WATERSHED MANAGEMENT EXTENSION AND ADVISORY SERVICES IN ADAMA DISTRICT, EAST SHOA ZONE, OROMIA REGIONAL STATE, ETHIOPIA

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ABSTRACT

The agricultural extension and advisory system in Ethiopia is at a crossroads towards pluralistic agricultural extension and advisory services. The natural resource management is the top agenda in the agricultural extension and advisory services of the country. Although various watershed management activities have been implanting in order to overcome the impact of floods, all efforts did not bring the desired results in terms of reducing floods. One possible reason could be the activities being done by respective organizations might be without much coordination. The study used agricultural innovation systems to analyzing the complex interplay between various actors in the context of watershed management extension and advisory services. The overall objective of this study was to explore the nature and process of the watershed management extension and advisory services in overcoming the problem of floods. The study used a cross-sectional research design and case study. Adulala watershed was selected for this study and 120 farmers, 22 VEWs and 19 SMSs were selected as respondents. Data were collected from both primary and secondary sources using questionnaire, self-administered questionnaire and checklist. Both quantitative and qualitative analysis methods were used to analyze the data. Some of the key findings of the study include: majority of extension personnel reported that they provided the required watershed management extension and advisory services for farmers. However, association members were able to receive better watershed management services than non-members. Majority of farmers were satisfied with the types of services provided by various stakeholders. However, coordination, collaboration and linkage among key stakeholders were weak in the study area, which affects the nature and process of watershed management extension and advisory services. Hence, for effective delivery of integrated watershed management extension and advisory services, it is

recommended to organize farmers into watershed management association; furthermore, participatory and systematic planning, designing, implementation, monitoring and evaluation is necessary for future sustenance to ensure high participation and create sense of ownership. It is also recommended that the both federal Government and regional Government should take the lead establishing watershed management stakeholders' platform to ensure coordination and collaboration among actors.

DECLARATION

I, SAMSON ESHETU LEMMA, do hereby declare to the Senate of Sokoine University of Agriculture that the work presented here is my own original work done and that it has neither been submitted, nor concurrently being submitted in any other Institution.

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DEDICATION

This thesis is dedicated to my father Eshetu Lemma and my mother Wude Cherenet who laid the foundation for my education and my present status.

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LIST OF ABBREVIATIONS AND ACRONYMS

ABC	Affective Behavioral Cognitive
ADBA	Adama District Bureau of Agriculture
ADP	Agriculture Research and Development
ADPLAC	Agricultural Development Partners Linkage Advisory Council
AEAS	Agricultural Extension and Advisory Services
AFAAS	African Forum for Agricultural Advisory Services
AGP	Agricultural Growth Plan
AIS	Agricultural Innovation System
ARDU	Arsi Rural Development Unit
ASARECA	Association for Strengthening Agricultural Research in Eastern and Central Africa
BPR	Business Process Reengineering
BSC	Business Score Card
CAADP	Comprehensive Africa Agricultural Development Program
CADU	Chillalo Agricultural Development Unit
CFW	Cash-for-work
CPP	Comprehensive Package Program
DAs	Development Agents
DDAEPA	Dire Dawa Administration Environmental Protection Authority
DPP and EW	Disaster Prevention, Preparedness and Early Warning
DREF	Disaster Relief Emergency Fund
EATA	Ethiopian Agricultural Transformation Agency
EEPRI	Ethiopian Economic Policy Research Institute

FAAP	Framework for African Agricultural Productivity
FAO	Food and Agriculture Organisation of the United Nations
FARA	Forum for Agricultural Research in Africa
FDRE-MoARD	Federal Democratic Republic of Ethiopia-Ministry of Agriculture and Rural Development
FDRE-MoFED	Federal Democratic Republic of Ethiopia-Ministry of Finance and Economic Development
FDRE-MoWR	Federal Democratic Republic of Ethiopia-Ministry of Water Resources
FDRE-MoWRNMA	Federal Democratic Republic of Ethiopia-Ministry of Water Resources National Metrology Agency
FGD	Focus Group Discussion
FGE	Federal Government of Ethiopia
FTCs	Farmers Training Centers
GA	General Assembly
GDP	Gross Domestic Product
GoE	Government of Ethiopia
GORS	Government of Oromia Regional State
GTP	Growth and Transformation Plan
ICT	Information and Communication Technology
IECCAMA	Imperial Ethiopian College of Agriculture and Mechanical Arts
IFM	Integrated Flood Management
IFPRI	International Food Policy Research Institute
IFRCRC	International Federation of Red Cross and Red Crescent Societies
KI	Key Informants

KIOs	Knowledge-Intensive Organizations
LA	Livestock Agency
LLPPA	Local Level Participatory Planning Approach
MERET	Managing Environment Resources to Enable Transition to more Sustainable Livelihoods
MoA	Ministry of Agriculture
MOAAS	Market-Oriented Agricultural Advisory Services
MPP	Minimum Package Project
NAADS	National Agricultural Advisory Services
NARIs	National Agricultural Research Institutes
NDMAGI	National Disaster Management Authority Government of India
NGO	Non-Governmental Oragnization
PA	Peasant Association
PADEP	Peasant Agricultural Development Program
PADETES	Participatory Demonstration and Training Extension Systems
PRA	Participatory Rural Appraisal
RAAKS	Rapid Analysis of Agricultural Knowledge Systems
RAS	Rural Advisory Service
RECs	Regional Economic Communities
RO	Research Organization
RL and EPA	Rural Land and Environmental Protection Authority
SG-2000	Sasakawa Global 2000
SIDA	Swedish International Development Authority
SMSs	Subject Matter Specialists
SPSS	Statistical Package for Social Sciences
SSA	Sub-Saharan Africa

SSA NGOC	Sub-Saharan Africa NGO Consortium
T and V	Training and Visit
USD	United States Dollars
VEWs	Village Extension Workers
WFP	United Nations World Food Program

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background Information

Ethiopia covers an area of 1,104,300 square kilometers and a total estimated population of 96.6 million (Ethiopian, 2015). Agriculture in Ethiopia is crucial for the country's food security and the sector is the largest contributor to the overall economic growth and poverty reduction. It accounts for about 46 percent of national GDP, almost 80 percent of the foreign exchange earnings, 85 percent of employment, and the livelihood of about 90 percent of the poor is fully or partly dependent on agriculture (EATA, 2014; FDRE-MoFED; FDRE-MoARD, 2010).

According to FDRE-MoFED (2010), an average of 8.4% annual agricultural growth was achieved during the period of 2005/06 to 2009/10, which contributed 41.6% of the real GDP, whereas, during the period of 2009/10 to 2012/13 it was 7.15% (EATA, 2014). Ethiopia is one of the few African countries that have consistently met the African Union's Comprehensive Africa Agricultural Development Program (CAADP) targets of: (a) increasing public investment in agriculture by 10% by year 2008, and (b) boosting agricultural production by an average annual growth rate of at least 6% by 2015 (EATA, 2014; FDRE-MoFED, 2010). However, agriculture in the country is still dominated by small-holder and largely subsistence farming with low productivity (Asres *et al.*, 2014; Beshah, 2003; Kassa, 2003; Kassa and Abebaw, 2004).

Though the country is showing an incremental investment in agricultural development, according to some empirical studies, lack of development impact in the country is manifested by many problems, among which are inappropriate agricultural policies

(Chanyalew, 2004) and poor communication and linkage among different stakeholders (Eshetu, 2007; Kassa, 2003; Kassa and Abebaw, 2004).

Currently, there is a change in the national agenda and aspirations for agricultural and rural development towards commercialization, economic growth and poverty alleviation in the national Agricultural Growth Plan (AGP) plan. The AGP envisions the transformation of smallholder production systems from subsistence to commercial with increasing diversification into high value products and more emphasis also given to natural resource management, as a means to rural poverty reduction (FDRE-MoFED, 2010). Moreover, the Government of Ethiopia (GoE) recognizes the importance of agricultural development and has shown a long-standing and strong commitment to the sector (EATA, 2014; FDRE-MoARD, 2010). Similarly, the agricultural extension and advisory service systems in Ethiopia are at a crossroad towards pluralistic agricultural extension and advisory services and natural resource management is the top agenda in the agricultural extension and advisory services of the country (EATA, 2014; FDRE-MoARD, 2010).

Though, the government is showing strong commitment to the agriculture sector, it has been facing recurring cycles of floods, drought and crop failures due to climate change which is affecting the sector negatively (DDAEPA, 2011). According to Tadesse and Moges (2011), droughts and floods are very common occurrences in Ethiopia and this situation of contrasting extremes is being exacerbated by the global climate change. A study by Tefera and Abebe (2007) provides evidence that in recent years floods in Ethiopia have become more frequent and of increasing severity. A close look at the trends of flood occurrence in the country show that major flood hazards have occurred in different parts of the country in 1988, 1993, 1994, 1995, 1996, 2006 and 2010 leading to loss of life and property (Ayalew, 2007; DDAEPA, 2011).

An analysis of the trend and especially looking at the most recent flooding in 2005, 2006 and 2007, it appears that two types of floods affect Ethiopia; flash floods (characterized by very fast rise and recession of flow of small volume and high discharge, which causes big damage because of suddenness (Eung and Hyun, 2012; NDMAGI (2008), and river floods (Ayalew, 2007; DDAEAP, 2011).

The occurrence of the floods of 2006 can be characterized as a national catastrophe as the flooding occurred in almost all parts of the country (Ayalew, 2007). For instance, the disaster experienced in Dire-Dawa in 2006 is a typical example of flash flooding. On the other hand, much of the flood disasters in Ethiopia are related to rivers that overflow and burst banks due to heavy rains and inundate lowland plains (IFRCRC, 2006). In this regard, the Government of Ethiopia has enacted different proclamations in relation to watershed management to reduce the severity of floods.

The mandate to pursue watershed development programs has been given to the Ministry of Water Resources, Ministry of Agriculture, and the Environmental Authority under proclamation Nos. 197/2000, 299/2002 and 456/2003, respectively (FDRE-MoWR, 2008). Additionally, the issue of floods is addressed under the section “Disaster and Public Safety”, in the water sector strategy, which was developed in 2001, with the main objective of developing and implementing a comprehensive plan of action to address flood related disasters. However, this strategic document is biased towards urban flood action, rather than mitigating rural flooding (Achamyeleh, 2003; FDRE-MoWR, 2008). According to Achamyeleh (2003), the only flood control and management activity being carried out in the country is the Awash River Basin project, which aims at minimizing the flood hazard in the flood prone areas of the Awash River. This shows that a flood in the country is a serious bottleneck for the agricultural sector.

Several empirical studies (Ayalew, 2007; DDAEPA, 2011; Tadesse and Moges, 2011) indicated that floods hazard in Ethiopia may continue as a result of increasing population that intensifies the floods damage due to increasing land and forest degradation, encroachment of people to settle in close proximity to the flood prone areas, degradation of watersheds, lack of policies and strategies on disaster risk management, inadequate watershed management extension and advisory services, weak early warning systems, weak communication, and weak collaboration and coordination among stakeholders. This indicates that the country should work towards efficient, cost effective adaptation mechanism to cope with the future floods damage through strengthening the agricultural extension and advisory services on natural resource management and disaster risk management in general, particularly on watershed management.

Historical trends show that planning the development of watersheds for Ethiopia started in the 1980s (Lakew *et al.,* 2005), and a planning unit for developing large watersheds comprising of 30-40 thousand hectares was established. The purpose was mostly for implementing natural resource conservation and development programs. Large-scale efforts remained mostly ineffective due to lack of effective community participation, limited sense of responsibility over assets created, and unmanageable planning units. Eventually as a result of the lessons learned from the large scale watershed experience MoA and support agencies like FAO were encouraged to initiate pilot watershed management planning approaches on a bottom-up basis. The approach was using smaller units and following community-based approaches. As a result, the minimum planning and sub watershed approaches were introduced (Beshah, 2003; Lakew *et al.,* 2005; Tadesse, 2011).

Minimum planning at the initial stage involved shifting from larger watersheds to smaller sub-watersheds. These were tested at the pilot stage through FAO technical assistance under MoA during 1988–91 (Lakew *et al.*, 2005). The success stories of early watershed projects were marked as the basis of major watershed initiatives in Ethiopia (Beshah, 2003; Habtam, 2011). However, currently, the government has given due attention to the extension and advisory services on natural resource and watershed management to enhance agricultural production and productivity so as to improve the food security status and livelihood of farming communities (FDRE-MoWR, 2008). It is worth mentioning the experience of Oromia region (one of the regions in the country, where this study was conducted) where a three year plan (2012-14) to cover 9 million hectares of land in watershed management activities were implemented. Out of this, 6 million hectares of land were covered during the first two years and the remaining were implemented in 2014 (ADAB, 2011). However, the problem of floods in the region as well as in the study area was a serious problem. Hence, the study was aimed at analyzing the problematic situation of floods in relation to the watershed management extension and advisory services in the study area to identify the research gaps.

1.2 Statement of the Problem and Justification

According to Golrang *et al.* (2012), natural resource degradation especially soil erosion is one the most important problems all over the world. Similarly, some empirical studies (Tadesse and Moges, 2011; Achamyeleh, 2007; Tadesse, 2011; Ketema, 2007; Kassahun *et al.*, 2007) show that floods in Ethiopia is an important problem, which are a result of a combined effect of natural (high rainfall and topography) and human-induced problems (land degradation, deforestation, increased population, and density along riverbanks). In addition, policy issues (poor land use planning and zoning, poor flood forecasting and

warning mechanisms, and unfriendly development interventions within the catchments), and lack of awareness (lack of flood risk consciousness, and wrong perception of flood plain areas as a vacant space to be used for settlement) are an important factors.

Similarly, a flood in the study area is a potential risk for the agricultural sector. In the last few decades, the Federal Government of Ethiopia (FGO) and the Government of Oromia Regional State (GORS) have been implementing various watershed management activities to overcome the impact of floods in the study area. Out of these measures, degraded range and forest land rehabilitation, soil and water conservation and integrated watershed management, water harvesting and irrigation infrastructural development, and flood protection structures were the major extension and advisory services interventions that had been done (FDRE-MoWR, 2008; ADBA, 2011). Besides, various governmental organizations (Adama district bureau of agriculture, Melkassa research center, rural land and environmental protection authority, Adama University, and non-governmental organizations (World vision, World Food Program) in the study area have been providing various watershed management extension and advisory services.

However, all these watershed management extension and advisory service efforts have not brought the desired results in terms of reducing floods. One possible reason could be the activities being done by respective organizations might be without much coordination, which affects negatively the collaboration and organizational linkages among stakeholders in providing watershed management extension and advisory services for clients in reducing floods in the study area. Besides weak coordination and collaboration among various stakeholders, lack of sufficient information and knowledge sharing, learning, and weak knowledge management systems on comprehensive watershed management

extension and advisory services might be the possible reasons for the damages by floods in the study area.

Empirical studies show that many countries have managed to drastically reduce flood damages through integrated flood detection, forecasting, warning and response actions through institutionally framed process (Ayalew, 2007). Furthermore, various studies (Beshah, 2009; Swanson and Rajalaht, 2010; World Bank, 2006) indicate that capacity development, integration and proactive watershed management extension and advisory services by different stakeholders contribute positively in reducing floods. In this connection, the use of Agricultural Innovation systems (AIS) in analyzing the complex interplay between watershed management extension and advisory services with various stakeholders' involvement is appropriate.

The AIS concept embraces not only the science suppliers but the totality and interactions of actors involved in innovation (Agwu *et al.,* 2008; Beshah, 2009; Dansou *et al.,* 2012; Swanson and Rajalaht, 2010). It also extends beyond the creation of knowledge to encompass the factors affecting demand for and use of knowledge in novel and useful ways (Agwu *et al.,* 2008; World Bank, 2006). All these indicate that there is need for well-tested institutional framework of watershed management extension and advisory services innovation systems. The framework ensures involvement of different actors, effective collaboration and coordination among them in order to overcome the problem of floods and benefit clients from the watershed management extension and advisory services in the study area.

Therefore, the study was aimed at evaluating the nature and process of watershed management extension and advisory services in overcoming the problem of flood damage

by different actors by analyzing linkage among various watershed management extension and advisory services actors in the study area. In so doing, the study was aimed at to contribute for the efforts being done, provides inputs for policy makers in identifying the gaps, indicates appropriate strategies in overcoming the gaps, and contributes new knowledge for the academic domain in watershed management extension and advisory services in overcoming the damage of floods in a more systematic manner.

1.3 Objective of the Study

1.3.1 General objective of the study

The overall objective of the study was to evaluate the nature and process of the watershed management extension and advisory services in Adama District, East Shoa Zone, Ethiopia.

1.3.2 Specific objectives of the study

The specific objectives of the study were to:

i. Analyze the roles of actors involved in watershed management extension and advisory services in overcoming the problem of floods;
ii. Examine the organizational linkages among stakeholders involved in watershed management extension and advisory services in overcoming the problem of floods; and
iii. Identify the enabling and disabling environments in watershed management extension and advisory services in overcoming the problem of floods in the study area.

1.4 Research Questions

The study addressed the following research questions:

i. What were the roles of actors involved in watershed management extension and advisory services in overcoming the problem of floods?

ii. How was the nature of organizational linkages among stakeholders involved in watershed management extension and advisory services in overcoming the problem of floods in the study area?

iii. What were the enabling and disabling environments in watershed management extension and advisory services in overcoming the problem of floods?

1.5 Theoretical Framework

According to Christoplos (2010), Agricultural Extension and Advisory Services (AEAS) must be part of more comprehensive solution to equity challenges by involving wider sets of stakeholders in innovation systems. This implies that AEAS should be pluralistic to find ways to mobilize and coordinate those service providers that can best meet the needs and demands of different groups (Agwu *et al.*, 2008; Beshah, 2009; Christoplos, 2010; Davis, *et al.*, 2010; Swanson and Rajalahti, 2010). The wider the stakeholders, the diverse the contents are provided for clients.

Though contents of AEAS should be determined by clients, generally AEAS content should cover wide range of themes (Adolph, 2011). Contents could range from technical to economic, production to marketing and natural resources management (Adolph, 2011; Agunga and Zeleza, 2014). This implies that the contents should satisfy the needs and demands of wide range of clients including farmers. In so doing, the AEAS should give more attention to a broader extension strategy that includes more attention to changing markets for high-value crops and products, organizing farmers into producer groups to supply these markets, and using more sustainable natural resource management practices (Christoplos 2010; Swanson and Rajalahti, 2010).

The landscape of service providers in pluralistic AEAS is increasing with a complex interplay between and among service providers. This multiplicity and diversity of

stakeholders also denotes the complexity of nature and process of services delivery as a system. Unlike the linear model of transfer of technology service delivery, the current trend of service delivery in agriculture and rural development calls attention for better understanding of its complexity as a system. This argument confirms the need for theoretical framework that embraces the complex process and interplay within a system. In this connection, the concept of innovation systems, with roots in the 1970's and 1980's (Leeuwis, 2004), has recently been further developed and gained increasing attention in the discourse on agriculture and rural development and referred to as Agricultural Innovation Systems (Leeuwis, 2004; Röling, 2009; World Bank, 2007).

According to Adolph (2011) and Swanson and Rajalahti (2010), Agricultural Innovation Systems (AIS) is a network of organizations, enterprises, and individuals focused on bringing new products, new processes, and new forms of organizations into social and economic use, together with the institutions and policies that affect their innovative behavior and performance. This description provides a holistic explanation of the nature and process of innovation in the context of wide range of actors in a very complex system. This implies that the evolution of innovation from a technological network perspective of innovation management to a social network perspective in a knowledge economy.

In addition, the World Bank (2006) and Beshah (2009), explained that the innovation systems concept is attractive not only because it offers a holistic explanation of how knowledge is produced, diffused and used but because it emphasizes the actors and processes that have become increasingly important in agricultural development (Dansou *et al.*, 2012). The systemic approach to innovation recognizes that innovation and knowledge generation take place as a result of a variety of activities. Knowledge is thus generated not

just in universities and research centers but also in a very wide variety of locations within and outside the complex system. In general, the theoretical framework of AIS consists of four main elements: key actors and their roles; the actors' attitudes and practices; the effects and characteristics of patterns of interaction; and the enabling environment for innovation (Agwu *et al.,* 2008; Beshah, 2009; World Bank, 2006; Swanson and Rajalahti, 2010).

The wrong connotation of agricultural innovation systems attached with development of new technologies. However, the agricultural innovation systems is not only about new technologies but also institutional and social changes (Al-Rimawi *et al.,* 2013; Gottret, 2006) that result from the interaction among multiple and diverse stakeholders with multiple sources of knowledge and its transformation into new things, products or practices, applied in a specific institutional and cultural context (Beshah, 2009; World Bank, 2006; Swanson and Rajalahti, 2010). The theoretical interpretation of AIS clearly point out that innovation process leads to creation and dissemination of the product, which is knowledge, between and among wide range of actors that bring a desired outcomes. Therefore, the attempt of the study was to conceptualize the theoretical framework of agricultural innovation system in the context of watershed management extension and advisory services in reducing impacts of floods in the study area.

1.6 Conceptual Framework

Watershed management programs generally adopt the micro-watershed as the basic management unit, since this allows the integration of land, water, and infrastructure development and the inclusion of all actors in a participatory process (Braimah *et al.,* 2014; Darghouth *et al.,* 2008). The boundary of the innovation system is not fixed and it

can only be defined in relation to a particular domain of human activity (Agwu *et al*., 2008; Daane *et al.,* 2009; Samuel *et al.,* 2012). Therefore, in this conceptual framework, watershed is the boundary of the innovation system and nature and process of watershed management extension and advisory services in overcoming the problem of floods is the central issue to be analyzed from different actors' perspectives.

The elements in the watershed management extension and advisory service in overcoming the problem of floods are the service providers, clients, and enabling/disabling environment (Adolph, 2011; Agwu, 2008). AIS framework is applicable in determining the nature of relationships among these elements within the micro watershed under consideration. The watershed management extension and advisory services in overcoming the problem of floods is the responsibility of wide range of both public and non-public actors.

Each actor plays its own role and responsibility in addressing the issue, which is determined by the capacity in terms of resources, knowledge, skills, and experience (Agunga and Zeleza, 2014; Isaiah *et al.,* 2013). There must be knowledge and experience sharing mechanism among actors to enhance the synergy of overcoming the problem of floods. Similarly, clients in catchment and flood prone areas of the watersheds are very diverse in terms of socio-economic, experience, and resilience capacity (Agunga, and Zeleza, 2014; Agwu, 2008; Al-Rimawi *et al.,* 2013). Clients in this context are encompassing the downstream and upstream farmers in the community who are living in and around the watershed.

Empirical studies show that effective flood management has been seen as a multi-stage and multi-organizational involvement with effective communication and networking

including community participation (Areeya *et al.*, 2015; Augustine and Paul, 2012; Ayalew, 2007; Braimah *et al.*, 2014; Wani *et al.*, 2006). This implies that the interaction between clients and advisory service providers should be two way (Agunga and Zeleza, 2014; Augustine and Paul, 2012). The combined effect of advisory service providers and clients harness the efforts of watershed management in overcoming the problem of floods in the study area. Beside the interaction between AEAS providers and clients, enabling/disabling environments, which include technological, infrastructural, policies and strategies, in facilitating the nature and processes of AEAS in watershed management will be considered within the watershed innovation system.

The overall interaction between different elements within as well as outside the watershed management extension and advisory services system leads to learning through knowledge sharing among different actors. In so doing, the study contributes to strengthening integrated watershed management extension and advisory services in overcoming the problem of floods in the study area. Therefore, this can be taken as a workable framework for the study area as well as for scaling up to other areas. The diagrammatical representation of the conceptual framework of this study is shown in Fig. 1.

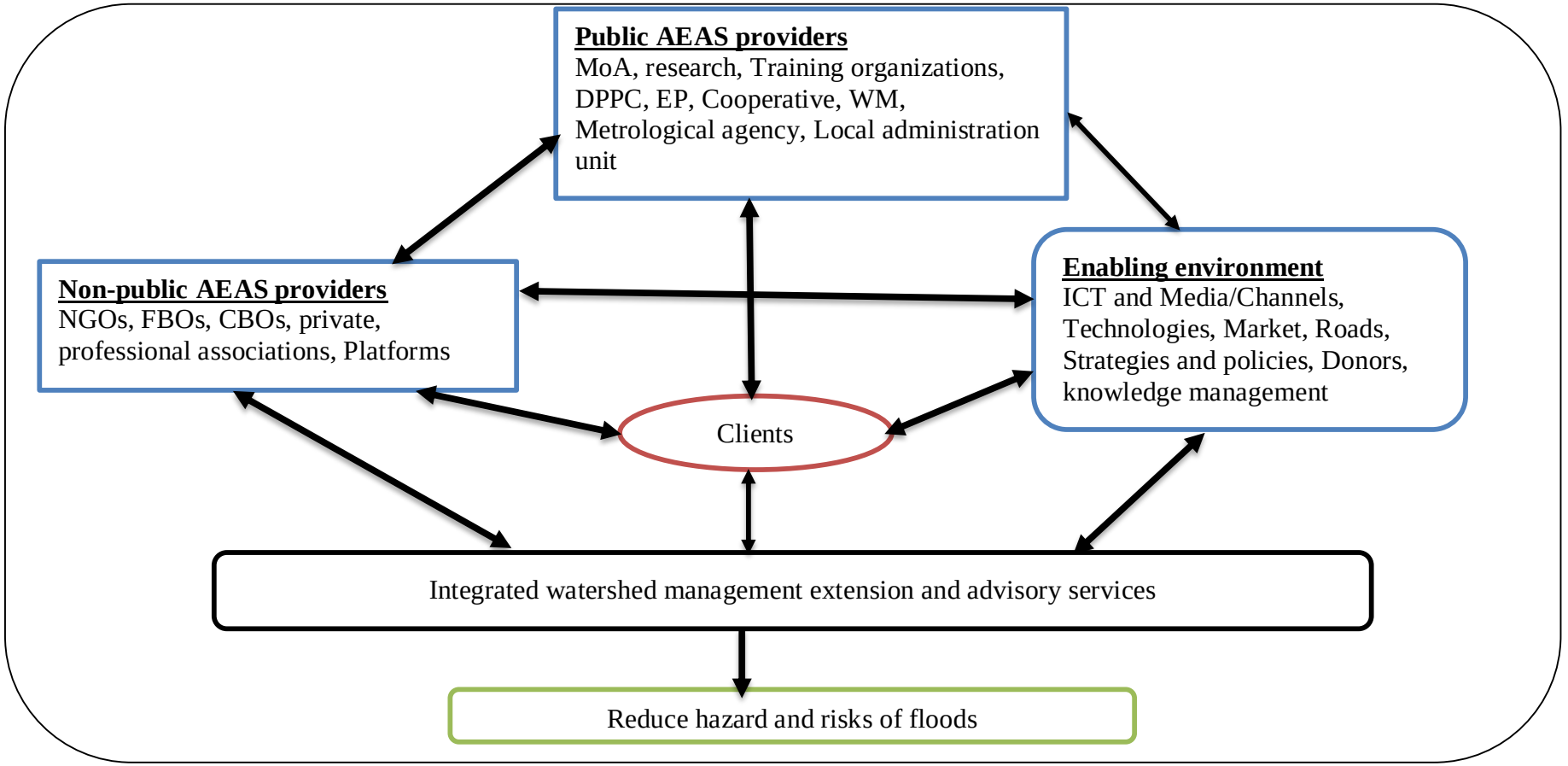

Figure 1: Conceptual framework of watershed management Extension and Advisory Service in reducing hazard and risks of floods in the study area (Adapted and modified from Adolph, 2011)

1.7 Operational Definitions

The following terms, which are used frequently in the text, are defined as follows to provide common basis of understandings.

a) Agricultural Extension and Advisory Services (AEAS): are all the different activities that provide the information and services needed and demanded by farmers and other actors in rural settings to assist them in developing their own technical, organizational and management skills and practices so as to improve their livelihoods and well-being;

b) Agricultural Innovation Systems (AIS): is a network of organizations, enterprises, and individuals focused on bringing new products, new processes, and new forms of organizations into social and economic use, together with the institutions and policies that affect their innovative behavior and performance.

c) Communication patterns: refers to the communication network among members of a given organization within and outside the system.

d) Enabling/disabling environment: are institutions that are facilitating the nature and processes of AEAS and providing favorable/non-favorable environment in order to make the advisory service provision efficient and effective, which include technological, infrastructural, policies, strategies etc.

e) Extension personnel: all extension workers who have a direct contact and work relationship with farmers in the rural areas. These include team leaders, department heads, SMSs, and VEWs.

f) Institution: is an established custom, law, practice or relationship in a society or community.

g) Organization: is a social unit of people that is structured and managed to meet a need or to pursue collective goals with a management structure that determines

relationships between the different activities and the members' assigned roles, responsibilities and authority to carry out different tasks.

h) Roles: is the characteristics and expected social behavioral pattern associated with a particular social status of an individual or organization.

i) Subject Matter Specialist (SMS): An extension worker who is specialized in one scientific discipline and working at district post who is providing technical support to VEWs.

j) Village Extension Worker (VEW): a generalist extension worker at the community/village level and responsible for the first contact of farmers with extension organization.

CHAPTER TWO

2.0 LITRATURE REVIEW

2.1 The Nature and Processes of Agricultural Extension and Advisory Services

Agricultural Extension and Advisory Services (AEAS) is becoming a common terminology synonymously used with agricultural extension by many organizations. AEAS are all the different activities that provide the information and services needed and demanded by farmers and other actors in rural settings to assist them in developing their own technical, organizational and management skills and practices so as to improve their livelihoods and well-being (Adolph, 2011; AFAAS, 2011; Christoplos, 2010; Faure *et al.*, 2012). According to FAO (2009), the concept of AEAS can provide a window for learning about rural change and innovation processes through the dialogue among extension workers, farmers and other value chain actors (Davis *et al.*, 2010; Swanson and Rajalahti, 2010).

Additionally, Anandajayasekeram *et al.* (2008) and Chipeta (2006) have elaborated more the concept of AEAS in such a way that include: dissemination of information, training and advice of groups of farmers or individual farmers, and testing new technologies on-farm level. With regard to the contents, based on the demands of farmers and other actors, are moving from technical to economic, production to marketing and natural resources management, and in terms of target, from farm level to collective level (Adolph, 2011; Swanson and Rajalahti, 2010). With regard to methods, unlike to the top-down approaches, it is shifting to more participatory approaches and focus on learning processes to strengthen farmers' capacities to make their own decisions in line with their objectives and resources (Swanson and Rajalahti, 2010).

The ongoing trends pose a particular problem to the staff of existing AEAS, who must find ways to deal effectively with such changes (Adolph, 2011; Christoplos, 2010; World Bank, 2006). The challenge lies in developing the necessary skills to work with new types of organizations, communicate with demanding farmers, and be professionally capable of providing diverse services (Adolph, 2011; Christoplos, 2010; Swanson and Rajalahti, 2010). This shows that the role of AEAS is becoming diverse in terms of contents and coverage. Therefore, current AEAS should give more attention to a broader extension strategy that includes more dynamic services including marketing, organizing farmers into producer groups to supply these markets, and using more integrated natural resource and watershed management services (Rajalahti *et al*., 2008). Similarly, Anandajayasekeram *et al.* (2008) and Christoplos (2010) emphasize that the role of AEAS has thus widened to include issues in rural areas that go beyond agriculture and focus on rural development.

Unlike the top down linear extension model, in the current demand driven AEAS system, service providers must listen their clients and be proactive for their needs and demands. In this regard, Swanson and Rajalaht (2010) strongly suggest that for extension organizations to be effective in a dynamic market-driven economy, extension officials and their field staff must listen to the clientele served, as well as other service providers.

A first step in moving towards demand-driven extension is to ensure that farmers feel they can make their concerns heard, and this in turn requires that service providers demonstrate their readiness to listen and respond to these demands (Adolph, 2011; Christoplos, 2010; Swanson and Rajalaht, 2010; World Bank, 2006). For AEAS to be successful, the demand should come from service users (clients) rather than service providers (Chipeta, 2006; Davis *et al.*, 2010; Swanson and Rajalahti, 2010). When farmers choose to use and pay for

agricultural extension and advisory services, it is the best indicator that the services reflect the content and quality that they require (Chipeta, 2006; Faure *et al.,* 2012).

The current move of AEAS is therefore, towards pluralistic, demand-led and market-oriented extension systems and should be focused on multi-stakeholders national ownership (Christoplos, 2010; Davis *et al.,* 2010; Swanson and Rajalaht, 2010). This means AEAS is no more the sole responsibility of public extension systems. Moreover, Swanson and Rajalaht (2010) contemplated that the task of strengthening agricultural extension and advisory systems is a complex process that must reflect each nation's primary agricultural development goals. In addition, primary clientele to be served and the capacity of institutional framework also should be strengthened (Augustine and Paul, 2012; Christoplos, 2010; Davis *et al.,* 2010; Faure *et al.,* 2012). This is due to the fact that agricultural extension and advisory services are currently being provided by different stakeholders, which needs coordination and collaboration among these actors/stakeholders to deliver the service effectively and efficiently.

An increase in landscape of actors involved in pluralistic AEAS delivery, integration and effective application of ICT tools in agricultural extension becomes essential to facilitate linkages, interactions and coordination among actors (Agunga and Zeleza, 2014; Swanson and Rajalaht, 2010). The linkages and interactions also include among producers, and between producers, value chain actors, and other stakeholders within and beyond the agricultural sector in knowledge sharing and supportive services (Christoplos, 2010; Davis *et al.,* 2010; Jadalla *et al.,* 2011; Swanson and Rajalaht, 2010).

Empirical studies show that in most Sub-Sahran Africa (SSA) countries, linkages between AEAS providers and other agricultural and rural development stakeholders are weak

(Agunga and Zeleza, 2014; Faure, 2012; Adolph, 2011; AFAAS, 2011). This might be the main causes of low production and productivity in the continent. However, currently, there are new arrangements between stakeholders to build new forms of AEAS, such as services directly managed by farmer organizations or NGOs, or public-private partnerships including professional bodies or contracts between a private firm and the state (Adolph, 2011; AFAAS, 2011; Davis *et al.*, 2010). This indicate that the ongoing trend is moving from 'national advisory service systems' towards more pluralistic 'innovation systems' where all stakeholders have a role to play.

In most African countries, AEAS are provided by a combination of public-sector and non-public sectors (Adolph, 2011; Agwu *et al.*, 2008; Faure *et al.*, 2012; Swanson and Rajalaht, 2010). This is due to the fact that public extension systems in many developing countries have shortcomings with regard to coverage, effectiveness, efficiency, and accountability (Agunga and Zeleza, 2014; Kassa, 2004). In order to overcome this problem, Swanson and Rajalaht (2010), suggested that developing strong public-private partnership should be an important goal in most countries.

2.2 Roles of Actors Involved in AEAS

According to AFAAS (2011), actors in AEAS are: extension agencies and other AEAS providers (ministries responsible for agriculture and related ministries), farmer organizations and commodity associations, civil society groups, private agribusiness firms providing AEAS, end users (farmers, pastoralists, and agribusinesses), and policy makers. In addition, Adolph (2010) also indicated that national, sub-regional and continental agricultural research organizations and networks; agricultural education organizations; various infomediaries; and donors supporting these processes are also actors involved in

AEAS. However, this framework misses an important element of the AEAS, which is professional associations/societies whose roles and contributions need to be studied so as to include as one of the key actors who play an important role in the AEAS. Generally, AEAS actors can broadly be categorized into public sector actors and non-public sector actors. The following section explains the roles of key public and non-public actors.

2.2.1 Public sector actors in AEAS

This section tried to describe few key public sector actors in AEAS. However, this does not mean that these are the only public actors. The public actors can be expanded based on the structure of AEAS in different countries. Hence, the attempt was to illustrate few examples of roles of major public sector actors in AEAS.

According to Qtaishat and Al-Sharafat (2012) and Adolph (2011), in most African countries, the ministry of agriculture is the dominant public organization provides agricultural extension and advisory services. However, the performance of the public sector in responding for the demands of clients is affected by very low extension staff to farmer ratios (Davis *et al.,* 2010; Samuel *et al.,* 2012). In most cases, the main constraints in the public sector AEAS are: lack of funding and investment, dependency on donor organizations, poor equipment, insufficient pre-service training of staff (in particular in market-oriented production, learning, communication, and facilitation), inadequate performance management, low pay, and poor incentive systems (Adolph, 2011; Agunga and Zeleza, 2014; Christoplos, 2010; Davis *et al.,* 2010). In addition, the ministry of agriculture is responsible in formulating regulatory policy framework and overall coordination of national AEAS.

The other key actors in AEAS are research organizations. Research organizations playing key roles in AEAS in Africa not only generate knowledge and technologies, but also act as

infomediaries by making research outputs available to users via a range of ICTs (Adolph, 2011; Faure *et al.*, 2012). Adolph (2011), described that national agricultural research institutes do not provide AEAS directly but are a key source of information for AEAS providers. However, testing of new technologies at farm level in collaboration with public extension workers are also the type of AEAS research organizations provide for farmers.

Like the research institution, in most African countries, universities play an important role in AEAS through providing pre-service and in-service training for extension workers as well as in providing other technical advisory and support services for value chain actors (Agwu *et al.,* 2008; Swanson and Rajalaht, 2010). Training in agricultural extension and advisory services (technical training on agricultural technologies and training in communication and facilitation) are offered by most agricultural colleges, which enhance efficiency and effectiveness of AEAS in the context of AIS (Abid *et al.,* 2015; Adolph, 2011; Agwu *et al.*, 2008; Faure *et al.*, 2012). However, in most cases, the linkage between research and academic institution is weak (Agwu *et al.*, 2008*;* Faure *et al.*, 2012).

2.2.2 Non-public sector actors in AEAS

Apart from the public sector, currently large number of non-public actors are providing AEAS to smallholder farmers in Africa (Adolph, 2011) including provision of inputs and credit, adoption and dissemination of technologies, capacity development, and wide range of services for clients and other users in the value chain (Agwu *et al.,* 2008; Faure *et al.*, 2012; Samuel *et al.,* 2012; Swanson and Rajalaht, 2010). Similarly, the attempt of this section was to illustrate few non-public sector actors in AEAS.

Farmers are probably the main source of informal agricultural advice in SSA (Adolph, 2011), where most subsistence farmers have not had much contact with formal AEAS.

This is due to the fact that in most cases farmers can easily be convinced by his/her neighboring farmers than extension personnel (Agwu *et al*., 2008; Eshetu, 2007). Similarly, farmers organization are providing a wide range of agricultural extension and advisory services for their members ranging from input supply to marketing of agricultural produce (Agwu *et al.*, 2008; Chipeta, 2006; Christoplos, 2010; Swanson and Rajalaht, 2010).

The other non-public actors that play a pivotal role in AEAS are NGOs. However, in most cases, NGO-provided AEAS generally follows a project mode, with funding limited to a specific period of time, geographic coverage, and scope of work (Agwu *et al.,* 2008; Davis *et al.,* 2010). Similarly, the private sectors play an important role and responsibilities in AEAS. The nature of agricultural extension and advisory services by private-sector firms in most cases focus on input supply, veterinary services, capacity development, provision of credit (Eshetu, 2007; Jadalla *et al.,* 2011; Swanson and Rajalaht, 2010). In some cases, private sector firms may work on a contract basis for the government and/or under the direction of farmer organizations (Adolph, 2011). However, the private sector is unutilized potential that enhance AEAS within the context of AIS.

According to Swanson and Rajalahti (2010), strengthening research and extension linkages, building public–private partnerships, working closely with producer groups, is of paramount importance in AEAS, since all actors should work as an open system (Agunga and Zeleza, 2014; Agwu *et al.,* 2008; Faure *et al.,* 2012). Especially, the organizational linkage with the private sector enhances the provision of AEAS to clients (Agunga and Zeleza, 2014; Jadalla *et al.,* 2011). Therefore, it is advisable to develop strong public–private partnerships, to enhance AEAS efficiency (Adolph, 2011; Swanson and Rajalaht,

2010; World Bank, 2006). The most recent attempt to privatize a public extension system and to make it farmer-driven in Africa was carried out in Uganda under the National Agricultural Advisory Services (NAADS) project (Adolph, 2011). However, this was recently restructured by the government due to its unsatisfactory performance in reaching farmers and currently the mandate of AEAS was given back to the ministry of agriculture.

2.3 Factors Influencing Performance of Actors Involved in AEAS

Performance of each AEAS provider determines the quality of services (Faure *et al.*, 2012). According to Agwu *et al.* (2008), Christoplos (2010), Davis *et al.* (2010) and Swanson and Rajalaht (2010), the performance of different organizations depend on the policy framework, institutional leadership, management structure (e.g., bottom-up rather than top-down) and availability of adequate human, financial, and other institutional resources, including staff training, information and communication technology (ICT) capacity.

Another critical factor affecting the capacity and performance of public, private, and civil society organizations to carry out effective extension activities is the size, as well as the technical and management expertise of the current extension staff (Agunga and Zeleza, 2014; Chipeta, 2006; Swanson and Rajalaht, 2010; World Bank, 2006). This implies that AEAS providers' performance is determined by individual, organizational and systems level capacity. Hence, the capacity at different levels should be critically analyzed and devise suitable strategy to strengthening the capacity for better service delivery.

2.4 Agricultural Extension and Advisory Services in the Watershed and Flood Management

According to World Bank (2001) cited by Darghouth *et al.* (2008:1), a watershed is an area that supplies water by surface or subsurface flow to a given drainage system or body

of water, be it a stream, river, wetland, lake, or ocean. Furthermore, the study contemplated that the characteristics of the water flow and its relationship to the watershed are a product of interactions between land and water and its use and management. Watershed degradation has emerged in recent decades in many different parts of the world as one of the most serious examples of natural resource degradation, with negative environmental and socio-economic consequences, particularly in developing countries (Areeya *et al.*, 2015; Darghouth *et al.*, 2008; NDMAGI, 2008).

As far as watershed management extension and advisory service is concerned, there are various approaches and models envisaged. One interesting empirical study in this regard indicates that integrated natural resource management approaches and watershed management programs for resource conservation and reduction of disaster risk associated with floods have got attention by AEAS providers (Darghouth *et al.,* 2008; Ruhul *et al.*, 2015). For instance, floods are recurrent phenomenon which causes huge loss of lives and damage to livelihood system, property, infrastructure and public utilities in India (NDMAGI, 2008). Though flood occurrence is associated with climate change, there are also other causes that exacerbate the situation, among which degradation of the watershed is the most serious factor (Darghouth *et al.*, 2008; Ruhul *et al*., 2015).

According to the World Meteorological Organization (2006), traditionally, flood management has focused on defensive and reactive practices but it is widely recognized that a paradigm shift is required towards proactive management of flood risks. There are different agricultural extension and advisory services measures for flood management, which include structural (physical and biological) and non-structural measures that strive to keep people away from flood waters (Darghouth *et al.*, 2008; Eung and Hyun, 2012;

Maidl and Buchecker, 2015). Of all the non-structural measures for flood management, which rely on the modification of susceptibility to flood damage, the one which is gaining sustained attention of the planners and acceptance of the public is Integrated Flood Management (IFM), through focusing on flood-forecasting and warning systems (NDMAGI, 2008).

IFM aims to create resilient communities through a best mix of short-term and long-term strategies comprising structural and non-structural flood management measures implemented through the active involvement of all stakeholders and the community at large (World Meteorological Organization, 2006). However, most of the time, the number of organizations and the volume of activities in the pre-disaster were negligible when compared to the post-disaster humanitarian activities (Kassahun *et al.,* 2007; Vilhelm *et al.,* 2015; Maidl and Buchecker, 2015). The experience in Ethiopia in this regard is worth mentioning in such a way that less work has been done in preventing watersheds from floods than the post-disaster efforts. The recurrent floods occurrence in most part of the country in general and the experience in Dire Dawa in particular is a good example. This highlights the need for integrated watershed management extension and advisory services by both public and non-public actors in overcoming the problem of floods in the country.

2.5 Methodological Review of Agricultural Innovation Systems and Watershed Management Extension and Advisory Services

Knowledge is the intellectual capital of organization and the primacy of knowledge in learning and adoption to become more relevant led to the emergence of the concept of knowledge management (AFAAS, 2011). According to Saadan (2001), cited by AFAAS (2011:10), knowledge management consists of three main activities, namely, knowledge

generation, codification and transfer. Similarly, Darghouth *et al*. (2008), also elucidated that the organizational density creates a management challenge and requires watershed management approaches to mitigate flood hazards to create broad and inclusive institutional platforms for knowledge and experience sharing.

The World Meteorological Organization (2006), clearly pointed out that being an interdisciplinary pursuit, integrated flood management calls for seamless interaction between various disciplines, government departments and various organizations and agencies within and outside government, who have to cooperate and bring coherence and synergy to their policies, development plans and activities. This implies that it requires coordination at all levels of administration and decision-making. Moreover, Darghouth *et al.* (2008) elaborates that watershed management works best when there is a supportive policy and legal framework. The application of agricultural innovation systems in context of watershed management extension and advisory services clearly spell out the interplay and synergy of each sub systems. However, choosing the right tools to assess the different features of complex system is important.

According to Agwu *et al.* (2008) and the World Bank (2006), in order to assess the features of the innovation system, researchers relied on a checklist of issues to be investigated and a number of tools to explore partnerships, attitudes, and practices. The tools included an actor linkage matrix tool for mapping patterns of interaction; a typology tool for differentiating among forms of relationships; a typology of different forms of learning (a key innovation process) and the partnerships needed to sustain the learning; and a typology of attitudes and practices that shape the key interaction patterns, the propensity to include poor stakeholders, and the willingness to take risk. This implies that

the nature of relationship between and among sub systems in an innovation system is non-linear. The patterns of interactions are always a two-way and reciprocal by its nature that demands critical analysis of the nature of interaction in innovation systems.

According to Reed *et al.* (2009) and Adam and Steiguer (2011), there are a collection of methods that have been developed to investigate the relationships that exist between stakeholders (as individuals and groups) in the context of a particular phenomenon. There are three principal methods that have been used to analyze actors relationships: (a) actor-linkage matrices; (b) social network analysis (identifying the network, collecting social interaction data and data analysis provides insights into patterns of communication, trust and influence between actors in social networks) and; (c) knowledge mapping analyses, which is the content of information between these actors. Moreover, Engel and Salomon (1997), cited by Dansou *et al.* (2012), developed a toolbox called Rapid Analysis of Agricultural Knowledge Systems (RAAKS) that provides methods to analyze configurations of organizational actors, their linkages and interactions so as to help those actors improve their concerted action.

2.6 Enabling/Disabling Environment in the Watershed Management Extension and Advisory Services

According to Adolph (2011), Swanson and Rajalaht (2010), World Bank (2006), and Christoplos (2010), challenges of AEAS include: low (insufficient) levels of investments in AEAS, including public-sector services, resulting in low coverage and possibly insufficient attention to vulnerable groups in remote areas; insufficient differentiation of services with regard to different types of clients; weak capacity of (public) AEAS providers due to lack of technical competency as a result of investment; insufficient or

inadequate communication (due to lack of communication infrastructure including ICTs) and coordination actors at all levels.

In addition, lacking clarity on roles and weak voice or AEAS actors; non-conducive policy environment for AEAS; and poor availability of evidence on AEAS are also important challenges of AEAS in Africa (Adolph 2011; Swanson and Rajalaht 2010). The empirical study in Ethiopia by Davis *et al.* (2010) also corroborates that there are serious constraints in the capabilities and mind-sets of most Development Agents (DAs), dominated by a "technology push" mind-set, and which focus on technology dissemination/transfer rather than on farmers' innovation and demand (Samuel *et al.,* 2012). Besides challenges related to technical, institutional and policy, lack of enabling environment for AEAS providers in terms of transport facilities, office equipment and conducive work environment significantly affect the performance of AEAS. This implies that the disabling environment that affects efficiency and effectiveness of AEAS negatively should be addressed through appropriate policy and strategy framework to enhance the nature and process of watershed management extension and advisory services.

2.7 Farmers' Attitude and Innovation for Rural Development

Rural development is an overall development of rural areas to improve the quality of life of rural people. It is an integrated process, which includes physical, technological, social, economic, political and spiritual development of the poorer sections of the rural society (Wikipedia, the free encyclopedia, 2015). Innovation, which generally refers to changing or creating more effective processes, products and ideas which can increase the likelihood of behavioral changes, is of paramount importance for rural development (Agwu *et al.,* 2008; Antonio and Jose, 2008; Shahroudi and Chizari, 2008). This implies that innovation is central to bring desired social and economic changes.

According to Zakic *et al*. (2008), innovation is driven by two different ways: internally and externally. From an external perspective, innovation management is driven by different knowledge-intensive organizations (KIOs) that build knowledge as their primary value-adding process (Golrang *et al.,* 2012; Qtaishat and AL-Sharafat, 2012). Whereas, from an internal perspective, innovation is driven by attitudes (Al-Rimawi *et al.,* 2013; Golrang *et al.,* 2012; Zakic *et al.*, 2008). The explanation clearly pointed out that attitude is a key factor that determines innovation to achieve social and economic changes.

Psychologists define attitudes as a learned tendency to evaluate things in a certain way. This can include evaluations of people, issues, objects, or events (Golrang *et al.,* 2012). Such evaluations are often positive or negative, but they can also be uncertain at times. Similarly, according to Hogg and Vaughan (2005) cited in McLeod (2014:1), an attitude is a relatively enduring organization of beliefs, feelings, and behavioral tendencies towards socially significant objects, groups, events or symbols.

Researchers also suggest that there are several different components that make up attitudes. The components of attitudes are sometimes referred to as ABC's of attitude: Affective Component (how the object, person, issue or event makes you feel); Behavioral Component (how the attitude influences your behavior); and Cognitive Component (your thoughts and beliefs about the subject) (McLeod, 2014; Karjaluoto *et al.,* 2002). Attitudes can also be explicit and implicit. Explicit attitudes are those that we are consciously aware of and that clearly influence our behaviors and beliefs (Golrang *et al.,* 2012; Heikki *et al.*, 2002), whereas, implicit attitudes are unconscious, but still have an effect on our beliefs and behaviors (McLeod, 2014). This explanation show that attitude is determined by several factors emanated from internal and external that influence a decision behavior of farmers and value chain actors, which is a subject that overlooked in the current view of AEAS.

There are a number of different factors that can influence how and why attitudes form. There are three factors that largely determine our attitude formation. These are the triple E's of attitude: Environment (positive or negative), Experience (direct and observation), and Education (formal and informal) (Abid *et al.*, 2015; Karjaluoto *et. al.*, 2002). According to McLeod (2014), people tend to assume that people behave in accordance with their attitudes. However, social psychologists have found that attitudes and actual behavior are not always perfectly aligned. In some cases, people may actually alter their attitudes in order to better align them with their behavior (Heikki *et al*., 2002; Qtaishat and Al-Sharafat, 2012). While attitudes can have a powerful effect on behavior, they are not set in stone. The same influences that lead to attitude formation can also create attitude change (McLeod, 2014; Qtaishat and Al-Sharafat, 2012). The strength with which an attitude is held is often a good predictor of behavior. The stronger the attitude the more likely it should affect behavior (Golrang *et al.*, 2012; Karjaluoto *et al.*, 2002; McLeod, 2014).

One very critical observation in most definitions of AEAS is that they give emphasis to knowledge (content) and skills/practices that should be covered by service providers and/or demanded by clients (Agunga and Zeleza, 2014; Obaid *et al.*, 2008; Samuel *et al.*, 2012). However, less emphasis has been given to attitude/mind-set. The ultimate aim of AEAS is to bring desirable behavioral change among farmers so as to improve their livelihoods (Adolph, 2011; Al-Sharafat *et al.*, 2012; Shahroudi and Chizari, 2008). This indicates that, most AEAS definitions miss an important aspect of behavioral change i.e. attitude.

One can easily draw a conclusion that innovation starts in the minds of people and attitude/mind-set is central to development. Any intervention/research/advisory

services/technology/innovation etc. targets to bring desirable change in the mind-set/attitude of people leads to development. One of the Framework's for African Agricultural Productivity (FAAP) principles is empowerment of end-users to ensure their meaningful participation in setting priorities and work programmes for research, extension, and training to ensure their relevance (FARA, 2006). The FAAP's core business is to empower farmers to be active players in improving agricultural productivity not just in terms of increasing their yields but also in decision making on how programmes and policies are shaped. Therefore, attitude of farmers significantly determines farmer's decision making power.

Although the mind-set of people is crucial for development, the mind-set before and mind-set after any AEAS intervention brings a desired change to development through adoption of new innovations. This clearly shows that the role of AEAS providers in changing the mindsets of clients is very critical in both physical (face-to-face) and virtual platforms. This argument leads to a conclusion of, unless there is a change in the attitude/mind-set of AEAS actors including farmers, the desired development cannot happen. This is because, people always have their own mindset initially, which either hinders or accelerates development. It needs to analyze the mindset of people before and after any AEAS intervention. However, measuring the mindset of AEAS actors before and after AEAS intervention is very critical using different tools and techniques in order to justify its contribution for rural development.

2.8 Overview of Agricultural Extension and Advisory Services Systems in Ethiopia

Historically, Ethiopia has been implementing various extension systems. For instance to mention the most recent experience, following the change in government in 1991, the

modified T and V system was adopted as a national extension system until its replacement by the Participatory Demonstration and Training Extension Systems (PADETES) in 1995. Originally, PADETES was adopted from Sasakawa Global 2000 (SG-2000), which was initiated in 1993 as an extension system in the country (Abata, 1997; Asres *et al.*, 2014; Belay, 2003; Beshah, 2003; Worku, 2000).

Since 1995, the rural centred agricultural development using PADETES and modified SG-2000 approach commonly called Newly Extension Intervention Program (NEIP) has been adapted as the national agricultural extension system in the country (Abate, 1997; Beshah, 2003; Kassa and Abebaw, 2004). The nature of AEAS during this period was focused on technological package using demonstration and training approaches. Though more focus was given to crop and livestock sector, natural resource management was one of the focus areas of AEAS during this period.

After the PADETES, there are also additional approaches that were introduced like family based extension packages and area based specialization approaches (Beshah, 2003; Worku, 2000). The focus of these approaches was to help farmers to be market oriented in some parts of the country, but the approaches were not adopted as a national extension system in the country.

Currently, after adopting the PADETES, the country's extension approach focuses on participatory extension system as a national extension approach, which focuses on ensuring food security and transformation of smallholder production systems from subsistence to commercial with increasing diversification into high value products through focusing on natural resource conservation and watershed development programs. This

confirms that in all the past extension systems the issue of soil and water conservation, afforestation, agro-forestry and watershed management were given due emphasis.

Similarly, like the previous extension systems, currently, the advisory service on natural resource and watershed management has got top priority of the country's agricultural agenda. On top of that, the country is committed to transform the country's agricultural sector by establishing an entity called Ethiopian Agricultural Transformation Agency. One of agency's aims is to develop an appropriate agricultural extension strategy to the country's agriculture sector. Accordingly, a draft extension strategy was developed and it was reviewed and validated by stakeholders. The strategic document clearly stipulated the framework of AEAS in the country and recognizes the mere contribution of non-public actors. In addition, the strategy emphasizes the need for coordination and collaboration among different AEAS actors. Although development of agricultural extension strategy is a big step, translating the strategies into action is what brings the desired results. Hence, the Federal Ministry of Agriculture should take the lead in this regard.

In summary, a critical review of the country's extension system indicate that Ethiopia has been exercising donor's imposed and program-based extension systems, which is a pendulum fashioned form of change. Always new extension models and approaches were started without due consideration of good practices and lessons of the past and the current extension systems. This could be one possible reason for the country's agricultural development sector in general and the agricultural extension system in particular was undergone recurrent reforms, which makes the sector unable to continue the service provision in a sustained manner. In addition, most of the time, agricultural extension system has been led by non-extension professionals that might seriously affected the

sector. The newly established Ethiopian Society of Rural Development and Agricultural Extension may play key role in promoting AEAS professionalization in the country as this is one of the objectives of the society.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Description of the Study Area

The study was conducted in Adama District, East Shoa Zone, Ethiopia (Fig. 2). It is located 100 km away from Addis Ababa towards the South East direction between 8^0 30' – 8^0 45'N and 39^0 15' – 39^0 30'E direction. It is bounded by Amhara region in the north; Oromia region, Arsi zone Dera district to the south, Boset district to the east, and Lume district to the west. The city of Adama sits between the base of an escarpment to the west, and the Great Rift Valley to the east (ADBA, 2011; ADBA, 2013).

The total land coverage of the district is 968.27 km^2. The altitude ranges 500-2400 m.a.s.l, the annual temperature ranges 12^0C – 33^0C, and the annual rainfall ranges 600 – 1100 mm. The district is dominated by undulating plains with extended ridges along its western part. Awash is the only significant river in Adama and it flows along the eastern part of the district. The Koka Lake (the third largest lake in East Shoa zone) belongs to the district.

Adama district comes under a sub-tropical agro-climatic zone. The major soil type in Adama is andosol, accounting for 74.3% of the land area of the district. Cambisols and luvisols cover 25.7%. Adama is dominated by sub-tropical grasslands, and there are also small scale publicly owned forests in the district.

Adama is the most populous district in East Shoa Zone. The total population of the district was 286,198 in 2006. The urban population was 59.8% of the total population in the same year. About 38.7% of the populations were 0-14 years, 58.5% were 15-64 years, While 2.8% were 65 years and above. About 51.6% of the urban and 48.7% of the rural population was females. The crude population density of Adama district was 295 persons per km^2 (ADBA, 2013).

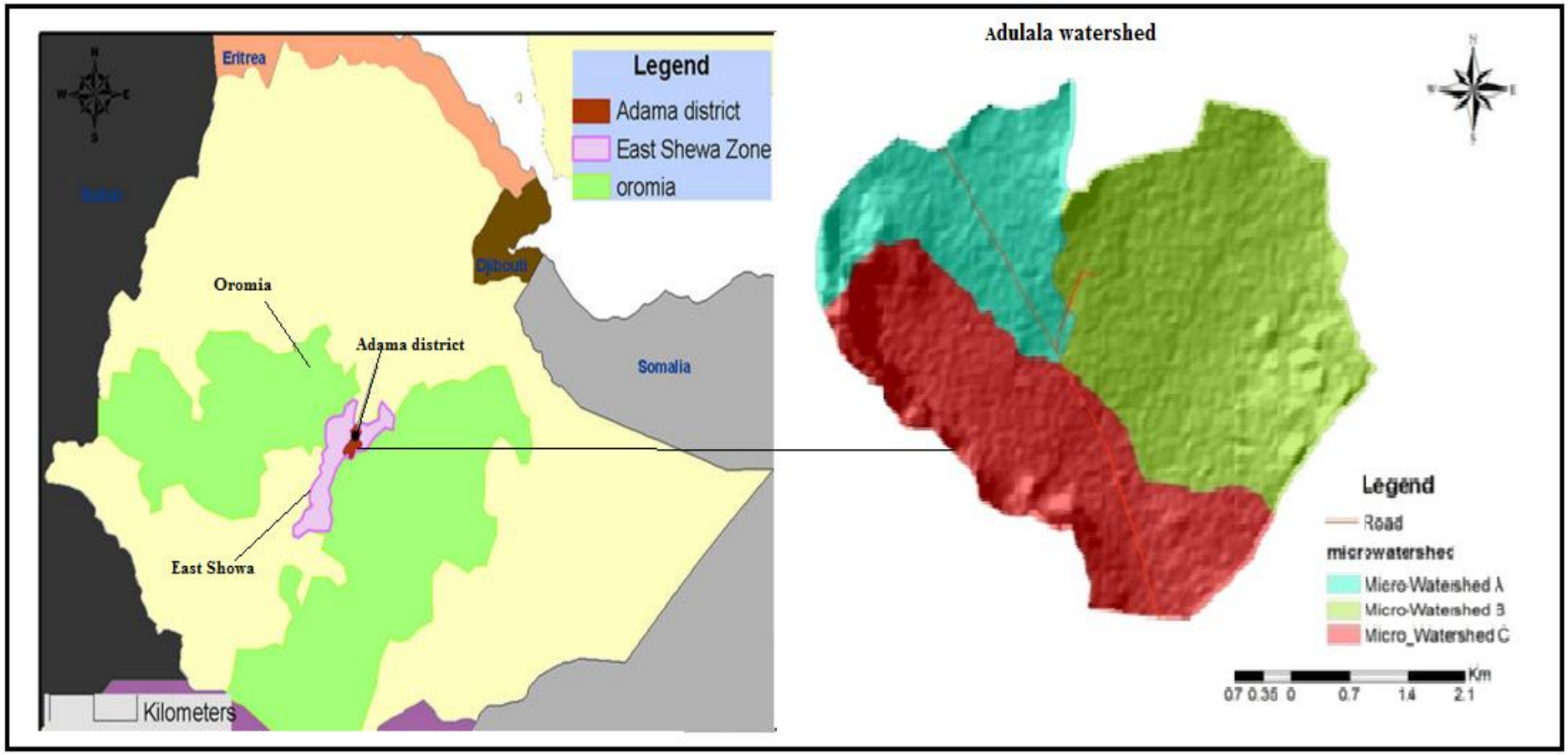

Figure 2: Map of the study area

According to Adama district profile (ADBA, 2011), agriculture plays a key role in the economy of the district. The major crops grown include: cereals, pulses, fruits and vegetable crops, while teff is the dominant and staple food in the study area. According to recent study data, it is estimated that 17 356 ha of land is arable. Out of this total area only 8 062.3 ha of land is under cultivation. The average land holding size of the area is less than 0.5 ha per household. The total livestock population of the district accounts for cattle 69 809; sheep and goats 77 683; draught animals 18 095; poultry 52 492 and traditional and modern bee hives 1 304 (ADAB, 2011: ADBA, 2013).

According to ADAB (2011), ADBA (2013) and ASARECA (2012), Adulala watershed is located in the Central Rift Valley of Ethiopia in East Shoa Zone and geographically situated between $8^0$26.5' to 8^0 29.5' N latitude and 39^0 17'to $39^0$20.5' E longitudes and between $8^0$33' 25" N latitude (Fig. 2). The total area coverage of the watershed is 26 Km^2. The rainfall of the watershed follows a bimodal pattern with short rainy season (March to April) and main rainy season (July to September). The average annual rainfall of the watershed is around 798 mm. It is characterized by a maximum annual mean temperature of 28.5^{0}C and a minimum annual mean temperature of 14^{0}C. In general, the seasonal rainfall in the watershed is inadequate in amount, poor in distribution (erratic) and intensive mainly during July and August that causes considerable amounts of runoff and soil erosion. Runoff and soil loss are severe in the upper reach of the watershed (ASARECA, 2012).

The Adulala watershed is a mixture of intensively cultivated land, open bush and shrubs, and rural residential area. Land use/coverage of the watershed is crop land 85.9%, settlement 2.4% and shrubs and bush lands 11.7%. Low crop production and productivity

is the main characteristics of the watersheds as compared to the potential productivity of the area (ASARECA, 2012). The area suffers from frequent severe droughts induced by the impacts of enhanced climate variability, poor management of natural resources and agronomic practices (ASARECA, 2011). As a result, agricultural productivity is very low. There are a number of gullies formed on the farmlands which resulted decrements in total croplands. Among the majority of the crops grown in the watershed, cereals such as maize, teff and haricot bean are among the staple crops. Vegetable crops are not grown because of irrigation water unavailability and requirements of high input and expensive irrigation equipment (ADAB, 2011; ADBA, 2013; ASARECA, 2012).

3.2 Research Design

The study used a cross-sectional research design which allows collecting data at a single point in time from selected sample of respondents. The design is most appropriate for descriptive interpretation as well as determination of relationships between and within variables (Mendenhall, 1989). Moreover, in order to get detailed information about the nature and process of watershed management extension and advisory services in the study area, a case study method was also used whereby data were collected from key informants who have rich experience in watershed management activities for that particular case.

3.3 The Study Population and Sampling Frame

The study population of farmers consisted of all heads of households in the Adulala watershed (123 association members and 88 non-association members). Whereas, for extension personnel, all Village Extension Workers (VEWs) in the Adama district (64), heads of each watershed management related organizations, and Subject Matter Specialists (SMSs) who were working in the selected organizations (agricultural office, world vision,

research organization, rural land and environmental authority, disaster prevention and preparedness office, and livestock agency) of the Adama district. The sampling frame from which the farmers were selected was obtained from the Peasant Association (PA) as well as from each watershed management associations, whereas, for VEWs and SMSs the lists were obtained from the respective offices of the selected organizations.

3.4 Sampling Procedure and Sample Size

There are 37 PAs in Adama district and three VEWs in each PA. The three VEWs are working and responsible for the activities of crop science, animal sciences, and natural resource management. Adulala hate haroreti is one of the PAs found in Adama district. The PA was selected for the study purposively due to the experience of the PA on watershed management activities and severity of floods damage in the area. Adulala Watershed belongs to this PA. The watershed has three sub-watersheds namely: Adulala hate mariam, Adulala lolefeta and Adulala haroreti. Out of these three sub-watersheds, the Adulala hate mariam and Adulala lolefeta sub watersheds were selected purposively due to their features of the sub watersheds in such a way that in these two sub-watersheds, farmers were able to organize themselves in watershed management associations. There were three watershed associations: Sulula kersa gerba (42 members), Kersa kella (40 members), and Lebu (41 members).

The total number of households in the three watershed management associations was 123. Whereas, the total number of non-association members' households were 88. For the study, 120 farmers were selected randomly from both association members (70) and non-members (50) using proportionate stratified random sampling technique/proportional probability sampling (PPS) technique (Golrang *et al*., 2012) in order to analyse the nature and process of watershed management extension and advisory services between these two categories.

The total sample size of extension personnel were 22 VEWs and 19 SMSs. SMSs were selected from six organizations (Agricultural office eight; NGO (World vision) one; Research organization one; Rural land and environmental authority five; Disaster prevention and preparedness two; and Livestock agency two).

In addition, in order to get in-depth information on the nature and process of the watershed management extension and advisory services in the study area, data were collected from three heads of organizations to enrich the data from extension personnel. Whereas, three key informant farmers (one from each watershed management association), 15 mixed farmers (men and women) were selected from both association members and non-members based on their experience in watershed management activities. Similarly, eight women farmers from both association members and non-members were selected for Focus Group Discussion (FGD).

3.5 Instrumentation and Pre-testing the Instrument

Primary data were collected using interview schedule (survey questionnaire) for farmers and self-administered questionnaire for VEWs and SMSs backed up by personal observation, group discussion, informal discussion, and semi-structured interviews with key informants and different groups. The interview schedule (questionnaire) was constructed using closed and open-ended questions. However, the self-administered questionnaire used for VEWs and SMSs was more of close-ended questions than open-ended questions. For the heads of organization, a checklist was used for face-to-face interview by the researcher.

The research instruments, both the survey questionnaire used for farmer's data collection and self-administered questionnaires (for both VEWs and SMSs with some variations),

were prepared after reviewing various literature and related empirical studies done in the country as well as elsewhere. Later, after incorporating comments obtained from supervisors, the final draft of the questionnaires were taken to the study area for pre-testing before using for actual data collection.

The interview schedule (survey questionnaire) was pre-tested on six farmers who were selected from the PA. The self-administered questionnaires were also pre-tested on two VEWs selected from two PAs and two SMSs selected from two organizations. The overall validity and reliability of both the interview and self-administered questionnaires were evaluated. The initial drafts of both the interview schedule (survey questionnaire) and self-administered questionnaires were revised with some minor changes after pre-testing.

3.6 Data Collection Techniques

The primary data were collected from respondents by the researcher assisted by three enumerators and one field assistant. The enumerators were trained before pre-testing of the research instruments. Although all enumerators had rich experience in data collection, there was close follow-up, inspection, and evaluation of enumerators during data collection time by the researcher on a daily basis to ensure the quality of data. For the extension personnel, there was frequent follow-up through telephone.

Additionally, in order to get in-depth information on the nature of watershed management extension and advisory services in the study area, data were collected from key informants who were selected from both members and non-members of the watershed management associations through personal interviews and focus group discussion. The KI interview and FGDs were enabled the researcher to collect information that could not be obtained

through survey questionnaire (Isaiah *et al.,* 2013). In addition, formal and informal discussions using semi-structured questionnaire were conducted with VEWs, SMSs, team leaders, and heads of the departments. On-spot observation of the watershed and the study area by the researcher also was used to get first hand observation in the field.

Secondary data were collected from annual reports of Adama bureau of agriculture, Melkasa research center, Adama metrological station. In addition, various literatures were obtained from different websites and various researcher publications to enrich the primary data.

3.7 Data Analysis Methods

The collected data were verified on daily basis in order to make sure that the interview schedule had been filled up accurately and completely by the enumerators. The data from the interview schedule and self-administered questionnaires were coded, entered, and analyzed using Statistical Package for Social Sciences (SPSS) version 20.0 and Microsoft Office 2007.

Descriptive statistical analysis (frequencies and percentages) were used to obtain variability among different variables. In addition, Chi-square test was performed to determine whether there were significant differences between farmers in the selected watershed management associations and non-members as well as VEWs and SMSs. This is due to the fact that chi-square can be used in a wide variety of research contexts and most frequently to test the statistical significance of results reported in bivariate tables (Connor-Linton, 2006). Whereas, the qualitative data were analyzed using content analysis and prescribed narrations. Finally, the results of data analysis were categorized, summarized, and presented in relevant formats.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSIONS

4.1 Characteristics of Extension Personnel and Farmers

This section describes brief the characteristics of extension personnel and farmers to look at their distribution and variability among respondents.

4.1.1 Characteristics of extension personnel respondents

This section presents the results of extension personnel respondents' characteristics namely: sex, educational status, age, and service years. The results in Table 1 show that the proportion of male extension personnel was greater than that of female extension personnel and most of them have diploma level training and above. The results on the age categories show that most of the VEWs were younger than SMSs and the chi square result also shows that there was significant age difference between VEWs and SMSs. Like age, a service year of extension personnel also significantly varies greatly between VEWs and SMSs.

Most of VEWs had served fewer years than SMSs, 5.7 years and 15.42 years respectively. These results imply that the agricultural extension and advisory services at a grassroots level in the study area was dominated by less experienced and male extension staff. This is likely to affect negatively the nature and process of agricultural extension and advisory services at the grassroots level in such a way that quality of services provided by less experienced extension personnel might not be satisfactory. However, the studies by Agunga and Zeleza (2014) and Okwuokenye and Okoedo-Okojie (2014) in Malawi and Nigeria respectively reveal that majority of extension personnel were aged 31 years and

older and have served more than six years and above. This result calls attention of top managers at district level to put a mechanism to retain experienced extension personnel at the grassroots level in order to improve the quality of services provision. The results of socio-economic characteristics of VEWs and SMSs are summarized in Table 1.

Table 1: Characteristics of extension personnel respondents

Variables	Distribution of respondents (%)		χ^2	P-Value
	VEWs (n=22)	SMSs (n=19)		
Sex of respondents:- Male	86.4	84.2	0.38	0.846
- Female	13.6	15.8		
Educational status:			22.041	0.000***
- Diploma	100	31.6		
- BSc/BA	0.0	57.9		
- Doctorate of Vet. Medicine	0.0	10.5		
Age			31.183	0.000***
- Less than 25 years	13.6	0.0		
- 26 to 30 years	72.7	5.3		
- 31 to 35 years	13.6	15.8		
- 36 to 40 years	0.0	15.8		
- Greater than 40 years	0.0	63.2		
Service years			19.552	0.000***
- Less than 5 years	45.5	31.6		
- 6 to 10 years	50.0	5.3		
- 11 to 15 years	4.5	10.5		
- Greater than 15 years	0.0	52.6		

Note: *** significant at 1% probability level

4.1.2 Socio-economic characteristics of farmers

Most farmers in the watershed were able to organize themselves into a watershed management association. This enabled them to synergize their efforts towards conserving the natural resources collectively. This in turn enhanced the benefit from the watershed management activities through improving the return from their farming as a result of reducing floods in their own farm lands as well as common lands.

Farmers during focus group discussions also reported that they benefited by being members of watershed management association in such a way that they protected their

farm lands from flood damage. Organizing themselves in association facilitated to receive watershed management extension and advisory services from service providers in an integrated way. This is because organizing farmers in an association create good environment for advisory service providers to provide the necessary services in an integrated way (Rebecca *et al.,* 2013). Similarly, Isaiah *et al*. (2013) and Kitojo and Viscal (2011), also indicated that farmers who are members of any local organization are more likely to be aware of new information and integrated natural resource management technologies. In addition, formation of farmers association facilitates the building of social capital (Nnadi *et al.,* 2013), increases accessibility (Dincu *et al.,* 2013), and reaching out the neglected group of the society (Gomina and Ayuba, 2015; Rebecca *et al.,* 2013).

The results in Table 2 show that male farmers dominate the watershed management association compared to their female counterparts, which implies that women's participation in the watershed management association is less than men's. However, women farmers' during FGD were reported that women are playing key role in leading the association together with their men counterpart. Majority of association members completed secondary level education and beyond and belong to the age group of 31 to 45 years, which accounts 67.1% and 45.7%, respectively. This implies that most of the association members were educated and at the productive age group, which probably may affect adoption of watershed management technologies positively.

The study finding by Isaiah *et al*. (2013) revealed that educational status of farmers is an important variable that positively and significantly influenced adoption of integrated natural resource management technologies in Kenya. Moreover, various studies indicate that more educated farmers are more active in taking up the role of disseminating

information and helping technical explanations to other farmers (Abid *et al.,* 2015; Areeya *et al.,* 2015; Chandre and Sreenath, 2015; Mustapha *et al.,* 2012).

Regarding the marital status and family size, majority of watershed management association members were married and have got family size of less than 4 persons, which account 78.6% and 37.1%, respectively. This implies that most of watershed management association members took their association as security strategy for their family as being a member of association has got multiple benefits to ensure collective work at farm level as well as community level agricultural activities (Nnadi *et al.,* 2013; Isaiah *et al.,* 2013).

Agriculture (both livestock and farming) is the main sources of income for association members. One interesting finding of this study shows that 67.1% of association members were earning an average annual income of more than 10 000 birr (equivalent to 500 USD), whereas as only 40% of non-members are earning the same amount. The chi-square result also reveals that there was a significant difference between association members and non-members at 1% level of significance. This implies that association members were better off than non-members as most farmers tend to be a member of association in order to revamp collective benefit and synergistic effect. In addition, as corroborated by Isaiah *et al.* (2013), farm income has significant relationship with adoption of watershed management technologies.

The result of land holding size shows that majority of association members as well as non-members hold less than 0.5 ha, which accounts, 42.9 and 58% respectively. This result also coincides with the average land holding size of the area, which is less than 0.5 ha per household. Empirical studies (Ahmed and Mohamed, 2012*;* Belay, 2003; Beshah, 2003;

Eshetu, 2007) show that land is one of the factors that affect adoption of improved technologies among farmers. However, not only availability of land but also the land size also matters in adoption of watershed management extension and advisory services as these technologies (physical and biological) demand considerable land size.

Table 2: Socio-economic data of farmers and watershed management association membership (n=120)

Variables	Socio-economic distribution of respondents (%)		χ^2	P-Value
	Members (n=70)	Non-members (n=50)		
Sex of respondents: - Male	82.9	84.0	0.027	0.868
- Female	17.1	16.0		
Educational status: - Cannot read and write	17.1	18.0	3.657	0.600
- Read only	5.7	0.0		
- Read and write, no formal Education	10.0	10.0		
- Primary education	38.6	42.0		
- Secondary education	17.1	22.0		
- Beyond secondary education	11.4	8.0		
Age: - Less than 30 years	20.0	28.0	4.070	0.254
- 31 to 45 years	45.7	54.0		
- 46 to 60 years	31.4	16.0		
- Greater than 60 years	2.9	2.0		
Marital status: - Single	2.9	4.0	0.199	0.978
- Married	78.6	78.0		
- Divorced	7.1	8.0		
- Widowed	11.4	10.8		
Family size: - Less than 4 persons	37.1	44.0	1.437	0.697
- 5 to 7 persons	35.7	38.0		
- 8 to 10 persons	8.6	6.0		
- Greater than 10 persons	18.6	12.0		
Source of HH income			4.512	0.105
- Agriculture (crops only)	14.3	28.0		
- Agriculture (livestock only)	1.4	4.0		
- Agriculture (both livestock and crops)	84.3	68.0		
Average annual income: - 5001 to 10000 birr	32.9	60.0	10.119	0.018***
- 10001 to 15000 birr	25.7	20.0		
- 15001 to 20000 birr	10.0	8.0		
- Greater than 20000 birr	31.4	12.0		
Average Land holding size: - Less than 0.50 ha	42.9	56.0	2.136	0.545
- 0.51 to 1.00	28.6	20.0		
- 1.01 to 1.50	17.1	14.0		
- Greater than 1.50	11.4	10.0		

Note: *, **, *** significant at 10%, 5%, and 1% probability level

4.2 Roles of Actors Involved in Watershed Management Extension and Advisory Services

This section describes the roles of each actor involved in the watershed management extension and advisory services in the study area. The variables included are types of training attended by the extension personnel, types of training used by extension personnel in providing watershed management extension and advisory services, communication methods and channels utilized by extension personnel, types of watershed management extension and advisory services provided by extension personnel, and types of watershed management extension and advisory services received by farmers.

4.2.1 Types of training attended by extension personnel

Training is very important to build the capacity of the extension personnel in order to make them capable of solving rural challenges, be exposed to up-to-date agricultural information and technologies, and provides the required agricultural extension and advisory services for clients (Al-Sharafat *et al.,* 2012; Eshetu, 2007; Qtaishat and Al-Sharafat, 2012). In addition, in the context of agricultural extension and advisory services organization, skilled extension personnel are needed to coordinate human, capital and material resources required to accomplish the goals (Obaid *et al.*, 2008). In this regard, the respondents were requested to indicate the type of short-term training (in-service and on-the-job) they had attended during their career after their formal education (diploma and degree). The results show that most of the extension personnel have taken the most relevant types of training as far as watershed management extension and advisory services are concerned. The types of training received by extension personnel are summarized in Table 3.

Table 3: Types of training attended by extension personnel

Types of training	Types of training attended by respondents (%)		χ^2	P-Value
	VEW (n=22)	SMS (n=19)		
Communication methods and media:	77.3	31.6	8.643	0.003***
Extension program planning, monitoring and evaluation:	95.5	63.2	6.771	0.009***
Training methodologies:	86.4	57.9	4.538	0.103
Participatory Rural Appraisal (PRA):	90.9	57.9	6.026	0.014**
Gender issues:	95.5	73.7	3.868	0.049**
Administration and management:	45.5	36.8	0.312	0.577
Watershed management:	100	73.7	6.594	0.010**
Flood management:	63.6	36.8	2.930	0.087*
Natural resource management:	100	89.5	2.435	0.119
Disaster prevention and preparedness:	59.1	52.6	0.173	0.678
Weather forecast and early warning systems:	72.7	47.4	2.755	0.097*

Note: *, **, *** significant at 10%, 5%, and 1% probability level

The results (Table 3) revealed that there was a statistical significant difference between VEWs and SMSs in attendance of various trainings. Majority (68.4%) of the SMSs reported that they did not take training on communication methods and media. However, for extension personnel in general and SMSs in particular, training on communication methods and media is important to communicate with farmers, development agents and other stakeholders in an effective and efficient way to overcome the complex rural development challenges. This is due to the fact that communication methods and media enable extension personnel to package different contents into relevant media to be used during communication with clients/users (Agwu *et al.*, 2008; Sue-Ho *et al.*, 2014).

The results further show that with the exception of 54.5% of VEWs and 63.2% of SMSs who did not take training on administration and management, majority of extension personnel were reported that they have attended the most relevant and crucial training aspects of agricultural extension and advisory services in watershed management. However, Obaid *et al.* (2008) indicated that in the field of agricultural extension and advisory services, leadership has a critical strategic importance since it deals with

developing groups of farmers in the community. This implies that future training programmes should consider training on leadership and management for extension personnel.

4.2.2 Training methods and communication media utilization by extension personnel

a) Training methods utilization

The role of agricultural extension and advisory service includes dissemination of information, building capacity of farmers through the use of a variety of communication methods to help farmers make informed decision (Al-Sharafat *et al.*, 2012). Extension personnel should utilize various training methods during training sessions and communication with farmers in order to convey the message in better way. The results in Table 4 show that both SMSs and VEWs have utilized different training methods. However, the results of chi square reveal that utilization of training methods significantly vary between SMSs and VEWs.

Table 4: Types of training methods used by extension personnel

Types of training methods	Training methods used by respondents (%)		χ^2	P-Value
	VEW (n=22)	SMS (n=19)		
Lecturing	90.9	68.4	3.283	0.070*
Group discussion	100.0	78.9	5.132	0.023**
Role playing	90.9	15.8	23.360	0.000***
Practical exercise	100.0	42.1	11.509	0.001***
Demonstration	100.0	42.1	17.407	0.000***
Case studies	68.2	10.5	13.963	0.000***
Extension campaign	100.0	26.3	24.616	0.000***

Note: *, **, *** significant at 10%, 5%, and 1% probability level

The results in Table 4 reveal that extension personnel were able to utilize various training methods including practical exercises and extension campaigns in providing watershed management extension and advisory services to farmers. These are the most effective methods in demonstrating watershed management activities and mobilizing farmers in groups (Altarawneh *et al.*, 2012).

b) Communication media utilization

Communication will be more effective when more media (audio-visual aids) are used between the source and receiver of information (Eshetu, 2007; Qtaishat and Al-Sharafat, 2012). In the same fashion, for extension personnel to make their communication effective and efficient, utilization of communication channel/media are important. The study has investigated utilization of communication media by extension personnel. The chi-square results show that there were a significant differences in utilization of communication media (audio-visual aids) between SMSs and VEWs. The results show that VEWs have utilized more communication media than SMSs do during communication with farmers and among themselves.

Table 5: Types of communication media (audio-visual aids) utilized by extension personnel

Types of media (audio-visual aids)	Percentage of respondents' utilization (%)		χ^2	P-Value
	VEW (n=22)	SMS (n=19)		
Chalk board	77.3	47.4	3.930	0.047**
Overhead projectors	9.1	31.6	3.283	0.070*
LCD projector	0.0	36.8	9.774	0.002***
Leaflets	22.7	5.3	2.489	0.115
Handouts (manuals)	95.5	47.4	12.008	0.001***
Posters	59.1	26.3	4.447	0.035**
Flipcharts	45.5	31.6	0.825	0.364
Models	54.5	15.8	6.600	0.01**
Specimens/real objects like seeds, etc.	63.6	10.5	12.085	0.001***

Note: *, **, *** significant at 10%, 5%, and 1% probability level

The results in Table 5 show that majority, which accounts for 77.3%, 95.5%, 59.1%, 54.5%, and 63.6% of VEWs have utilized chalk board, handout (manual), posters, models, and specimens respectively during communication with farmers in providing watershed management extension and advisory services. This implies that communication media (audio-visual aids) have been significantly utilized by VEWs as compared to SMSs. This

is because of the nature of work between these two categories of extension personnel in such a way that VEWs interact with clients more frequently than SMSs do. Moreover, VEWs have access to communication media as a result of the establishment of Farmers Training Centers (FTCs) at PA level. FTCs are furnished with basic communication media to facilitate and back up all training sessions by extension personnel.

4.2.3 Types of agricultural extension and advisory services provided by stakeholders

The nature of advisory services provided by service providers depends highly on the roles of each actor. The types of watershed management extension and advisory services were compiled from different literatures. Then, extension personnel were asked to indicate the types of watershed management extension and advisory services they provided to farmers. The results in Table 6 show that majority of extension personnel reported that they were able to provide the required watershed management extension and advisory services for farmers. The chi square results also indicate that there were significant differences in service provision between VEWs and SMSs. The results are summarized in Table 6.

Table 6: Types of watershed management extension and advisory services provided by public extension personnel for farmers

Types of advisory services	Advisory services provided by respondents (%)		χ^2	P-Value
	VEWs (n= 22)	SMSs (n= 19)		
Identification and prioritization of problems for intervention	95.5	68.4	5.262	0.022**
Participatory planning and implementation of watershed management research and development	95.5	63.2	6.771	0.009***
Holistic systems approach for watershed management for livelihood improvement	63.6	63.2	0.001	0.975
Soil and water conservation measures (water storage (check dams), gully control structures, gabion structures, diversion bund)	95.5	68.4	5.262	0.022***
Rain water harvesting	90.9	52.6	7.609	0.006***
Cost effective technology (environmentally friendly soil, water, nutrient, crop and pest management practices)	81.8	31.6	10.602	0.001***
Traditional knowledge of natural resource management practices	90.9	63.2	4.583	0.032**
Capacity building of local farmers	72.7	47.4	2.755	0.097*
Empowerment of communities and strengthening village level organizations	77.3	42.1	5.299	0.021**
Income generating micro enterprises	50.0	63.2	0.717	0.397
Monitoring and participatory evaluation	77.3	57.9	1.768	0.184
Community participation through watershed association, watershed committee, self-help group, user groups, and women self-help groups	68.2	73.3	0.1149	0.699
Tree planting,	90.9	63.2	4.583	0.032**
Irrigation	59.1	36.8	2.020	0.155
Agro-forestry practices	77.3	78.9	0.017	0.897
Weather forecast and early warning system	68.2	15.8	11.363	0.001***
Mixed farming and intercropping,	90.9	78.9	1.168	0.280
Public awareness creation campaign	77.3	57.9	1.768	0.184
Disaster risk management	68.2	36.8	4.027	0.045**

Note: *, **, *** significant at 10%, 5%, and 1% probability level

The results in Table 6 reveal that VEWs were able to provide more watershed management extension and advisory services for farmers than SMSs. One possible explanation could be due to the nature of work, VEWs are very close to farmers and they are available most of the time to provide the required services.

The results in Table 6 further show that with the exception of services on disaster risk management (63.2%), weather forecast and early warning system (84.2%), irrigation (63.2%), empowerment of communities and strengthening village level organizations (57.9%), capacity building of local farmers (52.6%), cost effective technology (environmentally friendly soil, water, nutrient, crop and pest management practices) (68.4%), which were reported as not provided by SMSs, majority of both VEWs and SMSs seem to have provided the required watershed management extension and advisory services for farmers and/or VEWs. This implies that farmers are getting the required watershed management extension and advisory services in order to reduce the impacts of floods in their own farm lands as well as communal lands.

4.2.4 Farmers lands proneness to floods and damage before watershed management association membership and/or participation in the national watershed management campaign

Farmer respondents were asked whether their lands were prone to floods before they joined watershed management association and/or the national watershed management campaign program. The results in Table 7 reveal that majority (88.6%) of association members reported that their land was prone to floods. This implies that land proneness to floods might be the major drive for joining the association to overcome the problem of floods damage on their farm lands as well as common lands. The chi-square result also shows that there was a significant difference in terms of land being prone to floods between members and non-members at 1% level of significance.

Table 7: Farmers' lands prone to floods and damage before joining the association and/or participating in the national watershed management campaign

Variables	Farmer respondents (%)		χ^2	P-Value
	Members (n=70)	Non-members (n=50)		
Land prone to floods damage	88.6	36.0	36.274	0.000***
Land damaged by floods	74.3	34,0	19.370	0.000***
Size of land damage:			8.428	0.015**
- Less than 0.1 ha	28.8	64.7		
- 0.1 to 0.25 ha	55.8	17.6		
- Greater than 0.25 ha	15.4	17.6		
Costs of crops damaged:			0.792	0.673
- Less than 500 birr	50.0	58.8		
- 501 to 1000 birr	28.8	29.4		
- Greater than 1000 birr	21.2	11.8		

Note: *, **, *** significant at 10%, 5%, and 1% probability level

The results in Table 7 further indicate that majority of association members (55.8%) reported that the damage by floods was 0.1 to 0.25 ha of lands. This implies that the size of land damaged by floods by association members was higher than non-members. The chi square result also confirms that there was a statistical difference between the two groups at 5% level of significance. However, the results of costs of crops damage by floods show that both association members as well as non-members lost on average less than 500 birr (equivalent to 25 USD).

4.2.5 Types of watershed management extension and advisory services received by farmers

The results in Table 8 show that farmers were able to receive diverse types of watershed management extension and advisory services from service providers. The results further show that in most of the services received by farmers, there were significant differences among association members and non-members. This implies that association members have received better watershed management services from service providers than non-members. The possible reason could be organizing themselves into an association might

have facilitated positively for service providers to reach more farmers at the same point and time in an integrated manner (Al-Sharafat *et al.*, 2012). Similar studies by Altarawneh *et al.* (2012) and Isaiah *et al.* (2013) reveal that there is a strong relationship between membership in a social group and adoption of integrated natural resource management technologies as they tend to work together and receive integrated advisory services.

The results in Table 8 further indicate that with the exception of extension and advisory services on irrigation, majority of the respondents reported that they had received the required watershed management extension and advisory services. This is due to less availability of water for irrigation in and around the watershed (ASARECA, 2011). The results are summarized in Table 8.

Table 8: Types of watershed management extension and advisory services received by farmers from different stakeholders (n= 120)

Advisory services	Response of respondents (%)		χ^2	P-Value
	Members (n=70)	Non-members (n=50)		
Identification and prioritization of problems for intervention	92.9	50.0	28.571	0.000***
Participatory planning and implementation of watershed management research and development	95.7	72.0	13.489	0.000***
Holistic systems approach for watershed management for livelihood improvement	88.6	74.0	4.289	0.038**
Soil and water conservation measures (water storage (check dams), gully control structures, gabion structures, diversion bund)	100	100	-	-
Rain water harvesting	90.0	64.0	11.955	0.001***
Traditional knowledge of natural resource management practices	82.9	90.0	1.224	0.269
Capacity building of local farmers	92.9	76.0	6.816	0.009***
Empowerment of communities and strengthening village level organizations	80.0	56.0	8.000	0.005***
Income generating micro enterprises (beekeeping, poultry, dairy production, sheep & goat fattening, etc)	87.1	66.0	7.682	0.006***
Monitoring and participatory evaluation	72.9	54.0	4.559	0.033**
Community participation through watershed association, watershed committee, self-help group, user groups, and women self-help groups	90.0	62.0	13.473	0.000***
Tree planting,	97.1	92.0	1.624	0.203
Irrigation	5.7	10.0	0.772	0.380
Agro-forestry practices	81.4	84.0	0.134	0.715
Weather forecast and early warning system	71.4	84.0	2.577	0.108
Mixed farming and intercropping,	92.9	84.0	2.369	0.124
Public awareness creation campaign	100	100.0	-	-
Disaster risk management	82.9	82.0	0.015	0.903

Note: *, **, *** significant at 10%, 5%, and 1% probability level

The study further investigated the sources of these advisory services. The results show that the sources for the aforementioned agricultural extension and advisory services were: agricultural office, neighboring farmers, United Nations World Food Program (WFP), research office, Media, and World vision in order of importance. Likewise, farmers during FGDs also reported that the agricultural office and WFP were the major stakeholders who supported them in establishing the association as well as providing the necessary watershed management extension and advisory services under the program called "Food for Work". However, currently, under the "National watershed management campaign program" apart from the agricultural office, farmers were able to receive watershed management extension and advisory services from various stakeholders including research, NGOs and the media.

4.2.6 Case studies in watershed management extension and advisory services in the study area

The study has reviewed two case studies in order to get in-depth information on the nature and process of watershed management extension and advisory services in the study area. Sections 4.2.6.1 and 4.2.6.2 present the findings of these two case studies.

4.2.6.1 Case study one: The nature and process of agricultural extension and advisory services under the Ministry of Agriculture-United Nations World Food Program (MoA-WFP)

According to Frank *et al.* (1999), "Food-for-Work" programs use food aid as payment for laborers in public work programs designed to build and maintain local infrastructure (e.g., roads, dams, wells, latrines, schools). Cash from monetization proceeds may also be used to purchase inputs or as cash wages in cash-for-work (CFW) programs. Results on the

nature and process of watershed management extension and advisory services under the WFP "Food for Work" program were determined from FGDs, KI interviews, and secondary sources.

The ministry of agriculture and WFP technical staff developed simple participatory and community-based watershed planning called the Local Level Participatory Planning Approach (LLPPA). LLPPA was developed for Development Agents, as a practical approach focusing mostly on integrated natural resource management interventions, productivity intensification measures, and small-scale community infrastructure such as water ponds and feeder roads (Lakew *et al.*, 2005).

The MERET project was introduced by development based rehabilitation program with the integration of "food for work" incentive and community self-help contribution mechanism designed by LLPPA. According to Lakew *et al.* (2005), during the last 10 years, hundreds of community plans were prepared and implemented with a significant results. To date, LLPPA is at the core of the MoA-WFP assisted MERET project to combat land degradation and food insecurity in several regions.

Similarly, the project in Adulala hate haroreti PA was started in 2006 by organising farmers in community based watershed management association. The project covered a total of 529 ha of land. Out of these, 185 ha, 332 ha, 10 ha, and 2 ha of farm lands, forest lands, grazing lands, and other lands respectively. The total beneficiaries of the project in this PA were 37 female-headed households and 164 male-headed households. .

There are three sub-watershed associations in the Adulala watershed. These associations were: Sulula kersa gerba, Kersa kella and Lebu, with a total member of 42, 40 and 41 farmers respectively. These associations started their watershed activities formally in 2006 under the MoA-WFP launched LLPPA-MERET project.

Initially, farmers in the watershed were working together on watershed management activities and natural resource management activities through the coordination of Kebele administration together with the agriculture office at the before they organized themselves into an association. However, the problem of floods was serious in the study area due to bareness of the mountain and limited physical and biological soil and water conservation practices. One of the main reasons for the establishment of the association was destruction of physical soil and water conservation structures by cattle. Additionally, members were not working in a coordinated way before they organized themselves into an association.

In this program, technical advice basically was given by district and village level agricultural office staff members. However, WFP staffs were providing technical backstopping and material incentives (wheat and edible oil) for farmers on the basis of volume of work. The program provides wheat and edible oil as an incentive for those who participated in the watershed management activities based on their performance at the rate of 30:70% to 40:60% ratio of wheat to labour, respectively. WFP supplies wheat directly to the agriculture office and staff members distribute the actual incentives for farmers based on their performance.

Initially the association's watershed management activities were being accomplished by the WFP "food for work" mechanism. Later on, after phasing out of the program, farmers were able to continue watershed management activities by themselves. Farmer respondents during FGD reported that members were willing and convinced to continue the watershed management activities by themselves after the project as they were able to see the positive effects of the project in reducing floods in their farm lands as well as common lands. Organizing farmers in watershed management association might help the program as a sound exit strategy that ensured sustaining the program.

The results of KI and FGD reveal that as result of the integrated watershed management extension and advisory services under this program, farmers were able to bring many changes including: reducing drastically the floods which were damaging crops and livestock; and increasing water retention on the mountain due to vegetation (biological) and physical conservation structures. In addition, respondents also reported that improvement of soil moisture, retention of top soil, improved soil fertility due to decomposition of plant residue, new innovation of cut and carry system reduced destruction of soil and water conservation structures by cattle, and improved vegetation cover in the watershed.

The watershed associations have their own by-laws. In the by-laws, various technical and administrative issues were articulated. By the time when this research was done, members were working on various watershed management activities, maintaining various physical and biological structures, as per approved work schedule. The schedule was prepared in a participatory manner by members. Members contribute money monthly for security guards, who look after the watershed day and night, from theft and cattle entrance. Any farmer whose cattle caught in the protected watershed area is subject to financial and administration penalty. The associations get all rounded support from local administration (Kebele) in this regard.

Every year, watershed development and planning committee members prepare annual plan in close consultation and technical support from staff of agricultural office. The draft then is presented to the General Assembly (GA) which discusses, improves and approves the plan for implementation. Members strictly follow the schedule and implement as per the approved plan. The problem of floods was very serious and farm lands have been washed by floods. However, after the integrated watershed management activities under this program, the problem of floods has been reduced drastically.

Table 9: Watershed management activities accomplished under the MERET project from 2006 – 2010 in Adulala hate haroreti PA

Activities	Unit	Years					Total
		2006	2007	2008	2009	2010	
Soil bund	Km	168.34	130.4	45.6	104.1	39	487.44
Hill side terrace	Km	2.73	10.14	17	31.4	60.07	121.34
Cut-off drain	Km	11.16	6.305	4.985	4.31	4.3	31.06
Check dams	M^3	8353	1936	3417.2	12267	15439.5	41412.7
Micro basin	No	10665	17500	8369	31500	122036	190070
Trench	No	13520	13774	7004	6504	1497	42299
Community ponds	No	3	3	-	-	-	6
Micro ponds	No	9	3	2	1	-	15
Area closure: Total	Ha	228	293	142	80	280	1023
Hill side	Ha	180	108	44	80	280	692
Farm land	Ha	48	185	98	-	-	331
Feeder road construction	Km	1.82	2.02	-	0.7	4.53	9.07
Feeder road maintenance	Km	8	2.8	5	2	21	38.8

Source: ADBA (2013)

4.2.6.2 Case study two: The nature and process of watershed management extension and advisory services under the national watershed management campaign

The Government of Ethiopia launched a three year program called national watershed management campaign in all its regions since 2011. The campaign aimed at conserving the natural resources through focusing on integrated watershed management. More specifically, the overall objective of the program was to improve the livelihood of community/households in rural Ethiopia through comprehensive and integrated natural resource development (Lakew *et al.,* 2005). Effective stakeholders' participation in the watershed management program is highly demanded and crucial (Areeya *et al.*, 2015; Augustine and Paul, 2012; Matthew and Umukoro, 2011). In this program, farmers, Government officials, agricultural professionals and other stakeholders have participated. The study critically analyzed the nature and process of watershed management extension and advisory services under this program.

a) Nature and process of the watershed management campaign

The nature and process of the program, though initiated by Government, was participatory in nature. Farmers and extension personnel were interviewed in order to get in-depth information on the nature and process of the program. The results in Table 10 show that at the initial stage of the campaign, the community perception was challenging and participation was low. However, after intensive awareness campaign and training, community members were convinced and their participation was increased. The awareness campaign was intensive and the training was continuous, the community members were integrated in terms of working together and participation was very high during implementation stage. This is due to the fact that there was a massive mobilization work during preparation stage of the campaign. In this regard, Kulkarni *et al.* (2011) clearly highlighted the importance of peoples' awareness, participation and response in achieving development goals. This implies that the more people aware, the higher the participation, which ensure the likelihood of achieving program goals.

One of the reasons for the success of the campaign was the use of community-based local level structure which was formed by the Federal Government dubbed "development group". The major successes attributed to the approach were organization of farmers into development groups and social networks. In this local level structural arrangement, each PA is divided into development zones based on the number of farmers in each village and convenience of grouping farmers for day to day interaction. Each development zone again is divided into development teams, which consist of 25 to 30 farmers. Farmers elect a team leader for each development team. The role of a team leader is coordinate and mobilizes members for any development activities. Each development team again organizes itself into different development network. The numbers of members in each development

network are five farmers, who are very close neighbors. Each development network constitutes one model farmer and four followers. Members in the development network work very closely and support each other. These development networks facilitated the process of watershed management extension and advisory services under this program.

b) Participation and opinion of farmers and extension personnel in the watershed management campaign

The results in Table 10 reveal that majority (90.8%) of farmers were confused at the initial stage of the campaign due to lack of awareness creation work. Later on there was massive awareness work and training was given to farmers about the overall objective of the campaign as well as technical aspects of watershed management activities. The results show that majority of farmers were able to attend the training and they were satisfied with the training. The results further reveal that overall coordination and collaboration among Government officials and extension personnel was medium.

The results in Table 10 further show that with the exception of overall extension personnel commitment and coordination and collaboration among Government officials (politicians) and extension personnel, which were rated as medium by majority of farmers, overall community members' participation and overall Government officials (politicians) commitment were high, which accounted for 91.9% and 59.7% respectively. The study result by Golrang *et al.* (2012) also corroborates that the level of farmers' participation in watershed management operations in Iran was moderate. This implies that extension personnel were less committed than Government officials (politicians). One possible reason might be the program itself was initiated by the Government. This implies that Government officials (politicians) were more aware and convinced than extension personnel. As a result of this fact, the coordination and collaboration between them was medium as rated by farmers.

Table 10: Participation and opinion of respondent farmers about the national watershed management campaign (n= 120)

Variables	Percentage of respondents
Opinion during initial stage	
- Confused	90.8
- Not convinced	5.8
- Convinced	3.3
Training attended	
- Yes	95.0
- No	5.0
Level of satisfaction about the training	
- Very satisfied	40.0
- Satisfied	60.0
Overall community members' participation	
- High	91.7
- Medium	8.3
Overall Government officials' (politicians) commitment	
- High	60.8
- Medium	39.2
Overall extension personnel commitment	
- High	38.3
- Medium	54.2
- Low	7.5
Overall coordination and collaboration among Government officials (politicians) and extension personnel	
- High	44.2
- Medium	50.8
- Low	5.0

Similarly, the results in Table 11 also show that at the initial stage of the campaign, majority (59.1%) of VEWs were confused due to low awareness creation work and lack of information about the program. The implication of this result is that some measures should be taken to improve the commitment of extension personnel as well as their coordination with Government officials (politicians) to bring the desired results.

Table 11: Participation and opinion about the national watershed management campaign as perceived by extension personnel

Variables	Response of respondents (%)		χ^2	P-Value
	VEWs (n= 22)	SMSs (n= 19)		
Involvement/participation: - Yes	100.0	78.9	5.132	0.023**
- No	0.0	21.1		
Opinion during initial stage [a]			15.329	0.000***
- Confused	59.1	6.7		
- Not convinced	31.8	26.7		
- Convinced	9.1	66.7		
Overall community members' participation [a]			4.067	0.131
- High	18.2	40.0		
- Medium	81.8	53.3		
- Low	0.0	6.7		
Overall Government officials' (politicians) commitment [a]			7.433	0.024**
- High	18.2	60.0		
- Medium	68.2	26.7		
- Low	13.6	13.3		
Overall agricultural extension personnel			0.655	0.721
- High	50.0	46.7		
- Medium	36.4	46.7		
- Low	13.6	6.7		
Overall coordination and collaboration among Government officials'(politicians) and extension personnel' [a]			0.630	0.730
- High	31.8	40.0		
- Medium	40.9	46.7		
- Low	22.7	13.3		

[a] values do not add up 100% due to missing values
Note: *, **, *** significant at 10%, 5%, and 1% probability level

c) Strengths and weaknesses of the National Watershed Management Campaign

The study further investigated the strengths and weaknesses of the campaign and generates possible suggestions in order to overcome associated weaknesses and to draw lessons for further improvement. The results in Box 1 illustrate that both groups of respondents (farmers as well as extension personnel) during survey, FGDs, and KI interviews reported that strong commitment from Government, huge awareness creation work, high participation of community members, huge attention to watershed management activities and natural resource management, high community mobilization, and the use of local innovation platform called "development group" were some of the strong points of the campaign.

The results in Box 1 further show that the national watershed management campaign was used different approaches to ensure high participation including massive awareness creation work and training. This resulted in mass mobilization of community members. During the FGDs one farmer reported that "I have never seen such a mass community mobilization in my life. We all were working as a one team including Government officials and extension personnel". One possible reason might be the use of local level farmers group of development network. This implies that awareness creation mobilizes community members and ensures high participation. In addition, the local level development structures served as a platform that brought together different service providers and clients for common purpose.

Box 1: Strong points of the campaign as perceived by farmers and extension personnel

Farmers	**Extension personnel (VEWs and SMSs)**
• Enhanced the culture of working together in group among farmers; • Ensured gender equality and high participation; • Huge attention and activities of watershed management by Government; • Sufficient awareness creation; • Integration of labour, resources and knowledge; • Participatory nature of the program; and • Technical support from professionals.	• Strong Government initiation and commitment to rehabilitate and conserve natural resource; massive watershed management activities within a short period of time; • Ensured high participation and mobilize community members through huge awareness creation work; • Involved various stakeholders and ensured high integration and team work among these actors; • Implementing the watershed activities according to the local conditions; and working with development army.

Though the campaign had its own strengths, the results in Box 2 show some of the weaknesses which need to be addressed in future in order to get the desired results.

Overall lack of follow up of the program, inappropriate timing for the construction of physical structures due to low moisture, lack of farm implements, low attention to quality, lack of knowledge and skills on watershed management aspects by Government officials, and less participation of agricultural professionals were some of the weaknesses of the campaign. Especially, the issue of quality and follow up should be taken very seriously as far as ensuring the benefits from the watershed management activities are concerned.

Box 2: Weak points of the campaign as perceived by farmers and extension personnel

Farmers	Extension personnel (VEWs and SMSs)
• Absence of closing the area from animals interference; • Absence of uniformity in rules and regulations; • Inappropriate timing to construct the physical structures due to low moisture of the soil; • Lack of farm implements; lack of follow up; insufficient tree planting; • Lack of attention for quality; and • Lack of awareness work at initial stage.	• The time of work is not proper against to farmers farming season; • Lack of logistics and lack of farm implements; • Lack of interest/willingness among some community members due to lack of awareness creation work at initial stage; • lack of follow up and lack of attention for quality; • Lack of commitment and coordination among some stakeholders and community members; • Lack of knowledge and skills about watershed management among some Government officials; • Less participation/involvement of professionals; top-down approach; and • Absence of socio-economic survey prior to the campaign.

Any development program should as much as possible ensure users benefit the maximum possible with standard quality. However, the results in Box 2 show that quality of watershed management activities was not seriously taken into account. Both farmers and extension personnel expressed their concern on the issue of quality and follow up. The experience of watershed management extension and advisory services under the MoA-WFP program showed that treated and closed watershed are much better than treated and non-closed watershed in terms of reducing floods.

a) Suggestions by respondents for overcoming the weaknesses of the program

Farmers as well as extension personnel (VEWs and SMSs) were asked to provide suggestions to overcome the weaknesses and ensure the sustainability of the watershed management extension and advisory services under the national campaign. The suggestions are summarized and presented in Box 3.

Box 3: Suggestions to overcome weaknesses and sustain the program as perceived by farmers and extension personnel

Farmers	Extension personnel (VEWs and SMSs)
• provide farm implements, sufficient tree planting along the physical structures and protect the area from cattle interference; • coordination among stakeholders; • early planning, close follow up and attention for quality; • strong awareness creation and training for farmers; • organize experience sharing program; • Establish sense of ownership and organize watershed users group in each watershed.	• ensure high participation and coordination among extension personnel and other stakeholders; • Strong awareness creation work; provision of logistics including farm implements; • sense of ownership should be created among community members and the watershed management activities should be managed by community members through watershed management association; • income generating activities should be integrated to benefit farmers; • bottom up planning, monitoring and evaluation work during and after the campaign; • the area should be kept small for effective implementation and supervision; • physical and biological structures should be balanced as well as maintained with quality; • Infrastructure development like road should be considered.

The results in Box 3 illustrate that Government should seriously consider the suggestions forwarded by the respondents. This implies that strong points of the campaign should be continued and weaknesses should be addressed in order to ensure the desired outcome of the watershed management extension and advisory services. It is also worth mentioning the importance of documenting lessons and success stories which could be used in the process of reviewing the program for better improvement.

The results in Box 3 show that coordination among stakeholders, sense of ownership among community members, quality of activities and close follow up of watershed management activities were some of the suggestions provided by the respondents during survey, FGDs, and KI interviews in their order of importance. This implies that though the achievement from the campaign were commendable, all the aforementioned suggestions that were provided by respondents should be taken into account to ensure maximum benefit from an integrated watershed management extension and advisory services. Especially, ensuring community based local structures and innovation platforms are the right move to ensure sustainability of the program through creation of sense of ownership. In this regard, Augustine and Paul (2012), and Isaiah *et al.* (2013), highlighted the importance of strengthening social groups to enhance adoption of integrated natural resource management technologies. Hence this implies that the existing local level development network's institutional capacity should be strengthened to enhance its effectiveness and efficiency.

Overall results from the two case studies reveal that due to the watershed management extension and advisory services farmers were able to bring numerous changes observed in various aspects including: drastic reduction of floods which were damaging crop and livestock; improving water retention on the mountain due to vegetation cover (biological) and various physical conservation structures; retention of top soil, reduction of trampling of the soil by cattle; and adoption of new innovation of cut and carry system instead of cattle grazing in the area. These results imply that farmers are benefiting from the watershed management extension and advisory services in the study area though floods in the study area are potential threats.

4.2.7 Farmers lands prone to floods and damage after watershed management association membership and/or participate in the national watershed management campaign

The study further explored changes observed in terms of floods damage after the watershed management extension and advisory services. The results in Table 12 show that farmers were able to benefit and reduce the effects of floods damage on their farmlands as well as common lands as a result of the watershed management extension and advisory services. The results further indicate that the size of damage as well as the costs of crops damage by floods was significantly reduced though some farmers are still facing floods damage in the study area. Moreover, farmers were able to harvest grass from closed and conserved common grazing lands as well as individual farms to feed their livestock, which improved feed for their livestock.

Table 12: Farmers lands damaged by floods after becoming association member and/or participating in the National Watershed Management Campaign

Variables	Farmer respondents (%)		χ^2	P-Value
	Members (n=70)	Non-members (n=50)		
Land damaged by floods	5.7	22.0	0.275	0.008***
Size of land damage: Less than 0.1 ha	100	100	-	-
Costs of crops damaged: Less than 500 birr	100	100	-	-

Survey data (2014)

Critical analyses of the results of survey as well as case studies reveal that each actor directly or indirectly has its own roles that contribute for the watershed management advisory service innovation systems. The nature of roles could be either directly contributing to a particular service and/or indirectly by providing inputs for the particular services under consideration. The roles of each actor in the watershed management advisory service innovation systems were analyzed and summarized in Table 13.

The results in Table 13 show that there are organizations that directly or indirectly play roles for policy formulation and regulatory roles (Bureaus of water, agriculture, disaster prevention and preparedness, and rural land and environmental protection), capacity building (universities and research), knowledge generation and knowledge sharing (research, universities and media), and implementation (Bureau of agriculture). This implies that different organizations play directly or indirectly different roles. However, there are some overlaps of roles that attract coordination among these organizations to avoid duplication of efforts as well as enhance lesson sharing mechanism. In addition, the results necessitate the need for legal institutional framework that governs the different roles in the watershed management extension and advisory services in order to avoid duplication of efforts.

Table 13: Key actors and advisory service providers' roles in the watershed management extension and advisory services

Key actors / Roles	Policy	Research	Finance	Technology	Regulatory	Capacity building	Technical support	Knowledge generation	Knowledge sharing	Program management	Networking	Implementation
Adama district bureau of water	+	+	+	+	+	+	+	+	+	+	-	+
Adama district disaster prevention, preparedness and early warning	+	+	-	-	+	+	+	+	+	+	-	-
Adama district bureau of agriculture	+	+	+	+	+	+	+	+	+	+	+	+
Adama district rural land and environmental protection	+	+	+	+	+	+	+	+	+	+	-	+
CBOs/watershed management associations	-	+	-	+	-	+	-	+	+	+	+	+
ADPLAC – Multi-stakeholders Platforms	-	-	+	+	-	-	-	+	+	-	+	-
Oromia radio and television corporation	-	-	-	-	-	-	-	-	+	-	+	-
Melkasa agricultural research center	-	+	+	+	+	+	+	+	+	+	+	+
Adama university	-	+	+	+	-	+	+	+	+	-	+	+
Farmers/pastoralists residing in and along the catchment	-	+	+	+	-	+	-	+	+	+	+	+
World vision	-	+	+	+	-	+	+	+	+	+	+	+
Adama district administration office	-	-	+	-	+	-	-	-	-	+	+	-
Adama metrological service agency	-	+	-	+	+	+	+	+	+	+	+	-
Adulala farmers' cooperative	-	-	+	-	-	+	-	+	+	-	-	+
Credit institutions and banks	-	-	+	-	-	-	-	+	+	-	-	-
Input suppliers	-	-	-	+	-	-	-	+	+	-	-	-
Transporters	-	-	-	+	-	-	-	-	+	-	+	-
Donors and fund managers	-	-	+	-	+	-	-	-	-	+	+	-

Key: "+" = Play roles "-"= Not play roles

4.3 Organizational Linkages among Stakeholders Involved in Watershed Management Extension and Advisory Services

The nature of work relationship and linkage within as well as among various stakeholders involved in the watershed management extension and advisory services is very critical in delivering integrated services for clients (Agunga and Zeleza, 2014; Jadalla *et al.*, 2011; Al-Rimawi *et al.,* 2013). Accordingly, this section highlights the nature of work relationship and linkages within the extension personnel, farmers with extension personnel, farmers with other stakeholders, and extension personnel with other stakeholders.

4.3.1 The nature of farmers' relationship with extension personnel

Frequency of farmers' contacts with extension personnel has effect in bringing a desired change in development through giving technical advice, dissemination of improved technologies, and generally to solve farmers' problems (Agunga and Zeleza, 2014; AL-Rimawi *et al.,* 2013). In Ethiopia, VEWs are the dominant public employees deployed very close to farmers who become indispensable in executing extension policies. Farmers were asked about the frequency of visits made per month by extension personnel for the past twelve-months.

The results in Table 14 show that majority of association members were visited at least once per month by VEWs and SMSs, which accounts for 77.1% and 55.7% respectively. The chi-square results reveal that there is a statistical significant difference in visiting association members and non-members by VEWs and SMSs. This implies that both VEWs and SMSs tend to visit association members than non-members. The possible reason might be organized farmers are more accessible than non-organized farmers. As a result, frequency of contact by extension personnel was high. However, both VEWs and SMSs frequency of contacts with farmers (once per month) was not adequate. This is

because, the nature of watershed management extension and advisory services demands close supervision and follow up. However, VEWs during informal discussion time brought up that absence of transport facilities as a bottleneck factor that hinders their frequency of supervision with farmers.

Table 14: Farmers' relationship with extension personnel as perceived by farmers (n= 120)

Variables	Farmer respondents (%)		χ^2	P-Value
	Members (n=70)	Non-members (n=50)		
Visit by VEWs per month:			32.092	0.000***
- Not at all	4.3	48.0		
- Once per month	77.1	40.0		
- Two to four times	18.6	12.0		
Visit SMSs from various organizations			63.066	0.000***
- Not at all	18.6	92.0		
- Once per month	55.7	4.0		
- Two to four times	25.7	4.0		

Note: *, **, *** significant at 10%, 5%, and 1% probability level

4.3.2 The nature of work relationship among the extension personnel

Apart from the relationship with farmers with extension personnel, the study also examined the nature of work relationship among extension personnel (SMSs) within their organization.

Table 15: Nature of work relationship within their own organization as perceived by SMSs (n=19)

Nature of relationship	Frequency and percentage of respondents				
	Very strong	Strong	Moderate	Weak	Very weak
Relationship within teams/sections	36.8	47.4	15.8	0.0	0.0
Relationship across teams/sections	0.0	26.3	57.9	15.8	0.0

The one to five communication networks (innovation platforms) within the organization has been implemented since 2013 in all civil service organizations. The aim of this innovation platform was to improve the nature of work relationship within each team/section in such a way that in each innovation platform members plan, discuss on problems, seek solutions, and provide feedback on each person's performance together on a weekly basis. This has a positive implication on sharing knowledge among extension personnel and the overall innovation process in the organization as a result of peers learning.

4.3.3 The nature of extension personnel work relationship with other stakeholders

In any development activity, collaboration and working together brings synergy than doing alone due to the fact that different actors bring their heads together, mobilize and integrate resources, and play pivotal role in an innovation process (Agwu *et al.*, 2008; Augustine and Paul, 2012; Kulkarni *et al.*, 2011). In addition, the nature of watershed management activities demands more effort in collaboration and synergy due to their diversity and multifaceted nature.

The study further explored the nature of extension personnel work relationship with other actors who have a stake in the process of provision of watershed management extension and advisory services. The results in Table 16 the nature of extension personnel work relationship with most key actors were supposed to be very strong as far as watershed management extension and advisory services are concerned. However, most of the extension personnel (VEWs and SMSs) work relationship with other key stakeholders was either weak or not at all. This implies that there was weak knowledge sharing and learning among various actors due to weak linkage. This in turn might have affected the overall watershed management extension and advisory service innovation system in the study area.

Table 16: Nature of work relationship between extension personnel and other stakeholders

Organizations	Percentage of respondents by category							
	VEWs (n= 22)				SMSs (n= 19)			
	Strong	Moderate	Weak	Not at all	Strong	Moderate	Weak	Not at all
Adama bureau of water and energy	0.0	9.1	45.5	45.5	5.3	26.3	36.8	31.6
Adama district disaster prevention, preparedness and early warning office	4.5	27.3	40.9	27.3	21.1	21.1	31.6	26.3
Adama district bureau of agriculture, Natural resource management team	45.5	45.5	4.5	4.5	63.2	10.5	10.5	5.3
Adama district rural land and environmental protection authority	9.1	27.3	40.9	22.7	21.1	26.3	10.5	42.1
Community based organizations/local disaster risk committee	9.1	40.9	40.9	9.1	15.8	21.1	36.8	26.3
ADPLAC – Multi-stakeholders platforms	4.5	9.1	45.5	40.9	0.0	10.5	10.5	78.9
Oromia radio and television corporation	9.1	27.3	45.5	18.2	10.5	31.6	26.3	31.6
Melkasa agricultural research center	13.6	13.6	50.0	22.8	26.3	31.6	21.1	21.1
Adama university	0.0	27.3	40.9	31.8	5.3	10.5	26.1	57.8
Farmers/pastoralists residing in and around the catchment	9.1	36.4	36.4	18.2	42.1	21.1	15.8	21.1
World vision	0.0	27.3	45.5	27.3	10.5	57.9	5.3	26.1
Adama district administration office	4.5	40.9	45.5	9.1	36.8	21.1	21.1	21.1
Adama meteorological service agency	0.0	18.2	27.3	54.5	0.0	5.3	26.3	68.4
Adulala farmers' cooperative	36.3	45.5	18.2	0.0	42.1	31.6	0	26.3
Private consultants	4.5	9.1	45.5	40.9	5.3	5.3	5.3	84.2
Credit institutions and banks	4.5	13.6	45.5	36.4	0.0	5.3	15.8	79.0
Input suppliers	4.5	27.3	50.0	18.2	0.0	31.6	15.8	52.6
Transporters	13.6	13.6	36.4	36.4	5.3	15.8	15.8	63.2
ICT providers	13.6	13.6	36.4	36.4	0.0	15.8	15.8	63.2
Donors and fund managers	0.0	4.5	31.8	63.6	15.8	10.5	21.1	52.6

The study also examined the nature of work relationship among key stakeholders in the watershed management extension and advisory services in the study area. The results in Table 17 reveal that with the exception of agricultural office, which had strong relationship with all key stakeholders, the nature of work relationship among other stakeholders was moderate and weak. This implies that coordination and collaboration among key stakeholders was weak, which affects the nature of watershed management extension and advisory service provision for clients.

Table 17: Nature of work relationship among various organizations in relation to watershed management extension and advisory services

Actors/degree of relationship	DPP and EW)	BA	RL and EPA	RO	LA	WV
Disaster prevention, preparedness and early warning (DPP and EW)		S	M	M	W	M
Bureau of agricultural (BA)			S	S	S	M
Rural land and Environmental protection authority (RL and EPA)				M	W	W
Research organization (RO)					W	M
Livestock agency (LA)						W
World vision (WV)						

Key: S: Strong M: Moderate W: Weak

4.3.4 The nature of farmers' relationship with other stakeholders

Similarly, the study also examined the nature of farmers' work relationship with other stakeholders in the watershed management extension and advisory services. Farmers are key players as far as watershed management extension and advisory services are concerned. However, the results in Table 18 show that the nature of farmers work relationship with the exception with Bureau of agriculture, the natural resource management team, local administration unit and farmers' organization, which they reported as strong, majority of respondents reported that their work relationship with major organizations were non-existent. This implies that the watershed management extension and advisory service innovation systems were missing important actors who

could play key roles on the nature and process of the watershed management extension and advisory services. Similar studies by Samuel *et al.* (2012) reveal that farmers in northern Ghana had weak relationship with key stakeholders including the Ministry of food and agriculture.

Although the achievement of watershed management extension and advisory services in the study area is tremendous, it would have been more than what has been achieved, if these organizations had participated in the watershed management extension and advisory services innovation systems. It is so possible to draw a narration that when there is weak communication among farmers and key advisory service providers, information and knowledge sharing will be very weak, which in turn demonstrates weak learning among farmers. In fact, the weak learning was not attributed only among farmers, but also among advisory service providers. This is to say that stakeholders failed to utilize rich and in-depth watershed management indigenous knowledge and practices which farmers had accumulated throughout their lives.

Therefore, it is possible to draw a conclusion that the watershed management extension and advisory services innovation systems was affected by weak learning and knowledge sharing as a result of weak relationship between farmers and key advisory service providers. This implies that serious attention should be given to improve the nature of work relationship between farmers and other key service providers to achieve the desired results.

Table 18: Nature of work relationship between respondent farmers and other stakeholders (n=120)

Organizations	Percentage of respondents			
	Strong	Moderate	Weak	Not at all
Adama bureau of water and energy	0.0	12.5	41.7	45.8
Adama district disaster prevention, preparedness and early warning office	3.3	12.5	33.3	33.3
Adama district bureau of agriculture, natural resource management team	55.0	40.0	1.7	3.3
Adama district rural land and environmental protection authority	6.7	21.7	9.2	62.5
Community based organizations/local disaster risk committee	18.3	21.7	34.2	25.8
ADPLAC – Multi-stakeholders platforms	0.0	5.0	20.8	74.2
Oromia radio and television corporation	5.0	20.0	31.7	43.3
Melkasa agricultural research center	20.8	58.3	15.8	5.0
Adama university	0.0	22.5	29.2	48.3
Farmers/pastoralists residing in and along the catchment	47.5	41.7	1.7	9.2
World vision	8.3	40.0	30.8	20.8
Adama district administration office	55.8	32.5	11.7	0.0
Adama metrological service agency	0.0	17.5	16.7	65.8
Adulala farmers' cooperative	53.3	42.5	4.2	0.0
Private consultants	0.0	15.0	9.2	75.8
credit institutions and banks	2.5	19.2	29.2	49.2
Input suppliers	35.0	45.0	18.3	1.7
Transporters	8.3	25.8	29.2	36.7
ICT providers	4.8)	19.4	4.0	71.8
Donors and fund managers	22.5	24.2	11.7	41.7

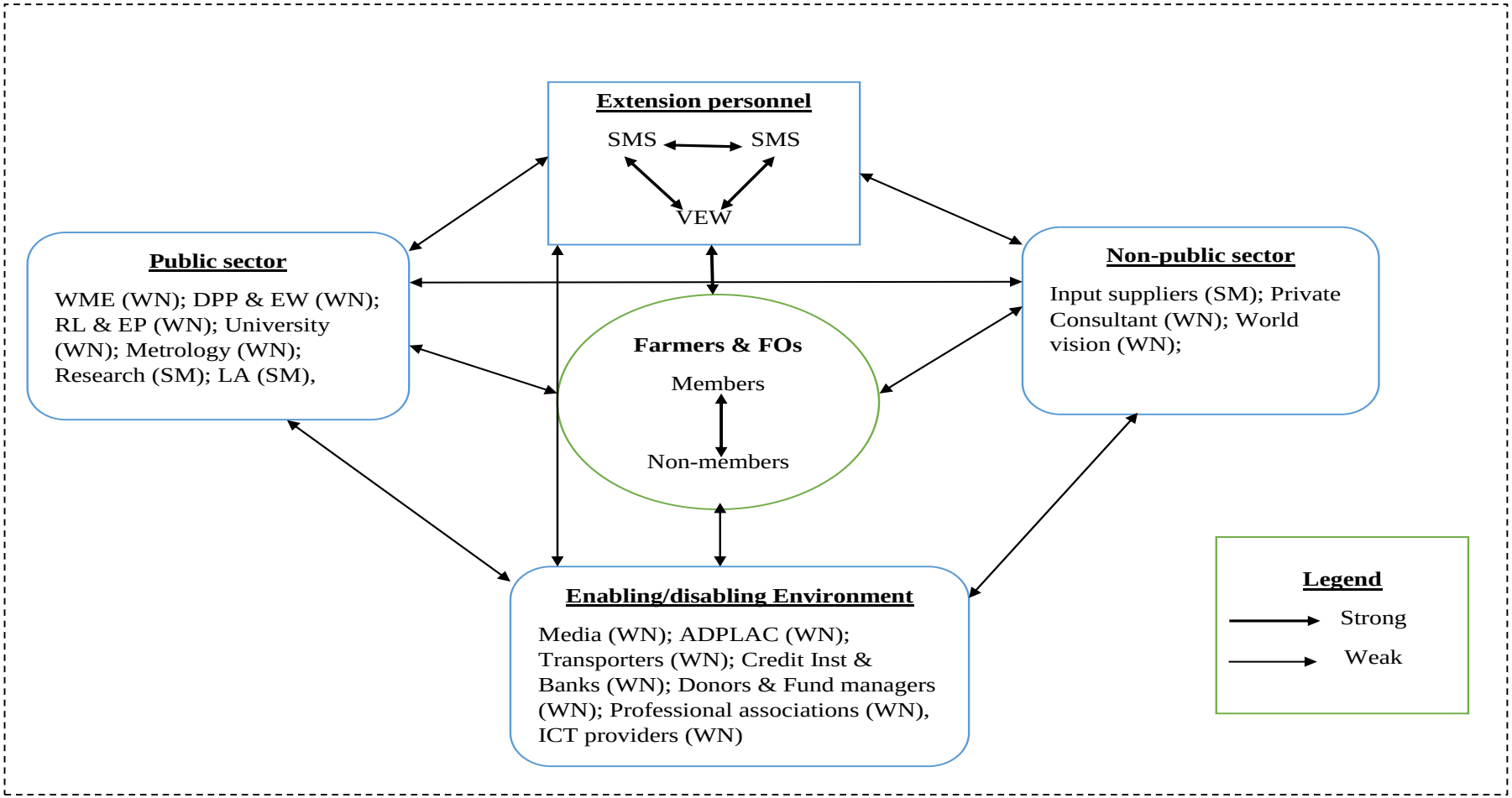

Figure 3: Service providers' linkage with farmers in a watershed management extension and advisory service in the study area
Key: WN= Weak and No linkage SM= Strong and Medium linkage

According to Adolph (2011), in most African countries, AEAS are provided by a combination of public-sector and non-public sector actors. Similarly, Claire *et al*. (2011) also corroborates that the agricultural extension and advisory services should be pluralistic involving the public, private, and civil society sectors. The nature of farmers' relationship among themselves and with farmers' organization in Fig. 3 was strong. However, the nature of farmers work relationship with both public and non-public sector actors, with the exception of agricultural office, research organization and input suppliers, was generally weak. This implies that the watershed management advisory service innovation system is seriously affected by poor communication, weak knowledge sharing, and poor learning. As a result, the watershed management extension and advisory services were being provided by few service providers rather than a range of actors who were supposed to provide the services for farmers. The study result by Kulkarni *et al.* (2011) and Lakew *et al.* (2005) also corroborates on the concept of participatory watershed development and management as that which emphasizes a multidisciplinary and multi-organizational approach for multiple interventions.

4.4 Enabling/disabling Environment in Watershed Management Extension and Advisory Services

The enabling/disabling environment in advisory service innovation system includes institutional and technological situations that either smoothen or impede the advisory service provision. The presence and absence of these environments affect the nature and process of the watershed management extension and advisory service delivery system. These enabling/disabling environments include: banks and other financial institutions; ICT providers; media and info-mediaries; inputs suppliers; transporters; donors and fund managers; policy makers; platforms; attitude and challenges.

4.4.1 The nature of actors' linkage with enabling/disabling environment

The actors' linkage map (Fig. 3) shows that the linkage of farmers as well as extension personnel work relationship with enabling/disabling environments was weak. This implies that the watershed management extension and advisory service innovation system was negatively affects in providing the desired extension and advisory service for clients. For instance, if the ICT providers provide effective infrastructures for the system, the watershed management advisory service can provide effective advisory service for clients and the knowledge sharing mechanism will be enhanced and knowledge management system will be strong (Agwu *et al.,* 2008; Al-Rimawi *et al.,* 2013).

Similarly, the results of the FGDs and KI interviews substantiate that farmers have limited access to credit due to weak linkage with banks and micro-credit institutions. This has negative implication in adoption of watershed management technologies as Agunga and Zeleza (2014) and Sabit and Mohammed (2015) clearly pointed out, farmers are unable to adopt farming innovations, if the necessary resources including credit are not readily available. Similarly, the linkage with transporters and input suppliers was also reported as weak. The connotation of this result was that the advisory service provision was affected due to the fact that without inputs supply and delivery system, the watershed management advisory service cannot be effective.

The results further show that the nature of work relationship and linkage of farmers as well as extension personnel with the agricultural development partners linkage advisory council (ADPLAC) was weak. ADPLAC was established to bring all development actors together and create a forum for lesson learning and experience sharing of agricultural and rural development related activities. However, firstly the council is dominated by public sector

development actors. Secondly, it is not visible enough due to weak institutional setup and governance structure of the council. This probably might be the reason for weak work relationship with farmers and extension personnel.

The study further examined the bottlenecks that caused weak communication and linkage among actors. Accordingly, respondents reported that lack of awareness and information about other stakeholders, absence of knowledge management system, weak communication skills and weak performance of platform (ADPLAC) were mentioned by the respondents in order of importance. This implies that there are many actors who could play significant role in watershed management extension and advisory services. However, their communication and linkage among them was weak which impede the nature and process of watershed management and advisory services in the study area as a result of aforementioned cause of weak linkages.

4.4.2 Farmers' attitude towards watershed management extension and advisory services

Measuring attitudes of farmers towards the extension and advisory services they received is crucial in determining its effectiveness and efficiency (Al-Sharaft *et al.,* 2012). This is because, farmers' attitude towards watershed management extension and advisory services is one of the indicators for the effectiveness of the extension and advisory services delivered by various stakeholders. This is because, satisfaction of clients is one of the critical goals of any advisory services. In addition, overall participation of farmers is positively and significantly correlated with attitude towards watershed management extension and advisory services (Golrang *et al.,* 2012). In this regard, farmers were asked to rate their level of agreement for each statement at a three level Likert scale measurement. The results in Table 19 indicate that majority of farmers were satisfied with the types of watershed management extension and advisory services provided by various stakeholders. The results are summarized in Table 19.

Table 19: Farmers' attitude towards watershed management extension and advisory services as perceived by farmer respondents (n=120)

Statements	Percentage of respondents (%)		
	Agree	Undecided	Dis-agree
I benefited much from advises provided on watershed management	100	0.0	0.0
Watershed management extension and advisory services are of much help to farmers	100	0.0	0.0
All advisory providers provide specific information and advice on watershed management	58.3	0.0	41.7
It is very risky to follow advise given on watershed management	22.5	4.2	73.3
I have confidence on watershed management agricultural extension and advisory service providers	94.2	1.7	4.2
The agricultural extension and advisory service providers have nothing new to tell me on watershed management	3.3	2.5	94.2
I feel satisfied with the work of agricultural extension and advisory service providers on watershed management	95.8	0.0	4.2
Agricultural extension and advisory service providers lack competence in teaching new practices on watershed management	14.2	1.7	84.2
All agricultural extension and advisory service providers pay attention to farmer's problems and try to help in finding solutions for farmers in relation to watershed management	85.8	5.0	9.2
All agricultural extension and advisory service providers cooperate with village community members	100	0.0	0.0
All agricultural extension and advisory service providers regard themselves superior than the rest of the villagers community members	10.0	4.2	85.8
Agricultural extension and advisory service providers visit and provide advice only for rich farmers	41.7	0.0	58.3
All agricultural extension and advisory service providers have ability to communicate with farmers	97.5	0.0	2.5

The results in Table 19 further show that all the respondent farmers reported that they benefited from the watershed extension and advisory services they received from service providers. In addition, farmers also witnessed that the extension and advisory services were of much helpful to them. A similar study by Golrang *et al.* (2012) in Iran also corroborates those farmers in had positive attitude towards adoption of watershed management operation. The findings also coincide with the findings of FGDs and KI where it was mentioned that farmers protect their farmlands from soil erosion by applying the watershed management advises they received from various stakeholders. The results further show that majority of farmers confirmed that service providers were able to provide new and useful services for farmers. In addition, farmers witnessed service providers' level competency, skills and ability to communicate with farmers. These results imply that farmers were satisfied with the nature and process of the watershed management extension and advisory services in the study area.

4.4.3 Challenges in the watershed management extension and advisory services

Extension personnel and farmers were asked to list major challenges that affect the efforts of watershed management extension and advisory services in overcoming the problem of floods in the study area. Accordingly, the results of survey, FGDs and KI show that lack of coordination and collaboration among actors, weak information sharing mechanism, lack of inputs and appropriate technologies, lack of follow up, weak capacity among farmers and extension personnel, absence of ownership by community members, lack of rural land use policy and absence of support system including office facilities and equipment for extension personnel were major challenges as perceived by extension personnel and farmers in order of importance. Hence, in order to improve the nature and process of the watershed management extension and advisory services in order to overcome the problem

of floods in the study area these challenges must be addressed. Individual farmers, community groups and various groups of stakeholders should play their own roles in addressing these challenges.

In summary, the findings of the study revealed that the types of watershed management extension and advisory services were very diverse in nature and were provided by various stakeholders in the study area. The results further show that in most of the services received by farmers, there were significant differences among association members and non-members. This implies that association members were able to receive better watershed management services from stakeholders than non-members. This was due to the fact that organized farmers were in a better position to be reached by service providers than non-organized farmers.

The results further show that majority of respondent farmers were able to benefit and satisfy with the types of watershed management extension and advisory services provided by service providers though still floods in the study area is a potential threats. The use of local level development structures (development groups and networks) were one of the drivers for the successes of watershed management extension and advisory services in the study area.

A critical analysis of results of the survey as well as case studies reveal that each actor has its own roles in the watershed management advisory service innovation systems. The results of the study show that there are organizations, directly or indirectly, who play key roles in policy formulation and regulatory, capacity building, knowledge generation and sharing, and implementation. This implies that though different organizations play

different roles, there are some overlaps that draw attention of coordination among stakeholders. This enables to avoid duplication of efforts and enhance lesson sharing mechanism. In addition, the results entail the need for legal institutional framework that governs the different roles in the watershed management extension and advisory services.

The nature of work relationship and linkage within as well as among various stakeholders involved in the watershed management extension and advisory services is very critical in delivering integrated services for clients. The results of the study show that most of the extension personnel (VEWs and SMSs) relationship with other stakeholders in general was weak. This has negative implications in the watershed management innovation processes and outcomes. This is due to the fact that innovation process is more complex with diverse actors. Hence, desired innovation outcomes will be achieved when more actors are involved in the innovation process. However, the results show that the nature of farmers' relationship with other stakeholders was weak. This implies that the watershed management innovation system was affected by weak learning and knowledge sharing as a result of weak relationship between farmers and advisory service providers. Therefore, mechanism has to be devised to improve work relationship among actors including famers. The study result further reveal that farmers have limited access to credit due to weak linkage with banks and micro-credit institutions. Similarly, the linkage with transporters and input suppliers was also reported as weak. These have negative implication in adoption of watershed management technologies.

The study critically investigated the major challenges that affect the efforts of watershed management extension and advisory services in overcoming the problem of floods in the study area. The result show that lack of coordination and collaboration among actors and

weak information sharing mechanism were the two critical challenges that need be addressed to improve the nature and process of the watershed management extension and advisory services in order to overcome the problem of floods in the study area.

CHAPTER FIVE

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The findings of this study have shown that organizing farmers in the watershed management association enables them to receive watershed management extension and advisory services from service providers in an integrated way. Moreover, this helps them to synergize their efforts towards improving the watershed and reducing the problem of floods in their own farm lands and common lands. Through, the nature and process of the watershed management extension and advisory services in the study are enable farmers to achieve remarkable changes in reducing floods damage in their farm lands as well as common lands. However, flood in the study area is still a potential risk that threatens farmers' agricultural activities.

Different organizations play different roles including policy formulation and regulatory roles, capacity building, knowledge generation and sharing, and implementation. However, there are some overlaps of roles that draw attention of coordination among these organizations to avoid duplication of efforts as well as enhance lesson sharing mechanism. The study result revealed that the use of a community based local level development structure and development networks were resulted in facilitating the process of watershed management extension and advisory services in reducing the impacts of floods in the study area. Hence, this local level development networks can be further tested by scholars of agricultural innovation systems to consider as one of the elements of agricultural innovation systems.

The nature of watershed management demands more efforts in terms of collaboration and synergy due to the diverse and multi-task activities. However, learning and knowledge

sharing mechanism in the watershed management innovation system was affected by weak linkage among actors in the study area. In addition, weak relationship between farmers and advisory service providers also significantly affected the nature and process of watershed management extension and advisory services in reducing floods in the study area. As a result of weak relationship, in most cases, farmers in the study area were able to get watershed management extension and advisory services from few service providers.

Farmers demonstrate positive attitude and will be willing to play a leading role if the watershed management extension and advisory services are designed with their full participation and aligned to their demand. Generally, the enabling/disabling environment serve as intermediary actors either trigger or impede the innovation systems. However, the weal linkage of farmers and other actors with the enabling and disabling environment (ICT providers, inputs suppliers and credit and financial institution) affected the nature and process of the watershed management extension and advisory service in the study area. The study found that lack of coordination and collaboration among actors and weak information sharing mechanism were among the major challenges of the watershed management extension and advisory services that draw serious attention.

5.2 Recommendations

The study has made the following recommendations based on the study findings:

a) The best practices and rich experiences of the community level watershed management association should be strengthened through institutional capacity development by the district bureau of agriculture to maximize the benefits of the watershed management extension and advisory services in the study area.

b) Systematic and participatory planning, designing, implementation, monitoring and evaluation should be considered for future sustenance of the program by both the federal ministry of agriculture as well as the regional bureaus of agriculture to ensure high participation and sense of ownership.

c) The local level development groups and networks' institutional capacity should be strengthened to ensure sustainability of watershed management results and use the structures for other agricultural extension and advisory services.

d) The federal ministry of agriculture as well as the regional bureaus of agriculture should take the lead and establish watershed management stakeholders platform to enhance coordination and collaboration among actors in the watershed management extension and advisory services.

e) The newly launched Government initiated watershed management program should be reviewed with active participation of potential and appropriate stakeholders based on lessons, strengths and weaknesses of the campaign before scaling it up/out within the sector or beyond.

f) The watershed management extension and advisory services should be undertaken on a continuous basis and must be institutionalized as part of the regular agricultural extension and advisory services programs to sustain the benefits of watershed management activities rather than its current ad-hoc and campaign nature.

g) Since the problem of floods in the study area is a serious one, apart from integrated watershed management extension and advisory services, the federal ministry of agriculture as well as the regional bureaus of agriculture in partnership with other service providers should introduce crops insurance scheme in order to minimize a risk of crops damage by floods.

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APPENDIXES

Appendix 1: Check list for KI and FGDs with key informants for farmers who are living in and around the Adulala watershed

List of KI respondents

No	Name of respondent	Age	Sex	Name of Association
1	Tesfaye Geda	46	M	Sulula Kersa Gerba
2	Dadi Bedadi	45	M	Lebu
3	Teklu Tuke	48	M	Kersa Kella

List of women farmers participated in FGDs

No	Name of respondent	Age	Family size	Land in kirt	Name of Association
1	Mare Wakeyo	65	4	8	Kersa kella
2	Gete Jebe	35	4	4	Kersa Lebu
3	Faye Tafa	45	11	16	Kersa Lebu
4	Dema Boset	44	10	16	Kersa Lebu
5	Wesene Telela	45	3	6	Kersa Gerba
6	Genet Asfaw	32	1	2	Kersa Lebu
7	Jebo Tufa	54	9	10	Kersa kella
8	Karu Shume	35	4	1	Non-member

List of mixed farmers participated in FGDs

No	Name of respondent	Age	Sex	Family size	Land in kirt	Name of Association
1	Shewaye Medeksa	42	F	5	5	Kersa Lebu
2	Robe Edeo	44	F	7	10	Kersa Kella
3	Damlew Negash	48	M	7	4	Kersa Lebu
4	Argaw Kebede	36	M	5	4	Kersa Lebu
5	Urge Shume	51	M	10	10	Kersa Kella
6	Megra Deme	35	M	6	4	Kersa Gerba
7	Deresu Geda	35	F	4	4	Kersa Gerba
8	Roba Korpu	25	M	2	1	Kersa Kella
9	Shambel Bose	52	M	12	16	Kersa Kella
10	Dadi Bedadi	45	M	9	10	Kersa Lebu
11	Gizaw Bedada	60	M	6	14	Kersa Lebu
12	Tesfaye Geda	46	M	8	16	Kersa Gerba
13	Balcha Dugo	65	M	5	10	Kersa Lebu
14	Anbesu Gurmu	33	F	9	2	Kersa Lebu
15	Mulu Shume	44	F	5	8	Kersa Gerba

1. When was started the watershed activities in this watershed?
2. What are the activities done so far in this watershed?
3. Who provide technical support/advisory services for members?
4. Where do you get inputs/materials to do activities of watershed management? (Soil and water conservation, check dams, diversion canals, beekeeping, dairy, etc)
5. What changes observed in this watershed? How do you describe the changes in terms of reducing flood damage, rainfall situation, productivity of crop, reduce soil erosion, etc over the years?
6. How community/watershed associations protect the watershed from any destruction? Do you have by laws in this watershed?
7. Are watershed members willing to work in the watershed? If yes, How the schedule will be prepared in the watershed?
8. What are the benefits of the community members from this watershed?
9. Do all these activities improve the problem of flood in the area? How?
10. How severe was the problem of flood in the area? How kind of damage occurred in the area because of flood? How did you overcome those?
11. How was the reaction of the community at the initial stage of the watershed management campaign?
12. How was the preparation stage of the watershed management campaign (in terms of mobilizing the people, training, material provision, etc)?
13. How was the community members' participation on the watershed management campaign implementation stage?
14. In your view, what are the strong points of this campaign?
15. In your view, what are the weaknesses of this campaign?
16. In your view, what should be done to overcome those weaknesses?
17. What mechanisms devised to sustain the outputs of the campaign by the community members as well as different stakeholders?
18. What is the trend of flood occurrence in the area?
19. What are the causes of flood problem in the area?
20. What are the measures taken so far to overcome the problem of flood in relation to watershed management extension and advisory services in the area? By individual farmer (rural dweller)? By the community? By other organizations?
21. Which organization (s) is (are) providing these measures?

22. Which organization (s) is (are) the most helpful in term of overcoming the problem of flood in relation to watershed management extension and advisory services in the area?
23. What coping mechanisms the community is being undertaking to overcome the problem of flood in relation to watershed management extension and advisory services in the area?
24. What are the available communication networks and information sources for watershed management and flood management?
25. Who are the most important sources of information and advice in the community for the farmers (rural dwellers) on watershed management and flood management issues?
26. What is the attitude and perception of farmers (rural dwellers) towards flood occurrence in the area?
27. What is the level of farmers (rural dwellers) satisfaction towards the advisory service provision on watershed management and flood management in the area?
28. What looks like the organizational structure/development network mechanisms at the local level?
29. Is there any village level watershed management or flood management committee? If yes, who are the members of this committee?
30. If yes, what are the main functions of this committee?
31. What should be done to sustain the benefits from the watershed in the area? By individual farmers? By the community? By other stakeholders?

Appendix 2: Farmers survey questionnaire

Instruction to enumerators

1. Make brief introduction to each farmer before starting any question, get introduced to the farmers (greet them in the local way), get his/her name, tell them yours, the organization you are working for, and make clear the purpose and objective of your questions.
2. Please ask each question so clearly and patiently until the farmer understands (gets your point).
3. Please fill up the questionnaire according to the farmers reply (do not put own opinion).
4. Please do not try to use technical terms while discussing with farmers and do not forget local unit.

Serial Number _____
Farmer's Name: _____
Interviewer's Name _____
Date of Interview_____

1. Name of village_____
2. Name of village_____
3. Sex (a) Male (b) Female
4. Age of respondents
   a) Less than 30 years
   b) 31 - 45 years
   c) 46 - 60 years
   d) Above 60 years
5. Educational status
   a) Cannot read and write
   b) Read only
   c) Can read and write, but no formal education
   d) Primary school education
   e) Secondary education
   f) Beyond secondary school education
6. Marital status
   a) Single b) Married c) Divorced d) Widowed

7. Family siz_____

8. What is (are) source (s) of income for the household?

   a) Agriculture (only Farming)
   b) Agriculture (only livestock)
   c) Agriculture (Both Farming and livestock)
   d) Petty trading (shop, selling chat, etc)
   e) Selling of charcoal and fire wood
   f) Other, Specify

9. What is your estimated average annual income in birr? _____birr _____USD
10. Land holding size (in kirt) _____ kirt (local unit)_____ in Ha
11. Does your land belong to the watershed? (a) Yes (b) No
12. Are you a member of the watershed management association? (a) Yes (b) No
13. Does your land prone to flood damage? (a) Yes (b) No

14. If yes, what measures did you take to protect your land from flood damage?

_____

15. Does any of your land taken away by flood before the national watershed management campaigns or after being a member of watershed management association? (a) Yes (b) No

16. If yes, when?_____year, what was the estimated land size?_____ha? What was the estimated cost of crop damage? _____birr

17. Does any of your land taken away by flood after the national watershed management campaigns or after being a member of watershed management association? (a) Yes (b) No

18. If yes, when?_____year, what was the estimated land size?_____ha? What was the estimated cost of crop damage? _____birr
18. What do you think the possible causes of flood in the area?

_____

19. How often does the Village Extension Worker(s) visit you?_____times per month
    a) Not at all
    b) Once per month
    c) Two to four times
    d) Five to eight times
    e) More than eight times

20. Have you been visited by extension workers other than village extension workers?
    (a) Yes (b) No
21. If yes, from which organization?_____
22. If yes, how often per month?
    a)
    b) Once per month
    c) Two to four times
    d) Five to eight times
    e) More than eight times

23. Have you received any of the following watershed management extension and advisory services for the past 12 months? (a) Yes (b) No

28. If yes, please indicate in the Table below the types of advisory services and providing organizations?

Advisory services	Yes	No	Who provided?
Identification and prioritization of problems for intervention			
Participatory planning and implementation of watershed management research and development			
Holistic systems approach for watershed management for livelihood improvement			
Soil and water conservation measures (Water storage (check dams), gully control structures, gabion structures, diversion bund)			
Rain water harvesting			
Traditional knowledge of natural resource management practices			
Capacity building of local farmers			
Empowerment of communities and strengthening village level organizations			
Income generating micro enterprises (beekeeping, poultry, dairy production, sheep and goat fattening, etc)			
Monitoring and participatory evaluation			
Community participation through watershed association, watershed committee, self-help group, user groups, and women self-help groups			
Tree planting,			
Irrigation			
Agro-forestry practices			
Weather forecast and early warning system			
Mixed farming and intercropping,			
Public awareness creation campaign			
Disaster risk management			
Other, please specify			

30. Do you work any activities related to watershed management, natural resource management, and flood management with other organization (s) other than Agricultural office?

(a) Yes (b) No

31. If yes, who are these organizations?

_____

32. If yes, what are the specific activities?

_____

33. Which are the main sources of information for the following agricultural activities?

Activities	Specify the organizations listed below the Table, if not in the list, specify
Watershed management	
Flood management	
Disaster risk management	
Soil and water conservation and irrigation	
Agro-forestry	
Weather forecast and early warning system	

Key: (1) Agri. Office; (2) NGOs; (3) Research organizations; (4) neighboring farmers; (5) World Food Program (6) Meteorology service agency; (7) Environmental Protection Authority; (8) Disaster prevention and preparedness; (9) Media (Radio, Television)

34. Have you heard about the national watershed management campaign? (a)Yes (b) No

35. What was your reaction when you heard about the program for the first time?
    a)
    b) Confused
    c) Not convinced
    d) Convinced
36. Where did you hear about the campaign?
    a)
    b) Neighboring farmers
    c) Radio
    d) Village Extension Worker
    e) District administration office
    f) Kebele administration
    g) Other, please specify _____

37. Have you participated in the national watershed management campaign? (a) Yes (b) No
If yes, answer questions No. 38 to 46?

38. When?

    a) In 2011/12
    b) In 2012/13

40. What was your contribution?
    a) Labour
    b) Money
    c) Farm implement
    d) Food
    e) Other, please specify_____
41. Have you received training before you participate in the program? (a) Yes (b) No
42. If yes, how do you rate your level of satisfaction about the training? Very Satisfied
    a) Satisfied
    b) Neutral
    c) Not satisfied

43. How do you rate the overall community members' participation in the program?
    a) High b) Medium c) Low

44. How do you rate the overall Government officials' commitment in the program?
    a) High b) Medium c) Low

45. How do you rate the overall Agricultural professionals' commitment in the program?
    a) High b) Medium c) Low

46. How do you rate the overall coordination and collaboration among Government officials' and Agricultural professionals' in the program?
    a) High b) Medium c) Low

47. If No, Why?
_____

48. In your view, what are the strong points of this campaign?
_____

49. In your view, what are the weaknesses of this campaign?
_____

50. In your view, what should be done to overcome those weaknesses?
_____

51. In your view, what should be done to sustain this program?
_____

52. Farmers attitude and perception towards watershed management extension and advisory services

Statements	**Agree**	**Undecided**	**Disagree**
I benefited much from advises provided on watershed management			
watershed management extension and advisory services are of much help to farmers			
All advisory providers provide specific information and advises on watershed management			
It is very risky to follow advise given on watershed management and flood management			
I have confidence on watershed management advisory service providers			
The advisory service providers have nothing new to tell me on watershed management			
I feel satisfied with the work of advisory service providers on watershed management			
Advisory service providers lacks competence in teaching new practices on watershed management			
All advisory service providers pay attention to farmer's problems and try to help in finding solutions for			

farmers in relation to watershed management			
All advisory service providers cooperate with village community members			
All advisory service providers regards themselves superior than the rest of the villagers community members			
Advisory service providers visit and provide advice only for rich farmers			
All advisory service providers have ability to communicate with farmers			

Key: 1 Agree 2. Undecided 3. Dis-agree

53. In your view, what are the types advisory services you would like to get in relation to watershed management?

_____

54. What is your work relationship among the following organizations in relation to watershed management and flood management issues?

Organizations	**Degree of relationship**			
	Strong	**Moderate**	**Weak**	**No at all**
Bureau of water, mines and energy				
Disaster prevention, preparedness and Early Warning office				
Bureau of Agriculture, Natural resource management team				
Environmental protection authority				
Health Bureau				
Community based organizations/local disaster risk committee				
Platforms like ADPLAC				
Media and communication				
Research organizations				
Training organizations				
Farmers/pastoralists residing in and along the catchment				
NGOs				
Regional and local administration unit, Police				
Metrological service agency				
Red Cross and Red Crescent				
Farmers organization				
Professional associations,				
Private consultants				
credit institutions and Banks				
Input suppliers				
Transporters,				
ICT providers				
Donors and fund managers				

Thank you for your cooperation!

Appendix 3: Self-administered questionnaire for SMSs

Research Topic: Watershed management extension and advisory services in Adama District, East Shoa Zone, Ethiopia,

Research registered at Sokoine University of Agriculture (SUA)
Department of Agricultural Education and Extension
Morogoro, Tanzania

General Instruction

1. Please answer all the questions
2. Your answer will be kept confidential
3. If necessary, please feel free to use Amharic language

Thank you for your cooperation and take your time to fill this questionnaire!

I. General Information

1. Name of your organization: _____
2. Current position_____

3. Sex (a) Male (b) Female

4. In which category does fall your age?
   a) Less than 25 years
   b) 26 - 30 years
   c) 31 - 35 years
   d) 36 - 40
   e) Greater than 40 years

5. What is your highest level of education?
   a) Certificate
   b) Diploma
   c) Advanced Diploma
   d) First Degree/DVM
   e) Masters Degree
   f) Philosophy of Doctorate (PhD
6. How long have you been working totally in this organization?_____years

7. Have you taken the following on-the job training? (Put √ Mark)

Types of training	**Yes**	**No**
Communication methods and media		
Extension program planning, monitoring and evaluation		
Training methodologies		
Participatory Rural Appraisal (PRA)		
Gender issues		
Administration and Management		
Watershed management		

Flood management		
Natural resource management		
Disaster prevention and preparedness		
Weather forecast and early warning systems		

8. Have you provided any of the listed training to DAs and farmers in the past 12 months?

Types of training	**Yes**	**No**
Communication methods and media		
Extension program planning, monitoring and evaluation		
Training methodologies		
Participatory Rural Appraisal (PRA)		
Watershed management		
Flood management		
Natural resource management		
Disaster prevention and preparedness		
Weather forecast and early warning systems		
Others, specify		

9. Have you used the following training methodologies during training? (Put √ Mark)

Training methods	**Yes**	**No**
Lecturing		
Group discussion		
Role playing		
Practical exercise		
Demonstration		
Case studies		
Extension campaign		

10. Which communication media (audio-visual aids) utilized during training f? (Put √ Mark)

Communication media (audio-visual aids)	**Yes**	**No**
Chalk board		
Overhead projectors		
Liquid Crystal Display (LCD) Projector		
Leaflets		
Handout (Manual)		
Posters		
Flipcharts		
Models		
Specimens/real objects like seeds, etc		

11. Do you provide any of the listed watershed management related advisory services for DA s or farmers? (Put √ Mark)

Advisory services	**Yes**	**No**
Identification and prioritization of problems for intervention		
Participatory planning and implementation of watershed management research and development		
Holistic systems approach for watershed management for livelihood improvement		

Soil and water conservation measures (Water storage (check dams), gully control structures, gabion structures, diversion bund)		
Rain water harvesting		
Cost effective and technology environmentally friendly soil, water, nutrient, crop and pest management practices		
Traditional knowledge of natural resource management practices		
Capacity building of local farmers		
Empowerment of communities and strengthening village level organizations		
Income generating micro enterprises		
Monitoring and participatory evaluation		
Community participation through watershed association, watershed committee, self-help group, user groups, and women self-help groups		
Tree planting,		
Irrigation		
Agro-forestry practices		
Weather forecast and early warning system		
Mixed farming and intercropping,		
Public awareness creation campaign		
Disaster risk management		
Other, please specify		

12. Have you participated in the national watershed management campaign?
    (a) Yes (b) No

13. If yes, when? _
    a) 2012
    b) Both 2012 and 2013

14. How was your reaction when you heard about the campaign for the first time?
    e) Confused
    f) Not convinced
    g) Convinced

15. How do you rate the overall community members' participation in the campaign?
    b) High b) Medium c) Low
16. How do you rate the overall Government officials' commitment in the campaign?
    b) High b) Medium c) Low

17. How do you rate the overall Agricultural professionals' participation and commitment in the campaign?
    b) High b) Medium c) Low

18. How do you rate the overall coordination and collaboration among Government officials' and Agricultural professionals' in the campaign?
    b) High b) Medium c) Low

19. In your view, what are the strong points of this campaign?
_____

20. In your view, what are the weaknesses of this campaign?

_____

21. In your view, what should be done to overcome those weaknesses?

_____

22. In your view, what should be done to sustain this program?

_____

23. In your view, what do you think the possible causes of flood in the area?

_____

24. In your view, what should be done to overcome the problem of flood in relation to watershed management in the area?

By individual farmers?_____

By the community?_____

By other organizations?_____

25. In your view, what are the possible constraints that affect the efforts of watershed management extension and advisory services in overcoming the problem of flood in the area?

_____

26. Are there any measures developed or taken by your organization to minimize the problem of flood in relation to watershed management in the area? If yes, please mention them

_____

27. Do you work with the neighboring districts or PAs in relation to watershed management extension and advisory services? (a) Yes (b) No

28. If yes, what are these activities?

_____

29. If no, what are the reasons?

_____

30. Do you have any work relationship with your colleagues within your section/team in relation to watershed activities? a) Yes b) No

31. If yes, how do you rate your relationship with them?

a) Very strong b) Strong c) Moderate d) Weak e) Vey weak

32. Do you have any work relationship with your colleagues outside your section/team but in your own organization in relation to watershed management activities? a) Yes b) No

33. If yes, how do you rate your relationship with them?

a) Very strong b) Strong c) Moderate d) Weak e) Vey weak

34. What is your work relationship among the following organizations in relation to watershed management and flood management issues?

Organizations	**Degree of relationship**			
	Strong	**Moderate**	**Weak**	**No at all**
Bureau of water, mines and energy				
Disaster prevention, preparedness and Early Warning office				
Bureau of Agriculture, Natural resource management team				
Environmental protection authority				
Health Bureau				
Community based organizations/local disaster risk committee				
Platforms like ADPLAC				
Media and communication				
Research organizations				
Training organizations				
Farmers/pastoralists residing in and along the catchment				
NGOs				
Regional and local administration unit, Police				
Metrological service agency				
Red Cross and Red Crescent				
Farmers organization,				
Professional associations,				
private consultants				
credit institutions and Banks				
Input suppliers				
Transporters,				
ICT providers				
Donors and fund managers				

35. Please indicate your organization's roles in relation to the watershed management extension and advisory services

Roles	Key: "X" = responsible "O"= not responsible
Policy	
Research	
Finance	
Technology	
Regulatory	
Capacity building	
Technical support	
Knowledge generation	
Knowledge sharing	
Program management	
Networking	
Implementation	
Other please specify	

Thank you for your cooperation!

Appendix 4: Self-administered questionnaire for VEWs

Research Topic: Watershed management extension and advisory services in Adama District, East Shoa Zone, Ethiopia,

Research registered at Sokoine University of Agriculture (SUA)
Department of Agricultural Education and Extension, Morogoro, Tanzania

General Instruction

1. Please answer all the questions
2. Your answer will be kept confidential
3. If necessary, please feel free to use Amharic language

Thank you for your cooperation and take your time to fill this questionnaire!

I. **General Information**

1. Name of your organization: _____
2. Name of Peasants Association_____
3. Current position_____

1. Sex (a) Male (b) Female

2. In which category does fall your age?
   a) Less than 25 years
   b) 26 - 30 years
   c) 31 - 35 years
   d) 36 – 40
   e) Greater than 40 years
3. What is your highest level of education?
   a. Certificate
   b. Diploma
   c. Advanced Diploma
   d. First Degree/DVM
   e. Master's Degree
   f. Philosophy of Doctorate (PhD)

4. How long have you been working totally in this organization?_____years

5. Have you taken any of the following on-the job training? (Put √ Mark)

Types of training	**Yes**	**No**
Communication methods and media		
Extension program planning, monitoring and evaluation		
Training methodologies		
Participatory Rural Appraisal (PRA)		
Gender issues		
Administration and Management		
Watershed management		
Flood management		
Natural resource management		
Disaster prevention and preparedness		
Weather forecast and early warning systems		

6. Do you provide any of the listed watershed management related advisory services for farmers? (Put √ Mark)

Advisory services	**Yes**	**No**
Identification and prioritization of problems for intervention		
Participatory planning and implementation of watershed management research and development		
Holistic systems approach for watershed management for livelihood improvement		
Soil and water conservation measures (Water storage (check dams), gully control structures, gabion structures, diversion bund)		
Rain water harvesting		
Cost effective and technology environmentally friendly soil, water, nutrient, crop and pest management practices		
Traditional knowledge of natural resource management practices		
Capacity building of local farmers		
Empowerment of communities and strengthening village level organizations		
Income generating micro enterprises		
Monitoring and participatory evaluation		
Community participation through watershed association, watershed committee, self-help group, user groups, and women self help groups		
Tree planting,		
Irrigation		
Agro-forestry practices		
Weather forecast and early warning system		
Mixed farming and intercropping,		
Public awareness creation campaign		
Disaster risk management		
Other, please specify		

7. Have you used the following training methodologies during watershed management extension and advisory services? (Put √ Mark)

Training methods	**Yes**	**No**
Lecturing		
Group discussion		
Role playing		
Practical exercise		
Demonstration		
Case studies		
Extension Campaign		

8. Which communication media (audio-visual aids) utilized during watershed management extension and advisory services? (Put √ Mark)

Communication media (audio-visual aids)	**Yes**	**No**
Chalk board		
Overhead projectors		
Liquid Crystal Display (LCD) Projector		
Leaflets		

Handout (Manual)		
Posters		
Flipcharts		
Models		
Specimens/real objects like seeds, etc		

9. Do you work any activities related to watershed management, natural resource management, flood management, disaster risk and early warning systems with other organization (s) other than Agricultural office? (a) Yes (b) No

10. If yes, who are these organizations?

_____

11. If yes, what are the specific activities?

_____

12. Have you implemented the national watershed management campaign in your PA?
(b) Yes (b) No

13. If yes, when? _____
a) 2012
b) 2013
c) Both 2012 and 2013

14. If yes, in how many watersheds/villages? _____

15. How was the reaction of farmers when they heard about the campaign for the first time?
h) Confused
i) Not convinced
j) Convinced

16. How many households participated from your PA? _____

17. What were the contributions of farmers?
f) Labour
g) Money
h) Farm implement
i) Food
j) Other, please specify____

18. Did farmers receive training before they participate in the program? (a) Yes (b) No

19. If yes, how do you rate the level of farmers' satisfaction about the training?
a) Very Satisfied
b) Satisfied
c) Neutral
d) Not satisfied

20. How do you rate the overall community members' participation in the campaign?
c) High b) Medium c) Low

21. How do you rate the overall Government officials' commitment in the campaign?
c) High b) Medium c) Low

22. How do you rate the overall Agricultural professionals' participation and commitment in the campaign?
    c) High b) Medium c) Low

23. How do you rate the overall coordination and collaboration among Government officials' and Agricultural professionals' in the campaign?
    c) High b) Medium c) Low

24. In your view, what are the strong points of this campaign?

_____

25. In your view, what are the weaknesses of this campaign?

_____

26. In your view, what should be done to overcome those weaknesses?

_____

27. In your view, what should be done to sustain this campaign?

_____

28. Does your PA prone to flood problem? (a) Yes (b) No

29. If yes, in your view, what are the possible causes of flood in your area?

_____

30. In your view, what should be done to overcome the problem of flood in relation to watershed management in the area?

By individual farmers?_____

By the community?_____

By other organizations?_____

31. In your view, what are the possible constraints that affect the efforts of watershed management extension and advisory services in overcoming the problem of flood in the area?

_____

32. Are there any measures developed or taken by your organization to minimize the problem of flood in relation to watershed management in the area? If yes, please mention them

_____

33. Have you ever faced any conflict between farmers within your PA in relation to watershed management and flood problems in your PA? (a) Yes (b) No

34. If yes, what was (were) the main reason (s)?

_____

35. If yes, how did you solve such kind of conflict (s)?

_____

36. Do you work with the neighboring districts or PAs in relation to watershed management extension and advisory services? (a) Yes (b) No

37. If yes, what are these activities?

_____

38. If no, what are the reasons?

_____

39. Have you ever faced any conflict between neighboring district/PAs farmers in relation to watershed management and flood problems? (a) Yes (b) No

40. If yes, what was (were) the main reason (s)?

_____

41. If yes, how do you solve such kind of conflict (s)?

_____

42. What is your work relationship among the following organizations in relation to watershed management and flood management issues?

Organizations	**Degree of relationship**			
	Strong	**Moderate**	**Weak**	**No at all**
Bureau of water, mines and energy				
Disaster prevention, preparedness and Early Warning office				
Bureau of Agriculture, Natural resource management team				
Environmental protection authority				
Health Bureau				
Community based organizations/local disaster risk committee				
Platforms like ADPLAC				
Media and communication				
Research organizations				
Training organizations				
Farmers/pastoralists residing in and along the catchment				
NGOs				
Regional and local administration unit, Police				
Metrological service agency				
Red Cross and Red Crescent				
Farmers organization				
Professional associations,				
Private consultants				
credit institutions and Banks				
Input suppliers				
Transporters,				
ICT providers				
Donors and fund managers				

Thank you for your cooperation!

Appendix 5: Questionnaire for the Head or deputy Head of selected organization

General information:
Name of organization: _____
Position of respondent: _____
Date of interview: _____

1. Does your organization involve in watershed management and flood management activities? Yes/No
2. If yes, how do you rate the involvement, roles of your organization in the following activities related to watershed management and flood management

Activities/roles	**High**	**Moderate**	**Low**	**Not at all**
Technical advisory services				
Financial support				
Providing training				
Advocacy				
Consultancy				
Input provision				
Facilitation role				
Networking				
Information provision				
Fund raising				
Project appraisal				
Dialogue				
Research and study				
Knowledge management				
Early warning systems				
Disaster prevention and preparedness				
Emergency aid and relief				
Others, specify				

3. Please indicate the types of target clients and advisory services, including training your organization's providing on watershed management and flood management.

Advisory services	**Target clients**			
	Individual farmers	**Group of farmers**	**DAs**	**SMSs**
Identification and prioritization of problems for intervention				
Participatory planning and implementation of watershed management research and development				
Holistic systems approach for watershed management for livelihood improvement				
Soil and water conservation measures (Water storage (check dams), gully control structures, gabion structures, diversion bund)				

Rain water harvesting				
Cost effective and technology environmentally friendly soil, water, nutrient, crop and pest management practices				
Traditional knowledge of natural resource management practices				
Capacity building of local farmers				
Empowerment of communities and strengthening village level organizations				
Income generating micro enterprises				
Monitoring and participatory evaluation				
Community participation through watershed association, watershed committee, self-help group, user groups, and women self help groups				
Tree planting,				
Irrigation				
Agro-forestry practices				
Weather forecast and early warning system				
Mixed farming and intercropping,				
Public awareness creation campaign				
Disaster risk management				
Other, please specify				

4. Would you please describe strengths and weaknesses of your organization related to watershed management and flood management advisory services.

   Strengths:

   _____

   Weaknesses:

   _____

5. What are major constraints and challenges that are having a negative influence on your organization's performance of watershed management and flood management activities?

   _____

6. Does your organization perform in collaborative or partnership with other organization (s) on watershed management and flood management activities? Yes/No

7. If yes, with which organization does your organization collaborate in watershed management and flood management activities?

Organization's name	Activities

8. Is there any conflict between stakeholders in watershed management and flood management work in the area? Yes/No

9. If yes, please describe the nature of conflict
   _____

10. What are the mechanisms of conflict resolution?
    _____

11. How do you evaluate the existence of enabling environment (policies, strategies, legal framework, infrastructures, etc) in watershed management and flood management activities in the area?
    _____

12. Do you think that your organization is interdependent with other organization (s) in watershed management and flood management activities? Yes/No

13. If yes, which organization (s)? List them_____

14. Do you think that your organization is complementary for other organization in watershed management and flood management activities? Yes/No

15. If yes, for which organization (s)? List them_____

16. In your view, what are the causes of flood occurrence in the area?
    _____

17. In your view, what should be done to overcome the problem of flood in relation to watershed management in the area?

By individual farmers?

_____

By the community?

_____

By other organizations?

_____

18. In your view, what are the possible constraints that affect the efforts of watershed management extension and advisory services in overcoming the problem of flood in the area
    _____

19. Are there any measures developed or taken by your organization to minimize the problem of flood in relation to watershed management in the area? If yes, please mention them
    _____

20. Please rate your organization's linkage and partnership with the organizations listed below in relation to watershed and flood management

Organizations	Strength of linkages			
	Strong	Moderate	Weak	No linkage
Research organizations				
Universities				
NGOs				
BOA				
DPPC				
EAP				
Meteorology				
Media and Communication				
Local administration				
Farmers organization				
Private sector (consultants)				
Donors and fund managers				
Credit institutions and Banks				
Platforms and professional associations				

21. Does your organization have internet services? Yes/No

22. Do your staffs have access to internet? Yes/No

23. Does your organization have website? Yes/No

24. If yes, does your organization provide information on natural resource management practices, watershed management, and flood management issues in your website? Yes/No

25. If no, why?_____

26. Does your organization have policies and strategies related to knowledge system and knowledge management? Yes/No

27. If no, why? (due to lack of technical, financial, technological, etc reasons)
_____

Thank you for your cooperation!

Appendix 6: Watershed management activities (physical structures) undertaken by the national watershed management campaign in 2012 and 2013 in Adama District

Name of PA	Types of watershed management activities in 2012						Types of watershed management activities in 2013					
	Terrace in km		Check dam in km		Cut-off drain in km		Terrace in km		Check dam in m^3		Cut-off drain in km	
	P	A	P	A	P	A	P	A	P	A	P	A
Adulala boku	181.5	165.5	8.19	8	1.09	1.09	266	239.8	747	215	4.2	3.1
Adulala hate	-	212	2.43	2	2.4	2.4	181	181	1097	1097	3	3
Awash melkasa	115.5	22	0.12	1	0.7	0.5	138	57.72	515	-	2.4	1
Bati kello	264	150	0.28	-	1.6	1.4	200	111	1200	140	3	1
Batu degage	226	153	0.78	1	4.4	3	868	316.5	2585	-	5.33	0.98
Bokoji daworo	195	75	1.5	1	2.97	1.7	591	385	689	513	2.59	2.5
Bati bora	131	89.5	0.25	0.4	1.4	1	276	234.6	2492	1789	3.1	3.1
Boti germama	313.5	375	5.33	9	1.9	1.5	375	272	1185	-	5.13	1.1
Bubisa kuraye	346.5	141.5	0.37	1.5	2	2	413	124.61	1328	1200	4.1	1.1
Cheka alem tena	132	50	0.8	2.8	0.79	0.6	189	171	587	115	4.42	0.98
Cheka hurufa	198	112	4.212	3	1.2	1	237	166.43	806	350	2.64	0.1
Dabe dengore	148.5	48	0.16	1.2	0.9	0.7	81	50.6	631	60	2.5	1.1
Dabula sapo	198	110	1.212	1	1.2	1.2	237	237	805	805	2.64	2.64
Dibi kello	132	68	0.141	-	0.8	0.8	207	65.8	873	80	6.42	-
Dibibisa	297	142.5	2.318	2	1.8	1.4	197	197	592	592	6.24	2
Didimtu	297	152.5	4.318	4	1.8	1.2	355	340	1154	950	2.95	1.95
Ejersa mersa	280.5	259.78	2.3	2	1.7	1	197	239	708	805	2.9	2.9
Gudemesa kurfa	330	134	0.35	1	2	2.5	394	301	916	526	4.06	0.95
Goldiya galiye	198	88.5	0.212	-	1.2	0.8	286	153.6	815	80	4.64	-
Geldiya mukiye	394	120	0.64	5	3.6	1.8	8	85	2108	600	5.94	1.2
Goro wagilo	297	126	1.318	1.25	1.8	0.8	158	125	1154	54	2.95	3
Guraja furda	363	109	5.39	4.9	2.2	1	197	157.2	689	72	5.64	0.78
Humo fechasa	181.5	87.5	0.18	-	1.08	1	266	139.3	747	-	4.6	1
Kabo luto	280.5	179	0.3	-	1.7	1.2	166	200.7	1096	2250	4.65	4.65
Kechema	280.5	292	0.3	1	1.7	1.2	334	368	1096	2426	3.9	10
Kelbo Mariam	297	185	0.318	1	1.9	2.1	355	183	1152	205	4.95	0.1
Kilinto	132	86	0.141	-	0.8	0.6	132	132	300	363	3.35	-
Leku bolchi	214.5	150	0.22	0.2	1.3	0.6	255	91.9	863	410	3.69	2.3
Merebe mermeresa	330	138	1.35	1	1.98	1	246	79.2	689	-	5.3	1.2
Mukiye haro	313.5	131	0.33	2.5	1.9	1.9	373	150	1224	1335	4	1.95
Roge Balewold	262	151.11	1.49	1.5	2.8	2.5	140	142.34	2108	1650	3	3.25
Sekekello	115.5	68.5	0.12	-	0.7	0.5	160	40.5	514	-	2.16	0.5
Shanan silase	133	90	1.35	2	1.98	1.8	434	216	134	191	3.2	0.9
Ulaga melkaoda	214	75	0.23	1	1.3	0.9	253	20	863	494	2.3	0.78
Wake mia	478.5	112	0.512	-	2.9	2.2	80	83	1444	530	3.54	2
Warsecha G/wahad	264	134	0.28	3	1.6	4	316	145.6	1038	555	3.85	2.5
Wenji kuruftu	99	45.5	0.6	0.5	0.7	0.4	118	120	456	26	2.32	0.4
Total												

(Source: Wereda Agricultural Office report) P: Planned A: Accomplished

Appendix 7: Watershed management activities (biological structures) undertaken by the national watershed management campaign in 2012 and 2013 in Adama district

Name of PA	Watershed management structures in 2012				Watershed management structures in 2013			
	Water harvesting structures (trench and micro-basin)		Area closure		Water harvesting structures (trench and micro-basin)		Area closure	
	P	A	P	A	P	A	P	A
Adulala boku	3410	1500	500	471.4	2107	1108	80	80
Adulala hate	7416	1200	500	500	1010	1127	51	51
Awash melkasa	2170	110	50	45	1554	122	81	81
Bati kello	4960	378	100	80	765	65	80	80
Batu degage	1364	250	100	60	3902	550	794	794
Bokoji daworo	9300	100	30	20	1905	1565	54	54
Bati bora	4340	-	100	50	663	358	252	252
Boti germama	1495	-	50	-	1495	89	78	78
Bubisa kuraye	6510	16	100	70.75	2163	7630	378	378
Cheka alem tena	2480	1000	200	100	876	876	144	320
Cheka hurufa	3720	55	20	12	1795	1015	216	216
Dabe dengore	2790	-	100	80	1765	54	81	81
Dabula sapo	3720	170	50	38	1795	1650	216	216
Dibi kello	2480	322	100	100	1295	120	144	144
Dibibisa	5580	80	100	80	1750	1750	80	80
Didimtu	5580	2500	500	500	1225	1100	325	325
Ejersa mersa	5270	-	500	500	2045	2080	306	306
Gudemesa kurfa	6200	950	500	500	2129	1100	360	360
Goldiya galiye	3720	162	300	260	1878	133	234	234
Geldiya mukiye	1160	200	500	300	4103	402	900	60
Goro wagilo	5580	3300	300	265	2158	800	180	180
Guraja furda	6820	26	10	10	1835	200	80	80
Humo fechasa	3510	-	50	10	684	210	198	198
Kabo luto	5270	-	300	230	1613	1072	94	290
Kechema	5270	139	50	60	2055	2965	300	689
Kelbo Mariam	5580	1513	100	110	2119	422	324	324
Kilinto	2480	-	50	-	1499	372	81	81
Leku bolchi	4030	100	100	60	1908	509	234	234
Merebe mermeresa	6200	300	30	27	1575	444	80	80
Mukiye haro	5890	-	250	240	2100	1300	342	342
Roge Balewold	8680	-	100	60	2393	3550	108	108
Sekekello	2800	-	100	96	745	-	27	27
Shanan silase	6200	238	150	100	1224	212	397	397
Ulaga melkaoda	4030	79	100	130	2132	-	234	120
Wake mia	5990	860	30	25	2633	683	38	38
Warsecha G/wahad	4960	150	100	100	2294	350	144	144
Wenji kuruftu	1860	1360	300	105	772	215	108	108
Total								

(Source: Wereda Agricultural Office report) P: Planned A: Accomplished