers are often unavailable and are unaffordable for the resource-poor rural farmers. As such, already exhausted soils are increasingly being depleted of nutrients due to unsustainable practices such as mono-cropping system. Consequently, food production has decreased while population of both human beings and animals has increased, laying huge pressure on fast depleting natural resources (Jama & Zeila, 2005). The unprecedented negative impact of climate change, economic meltdown and internal conflicts, has forced the majority of the population in the rural areas in poor countries in Africa to increasingly rely on food aid provided by International Humanitarian Organizations (Pye-Smith, 2008). However, due to adoption and up scaling of agroforestry technologies, waves of hopes are now blowing over many parts of Sub-Saharan African countries plagued with acute food insecurity. For example in a dryland country of Malawi, Pye-Smith (2008) found out that a program code name “farming trees, banishing hunger” has supported millions of extremely poor smallholder farmers to grow more food and significantly improved their livelihoods. With the up-scaling of “agroforestry for food security program, coordinated by ICRAF with direct support from Irish Aid, this program has successfully supported approximately 1.3 million, among the poorest in
Malawi to boost their food production and improve their nutritional status. With the use and incorporation of “fertilizers trees” such as *Gliricidia spium* through cornfields, poor farmers were able to double their yields (Pye-Smith, 2008)

Agroforestry is a complex and labour intensive land use system that is increasingly recognized by the international donor community and development practitioners as one of the most appropriate farming systems, with great potential to address food insecurity as well as provide environmental services to small holder farmers in developing countries (Garrity, 2005). In addition, agroforestry has also currently become a focal entry-point for development (Kidd & Pimentel, 1992; Steppler & Nair, 1987). There is increasing evidence that shows agroforestry projects have been increasingly financed by international development Bank. In addition, to direct support from lending programs at the local level in several developing nation, given its high promises in boosting farm productivity and ability to generate relatively good income for the rural people (Steppler & Nair, 1987). In this regard, NGOs are increasingly adopting agroforestry as a multipurpose pro-poor and viable strategy of achieving sustainable development instead of investing in unsustainable approaches such as food aid and monoculture agricultural systems (White, 1993). Garrity et al. (2006) argues that the adoptions of innovative food production systems such as agroforestry technologies would support poor nations in the developing nations to achieve the eight thresholds of the United Nations’ Millennium development goals with greater ease. Garrity et al., (2006) further notes that through agroforestry systems that improve soil fertility, hunger can be eradicated by adopting pro-poor food production system, especially, in marginalized and degraded land where agroforestry can replenish and regenerates land. Similarly, agroforestry can reduce rural poverty through market-base and adoption and promotion of bottom-up local knowledge-base trees plantation systems in the cropland.
An agroforestry system integrates a wide range of “working trees” that are deliberately grown simultaneously with food and fodder crops, while at the same time keeping livestock. The significant interaction between trees, crops and animals on the same spatial arrangement provide important benefits to the land, the animals and socioeconomic benefit for the people. In addition to fruit trees for nutrition, fodder trees improve livestock production while timber provides shelter, fuel wood and medicinal herbs for both human and livestock (ICRAF, 2006).

Slivopastoral systems encompass growing and maintenance of selected trees for their high protein fodder for livestock and wildlife. This system creates a dual habitat that conserves biodiversity for the benefit of domestic stocks and large bodied-wildlife. For example, conserved areas with leguminous trees maintained in rangelands in Jonglei have provided fodder for large herds of livestock and an appropriate habitat suitable to support larger herds of migratory wildlife the migrate to Jonglei area for its rich and diverse ecosystem (UNEP, 2007; Walter, 2008).

Since the 1980s, agroforestry has been practiced and promoted as a sustainable land use option, particularly relevant to agro-ecological zones in sub-sub-Saharan Africa (ICRAF, 2010). As an interdisciplinary science and practice, agroforestry has various slightly different definitions. Presumably, the most inclusive definitions as adopted by the international Council for Research in Agroforestry (ICRAF) defines agroforestry to be A “collective name for land-land use systems and practices, where woody perennials (trees, shrubs, bamboos, vines etc.) are intentionally incorporated to create an agro-ecosystem with crops/or animals on the same spatial and temporal arrangement There must be both ecological and economical interactions between the woody and the non-woody components to qualify as an agroforestry system” (Lundgren, 1987). Lundgren (1987)
further notes that agroforestry system entails growing of two or more plant species in spatial and temporal arrangement which may include raising of livestock and at least a plant component preferably a woody perennial tree or shrub.

A typical agroforestry system usually has two or multiple products or benefits within the same ecosystem. Furthermore, the normal cycle of agroforestry system is usually estimated to last for at least more than one year. Any basic or simple agroforestry system(s) is increasingly becomes a complex ecological (structurally and functionally), and it encompasses a complex socioeconomic as opposed to traditional mono-cropping system (Lundgren, 1987). Adoption of agroforestry system entails a variety of goals and objectives, represents integration between agriculture and forestry, and espouses a mixed land use system. Steppler &Nair, (1987) notes that a typical agroforestry system allows symbiotic economic and ecological interactions between the woody and non-woody components to increase, sustain, and diversify the total land output.

In arid and semi-arid environments, agroforestry systems in Kenya are increasingly becoming essential in providing greater insurance against unfavorable weather conditions that usually reduces food crop production; reduces or depletes grazing pastures, leading to food insecurity. Within the dry land system, many multipurpose trees such as *Prdsopis cineraria*, *Zizyphus rotundifolia*, *Casuarina* spp., *Tecomella undulata*, *Acacia tortilis*, and *Dalbergia*shoo are able to thrive and withstand long periods of drought. Consequently, crops grown with these trees may not show any significant reduction in crop yields. Perennial shrubs such as *Sesbania* and *Cajanus cajan* have potential to improve production of food, fodder, and fuelwood (Jama & Zeilis, 2005).

There is a compelling evidence in the development literature that link peacebuilding with poverty eradication and food security as highlighted by Borlaug (2004)
that “World Peace cannot be built on empty stomachs” not only is food security essential for conflict prevention in conflict-prone countries such as South Sudan, food insecurity has a direct impact on World peace as food security is a prerequisite for a peaceful environment in our world today (WFP/USA, 2011). Several international donor agencies and NGOs are supporting several agricultural projects in Jonglei with the main objective of increasing access to food security and peacebuilding including direct financial support to women agroforestry farming groups. This multimillion dollars project aim to increase food security and mitigate conflict for the impoverished rural population in Jonglei who are affected by persistent environmental hazards and intertribal conflict (NPA, 2011; USAID, 2011; Sudan Tribune, 2011).

For comparison, agroforestry as sustainable agricultural systems has been successfully used to significantly increase crops yields in dry land in several African countries with similar ecosystem to that of South Sudan. For example, (Buck, et al., 1998) found out that under fully-grown of *Faidhlerbia albida* in parkland systems crops yields of sorghum (the main stable crop in South Sudan) were increased by 36 percent, in Ethiopia and 125 present, in Burkina Faso respectively. Additionally, under the same system, maize (the second staple crop in South Sudan) yields were increased by 100 percent in Malawi (in a dryland climate) and maize yields were increased 76 present in Ethiopia. In the Blue Nile region of North Sudan for instance, high yields of sorghum crop under rain-fed *Acacia senegal* agroforestry system were reported. Additionally, high yields of sesame were also reported under the same system as compared to mono-cropping system in the same area in Sudan (Raddad & Luukkanen, 2006).

Miller, (1999) argues that the traditional silivopastoral and agrosilvopastoral systems in the arid or semi arid climate have shown high promises in supporting food
security and livelihoods of the rural communities in Africa. This system encompasses maintenance of naturally dispersed or systematically grown leguminous trees in the rangeland. For example, a literature review conducted by Miller (1999) notes that traditional agrosilvopastoral technologies have shown remarkable results in dry land areas western Kenya. This system has socially and economically supported livelihoods of several tribal groups living in this area. The robustness of this system lies in the close interaction between trees, cops and livestock. Miller, (1999) summarizes this beneficial interaction in the following points:

- Livestock provides farm power to transport crops, farm input and ox plough that provides tillage for large fields including non-arable land that maybe challenging for women to cultivate by hand,
- During times of crops failures part of the investment spent on the failed field crops could be redeemed through livestock grazing on failed farm crops, hence increases their body weight while increasing their market value,
- Livestock are usually used as a store of value that can be reinvest in crops production through the sale of livestock during times of needs either through sale of healthier animals, or additional income generated through the sale of milk, meet and hide.
- Farm or rangeland trees (leguminous) provides high protein fodder, traditional and ethno-veterinary medicines, shade to livestock, hence their body weights are significantly increased, and their calving, milking as well as their market value are also greatly improved.
• Trees can provide fertilizer in the form of nitrogen fixation, litter and biomass to the soil, while livestock can provide manure through recycling of nutrients that can be available to trees and crops.

• This system can provide farmers with stable, diversified sources of food security, fuelwood, medicinal herbs and income from the sale of tree and non-tree farm products harnessed from the system. As seen from the above discussion, the adoption and up scaling of various agroforestry systems in Jonglei can in many ways support food security, prevent conflict and enhance peacebuilding.

A host of international donors, including USAID, SNV and FAO have recently funded and facilitated an international workshop on the prospects of Acacia Gum production system South Sudan (SNV, 2009). Findings from this intentionally well-attended workshop suggest that Sudan is indeed the world’s largest producer of Gum Arabic. Additionally, South Sudan is in the fourth place but has not fully exploited its Gum Arabic potential, due to the long civil war. What makes the prospect of Gum Arabic production to have a great future prospects in the new country is that South Sudan has very high Acacia Gum trees densities, better than the ones in Northern Sudan (estimated at 994 trees per hectare) as well as favorable ecological and climatic condition that can potentially supports large expansion in Gum Arabic production. Additionally, findings from this workshop revealed incorporation of food crops with the leguminous trees (Acacia agroforestry systems) can potentially and significantly increase crops yields, diversify income with many products that can support both local and overall country economy from farm products and exports of Acacia Gum to the international market. Given that, the prices of Gum Arabic have recently up-surged in the international market from $1,800 per metric ton (PMT) to $3,700 PMT (Agrigum, 2011). Findings from the workshop also
reveal that Jonglei state is located in the heart of the Acacia Gum belt with high Acacia Gum tree densities with suitable agro-climatic conditions that can support expansion and development of large Acacia Gum plantation through agroforestry systems. With some foreign investment, this system could potentially support the local economy in Jonglei and that of South Sudan (SNV, 2009).

2.4 The Conceptual Framework

The conceptual framework for this study is adopted form (OECD, 2009) armed conflict lens. The key concepts for this framework are the negative and positive influencing factors of the intertribal conflict in Jonglei. These key concepts are the negative and positive influencing factors of this conflict. These factors include institutions, agents and instruments. Additionally, this bottom-to-top framework links all the four levels, starting from the local, to the national, regional and the global and is a “strategically integrated approach” appropriate to address a complex emergency situation such as the one in South Sudan (OECD, 2011, Oxfam 2011). It’s also a system perspective, that supports people as they engage in agroforestry farming system aiming to transforms their lives from the state of being food insecure (that triggers intertribal conflict) to a state of food security and social stability that would potentially contribute to the wider peacebuilding efforts through approaches such as agroforestry system (WFP, 2011, p. 8, FAO, 2010). Furthermore, this framework espouses a people-centered perspective as they embark on their livelihood activities as means of self-support. Hence, adopting a bottom-up approach grounded in the in this conceptual lens is key to “developing local capacities” as the entry point of development intervention with financial and technical support from the international NGOs and donors that is responsive to the needs and builds resilience of the local in the event of
shock caused by hazards and conflict (OECD, 2009:52).

Within this system, people are perceived as “active participants” in development programs and who have a say in the process of designing, planning, implementing and evaluating projects as opposed to being just “passive recipients” of humanitarian aid assistance (Oxfam, 2011). This framework, locates both formal and informal institutions of governance at the state and federal levels. The informal institutions (traditional and cultural) are mostly traditional systems, norms rules and practices among ethnic and tribal groups in Jonglei. These institutions are challenged to address and mitigate conflict. This framework also includes agents that are the perpetrators of the intertribal-armed violence in Jonglei. These groups consist of a growing number of uneducated, unemployed youth and armed tribal militias whose motivation is to use armed violence to raid cattle and loot any “lootable” items as a means of meeting their food security and livelihoods. Equally, the instruments that are featured in this conceptual lens, focuses on supply and availability, widespread and proliferation of small arms and weapons and other remains of war that reinforce conflict and violence, in addition to factors affecting their supply in Jonglei State. Central to this system are the people, mainly agropastoralist rural communities, societies and groups of women and youth farmers affected by intertribal violence who are engaged in agroforestry practices that provide them with access to food security and potentially contribute to conflict prevention and peacebuilding.

However, lessons learned from similar situation such as the one in South Sudan have shows that institutional weakness at the national level, inadequate legislation or law enforcement capacity, coupled with incompetent security management and weak border controls pose a great challenge to conflict prevention and peacebuilding efforts. Plausibly, conventional approaches to addressing instruments have proven to be limited in their scope
to technically and successfully control illicit arms proliferation because they fail to address the root causes that underlie the use of arms (HSBA, 2011). Equally, the “second-generation” disarmament efforts are adopting more developmental oriented approaches to address the underlying demand factors for small arms and the factors creating the enabling environment for poor communities to perpetrate armed violence (for example to access sources of food (ibid).
Figure 2.1: The conceptual framework: Agroforestry systems for food security, social stability and peacebuilding.

Source: Adopted by the author from OECD, (2009)
2.5 Summary

This chapter examines the relevant literature in the field of natural resources management, agroforestry, food insecurity, and conflict stemming from food insecurity, and competition over dwindling natural resources. Against this background, this chapter established the connection between the eruption of intertribal conflict due to growing numbers of unemployed, illiterate, and marginalized youth. This chapter also explores the instruments of conflicts that include the proliferation of unregulated weapons of war and factors that may affect their supply. This chapter also introduces the conceptual framework that guided the study and afterwards the findings discussions in chapter six.
CHAPTER THREE
METHODOLOGY

3.0 Introduction

This chapter explains the theory behind the fieldwork, the design of the research, and the method used for data collection and analysis. This qualitative research strategy is based on an instrumental case study within a bounded system of specific setting and context follows Stake (1995) approach. According to Tellis (1997), a case study is an appropriate methodology particularly when a comprehensive, in-depth inquiry is required. Case studies have been utilized in an array of social science inquiry. While other methods of data collection and analysis have a tendency to conceal some essential details (Stake, 1995), case studies are designed to reveal and produce details from the perspectives of the participants by utilizing multiple sources of data. The unit of analysis is a significant element in case study. It is essentially a plan of action of one case as opposed to actions taken by individuals or group of people (Tellis, 1997). Therefore, case studies are an essential means of enriching human knowledge and learning.

This research aims to explore the role of agroforestry in supporting food and livelihoods security environmental rehabilitation, peacebuilding in the context of intertribal conflict in Jonglei stat, South Sudan. Therefore, the aim of, this case study is to intrinsically generate context-dependent knowledge, based on real life and human experiences. The data collection for this study was based on multi-sources data collections, which include participant observations in situ, key informant’s interviews, farm visits, and farmer group discussions. The study utilizes a qualitative phenomenological research design which is an appropriate strategy for an exploratory inquiry such as the case with this study.
3.1 Epistemology

This study follows a philosophical paradigm known as social constructivism. Social constructivist research tradition traces the origin of knowledge, understanding and meaning to human relations and social interactions (Reason and Bradbury (2008). According to Denzin and Lincoln, (1998) Constructivist theory argues that to understand the complex world of lived experiences we must interpret it through the perspectives and experiences of those who live it. Social constructivism inquiry is principally concerned with how people construct and make sense of their World. It articulates how humans understand or construct their life’s experiences in a specific linguistic patterns, artifacts, expressed in social and historical context, thus, knowledge is not discovered but produced through social discourse (Schwadt, 2001). Furthermore, constructivism proposes that knowledge, meaning and understanding of the “phenomenon” are constructed by social actors (involving both the researcher and the researched) in specific context and place, meanings and events are fashioned through prolonged, complex social interaction pertaining to historical period, language and action (Denzin and Lincoln, 1998). Constructivism postulates that personal meaning is made by the inquirer and the inquired and it is therefore highly relevant to a study where participatory and qualitative methods are used to understand the relevance of food security through agroforestry to human security and well-being. Additionally, reality is individually constructed as well as socially negotiated within specific social context and time period (Merriam et al.2002; Schwadt, 1994)

This research is informed and influenced by the feminist standpoint perspective. Feminist research objectives seek to empower and liberate women and other marginalized and oppressed groups and people from social discrimination (Schwandt, 2001). However, feminist standpoint research is guided by women’s lives realities, experiences, rights, and
aspires to give voices to voiceless women. Feminist standpoint and critical hermeneutics are about how women construct and make sense of their world, based on their lived socio-political experiences. As such, they emphasize how gender is socially constructed (Denzin and Lincoln, 1998). Feminist research seeks to bring to light discriminatory practices against women in an effort to eradicate gender inequality. This has often been sought through women telling their own narratives and experiences, seeing and understanding the World through the lenses and experiences of oppressed women (Brooks and Hesse-Biber, 2007). Feminist standpoint epistemology aims to locate women’s “concrete experiences” at the heart of the research process, thus, elucidating the vision and knowledge of oppressed women to foster social justices and social change (Brooks and Hesse-Biber, 2007). The feminist standpoint approach is more complex and multidimensional and continues to evolve over time. As such, the feminist research approach no longer equates women’s experiences or conflates all women into one oppressed group. Instead it identifies that women hail from a diverse range of class, cultural, and racial backgrounds, which inhabit many different social realities, and endure oppression and exploitation in many different shapes and forms (Brooks and Hesse-Biber, 2007).

3.2 Research Methods

This research process incorporates the community participatory paradigm and collaborative inquiry techniques. As explained by Tellis (1997) this study is based on multi-perspective approach as it is not only considers the voices and perception of the “main actors”, this case the farmers, but also incorporates the contribution of a wide range of relevant stakeholders to the study. Additionally, this research process encompasses a participatory tool for development research known as Socio-Economic and Gender
Analysis tool (SEGA). Participatory research is all-inclusive and it advocates for social change, economic justice and empowerment of marginalized and disenfranchised communities. The participatory research approach has been used by different schools of thought to meet challenges of social transformation, socio-economic development and peacebuilding (Rivera, 2009). Participatory approaches focus on community change and assume that ordinary people are capable of critically reflecting and analyzing their personal experiences and social challenges and peacebuilding (Rivera, 2009). Participatory approach is a people-centered perspective, it builds on people’s knowledge and social networks in changing their lives.

3.4 Research Design

As recommended by Yin (1994) this study was designed based on the case study procedure. These procedures included the skill of the researcher to ask relevant questions and be able to candidly interpret the responses, be a good listener, be flexible and adaptive in order to react to complex circumstances, have deep understanding of study context, and not to be biased by preconceived ideas.

Against this background, this investigation uses qualitative methods to build on South Sudan National Households Baseline Survey (NBHS) which was conducted in 2009/2010 by South Sudan Center for Census, Statistics and Evaluation (SSCCSE). Simultaneously, this study is informed by the Annual Needs and Livelihoods Assessment (ANLA) which was conducted in 2009/2010.

This qualitative research utilizes the Socio-Economic and Gender Analysis Program (SEGA) tool in order to aggregate and explore in more depth and details, challenges and complexities faced by women in the post conflict context in Jonglei state. The protracted
war in South Sudan has resulted in high rates of extreme poverty and deprivation, especially among women. Women constitute more than 80 percent of farm labor in South Sudan. Gender analysis and disaggregation is necessary in order to determine specific roles of women in the hierarchal rural community and to understand how women function and what resources are available to them. Furthermore, using SEGA provides women with a voice and consolidates their collective strength in order to mitigate the effects of poverty and marginalization (Hill, 2003). A participatory research tool for data collection provides a communications space, and thus, reduces the power inequality which usually exists between the researcher and participants (Creswell, 2007). Improving access to food security and enhancing people’s livelihoods in a conflict situation is quite complex and calls for a comprehensive and multidisciplinary approach that includes collection, management and analysis of data for agriculture and rural development (Tanner et al., 2006).

This research design has set out flexible guidelines which logically connects a theoretical paradigm to overall research strategies and empirical data collection method. Furthermore, this research design locates the inquirer in the empirical milieu of the study, thus connecting the researcher to the specific sites, communities, groups, institutions and organizations relevant to the subject of the study and research questions.

This qualitative inquiry is designed to use multiple sources of data in order to establish trustworthiness and authenticity of field data through the process of data triangulation. Triangulation is the process of juxtaposing various data or “views” accruing from various respondents who have been exposed to the same sets of research questions to reduce the possibility of data misinterpretation and see the same research question through different perspectives (Richards, 2005). The triangulation approach used in this study is
known as data sources triangulation which proposes that the researcher looks for data consistency among different contexts (Tellis, 1997) See table 1.2.

3.5 Partner Organization

This study was conducted in partnership with ADRA/ South Sudan (The Adventist Development and Relief Agency (ADRA). ADRA is an international non-profit faith based humanitarian Organization operating in the field of development and relief in Sudan since 1985, with its head office in Washington DC, USA. ADRA’s mandate is to improve livelihoods and support resource -poor Internally Displaced Persons (IDP’s) and smallholder farmers to “attain food security” (ADRA, 2008) .ADRA Sudan has a vast experience in implementing large size programs within various sectors throughout South Sudan. Over the years, ADRA has accumulated significant amounts of knowledge and insight on the situation in South Sudan, and has also built good working relationships and partnerships with the local communities at the grassroots levels, local government authorities as well as other organizations operating in South Sudan. ADRA is currently supporting smallholder rural communities in the field of food security, primary education, health, and water and sanitation programs in Bor County in Jonglei State. ADRA has helped my research process by providing some of the logistical support to identify several locations where this research was conducted. ADRA/Sudan has officially requested me to include some of their current projects in this inquiry. Before data collection, research questions were pre-tested with ADRA/South Staff with full participation of my four research assistants and at the end of this mock exercise ADRA staff provided their comments which were incorporated in the final research instruments.
3.6 Research Assistance

Several organizations have provided assistance to support this research. Before entering the field, the International Council for Research in Agroforestry (ICRAF) provided technical support through their facility in Nairobi. At the field level ADRA/South Sudan provided a vehicle, a guard, lodging and office space. During my research period in the field I was assisted by four research assistants. ADRA and FAO assisted me through a competitive and transparent process to select my final list of a total number of four research assistants, two men and two women. The men had post secondary education. One of the women research assistant, with secondary school education, joined my research team at a later stage, and participated mainly during the women farmers’ discussion group.

My research assistants were knowledgeable, and had great understanding of the local culture and people. I particularly felt the importance of having a local research assistant during two critical stages of my research proceedings, first, when my second research assistant guided our vehicle through unavoidable landmines field because of his thorough knowledge of the area’s landscape. The second instance was when we suddenly encountered armed youth, thanks to my research assistant who was familiar with the group and was able to negotiate our safe passage through these insecure areas. Though I hail from the area, I felt that the protracted war has changed the norms and the tradition of the local population. Without the help of my research assistants it would have been extremely difficult for me to complete this study.

3.7 Data Acquisition Methods

According to Schwandt (2001), the field is not an object out there to be discovered by the researcher, rather, it is a web of interaction, reflections and relationship between the
researcher and participants, and thus, the field is a stage where “knowledge is constructed”. The process of collecting field data took sometime due to logistical and security constraints. I was directed by the Canadian diplomatic mission in South Sudan to Contact the United Nations Mission to register as an international researcher in order to get security and logistical support from the UN mission in case of emergencies or medical evacuations, given that Jonglei State is a security hazard area due to continued intertribal conflict and the presence of active political and military insurgency in some parts of the state.

Against this backdrop, the data collection commenced with Key Informant Interviews (KII), farm visits and farmers’ group discussions. Nonetheless, during farmers’ group discussions the researcher and the team spent long hours of observation and interaction. Certainly, it is during these long discussions with farmers and community members that the researcher gained an understanding of various farm livelihood activities and interactions taking place in the community.

### 3.7.1 Key Informant’s Interviews (KII)

KII are useful tools for exploratory research. A key informant is usually an individual who is knowledgeable and has expertise. She/he is purposely selected to provide specific information relevant to the study or problems and is willing to share knowledge. To obtain the necessary information from a key informant, a researcher can converse with them informally, use formal techniques such as written questionnaires, personal interviews, group interviews or community forums and public debates (McKillip 1987). The sampling method for KII of women and men involved in this study was purposive maximal sampling as suggested by Creswell (2003). Various KIIs were conducted at different locations with key stakeholders located in Sudan and Kenya. Throughout the study, 24 KII interviews
were conducted at three important levels. The first level selected for KII informant interviews was the international/regional level based in Nairobi, Kenya, where very important regional and international organizations working in the field of agroforestry research and environmental conservation, namely ICARF and UEP, are headquartered. The second level where KII interviews were conducted was Khartoum and Juba, both the federal capital for Sudan and South Sudan, respectively. Juba and Khartoum are both the venue of various in-country head offices of the United Nations Agencies and NGOs/INGOs. The third level where KII informant interviews were conducted was the state and community levels in Bor, Panygor, Akobo, and Pibor, where influential community leaders, political figures, law makers, agricultural/veterinary specialists working in public service and NGOs located in.

Prior to commencement of field data collection, I was formally introduced by the management of ADRA to the local paramount chiefs, religious leaders, district courts, committees, and native administration.

### 3.7.2 Oral Histories

Upon arrival in the field, I held meeting sessions with the State Ministry of Agriculture and forestry. After this meeting, six key informants from different tribal background and gender, with considerable experiences on agroforestry, were chosen as key informants and oral history interviewees. These individuals provided rich information about native tree species, crop-tree-animal interactions. They indicated that how trees have provided socio-economic, medicinal and cultural benefits to the local population, especially during the time of war and food crises. Oral histories from key informants provided important information for this research, as they traced the practice of agroforestry-related farming systems and
its contribution to access to food security and economic recovery, stability, social transformation, peacebuilding and strategies used over the time for combining trees and crops for human and animal consumption. The data that emerged from these interviews was later used to generate the appropriate themes for farm visits and discussions with farmer groups.

3.7.3 Farm visits

In the context of South Sudan tribal chiefs, witch doctors and community opinion leaders still command a significant leverage over the rural population which has a high rate of illiteracy and poverty. Therefore, introduction of the research subject to the local and community was necessary in order to explain to the community the purpose of my research project and the potential benefits the community might receive from my research findings. Thus, to be granted approval by the community leadership signify entering to the community and call on its members to cooperate. and allowed me and my research team to freely enter the community and conduct interviews, especially with women, because of women’s special status in the patriarchal communities in South Sudan. However, according to the best practices and due to respect for the local culture and customs, I was careful to hold all women farmer discussions in either the farms or workshop hall (simple structures) constructed by International Non-Governmental Organizations (INGOs) as training facilities for women. All interviews and focus groups involving women were held in places where participants felt comfortable.

A list of potential farms to be visited by the research team was generated in consultation with ADRA, FAO, SMAF and AYAD and a sample of 8 farms were selected randomly according to the following criteria while the communities were selected based on the following criteria:
All farms and communities selected were located within conflict district of the livelihoods zone of Nile/Sobat Rivers and pastoral, which are practicing similar types of agroforestry of smallholders farming systems and livestock rising.

- Have agroforestry, and cattle keeping as the main support for their livelihood.
- Have farmers and cattle herders that represent a range of age groups, specifically youth, former combatants including women of various classes, age groups, marital status including women in polygamous relations, widows who are either IDPS or sedentary or nomadic.

### 3.7.4 Farmers’ Group Discussions

Women constitute more than 80 percent of the farmers’ population in South Sudan (SSCCSE, 2010). As such, women farmer group discussion was pivotal to this research. The researcher and the research team in conjunction with FAO conducted 12 farms field visits and facilitated six farmers’ group discussions in six different communities, with the group sizes ranging between 9 to more than 80 participants depending on the location and day of the week. During weekends the groups were less because this is usually when women sell their farm produce. The farmer discussions generally started with a formal introduction of the researcher and his team, by either ADRA or FAO representative. This was followed by a brief introduction by the researcher outlining the research objectives and goals, followed by farmers’ plenary discussion where every participant was given freedom to speak and express him/herself freely about the research questions and issues pertaining to the research objectives. In order to build mutual trust and confidence, it was necessary to allow the women to express themselves freely and to let their voices, perspectives and concerns to be heard. The women’s group meetings were usually without the presence of
the chief or other men in positions of power. As a result, the discussions were very detailed and informative. After each discussion the researcher and his team held a debriefing session where notes and different perspectives from the discussions were compared and recorded.

3.7.5 Participant Observation, Daily Research and Journaling

Participant observations were crucial to this study as they provided important and insightful information that complemented the responses produced through daily research in the communities, including women farmer group discussions, community meetings and semi-constructed interviews. Participant observation is a way of knowing and acquiring knowledge. It includes direct observation of activities, political, logistical and ethical concerns of the groups under the study. It allows the researcher to become socialized while maintaining a respectable, empathy but not sympathy with the group under study (Schwandt, 2001). Participant observations took place before (exploratory method) and during or in relation with farm visits (supplementary method). It involves observing agroforestry farming practices and other households’ activities without a special planned program, this allows for informal conversations with participants that will generate understanding and knowledge about the activities and the setting in which farmers activities are taking place (May, 2001). The researchers used journaling to continuously record field notes and create field journals for each day and time spent in the field throughout the fieldwork period.

3.7.6 Focus group Discussions

Two focus group discussions were conducted during the period of this study. The participants were selected in consultation with ADRA and the State Ministry of
Agriculture and Forestry in Jonglei State. The first group was made up of men and women from different ethnic backgrounds. They included members of parliament, chiefs, farmers and cattle keepers as well as young people. The second group was made up of only women, mainly farmers from different ethnic and age diversity. The first focus group discussion meeting was conducted under the community tree where all the members of the community felt free and comfortable. The second group’s meeting was conducted in the women training center. All the two meetings were conducted in English, Arabic and the local dialect of either Dinka or Nuer. I facilitated the meetings and recorded the notes in English while the research assistants translated from Arabic, Nuer and Dinka to English and recorded in Dinka or Nuer.

3.7.7 Semi-structured interviews

Interviewing is certainly one of the most important methods of exploring people’s experiences, perception and understanding of issues of importance in their lives. It can be conducted in a form of face to face conversation, or through other means of communication. Interviews are ideal methods of collecting rich and insightful data in comparison with other means of data collection (Richard, 2005). The research team conducted thirty semi-structured interviews with individuals and key informants. Semi-structured interviews conducted during field work utilize an open framework, which allows for focused, conversational, two-way communication that has provided in-depth and rich data. The process was interactive which encompasses the process of both to give and receive information between the research team and the respondents. Unlike the questionnaire framework, where detailed questions are formulated ahead of time then presented to the respondents during the time of the research. However, for the purposes of this study, the semi-structured interviewing started with more general questions or topics. As relevant topics were initially identified,
and the relationship between the research topics and the reaction from the respondents became more specific, new questions were developed based on the new context and issues. Not all questions were designed and phrased ahead of time. Instead, the majority of questions were created during the interviews, allowing both the interviewer and the person being interviewed the flexibility to probe for details or discuss issues.

### 3.8 Data Analysis

All the data collected from different respondents were recorded as accurately as possible during data collection while in the field. The data were then transcribed, examined, tabulated and arranged and coded independently to look for meanings and themes in the data. Using open coding was useful to create mutually exclusive categories. The transcripts were then read thoroughly several times to identify major themes and perceptions to compare cases, attitude, blend combination of different categories to find patterns in attitudes on the subject of study, for example by gender, age and experiences. These major themes were then assigned numbers. This process was followed by thematic analysis across the four areas visited to further identify the connections between themes in each case to determine the similarities and the differences between each area. The objective of identifying and categorizing the themes within and across and areas visited was to identify the similarities, and differences as regards to key themes that were important to determine the relevance of agroforestry technologies and peacebuilding nexus in Jonglei stat. After reading each interview transcript thoroughly for several time, emerging themes and supporting quotation were then recorded in a spreadsheet. The process was applied to each farmers group’s discussion. Key informant interviews and discussions were also transcribed and coded using the same process but each was assigned
deferent codes. Farms visits and field observations were also recorded to support my findings. Results were then compile and recorded in the findings chapter.

3.8.1 Limitations

Despite the effort made by the researcher, this research was limited and constrained by several factors and challenges. The first limiting factor of this study was the time factor. Time was very short given the vastness and the difficulty of the terrain that was covered during the research. The research proceedings started in Khartoum the capital city of North Sudan, then moved to Nairobi in Kenya and Juba, Bor in South Sudan. Most of all, traveling inside in Jonglei, South Sudan was the greatest challenge given lack of any road network infrastructure inside Jonglei state. However, what made matters worse was the deteriorating security situation due to open rebellion, cattle rustling and the ongoing interethnic conflict. Another factor that limited this research was the heavy floods on 2010 in Jonglei that prevented me from visiting some important areas where agroforestry farms are located. Another challenge was the travel restriction imposed by the UNMISS and the government of South Sudan to areas in Jonglei still under heavy landmines since the time of civil war.

These above-mentioned limitations have restricted this study from covering important but isolated areas. Another constraint was lack of healthy accommodation. Due to poor living conditions, the researcher was attacked by malaria and typhoid fever. In spite all these logistical challenges and financial constraints, the researcher was able to cover 80 percent of sites intended for this study due to logistical help from the UNMIS air transport team and the WFP air operations in South Sudan. Another limitation is that findings of this study are context specific and cannot be generalized to cover other contexts.
3.8 Summary

Despite these limitations, the study was able to successfully collect data from multiple sources during five months of extensive fieldwork in Bor, Twich east, Akobo and Pibor involving extensive travel through very vast and logistically difficult terrain in South Sudan. An array of qualitative data collection methods were used including key informant interviews at the global, regional, national and in various diverse local communities. In addition, to field observation, these were farm visits, farmers’ group discussions, semi-structured interviews and focus group discussions. The diversity of the data aims to elicit a wider perspective due to the newness of the subject under the study.
CHAPTER FOUR
THE STUDY CONTEXT

4.0 Introduction

Chapter four begins with the background information of the new republic of South Sudan. It briefly explains the dynamics of politics and the civil war in South Sudan. It briefly examines the economic development and contribution of the oil to the economy of this newly born country and the challenges that faces it. This chapter discusses key Agro-Ecological features of South Sudan. In addition, this section presents various Agro-Ecological zones in the study area. In addition, chapter four presents the social and cultural Structure in South Sudan. It discusses the gender roles in the livelihoods zones in Jonglei. This chapter presents the South Sudan forestry policy framework, which espouses to use forestry and agroforestry resources to support the livelihoods of the people of South Sudan. Finally, chapter four ends with brief summary.

4.1 Geography

South Sudan is the newest Country in the World, with Juba being its capital and the largest city. The population of South Sudan is 8.26 million, with a total area of 644,329 sq. km. The proportion of its population is divided into 4.29 millions as males and 3.93 millions as females. The population of South Sudan is quite young with 72 percent of its total population being under the age of 30 (SSCCSE, 2010). Boarded by Ethiopia, Kenya, Uganda, and the Democratic Republic of Congo, South Sudan is primarily divided into 10 different states each with its capital city (see the table below). There are wide variations in the population between states, with Jonglei being the largest and most populous state, at 1,358, 602 people, which constitute 16 percent of the total population in South Sudan. The least populous is found in Western Bahr el Ghazal with a population of
333,431 million that is four percent of the total population. The population of South Sudan is largely rural, with 83 percent residing in rural areas. This varies between states with 92 percent of the population in Northern Bahr el Ghazal classified as rural, compared to 57 percent in Western Bahr el Ghazal. This study focuses on the Jonglei state with an area of 122,479 km² and the population of 1.3 million people making it the largest and the most populous state among the ten states of the republic of South Sudan (SSCCSE, 2010).

Table 4.1: States, Capital Cities, and populations in South Sudan

<table>
<thead>
<tr>
<th>States</th>
<th>Capital city</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jonglei</td>
<td>Bor</td>
<td>1,358,692</td>
</tr>
<tr>
<td>Central Equatoria</td>
<td>Juba</td>
<td>1,103,557</td>
</tr>
<tr>
<td>Warrap</td>
<td>Kuajok</td>
<td>972,928</td>
</tr>
<tr>
<td>Upper Nile</td>
<td>Malakal</td>
<td>964,353</td>
</tr>
<tr>
<td>Eastern Equatoria</td>
<td>Torit</td>
<td>906,161</td>
</tr>
<tr>
<td>Northern Bahar-Ghazal</td>
<td>Awil</td>
<td>720,898</td>
</tr>
<tr>
<td>Lakes</td>
<td>Rumbeck</td>
<td>695,730</td>
</tr>
<tr>
<td>Western Equatoria</td>
<td>Yambio</td>
<td>619,029</td>
</tr>
<tr>
<td>Unity</td>
<td>Bentiu</td>
<td>585,801</td>
</tr>
<tr>
<td>Western Bahar-Ghazal</td>
<td>Wau</td>
<td>333,431</td>
</tr>
<tr>
<td>Total population</td>
<td></td>
<td>8,260,490</td>
</tr>
</tbody>
</table>

Source: South Sudan Centre for Census, Statistics and Evaluation (SSCSE, 2010).

4.3 Politics and Civil War

The Republic of South Sudan is the World’s 193rd and Africa’s 55th nations as of July 9, 2011. The World Bank, (2011) reports that the landlocked country of South Sudan started its existence with numerous and daunting challenges after its citizens’ voted with a 99 percent majority to break away from the Republic of Sudan in an internationally monitored referendum held in January 2011. This referendum was a culmination of the final benchmarks of the 2005 peace deal which ended a 22 year civil war (1983-2005). As indicated in the chronology, the country of Sudan has been at war with itself for most of its post-independence era. The first civil war erupted between the South and the North just
before Sudan gained its independence from the British colonial administration in 1955. However, the war came to a peaceful ending in 2005 after the two warring parties reached a peaceful settlement. (Please refer to the chronology of the conflict in Sudan in the appendix). However, as per the provisions of the Comprehensive Peace Agreement power sharing agreement, the former rebel’s movement, the Sudan People’s Liberation Movement (SPLM) became the ruling party in the semi-independent region of South Sudan. Therefore, the Sudan People’s Liberation Army (SPLA) became the official army of South.

Ostensibly, the CPA has effectively ended the North-South war. However, there have been an ongoing and low profile conflicts between the SPLA and the armed groups loyal to the movement in North Sudan. For example, the Sudanese armed forces (SAF) have been clearly and continually playing an antagonistic role throughout the interim period. Evidently, several international reports and studies have indicated that the (SAF) military intelligence have been directly providing weapons, ammunitions and funds to various tribes in South Sudan to fuel intertribal conflict. The intentions of SAF are to undermine and portray to the international community that the SPLM is unable to govern the people of South Sudan. Therefore, the independence of the oil rich South Sudan would result into a failed state that may disintegrate into a chaotic situation without the north playing a pivotal role guaranteeing the stability of South Sudan (ICG, 2009). In order to keep it loyalty, the government of South Sudan allocates approximately 40 percent of its annual budget (the total annual budget of South Sudan is $2.3 billion) to maintain its large army. This large army is primarily made up of former guerrilla fighters drawn from conflicting tribes in South Sudan, with very little or no professional military training. However, some elements of (SPLA) are reported to have been secretly supporting their
tribal affiliates, through directly getting involved in the intertribal conflict or through the provisions of weapons and ammunitions to their tribesmen (Small Arms Survey, 2007).

Despite the independence of South Sudan, the intertribal conflict continues to claim thousands of lives of the people of this new nation in 2012, especially those who live in the rural areas. For example, the international media reported that 3,000 people were killed and 80,000 cattle raided in the latest wave of intertribal conflict in 2012 between the warlike tribes of Nuer and Murle in Jonglei state (France 24, 2012). As a result of high rates of deaths and civilian displacement owing to this new cycle of intertribal conflict, the government of South Sudan has declared Jonglei state as an area of humanitarian crises that requires an immediate international intervention in order to save thousands of lives affected by this conflict. Consequently, the United Nations is organizing a high scale humanitarian emergency intervention, aiming to provide humanitarian assistance to more than 120,000 people affected by the recent intertribal conflict in Jonglei in 2012 (UN, 2012).

Despite several challenges, the elected government of South Sudan has established and consolidated its political institutions at the federal, state and at the local levels. At the federal level, South Sudan has adopted a democratic and decentralized presidential system. While at the state level, the governor and the state legislative assembly are elected officials. In addition, the lower system of government at the local level is made up of counties head by commissioners. Whereas, the smaller administrative units at the village level known as Payams and Bomas are headed by local administrators.
4.5 Economic Development

Generally, 90 percent of the households in South Sudan depend on subsistence smallholders’ crops production and livestock rearing as their mainstay. The practices of agropastoralism and pastoralism system in South Sudan entails a mixture of a growing variety of crops through slash and burn rain-fed monoculture, intercropping agroforestry system; while some irrigated crop production mainly vegetable gardening and fruits orchards are widely practiced near rivers, permanent water streams, and home gardens. Similarly, raising local livestock breeds mainly cattle, goats and to less extends sheep and chicken. From the time Sudan became an independent state in 1956, South Sudan has remained severely undeveloped. There have been no industries or infrastructures established or developed in South Sudan to date (CIA, 2011). For example, there is less than 50 km of paved roads in the whole country of South Sudan. There is no running water or electrical power in the major cities and electricity is generated through expressive small diesel engines to supply limited power to foreign organization and firms (Ibid).

Overall, the meager infrastructure left by the British colonial administration has been destroyed during the protracted civil war (GOSS, 2011). In 2010; only one percent of households in South Sudan reported that they hold bank accounts due to basic and evolving economic sector (SSCCSE, 2010). The United Nations Development program (UNDP) has ranked Sudan in 2011 as number 169 country out of 187 countries around the world based on its human development index (HDI). However, owing to lack of reliable economic data, the new country of South Sudan has not yet been assigned a human development index (UNDP, 2011). Although being a small actor in the global oil market, since oil was discovered in Sudan in 1978, it has since then significantly shaped the geo-political, economy as well as the future relations of both countries of Sudan.
The Republic of South Sudan has two almost entirely separate sources of economies, both formal and informal. The formal source of economy that provides nearly all the income of the Government of South Sudan (GoSS) is dominated mainly by production and exportation of crude oil, which also greatly contributes to the advances of employment in the newly born state. Oil production in South Sudan began in the 1990’s, and since then it became the mainstay of the economies of the South. South Sudan produces almost three-fourths of the former Sudan’s oil, an output of nearly half a million barrels per day. The Government of South Sudan (GoSS) obtains nearly 98 percent of its budget revenues from oil (CIA, 2011). To a lesser extent, South Sudan’s economy is also influenced by multilateral, bilateral and nongovernmental organization (NGO) aid. South Sudan has received more than $4 billion in foreign aid since 2005, mainly from the UK, US, Norway, and Netherlands. The World Bank plans to support investments in infrastructure, agriculture, and power supplies. The newly born country had a target for economic development and growth by six percent in 2011, and plans to increase growth by 7.2 percent in 2012 (CIA, 2011). The budget for 2011 made prior to South Sudan’s independence with an increase in oil prices indicate that oil revenues will provide 98 percent of the new of country’s $2.3 billion budget. South Sudan oil is still being exported through Chinese built pipelines at Port Sudan on the Red Sea. The 2005 oil sharing agreement called for a 50-50 sharing of oil profits between the two countries. That deal however expired on 9 July of 2011. However, despite being politically independent, South Sudan will undoubtedy continue to economically depend on Northern Sudan for exporting its oil for quite sometimes. This dependency stems from the fact that almost all the oil exporting facilities for South Sudan oil are located in North Sudan.
4.6 Agro-Ecological features of South Sudan

4.6.1 The White Nile

The White Nile is by far the dominant geographical feature and social landscape of South Sudan. Indeed 90 percent of land of South Sudan falls within the White Nile basin. The agro-ecological landscape of South Sudan is defined by two major water shed namely the White Nile and the Sudd. Approximately 20 percent of the White Nile falls in South Sudan. The water flow of the White Nile from Lake Victoria across South Sudan is about 23 billion cubic metres (BCM) of the total flow of the main body of the Nile, which amounts to 84 billion cubic meters measured at Aswan in Egypt. The White Nile provides South Sudan with all its water needs for its peoples, livestock and futures expansion in irrigated agricultural development including reforestation. The White Nile recharges the large swamps of South Sudan with a million cubic metres of water a. These watersheds are namely the Sudd (the Arabic word for barrier), Bahr el Jebel, Bahr el Zaraf, the Bahr elghazal. However, the Jonglei canal (where the state draws its name) was initially planned to channel the enormous water that is being lost to evaporation at the Sudd in Jonglei State.

4.6.2 The Sudd

The Sudd wetland in South Sudan is one of the largest tropical wetlands in the world. It is situated in Jonglei, near the lower parts of Bahr el Jebel in South Sudan. The Sudd wetland is a part of the administrative region of the South Sudanese. It’s located in five states of Jonglei, Upper Nile, Lakes, Unity, and Central Equatoria. The site of Ramsar wetlands in South Sudan lies within the floodplains of the Sudd region. The wetland is inundated by freshwater inflows from the spill of Bahr el Jebel that flows from Lake Victoria in Uganda and also flow from the overflow of the adjacent flat terrains in Jonglei
State. The area of the Sudd wetland consists of permanent swamps that extend from Jonglei to Lake No; it falls within three distinctive belts. A narrow Southern belt extending 146 Km long and 10 Km wide has a featureless floodplain with a self-governing mechanism that fills and empties to the west depressions in Jonglei state. The Flat central portion of the floodplain extending from Jonglei to Lake No has a width of 40 km and is the largest belt. The third and smallest belt is a northern portion extending from Lake No to the confluence of Bahr Elzerafi with the White Nile (two km wide).

The topographical feature of the area that makes up the wetland is an integral part of the Sudd region. The site falls within the mud flats of the Sahelian Region of Africa, situated at the lower division of Bahr el Jebel. The Sudd is an alluvial floodplain of geological formation consisting of vetric soils, which are interspersed by alfisols. The characteristics of the Sudd soil vary along the lateral range of the floodplain. Soils of the highland areas are composed of different kinds of loamy soils. These soils are general alkaline of low organic matter content, high salinity and a clay content ranging from 15 to 40 percent. The surface area of the Sudd wetland is approximately 30,000 to 40,000 km². Temperatures in the Sudd range between 30° - 33° in the dry season, and drops to an average temperature of 18° in the wet season. (Mohamed et al, 2006). Rainfall in a typical season lasts from April to November with 850mm/yr. in the northern part to 950mm/yr. in the southern part. The Sudd wetland is accustomed to seasonal flooding from July to December and an increased evaporation volume of water from the extended swamps. Humidity exceeds 80 percent during the rainy season, and drops to below 50 percent in the dry season (Mohamed et al, 2007).

The White Nile flows from Lake Victoria in Uganda through South Sudan to drain into the wetland in the Sudd of Jonglei. Other rivers that drain into the wetland have their
origin from the Nile-Congo divide. The southern limit of the permanent swamp is Bor, the capital of Jonglei state. The inflow to the swamps joins the outflow from the East African lakes, which then slowly respond to periods of high and low rainfall. As a result, the seasonal variable flows of the rain-fed torrents above Mongalla in Central Equatoria. For about half of the year, the flow at Mongalla relies on lake levels, while the high flows between May and October derive from local rain fall. Long-term variations in East African lake levels and outflows play an important role on the Mongalla outflow. The Sudd wetland acts as a giant filter that controls and normalizes water quality, and a giant sponge-like body that stabilizes water flow. The wetland is an essential source of water for domestic, livestock, and wildlife uses in Jonglei and Upper Nile states in South Sudan.

Being one of the largest floodplains in the world, the Sudd provides watering and feeding grounds for dry seasons grazing areas for most of 1.4 herds of cattle floodplain grasses that is used for grazing to herds of cattle. The Sudd also provides important habitat for various species of birds. The floodplains sustain the largest population of shoebill in Africa. The endangered white pelican flies over 2,000 km from East Europe and Asia to reach one of its most important wintering grounds on the floodplains in the Sudd flood plains in Jonglei. The wetland is also a well-fortified place for the black crowned cranes, which is a species that has been declared as vulnerable. Fish is also a means of livelihood in the Sudd. The Sudd environment sustains a variety other of species including: Cyperus, Phragmites (reed), Typa swamps (cattail), and wild rice (Oryza longistaminata). The growth of wild rice is a clear indication that rice crop can be grown widely in this region for local consumption and export. Other flora in the agro-ecological zone also includes papyrus, reeds, Acacia and water hyacinths. The Sudd environment is reported as a harbor to the largest population of crocodiles in the world. (El-Moghraby et al, 2006).
4.6.3 The Jonglei Canal

The Jonglei Canal was initially envisioned by Britain, which was the colonial power ruling Sudan in partnership with Egypt. Seeking to supply the Egyptian people with sufficient water for agricultural benefits, Britain proposed the Canal in the 1930’s. The Canal was intended to deliver 20 million m$^3$ (Ahmad 576) of water per day. The Jonglei Canal is the first phase in a series of proposed water conservation projects. The length of the Canal is 360 km, bed width of 38m, a 4 to 8m water depth, and a ground slope ranging between 7 to 12 cm/km. However the Canal project would result in shrinking the wetland by 40 percent. A second stage in the project was also planned, which would entirely dry up the wetlands. The Canal project did not materialize under British rule; it was later resurrected by the national regimes government in the 1970’s. The North Sudan government shares the increased Nile flow with Egypt and established that the Canal would assist the progress of development in the South but did not include the interest of South Sudan, thus it was attacked during the war.

4.7 Agro-Ecological Zones in Jonglei

Jonglei State is one of the 10 states that make up the new Republic of South Sudan. It is geographically located on the eastern part of S Sudan. According to S Sudan Center for Census, Statistics and Evaluation (SSCCSE, 2010), Jonglei State is the largest of the 10 states with a total area of 122,581 square kilometers, comprising 11 counties. In addition, this state is the most populous with a total population of 1.4 million and a density of 11 people per square kilometer, made up mainly of agro pastoral nomadic tribes of Dinka, Nuer, Murle and sedentary agriculturalists, Anyuak (SSCCEE,2010). Rural communities for this study are located in the following two livelihood zones:
4.7.1 Nile/Sobat Rivers Livelihood Zone

According to FAO (2010), this livelihood zone spreads alongside the great Nile and Sobat Rivers. This is where the majority of 1.4 million of the population live. This zone is administratively divided into nine counties: Fangak, Bor, Twich East and Duk, Akobo, Ayod, Uror and Nyrol. Due to its proximity to the Nile and Sobat Rivers, the zone is featured by fertile black cotton clay soil and swampy vegetation in the sudd areas. Inhabitants of this livelihood zone are known for practicing agro-pastoralism and keeping large herds of livestock with an estimated 1.5 million heads of cattle that sustains more than 90 percent of the population (FAO, 2011). During the dry season, these large herds of cattle graze in the vast toichs (flooded areas besides the Rivers in Dinka and Nuer land). In addition, subsistence rain-fed farming system is practiced with sorghum and maize as the main staple crops. Similarly, wild fruits and fish, which are in abundant supply, contributes significantly to food security for communities living in this zone particularly when food stocks are low either due to recurring conflicts or natural disasters such as floods and drought. The main ethnic groups living in this zone are mainly the Nuer and Dinka tribes.

4.7.2 Pastoral Livelihood Zone

This livelihood zone covers Pibor County, home to the warlike Murle tribes. The main features of this zone are its black cotton clay fertile soil, vast grassland, scattered trees and seasonal water streams that is a source of water during the rainy season only as it dries up during the dry season. The swampy plains in Dinka-land provide grazing pastures during the dry season for both livestock and wildlife. The main source of livelihood in this zone, particularly around villages, is mainly livestock products and subsistence farming of sorghum, maize, groundnuts and vegetables as well as wild fruits.
4.8 Social and Cultural Structure of South Sudan

The social and cultural structures of South Sudan have been severely affected by decades of civil war. Since the time Sudan became an independent country in 1956, there has not been reliable statistics data ever developed and recorded about South Sudan. The South Sudan Statistical Yearbooks of 2009 and 2010 are the first compressive and reliable statistical data recorded in South Sudan (SSCCSE, 2010).

The Statistical Yearbook for South Sudan of 2010 reports that the total population of South Sudan is 8,260,490, with a total area of $644,329^2$ km. The population of South Sudan is quite young. Key indicators for South Sudan records that 72 percent of the population are bellow the age of thirty years old. In addition, 83 percent of this population lives in the rural area with adult literacy rates of only 12 percent of the total population (SSCCSE, 2010).

There are approximately 65 local languages spoken throughout South Sudan. These languages are grouped into 40 percent Dinka, 20 percent Nuer and 10 percent Azande (ICG, 2009). See table 4.2 below

**Table 4.2: Major Tribal groups and languages in South Sudan**

<table>
<thead>
<tr>
<th>The tribal group</th>
<th>State s</th>
<th>Percentages to the total population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dinka</td>
<td>Jonglei, Warap, North and West Bahar-gal, Lakes, Upper Nile, Unity</td>
<td>40 percent</td>
</tr>
<tr>
<td>Nuer</td>
<td>Jonglei, Upper Nile, Unity</td>
<td>20 percent</td>
</tr>
<tr>
<td>Azande</td>
<td>Western, Equatoria</td>
<td>10 percent</td>
</tr>
<tr>
<td>Others</td>
<td></td>
<td>30 percent</td>
</tr>
</tbody>
</table>


Access to secondary health facilities in South Sudan is very low. However, the South Sudan 2010 Statistical Yearbook shows that only 70 percent of the total population has access to a primary health facility, while 30 percent do not have access to any health
facilities. Furthermore, only 55 percent of the total population in the rural areas has access to improved sources of drinking water, and 80 percent of this population category has no access to any toilet facility (SSCCSE, 2010). Decades of civil have destroyed almost all the meager school facilities in South Sudan. After the peaceful end to the conflict in 2005, the government of South Sudan has established several school facilities from scratch. For example, by the end of 2010, a total of 169 pre-elementary schools were built with 47,266 pupils, while 3,195 elementary schools were built with an enrolment rate of 1.3 million pupils, and 168 secondary schools were built with 34,487 students. Despite all these enormous efforts by the government of South Sudan, an estimated two million children are not attending schools in 2011 due to lack of schooling facilities, equipments and teachers (The Guardian, 2012a). The settlements patterns in South Sudan are very basic towns due to the displacement of a significant population of South Sudan during war compounded by high rates of poverty within its population. Against this backdrop, key statistical indicators for South Sudan shows that 83 percent of the total population of South Sudan lives in small mud houses with thatched roofs known as Tukuls (SSCCSE, 2010b).

Clearly, South Sudan society is inherently patriarchal in their nature. Male dominance is widely practiced despite the significant changes towards gender equality and the important roles played by women in post-conflict institutional and political development of this new country. For example, the interim constitution of South Sudan has provided women with equal representations as men at all the government levels including the private sector. However, due to low literacy among women in South Sudan, which is estimated to be only 10 percent of the total population, women’s roles are being constrained due to lack of education among women (IPS, 2012). For the most part religious affiliation is very diverse in South Sudan, with the majority being Animist and Christians,
and a minority of a Muslim population. Polygamous marital arrangements are widely practiced in South Sudan, especially in the rural areas. In the context of South Sudan, family sizes are quite large due to the livelihood pattern that requires family labor to farm the land and attend to the households’ livestock (DFID, 2011).

4.8.1 Gender roles in the Livelihoods Zones in Jonglei

Gender roles in the different livelihoods zones in Jonglei are very important in achieving food security, especially in Nile and Sobat livelihoods zone where mostly agropastoralism is widely practiced. Ideally, in this livelihood zone communities depend on a mixture of cattle herding crops production, fishing and wild food collection. The gender roles are divided based on the nature and the type of activity required from both men and women in such patriarchal society. Typically, during the crops planting season men do the heavy work such as land preparation and tree pruning especially during peak labor periods when collective labor is highly needed. Women do crops planting, weeding and harvesting, as well as all the post harvesting activities. In addition, women milk cows, collect fuelwood and prepare the food for the households. However, due to the impact of the long civil war most households in South Sudan are women headed. The rise in the numbers of widows in the post conflict context of South Sudan has placed a significant burden on widows-headed households. These widows headed household are faced with condition of extreme poverty in a patriarchal society such as the one of South Sudan. Generally, the numbers of female-headed in Jonglei state are higher than the numbers of male-headed households (WFP, 2010a). Undoubtedly, the impact of civil conflict couple with the inter-ethnic conflict in Jonglei state has clearly left significant numbers of women as households head widows (Mackenzie & Buchanan-Smith, 2004). Consequently, women
undertake all the farming activities including land preparation, planting and weeding in the absence of male. In addition, women take care of small livestock and milking cows.

Generally, the average number of members of households in Jonglei state is the highest in comparison to the general averages in the other states of South Sudan. WFP, (2010b) records the average household size in the Nile/ Sobat River is above eight members (Ibid). This high household size indicates that widow-headed households depend on their family members as farm labor.

In the pastoral livelihoods in Jonglei state, crops production is the main responsibility of women, while men devote most of their herding cattle (Omondi, 2010). In this livelihoods zone women undertake all the farming activities including land preparation, crops planting, weeding and harvesting. Women in this context are usually constrained by the lack of male labor. In addition to crops production women milk cows, cook and undertake all the other domestic work including fetching water and fuelwood.

Equally, the average household size in the pastoral livelihood zone is seven people (WFP, 2010). This high household size suggests that women in this livelihoods zone depend on family members for farm labor.

4.8.2 Gender Access to Land

Despite the clear provisions in South Sudan Interim constitution that permits women to free landownership, women rights to land are still restricted due to complex land tenure based on customary practices. Additionally, the South Sudan land Act of 2009 acknowledges the rights of all adults citizens of South Sudan to landownership regardless of sex or political affiliation, USAID, (2010). Regrettably, the legal framework in the post conflict South Sudan is not robust enough to ensure women’s secured land ownership,
thus, women in reality do not own land per se, due to strong patriarchal norms and traditional beliefs pervading throughout South Sudan, particularly in the rural areas that restrict and in many cases prohibits women from access to “secure landownership” (USAID, 2010; Patuliano, 2009; Shanmugaratnam, 2008). For example, in Jonglei state women landownership is restricted until when they are married and have children, and then they may partake in their husband’s land, thus, rights of landownership of older women and widows are more protected than younger women as long as they remain in the communities of their deceased husbands USAID, (2010). However, as consequences of the destructive two decade of severe and deadly civil conflict in South Sudan, during which a significant number of male have been killed and most of the communities were dislocated from their homelands and their social fabric destroyed, more than 50 percent of the returnees’ households are currently being headed by women. In this context, women have 100 percent to their deceased husband land. They are also provided land through customary practices where that grow permanent crops such as trees and shrubs that takes many years to establish. Equally, most stallholder agroforestry farmers in the rural areas in South Sudan are females as males are either killed during the war or prefer to go the large town and cities to look for job, while leaving women to take care of food crops (the Guardian, 2012 b). Additionally, as articulated by United Nations Children Educational Funds (UNCEF/ Sudan, 2008) that South Sudan is considered as an HIV/AIDS infested area, with HIV/AIDS being endemic, coupled with extreme poverty, high rates of illiteracy as well as lack of adequate health services, women’s rights to landownership are being further jeopardized, as more men (Husbands) are expected to die due to HIV/AIDS, leaving their infected wife (wives) without secure lands right or secure landownership. As the repatriation program of IDPs continues, the issue of women access to secure land
tenure continues to dominate efforts exerted by the government of South Sudan (GoSS) with its main international donors and development partners.

4.8.3 Gender Access to Capital

Generally, the post conflict situation is South Sudan is defined by high rates of poverty. The World Bank (2011) estimates that more 50 percent of households headed by men in South Sudan lives below the poverty rates (earning less than one dollar per day to meet their daily needs), while 60 percent of women headed households live below the poverty line. However, due to high rates of poverty and low rate of literacy among the population of South Sudan owing to decades of war, access to farm credit is not available from private creditors (Miller, 2008). The important role of women in the post conflict development in South Sudan has recently been heightened by the largest international development donors in the world. An international conference on engagement in South Sudan was recently held in Washing D.C, in United States of America. This conference recommended to the major international donors agencies and countries to establish a Women Bank in South Sudan, with an initial capital of 10 million US dollars. This Bank will provide women with access to low interest loans for agricultural development with social collateral. This social collateral system is intended to replace the physical collateral which women in South Sudan do not have (UN Woman, 2011).

Given the important role played by women in agricultural production and food security, several international donors and NGOs are providing women with capital access to crops for food production in Jonglei. For example, the Norwegian People Aid has been providing several women farmers groups with non-repayable financial grants to be invested in agroforestry farming systems (NPA, 2010).
4.8.4 Gender Access to Information and Organizational Support

Access to information for agricultural production and crop market in South Sudan is available to women through agricultural field Schools. In addition, men and women can access crops market information from South Sudan crops and livestock market information system (CLiMIS) supported by FAO, the government of South Sudan and other several NGOs. However, low rates of literacy among women are constraining their access to farming information.

Gender organizational support is important for women empowerment and building their social asset. FAO is in the forefront in supporting women’s organizational support through farmers’ field schools in Jonglei. Other donors such as USAID and EU are also providing women farmers in Jonglei with organizational support in order to develop their productive capacity and social network.

4.9 South Sudan Forestry Policy Framework

South Sudan is well endowed with a diversity of natural forest and woodlands, due to its geographical location that stretches from woodland savannah in the north to the rich moist and tropical and highland mountainous range in the south. It is estimated that natural forests and woodland of South Sudan covers a total area of approximately 191,667 km\(^2\) that represents 29 percent of its total area. The South Sudan Forestry policy framework is embedded in the significant role of forest and agro forestry in food security and poverty mitigation as well and ecological stability of the war ravaged region. However, the protracted civil war in South Sudan has caused significant destruction to the environment as well as enormous ecological disability. During the conflicts, both parties to the conflict, the government of Sudan and the Sudan People’s Liberation Army resorted to systematic
and deliberate destruction of forests as part of war strategy. As such, massive forest coverage have been eliminated either by direct cutting or destruction of forest by use of heavy war machinery such as tanks, bulldozers or by bombing either by land or by air in addition to chemical spraying, in order to clear areas covered with heavy forests and shrubs around garrison towns were governments troops concentrates or rebels combatant’s camps in order to deprived either forcers of hideouts in the bush.

4.9.1 Principal Objectives

Generally, South Sudan receives between 500-2000 mm/ of annual rainfall and has a fertile soil that is suitable for growing a wide range and variety of crops and trees. All the ten States of South Sudan have bio-climatic conditions suitable for growing staple food crops such as sorghum, mile, maize, groundnuts, cassava, rice and wide range of pulses and legumes that are grown for local consumption and local markets. Additionally, with immense water resources that South Sudan has in the form of precipitation and the River Nile, there are great potential to increase agricultural production through irrigated farming systems. With the diverse soils types well spread across South Sudan which provides various options to grow food crops. These immense resources if well used can support any community food security programs. However, lack of permanent roads will hamper any meaningful agricultural development. Roads are important channels form access markets for food crops. Ideally, the agro-climatic condition in all the ten state of South Sudan are suitable for growing commercially valuable trees such as Oil Palm, rubber trees as well as trees such as Acacia seyal or Acacia senegal that are the main producers of the profitable cash crop of gum Arabic.

From the forestry management view point, South Sudan can be generally divided
into three broad agro-ecological regions, based on each region’s soil and forests distinctive characteristic, the first region is the greater Bahr-el-Ghazal states, which is located north east of River Nile, with its ironstone lateritic soil to the south and alluvial plains in the center. Rainfalls range from 300-900 mm annually. The dominant natural vegetation is dry savannah woodlands. The main trees species include Acacia seyal, Acacia Mellifera, Balanties aegyptiaca, Acacia senegal. Gum Arabic production is the main source for the rural communities. The second region is the greater Upper Nile states, which lies northeast of the River Nile, (where Jonglei state is located). Rainfalls ranges is 700-1300 mm/annum, the flood plain around the River Nile are characterize with the rich alluvial soils. The dominant trees species are Acacia senegal, Acacia seyal, Hyphaene thebaica, Borassus aethiopum, while open woodland is dominated by Balanties aegyptiaca. The third region is the greater Equatoria state, located southwards with rain falls of more than 1200 mm/annum. This region lies in the green belt with its thick forest. The dominant species are Acacia senegal, Mahogany trees.

4.9.2 The Forestry Policies and Regulations

The vision of the Ministry of Agriculture and Forestry (MAF) in South Sudan is based on “green South Sudan, with fully recovered natural and plantation forests, effectively managed for sustainable socio-economic development of its peoples”(Lomuro,2007). The mission of this forestry policy framework is to develop and implement appropriate policies and regulation and legislations for institutional reform. This is achieved through fostering strategies for sustainable management of forestry sector, in order to meet the growing local and international demands for industrial and non-industrial timber as well as supporting the introduction of competitive private sawmills,
with modern market based forest industries. Additionally, MFA espouses to combat
desertification and desert encroachment by conserving forest biodiversity, tree plantation
and to reverse the declining forest cover by allotting a minimum of 20 percent of South
Sudan’s land to remain as forest area. The prime goals of South Sudan forestry policy
framework are to ensure the long-term health of our forest ecosystems for the benefit of the
local and global environments. This (FPF) espouses to enabling present and future
generations to meet their material and social needs while protecting the environment. The
GoSS will continue to support the forestry institutions and will enact proper policies to
enhance and increase adoption of agroforestry based initiatives in order to increase access
to food security and poverty alleviation for the resources poor.

4.9.3 The Guiding Principles for South Sudan Forestry Policy Framework

Forestry plans and programs in South Sudan are developed within the overall
framework of the Government of South Sudan National forest program (GoSS-NFP),
which is country focused, and owned by the people and the Government of South Sudan.
The National Forestry Planning (NFP) process is to commence with the necessary policy
and institutional reforms. This process will embrace participatory, bottom-up planning
process in order to draw South Sudan forestry Master Plans for duration of defined five
years periods (2007-2011) as well as in the long term projection. The responsibilities of the
GoSS-MFA are:

To ensure that GoSS is to take over and assume the responsibility to protect all the
national forest reserves in South Sudan are protected, preserved, and effectively managed
in a sustainable manner at the Federal levels in partnership with various States and counties
• To develop and ensure an accelerated approach for forest plantation in National forest Reserves ad public and community land with the consent of the local communities at all levels, while promoting compensatory afforestation strategies whereby low productive natural wood vegetation are replaced with well managed and highly productive plantations, however, an environmental impact assessment and due caution will be taken in order to ensure the conservation of biodiversity in the natural wood lands and vegetation.

• The Government of South Sudan is committed to integrated rural development through strategies that includes forestry, agro forestry systems aimed at ensuring that all the rural population of South Sudan have access to basic needs which includes sustainable household food security, shelter, wood fuel, safe clean water, sanitation and healthy environment and conservation of rural environment.

• Incorporating environmentally farming practices inputs such as chemical pesticides and fertilizers as well as a careful selection of appropriate technologies for forests resources and produce processing and utilization.

• The primary role of the MFA is to formulate policies, guidelines and in conjunction with South Sudan legislative parliament, while ensuring that forest policies are in line with, and supportive of overall Government of South Sudan post conflict rehabilitation, reconstruction and development strategies and approaches. Additionally, the MFA will incorporates and ensure that developments strategies and plans of international aid organization and specialized United Nations agencies in field of food security and environmental conservation.
4.9.4 Role of Communities
At the heart of this policy framework, is community participation in the process of policy formulation and implementation. The MFA seeks to combine public involvement with best available scientific knowledge and research in the process of managing and protecting forestry resources. Thus, local communities will be encouraged and supported to be major players in the forestation efforts throughout South Sudan. The GoSS will provide the necessary support for capacity building for impoverished rural communities to enable them manage their own forest. Furthermore, international NGO’s and local CBO’s will play a major role in promoting and ensuring community participation in forest protection and management. Additionally, community-private sector partnership will be encouraged for maximum utilization of forest resources.

Summary
This chapter briefly describes the relevant socioeconomic, environmental and hydrological context of the study. In this context, the Jonglei areas are endowed with immense untapped water resources suitable for agricultural development. This chapter describes how rights and access to land for women is still embedded in the cultural and traditional norms. The chapter looks at the emerging feminist voices for equal land rights as these rights affect women choice for agroforestry. The forestry policy framework of South Sudan was addressed in order to set the scene for the potentials of agroforestry and forestry resources in supporting food and livelihood security and environmental protection. The last part ends with the overview of the main livelihood zones of the study context.
CHAPTER FIVE
RESEARCH FINDINGS

5.0 Introduction

This chapter enumerates and summarizes key research findings in relation to the three research objectives. These findings are mainly elicited from twenty key informant interviews (KII), 14 farms visits, 6 farmer’s groups’ discussions (FGDs) and two focus groups discussions (FG). Additionally, other findings for this research were drawn from daily journaling, reviews of available archival documents and reports, personal observations and semi-structured interviews from smaller samples, drawn from the farmers’ group discussions. Due to the diversity of both the locations and professions of key informant interviewees, their findings are further assembled into three categories. The first category represents the key informants interviewees at the regional and international level based in Nairobi. The second category represents key informant interviewees at the federal levels based in Khartoum (the federal capital of the former united Republic of Sudan), and Juba, the capital of the newly created independent State of South Sudan. Lastly, the third category represents key informants interviews working with international aid agencies, United Nations agencies, and the various senior state government officials based at the state as well as at the community levels in Jonglei State, South Sudan.

The first section of this chapter presents a brief demographic profile of the participants and brief community and farms characteristics based on farm visits, semi-structured interviews. This section also presents findings from farmer groups’ discussions perspectives in two summary tables. The second part of this section present finding from the key informants in a form of two organization analysis. This chapter is concluded with a brief summary of the entire chapter.
The breakdown of respondents in the semi-structured interviews indicated in table 5.1 illustrates that there was a very high number of widows in the sample. Out of a total of 100 farmers, 81 of the participants were women. Out of the 81 women, 56 of them were widows, 15 of the participants were women in polygamous marital relationship, 5 of the women were in monogamous marital arrangement and 5 of the women were unmarried. In the same sample, 24 were male farmers. Out of the 14 of the men were married while five of them indicated that they were not yet married. The very high numbers of widows in the farmers sample is primarily attributed to the long civil and intertribal conflicts. The farmers indicated that both conflict have killed most of their husbands. In this polygamous society if one man is killed he will leave behind several wives as widows (See table 5.1).

**Table 5.1: Sex and marital status of farmers’ participants in the semi-structured interviews**

<table>
<thead>
<tr>
<th>Sex</th>
<th>Married</th>
<th>Widows</th>
<th>Unmarried</th>
<th>Total</th>
<th>Total male &amp;female farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>P</td>
<td>M 15</td>
<td>56</td>
<td>5</td>
<td>81</td>
</tr>
<tr>
<td>Male</td>
<td>5</td>
<td>0 Widowers</td>
<td>14</td>
<td>19</td>
<td>100</td>
</tr>
</tbody>
</table>

*Men in this culture are mostly polygamous.*

The household is recommended by the UN as the basic unit of analysis when investigating the economic, food security and well-being of rural societies who are dependent on agriculture for their livelihood (UNECE, 2007). The breakdown of the sample sizes of the respondents illustrate that the household sizes were very large. For example out of a sample of 100 participants, 95 respondents indicated that their household size ranges between four to eight family members. Only five respondents indicated that their household members range was one to three. From these findings however, it appears
that the average family membership in the study is generally very high (94 percent
household members are 4-8). The participants indicated that the underlying reason for high
household sizes in Jonglei state was that in one household you will find several widows
who were co-wives with several children from one man. As people of these pastoral and
agropastoral communities marry with cattle as dowry wealth. According to the Nilotic
traditions, participants indicated that if a husband dies, the wives and the children remain
under the custody of the family of the deceased. (Please see Table 5.2).

**Table 5.2: Participants household’s size**

<table>
<thead>
<tr>
<th>HH seizure &lt; 8</th>
<th>HH Size of 6-8</th>
<th>HH seizure of 4-5</th>
<th>HH of 1-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>55</td>
<td>20</td>
<td>5</td>
</tr>
</tbody>
</table>

Numbers in this table are total numbers of participants.

Household headship was also considered in this research in connection with decision
making within the context of rural household’s well-being in Jonglei State. According to
the semi-structured interviewees 60 participants indicated that their households were
headed by females who are widows, while 40 respondents indicated that their households
were headed by male. The slight divergence in the increase of male headed households was
that several female respondents who indicated that their households were headed by their
one husband in the polygamous relationship (See table 5.3).

**Table 5.3: Household’s Headship**

<table>
<thead>
<tr>
<th>Male headed HH</th>
<th>Female headed HH</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>60</td>
</tr>
</tbody>
</table>

Many of the households are headed by widows. (Figures are numbers)

The age range of farmers was also considered as an important factor for food
security in relation to farmers’ productive age, given that in South Sudan statistical data on
births and deaths is absent. These figures given here are therefore merely estimates of
population distribution. There was no real consideration to disaggregate women’s age distribution from men because women comprise a distinctive visible majority in the farmers’ group of semi-structured interview participants (see table above). Age distribution analysis revealed that 42 of the respondents were below 30 years of age, whereas 58 of the participants indicated that their age ranges were 32 and 50 years. From these findings, 78 percent of the farmers were still in the productive age range. However, there is a divergence in the age range between the findings of this study and data of 2009 South Sudan Center for Census, Statistics and Evaluation (SSCCSE) in regards to age. The age ranges of (SSCCSE) shows that the 72 percent of the population of South Sudan is below the age of 30. (See table 5.4).

Table 5.4: Age distribution of participants

<table>
<thead>
<tr>
<th>Below 19 years</th>
<th>AR of 20-25</th>
<th>AR 26-30</th>
<th>AR 31-40</th>
<th>AR 41-50</th>
<th>AR &lt; 51</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>12</td>
<td>23</td>
<td>30</td>
<td>22</td>
<td>6</td>
</tr>
</tbody>
</table>

AR= age range

According to semi-structured interviewees 93 of the total of 100 participants were illiterate and do not read or write English or Arabic. However, most were able to read, write and do simple arithmetic in their local languages, Dinka, Nuer or Murle and others. Equally, these languages are recognized and widely accepted in the local church worship services. Additionally, 83 participants indicated that they did attend FAO Agricultural Field School taught in local languages, and 4 of the participants mentioned that they attended only up to primary school in English while in the refugee camps in East Africa. One of the participants indicated that she did attend secondary school and could speak and write in English (see table 5.5)
### Table 5.5: Participant’s level of Education completed

<table>
<thead>
<tr>
<th>Community</th>
<th>Primary level</th>
<th>Secondary Level</th>
<th>No formal Education</th>
<th>Attended FAO Agric. Field School</th>
<th>Vernacular Education</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bor South</td>
<td>3</td>
<td>1</td>
<td>26</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Twic East</td>
<td>2</td>
<td>0</td>
<td>28</td>
<td>4</td>
<td>30</td>
</tr>
<tr>
<td>Akobo</td>
<td>1</td>
<td>0</td>
<td>19</td>
<td>5</td>
<td>20</td>
</tr>
<tr>
<td>Pibor</td>
<td>0</td>
<td>0</td>
<td>20</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>6</td>
<td>1</td>
<td>93</td>
<td>39</td>
<td>83</td>
</tr>
</tbody>
</table>

The figures in this table are total numbers

Most semi-structured interviews participants indicated that they have had several years of farming experience depending on their age, areas and location where they moved to during the war to live as IDPs/refugees. The semi-structured interviews revealed that most of the selected farmers indicated that they came back home from the refugee camps in neighbouring countries such as Uganda, Kenya and Ethiopia or were IDPs (came from elsewhere within the larger country of Sudan). They indicated that they have been practicing farming as their main source of livelihood wherever they came from. These returnees/IDPs have indicated that they have consistently practiced some form of traditional agroforestry. The table shows that 75 of the participants had more than 20 years of farming experience. However, respondents indicated that they have been farmers since they were 10 years old, from the time have they spent in refugees and IDPs camps (See table 5.6).

### Table 5.6: Years of farming experience

<table>
<thead>
<tr>
<th>20 years of experience</th>
<th>10 or more years of experience</th>
<th>5 or less years of experience</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 participants</td>
<td>35 participants</td>
<td>25 participants</td>
<td>100</td>
</tr>
</tbody>
</table>
The table below illustrates that 55 semi-structured interviewees indicated that they were smallholders with farm sizes range between 10-20 acres per farm. Fifteen farmers indicated that their farm sizes range was over 20 acres per farm. However, due to absence of any legal documents most of these farms are owned through customary arrangements through tribal chiefs.

**Table 5.7: Farms Sizes (100 farmers)**

<table>
<thead>
<tr>
<th>Frame size of 5-10 acres</th>
<th>Farm sizes of 15-20 acres</th>
<th>Farm sizes more than 20 acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>55 farmers</td>
<td>30 farmers</td>
<td>15 farmers</td>
</tr>
</tbody>
</table>

The semi-structured interviews showed that 80 of the participants practice a mixture of traditional agrosilvopastoral and silvopastoral systems as their mainstay. Fifteen of the participants said they practice agrisilvipastoral farming but also depend on fishing and hunting as an alternative source of livelihood. These findings show that the majority of the population in this study area indicated that they entirely depend on subsistence farming, fishing and hunting as their main source of livelihood and food security. (See table 5.8)

**Table 5.8: Farm livelihoods**

<table>
<thead>
<tr>
<th>Agrosilvopastoral system</th>
<th>Silvopastoral system</th>
<th>Agrisilvicultural system</th>
<th>Other agroforestry systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 farmers</td>
<td>30 farmers</td>
<td>15 farmers</td>
<td>5 farmers</td>
</tr>
</tbody>
</table>

Owing to lack of any crop irrigation systems in Jonglei, farmers indicated that they only depend entirely on rain-fed farming systems, with the exception of small numbers who are mainly youth. These small groups of youth farmers grow vegetables near small towns in Jonglei. They are financially and technically supported by FAO through provisions and the use of treadle pumps to irrigate their dry season vegetable farms along the Nile. Through this system, these youth groups were able to learn new skills, access employment
opportunities and generate income for themselves.

5.2 Inventory of Agroforestry Systems in Jonglei

Several participants identified several agroforestry systems to be practiced in Jonglei. Appendix reports that farmers practice agrosilvopastoral systems that includes home gardens, compound farms, woody hedges, and green manure and fertilizer trees. In addition, participants noted that farmers grow shrubs in pastures, protein banks and biomass transfer in silvopastoral systems. As recorded in appendix 10, participant’s highlights that farmers widely practice agrisilvicultral system to grow sorghum, maize and high value dry season vegetable farming, with the use treadle irrigation pumps near the River Nile.

5.3 Key Findings on Root Causes of Intertribal Conflicts in Jonglei

Table 5 demonstrates key findings of the causes of intertribal conflicts in Jonglei as reported by the farmers who took part in this study. As shown in the table, the participants in the farmer group discussions indentified an array of factors to be the main causes for the upsurge in intertribal conflicts in Jonglei. As shown in table (5.9), the participants in this study highlighted food insecurity as one of the main causes of intertribal conflicts in the context of extreme poverty and growing numbers of unemployed armed youth. These youth are former armed soldiers that were actively participating during the civil war as child soldiers for different arms groups, or members of different tribal militias groups in Jonglei. In addition, participants in the farmers’ group discussions point out that food insecurity and lack of livelihood assets forces armed youth and other marginalized and socially excluded groups to perpetrate cattle rustling as means of accessing food and livelihoods security. The participants also identified environmental stress that leads to food security and competition over renewable key natural resources as one of the causes of
interethnic conflict. Similarly, the table illustrates that farmers at the community level in Jonglei identified prevalence of extreme chronic poverty as one of the main causes of inter-tribal conflict. The participants in the study also highlighted the breakdown in the traditional system that used to act as conflict prevention and resolution as one of the causes that exacerbates the intertribal conflicts. Other factors identified by the participants in the study as the “why” reasons of the upsurge of the intertribal conflict in Jonglei includes marginalization and social exclusions. According to the participants, marginalized and socioeconomically excluded armed people are inclined to be involved in armed conflict due to their high feelings of frustration.

Table (5.9) also illustrates the participants’ perspectives on how the above mentioned factors reinforce the intertribal conflicts in the Jonglei area. The factors that are explained in table (5.9) include low food crops productivity and crops failures as well as the intertribal conflicts. Furthermore, the farmers’ participants in the study identified lack of access to productive assets such as land, farm inputs and credits to underpin food insecurity that gives rise to conflict. Other important underlying causes highlighted in the table by the participants in the study includes increasing numbers of illiterate armed and unemployed youth within the rural communities in Jonglei. In addition, farmer participants in the study indicate that competition over renewable key natural resources is one of the factors that trigger interethnic conflict (see table 5.9).
Table 5.9: Farmers Perspectives

<table>
<thead>
<tr>
<th>Themes</th>
<th>Illustrative Farmers Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Why</td>
<td></td>
</tr>
<tr>
<td>Food insecurity</td>
<td>“Food insecurity is the main cause of intertribal conflict in Jonglei” (FG1)</td>
</tr>
<tr>
<td>Cattle rustling</td>
<td>“Growing numbers of unemployed youth in Jonglei perpetrate cattle rustling as means of livelihoods” (FGD1.3.7)</td>
</tr>
<tr>
<td>Environmental stress</td>
<td>“Seasonal droughts in Jonglei causes food insecurity that cause conflict” (FGD 2.3.7) \ Seasonal floods in Jonglei causes food insecurity that leads to conflict” (FGD4.2.4)</td>
</tr>
<tr>
<td>Extreme Poverty</td>
<td>“Prevalence of extreme poverty increases incidence of inter-ethnic violence due to low opportunity cost for conflict (FGD1.2.3)</td>
</tr>
<tr>
<td>breakdown in the traditional system</td>
<td>“Break down in the traditional systems that use to mitigate conflict... encourages intertribal conflicts with impunity”(FG1)</td>
</tr>
<tr>
<td>Marginalization and social exclusion</td>
<td>“Socioeconomic marginalization of communities in rural areas in Jonglei constitutes the bases of frustrations and induces intertribal conflict” (FG1)</td>
</tr>
<tr>
<td>How</td>
<td></td>
</tr>
<tr>
<td>Low food crops productivity</td>
<td>“Low food productivity due to land degradation has been one the causes of food insecurity in Jonglei” (FGD.5.2.1)</td>
</tr>
<tr>
<td>Food Crops failures</td>
<td>“Crops failure due to environmental hazard means food insecurity which induces intertribal conflicts as means of access to food security” (FGD4.3.2)</td>
</tr>
<tr>
<td>Intertribal conflict</td>
<td>“Intertribal conflicts leads to food insecurity through killing of farmers and distraction of their productive assets”(FG2)</td>
</tr>
<tr>
<td>Lack of access to productive assets</td>
<td>“Lack of access to productive assets such as land, credits and information increases the rate of chronic poverty trap in the rural communities in Jonglei” (FG1)</td>
</tr>
<tr>
<td>Youth unemployment</td>
<td>“increasing numbers of unemployed armed former youth rebels fighters are perpetrating intertribal conflict as means of livelihoods”(FG1)</td>
</tr>
<tr>
<td>Competition over natural resources</td>
<td>“Competition over pastures and water-points between tribes triggers interethnic conflict in the dry season grazing pastures in toiches” (FG2)</td>
</tr>
</tbody>
</table>
5.4 Findings on Agro-ecological Considerations of Agroforestry for Peace building

The groups of findings in table (5.10) illustrate the farmers’ perspectives on agro-ecological potential and benefits as means of peacebuilding in Jonglei state. In this table farmers highlight increased, diversified, and sustainable access to food security as one of the main potentials of adoption of agroforestry as means of peacebuilding in Jonglei. Farmers’ participants in the study indicated that achieving sustainable food security supports and enhances peacebuilding, as the opportunity cost for armed conflict becomes very high. In addition, farmers in the study demonstrate that improving livestock pastures and animal feeds through up calling agroforestry systems such as fodder bank and parklands systems can reduce competition over key renewable natural resources. Farmers point out that reducing competition over natural resources can prevent conflict and enhance peacebuilding. As illustrated in table (5.10) farmers highlight that reclaiming marginal lands through agroforestry systems has supported women widow household heads to access food and income security that supported their children’s education. In this case farmers pointed out that the adoption of agroforestry systems can support social stability and enhance peace building by helping poor widows to educate their children who will earn a better future. Farmers in this study emphasized that there are several agro-ecological benefits of agroforestry as illustrated in table (5.10) that can potentially support peacebuilding.
Key findings on agro-ecological benefits of agroforestry

Table 5.10: Farmers Perspectives

<table>
<thead>
<tr>
<th>Themes</th>
<th>Illustrative Farmers Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Why Increase, diversified and sustainable access to households food security</td>
<td>“Through adoption of agroforestry systems I and other 10 IDPs farmers were able to achieve our sustainable households’ food security” (FGD.4.2.8)</td>
</tr>
<tr>
<td>Improved pastures and livestock feeding</td>
<td>“ By planting trees we were able to improve the natural pastures for our animals that there is enough feed the pastures and from tree, so we do not have to compete over grazing pastures (FGD2.5.4)</td>
</tr>
<tr>
<td>Improves soil fertility in degraded lands</td>
<td>Adoption of agroforestry system has supported our IDPs women widow farmers group to reclaimed marginal and degraded land, so we are able produce enough food for our families and supporting our children to go to school (FGD 2.3.2)</td>
</tr>
<tr>
<td>How Offsets environmental hazards</td>
<td>We have realized that the trees that we grow in our farms are able capture certain power form the air that keeps our farms productive even during low rainy seasons (FGD 4.3.4)</td>
</tr>
<tr>
<td>Improves soil fertility</td>
<td>The fertilizer trees and shrubs we grow in our farms have greatly increased soil fertility in our farms and significantly increase our food crops production, no more crops failures (FGD2.2.7)</td>
</tr>
<tr>
<td>Minimizes the impact of seasonal drought</td>
<td>“Incorporating trees and shrubs in our farms has greatly reduces the impact of drought and enables us have good crop during bad rainy period” (FGD3.2.5)</td>
</tr>
<tr>
<td>Minimizes the impact of seasonal flood.</td>
<td>“Combining Eucalyptus and Acacia trees in flooded areas has minimized the impact of flood and enables us to grow good crops of maize and sorghum” (FGD 3.2.5).</td>
</tr>
<tr>
<td>Improved livestock production</td>
<td>“Incorporating protein-rich trees and shrubs in our farms has improved food security and income through improved livestock health and production” (FGD 5.2.3)</td>
</tr>
</tbody>
</table>

5.5 Key Findings on Socioeconomic Consideration of Agroforestry

Table (5.11) demonstrates farmers’ perspective on several socioeconomic benefits of agroforestry that can potentially support socioeconomic stability, conflict prevention and
enhance peacebuilding. For example, farmers highlighted that income generation and youth employment as two of the main socioeconomic priorities of agroforestry for peacebuilding. Farmers’ participants in the focus group discussion indicated that growing numbers of unemployed armed youth resort to looting or raid cattle for their food and livelihood security. Therefore, providing them with income and employment is making a great change as many of them have abandoned their armed groups and embrace dry season high value vegetables farming. In addition, farmers illustrate that access to land is pivotal for them to adopt agroforestry. In the context of the patriarchal orientation in South Sudan, women can have access to land through their marital relationships. However, due to exceptionally high numbers of widows with many children and extended families, access to land was made possible to women through agroforestry systems as well as the support of NGOs to farmers. In this regard, participants indicated that a large numbers of women returnees IDPs/ refugees, would not have access to land were allotted these marginal land that was abandoned by the local communities for being unproductive. These IDPs women were able to reclaim and use these lands through planting leguminous trees that supported food crop production. Women participants established that the sale of food crops surplus and fuelwood from their farm was able to accrue enough income that supported the education of their orphan children. Educating children and early teens prevents them for joining militant groups. Equally, socioeconomic benefits of agroforestry can prevent conflict and enhance peacebuilding.

As shown in table (5.11), farmer participants in the study illustrates that embracing agroforestry systems has helped several households in Jonglei to come out of poverty trap through the sale of surplus crops adopting cottage industries. These cottage industries include smoked fish, charcoal production and value added milk products. However, table.
(5.11) illustrates several socioeconomic benefits of agroforestry that can support peacebuilding as highlighted by the participants in this study. These benefits do not operate in isolation from one another, but rather they operate in a holistic way. Therefore this table enumerates these benefits in a summary form. For the most part, farmers at the local level indicated throughout the study that embracing agroforestry by women farmer groups has supported them to attain their access to food and livelihood security in a holistic manner (see table 5.11 below).
<table>
<thead>
<tr>
<th>Themes</th>
<th>Illustrative Farmers Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>How</strong></td>
<td></td>
</tr>
<tr>
<td>Employment and income generation for the youth groups</td>
<td>“Our youth group was able to generate an equivalent of $6,000 from the sale of high value dry season vegetable agroforestry farming” (FGD.2.4.6)</td>
</tr>
<tr>
<td>Access to land</td>
<td>“Adoption of agroforestry has provided the growing numbers of women IDPs farmers in our community with access to land in which we are able to maintain and grow more trees for crops and fuelwood production” (FGD2.2.4).</td>
</tr>
<tr>
<td>Poverty reduction</td>
<td>“Our agroforestry women farmers group has supported us to reduce the high rates of poverty through the sale of surplus vegetable and agroforestry cottage industry (FGD1).</td>
</tr>
<tr>
<td><strong>Why</strong></td>
<td></td>
</tr>
<tr>
<td>Improving human health</td>
<td>“Incorporating medicinal trees such as Tamarind has been vital to our community’s health and socioeconomic stability. Because this can cure many diseases including Malaria” (FGD.5.3.7)</td>
</tr>
<tr>
<td>Women empowerment</td>
<td>“Participation of women in agroforestry farmers in our field school has increased our socioeconomic status and that of our local communities” (FGD 4.3.8)</td>
</tr>
<tr>
<td>Gender relation</td>
<td>“Adoption agroforestry in our community has improved gender relations by providing women with productive asset allowing labour division in the households …hence increase food production” (FGD1.5.4)</td>
</tr>
<tr>
<td>Farmers social safety nets</td>
<td>“Our adoption of agroforestry systems in the farmers filed school has created group social interconnectedness that help us to create safety net for other poor women in our groups” (FGD 3.2.5)</td>
</tr>
<tr>
<td>Collective farm labour</td>
<td>“Our collective farm labour as women and our households has supported us harness the benefits of effort as a group”</td>
</tr>
<tr>
<td>Knowledge</td>
<td>“We have gained a significant amount of knowledge about agroforestry system by working together in women farmers field school” (FGD2.4.6)</td>
</tr>
<tr>
<td>Skills</td>
<td>“A youth group having to learn new skills in using treadle pump and growing high value vegetable using agroforestry system has greatly enhances our skills as youth” (FGD.2.5.2)</td>
</tr>
<tr>
<td>Attitude</td>
<td>“Our enrolment in the farmers field school that use agroforestry systems has positively hanged our attitudes towards growing trees (FGD.5.4.5)</td>
</tr>
</tbody>
</table>
5.6 Analysis of Key Informants Interviews

Table (5.12) and (5.13) illustrate the findings of the key informants’ interviews of this study at the international, national and local level in South Sudan. The international and regional levels include key informants at ICRAF, UNEP and other NGOs in Nairobi and Khartoum. The key informants at the national and local levels include key informants at the federal level in Juba the capital of South Sudan and key informants at the local level within Jonglei state. For example, several key informants at the international, the federal and local level indicated that food insecurity is one of the major contributors the upsurge in the intertribal conflicts in Jonglei state. One key informant at the international level was very clear in stating that: “Findings from our recent South Sudan Annual Needs and Livelihoods assessment indicates that food insecurity is indeed a major cause of intertribal conflicts in Jonglei state” (KII3b.2.3).

Findings from key informants at both the international and the local levels as reported in table (5.12) highlights cattle rustling as one of the major causes of intertribal conflicts between different tribal groups in Jonglei. For example, this theme was emphasized by one key informant at the federal level in South Sudan that: “Cattle resulting during dry season hunger period is one of the main causes for intertribal conflicts in Jonglei state” (KII7.3.4).

As demonstrated in table (5.12), key informants at the international, national and local levels equally emphasized that environmental stress is a key underlying cause of the intertribal conflict in Jonglei “The post-conflict environmental assessment we conducted in South Sudan in 2007 clearly showed that environmental stress is a major cause of intertribal conflict in Jonglei” (KII3a.1.4)
Table 5.12: Organizational Analysis of Key Informants’ Interviews

<table>
<thead>
<tr>
<th>Why</th>
<th>KII Findings on cause of intertribal conflict</th>
<th>KII at the International and regional levels</th>
<th>KII at the National and local levels in South Sudan</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Food in security as the main cause of intertribal conflict</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>Cattle rustling as the cause of intertribal conflict</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>Environmental hazards and stress as the cause of intertribal conflict</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>Competition over natural resources (land, pastures and water points)</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>Outbreak of livestock diseases</td>
<td></td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>Growing numbers of armed unemployed youth</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>Lack of capacity due to state weakness and fragility</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>How</td>
<td>Socioeconomic exclusion</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>High rates of poverty</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>Retaliatory intertribal conflict</td>
<td></td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>Cattle rustling to restock of lost cattle herds</td>
<td></td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>Ethnic animosities</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>

Key informants narrative data for the rest of the findings in this table are found in the Appendix (7).

Tables (5.13) bellow present groups of findings that illustrate key informant interviewees’ perspectives on the potential of agroforestry as means of peacebuilding. However, this section briefly highlights key findings only. The other findings will be presented in the
appendix. In the “why” section, the key informants in this table from both the international, national and local levels indicated that up scaling agroforestry systems can support sustainable access to household food and income security in South Sudan. This theme was emphasized by a key informant at the national that:

“Up scaling agroforestry systems can greatly increase soil fertility that in turn can support an increased and sustainable access to household food and income security to resource poor farmers in Jonglei...given its immense natural resources” (KII8.2.4)

Additionally, key informants at the national and local level persistently reinforces that the promises of agroforestry systems for poverty reduction and in Jonglei are very high. This theme was highlighted by a key informant at the local level in Jonglei that:

“Definitely, agroforestry system as low input and low energy farming system with its multi-products can significantly support resource poor farmers to increase income and support them come out of poverty trap...considering the high demand on food and fuel in Jonglei” (KII17a.2.4)

Key informants at the international and national levels underline the importance of capacity development for various stakeholders of agroforestry in South Sudan. This finding was emphasized by a key informant at the national level that:

“We have been actively engaged in capacity development for local farmers through collaborative efforts of various stakeholders to ensure that local farmers are supported with the latest knowledge in agroforestry systems” (KII8.2.1)

The importance of technical support to NGOs supporting local farmers in South Sudan was identified by key informants at both the international, national and local levels. This theme was highlighted by a key informant at the international level that:

“We are providing technical support to various UN agencies and NGOs working in agroforestry with latest field base tested knowledge that they (NGOs) will impart this knowledge to the local farmers in their project at the local level in South Sudan”(KII1.1.2)

Key informants emphasized the importance of the twin-track approach to support local
farmers in Jonglei. The main objective of this strategy is to support farmers to increase their productive capacity as well as helping them to withstand various challenges facing them. This finding was reinforced by a key informant at the national level that:

“The twin-track approach that we are implementing in Jonglei aim to enhance the productivity and resiliency of the resource-poor rural farmers through providing various productive assets and food aid at the same time as well as community based peacebuilding efforts” (KII11.2.6)

In the “how” section in the table below demonstrates key informants perspectives at international, national and local levels on a group of findings of on how agroforestry can support increase access to households’ food security supports socioeconomic stability and peacebuilding. To illustrate this point, a key informant at the local level highlights that improving soil fertility through agroforestry in order to support sustainable food production. This theme was underscored by a key informant at the national level that:

“Several exogenous fertilizer trees were introduced to Jonglei canal area to support farmers to increase soil fertility through natural means…these trees have now naturally spreads all over the state and are supporting large numbers of farmers to increase their food production” (KII8.1.2)

Key informants at the local and local level highlighted improving livestock production to support socioeconomic stability and peacebuilding in Jonglei.

“Improving livestock production through agroforestry systems has significant impact to enhance socioeconomic stability and peacebuilding as 90 percent of the rural economy and food security in Jonglei depends on livestock” (KII15.3.3)

In addition, key informants at the local level indicated that providing unemployed youth with good skills and employment opportunities through agroforestry technologies has supported peacebuilding efforts in Jonglei. This theme was reinforced by a key informant at the state level who noted that:

“We are providing a number of unemployed youth groups in the rural areas of various counties of Jonglei with skills and employment opportunities through
dry season irrigated high value vegetables that has earned them very good income” (KII10.3.4).

Table 5.13: Organizational Analysis of Key Informants Interviews

<table>
<thead>
<tr>
<th>Why</th>
<th>KII Findings on agroforestry for peacebuilding</th>
<th>KII at the International and regional levels</th>
<th>KII at the National and local levels in South Sudan</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Increase access to household food and income security.</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>Poverty reduction</td>
<td></td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>Technical support to NGOs</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>Building productive assets for women farmers</td>
<td></td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>Capacity development of local farmers</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>Twin-track approach</td>
<td></td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>Improve soil fertility</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>Improved livestock production</td>
<td></td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>Improved fallow</td>
<td></td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>Direct not-repayable financial grants and inputs support to the local women farmers groups.</td>
<td></td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>Reduces competition over key renewable natural resources</td>
<td></td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>Minimizing environmental hazards</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>Creating employment opportunities for unemployed armed youth</td>
<td></td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>Improves crops and livestock marketing information system through CLiMIS, use of mobile phones and ICTs</td>
<td></td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>The prospects of Gum agroforestry in South Sudan</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>

Key informants narrative data for the rest of the findings in this table are found in the Appendix (7).
5.7 Summary:
The findings in this chapter are the result of the data collected through the key informant interviews, farmers group discussions, semi-structured interviews, focus groups, and participant observation and review of relevant documentation. These findings include farm field visits that preceded the farmers’ group discussions. This chapter explores the nature of the intertribal conflicts in the context of extreme poverty and food insecurity that underpins ethnic tensions, cattle rustling and the resultant retaliatory and cycle of inter-ethnic conflict trap. In addition, chapter five presents the findings of the potential of agroforestry systems and technologies as means of access to food security, socioeconomic stability and peacebuilding. These findings are then used in the discussion chapter in relation to the literature review of this study.
CHAPTER SIX
DISCUSSIONS

6.0 Introduction

Chapter six discusses the research findings in connection to the literature review and conceptual framework that guided this study. It further identifies areas of communalities or anomalies between the findings and the literature review of the study. The first part of this chapter discusses the nature of the inter-ethnic conflict in connection to food insecurity, cattle rustling. The second part discusses the impact of natural hazards, environmental scarcity and the climatic change on food security in the context of post conflict poverty and conflict in Jonglei state. In addition, it discusses the areas of agreements and divergences between the findings and the literature reviews the key considerations of agroforestry technologies as means of increase access to food security, enhancement of socioeconomic stability and peacebuilding in context of intertribal conflicts in Jonglei State, South Sudan. Chapter six also presents the new model of agroforestry for peacebuilding. This chapter then ends with the overall summary of the discussion of the findings of the study.

6.2 The Nature of the Intertribal Conflict in Jonglei

This study uses the OECD, 2009 armed conflict conceptual lens to inform and guide the discussions of its findings. The integrated conflict lens used in the study was highly influential and flexible during the study. In many ways, the OCED conflict lens was quite relevant to assess and address the potential of agroforestry technologies as a means of peacebuilding efforts in post-conflict situation and fragile state affected by civil conflict in South Sudan (OEDC, 2009). Ideally, the relevance of this conceptual leans to analyze the intertribal conflict in Jonglei hinges on two important concepts. First, the OECD contraries
have selected South Sudan as the “testing ground” for evaluating the effectiveness of international assistance in extreme humanitarian crises and a post conflict situation. Therefore, using this conflict lens to analyze the conflict at hand is consistent with the OECD peacebuilding strategies of good international engagement in a context of state fragility and inter-ethnic conflict in South Sudan (OECD, 2011). Within the context of this extreme crisis, the humanitarian assistance provided by the OECD countries to South Sudan follows the twin-track approach that entails the provision of short-term emergency assistance and at the same time upholding long-term development as well as peacebuilding efforts (FAO, 2010) (See the twin-track strategy in appendix 5). However, the core elements of the OECD conflict lens of this study are the three agents of the intertribal conflicts in Jonglei. (See figure 1.6). These three agencies of war are primarily the perpetrators, the instruments and the institutions of the conflict in Jonglei. At the center of this lens lie the people that are affected by the three agents of conflict. Additionally, the affected people by this interethnic conflict chose to engage in agroforestry technologies supported by international aid organizations as means of access to food and peacebuilding. Equally, one of the major attributes of this conflict lens is that it is a bottom-up and people-centered prospective. This people-centered approach was conceptualized by the OECD-DAC in order to guide and support conflict prevention and peacebuilding programs -supported and funded by the OECD countries (OECD, 2009). Similarly, findings of this study indicate that there is an inter-play between the institutions, the agents and the instruments of this conflict. These three agencies of conflicts are linked at the four levels of this conflict lens. These four levels are primarily the global, regional, national and the local. Following are the most important agencies and the linkages between the different levels of conflict in Jonglei.
This study revealed that the most important institutions of the conflict under study are both formal and informal institutions of governance. However, during the study, findings indicate that there are new institutions on the ground in Jonglei at different levels. For example, one of the new major institutions at the global on ground at the local level in Jonglei is the United Nations Mission in South Sudan (UNMISS). The main mandate of UNMISS is to coordinate peacekeeping and peacebuilding efforts in this new country. In addition, there are other several new international institutions on ground in Jonglei. Some of these new players are supporting agroforestry system in order to increase access food production that may support larger peacebuilding at the local level. The informal institutions include traditional, cultural norms, rules and practices that are reinforcing the inter-ethnic violence conflict among various tribes in Jonglei. As indicated in the literature, these tribal norms and traditions in Jonglei seek to embrace the use of armed violence in order to loot food and raid cattle as means of livelihoods (OECD, 2009). The findings of the research suggest that the upsurge in inter-ethnic conflict in Jonglei is partially blamed on the breakdown of traditional norms and cultural system and the native governance that were used to facilitate conflict in the past. The key institutions of intertribal conflict in Jonglei are the tribal organization and militias and they are affected by food insecurity (ICG, 2009).

Findings from this study show that the agents of the conflicts in Jonglei are the growing numbers of illiterate and unemployed youths, who are primarily members of various tribal militia groups. The study further indicates that these perpetrators of violence are mainly former combatants, members of tribal militias and child soldiers made up mainly from members of various rival tribes in Jonglei. Members of these militia groups are former allies to the either North Sudan Armed Forces or South Sudan rebels groups
during the long civil war. However, after the end of war and return of peace to South Sudan in 2005, these armed groups were laid off and abandoned without proper arrangement of disarmament and reintegration into civil life (Evoy & LeBrun, 2010). Most of all, evidence from this study exhibits that the inter-ethnic conflict in Jonglei is highly gendered. Thus, during intertribal-armed conflict, young males are often the perpetrators of the conflict and at the same time, they are the main victims of it. This finding is highlighted by Hilker & Fraser (2009) argument that growing numbers of unemployed, uneducated and discontented youth in the rural areas in South Sudan are often recruited into tribal armed groups to carry out armed attacks to steal cattle and loot food as means of livelihoods.

Evidence from the study suggests that the most important instruments that are reinforcing this intertribal conflict and food insecurity, are widespread and proliferation of weapons and other remains of war. In addition to the old and new factors that are influencing their supply. The supply of these new weapons is encouraging the perpetrators of conflict to escalate their attacks on other communities. The literature acknowledges that new evidences in South Sudan suggest that North Sudan is still supplying various tribal militias with new weapons in order to undermine the government and people of South Sudan. For example, Lewis, (2009) found out that the modern weapons from China, Iran and Belarus were captured from SAF former allies in Jonglei. These weapons are being widely used in inter-ethnic cattle raiding and conflict over resources. As highlighted above, global arms suppliers and networks are having a direct impact on the upsurge of inter-tribal conflict at the local level in Jonglei. Findings from the study show that supplies of arms from global institutions are trickling down through SAF (at the regional level) to fuel intertribal conflict at the local communities in Jonglei.
At the center of this conceptual lens that guided the study are the people that are caught up between the three agents of inter-ethnic conflicts. However, the focuses of this people-centered and people-perspective lens are the women and youth farmers groups, agropastoralists, pastoralists and other members of the societies in Jonglei. In addition, this study indicates that the numbers of people killed due to the upsurge in cattle raiding and intertribal violence at the peak of high rates food insecurity in 2009 in Jonglei were unprecedented. This finding support what is indicated in the WFP, (2010) annual needs and livelihoods assessment (ANLA) 2009/2010 Jonglei report. This report indicated that the upsurge in the intertribal conflict in Jonglei in 2009 was due to high rates of food insecurity due to extreme drought caused by lack of rains. In addition, the numbers of deaths reported in Jonglei in 2009 because of the intertribal conflict was far higher than the numbers of deaths reported during the ongoing civil conflict Darfur region of Sudan during the same time (ICG, 2009).

Against this background, this study found out that the intertribal conflict is an old phenomenon that has defined the socio-cultural relations between the three main agropastoralists’ tribal communities who inhabited Jonglei for a long time. Previously, and during the intertribal conflicts, either over access to grazing land, water point or during cattle rustling, these tribes used to resort to traditional means of peacefully and amicably resolve any arisen disputes. Similarly, participants noted that during the intertribal conflict in the past, the tribes in Jonglei used to resort to different types of traditional weapons as means of war. These weapons include spears, sticks, knives, clubs, machetes bows and arrows (Evans-Pritchard et al, 1972). However, participants in this study indicated that what makes the current intertribal conflict to be different from the ones in the past is the use of modern weapons as instruments of war. As demonstrated in the finding chapter, this
study revealed that poverty and food insecurity prompts unemployed youth groups, who are the agents of conflict to acquire weapons as means of accessing food and livelihoods security. In agreement to the later finding, Arnold & Alden (2007) argues that there are four underlying causes of the intertribal conflict in South Sudan. These include:

- High rates and prevalence of extreme poverty,
- High rates of chronic food insecurity,
- Prevalence of low rates of literacy,
- High unemployment rates among the youth population.

The prevalence of these appalling conditions has led the rural population in Jonglei to be increasingly dissatisfied. The feeling of dissatisfaction among the youth forces them to join the armed tribal militia. These militia groups organize themselves into gangs along tribal line in order to raid cattle, loot food and other valuable assets from other rival tribes. During these raids, cycles of retaliatory and counter raids often triggers series and cycle of intertribal conflicts (Arnold & Alden, 2007).

It is probable that one of the causes of food insecurity in Jonglei is low food crops production and productivity. Other reasons of crops failures include natural and manmade environmental hazards. This finding is supported by UNEPs, (2007) argument that natural hazards such as seasonal floods followed by long periods of droughts, in addition to slash-and-burn farming practices are the underlying causes of food insecurity in Jonglei. Equally, this study shows that other exacerbating factors of food insecurity include low soil fertility, lack of basic infrastructure such as roads, banking and the lack of local developed crop markets. However, under these scenarios of prevalence of food insecurity and high proliferations of arms poor communities resorts to armed conflicts as a means of survival especially armed unemployed youth. These findings are highlighted by Brinkman
Hendrix’s (2011) argument that intertribal conflict in Jonglei is a result of food insecurity as tribes restrains from armed violence when enough food is provided by the NGOs or when crops harvest are plentiful due to good rains.

Evidence from the study revealed that livestock rearing is a major component of food and livelihood security as well as the source of socioeconomic wellbeing of more than 95 present of the tribal communities in Jonglei. This finding is supported by Evans-Pritchard’s (1940) argument that cattle herding represents the main source of food and wealth for the Nuer and Dinka agro-pastoralist tribes as well as for the Murle pastoralists’ tribe of South Sudan. He continues to argue that keeping cattle in these communities is a matter of life and death. Furthermore, Alinovi, et al., (2008) acknowledges that livestock-rearing communities in the agropastoralists and pastoralist in Jonglei depend entirely on livestock rearing for food and socioeconomic stability. He continued to argue that social contacts and ceremonies such as marriages, births and deaths are often sealed between families and communities through the exchange and payment of livestock. Equally, findings from this study indicate that cattle are considered as a store of wealth and are easy assets to be looted. This finding is supported by the argument of (Catley et al., 2005) who indicates that cattle in Jonglei area are easy to raid and easy to sell or barter or even use as an immediate currency or source of mobile source of food security for the rustlers and their families.

Findings from this research indicates that the direct impact of the intertribal conflict in Jonglei has further caused significant and immediate effect that resulted to more deaths due to massive displacement of poor and the most vulnerable people. These most vulnerable people such as women and children are often exposed to diseases, hunger and harsh environmental conditions and long term socioeconomic shocks because of being
uprooted from their natural habitat. These findings are consistent with the latest (UNMISS’s, 2012) report that the intertribal conflict in Jonglei has created a “terrible” humanitarian crises. In this situation, the most vulnerable segments of population, mainly children, women and the elderly are exposed to extreme hunger, thrust, and life threatening diseases.

Findings from the research point to the conflict as a possible cause of environmental hazards and soil degradation. When people and their livestock are displaced by conflict, they often resort to cutting trees to clear forests in order rebuild new settlements and use cleared forests as farms. However, when such environmental degradation becomes so severe so as to undermine human livelihoods, by depleting the available key resources such as grazing pastures, water, and fuel wood, the natural scarcity often triggers cycle of conflicts (Homer-Dixon, 1994).

6.3 Key Findings of agroforestry for Peacebuilding

The literature of this study indicates that severe declines in agricultural production and productivity are exposing the population in South Sudan to chronic food insecurity, hunger and death. This crisis of food insecurity in South Sudan is compounded by high rates of poverty and lack of productive resources (FAO, 2010). In order to salvage this appalling situation, an array of approaches has been undertaken by the UN agencies, bilateral donors and NGOs in order to enhance food production support and wider peacebuilding strategies. These approaches include provision of agricultural inputs, livelihoods diversification, and development of agroforestry technologies through conservation agriculture that combines sustainable agriculture as well as offsetting the effect of climate change (FAO, 2010). The emergency package of support provided by the
bilateral organization to provide resources for poor smallholder framers in Jonglei include improved crops seeds, hand tools and treadle pumps for various youth groups (Ibid).

Evidence from this study indicates that adoption of agroforestry systems and practices in Jonglei provide a sustainable approach and strategy to achieving food security. Against this background, the study found out that there is growing evidence that the NGOs are increasingly supporting agroforestry technologies projects in South Sudan. This finding is supported by the Government of South Sudan indecision in 2010 to allocate 70 percent of donors support to the natural resource funding to be allocated to the agroforestry programs (GoSS, 2011). As part of this international support, the Norwegian Peoples Aid (NPA) has recently supported several women farmers groups in Jonglei in 2010. Owing to this significant and direct financial support to several women farmers groups in Jonglei state, media houses reported that these women farmers groups “flood the market with vegetables” (Sudan Vision, 2010). This finding is supported by the USAID’s, (20110) report during the launching of its $54 millions support to farmer in Jonglei state.

According to this report, the USAID intends to support more than 150,000 agro-pastoralist and pastoralist resource poor households’ communities in Jonglei. Because of this support from the global and bilateral organizations, these communities will be able to produce enough food for a period of three years starting from 2011. The following are the key findings of agroforestry as means of socioeconomic stability and peacebuilding.

6.4 Agro-Ecological consideration of agroforestry

Findings from this study show that adoption and scaling-up of agroforestry technologies among poor rural farmers in Jonglei is key to increasing access to food security and can robustly prevent interethnic conflict and enhance peacebuilding programs.
In a wider sense, respondents of this study pointed out the potentials of agroforestry technologies can potentially support social stability and peacebuilding through the following are the summary of the participants’ perspectives:

- Increasing access to food and livelihood security in a sustainable manner can significantly increase the “opportunity cost” for conflict and renders the involvement in intertribal conflict less attractive for disgruntled population.

- Providing sufficient access to households’ food and income security reduces dissatisfaction and social tensions in the poor communities and prevent conflict.

- Adoption agroforestry systems diversifies crops production and ensures access to food security during crops failures or environmental hazards and stress, thus reduces likelihoods of using arms to loot food or raid cattle.

These finding are substantiated by Buck et al., (1999) argument that agroforestry technologies have been effectively used to support farmers to triple crop yields in dry land rain-fed condition. For example, crops yields of Sorghum were increased more than 80 percent under open canopy of Faidherbia albida in parkland system. These reported increments in yields of the main food crops and stables have contributed to reduction of hunger and significantly increased sustainable food security and social stability in neighboring countries to South Sudan. Some of these countries have similar dry land environmental and socioeconomic conditions such as South Sudan. Most of all, respondents pointed out that embracing agroforestry technology in Jonglei was very effective in address the post-conflict recovery program, supported by several international donors. Clearly, participants in this study indicated that the significant contribution made by the international donor agencies to support agroforestry-farming systems was an
important indication agroforestry could indeed support food security, socioeconomic transformation and peacebuilding in Jonglei state in South Sudan.

Findings of participants from the women farmers’ field school indicated that embracing agroforestry innovative framing technologies has robustly diversified and increased access to households’ food security in their community. They indicated that since their community became food secure, incidents of inter-communal armed violence in their community have been significantly reduced. In agreement with this finding, the literature indicates that food insecurity is possibly one of the main underlying causes of armed conflict (Brinkman & Hendrix, 2011). Armed conflict itself often leads to food insecurity. Evidently, during armed violence critical assets to agricultural production are often destroyed, farmers are killed or displaced and crops are looted or burned. As a consequence of armed violence the affected communities by food insecurity-induced conflict often resort to retaliatory and reciprocal armed violence in order to loot and steal food to meet their own food security. In this case, communities affected by food insecurity and violence become entrenched in conflict trap (Collier et al., 2003). This finding is consistent with ICRAF’s (2011) report that with improved farming practices, the newly independent country of South Sudan plans to significantly increase its agricultural production as well as food security and ensure peace for its people. These plans are underway with significant support from its major development donors at the global level. These donor agencies include USAID, and other European donors.

6.5 Locally Available Inputs

This study reveals that low crop production and productivity is attributed to a significant decline in soil fertility. Farmers said excessive decline of soil fertility is a major
obstacle to achieving food security and avert conflict due to chronic food insecurity. Farmers further indicated that decline in soil fertility and land degradation is caused by three closely interrelated factors. These factors include:

- Breakdown of the traditional long fallow system because of population pressures due to high influx of returning refugees to Jonglei state from the neighboring countries.
- High degree of soil erosion and nutrient leaching due excessive floods and the effect of extensive dry winds.
- Inadequate use of organic matter such as crops residues and animals manure to replenish excessive lost of soil nutrients due to intensive farming practices.

In order to overcome these challenges, participants indicated that the fertilizer tree system was the only available remedy to achieving food security through intensifying land use for sustainable crops production. Incorporating fertilizer tree (FT) with food crops can potentially reverse the decline in soil fertility, builds soil organic matter and can significantly increase soil fertility in a sustainable manner. This evidence is in line with the argument Batish et al, (2008) who say that combining nitrogen-fixing fertilizer tree with food crops in smallholder farming systems replenishes the soil fertility and significantly increases food crops production and reduces poverty through the sale of surplus crop. In this study, however farmers asserted that with direct technical and financial support from NGOs and through field trials and experimentation by members of farmers’ field schools and participatory women farmers groups, farmers have been able to successfully use various leguminous fertilizer trees and shrubs in their small family farms. Several participants in this study argued that up scaling the fertilizer tree system in Jonglei can potently and increase access to food security, reduces poverty and supports peacebuilding efforts. This study found out that there has been widespread introduction of exogenous and
indigenous fertilizer trees before the war as part of offsetting the impact of Jonglei canal project. These fertilizer trees such as Gum Arabic tree *Acacia senegal* and flood resistant trees such as *Eucalyptus microtheca* have been reported to be widely used in various agroforestry systems in Jonglei. For example, participants at the national level in South Sudan indicated that a local farmer has developed an innovative. This system entails the combination of *Eucalyptus microtheca* and *Acacia senegal* with several food crops in an intensive intercropping agroforestry system. In this system, farmers combine *Acacia senegal* and *Eucalyptus microtheca* with various crops grown between trees. The Acacia is used to fix nitrogen and Eucalyptus is used to offset flooding while the system supports food crops. These food crops include Sorghum, maize and pigeon pea (*Cajanu cajan*). Participants in the study argue that this system has been successfully use by farmer offset and reclaimed vast land that use to be under flood and increase food crops production. Thus, the study shows that fertilizer trees are playing an increasingly important role in increasing access to smallholder households’ food security, socioeconomic stability and peacebuilding in the study areas. In addition, findings from this research highlights that reclaiming flooded land has reduced conflict over land, provided additional grazing pastures and fodder to livestock, thus significantly prevented conflict and have contributed to wider peacebuilding efforts in Jonglei.

Findings from the study notes that farmers have been widely growing high value vegetables during the dry season in the wetlands near the Nile and Sobat River banks, through the use of biomass transfer (green manure) system. This system involves cutting and carrying nutrient-rich leaves agroforestry tree or shrubs species to be directly applied as green fertilizer to soil in the farm. Through this system, several members of women farmers groups in Jonglei indicated that they were able to significantly increase food crops
production during the dry season. For example, one smallholder farmer from the women farmers’ group in Jerweng said that by using biomass transfer she and her group were able to increase soil fertility in their farm more than 100 percent. As a result, they are able to grow enough vegetables for their households’ food security and are able to generate considerably good income from the sale of high-value vegetables. With this, system farmers said they are no longer poor.

The literature emphasizes that as a remedy to sever decline in soil fertility, farmers in the dry land region of East Africa use a mixture of animal manure and biomass transfer of several leguminous and non-leguminous nutrients- rich tree and shrubs in order boost their soil fertility and crops production and productivity. Biomass transfer systems have been successfully used in many poor African countries to support rural smallholders’ farmers to offset soil infertility in a sustainable manner with minimal cost. The process of biomass decomposition releases significant amounts of essential plant nutrients to soil and make them available to the crops grown in the field for a period of two to three years without adding any organic fertilizers (Garrity et al., 2006). The study indicates that this system has provided youth and women farmer groups with the opportunity to access high paying farm employment through growing high value vegetables and maize crops. The success story of this project has prompted FAO to freely provide farmers in Jonglei with treadle pumps in farms along the Nile and Sobat Rivers in Jonglei (FAO, 2010) with the use of this system, farmers, mainly women and youth groups have reported high income from the sale of dry season vegetable from their farms. They said providing decent employment reduces dissatisfaction and frustration and supported them to quickly and peacefully integrate into civilian life instead of becoming recruited to loot-seeking armed youth who may likely engage in subversive and armed conflict activities as a loot-seeker as a means of food and
livelihoods security. Adoption of this agroforestry system by women and youth farmers groups has thus, contributing to the wider peacebuilding efforts in Jonglei.

Findings from the research indicate that slash-and-burn in shifting cultivation system has been use in Jonglei for a long time. The literature has identified the slash-and-burn system as the main reason of land degradation and desertification in Jonglei (UNEP, 2007). In addition, the study further indicates that long periods of fallow systems have been used in the past to reclaim and offset the degraded lands. However, owing to high demand for agricultural land due to population pressures, short and improved fallow system has been suggested by NGOs as the most sustainable means of replenishing soil nutrients and reclaiming the degraded land in a short time. In this system, the study revealed that planting and managing fast growing nitrogen fixing leguminous trees and shrubs in fallow land has been widely practiced in improved fallow system. The trees in the rangeland or cropland are allowed to grow for 2-3 years. During this period and when the trees are well established, livestock and wildlife are allowed to graze on the rich growing grass and falling leaves under the primary forest.

By allowing herbivores to graze in this system, they add more organic matter through their droppings and urine, thus adding more nutrients. The study found out that the selection of leguminous tree species to be planted or maintained in the farm or rangeland are influence by the socioeconomic considerations of the local population. The study found out that experienced elderly people in the village who have great knowledge about indigenous nitrogen fixing, wild food and medicinal trees often select the promising species. Findings from the study indicate that growing trees are protected through the customary and traditional regulation. These traditional norms and regulations are reinforced because native people in Jonglei appreciate the dual benefits trees can provide.
in improved fallow system by replenishing soil nutrients, providing protein-rich fodder for livestock, shade and quality fuelwood for the community.

After the fallow periods are over, the trees are used as fuelwood or timber for building purposes or sold in the local market for additional households’ income. Farmer participants in this study said that the fields in this system are then use for growing crops for a period of three to four years before a new fallow system is reintroduced. Under similar conditions, improved fallow systems have significantly increased crop yields. For example, crops yields of maize or sorghum have been reported to have increased more than 100 percent in Kenya and Malawi for a period of 3-4 years before the improved fallow is started all over again (Buck, et al., 1999). Other evidence from the study further notes that due to the eco-feminism orientation among women in the study areas some leguminous trees in the forest or bush fallow are of particular interest to women. During conflict, famine or environmental stress, women often resort to indigenous wild food trees and shrubs as a means of survival. Participants in the research added that this system can in many ways increase food security, support livestock herding and contribute to social stability and peacebuilding.

Findings from this study propose that the adoption of fodder bank system is a pivotal strategy to improving and enhancing livestock production system in Jonglei. Though this system has been used in the past by farmers in Jonglei to support small numbers of milk producing cattle during the dry season, they (farmers) have now realized the importance of up scaling this system in order to support their growing numbers of livestock herds in the face of dwindling renewable key natural resources. This finding is supported by Jera & Ajayis, (2008) who argue that fodder bank systems is an appropriate strategy for smallholder farmers to support their livestock herds, raise their farm income, and reduce
food insecurity which affect several rural small households farmers in many sub-Saharan African countries.

This system entails growing and maintaining leguminous trees and shrubs on a protected land. These tree and shrubs are allowed to mature and established. These trees and shrubs are than harvested by farmers to be provided as protein-rich fodder to the livestock as fodder supplements during the dry season. Findings from this study indicate that fodder bank system is an excellent and sustainable supplement to the open dry season grazing system if widely adopted by herders in Jonglei. Farmers noted that leguminous trees and shrubs are resistant to drought and environmental stress once they are fully established.

This study revealed that improving livestock production and marketing systems in Jonglei State holds the key to socioeconomic stability, supports conflicts prevention and peacebuilding for its agropastoralists and pastoralists tribal communities. Indeed, the future prosperity of South Sudan hinges on the development of the agricultural sector including the livestock sub-sector (FAO, 2011). Findings from this study suggest that the demand for livestock and livestock products in South Sudan is rapidly expanding, especially in large towns. Currently, the demand for livestock and livestock products in these expanding towns are not satisfied by current rates of local supplies. However, Ngigi, (2008) found out that despite the great potential of home grown South Sudanese livestock in providing enough animal base products, the large volumes of livestock and livestock products are currently being imported from the neighboring countries of East Africa to meet the growing demand in Juba and other major towns in this new country.

In addition, findings from this study show that the increase in the demand of value added livestock products is attributed to growing markets, especially with South Sudan
becoming an independent country in 2011, given its huge oil income. This finding is supported by ILRI’s (2011) report that there is a big increase in the demand for value added livestock products such as meat and processed milk product in East Africa and especially in South Sudan. This study shows that adoption and up scaling of agroforestry technologies in Jonglei can potentially supply these huge and growing markets for livestock products such as Juba the capital of South Sudan. In addition, evidence from the study indicates that Livestock markets are currently rapidly growing and many livestock traders from Jonglei are tracking their livestock to the lucrative markets in major cities of South Sudan. If this trend continues, key informants indicated that this high demand for livestock products would create huge employment opportunities for most young people from Jonglei, as these markets would generate significant income, thus raising opportunity cost for bearing arms. Consequently, many young people will abandon bearing arms and deserts being a member of an armed tribal militia, given the mounting pressure on these armed groups from the national government of South Sudan and the international community to end inter-ethnic violence in Jonglei through a nationwide systematic disarmament process (SCRN, 2012).

6.7 Socioeconomic consideration of agroforestry in South Sudan

The study indicates that gender access to productive resources in the rural areas in Jonglei is becoming a great challenge to resource poor farmers. The literature highlights that gender access to productive sources in South Sudan is profoundly challenged by several socioeconomic factors. These factors include high rates of extreme poverty, gender inequalities as well as non-existence of economic and physical structures in post conflict South Sudan (USAID, 2010). Findings from this study indicates that 81 percent of the
farmers interviewed in Jonglei are women. Among these women, 70 percent are widows. This finding is supported by the argument presented by Mackenzie & Buchanan-Smith, (2004) that the numbers of widow-headed households are significantly increasing in South Sudan. This increase of widows is primarily attributable to the protracted civil war and intertribal local conflicts. In this context, widow-headed households are among the most economically deprived and socially marginalized. Traditionally, women in South Sudan produce 90 percent of food and they provide 95 percent of farm labor, especially in the rural areas (FAO, 2010).

In addition, findings from this study highlight that agroforestry system in South Sudan is increasingly becoming a landscape for widows. Widows in South Sudan are primarily the household-heads in most of the returnees’ communities (IPS, 2011). In this context, FAO, (2010) argues that women in South Sudan lack access to productive resources such as land, farm credits and lack to additional farm labor. Lack of male labor, especially during the peak-periods at the beginning of the planting season places additional challenges on women who have do all the farm labor including trees cutting and pruning without the help and support of men. In addition, women in South Sudan lack access to land ownership due customary laws that only allows men access to land in the patriarchal societies of South Sudan. Certainly, because women lack access to land means that they also lack access to farm capital, as land is used as collateral to access farm capital. As seen in the above findings and discussions, women in South Sudan are faced with huge challenges due to the lack of access to productive resources, especially for widows.

However, findings from the study further indicate that international and bilateral organization and NGOs are momentarily providing women farmer groups with the needed
productive resources. These productive resources includes farm inputs such as hands tools, seeds and not-repayable capital to enable these resources-poor women produce food for their households food and income security. This finding is supported by the argument presented by the head of peace and security program at UN women, that supporting women in South Sudan will enable them to contribute to the stability and wellbeing of their communities. According to her recent address to South Sudan international engagement conference (IEC) in Washington D.C. in 2011, that rural women around the world tend to use and invest 90 percent of their agricultural production in supporting their families in comparison to men who only invest 40 percent of their production (Wilson, 2011). In addition, findings from this research indicate that households’ sizes in Jonglei are very large. Respondents pointed out that 94 percent of sizes range between four to eight members. This finding is highlighted by the argument made by WFP, (2010) that the average household size in Jonglei is 10.5 members per households. This high households average sizes in Jonglei is attributed to the high numbers of children in one household due to polygamous relationship, though most of these households are female headed.

Traditionally, widows in the Nilotic tribes of South Sudan stick to their deceased husband’s household. Within these communities, marital bonds between women and men remain even after the death of their husbands (HSBA, 2011).

The literature from this study acknowledges that lack of access to land by widows continues to reduce their capacity to produce food for their large households. Findings from the study indicate that widow headed households in Jonglei are only accessing land through women farmers’ groups and farmer field schools supported by NGOs. With the increase of women’s participation in the newly elected political institutions in South Sudan, it is likely that women will reintroduce a new political reality that may remove
gender in equalities, if women remain united as they clearly form more than 50 percent of the population in post conflict democratic South Sudan (Wilson, 2011).

Findings from this research show that young farmers groups are now reporting significant income from each acre of land they planted with vegetables with the support of AFO. This finding is supported by the FAOs (2010) report that in some areas in Jonglei, the generated annual income of one acre of land amounts is more than $10,000 per acre per a year. Other findings from this study also revealed that, through their involvement in these profitable agroforestry systems, large numbers of unemployed youth in the rural areas of Jonglei are increasingly becoming unavailable to be recruited in the tribal militia. Findings from this study suggest that these youth-led agroforestry projects are significantly contributing to poverty reduction, conflict prevention and peace building in Jonglei. The future development and peacebuilding interventions in Jonglei, which include the growing numbers of unemployed youth, are currently underway supported international donors and NGOs (CRS, 2012). For example, women farmers of seven members in Southern area of Jonglei said their collective annual income range between $4-10, 000 from the sale of value added agricultural and livestock products. The study also indicates that youth farmer groups were able to generate a significant income from the sale agroforestry products. Other findings from this study revealed that women farmers are able to generate significant income from agroforestry tree products (AFPS) such as building posts, fuelwood and charcoal. This high demand for timber and building materials in South Sudan is attributed to the growing construction business. This high demand is coupled with demand for fuelwood due to highly growing local markets.

This study shows that markets for agricultural products and inputs are highly undeveloped in South Sudan. Decades of war have effectively destroyed traditional rural
crops and livestock markets as well as disrupting trade linkages and networks that used to exist between different tribes in South Sudan before the war. In addition, this study indicates that it is impossible to upscale agricultural investment and intensify crops production without well-developed market outlets. However, the study shows that after the 2005 peace agreement and the massive return of IDPs in addition the establishment of the civil institutions, the local and rural markets in South Sudan has started to develop from scratch. In the context of the rural areas in South Sudan, the rural markets are divided into two types. The first market is the rural primary markets located in the local villages and small towns in Jonglei where mostly food crops and small livestock are usually sold for daily consumption. The second market is the rural assembly markets located in agricultural surplus areas where large crops surplus are sold to traders and on a periodic basis (Miller, 2008). However, in the context of rapid economic growth in South Sudan, the literature indicates that South Sudan economy has remarkably grown following the 2005 peace agreement. This immense economic growth is South Sudan is attributed to its huge oil income that amounts to two billion dollars per year as part of North-South peace deal in 2005 (Shankleman, 2011).

Owing to this significant growth in South Sudan economy, findings from the study indicate that the demand for food product has also drastically grown following the massive return of the war displaced people. This economic growth is also coupled with the establishment of the government and civil institutions. These new institutions includes significant numbers of UN agencies, international organizations other international bodies with their international and local staff at all levels over South Sudan. Against this background, findings from the study argue that apart from their contribution to the local food security, agricultural and agroforestry products are highly marketable in South Sudan.
This study show that the establishment of crops and livestock market information system (CLiMIS); has supported the rapid growth in in crops and livestock marketing systems. Furthermore, this study indicates that this system has effectively link crops and livestock markets at the local and national level across South Sudan and regionally with the East Africa through the Regional Agriculture Trade and Intelligence Network (RATIN).

In addition, the study indicates that other ICTs connections with various local and regional markets through several mobile phone companies have connected the food crops and livestock markets both locally and with the entire east African region. These mobile phone companies are providing crops marketing information to the farmers through text messaging and mobile information and funds transfers. Participants indicated that these local mobile phone companies in South Sudan include Zain, MTN, Gemtel  Sudani and Viva-Cell. This study revealed that these ICTs and regional trade linkages would greatly enhance and support current and future advances of agricultural development and supports economic growth and peacebuilding in South Sudan. From the discussion above, this study argues that income generated from the sale of agroforestry product can potentially enhance food security, fosters social stability and supports peacebuilding process in Jonglei state.

The study found out the potential for commercial agroforestry system for production of Gem Arabic crops for exports in South Sudan are quite promising. Key informants in this study indicated that with further development and technical support from the International Association for Promotion of Gums (IAPG), South Sudan could become one of the leading Acacia Gum producing countries in the world. As highlighted in the literature, Jonglei state is in the middle of the Acacia Gum tree belt in South Sudan with an average of very high density of 994 Acacia trees /ha. Moreover, the belt of Gum tress covers 46 percent of the total area of South Sudan (SNV, 2010). Evidence from the study
revealed that several USA and European based companies are developing baseline assessment to develop this sector with the view of incorporating the local smallholder farmers in South Sudan to be the center of agroforestry project for food crops and Acacia Gum production. As demonstrated in the study, if the enormous agricultural potentials of South Sudan would be effectively utilize, this sector would support South Sudan socioeconomic transition, sustainable development that would potentially creates employment opportunities and generate significant income (FAO, 2011).

6.8 Towards a New Model of agroforestry for peacebuilding

The new conflict model shown in this chapter was primarily adapted by the author from the OECD, 2009 conceptual framework presented in Chapter two of this study. This conceptual lens was very effective, flexible and influential during the study as an analytical tool to understand the complex context of the inter-ethnic in Jonglei. However, after the completion of the study and compilation of the research data presented in Chapter five of this study, it became necessary to modify the initial conceptual framework. The new modified conceptual framework (figure 6.1) diagram has incorporated the new situation that has emerged in South Sudan during study. This new situation has involved the entrance of additional agents of conflict prevention and peacebuilding agents into the humanitarian landscape of this nascent country. These new global and bilateral agencies came to South Sudan to help and support its people and the government to mitigate the impact of the extreme and protracted crises that is beyond the capacity of a single organization to address. This finding is supported by Alinovi’s, et al. (2008) assertion that the extreme humanitarian crisis in South Sudan requires collective efforts and interventions of more than one agency due to the enormity and complexities of this protracted emergency that is beyond
the capacity of one organization. This multidimensional crisis entails complex emergencies including widespread chronic food insecurity, influx of returnees, severe impact of environmental hazards and an ongoing intertribal armed conflict.

This modified conceptual framework has now included new factors at its three dimensions and levels of the conflict agents. These three levels include institutions, agents and instruments of conflict. At the center of the modified conceptual are the people who chose to use various agroforestry technologies as means of access to food security, socioeconomic stability and peacebuilding. The modified conceptual lens after data collection and findings discussion has identified ten interrelated key considerations of agroforestry as means of conflict prevention, socioeconomic stability and peacebuilding.

These ten key factors as presented in the box at the right side of figure 6.1 are broadly divided into two main consideration of agroforestry, namely biophysical and socioeconomic factors.

**Table 6.1: Key consideration for agroforestry for peacebuilding**

<table>
<thead>
<tr>
<th>Agro-Ecological considerations</th>
<th>Socioeconomic considerations</th>
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<tbody>
<tr>
<td>Improve access to food security.</td>
<td>Access to productive resources</td>
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<tr>
<td>Fertilizer tree systems</td>
<td>Gender relation</td>
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<tr>
<td>Biomass transfer system</td>
<td>Income generation</td>
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<td>Improved fallow system</td>
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<td>Fodder Bank system</td>
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<td>Improve livestock production</td>
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**The Institutions**

The institutions of the conceptual framework presented in chapter two have now changed, with new institutions plus the old ones. These new institutions are primarily institutions from the global level that have come to South Sudan to support its peoples and
government to mitigate the impact of conflict and support post-conflict peacebuilding process through comprehensive development including management of natural resources (UMISS, 2011, p. 2). Equally, evidence from the study suggests that post-conflict peacebuilding in South Sudan to include peacekeeping efforts. This decision was part of a process undertaken by the United Nations Security Council (UNSC) to ensure that post-conflict peacebuilding process in South Sudan are given the full support by the international community. This finding is substantiated by the (UNSC, 2011) resolution number 1996(2011) that the commission the formation of the United Nations Mission in the Republic of South (UNMISS).

Apart from the UNMIS, the study showed that there are other several International and bilateral NGOs from the global level that are now supporting post-conflict reconstruction and peacebuilding in Jonglei. For example, several of such NGO’s are currently supporting long-term agricultural and agroforestry development projects in Jonglei. As highlighted by FAO, (2010), that supporting agricultural development in South Sudan was intended to support its peacebuilding efforts. However, due to its extreme humanitarian crises due interethnic conflict, Jonglei has been declared by FAO in 2010 as a priority area (PA) of support (Ibid). Consequently, the study shows that major donors and NGOs are currently funding women and young farmer groups to advance agroforestry technologies in Jonglei. This finding is highlighted by USAID’s (2011) press release that the UID is currently supporting the pastoralists and agropastoralists communities in Jonglei to achieve their long-term households’ food security. This 54 million dollar program is primarily geared towards supporting innovative agricultural technologies to enable local communities in Jonglei to achieve their long-term household food security in a sustainable manner.
In addition, other findings from the study indicates that the formal agents at the national and local level and informal and the traditional agents at the local level have recently become involved in agricultural projects aiming to increase access to food security and peacebuilding. Similarly, the literature acknowledges that the presence of UN peacekeeping forces and other peacebuilding partners on ground in Jonglei has created a new thrust for peacebuilding involving local churches, women groups and community leaders (Gounden, 2011).

The Agents

The modified conceptual lens indicates that the agents that are influencing intertribal conflict in Jonglei at local level have remain the same. However, evidence from the study argues that some of these unemployed and illiterate former combatant young males are being included in food production and various income generation agricultural programs. As can be seen from the above discussion, the study shows that youth employment through agroforestry technologies is helping growing numbers of unemployed youth to get out of the intergenerational poverty traps.

The OECD, (2009) links the increasing inter-ethnic violence in South Sudan to the proliferation of unregulated weapons. In addition to factors influencing their availability and supply. Evidence from the study indicates that new weapons are being supplied to the several armed groups in Jonglei from global supply chain through the government of North Sudan. This finding correlates with the (Sørbo, 2010; HSBA, 2011) argument that these new weapons are being provided by the (GoS) to the perpetrators of conflict in Jonglei, mainly through supplying them to illiterate and unemployed youth. The study revealed that adoption of agroforestry technologies can provide a good source of income thus makes ac-
quisition of arms and arms conflict less attractive to for these youth by increasing the opportunity cost for such conflict.

The study concluded that the ten key factors of agroforestry technologies indicated in the middle of the modified conceptual framework are holistic and dynamic. The lens show these integrated and interlaced key consideration of agroforestry systems for peacebuilding will only turn around to support and rehabilitate the people, the institution as well as the agents of conflicts under one condition. This condition includes the support and intervention from the formal international institutions and bilateral agencies to the national government of South Sudan as well local the communities to upscale agroforestry technologies aim to achieve sustainable access to households’ food security, socioeconomic stability and peacebuilding.

Findings from the study recommend an array of key tree species that can significantly support the advancement in agroforestry systems in South Sudan in general and the three livelihoods zones in Jonglie. The recommended trees cover all the ten key considerations suggested by the new model of agroforestry as a means of peacebuilding. (see appendix 3)
The Potential of Agroforestry System for Peacebuilding

Figure 6.1: The modified conceptual framework

Source: Adapted by the author from the OECD, (2009) conflict lens
6.9 Summary

This chapter, through the process of interpretation and analysis, explains and establishes the nature and the underlying cause of the inter-ethnic conflict in Jonglei state, South Sudan. The chapter identifies food insecurity and cattle, due to poverty and environmental stress to be the main causes of the conflict. This chapter further explains that the key negative and positive influencing factors of the conflict are both the informal and formal institutions of conflicts. Other influencing factors include the agents and the instruments of the intertribal conflict in Jonglei. The next section of the chapter identifies and explains the ten key factors, priorities and potentials of agroforestry technology as a sustainable means of increasing access to households food security, socioeconomic stability and peacebuilding. In addition, a modified conceptual framework that guided and informed the discussion of the study is presented at the end of the chapter. Within the center of this modified conceptual lens, are the key priorities of agroforestry embedded in the circle in the middle of the lens. These key factors of agroforestry include socioeconomic and biophysical factors. Furthermore, this chapter emphasizes that the circle (factors of agroforestry) will only turn around to support the people who are trapped in conflict if the global development partners, the government and the local communities in Jonglei take these key factors of agroforestry into account. In the event these factors are taken into account at the different levels, then agroforestry can support the people affected by the conflict in achieving access to food security, socioeconomic stability and support.
CHAPTER SEVEN

SUMMARY, CONCLUSION AND RECOMMENDATIONS

7.0 Introduction

This chapter presents the final summary of the study. It provides key conclusions according to the research objectives and gives a summary on key considerations of the potentials of agroforestry systems, as effective means for socioeconomic stability, conflict prevention and peacebuilding. In addition, chapter seven situates the findings in the context of the inter-ethnic conflict and extreme poverty in Jonglei state, South Sudan. This chapter concludes several recommendations to various stakeholders including NGOs, the government of South Sudan, and various local community based organizations on ground in Jonglei. The last part of chapter seven presents the final recommendations to the study to various stakeholders in the field of agroforestry and food security including recommendation to further researchers on agroforestry in South Sudan. This chapter then ends with the final concluding remarks.

7.1 Final Summary

As described in chapter one, the main objective of this study was to understand the potential and the relevance of agroforestry systems and technologies as a means of increasing access to food security and support to peacebuilding. As explained in chapter two of this study, a proper understanding of the concept of agroforestry systems and technologies in supporting increased access to food security, socioeconomic stability can potentially lead to peacebuilding. The study in chapter four describes the context of extreme poverty and the lack of access to productive resources to the local farmers in South Sudan due to decades of war and socioeconomic marginalization. Chapter four clearly points out the great potential of agriculture in the new country of South Sudan. In
this regard, participants in this study indicated that if well developed, the agricultural sector in South Sudan could turn this poor country into the bread basket of Africa, given its enormous natural resources including arable land, water resources and huge income from oil exports. Chapter five of this study found out that adoption of agroforestry systems by farmers trapped in inter-generational poverty would not support food security as agroforestry land use systems requires intensive labor, time and credits. Thus, this study focuses on the support of the international donors, aid agencies, and the government of South Sudan to enhance and develop the capacity of the local farmers to enables them to successfully adopt and upscale agroforestry systems.

In many ways, agroforestry technologies as a low-input and low energy natural resources management system that can be effectively used to manage soil fertility, water resources and biological diversity for sustainable production of food, fodder and fuelwood, while protecting the environment locally and globally. Against this background, this study revealed that scaling-up agroforestry is increasingly being viewed by the international multilateral and bilateral donors and aid agencies as the main entry point for sustainable development in poor countries afflicted by environmental stress due to climate change. This research focuses on the important role women can play in advancing agroforestry land use systems to empower them through income generation and value added smallholders cottage and agro-industries. However, this study indicated that most of farmers embracing agroforestry systems in Jonglie South are widowed. Participants indicated that widows are often time marginalized in patriarchal societies such as the one in South Sudan. As such, findings of this study argue that supporting gender attributes in agroforestry can empower the increasing numbers of widow-headed households to increase their socioeconomic status and help to mitigate social inequalities. As the domain of the women, agroforestry
land-use systems can advance the important role of women in providing access to households’ food and income security. In this way, agroforestry can support gender equality as empowering women economically and socially can reduce gender inequality, foster socioeconomic development and enhance peacebuilding process. As such, the role of women in shaping the post-conflict socioeconomic and political landscape in South Sudan cannot be underestimated.

The conceptual framework of this study was adapted from the OECD (2009), conflict prevention lens. Most of all, this conceptual framework was very influential in indentifying the main institutions, agents and instruments of conflict in Jonglei South Sudan. Being people-centered and bottom-up people perspectives, this conceptual lens was effective in analyzing the nature of the conflict at hand and was able to incorporate key consideration of the potential of agroforestry systems and technologies in supporting food security, socioeconomic recovery, and social stability and peacebuilding in South Sudan.

This research used a variety of qualitative data methods mentioned in chapter three for the triangulation of results. These methods include key informant interviews, farmer group discussions, farm visits, focus group discussions, and field and participants observations for a period of five months. Due to the nature of the post conflict context of South Sudan, the data collection was conducted over three countries involving stakeholders at the global, regional, and national and local levels. Additionally, the study explained the reason why the backgrounds of the respondents of this study were very diverse across and between the four levels in which the data were collected. This great diversity was meant to elicit different perspectives given several important factors considered by the study. Nonetheless, the key consideration for covering the three levels of conflicts as explained by the OECD, (2009) conflict lens was that the conflict in Sudan has connections with the
international and regional unregulated weapons dealers and network. Against this background, the study indicated that the local instruments of the inter-ethnic conflict in Jonglei are indeed connected to China, Iran, and Belarus, through Northern Sudan. The other factor taken into account during date collection was that peacebuilding in Sudan was of great international concern and interest as conflict anywhere threatens peace everywhere. This finding is supported by the fact that South Sudan is indeed the major recipients of official development assistance (ODA). This massive international official development aid to South Sudan is provided to support post conflict development and peacebuilding process in this poor nation (Poole, 2011). In addition, this study found out the USAID’s support to South Sudan is the largest of such assistants in Sub-Saharan Africa. The main objective of USAIDs support among others is to enhance food security that prevents conflict and supports peacebuilding efforts through pro-poor food production initiatives (USAID, 2011). Due to these considerations, this study was commenced in Khartoum in North Sudan, Nairobi, and Juba and in the field in Jonglei state.

The main objective of this study is rooted in three key objectives. The first objective was to seek and determine the relevance of agroforestry sustainable land use system as a means of conflict prevention, conflict transformation and peacebuidling in Jonglei. Against this backdrop, the participants indicted agroforestry technologies can help to eradicate hunger through pro-poor and sustainable food production systems. The second research objective was to seek and identify cases and examples of agroforestry technologies that can address the need for poverty reduction within the context of existing or potential armed conflicts. In this context, the study revealed that agroforestry can reduce rural poverty and achieve the Millennium Development Goals (MDG). The third objective of this study was to identify agrosilvopastoral interventions that would support women’s role in food security,
peacebuilding and post conflict recovery under a thread of interethnic conflict situation. The participants indicated that agroforestry has provided poor IDP women with the opportunity to raise small livestock, grow vegetable for food security and income generation. Adoption of agroforestry in Jonglei has advanced widows’ resiliency and recovery from the effects of intertribal conflict. Through agroforestry system, this study revealed that supporting widows would eventually support several widow-headed families and large numbers of children with increase access to food and income security.

7.2 Conclusions

This study investigated the potential of agroforestry as the most appropriate means of increasing access to food security, socioeconomic stability and peacebuilding in the context of extreme poverty and intertribal conflict. Adoption of agroforestry can potentially support poor communities to increase food security, and help them generate income in a sustainable manner. This study has indentified ten important and considerations of agroforestry that can potentially support women, youth and livestock herders in Jonglie to increase their livelihoods’ assets base and advance their socioeconomic recovery and enhance peacebuilding efforts in this conflict ridden state.

7.3 Agro-ecological considerations

The seven agro-ecological considerations underscored by this study are the priorities of agroforestry interventions that if taken into consideration by the international and bilateral organization as well as the government and the local communities in South Sudan, peace can be achieved. However, while the oil exports constitute more than 89 percent of revenues for the government of South Sudan, agriculture is by all accounts, the most important economic activity in this nascent country. The agricultural sector, including
agro-pastoralism and pastoralism, provides employment for more than 85 percent of the population of South Sudan. Most of all, agricultural activities in the rural areas in this newly born country consists of subsistence agriculture with low levels of productivity, and little or no surplus income for farmers or tax income for the government. This intensive slash-and-burn mono-cropping system, which is being widely practiced in South Sudan, is not sustainable, given lack of physical or financial assets for most of the rural population, owing to its high rates of poverty. Furthermore, this system requires expensive external inputs such as commercial fertilizers, machinery and well developed markets. Overall, this conventional farming system tends to deplete the soil, reduces biodiversity and pollutes the environment. By all accounts, the feasible alternative recommended by the international development agencies is the low-input and low-energy agroforestry technologies and systems.

Ideally, advances of agroforestry systems in South Sudan require initial investment in basic agricultural infrastructure as well as effective partnership between the NGOs, research instructions farmers and local government. Once established, agroforestry systems can potentially improve security, support the livelihoods of the rural communities, protect the environment, and maintain the local eco-biodiversity. In addition, by increasing local communities’ financial income through agroforestry, these local communities will be able earn a stable income and will be able to pay taxes to the local and national government, thus reducing socioeconomic marginalization through redistribution of the national income. First and foremost, this study found out that embracing agroforestry by poor farmers means increasing their access to food security within affordable means.

Additionally, participants in this study indicated adoption of agroforestry by agropastoralists and pastoralist communities can provide them with constant supply of
fodder, and maintain their natural pastures. Moreover, participants in this study points out that growing nitrogen fixing dodder trees and shrubs in their parklands has helped them to regenerate and expand the availability of key renewable natural resources in their natural pastures. In addition, nitrogen fixing trees can support rigorous growth of greener pastures as well as supplying abundant of protein-rich shrubs understory to be browsed by the herbivores. Consequently, if agroforestry systems are widely adopted by the agropastoralists and pastoralist ethnic groups in Jonglei, competition and conflict over natural resources could be drastically reduced and peace can be effectively restored.

7.4 Socioeconomic consideration

Lack of access to land is a fundamental challenge for poor rural communities in South Sudan and women are profoundly affected by lack of access to land. However, owing to decades of civil war and persistent inter-ethnic conflict, more than 52 percent of households in Jonglei are female headed-households (WFP, 2010). Key findings from the study indicate that the majority of agroforestry farmers in Jonglie are widows. Due to their being the majority, the study points out that these widow-headed farmer households’ in Jonglie are faced with enormous challenges that hinders and reduces their capacity to effectively produce food crops. Widow farmers found themselves standing alone in the resource-poor rural and patriarchal societies South Sudan. They lack productive resources such as land, men’s labor and farming capital. However, owing to their being the majority, the study revealed these widows have decided to stand together in order to surmount the above mentioned challenges. One of the new roles assumed by these widow farmers is to organize themselves into women farmer groups in order to strengthen their social network through community organization. Clearly, the participants in this study indicated that
women are accessing land through farmer field schools and use it to advance agroforestry farming systems. As demonstrated in the literature and the findings of the study, the international NGOs are currently providing funds to women agroforestry farmers through farmer field schools.

The study also points out that through their interconnectedness and interdependency, these women farmers groups are pooling their workforces through working collectively in their fields. They prepare their land, plant cop weed their field and harvest their crops collectively. In addition, they share their crops surpluses with their group’s members, especially during times of sickness or during poor harvest and lean crop times. Consequently, their collective access to land is directly supporting socioeconomic stability and enhances peacebuilding through adoption of agroforestry systems. Widows are a reality of the rural areas in the post conflict era of South Sudan. They are often the most marginalized among the marginalized resource poor rural societies. However, this study found out that through their collective efforts in adopting agroforestry systems, these women farmer groups are able to build their social and physical capital. This study revealed that proper organization and building social capital among women farmers groups has encouraged several bilateral organizations to organize systematic support without the need for developing a collateral system.

7.5 Gender relations

As mentioned above, women are increasingly assuming leadership roles and decision-making in the absence of men. In addition, women’s social relations, interdependency and interconnectedness are supporting them to build their social assets necessary to mitigate the impact of poverty. Conversely, building social assets encourages
women to build their physical, natural and finical assets through adoption of agroforestry technologies. In many ways, enhancing women capacity through farmer field schools in Jonglie increases women’s knowledge about marketing information systems necessary for agribusiness. In addition, the study indicated the ICTs as well as the crops and livestock marketing information system (CLiMIS), are providing crops and marketing information to women in Jonglei, thus, enabling them to access market opportunities through sale of surplus crops.

Findings from this study indicate that women in the rural communities tend to share their earnings from the sale of their crops to support their children’s education and provide better health service to their entire households. The overall impacts of empowering women also prevent early marriages as a thrust for girls’ education is now pervading throughout South Sudan. In this new context in South Sudan, women education is now being seen as the gateway to eliminate gender inequalities and reduce poverty as illiterate female are the most marginalized among the marginalized. Additionally, this study revealed that intertribal conflict in Jonglei is highly gendered as young males constitute most of the agents of conflict. The role of women in generating income through the sale of surplus food crops, value added livestock products, and fuel wood can directly support socioeconomic stability and augment peacebuilding.

7.6 Youth employment

The main agents of intertribal conflicts in Jonglei are growing numbers of unemployed and illiterate youth. This study eluded that with the technical support from multilateral and bilateral aid agencies, advances in agroforestry vegetable gardening are opening new windows of opportunities for youth while providing them with lucrative
employment. With the new markets that are now opening up in Jonglei, driven by increasing waves of returnees and relatively growing economy due to oil revenues, the study indicated that there is a high demand for locally grown fresh vegetables. Consequently, these youth groups who are intrinsically more interested in market oriented high value vegetables, are able to momentarily access these new markets and accrue significant incomes. Participants indicated that youth are reinvesting their income in other small agribusiness and entrepreneurial initiatives. Accessing new and growing crops markets have provided the unemployed youth in Jonglei with good employment opportunities. As such, reducing youth exclusion and marginalization raises the opportunity cost for youth to acquire weapons or being recruited into loot-seekers. Because of these youth centered agroforestry initiatives, several of the youth groups are currently contributing to socioeconomic stability and peacebuilding. However, as the study indicates, the numbers of youth and children in the rural households in Jonglie are large. There may not be enough land or opportunities for these growing numbers of youth to embrace agroforestry systems, due to lack of access to land and capital. Most of these children are orphans growing up with their mothers and grandmothers without the support of their fathers due to the war. As these youth grow up, their lack of access to land and productive resources as well as livelihoods assets will pose a great threat to the rural communities if these youth are not provided with skills and productive assets, given their low literacy rates.

Finally, this study’s results have reinforced a strong relation between food insecurity and conflict in Jonglei. In this context, the intertribal conflict continues to threaten the poor and food insecure rural communities, who are unable to provide for their households due to high rates of intergenerational poverty traps. The study revealed that embracing pro-poor
sustainable food production through advancing agroforestry land use system and technologies can effectively increase access to food security, socioeconomic stability and enhances peacebuilding. In many ways, the current support provided by several bilateral agencies and NGOs in Jonglei to women and youth agroforestry farmers, can potentially end the intergenerational poverty trap. As agroforestry technologies and systems are so flexible and can meet the needs of various land users. These land users includes pastoralist and agropastoralist within and across the gender and age divide. As demonstrated by the study, adoption of agroforestry systems in Jonglei has great potential to increase access to food and income security, protect the environment locally and globally as well as contribute to socioeconomic recovery, conflict prevention and peacebuilding.

7.7 Recommendations:

The following recommendations are specifically made for the international donors, oil exploration companies, the government of South Sudan, church base organizations as well as farmers’ organizations and future research in agroforestry.

7.7.1 International donor countries NGOs

The importance and the significance of the international donor countries and NGOs engagements in South Sudan in the past cannot be underestimated. Clearly, without the international community’s support during the time of the civil war, most of the population of South Sudan people would have perished. The people and the rural environment in South Sudan have been a subjected to a brutal war that has effectively killed millions of people and destroyed the local environment. However, with the return of peace, the international aid and humanitarian agencies’ engagement in South Sudan should move away from providing addictive food aid to focus more on sustainable development.
Based on its findings, this study recommends that the central focus of the international aid for food and livelihoods security in South Sudan should be centered on developing and supporting locally owned and locally led agroforestry interventions. In addition, this study recommend that the NGOs the privates sectors and the government of South Sudan should invest in community based agroforestry projects based on the interests of the local community and the investing companies. This investment must also include setting up of agrarian enterprise and creation of local markets in order to promote income generation for the local communities in Jonglei. Based on this study, local people indicated that the best approach to development in the rural areas is through supporting the ten priorities they have been indentified in this study, mainly the agro-ecological and socioeconomic factors of agroforestry in the new conceptual model in Chapter six of this study.

However, the other two important areas identified by the rural communities as their priorities in which the international community can best support food security, conflict prevention, and peacebuilding in their areas are based on agroforestry systems and technologies. The first area identified by the local people is for the NGOs to provide technical support based on simple bottom- up initiatives. They have indicated that this support should include infrastructural development, such as establishing permanent trees and vegetable nurseries in each local communities managed by them. Additionally, the technical support should include development of proven indigenous nitrogen fixing and fodder tree species. They said if necessary introduction of exogenous tree species and shrubs should come from the neighboring countries such as Kenya or Uganda that have similar dry and semiarid climate such as South Sudan. This area should also include technical training that can enhance the professional development of illiterate women.
Another area of the local communities’ interest is for the international NGOs support to cross breed the local cattle and goats with exogenous high milking, better beef and short horns breed from within the region of Eastern Africa.

The second area local communities identify in relation to the international NGOs support is to develop the socioeconomic aspect of agroforestry development. The first of this support is to provide long-term credits and loans with no collateral conditions. The second part of this support must include training the local communities in areas of community participation and human rights. These training programs should be in conflict management and preventions as well as peacebuilding programs through the local farmers and pastoral field schools.

7.7.2 Oil Exploration Companies

Oil exploration and development have been going in Jonglei state for some time. There are currently several oil exploration companies on ground. This study recommends that any oil exploration must include and incorporate the perspective and the interest of the local pastoralist and agropastoralist farmers. The local people said the oil investment must include socioeconomic and agro-agro-ecological benefits to the local communities. These benefits must include supporting the local communities to grow trees and shrubs that can offset the environmental degradation and pollution induced of oil explorations. The oil companies must also support training the local CBOs, farmers and pastoral field schools in the field of small agro-business development, credit management and peacebuilding initiatives that include capacity development and extension for the local communities; especially for women and youth within the areas of operations in Jonglei.
7.7.3 The Government of South Sudan

The government of South Sudan (GoSS) must continue to increase its contributions from the oil income to the Multi-Donor’s Trust funds (MTDF) of the World Bank that has been supporting agroforestry systems framing initiatives in the rural areas of Jonglei state since 2005. The (GoSS) must reform the land policies that must unconditionally allow women access to have access to secure land and tree tenure. The (Goss) must not approve or allot land to any foreign or local investors without taking the interests of the local communities into account. The study revealed that lands that have been already grabbed by some international investors without the consent of the local people must be returned and the local people compensated. The (GoSS) must train local people on how to manage land and include local people in (GoSS) land commission.

7.7.4 Farmers Organizations

As key findings of this study indicate, women smallholders’ farmers in South Sudan are the main producers of household’s food security and through them most rural households acquire their income. In addition, key findings from this study points out that most of women farmers in the rural areas in Jonglie are widows. This study then recommends that farmers’ organizations at the grassroots level in the local communities in Jonglie must work collectively and set out clear objectives and guidelines on how to achieve household food security. Undoubtedly, widows in Africa are strong if they are not marginalized. Therefore, this study recommends that farmers’ organizations must be inclusive, identified, and select visionary leaders to that can lead them to access productive resources through the government and bilateral organization such as USAID who are willing and ready to support farmers’ groups as indicated in USAIDs recent press release.
This study found out that soil infertility and soil nutrients depletion is a major constraint to smallholders’ resource poor farmers to increase food crops production. This study recommends that women farmers’ organizations work through farmer field schools to strengthen participatory learning in order to identify agroforestry systems and technologies that can support sustainable soil fertility that would enable the growing members of women farmers as well as the local farmers groups to produce enough food for their households’ needs and surplus for income generation.

This study revealed that women farmers are interested in raising and managing small livestock for household food and income security. This study recommends that farmers’ organizations work hand in hand with bilateral organization and the government of South Sudan in order to establish and introduce community based on milking goat lending initiatives. This project entails introduction and cross breeding of high milking goats breeds with the local breeds for the benefit of members of the farmers groups. This program is recommended by this study as part of incorporating high producing livestock in the agroforestry farming system that women can offer each hybrid female (goats’ bank) goat to poor women with several protein-rich tree and shrubs seedlings free.

7.7.5 The Church Based Organizations

The study recommends that local church based organization must sensitize the young women and include them in their social and development as well as proving professional development apart from their engagement in agroforestry. These training programs must include carpentry and wood work for building furniture and houses. The CBOs and Church based organization must include rights based training that includes
community advocacy, human rights and adult education.

7.7.6 Future Research on agroforestry in South Sudan

The future researchers in the field of exploitation of natural resources such as soil and water engineering must also consider socioeconomic aspirations of the local communities. It must also include the role of high value extractable natural resources such as valuable minerals, oil timber in the process of extending local people’s capacities and peacebuilding. Another field of interest for research is to study and explore commercially growing Jatropha tree in marginal lands in Jonglei for production of biofuels for export, given that Jatropha tree grows wild in South Sudan as it requires very minimal care. Another area of possible research is to explore the possibility of developing and exploring a local knowledge based ethno-pharmacology and ethno-veterinary benefits of the indigenous trees, shrubs and herbs. Conversely, during the study the local people indicated that trees and shrubs were the main sources of medicine for them and their animals.

7.8 Concluding remarks

This study is the first piece of research on agroforestry systems and technologies in South Sudan based on farm level research. This exploratory study is extremely important as its highlights the importance of agroforestry systems for resources poor communities’ amid the challenges of high rates of poverty and chronic food insecurity within the rural communities in this nascent nation. High rates of poverty and food insecurity are prompting poor people within these communities to perpetrate violence as a means of strategy. Agroforestry systems are recognized by international development agency as the entry-point to access to food and income security and can prevent conflict and enhance peacebuilding. These objectives can be achieved through sustainable management of key
renewable natural resources for the benefits of the current generations, without compromising the rights of future generations. Advancement in agroforestry through field based research parent great opportunities for rural farmers and the various stakeholders in field of natural resources management in South Sudan. It challenges them to set their priorities on how agroforestry can attend to core issues and challenges of offsetting environmental degradation by growing oil exploration operation and extraction on the local environment as well as offsetting the impact of climate change amid the growing needs for natural resources by the people of South Sudan.
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Appendix 1

Chronology of civil war in Sudan

South Sudan’s independence was the final stage of more than 50 years of civil war and 6 years of peace agreement ending decades of civil war. The referendum was one of the consequences of the 2005 Naivasha Comprehensive Peace Agreement (CPA) between Khartoum’s central government and the Sudan People’s Liberation Army (SPLA). The following chronology outlines in sequential order past conflicts and events that have occurred leading to the Comprehensive Peace Agreement as well as leading to the independence of South Sudan making it the world’s 193rd nation in July of 2011.

1899-1955: Sudan under the Anglo-Egyptians rule

1955: The first North – South civil war started in South Sudan that lasted for 17 years (1955-1972).

1956: (January) Sudan becomes independent from Anglo-Egyptian colonial rule.

1958: The first Military coup d'état took place in Sudan. As a result, the civil conflict in South intensified.

1962: A sustained guerrilla war begins between the central government of Sudan and the first South Sudan rebels movement known as the Anya-Nya (The poisonous insect) rebel’s movement.

1969: Second Military coup d'état that recognized the rights of South Sudan for a regional autonomous government within the United Sudan.

1972: after months of negotiations, an agreement was announced in Addis Ababa between the Sudan government and Anya Nya movement after 17 years of a bitter civil war. The Addis Ababa agreement granted South Sudan an autonomous Self-governed rule.
1987: Oil was discovered in Bentiu by the American based Chevron Company.

1983: (May) the second civil war erupts once more in Bor the Capital of Jonglie province between the Sudan people’s Liberation Army (SPLA) and the government of Sudan.

1983: (September) Sudan was declared as an Islamic state by the central government in Khartoum. According to Sharia Islamic laws, non-Muslims citizens of South Sudan become second class citizens without any rights. While the economy including the Banking system was completely Islamized hence, the citizens of South Sudan were deprived and denied any access to economic rights.

1985: A popular uprising took place in Sudan because of a weakened economy owing to the high cost of North-South civil war, followed by the 3rd Military coup d'état. The civil war in South Sudan continued unabated.

1986: The military government handed over power to an elected civilian government dominated by the Northern Arabic Islamic elite’s central political establishment.

1989: A forth military coup d’état took place in Sudan that brought the current dictatorial Islamic and Arabic-oriented to the helm of power. The reason given by the military regime was that the rebels were advancing to control more than 80 percent of the rural areas in South Sudan, while the three major garrison-towns remains in the hands of the central backed by Iran, Iraq and Saudi Arabia.

1991: The South Sudanese rebels forces (SPLA) were forced out of Ethiopia by the new Tigrinya People's Liberation Front (TPLF) that took power in Ethiopia after the demised of Mengistu regime. Mengistu supported the SPLA. As result, a major split along ethnic lines took place within the SPLA involving the of Dinka and Nuer tribes.

1992: A devastating intertribal conflict erupts within the SPLA between Dinka and Nuer
tribes in Jonglei killing 5000 Dinka people and 1 million cattle, mainly from the Dinka tribe were reported killed or raided by the invading Nuer tribe. As a result of this conflict, the entire Dinka populations in the rural areas in Jonglei were displaced.

1998: A devastating famine that killed an estimated 70,000 people takes place in South Sudan as a result of the civil war (IRIN, 2012).

2003: Another severe civil war erupts in western region of Darfur between Sudan Liberation Movement of Darfur (SLM) and the Sudanese Government. The rebels in Darfur claim that the people of Darfur have been politically and economically marginalized by the center.

2005 The government of Sudan and the Sudan’s Peoples’ Liberation Army (SPLM) finally signed an internationally brokered Comprehensive Peace Agreement (CPA) that includes permanent cessation of hostilities, national wealth and power sharing between the two parties of the conflict.

2006 November – Fighting erupts between Northern Sudanese forces and their former Southern rebel foes since the CPA signing. Fighting is centred on the Southern town of Upper Nile.

2007 May - US President George W Bush announces fresh sanctions against Sudan due to atrocities in Darfur.

2008: March - Clashes arose between Arab militia and SPLM in Abyei area on North/South divide.

2009: March- the International Criminal Court (ICC) in The Hague issues an arrest warrant for President Bashir on charges of war crimes and crimes against humanity in Darfur. This is the first ever indictment by the ICC for the arrest of a sitting head of state. Sudan rejects the indictment.
2009 A fierce intertribal erupted in Joglei over grazing land and cattle rustling between The Nuer, Dinka and Murle tribes killing several hundred from both sides.

2011 (July): South Sudan became an independent country after its citizens voted with 99 percent majority to succeed from Sudan.

2012: The government of South Sudan declares Jonglie state as a disaster area, owing to a fierce cycle of intertribal conflicts between the Nuer, Murle, and Dinka tribal youth. This conflict left several thousand killed, tens of thousands of cattle raided as well as displacing more that 150 thousand people.

### Appendix 2

**Data Analysis Matrix: list and codes of Key Informants Interviews and Farmers Group Discussions**

<table>
<thead>
<tr>
<th>Key informants</th>
<th>Location and code</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>At the International/Regional levels</strong></td>
<td></td>
</tr>
<tr>
<td>An international expert at ICRAF - International / Regional level- Nairobi : KII 1</td>
<td></td>
</tr>
<tr>
<td>Department Director at ICRAF, at the International/Regional level - Nairobi : KII2</td>
<td></td>
</tr>
<tr>
<td>Director at World head office of UNEP at the International level- Nairobi : KII 3</td>
<td></td>
</tr>
<tr>
<td>Regional Director of CRS at regional level in Nairobi : KII4</td>
<td></td>
</tr>
<tr>
<td><strong>At the Federal levels – Khartoum (Former federal capital of Sudan)</strong></td>
<td></td>
</tr>
<tr>
<td>Director at the federal level of the United Nations Mission in Sudan (UNMIS) Khartoum KII 5</td>
<td></td>
</tr>
<tr>
<td>ADRA/Sudan Country Director- Khartoum KII 6</td>
<td></td>
</tr>
<tr>
<td><strong>At the Federal level-Juba South Sudan</strong></td>
<td></td>
</tr>
<tr>
<td>Director at the Ministry of Agriculture and Forestry at the national level- Juba S. Sudan : KII 7</td>
<td></td>
</tr>
<tr>
<td>Director at the Ministry of Agriculture and Forestry at the national level- Juba S. Sudan : KII 7</td>
<td></td>
</tr>
<tr>
<td>Director at the Ministry of Agriculture and Forestry at the national level- Juba S. Sudan KII 8</td>
<td></td>
</tr>
<tr>
<td>Director at ADRA at the national level –Juba S. Sudan: KII9</td>
<td></td>
</tr>
<tr>
<td><strong>State Levels – Jonglei State Bor</strong></td>
<td></td>
</tr>
<tr>
<td>Director at FAO Jonglei State office –Bor KII10a</td>
<td></td>
</tr>
<tr>
<td>Director at FAO Jonglie state office Bor KII 10b</td>
<td></td>
</tr>
<tr>
<td>Director at WFP office Jonglei state –Bor KII 11</td>
<td></td>
</tr>
<tr>
<td>Director at CARE International Jonglei state - office KII 12</td>
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</tr>
<tr>
<td>Director at Lutheran World Federation Jonglei office KII13</td>
<td></td>
</tr>
<tr>
<td>Director at ADRA office at state level -Bor KII 14</td>
<td></td>
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<tr>
<td>State Levels – Jonglei State Bor</td>
<td>VSF Germany staff- at state level-Jonglei (group interview) KII15</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>State Minister at state level -Jonglei Bor KII 16a</td>
</tr>
<tr>
<td></td>
<td>State Minister at State level-Jonglei State KII 16b</td>
</tr>
<tr>
<td></td>
<td>County commissioner-Jonglei State KII17a</td>
</tr>
<tr>
<td></td>
<td>County commissioner-Jonglie State KII 17b</td>
</tr>
<tr>
<td></td>
<td>County commissioner-Jonglei State KIIc 17c</td>
</tr>
<tr>
<td></td>
<td>County commissioner-Jonglei State KII d 17d</td>
</tr>
<tr>
<td></td>
<td>Director at state Ministry of Agriculture -Jonglei : KII 18a</td>
</tr>
<tr>
<td></td>
<td>Director at State Ministry of Agriculture -Jonglei : K I8b</td>
</tr>
<tr>
<td></td>
<td>Director South Sudan Relief and Rehabilitation Commission (SSRRC) Jonglei state KII 19</td>
</tr>
<tr>
<td></td>
<td>Jonglei state Legislative Assembly(JSLA) – head of committee KII 17a (male)</td>
</tr>
<tr>
<td></td>
<td>JSLA –Head of a committee KII 17b – Male</td>
</tr>
<tr>
<td></td>
<td>JSLA head of a committee KII 17c –Female</td>
</tr>
<tr>
<td></td>
<td>JSLA member from Bor KII 17d</td>
</tr>
<tr>
<td></td>
<td>JALS member for Pibor KII 17 e Female</td>
</tr>
</tbody>
</table>
### Table 1 Participants in the Semi-Structured interviews and farmers groups discussions.

<table>
<thead>
<tr>
<th>Community</th>
<th>Location of the selected community</th>
<th>Semi-Structured Interviewees</th>
<th>Farmers Groups Discussions (FDGs)</th>
<th>Ethnic background</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bor South County</td>
<td>1. Lewdiet – Bor North 2. Jerweng-Bor South</td>
<td>30</td>
<td>2 Groups (FGD1 and 2)</td>
<td>Dinka</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Twich East County</td>
<td>1. Panyagor West 2. Panyagor South</td>
<td>30</td>
<td>2 Groups (FGD3 and 4)</td>
<td>Dinka</td>
</tr>
<tr>
<td>Akobo County</td>
<td>1. Akobo Center</td>
<td>20</td>
<td>1 Group (FGD5)</td>
<td>Nuer</td>
</tr>
<tr>
<td>Pibor County</td>
<td>1. Bibor Center</td>
<td>20</td>
<td>1 Group (FGD6)</td>
<td>Murle</td>
</tr>
<tr>
<td>Total</td>
<td>6</td>
<td>100</td>
<td>6 groups and an approximately total numbers of 295 Farmers</td>
<td></td>
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</tbody>
</table>

**Focus Groups discussions**

<table>
<thead>
<tr>
<th>Name and code of focus group(FG)</th>
<th>composition of FG</th>
<th>Location of FG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focus group’s discussion 1 (FG1)</td>
<td>5 men and youth farmers and cattle herder of diverse backgrounds</td>
<td>Bor – Jonglei</td>
</tr>
<tr>
<td>Focus group’s discussion 2(FG2)</td>
<td>7 of women farmers of diverse backgrounds</td>
<td>Bor Jonglei</td>
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</table>

Sources: participants in the study and agroforestree database for Sudan
Summary table of AF tree species for Decision Support System for AF program in South Sudan.

<table>
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<th></th>
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<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Agropastoralism system (Agric. Crops+pasture+Animals)</td>
<td>All the three livelihood zones of Jonglei</td>
<td><em>Faidherbia albida</em> (Haraz)</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>1</td>
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<tr>
<td></td>
<td></td>
<td><em>Acacia Mellifera</em> (Kitir)</td>
<td>4</td>
<td>5</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Silvopasture system (Pastoralism ) (Trees+Pasture and Animals)</td>
<td></td>
<td><em>Tectona grandis</em> (Teak)</td>
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<td>1</td>
<td>2</td>
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<tr>
<td></td>
<td></td>
<td><em>Acacia senegal</em> (Hashab)</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>1</td>
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<tr>
<td></td>
<td></td>
<td><em>Acacia seyal</em> (Teleh)</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>5</td>
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<tr>
<td></td>
<td></td>
<td><em>Acacia tortilis</em></td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
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<td></td>
<td></td>
<td><em>Acacia nilotica</em> (Garadh)</td>
<td>4</td>
<td>3</td>
<td>5</td>
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<td></td>
<td></td>
<td><em>Tamarindus indica</em> (Aradeb)</td>
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<tr>
<td>Intercropping System (Value added multi-purpose trees and agric. crops and or vegetables)</td>
<td></td>
<td><em>Faidherbia albida,</em></td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>3</td>
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<tr>
<td></td>
<td></td>
<td><em>Acacia senegal</em></td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>1</td>
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<tr>
<td></td>
<td></td>
<td><em>Gloricidia sepium</em></td>
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<td>5</td>
<td>4</td>
<td>4</td>
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<td></td>
<td></td>
<td><em>Syzgium guineense</em></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>5</td>
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<tr>
<td>Intercropping System (Value added multi-purpose trees and agric. crops and or vegetables)</td>
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<td>1</td>
<td>4</td>
<td>4</td>
<td>5</td>
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<td></td>
<td></td>
<td>Citrus sinensis (Butochal)</td>
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<td>1</td>
<td>2</td>
<td>5</td>
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<td>Balanites aegyptiaca</td>
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<td>4</td>
<td>3</td>
<td>5</td>
<td>3</td>
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<td>Intercropping System (Value added multi-purpose trees and agric.crops and or vegetables)</td>
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<td>Mangifera indica</td>
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<td>4</td>
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<td>Milicia excelsa</td>
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<td>Annona squamosa(Ghista)</td>
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<td></td>
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<td>Passiflora edulis</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>5</td>
<td>3</td>
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<tr>
<td>Intercropping System</td>
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<td>Eucalyptus Microtheca (Ban)</td>
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<td>1</td>
<td>5</td>
<td>3</td>
<td>3</td>
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<td></td>
<td></td>
<td>Khaya senegalensis</td>
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<td>2</td>
<td>4</td>
<td>4</td>
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<td></td>
<td>Persea Americana</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>5</td>
<td>3</td>
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<tr>
<td></td>
<td></td>
<td>Faidherbia albida</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Acacia senegal</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>2</td>
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<tr>
<td></td>
<td></td>
<td>Acacia seyal</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Improved fallow system (Reclamation of low fertile lands through N fixing trees)</td>
<td>Nile and Sobat Rivers areas</td>
<td>Faidherbia albida</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Acacia Senegal</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>2</td>
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<tr>
<td></td>
<td></td>
<td>Acacia seyal</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Improved fallow system (Cut and carry fodder systems for livestock)</td>
<td></td>
<td>Leucaena diversifolia</td>
<td>3</td>
<td>1</td>
<td>5</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

frt. = fertilizer. fodd. = fodder.

Sources: participants in the study and agroforestry tree database for Sudan.
Appendix 4

Semi-Structures Questionnaire / Farmers discussions Guide.

(Draw in separate sheet a sketch map of the Farm showing approximate distance to main rod, market River etc.)

Background Information

1. Farmers Information:
   A. Age: _______________________

   B. Sex : Male ____________ Female_____________________________

   C. Name of community / village/ Town __________________________

   D. Educational Level_____________________________________

   E. Years of farming experiences ______________________________

   F. Household’s Size: Small Size 1-4( ) Medium Size 4-9( ) Large Size 9+ ( )

   G. Marital Status: Married ( ) Single ( ) Divorced ( ).

2. Land Tenure System:
   A. Do you own the Land? Yes ( ) No ( ).

   B. How did you acquire the land?
      i) Family Owned

      ________________________________

      ii) Allotted by the Community (communal own).
iii) State owned

iv) Tenancy (shared cropping/cooperative)

v) Others

C. Do you think you may have a problem with the land in the future once (GoSS) issued its own land law? Yes ( ) No ( )

Why? _________________________________

3. Land use system and practices in the area

D. Framing Type

i. Subsistence farming System

ii. Commercial farming System

E. What type of crop(s) grown and the purpose of your land use?

i. Food Crops (Mono-cropping)
ii. Agroforestry System(s) and Technologies

iii. Fuel wood

iv. Animals Fodder crops

v. Silvopastoral systems?
   1. ___________________  2. ___________________
   3. ___________________

vi. Agrosilvopatal Systems?
   1. ___________________  2. ___________________
   3. ___________________  4. ___________________

vii. Agrisilvocultral Systems?
   1. ___________________  2. ___________________

F. Types of crops produced.

i. ________________Crop

ii. Crop____________________

iii. Crop_________________________

iv. Crop_________________________

G. Types of Animals raised in the farm?

1. _______________ 2. _______________ 3. _______________

H. Management system and herd’s type?

_________________________________________________


3. Stall feeding _________________

I. What types of farm labour used in your farm?
1. Family /households       2. Hired ______________Cooperative ______

3. Community support (Mauna/ nafeer __________________________

4.____________________ (Mauona and nafeer)

J. What are the Sources of the planting inputs used?

1. Government ___________ 2. FAO ________ UNMIS __________

2. NGO (specify) ______________ Local Market ______________

Others (Specify) ____________________________

K. Where do obtain farm credit?

1. Government ________ 2.NGOs____________ 3.UNMIS ________

4. CBO___________________ 5. Self______________6. cooperative_________

7. Others________________

L. Where do you sell or barter your crops/ tree crop surplus / livestock?

1. Local village Market___________ 2. Peri-urban Market
3. Others_________________

M. From where do you receive extension services?

1. Government ___________ 2.NGOs___________ 3. FAO___________

H. What are socio-cultural aspects of agroforestry in the rural areas of Jonglei state?

I. What is the economical importance of agroforestry in your community?

J. General Discussion questions

1. What are some of the current challenges faced by farmers in Jonglei State?

2. What are the best ways to use agriculture activities to build peace?

3. What knowledge, attitudes and skills do farmers have in agroforestry?

4. In which ways can rural women be supported to increase food production to increase access to food security and increase income in Jonglei state?

5. In which way can researchers, Government and NGOs assist farmers?
### Appendix 5

#### Table 1: The main features of Diagnosis and Design in agroforestry research

<table>
<thead>
<tr>
<th>D&amp;D Stages</th>
<th>Basic question to answer</th>
<th>Key factors to consider</th>
<th>Mode of inquiry</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pre-diagnostic</strong></td>
<td>Definition of land use systems and site selection (Which system to focus on?)</td>
<td>Distinctive combinations of resources, technology and land use objectives</td>
<td>Seeing and comparing the different land use systems.</td>
</tr>
<tr>
<td></td>
<td>How does the system work? (How is it organized, how does it function to achieve its objectives)</td>
<td>Production objectives and strategies, arrangement of components</td>
<td>Analysing and describing the system</td>
</tr>
<tr>
<td><strong>Diagnostic</strong></td>
<td>How well does the system work (what are its problems, limiting constraints, problem-generating syndromes &amp; intervention options?)</td>
<td>Problems in meeting system objectives (production shortfalls, sustainability problems)</td>
<td>Diagnostic interviews and direct field observations</td>
</tr>
<tr>
<td></td>
<td>Causal factors, constraints and intervention points</td>
<td></td>
<td>Troubleshooting the problem subsystems</td>
</tr>
<tr>
<td><strong>Design and evaluation</strong></td>
<td>How to improve the system? (what is needed to improve system performance)</td>
<td>Specifications for problem solving or performances enhancing interventions</td>
<td>Iterative design and evaluation of alternatives</td>
</tr>
<tr>
<td><strong>Planning</strong></td>
<td>What to do to develop and disseminate the improved system?</td>
<td>Research and development needs, extension needs</td>
<td>Research design, project planning</td>
</tr>
<tr>
<td><strong>Implementation</strong></td>
<td>How to adjust to new information?</td>
<td>feedback from on-station research, on-farm trials and special studies</td>
<td>Re-diagnosis and redesign in the light of new information</td>
</tr>
</tbody>
</table>

Source: Nair,(1998)
## Appendix 6

### The twin-track approach

<table>
<thead>
<tr>
<th>Track one: Rural development through productivity enhancement</th>
<th>Availability</th>
<th>Access</th>
<th>Stability</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Enhancing food supply to the most vulnerable</td>
<td>Re-establishing rural institutions</td>
<td>Diversifying agriculture and employment</td>
</tr>
<tr>
<td></td>
<td>Improving rural food production, especially of small-scale farmers</td>
<td>Enhancing access to asset</td>
<td>Monitoring food security and vulnerability</td>
</tr>
<tr>
<td></td>
<td>Investing in rural infrastructure</td>
<td>Reviving rural financial systems</td>
<td>Dealing with the structural causes of food insecurity</td>
</tr>
<tr>
<td></td>
<td>Investing in rural markets</td>
<td>Strengthening the labour market and management</td>
<td>Reintegrating refugees and IDPs</td>
</tr>
<tr>
<td></td>
<td>Revitalization of livestock sector</td>
<td>Mechanism to ensure safe food</td>
<td>Reviving access to credit system and saving mechanisms</td>
</tr>
<tr>
<td></td>
<td>Resource rehabilitation and conservation</td>
<td>Social rehabilitation programs</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Enhancing income and other entitlements to food</td>
<td>Transfers: food and cash based</td>
<td>Re-establishing social safety nets</td>
</tr>
<tr>
<td></td>
<td>Food aid</td>
<td>Asset redistribution</td>
<td>Monitoring immediate vulnerability and intervention impact</td>
</tr>
<tr>
<td></td>
<td>Seed/inputs relief</td>
<td>Social relief, rehabilitation programs</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Restocking livestock capital</td>
<td>Nutrition intervention programs</td>
<td>Peacebuilding effort</td>
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<tr>
<td></td>
<td>Enabling market revival</td>
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Appendix 7

Key informants’ narratives

Low food crop productivity

According to a key informant at the federal level, a link exists between conflict and food insecurity. Farmers in the rural areas suffer from low crops production and productivity due to lack of productive resources. “This often tomes causes low food productivity. In turn, intense food insecurity was experienced which led to hunger, and ultimately to conflict” ((KII5.2.2)

Prevalence of extreme poverty

A key informant at the national level confirmed that prevalence of extreme poverty in the rural pastoral community of Jonglei state was one of the main reasons causing intertribal conflicts. Excessive poverty leads growing numbers of armed youth to engage in violence and robbery as a means of survival. Small arms are therefore considered as a means of survival; thus, proliferation of small arms within the rural population and the condition of their supply is triggering intertribal conflict in Jonglei. One key informant said, “These arms were sourced from neighboring countries and were used constantly in intertribal raids” (KII7.2.4).

Cattle rustling

One key informant at the national level observed that conflict in Jonglei often occurs because of cattle rustling and retaliatory attacks due previous incidents of intertribal cattle raiding.

“Victims of cattle rustling instigated their youth to retaliate and restock stolen, dead animals or simply return the stolen cattle. Revenge attacks usually triggered deadlier and considerable intertribal conflict fought with modern weaponry such as AK47, anti-tanks and antiaircraft”. (KII8.5.3)
Environmental hazards

Several key informants at the state levels identified environmental hazards and their impact on both livestock and food crops production as playing the key role in inducing intertribal conflicts. These hazards included seasonal floods, drought and seasonal outbreaks of pest and diseases. For example, one key informant at the state level said:

“Seasonal floods occurred between the months of August and October every year. These seasonal floods destroyed farms, crops and pastures, causing high food insecurity, which in turn rendered youth to be destitute and desperate. Survival instincts prompted the youth to arm themselves in response to food insecurity” (KII16.5.8).

Competition over natural resources

Key informants at the local level identified competition over natural reprocess between different tribes as an underlying cause of intertribal conflicts. This point was clearly stated by one key informant in this statement: “Competition over dawdling natural resources b such as pastures and water points between tribes often triggers intertribal conflict in South Sudan” (KII17.4.2).

Outbreak of livestock diseases

Key informant at the state level identified outbreak of livestock diseases as one cause of food insecurity and conflict. He said:

“When there are out breaks of endemic in Jongle, livestock disease that kill large herds of livestock people becomes hunger and resort to cattle raiding to restock their dying herds as means of survival” (KII15.4.2).

Growing numbers of unemployed and armed youths

Several key informant interviewees identified growing numbers of armed uneducated and unemployed youth to be another reason for intertribal conflict. One key informant at the local level said:

“We have here a large numbers of armed uneducated of youth who are former combatants. These youth are causing interethnic conflict when they become
hungry...these youth tribal militia had become more armed and better equipped than the states” (KII17a.2.4)

**State fragility and weakness**
Several key informants identified lack of capacity and infrastructures as an exacerbating factor that prompts intertribal conflict in Jonglie. One key informant at the state level said:

> “Lack of basic infrastructures such as roads and low capacity of law enforcing agents due to state weakness are some of exacerbating factors underlying intertribal conflict in Jonglei, and indeed the whole of South Sudan” (KII17b3.1.5)

**Social exclusion**
Social and economic exclusions were identified by key informants as one of the reason inducing intertribal violence in South Sudan. Key informants at the regional level indicated that:

> “Socioeconomic exclusions of several communities in South Sudan is causing these tribes to carry arms in order to access economic benefits or means of livelihoods, so because all the tribes are armed any they fight over food and economic assets”(KII5.2.1)

**High Rates of Chronic Poverty**
A key informant at the international level identified high rates of chronic poverty to be the cause of intertribal conflict in Jonglei stat. This key informant highlighted that:

> “Prevalence of high rates of chronic poverty has been the main cause we found to be behind the rise of the intertribal conflict in Jongle worsened by high proliferation of small weapons”( KII4.2.2).

**Retaliatory Intertribal conflicts**
Several key informants at the nation and local levels in South Sudan identified retaliatory armed cattle resulting to underpinned intertribal conflict. One key informant at the state level concluded that:

> “Because the inhabitants of Jonglei depended on livestock for their nutritional requirements, loss of livestock through cattle raiding caused food insecurity and when they (tribes) become hungry, they will immediately retaliate to recover stolen cows or steal others as means of livelihoods (KII17c.2.2)

**Ethnic animosities and hatred**
Several key informants have indentified ethnic animosities and hatred to be another cause of intertribal conflict in Jonglie due to competitions over assets and natural
resources.

“Tribes with similar livelihoods pattern but belonging to different groups fight over asset and natural resources due to long history of tribal animosities and hatred in Jonglei” (KII 17b.3.4)

**Agro-Ecological consideration of agroforestry for peacebuilding**

**Soil fertility and food Security**

Several key informants agreed that agroforestry systems were multifaceted and therefore had the potential to endow rural communities affected by conflict with sufficient food. One key informant at the international level indicated that:

“Agroforestry systems have great potentials to improve greatly soil fertility, provide many benefits such as sustainable access to food and enhance income generation initiatives. Ultimately, evolution of social transformation and peacebuilding would follow” (KII2.3.5).

**Minimizing the hazards of floods**

A key informant identified a particular agroforestry system to have minimized the effect of floods in one location in Jonglie through innovative locally invented agroforestry system

“Agroforestry system was use by farmers in one location typical where *Eucalyptus microtheca* species was used in combination with *Acacia nilotica*, to ease the impact of seasonal floods and to improve soil fertility. Farmers were reported to have achieved food security via production of bumper crops of maize, sesame and vegetables. (KII8.3.7)

**Improved range management**

A key informant interviewee identified improved grazing and range management for livestock through silvopastoral systems. One key informant at the national level narrated that:

“High fodder yielding indigenous trees and shrubs were incorporated in this system, which increased livestock carrying capacity. Livestock herds were then maintained at a more manageable level keeping everyone occupied. Ultimately, the silvopastoral systems increased access to food security and social stability, potentially leading to social stability and peacebuilding” (KII18a.3.8).
Cottage industries

Key informant group interview at the state level revealed that support to cottage industry had a value added to small rural entrepreneurship. This finding was highlighted by one key informant at the state level that:

“We supported cottage industries through training, extension services and simple marketing techniques. Provision of raw milk processing utensils and technical know-how to various communities was found to be appropriate. Great-value was added to cow and goat’s milk, which led to significant generation of income and poverty reduction and peacebuilding” (KII15.5.6).

Ethno-veterinary

A key informant at the state level identified the relevant of Ethno-veterinary in agroforestry as means of peacebuilding in Jonglei. This key informant said:

We realized that there was a significant loss of cattle herds,’ through death related to diseases and this resulted in increased cattle rustling among the three pastoralist tribes. We immediately introduced robust Ethno-veterinary program through use of shrubs and trees base treatment of cattle, these shrubs are abundant here in Jonglei this system has reduced cattle deaths and restored peace (KII12.5.6).

ICTs in promoting livestock and crop marketing

Several key informants identified the important role of ICTS crops marketing based systems in promoting crops and livestock markets in South Sudan. One key informant from the state level noted that:

“Crops and livestock are very important for agricultural development and peacebuilding. Through Crops and Livestock Marketing Information Systems (CLiMIS) Jonglei’s market s has been linked to regional and international markets through east Africa gate-way. Eventually, the strategy will reduce chronic poverty, food insecurity and cattle rustling and support social transformation and peacebuilding “(KII 10a.4.2).
Appendix 8

Photos

The only available means of transport between counties in Jonglie is by air. (By Paul Wel)

Women Farmer Group Discussion (By Paul Wel)
Social Safety Net: WFP Food Storage in Jonglie (By Paul Wel)

Youth Farmer in Jonglei  (By Deng Agook)
Women Self Help Group Farmers Field School in Jonglei (By Paul Wel)

Farmers Field School Sign Post in Bor (By Paul Wel).
Agropastoralists Cattle Camp in Jonglei (By Deng Agok).