**CHAPTER ONE**

**INTRODUCTION**

**1.1 Background of the study**

climate change as statistically significant variations in climate that persisted for an extended period, typically decades or longer. It includes shifts in the frequency and magnitude of sporadic weather events as well as the slow continuous rise in global mean surface temperature. Climate change is predicted to have the main impact on agriculture, economy and livelihood of the populations of under-developed world and mainly in Sub-Saharan (World Bank, 2013; UNECA, 2011). Climate change is probably the most complex and challenging environmental problem facing the world today. Global climate change is one of the most critical challenges that the international community faces at present. Climate change and its variability pose severe risk to lives and livelihoods, particularly for the world’s poorest and the most vulnerable populations due to its adverse consequences on human health, food security, economic activities, natural resources and physical infrastructure (FAO 2014; IPCC, 2007). Of all the sectors of any economy, agriculture being the main source of providing livelihoods to majority of the rural households is extremely vulnerable to climate change. The extent of vulnerability depends, along with exposure, sensitivity and upon adaptive capacity of a household (IFAD, 2010). Africa is one of the most vulnerable continents to climate change and climate variability where the situation is aggravated by the interaction of multiple stresses, occurring at various levels, and low adaptive capacity (Boko *et al*., 2007; Sarr, 2012).The agriculture sector is the backbone of the economies of most of the developing world, employing about 60 percent of the workforce and contributing an average of 30% gross domestic product (GDP) in sub-Saharan Africa (World Bank, 2011; Williams, et al., 2012; Williams, 2014). Climate change with expected long-term changes in rainfall patterns and shifting temperature zones are expected to have significant negative effects on agriculture, food and water security and economic growth in Africa; and increased frequency and intensity of droughts and floods is expected to negatively affect agricultural production and food security (DFID, 2004). For instance, the recurrent droughts in many African countries have demonstrated the effects of climate variability on food resources (Stanturf *et al*., 2011). The Continent is particularly vulnerable because of its ecological fragility, abject poverty, institutional weaknesses and political instability, now aggravated by climate change (Dixon *et al*., 2001; Livingston *et al*., 2011).

Agriculture in Africa must undergo a major transformation in the coming decades in order to meet the

intertwined challenges of achieving food security, reducing poverty and responding to climate change without depletion of the natural resource base(FAO,2014; ACCRA,2010) .‘Climate-smart agriculture’(CSA) has the potential to increase sustainable productivity, increase the resilience of farming systems to climate impacts and mitigate climate change through greenhouse gas emission reductions and carbon sequestration (FAO, 2010). Climate-smart agriculture can have very different meanings depending upon the scale at which it is being applied. For smallholder farmers in developing countries, the opportunities for greater food security and increased income together with greater resilience will be more important to adopting climate-smart agriculture than mitigation opportunities (Thornton *et al*., 2009a, 2009b and 2009c; FAO, 2010a; Lobell *et al*., 2011). There are a number of household agricultural practices and investments that can contribute to both climate change adaptation– a private benefit – and to mitigating greenhouse gases (GHGs)—a public good. For instance, a striking feature of many SLM practices (boundary trees and hedgerows, multipurpose trees, woodlots, fruit orchards, crop rotations, greater crop diversity, production of energy plants, improved feeding strategies (e.g. cut and carry), fodder crops, improved irrigation (e.g. drip), terraces and bunds, contour planting, water storage (e.g. water pans), and many more ) and investments is that many of these activities also increase the amount of carbon sequestered in the soil or above ground, including agroforestry investments, reduced or zero tillage, use of cover crops, and various soil and water conservation structures(Hoerling *et al*., 2006; IPCC, 2007; IPCC, 2014). Thus, there are often long-term benefits to households from adopting such activities in terms of increasing yields and reducing

variability of yields, making the system more resilient to changes in climate (Thornton et al., 2007, Jones and Thornton, 2008). Such activities generate both positive “local” (household-level and often community-level) net benefits as well as the global public good of reduced atmospheric carbon. However, adoption of many climate change-smart agricultural practices has been very slow, particularly in food insecure and vulnerable regions in sub-Saharan Africa and Southeast Asia (Jones and Thornton, 2008).