UNIVERSITY OF CAPE COAST

DETERMINANTS OF COLLECTIVE ACTION FOR SUSTAINABLE NATURAL RESOURCE MANAGEMENT IN HARAMAYA DISTRICT OF ETHIOPIA

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BY

JEMAL YOUSUF HASSEN

THESIS SUBMITTED TO THE DEPARTMENT OF AGRICULTURAL ECONOMICS AND EXTENSION OF THE SCHOOL OF AGRICULTURE, UNIVERSITY OF CAPE COAST IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR AWARD OF DOCTOR OF PHILOSOPHY DEGREE IN AGRICULTURAL EXTENSION

JANUARY 2011

DECLARATION

Candidate's Declaration

I, hereby, declare that this thesis is the result of my own original research and that no part of it has been presented for another degree in this university or elsewhere.

Candidate's Signature:_____ Date: 23/06/2011

Name: Jemal Yousuf Hassen

Supervisors' Declaration

We, hereby, declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision of thesis laid down by the University of Cape Coast.

Principal Supervisor's Signature:_____ Date: 2011/06/23

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ABSTRACT

The study set out to assess determinants of collective action for sustainable natural resource management in the Haramaya District of Ethiopia. It employed a combination of purposive and random sampling techniques to select three representative sites in the district and interviewees for the first phase community level survey and 180 sampled respondents for second phase household level survey respectively. The primary data were collected using both qualitative and quantitative approach. Description of verbal expression of respondents, interpretation and appreciation of facts were used for the qualitative data analysis. Simple descriptive statistics were used to analyze the quantitative data.

The study revealed an increasing level of natural resource scarcity and degradation over time implying the need for collective action among different resource users. However, the likelihood of collective action among resource users was found less likely to happen mainly due to dwindling social capital (trust) among resource users, low support of institutional (endogenous and exogenous) arrangements, and differences among resource users (farm proximity to commons). Furthermore, low level of past collective action experience, low understanding of the resource situation – perceived level of natural resource degradation and natural resource interdependencies – and required coordinated action among resource users to overcome natural resource degradation were found to have reasonably contributed to the low likelihood of collective action. The research, thus, recommends the need for institutional policy reform and the enhancement of community awareness about the natural resource situation and the required collective action.

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Finally, I would like to thank the enumerators, district staff of Bureau of Agriculture and Rural Development (BARD) and especially farmers who cooperated in providing information during field data collection.

DEDICATION

To my family, my wife Saliha; my children Teqiya, AbdulHafiz and Gist-Marry; and in memory of my late father Yousuf Hassen.

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BARD	Bureau of Agriculture and Rural Development
BLEP	Bureau of Land and Environmental Protection
CA	Collective Action
CBNRM	Community Based Natural Resource Management
CPR	Common Pool Resource
CSA	Central Statistical Authority
Derg	the name by which the military government that ruled Ethiopia from1974 to1991 was known
EC	Ethiopian Calendar
EPRDF	Ethiopian Peoples' Revolutionary Democratic Front
EZFEDO	East Hararghe Zone Finance and Economic Development Office
FAO	Food and Agricultural Organization
FDRE	Federal Democratic Republic of Ethiopia
FFW	Food-for-Work
GoE	Government of Ethiopia
IFPRI	International Food Policy Research Institute
LHCA	Likelihood of Collective Action
MD	Mean Difference
MoFED	Ministry of Finance and Economic Development

NR	Natural Resource
NRM	Natural Resource Management
NGO	Non-Government Organisation
OLS	Ordinary Least Square
RGO	Regional Government of Oromia
SD	Standard Deviation
SSA	Sub-Saharan Africa
SPSS	Software Package for Statistics and Simulation
PA	Peasant Association
PC	Producers' Cooperative
TLU	Tropical Livestock Unit

CHAPTER ONE

INTRODUCTION

Background to the Study

In Ethiopia, natural resources such as land, water, and forests are at the centre of any agricultural and economic development endeavour of the country. Agriculture provides employment for 85% of active labour force contributing about 55% to GDP and foreign exchange earning, and responsible for over 95% of food consumed in the country (FAO, 2003; Federal Democratic Republic of Ethiopia Ministry of Finance and Economic Development [FDRE-MoFED], 2002). Ethiopia is known to be dependent on small-scale crop-livestock mixed farming which covers most parts of cultivated land in the country. Thus, the importance of natural resource to livelihood security of farm households in Haramaya District, where this study was conducted is critical.

In general, the reports of Ethiopian Government and others (FDRE-MoFED, 2002; FAO, 2003; Hoben 1995) indicate that the country has reasonably good NR potential. However, it is also among the Sub-Saharan African (SSA) countries known for accelerated natural resource degradation (Tefera, 2006). Degradation of the renewable NR of the country in terms of erosion-induced soil fertility depletion leading to low land productivity,

deforestation, dwindling communal grazing land and water resources such as lakes and streams is well documented (Asfaw, 2003; Bishaw, 2009; FAO, 2003; Hoben, 1995; Shiferaw & Holden, 2001; Teklu, 2004). For instance, glaring impact of soil erosion on both arable and grazing lands is estimated at US $1 billion per year in Ethiopia (Sonneveld, 2002 cited in FAO, 2003). Studies in Ethiopia also shows that the consequence of NR degradation has already gone beyond the indicated catastrophic economic loss. For example, Adnew (2008), Bogale, Taeb and Endo, (2006), Teklu (2004) report several cases of NR scarcity or degradation induced disputes and conflicts in different parts of the country.

The case of Haramaya District is no exception to the above mentioned problem in the country. Studies conducted over the past two decades (Hawando, 1981, 1986) and recently (Lemma, 2003; Muleta, 2002) report severe situations of NR degradation in terms of soil erosion, deforestation and degradation of water stocks. Further, these studies indicate deforestation in hillside communal lands, inappropriate agricultural practices such as cultivation around lakes and absence of conservation measures on farmlands. These had led to high level of erosion on farmlands and hillsides, and contributed to degradation of ecologically and economically important lakes in the district. The forecast made by these studies including possible extinctions of lakes due to silt accumulation of eroded soil, is being witnessed presently. Moreover, using standard scientific measures of soil erosion intensity on farmlands, Muleta (2002) concluded that most farmlands around the Haramaya Lake will soon be out of production unless proper land conservation measures are undertaken. Apart from these empirical studies, the

prevalence of NR is directly visible in hillsides (upstream) of the catchments and basins (downstream), hereafter referred as upstream and downstream respectively. One can easily observe hillside common land in the upstream suffering from loss of vegetation cover and fertile top soil, and the downstream from continuous drying of streams, ponds and lakes such as Lake Adele, Haramaya, and Finkile.

To date, government efforts to overcome NR degradation in the country have been shown to be counter-productive in most cases (Bishaw, 2009; Hoben, 1995). Before 1974, Ethiopia had no natural resource conservation policy and it was the 1974 – 1975 famine in the country that marked the turning point in the country in linking NR degradation to famine. The awareness of the problem led the then Derg government to take action with support from donor agencies and various NGOs to draw and implement large scale soil conservation and land rehabilitation projects (FAO, 2003; Hoben 1995). For example, Hoben (1995) noted massive environmental reclamation program launched by the Ethiopian government in different parts of the country between 1985 and 1988. During this period, millions of kilometres long stone bunds and terraces constructed in farmland and hillside slopes, of about 80, 000 hectares were enclosed for regeneration, and 300,000 hectares of trees were planted as community woodlot.

The result of foregoing interventions, which were supported by food-for-work (FFW) program, i.e. paying farmers' grain for their labour contributions as incentive mechanism, is reported to have become counter-productive in rehabilitating natural resources of the country (Hoben, 1995). In brief, the failures of the Derg government's massive rehabilitation program

and continued NR degradation to date in the country resulted from the conventional top-down approach. In other words, the influence of intertwined socioeconomic, ecological and institutional factors on communities' incentives for NR conservation has been overlooked (Admassie, 2000; Bishaw, 2009; FAO, 2003; Hoben 1995; Rhameto, 2001; Shiferaw & Holden, 2001). For example, local organizations which could play roles in NR management have been marginalized and replaced by state organization. The state introduced organizations are loyal to state and used as instrument to coerce people to adopt conservation measures in which they have no belief (Adal, 2001; Zewdie, 2004).

In short, the rapid degradation of NR is affecting the livelihood security of subsistent households in Haramaya in particular and other parts of Ethiopia. Hence, ensuring sustainable management of NR is an alarming challenge which researchers, policy makers, and farmers alike in Ethiopia in general, and Haramaya in particular, have to deal with.

Although the government of Ethiopia has made some positive policy measures to deal with the challenges of NR degradation in the last two decades, there are some views (FAO, 2003) that these have not been effective. It is argued that there is lack of full implementation of the provisions in the new land use policy (Adnew, 2008; Crewett & Korf, 2008); continued state legacy of excluding local organization in development intervention and in NRM (Adal, 2000; Deininger, Ali, Holden & Zevenbergen, 2008); and supply side driven extension service focusing on yield increase with little or no serious effort of integrating environmental sustainability (FAO, 2003).

To address the shortfalls of the existing NRM policy in Ethiopia, it is becoming accepted that it requires some collective action among resource users. To this end, in retrospect, centralized conventional state command and control of NR has been informed by Hardin's 1968 theory, "The Tragedy of the Commons", which undermines the capacity of local communities to govern NRs that demand collective action among resource users (Leach, Mearns & Scoones, 1999; Ostrom & Janssen, 2004; Quinn, Huby, Kiwasila & Lovett, 2007; Thakadu, 2005). In brief, the argument of conventional theory which also influenced scholars writing about community and NRM is that resource users cannot overcome 'commons dilemma' in conserving NR that demand collective action. Thus, state command and control over the resource is recommended by the conventional theory as a solution to the problem of collective action among resource users (Ostrom, 1999; Varughese & Ostrom, 2001).

The failure of state centralized approach and many successful community self-initiated organizations in NRM demonstrated the potential capacity of local community to overcome collective action problems (Meinzen-Dick, Raju & Gulati, 2002; Ostrom & Janssen, 2004). This in turn has led to the decentralized approach to NRM such as community-based natural resource management (CBNRM) across industrialized and developing nations (Agrawal, 2001; Leach *et al.*, 1999; Thakadu, 2005; Williams, 1998).

Literature further shows that decentralization of NRM to local community is not always successful in terms of resource improvement as well as equitable community ownership of the resource (Coombes, 2007; Leach *et al.*, 1999; Quinn *et al.*, 2007; Dowsley, 2008; Marshall, 2008.). It is rather

community engagement in collective action that makes decentralization approach such as CBNRM successful (Agrawal & Gibson, 1999; Pretty & Ward, 2001). Collective action for natural resource management, however, may not happen everywhere (Meinzen-Dick *et al.*, 2002).

Literature also shows that the concept of collective action is dynamic and what constitutes collective action and its determinants vary in different settings (McCarthy, Dutilly-Diané & Drabo, 2004). Moreover, most collective action studies focus on common-pool natural resource such as forest, irrigation system and pasture land. Nonetheless, natural resource in a watershed, like in the area under study, may contain ecologically interdependent privately-owned and common-pool resources, all providing livelihoods for the rural households. In this regard, Kerr (2007) indicated that such resources in a watershed are a special kind of common-pool resource facing coordination problem like that of any typical common-pool resource Hence, only context-specific studies guided by broader analytical framework that systematically integrates the alternative perspectives provide more reliable and useful information that guide specific policy formation and its implementation.

Problem Statement

Natural resource, which in this study refers to farmland, common water points and grazing land, is at the centre of livelihood of rural households in the Haramaya District. Small-scale crop-livestock mixed intensive farming is the main source of livelihoods for rural household in Haramaya District. However, as briefly indicated in the background, the serious problem of natural resource degradation such as denuded hillside common land, soil erosion on farmlands, and extinction of economically and ecologically important lakes is affecting

the livelihoods of rural households as well as environmental wellbeing in the district.

Haramaya District is characterized by hilly landscape which makes the problem of natural resource and its management interdependent, at least within sub-catchments of a watershed. This is evident, for instance, from empirical studies (Hawando, 1981, 1986; Lemma, 2003; Muleta, 2002) reported about the study area showing downstream effect of deforestation on hillside, soil erosion on farmlands and water resources degradation. With the view that state centrally-planned NRM interventions have not been effective and expected, overcoming the problem of natural resource degradation and ensuring its sustainable management in the context of Haramaya demand different individuals to coordinate their use of and investment in the resource management. This local community engagement in collective action is the current view of what can ensure sustainable use and management of natural resources in Ethiopia. Interestingly, there is limited empirical information on the dynamics and factors that can influence collective action to inform NRM policy decisions in the country.

It is against this background that this study intended to explore determinants underlying the likelihood of collective action among resource users for its sustainable management in the Haramaya District of Ethiopia. It intends to identify a range of factors that are likely to influence resource users' incentive to voluntarily take part in collective action for NRM.

Objectives of the Study

The overall objective of this research was to assess determinants of collective action for sustainable management of natural resource in the Haramaya District of Ethiopia. The specific objectives of the study were to:

1. describe the attributes of the resource in terms of level of degradation and scarcity
2. describe the attributes of the resource users in terms of their:
    - level of dependence on the resource
    - perceived natural resource degradation
    - perceived cause of natural resource degradation
    - perceived natural resource interdependencies
    - perceived required coordinated action to overcome NR degradation
    - past level of participation (experience) in collective action in natural resource management
    - social capital (trust on others cooperation in natural resource management)
3. describe key collective action problems for natural resource management in the study context
4. assess resource users' likelihood of collective action in natural resource management
5. find the relationships between selected resource users characteristics and their likelihood of collective action in natural resource management
6. determine the level of support of endogenous institutional arrangements for collective action in natural resource management

7. determine the level of support of exogenous institutional arrangements for collective action in natural resource management
8. determine the influence of external factor on collective action in natural resource management in terms of:
    - market opportunity
    - availability of off-farm income sources
9. determine key differences among resource users that are relevant for collective action in natural resource management
10. determine best predictors of likelihood of collective action in natural resource management in the context of the study area.

Research Questions

This study seeks to answer the following questions:

1. What are the attributes of the resource in terms of degradation and scarcity?
2. What are the attributes of resource users in terms of their:
    - level of dependence on the resource;
    - perceived natural resource degradation ;
    - perceived cause of natural resource degradation;
    - perceived natural resource interdependencies;
    - perceived required coordinated action to overcome NR degradation;
    - past level of participation (experience) in collective action in natural resource management; and

- social capital (trust on others cooperation in natural resource management)?

3. What are the collective action problems that exist among farmers for natural resource management?
4. What is the likelihood of resource users' collective action for natural resource management?
5. What are the relationships between attributes of resource users and their likelihood of collective action?
6. What are the levels of support of endogenous institutional arrangements for collective natural resource management?
7. What are the levels of support of exogenous institutional arrangements for collective natural resource management?
8. What are the influences of external factor on collective natural resource management in terms of:
    - market opportunity; and
    - availability of off-farm income sources?
9. What are the key differences among resource users that are relevant for collective natural resource management?
10. What are the key determinants of collective action in natural resource management in the context of the study area?

Research Hypotheses

Based on the literature review and the conceptual framework, the research hypotheses were specified as:

1. H_o: Resource users' likelihood of collective action does not have any relationship with level of natural resource scarcity.

   H_1: Resource users' likelihood of collective action has a direct relationship with level of natural resource scarcity.

2. H_o: Resource users' likelihood of collective action does not have any relationship with their level of dependence on the resource.

   H_1: Resource users' likelihood of collective action has a direct relationship with their level of dependence on the resource.

3. H_o: Resource users' likelihood of collective action does not have any relationship with their perceived level of resource degradation.

   H_1: Resource users' likelihood of collective action has a direct relationship with their perceived level of resource degradation.

4. H_o: Resource users' likelihood of collective action does not have any relationship with their perceived cause of resource degradation.

   H_1: Resource users' likelihood of collective action has a direct relationship with their perceived cause of resource degradation.

5. H_o: Resource users' likelihood of collective action does not have any relationship with their perceived level of natural resource interdependencies.

   H_1: Resource users' likelihood of collective action has a direct relationship with their perceived level of natural resource interdependencies

6. H_o: Resource users' likelihood of collective action does not have any relationship with their perceived required coordinated action.

   H_1: Resource users' likelihood of collective action has a direct relationship with their perceived required coordinated action.

7. H_o: Resource users' likelihood of collective action does not have any relationship with their past level of participation in collective action.

   H_1: Resource users' likelihood of collective action has a direct relationship with their past level of participation in collective action.

8. H_o: Resource users' likelihood of collective action does not have any relationship with their perceived level of trust on cooperation of others.

   H_1: Resource users' likelihood of collective action has a direct relationship with their perceived level of trust on cooperation of others.

9. H_o: Resource users' likelihood of collective action does not have any relationship with market opportunity.

   H_1: Resource users' likelihood of collective action is inversely related to market opportunity.

10. H_o: Resource users' likelihood of collective action does not have any relationship with availability of alternative off-farm income.

    H_1: Resource users' likelihood of collective action is inversely related to availability of alternative off-farm income.

11. H_o: Resource users' likelihood of collective action does not have any relationship with their farmland proximity to the common resources.

    H_1: Resource users' likelihood of collective action is inversely related to their farmland proximity to the common resources.

12. H_o: Resource users' likelihood of collective action does not have any relationship with their wealth.

    H_1: Resource users' likelihood of collective action is inversely related to their wealth.

Research Variables

The dependent variable of this study is likelihood of collective action. The research considered several independent variables related to attributes of resource and resource users, institutional arrangements, other external factors (market and off-farm income) and difference among resource users (wealth and farm proximity) assumed to affect individual likelihood of collective action. These independent variables are listed below.

- Level of natural resource scarcity;
- Level of dependence of natural resource;
- Perceived level of natural resource degradation;
- Perceived cause of natural resource degradation;
- Perceived required action to overcome NR degradation;
- Perceived natural resource interdependence;
- Past participation in collective action;
- Trust on cooperation of others for NRM;
- Exogenous institutional support;
- Endogenous institutional support;
- Market opportunity;
- Involvement in off-farm income;
- Wealth; and
- Farm proximity.

Definition of Terms

The following terms have been defined in the context of this research.

Natural resource – refers to resources in catchments which include farmlands, common grazing land and common water points.

Attributes of natural resource – refers to level of scarcity and/ or degradation of the resource.

Natural resource scarcity – refers to decrease in farmland size and quality, size of farmland irrigated, and decreases in number of livestock kept in common grazing land as compared to the 10 years period before the study.

Level of dependence on natural resource – refers to monitory estimate of yield obtained from farmland using irrigation from common water points and main production season (rain-fed) and livestock kept in common grazing land.

Collective action – refers to voluntary contribution of individuals to overcome shared problem of natural resource degradation or for sustainable NRM. In this context, collective action is not equivalent to coordination. Coordination for NRM can be provided through enforcement or state coercion or through collective action among resource users which is voluntary.

Likelihood of collective action – refers to resource users' likelihood to share information with or encourage others for natural resource management, contribute labour, allocate land area, initiate voluntary community meeting, participate in voluntary community meeting initiated by other farmers, and provide all necessary support such as money for establishment of voluntary farmers association at sub-catchments level for natural resource management

Collective action problem – refers to a problem that prevails whenever multiple resource users are needed to obtain a jointly beneficial outcome of NRM, but each user has a short-term incentive to hold back a full contribution to the joint endeavour (Ostrom and Janssen, 2004).

Perception/perceived – refers to the impression or attitude or understanding based on what is observed and thought of (Encarta dictionary 2009 version).

Externality – "externalities are unreimbursed costs or uncharged benefits accruing to people resulting from someone else's actions" (Kerr, 2007, p. 91).

Catchment/ sub-catchment – refers to an area which drain to common points (Kerr, 2007).

Farm proximity – meant to distinguish households with relative difference in access to common-pool resource. That is, households with at least one farm plot sharing border with common grazing land and/ or having access to common water points, and households without this advantage.

Institutions – refer to rules and organizations. Rules include formal written laws, informal customary rules, and regularized common practices that can be derived from both formal and informal rules (Ostrom, 1990).

Exogenous institutional arrangements – refer to formal rules granting bundles of right to natural resource, right to self-organization and enforcement of these rights.

Endogenous institutional arrangements – refer to local level institutional environment which include regularized practices related to natural resource use and management; and natural resource related conflict resolution mechanism.

Significance of the Study

This study has various significances. First, it helps in providing relevant policy information concerning likelihood of collective action among resource users and associated factors. To this end, for instance, the current government's initiative of decentralized approach to NRM would be far to be achieved without ensuring collective action among individuals (resource users) in a community. Thus the information generated by the study can be used by Oromia Regional State in designing implementation strategies of its new land use and administration proclamation.

Second, limited empirical evidence along the line of this study and its location where catastrophic NR degradation (such as extinction of ecologically and economically important lakes) is experienced further substantiate its importance. The information generated by the study can be used in the future intervention by the District BARD and BLEP, and researchers. For example, the result of the study provides insights concerning different resource users with different interest of using the commons which can be considered by district BLEP in enforcing provisions in regional policy text. This in turn contributes to sound management of NRs and thus improvement in livelihood of resource dependent farmers. Moreover, the consequence of NR degradation is known of having effects beyond specific locality or resource users and thus ensuring sound NRM will benefit the general public.

Finally, studying collective action at watershed level based on scholars' achievements in common-pool resource management is recent phenomena (Kerr, 2007). Besides, studying likely emergence of collective action where it is missing is overlooked in wider literature (Meinzen-Dick,

Gregorio & McCarthy, 2004). This study which considers likelihood of collective action at sub-catchments level by extending achievements made so far contributes to theoretical knowledge in this line.

Delimitation of the Study

The issue of natural resource degradation mainly contains two major arguments: the controversial population-resource-welfare nexus and the non-demographic factors (Tefera, 2006). The former argument is unsettled due to non-direction impact of population pressures on resource degradation and it is also criticized to be considered as the only constraint in developing strategic direction in Sub-Saharan Africa in general (Leach *et al.*, 1999; Kabubo-Mariara, 2007) and Ethiopia in particular (Tefera, 2006, Chisholm, 2003). This study, although not primarily aimed at taking a stance against discourse of population-resource-welfare nexus, focuses on the non-demographic determinants that potentially influence collective NRM.

Assessing determinants of collective action for sustainable natural resource management in the district did not include all farmers. Rather, it covered farmers in three major sub-catchments along three lakes (Adele, Finkile and Haramaya) known for containing hillsides devoid of vegetation cover and contributing water as well as silt washed from farm plots and common hillsides to lake sites in downstream. Moreover, very limited prior research and documents such as time serious physical resource maps, absence of complete record containing households resource use (example, size and slop of farm plots, irrigation access and communal grazing use) limited the physical area that could be covered in the study. This and the nature of the study implied the need to consider intermediate result from extensive

community level survey to draw representative sample households. This in turn, determined area coverage, given time and resource constraints.

Limitations of the Study

Due to resource constraints (including time) and nature of the problem addressed by this study, the research had the following limitations. First, the scope of this research was broad and it was relatively less focused in realization of necessity of the problem it intended to explore. It covered both commonly and privately owned NRs in sub-catchments due to the fact that they are interdependent and rural households depend on both resources for their livelihoods. The study investigated both local level and remote factors important for collective natural resource management. Therefore, a trade-off between analytical rigor and comprehensiveness were unavoidable because of the nature of the study.

Second, information concerning resource degradation and/ or scarcity faced by the households (for instance, in terms of farmland size owned and area irrigated before 10 years, size of livestock kept in common pasture before 10 years) may not be free from error due to absence of record keeping habit of farmers. As a result, such information relies on farmers' power to recall.

Organization of the Thesis

The thesis is organized into five chapters. Chapter One has already set the background of the study. Chapter Two presents review of relevant literature. Chapter Three presents methodology employed by the study. Chapter Four presents major findings and discussion. The final chapter presents summary, conclusions and recommendations of the study.

CHAPTER TWO

LITERATURE REVIEW

Overview

This chapter reviews some selected concepts, theoretical perspectives and empirical evidence related to the main themes of the study. The chapter is organized as follows. It starts by clarifying concepts of collective action in natural resource management, followed by types of natural resources and associated potential collective action problems. These are followed by a review of the conventional approach as a solution to collective action problems in natural resource management and its limitations. After presenting limitations of the conventional approach, community-based approach as a solution and its challenge are highlighted. Then, determinants of collective action is discussed in detail focusing on attributes of resources and resource users, differences among resource users (heterogeneity factors – wealth status and location within resource system), external factors (market opportunity and availability of alternative off-farm income opportunity), and institutional arrangements (endogenous and exogenous). Finally, after presenting the developed conceptual framework for the study, the chapter winds up by summarizing major findings from the reviewed literature.

Concepts of Collective Action in Natural Resource Management

Most natural resource systems demand coordination among individual resource users or managers to limit overuse and ensure sufficient investment required to sustain the resource base (Meinzen-Dick, 2009). Coordination is inevitable in natural resource management (NRM) mainly due to interdependence of natural resource (NR) problem and its management transcending specific resource or farm boundary; and multiple use and users involved in NR having different interest in its use (Meinzen-Dick, 2009; Ravenborg & Westermann, 2002; Swallow, Johonson, Knox & Meinzen-Dick, 2004; Williams, 1998).

Developing rules for resource use, monitoring compliance with the rules and sanctioning violators, and mobilizing the necessary cash, labour, or material resources to invest in maintenance and improvements in the resource base are among the critical coordination tasks required in NRM (Meinzen-Dick, 2009). Moreover, she indicated that for most NRs coordination is often provided through the state (example, state managed forest) or collective action (example, NR user groups) institutions. In brief, based on worldwide experience, wide ranges of literature (Aggarwal, 2000; Mattta & Alavalapati, 2006; McCarthy, Dutill-Diané & Drabo, 2004; Pretty & Ward, 2001) documented failed state centralized approach to NRM and growing interest in collective action which has been at the centre of effective and sustainable NRM. The limitation of the state centralized approach is discussed in detail in a later section after reviews of different potential collective problems associated with different types of natural resources.

Although the concept of collective action has been and remains to be popular in natural resource management studies, there is still some difficulty associated with defining the concept and addressing it empirically, confusion and dispute regarding determinants of collective action, and indicators constituting successful collective action and their measurements (Araral, 2008; McCarthy *et al.*, 2004; Meinzen-Dick, Di Gregorio & McCarthy, 2004; Poteete & Ostrom, 2004b). This section therefore limits itself to definition of collective action while other issues will be dealt in other sections when necessary.

The definition of collective action and what it constitutes may vary in different contexts (McCarthy *et al.*, 2004; Poteete & Ostrom, 2004b) and so it is inappropriate to fix one single definition (Meinzen-Dick *et* al., 2004). The latter authors indicated that it is rather better to consider the common domain all definitions need to contain. That is, collective action requires the involvement of a group of people with shared interest and some kinds of common action which works in pursuit of that shared interest. Further, the action should be voluntary which distinguishes collective action from hired labour (Meinzen-Dick *et al.*, 2004). While containing these elements, collective actions may include coordination of activities, development of institution, resource mobilization, information sharing, collective decision-making, setting rules of conduct of a group and designing management rules, implementing decision, and monitoring adherence to rules (Meinzen-Dick, 2009). Members' contribution to collective action to achieve a shared goal can be in various forms: money, labour or in kind contribution (Meinzen-Dick *et al.*, 2004).

To sum up issues related to the concept, we may consider the following definition by (McCarthy *et al.*, 2004, p. 236). They defined collective action in NRM as "the act of internalizing negative externalities and/or the generation of positive externalities in the use and management of natural resources". Externality is further explained as occurring whenever one person's decisions affect outcomes for another person. They illustrated the concept with an example. Negative externality is illustrated with what they called traditional example of livestock on common pasture; the number of livestock one person puts on the pasture affects his/her own production and also affects livestock production of all others sharing the commons as well. In this case, use of the common pasture generates a negative externality. An example of a positive externality can be different soil erosion control measures in a watershed that improves soil productivity in the specific area, and also generates positive externalities via improved erosion control over a much wider area.

Types of Natural Resources and Potential Collective Action Problems

Goods or resources are classified in literature (Hess & Ostrom, 2001) using two exclusive criteria – subtractablity and excludability/feasibility of exclusion. Subtractibility of goods or resources refers to whether the benefit consumed by one user reduces the benefit available to others. Excludability refers to the difficulty and cost involved to exclude individuals (i.e. either through physical barrier or legal instruments) from using the flow of benefits unless they meet certain criteria (Hess & Ostrom, 2001; Kiresten, Karaan & Dorward, 2009, Ostrom, 1990; Williams, 1998). Using the two criteria, four

logical types of goods are public goods, toll or club goods, common-pool resource and private goods (see Table 1).

The discovery of these two attributes enables scholars to identify core theoretical problems in natural resource management including Hardin's 1968 seminal article 'Tragedy of the Commons' (Hess & Ostrom, 2001; Husain & Bhattacharya, 2004).

Table 1: Types of Goods and Associated Problem of Exclusion and Subtractibility

		SUBTRACTIBILITY	
		Low	High
EXCLUSION	Difficult	**Public goods:** Sunset, clean air, institutional service such as law and order	**Common-pool resources** irrigation system, common land using for grazing
	Easy	**Toll or club goods** day-care centres country clubs	**Private goods** food, clothing and consumer good

Source: Hess and Ostrom (2004) and Kiresten, Karaan and Dorward (2009)

Common-pool resources are described as natural or man-made resources jointly used (simultaneously or sequentially) by a group (Husain & Bhattacharya, 2004; Ostrom 1990; Williams, 1998). Williams (1998), for example, indicated that in semi-arid West Africa, the common-pool resources include rangeland, uncultivable fields, fallow fields, crop residues, forest, inland water ways, seasonal ponds and low-laying wetlands. All common-pool resources share with public goods the difficulty, if not impossible, of

exclusion through developing physical barriers or institutional means. These resources are liable to temptation of free ride that leads others to make less effort to invest in its improvement, monitoring use, and sanctioning rule-breaking behaviour unless means are designed to protect non-authorized users from obtaining the benefit from the resources (Husain & Bhattacharya, 2004; Ostrom 1990; Williams, 1998).

As illustrated in Table 1, all CPRs share the attributes of generating substractible benefits with private goods. This implies that unless means are designed and enforced to sanction harvesting or use limit, CPRs are liable to the problem of degradation (Husain & Bhattacharya, 2004; Ostrom, 1990; Varughese & Ostrom, 2001; Williams, 1998).

It is indicated that "collective-action problems exist whenever multiple actors are needed to obtain a jointly beneficial outcome but each actor has a short-term incentive to hold back a full contribution to the joint endeavour" (Ostrom & Janssen, 2004, p. 242). According to the above indicated criteria, the collective action problem potentially associated with goods or resources is coordination of provision. Individuals may free ride on others' contribution, given the difficulty to exclude non-contributors. In the case of common-pool resources, the collective action problems are not only provision problem like in public goods but also coordination of withdrawal of resource units to ensure regeneration capacity, given the subtractiblity problem that may lead to degradation and complete collapse of the resource (Hess & Ostrom, 2001; Marshall, 2004).

Natural resources system, however, may not contain only the above indicated division in all settings. In the study area of this research (i.e.

Haramaya District) in micro watershed and/ or even in a sub-catchment, we may find different types of natural resources which include privately owned farmlands and more than one type of common pool resources – common water points and communal land containing pasture and vegetation cover. Moreover, the hilly nature of landscape made all these types of resources, including privately own farmlands ecologically interdependent and thus demand coordination among individuals for using the natural resource and its management. By coincidence, it is found in literature (Kerr, 2007) that watershed or catchments containing these types of natural resources are a special kind of common pool resource. "A watershed is a special kind of common pool resource: an area defined by hydrological linkages where optimal management requires coordinated use of natural resources by all users. Management is difficult because watershed systems have multiple, conflicting uses, so any given approach will spread benefits and costs unevenly among users" (Kerr, 2007, p. 89).

Kerr (2007) indicated that watershed may contain multiple resource users as well as resources such as forests, pastures, agricultural land, surface water and groundwater, all being linked through hydrology. Due to such link, they are characterized by high exclusion costs and subtractability, the two main attributes of common pool resources indicated above. Hence, such resources face collective action problem like that of common pool resource – dilemma of the 'commons'.

To conclude, following the implication of arguments of other scholars (Olson, 1965 cited in Marshall, 2004), in context of natural resources in a micro watershed/sub-catchments such as in Haramaya context, the collective

action problem is assurance problem of providing collective goods (i.e. compliance that other will also contribute to collective good). Here, the collective good is impure public as individual investment onsite on the farm and offsite on the commons generate private benefit as well as joint collective benefits. For example, in case of Haramaya, investment on soil erosion control measure reduces erosion on farmland and also reduces silt accumulation in common water point or improve lifespan of water stock in the catchments. The following sections review the conventional approach followed as a solution to collective action problems for NRM, limitations of this approach and the consequences on the resources.

Conventional Approach as Solution to Collective Action Problems in Natural Resource Management

In the conventional approach, it is basically argued that rational actors (i.e. resource users) cannot come out of 'commons' dilemma in managing NRs that involve coordinated action among different resource users. This has been extensively debated in the Conventional Theory of Common-Pool Resources which is associated with the earliest work of Gordon (1954) and Scott (1955) based on the common-pool resource system which was mainly on open-access fisheries and later dominant seminal article of Hardin (1968), "Tragedy of the Commons" based on open access pasture but its parable extended to all kinds of resources (Ostrom, 1999; Mansfield, 2004).

According to Hardin (1968), for any resource held in common, more use of the resource by individual users brings economic gain while sharing cost with other users. For example, Hardin argued that adding one cattle for a herdsman brings nearly +1 return, while the cost shared with other herdsman

is in fraction of -1. Thus, because the costs will be much smaller than the gains, it is economically rational to use the resource, even if doing so brings ruin to all. To overcome this problem, he recommended external state or market intervention to provide coordination or privatization of the resource.

It is noted that the influence of "tragedy of the commons" has led to numerous worldwide calls for either privatization or nationalization of many shared natural resource so that either the market or state would provide coordination and thus overcome 'commons' dilemma (Meinzen-Dick, 2009; Ostrom & Jannsen, 2004). Moreover, it is widely documented that the 'tragedy of the commons' informed early policy of conservation and scholars writing about community and natural resource conservation considered community as an obstacle to resource conservation. For instance, the argument of this theory is often used, especially in developing countries, to support the change in property right to state control which further resulted in degradation of the resource rather than its management (Agrawal & Gibson, 1999; Leach *et al.*, 1999; Quinn, Huby, Kiwasila & Lovett, 2007; Thakadu, 2005). The following section discusses limitation of the conventional approach and the policy it informed.

Limitations of Conventional Approach

In the conventional theory, it is generally assumed that resource generates a highly predictable and finite supply of one type of resource unit. Users are assumed to be homogeneous in terms of their assets, skills, discount rates and cultural views. They are also assumed to be short-term, profit-maximizing actors who possess complete information. According to the argument of this theory, anyone can enter the resource and appropriate

resource units. Users gain property rights only to what they harvest, which they then sell in an open competitive market. The open-access condition is given. The users make no effort to change it. Users act independently and do not communicate or coordinate their activities in any way. The prediction from this theory is that over-harvesting and degradation will result (Ostrom, 1999).

The conventional theory, and by extension the policies, state control or market incentive, it has informed was not challenged until mid-1980, given many dramatic examples of resources destroyed by users acting independently. For example, the massive deforestation in tropical countries and the desertification of the Sahel confirmed the worst predictions to be derived from this theory for many scholars (Ostrom, 1999).

Given the unavoidable challenges of collective action problems in natural resource management in certain contexts, early conventional theory has been challenged not for its empirical validity but for its generalizability (Baland & Platteau, 1999; Ostrom, 1999; Varughese & Ostrom, 2001). Some of the outstanding weakness of this theory and the policy it has informed for decades are highlighted below.

One of the criticisms raised against the conventional theory by scholars (Hess & Ostrom, 2001; Williams, 1998) is its simplistic stereotyping of all common-pools and equating a property regime (i.e. common property regime) and common-pool resources. All common-pool resources share the two attributes of subtractibility and excludability, but a particular common-pool can differ on many other attributes that determine their economic usefulness including their extent, shape, productivity and the value, timing, and regularity of the resource unit produced. Further, common-pool resources may be owned

by national, regional, or local governments; by community groups; by private individuals or corporations; or used as open access by whoever can gain access. Thus, no automatic association exists between common-pool resources with common property regimes – or with any other particular type of property regime.

Moreover, based on the work of Ciriacy-Wantrup and Bishop 1975 Hess and Ostrom (2001) clarified the difference between open access and common property regimes. Under open-access regimes, no one (individual or group) has the legal right to exclude anyone from using a resource. Whereas under common property, a resource is owned by a well-defined group of people and the group has a legal right to exclude non-members of that group from using a resource

Hardin exemplified the 'Tragedy of the Commons' as "picture a pasture open to all" (Hardin, 1968 p. 1243). According to this description of the commons, if anyone can use a resource or if the resource is owned by no one, this shows that the resource is open-access resource, so, no one has an incentive to conserve its use or to invest in its improvements. Thus the tragedy is not in the commons but it is rather 'the tragedy of open access' since the situation he described is lack of effective regulation (Husain & Bhattacharya, 2004; Mansfield, 2004; Meinzen-Dick, 2009; Ostrom, 1990).

The assumed open-access, as given, is another criticism raised against the conventional theory. For example Hess and Ostrom (2001) noted the situation of different open-access regimes. Some open-access regimes lack effective rules defining property rights by default. The resources are either not controlled within a nation-state or no entity has successfully laid claim to

legitimate ownership. Other open-access regimes are the consequence of conscious public policies to guarantee the access of all citizens to the use of a resource within a political jurisdiction. Still other open-access regimes result from the ineffective exclusion of non-owners by the entity assigned formal rights of ownership. In many developing countries, the earlier confusion between open-access and common-property regimes paradoxically led to an increase in the number and extent of local resources that are de facto open access. State intervention and its consequence in developing countries are indicated as follows:

> As concern for the protection of natural resources mounted during the second half of the last century, many developing countries nationalized all land and water resources that had not yet been recorded as private property. The institutional arrangements that local users had devised to limit entry and use lost their legal standing. The national governments that declared ownership of these natural resources, however, lacked monetary resources and personnel to exclude users or to monitor the harvesting activities of users. Thus, resources that had been under a de facto common-property regime enforced by local users were converted to a de jure government-property regime, but reverted to a de facto open-access regime (Hess & Ostrom, 2001, p.58).

The other argument, in brief, against conventional theory is that it is most successful in predicting likely outcomes in situations where appropriators cannot effectively communicate with each other. However, this theory neither considers settings where resource users are able to create and sustain agreement to tackle problems of resource overexploitation, nor predicts

well the condition under which government ownership or private ownership will improve the outcomes.

Furthermore, the argument against the conventional theory is based on evidence from worldwide experience showing the capacity of community to overcome collective action problems. Literature has documented, for example, potential capacity of community to negotiate collective action such as assurance problem in provision of collective goods needed for NRM in watershed through negotiation (Marshall, 2004); emergence of many self-organizations for resource management at local level and sustainable functioning of commons institution; and many examples of failure of state controlled natural resource management (Agrawal, 2001; Ostrom, 1990, 1999; Ostrom & Varughese, 2001; Meinzen-Dick, 2009). In this regard, research in sub-Saharan Africa (Roe, Nelson & Sandbrook, 2009; Thakadu, 2005) shows the preservation strategy advocated in natural resource conservation in the region, alienating local communities from the resource led to conflict between preserving agency (state) and rural community and in turn resulted in further decline of the resource instead of improvement.

To conclude, centralized state approach of 'fines and fence' is widely criticized on two grounds, especially in the context of developing countries. On one hand, the state centralized approach denied local communities access to the resource on which they depend for their livelihoods. This, in turn, ingrained externalities among local communities concerning conservation of the resource and rather use any available opportunity to exploit the resource. On the other hand, the state has limited capacity to coordinate natural resource management at the local level and/ or coercing communities to state

conservation policy (Agrawal & Gibson; 1999; Matta & Alavalapati, 2006; Meinzen-Dick, 2009; Thakadu, 2005).

Community-based Approach as Solution and its Challenges

The above section's review shows failure of state controlled approaches. To this end, literature also shows worldwide growing interest of decentralized approaches to NRM such as CBNRM. In brief, it is indicated that unlike the state centralized approach, the decentralization approach provides the opportunity to overcome coordination problems mainly because of the fact that communities have knowledge about natural resource in which they live and resource users (Agrawal & Gibson, 1999; Matta & Alavalapati, 2006; Meinzen-Dick, 2009; Thakadu, 2005). However, decentralization of NRM to grass-root level may not always result in effective management of the resource (Dowsley, 2008). In this regard, recent research finding of CBNRM in Africa (Roe *et al.*, 2009) and other different scholar's past studies for example in Australia (Marshall, 2008), Botswana (Thakadu, 2005) and India (Matta & Alavalapati, 2006) indicated poor outcome of CBNRM.

Regardless of how disappointing the past outcomes have been, CBNRAM remains popular in ensuring sustainable management of natural resource as well as the rural development policy goal, especially in Africa (Blaikie, 2006; Roe *et al.*, 2009). In retrospect, the literature shows that the poor outcomes of CBNRM are not due to the inherent problem of community as argued by conventional theorists and its policy advocates who considered community as an obstacle to natural resource conservation. It is rather due to a number of factors such as incomplete implementation of the approach, the way community and natural resource management has been perceived, institutional

arrangements and other external factors overshadowed the latent merit of community (Agrawal & Gibson, 1999; Coombes, 2007; Matta & Alavalapati, 2006; Thakadu, 2005).

It is indicated that the conception of community in natural resource management as territorially fixed homogenous social entity sharing the same interest – early Social Theory's influenced conception of community – and thus failure to acknowledge community as heterogeneous collective agents; entitlement to resource and authority to manage the resource; and overlooked catchment scale politics needed in NRM have resulted in poor outcomes of CBNRM (Agrawal & Gibson, 1999; Coombes, 2007; Leach *et al.*, 1999).

In general, from the above argument, rational management of natural resource should not consider community as territorially righteous, politically functional, and socially undivided. Communities are composed of multiple actors with diverse interests and priorities in resource use and management. Thus, CBNRM is different from conventional assumption of decentralizing natural resource management to the local level. It rather demands understanding of potential for community to engage in collective action as decentralization may not necessarily result in collective action. Moreover, emergence of collective action is a complex phenomenon and does not happen everywhere (Meinzen-Dick, Raju & Gulati, 2002). Factors underlying individual incentive to participate in collective natural resource managements are reviewed in the next section.

Unlike the conventional theorists' view, it is now widely established that the collective action problem in natural resource management is not an inescapable dilemma though it is not without challenges (Baland & Platteau, 1997; Marshall, 2004; Ostrom, 2004; Varughese & Ostrom, 2001). The above sections' review briefly indicated that under certain conditions communities have the capacities to overcome collective action problems. In this regard, the wider literature shows that attributes of the resource, attributes of resource users, institutional arrangement and other external factors are the four widely agreed determinants conditioning capacity of the community to initiate and sustain collective action for NRM (Matta & Alavalapati, 2006; Ostrom, 1999; Poteete & Ostrom, 2004b).

Literature shows that the explanatory variables of these determinants are many and scholars' disagreement regarding their interaction effect in influencing collective action. For example, Agrawal (2001) in his review, identified two dozens of explanatory variables considered by scholars as important and other scholars (Araral, 2008; Poteete & Ostrom, 2004b) noted disagreement among scholars regarding interaction among explanatory variables.

Regarding the explanatory variables Ostrom (1999) indicated that the concern should not be whether all factors are favourable or not but the relative size of the expected benefits and costs they generate as perceived by individual resource user to make decision to take part in collective action should be the concern. That is, either one factor or a combination of them potentially affects collective action in different contexts. Moreover, she noted

that none of the explanatory variables and/or their interactions works in the same manner in all settings because, for example, resource system may differ from context to context and similarly attribute of resource users such as perceived attributes of resource, and level of dependence may vary among resource users. With regard to institutional arrangement Meinzen-Dick (2009) indicated that the support of a set of institutional arrangements (formal and informal) for collective action in one village which perhaps found being effective may not be replicated in another village. She indicated it is rather better understood in specific local context.

In brief, it is noted that these determinants (i.e. both local and remote outside factors) and the explanatory variables provide a clearer picture when considered in social, political, ecological and economic contexts of a particular setting because resource users consider both remote factors which are out of the control of the community and local factors which are within the control of local community in their context in cost benefit analysis of decisions related to collective action (Husain & Bahattacharya, 2004; Meinzen-Dick; 2009). For example, a study of forest users in Nepal (Shaktikhor) revealed that resource users depend on different products of the forest for their livelihoods, share common understanding of the role and use of the forest, perceive its degradation and the need to overcome its degradation. However, absence of resource users' autonomy constrained their likelihood of collective action (i.e. investing in designing forest management institution) (Schweik, 2000).

In light of the above, the review of explanatory variables is limited to variables considered relevant in the context of this research. The review of explanatory variables below is done separately for convenience. In realization

of the above indicated concerns, however, different explanatory variables are discussed together where their interactive effect on collective action is discussed.

Attributes of the Resource

As already indicated above, the collective action problem in managing natural resource of communal nature such as resource in a watershed can be due to physical characteristics of the resource – difficulty to exclude non-contributor to collective activities for resource wellbeing and subtractibility of resource units. That is, these two physical attributes which characterize most natural resource systems potentially lead to free-riding problems associated with the provision of collective goods or semi-public goods in natural resource management such as conservation measure in a watershed. This, in turn, can result in under provision of management and thus degradation of the resource (Marshall, 2004; McCarthy *et al*., 2004; Poteete & Ostrom, 2004a)

In certain ecological contexts such as hilly landscape, the collective action problem in a watershed is potentially associated not only with common-pool but also in managing privately owned farmlands (Marshall, 2004; Ravenborg & Westermann, 2002). In such contexts, for example, the individual investment on soil conservation practice has both private cost and benefits, while also benefiting others by reducing soil erosion. In this type of setting individual is not only discouraged to provide impure public goods but free-ride on efforts of others. Thus, in such conditions, where the provision of management provides joint outcomes for private use and others, individual decision to provide management happen when perceived benefits of investment outweighs the cost (Marshall, 2004).

In general, no resource system settings are likely to be the same. Similarly, the number and types of attributes conducive for collective action present in a resource system may vary in different contexts. To understand whether collective action (for example, self-organization) will emerge Ostrom (1999) suggests the need to look at the way resource attributes affect the basic benefits-cost analysis of a set of users utilizing a resource. For instance, resource scarcity or level of degradation is noted as being among important resource attributes influencing individuals' incentive for collective action in the management of the resource.

Level of Resource Degradation and or Scarcity

As indicated above, individual decision to take part in collective action for resource management involves cost (for example, time for coordinating activities among resource users, investment in resource maintenance) in expectation of return. In this regard, how NR scarcity/level of degradation condition resource users' decisions to take part in collective action is explained as follows. It is noted that if the resource is abundant, there is very little reason for users to invest in collective action/ organizing. Similarly, if the resource is seriously degraded then the costs of organizing may far exceed the expected benefits and this can discourage users from organizing. Thus, collective action can be expected only when the users sense substantial scarcity but not full degradation (Ostrom, 1999, 2004).

In brief, the general agreement among scholars (for example, Araral, 2008; Meinzen-Dick *et al.*, 2002; Ostrom, 1999; Varughese & Ostrom, 2001) is that resource users will make little effort to participate in collective action until substantial scarcity is observed. The relationship between resource

scarcity/level of degradation and likelihood of self-organization/cooperation is noted being inverse U-shaped.

The widely agreed relationships between resource scarcity/level of degradation and likelihood of collective action, however, may not hold in all settings, as indicated above, that the effect of individual variables or a combination of them depends on the context (Husain & Bahattacharya, 2004; Ostrom, 1999). For example, the case study in India (Rajasthan and Karnataka state) shows that water scarcity is not among factors influencing farmers' organization (Meinzen-Dick *et al*., 2002). They further indicated that unlike in their study, other studies (i.e. Bardhan, 1993 and Uphoff, 1986), showing water scarcity as a key aspect of physical environment that affects farmers participation in irrigation. The above indicated study in Nepal (Schweik, 2000) also reported that though forest users perceived forest degradation and the need to tackle this problem, absence of autonomy constrained their investment in collective action for its management.

Attributes of Resource Users

Generally agreed attributes of resource users conditioning individual's likelihood of collective action for natural resource management are resource users' dependence on the resource, low discount rate, trust and reciprocity among resource users, shared common understanding of resource situation (i.e. attributes of the resource and effect of their interaction), autonomy to make their own rule/self-organize and prior organizational experience (Ostrom, 1999; Varughese & Ostrom, 2001). For example, Ostrom noted general agreement among scholars that resource users who depend on a resource and intend to use their resources over a long period of time and who

have achieved certain levels of trust, and possess some level of autonomy to make their own rules are more likely to participate in collective action (self-organize). In this regard, a study of forest users in Kumaon Himalaya, India asserted that these attributes of the resource users contributed to collective action (i.e. organization of group of resource users and its function) in forest management (Agrawal, 2000).

Whether resource users actually participate in collective action (in this case self-organization for natural resource management) depends on costs and benefits of collective action perceived by critical mass in the community (i.e. those who can change prevailing local institutional arrangement). Further, heterogeneity among resource users (for example difference in wealth status) influences their likelihood of collective action (Ostrom, 1999; Varughese & Ostrom, 2001). Being informed with these, relevant explanatory variables for the context of this research are reviewed below.

Resource Users' Level of Dependence on the Resource

In order to participate in collective action for NRM, resource users frequently have to invest their private , for example, contribute labour or forgo some immediate, short-term benefits to follow and enforce resource conservation rules (Baland & Platteau, 1999; Meinzen-Dick *et al.*, 2004). Their likelihood to undertake these kinds of investments needed for collective management of the resource may be affected by their degree of dependence on the resource (Baland & Platteau, 1999; Ostrom, 1999; Varughese & Ostrom, 2001).

The extent of farmers'/resource users' dependence on the resource as a major source of income may have different effects on their incentive to

participate in collective action. In some cases, it can have a negative impact. In most situations, the more resource users depend on the resource, the more likely they are willing to cooperate for collective action by investing private resources or forgoing immediate benefits to conserve the resource (Varughese & Ostrom, 2001).

In brief, the general argument is, if users of the resource do not obtain a major portion of their income from a resource, the high cost involved in collective action may not be worth their efforts (Araral, 2008; Ostrom, 1999; Thakadu, 2005; Varughese & Ostrom, 2001). However, the level of dependence on the resource and thus incentive for likelihood of collective action can be conditioned by other factors. For example, resource users discounting the importance of future income from the resource (due to alternative income and tenure right) may prefer to exploit the resource without investing on its management (Ostrom, 2004; 1999). A study in northern Ethiopia, Tigray (Gebremedhin & Swinton, 2003) also reported that availability of other alternative income affects investment in soil conservation measure.

We can still find contrary outcomes in the absence of alternative off-farm income due to wealth status of resource users while the resource is an important part of household income. Given the usual present cost implied (example, present contribution of labour in collective activities, forgoing immediate benefits) in collective action, the poor household may not afford diverting the resource from immediate survival of the household in expectation of future benefit (Baland & Platteau, 1999; Ostrom, 1992). Along this line, it is also important to note that different studies, for example

(Shackleton & Shackleton, 2006) show that wealth status and resource dependence is not always in one direction, that is, the poor are more dependent on the resource than the rich.

By the same token, the availability of alternative resources (i.e. to a particular resource) may increase or decrease incentive for collective action, depending on specific situation. For example Tang (1998) reported from a study of irrigation system in Nepal and India that availability of alternative source of water to common-pool showed both negative and positive on farmers' incentive to participate in collective action. In some situations, the availability of alternative source of water reduced tension among irrigators when water flow in the system was scarce, thus, facilitating their long-term collective action. In other situations, irrigators with access to an alternative source of water become less willing to contribute to collective activities, thus inhibiting their log-term collective action. The effect of alternative source in this study is noted as being influenced by other contextual factor such as reliability and relative cost involved in the use of alternative water sources.

As indicated in the previous discussion, a single factor may not stand on its own in conditioning likelihood of resource users' involvement in collective action in all settings. A study in western Rajasthan shows how wealth status, availability of alternative source and absence of institutional support negatively influence collective action and thus degradation of the resource on which the poor depend. In this study, the reluctance of the rich to take part in collective action is associated with alternative pasture on their private land and their capacity to purchase supplementary feed from the market. This in turn led to degradation of the remaining communal grazing

lands on which the poor highly depend. The poor are unable to manage the communal grazing land due to concern for immediate survival and lack of suitable institutional arrangement (Gupta, 1986; Shanmugaratnam, 1996 cited in Baland & Platteau 1999).

Understanding of Natural Resources Interdependencies

Many natural resource management problems are interdependent and go beyond farm or natural resource boundaries that belong to different resource users who often make decisions independently. For example, in hilly landscape, farmlands are often fragmented and belong to different individuals who make decisions with regard to on-farm conservation independently. In such cases decisions on-farm conservation measure may have positive or negative impact on others farm in downstream. Management of such interdependent natural resource in turn demands collective action among individuals (Meinzen-Dick *et al.*, 2004; Ravenborg & Westermann, 2002).

Difference among individuals' perception of natural resource interdependency, however, may influence their likelihood of collective action to manage the resource. In this regard, research in micro watershed management in Colombia Andes has shown the importance of farmer's perception of interdependence of natural resource management problem for further intervention to overcome collective action problems (Ravenborg & Westermann, 2002). Another study of Joint Forest Management Program in India, Tamil Nadu also indicated the importance of individual's valuation of environmental benefit and water supply of forest management in influencing their perception about collective management of the forest (Matta & Alavalapati, 2006).

Understanding Required Coordinated Action

Resource users' understanding of the need for coordinated action with others influences their likelihood of collective action (Matta & Alavalapati, 2006; Ravenborg & Westermann, 2002). The required coordinated action in this context refers to individual interest based voluntary coordinated action. This is cognizant of the failure of state coordinated natural resource management intervention widely documented in past literature (Meinzen-Dick, 2009; Thakadu, 2005).

Research has shown that state interventions in natural resource management are often perceived by local communities as state appropriation of the resource as state often alienated customary right of local communities and declared ownership to the resource. For example, a study in Ethiopia has shown that communities' perception of state intervention in natural resource management as state appropriation of the resource (FAO, 2003). Other studies in Ethiopia also indicate that farmers occasionally dismantled conservation structures built on their farmlands through state intervention program (Shiferaw & Holden, 2001).

Moreover, research shows that state intervention has resulted in a dependency on the state for natural resource management which is often ineffective as already indicated. For example, a study conducted in northern Ethiopia (Tigray) shows direct public investment in conservation appeared to undermine individual incentive to invest in conservation measures (Gebremedhin & Swinton, 2003).

Past Collective Action Experience

Here, past collective action experience refers to voluntary participation in collective action. Government enforced organization for resource management can be perceived negatively among local communities (Araral, 2008). It is also indicated that involvement in collective action for natural resource due to fear of power in undemocratic society is liable to erosion, resulting in negative consequence on the resource (Pretty & Ward, 2001).

With regard to voluntary based involvement in collective action, it is noted (Ostrom, 2004, 1999) that voluntary-based experience in collective actions such as local organization enhances resource users' understanding of rules and strategies needed for collective natural resource management. Further, resource users are more likely to agree upon rules whose operation they understand from prior experience than upon rules that are introduced by external actors and are new to their experience.

In brief, the literature shows the likely positive contribution of voluntary-based collective action experience on individuals on future intent of collective action. Studies by Ostrom and Varughese (2001) also show prior experience in cooperation and leadership influencing resource user's interest in collective action. For example, in this study of 20 villages in Chota Nagpur, Orissa, India, showed that community-based forestry efforts were more successful in villages with pre-existing local organization. Other studies of canal irrigation system in India (Rajasthan and Karnataka) also show the positive impact of prior organization and leadership on collective action (Meinzen-Dick *et al.*, 2002). In a study in western Ecuador, Lome Alta also

reported positive influence of prior organizational experience of forest users on their likelihood of collective action (Gibson & Becker, 2000).

Social Capital

The central role of social capital in widely popularized collective action in local rural development and NRM is well documented in the literature (Ostrom, 1992; Pretty & Ward, 2001). This research limits itself to two aspects of social capital indicated by Pretty and Ward among others: relationship of trust, and reciprocity and exchange. They indicated trust lubricates cooperation by reducing transaction cost which liberates resources. That is individuals who trust one another save time and money that may be needed to invest in monitoring one another as trust creates social obligation of acting as expected by others. Reciprocity and exchange also increase trust. Reciprocity in general may include specific reciprocity which is a simultaneous exchange of items of roughly equal value. The other form of reciprocity is diffused reciprocity referring to continuous relationship of exchange without necessary exchange of payment at a given time but repaid over time and balanced. This contributes to long term development of obligation between people which can be an important part of achieving positive environmental outcomes.

In general, the literature (Meinzen-Dick *et al.*, 2002; Ostrom, 1992; Pretty & Ward, 2001) indicates that social capital has contributed to the success of collective NRM. For instance, Pretty and Ward indicated in their review of world wide experience that the success of collective NRM is associated with the presence and operation of social capital. This is mainly because social capital lowers the cost of working together and facilitates

collective action. That is people will have confidence to contribute to collective activities, knowing that others will also do the same. They will also be less likely to engage in selfish private activities that may have negative impact such as NR degradation.

It is also noted that trust among resource users along with resource users' right or autonomy to self organize is among a minimum requirement for likely emergence of voluntary collective action for NRM in situations where the local authority that controls free-rider behaviour is absent or not effective. This is because resource users who trust one another to keep agreement and use reciprocity in their relationships face lower expected costs for collective action (monitoring and sanctioning) over time (Ostrom, 1999). Ostrom (2004) also indicated that if people suspect that others will take advantage of them without reciprocating, no one will initiate costly collective action.

A study conducted in south-eastern Australia examining farmers' likelihood of collective management of water logging and salinisation problems, illustrated importance of trust for collective action. In this case, farmers' adoption of on-farm irrigation technology provides a number of collective good such as lowering water tables, and consequent reduction of soil salinisation and water logging across four districts. In other words, the irrigator obtains a private benefit for adoption of the technology, but also provides external benefit for other farmers. The study found trust that others will also cooperate to be among the key factors influencing farmers' likelihood of collective action (Marshall, 2004).

It is also important to note the underlying confusion between participation in organization and social capital. Frequent involvement in

association as indicator of social capital may not guarantee collective action (Meinzen-Dick *et al.*, 2004). Individual involvement may be temporarily due to lack of other opportunities (Leach *et al.*, 1999) or due to fear and power, for instance, in undemocratic societies. Such type of social capital which is not based on trust but on fear and power are liable to erosion with negative consequence on NRM (Pretty & Ward, 2001).

Before closing this section it is important to note that "trust takes time to build but can easily be broken … Social capital is not automatically or spontaneously produced. It must be crafted" (Ostrom, 1992 p. 38) and it can be created where it has been missing (Pretty & Ward, 2001). The latter authors indicated that social capital is self-reinforcing when reciprocity increases connectedness between people, leading to greater trust, confidence and capacity to innovate. They further supported their argument with extra ordinary expansion of collective management programs throughout the world (example, community management, indigenous management) which advances in social capital creation.

Differences among Resource Users

It is indicated that low level of performance of CBNRM and/ or short life of collective action in CBNRM is due to presumed homogeneity among community members while they are dives (Agrawal & Gibson, 1999; Coombes, 2007; Matta & Alavalapati, 2006). These authors further noted that there can be deep-rooted socioeconomic, cultural and political difference within communities with the potential to pose challenge in collective NRM. The literature on influence of heterogeneity factor (i.e. difference among resource users) on collective action is vast and touches on a number of issues

such as political power, wealth status, cast, ethnicity, religion, and location of resource users within the resource system. Moreover, the influence of heterogeneity on collective action is unresolved. For example Ruttan (2008) indicated that the question of how economic and socio-cultural heterogeneity influence commons management has been receiving increasing attention, but without resolution. This research, considering the relevance of these factors in its context, limits itself to review of influence of wealth status and location of resource users within resource system.

Wealth status

Household's wealth difference (which in different context refers to accumulated asset such as land, herd size, other physical asset) has been a central focus of a considerable number of theoretical and empirical research (Varughese & Ostrom, 2001). The impact of wealth heterogeneity on collective action is still contentious (Ruttan, 2008). Theoretical arguments are made on how asset heterogeneity is positively, negatively, or unrelated to successful efforts to regulate the use of common-pool resource. Some theoretical and empirical studies lead to a presumption of a U-shaped relationship (Baland & Platteau, 1999; Ostrom, 1999; Varughese & Ostrom, 2001).

Empirical research has shown different influence of wealth status in different contexts. A study in India, Chota Nagpur, Orissa, (Varughese & Ostrom, 2001) shows that some inequality of wealth provided incentive for certain individuals in the community to bear disproportionate share of costs associated with organizing collective action for community-based forest management. Further, indicated that the contribution of relatively wealthy

individuals was associated with prior experience of cooperation and leadership. Too much wealth difference, however, diminishes shared interest in collective goods due to subsequent capture by the elite (Baker, 1998 cited in Varughese & Ostrom, 2001).

Contrary to the above finding, a study of the Fulani from Mali (Vedeld, 1997 cited in Varughese & Ostrom, 2001) shows heterogeneity in wealth did not prevent common interest among elite and subordinate groups in collective agreement. This case is indicated as being associated with underlying similarity of economic interest (i.e. a mix of agriculture and pastoralism) among political elites (consisting clergymen and cattle-rich craftsmen) with a possibility of assuming leadership and thus providing authority structure for rule enforcement. An interesting scenario in a similar setting indicates that difference in economic interest (i.e. agriculture versus pastoralism) with regard to using common-pool resource resulting in conflict. Another Study in Philippines (Araral, 2008) irrigation association, wealth status of households has shown negative effect on likelihood of collective action.

Other scholars (Baland & Platteau, 1999) also noted contextual impact of wealth status on collective action. In south India, the success of irrigation system was as a result of large land holders who decided to take the larger share of organizational costs (Wade, 1987, 1988 cited in Baland & Platteau, 1999); and in Lesotho, the success of rotational grazing introduced in the village was as a result of the local chief with the greatest number of livestock deciding to take livestock to mountain areas out of the village (Swallow & Bromley, 1995 cited in Baland & Platteau, 1999). On the contrary, findings in Mali indicate that more endowed absentee herders (town dwellers such as

traders and civil servants, emerged as a result of the 1970s drought of great Sahelian where pastoralists where forced to sell their livestock to such herders) use their endowment to disrupted collective management of range lands (Shanmugaratnam *et al.*, 1992 cited Baland & Platteau, 1999).

In sum, it is indicated that theory in general suggests heterogeneity should be expected to have a negative effect on collective action, usually measured as levels of participation. However, economic heterogeneity can be expected to have positive effects on the provision of collective goods when two specific conditions hold true. The first context is in a setting where the more endowed/wealthy individuals gain from providing collective good, and thus willing to pay a greater share of the costs. The second context is in a setting where the actions of one or a few individuals provide sufficient positive externalities to provide the good for all (Ruttan, 2008). Ruttan supports this scenario based on 94 cases of common resources (i.e. irrigation system and fisheries) from across the world, including both developed and developing countries. Finally, the suggestion made by the author for future study on likely influence of economic/wealth heterogeneity on likely initiation of collective action is found coincidental with this research.

Location of Resource Users within the Resource System

Location of resource users within natural resource system is another heterogeneity factor considered in collective action studies (Saha, 2004; Varughese & Ostrom, 2001). Households differently located in a watershed, for instance, in upstream and downstream, may have different levels of externalities to manage the resource hillside common land with downstream impact on farmlands. For instance Swallow *et al.* (2004) indicated the soil

erosion on upstream farm can have both positive and negative outcomes (externalities). It can negatively influence by transporting pesticides that pollute others' farm in downstream. Positive outcome by transporting fertile soil to others farm on downstream.

Although much evidence is not com-across in the literature with regard to the influence of location on likelihood of collective action, it is noted as (Varughese & Ostrom, 2001) determined by local context like other heterogeneity factors, i.e. wealth status. Further, they noted that heterogeneities do not have determinantal effect on likelihood or successes of collective action, as the condition under which certain types of heterogeneities undermine or enhance collective action remain unknown.

From an institutional perspective Varughese and Ostrom (2001) noted that the difference among users can lead to difference in interest which may lead to multiplicity of outcomes that are impossible to predict in the absence of knowledge about institutional arrangement. Community can overcome heterogeneity through institution (Agrawal & Gibson, 1999). For example, in their (Varughese & Ostrom, 2001) finding from a study of community forestry in Nepal, regardless of group differences in terms of wealth and location with respect to the resource and other heterogeneity factors, people participated in collective action where they obtained substantial benefits in return. They also noted that in the areas of high location difference, they managed to overcome this difference by designing different membership rights and duties.

The Influence of External Factors

Market Opportunity

The influence of market access on collective action is diverse. While better market access may increase the value of the natural resource and the return from managing the resource effectively, thus favouring incentive for collective action, better market access may also decrease the incentive of individuals to abide by community rules by increasing the opportunity cost of labour or by providing more alternative 'exit' options, making enforcement of rules more difficult (Araral, 2008; Gebremedhin *et al.*, 2002). Gebremedhin *et al.* in the study of grazing land management in Northern Ethiopia (Tigray) found that market distance has positive influence on collective action. In other words, those closer to a market were found to be lees likely to take part in collective action mainly due to high opportunity cost of labour or exit option. Becker and Rosario (2000) in Bolivian Amazon also reported that improved market opportunity increased exploitation of forest. They also reported that due to pressure of market, forest users' disproportionate benefit obtained from forest exploitation resulted in affecting trust among them which in turn influenced collective action for its management.

In general, although market influence is not always positive on likelihood of collective action, poor market access increases transaction cost of agricultural marketing and high transaction cost generally causes farm-households to rationally settle for production of low return subsistence crop. This in turn may lower the incentive for household to invest in resource conservation by cooperating with others.

Availability of Off-farm Income Source

Outside economic opportunity in a given time period may have impact on resource users' preference of time horizon in resource use and thus influence incentive for resource conservation. Those currently having and anticipating alternative income consider present and future returns from conservation with benefit from alternative source. Those with alternatives may have incentive to overexploit or disregard conservation while those without alternative opportunity may attach higher value to the state of the resource (Baland & Platteau, 1999; Ostrom, 1999). Furthermore, the likely contributing factor in such scenarios is important, for example, Ostrom (2004) indicated that lack of trust on others and insecure right to the resource may result in individuals to have high discount rate about resource and thus may think of short term exit than initiating costly collective action.

The relationship between wealth distribution and outside alternative is ambiguous. The wealthy may have better opportunity due to their endowment and social network while less resource base of the poor forces them to seek outside employment. Due to the risky employment condition, the poor are keen to preserve local common resources. For example, poor migrant workers' have interest in management and their right of CPR in their native village while the rich migrant tend to move permanently to new locations and detach from native villages (Baland & Platteau, 1999).

Availability of alternative off-farm income sources can increase opportunity cost of labour which in turn influences investment in resource conservation. For example, a study in North Ethiopia (Tirgray) concluded that collective management of grazing land was more likely in communities with

was more distance from the market than in communities closer to the market. This is noted due to lower opportunity cost of labour or limited exit option for communities located in far distance from market (Gebremedhin & Swinton, 2003).

Institutional Arrangements

Wide range of literature from policy perspective shows that institutional arrangements (at different levels) are the most important among the four factors underlying resource user's incentive for natural resource conservation (Agrawal, 2001; Agrawal & Gibson, 1999; Coombes, 2007; Matta & Alavalapati, 2004; Ostrom, 1992; Thakadu, 2005). This was mainly the case because of the fact that institutional environments (internal and external) certainly play an important role in shaping how individuals within a community interact with each other and with natural resources (Agrawal, 2001; Agrawal & Gibson, 1999; Leach *et al.*, 1999). Research also shows that possible collective action problems that may arise due to other factors can be solved through institutional arrangements. For instance, a study in Nepal (Varughese & Ostrom, 2001) showed that good institutional design enabled overcoming collective action problem which could arise from difference among individuals in terms of location with respect to natural resource and wealth status. In this study, designing rules stating proportionate contribution and share of benefit for individuals differently located with respect to the resource ensured their collective action in its management.

In general, there is no dispute in the literature with regard to the central role of institutional arrangements on individual incentive and thus on ensuring sustainable management of natural resources. However, the influence of

institutional arrangements on individual incentive for natural resource management is widely argued from different perspectives and thus implies varied approaches to institutional analysis. To this end, it is useful to indicate a review of institutional arraignment from the perspective of different disciplines and empirical evidence is far beyond the scope of this research to be reviewed entirely. This research, thus, within its context, limits itself to influence of institutional arrangements (exogenous and endogenous) on resource users' incentive for NRM and thus on likelihood of collective action for NRM.

Literature (Agrawal, 2001; Leach *et al.*, 1999; Meinzen-Dick, 2009) also suggested the need to consider institutional arrangements at these two levels to have a clearer picture and to suggest the sort of institutional arrangements needed in a particular context. Moreover, a more accurate understanding of these institutions as dynamic entities is more likely to lead to appropriate strategies than merely applying rigid formulations of institutional engineering – particularly those that import and impose foreign institutions.

Exogenous Institutions

Property Right

Among external institutional factors, the influence of property rights on individual incentive and authority to manage the resource is now a solidly established fact (Kerstin, Karraan & Dodwar, 2009). In this regard, recent literature shows that studies in Africa (Mwangi & Meinzen-Dick, 2009) in general and Ethiopia in particular (Crewett, Bogale & Korf, 2008; Dininger *et al.*, 2008) usually pursued along tenure security from the perspective of ownership influencing individual investment in NRM. That is, state ownership

underlying individual disincentive to invest in NRM. In Ethiopia, it is shown that the argument of state versus private ownership has been dominant and class antagonistic (Crewett & Korf, 2008).

Along the above mentioned ownership perspective of tenure security and its influence on individual investment in NRM, different empirical evidence can be cited from past studies conducted across different sub-Saharan Africa countries across individual level investment on farmland conservation measures and communal resource such as forest and pasture land (Deininger & Jin, 2006; Gebremedhin & Swinton, 2003; Thakadu, 2005). However, recent reviews of scholars writing in Africa (Kirsten *et al.*, 2009; Mwangi & Meinzen-Dick, 2009) in general and Ethiopia (Crewett *et al.*, 2008; Dininger *et al.*, 2008) in particular show that focusing on property right from the perspective of ownership is less precise to represent practical reality in the context of Africa as discussed below. Moreover, it is indicated that most studies focused on right to land (land tenure) while rights to other natural resources such as tree and water is equally important, especially in watershed management. The exclusion of such resources complicate watershed management as right to land often does not coincide with rights to tree and water (Mwangi & Meinzen-Dick, 2009; Swallow *et al.*, 2004).

Property right is not mere ownership to the resource, it rather contains bundles of rights which can be categorized as: access and use right (the right to enter and withdraw benefit from the resource); management right (the right to regulate internal use patterns and transform the resource by making improvement); exclusion right (the right to determine who will have access right, and how the rights may be transferred); and alienation right (the right to

sell or lease either or both of the above collective choice rights). Moreover, individual right to the resources includes responsibilities to do certain things to maintain right to the resource as well as others commensurate duty to observe this right (Schalger & Ostrom, 1992). In other words, property rights are meaningless unless enforced and others respect one's property right (Kerstin *et al.*, 2009; Mwangi & Meinzen-Dick, 2009).

Tenure rights are not exclusive to be secured as it overlaps (Swallow *et al.*, 2004; Toulmin, 2008) and the above mentioned bundle of rights can be held by different actors at different times and spaces. For example, a farmer may have the right to plant crop on a piece of land, but anyone can cross the land to get water, pastoralists may have the right to graze their herds on the land in the fallow season, family elders may have the right to allocate or reallocate the land, and the state may claim ultimate ownership of the resource. Such kind of overlapping rights, co-existence of customary and statuary rules - commonly called legal pluralism – characterize African tenure system (Mwangi & Meinzen-Dick, 2009). Other research (Toulmin, 2008) in sub-Saharan Africa in general report rights to land include first settlement, conquest, long occupation and use, governmental allocation and market transaction.

In the light of the above, property right and its influence on individual incentive is better explained in the context of sub-Saharan Africa by looking into how bundles of rights individuals hold, their enforcement and institution backing the right claim influences individual incentive to invest in NRM (Crewett, Bogale & Korf, 2008; Kerstin *et al.*, 2009; Mwangi and Meinzen-Dick, 2009).

It is indicated that the co-existence of customary rules and state rules, which often contradict one another, results in conflict and tenure insecurity and thus affect individual incentive to invest in natural resource management. This is mainly because right claim by individual is as strong as the institution backing the right which also varies in time and space. For instance, customary rule is stronger in remote areas than state rules, while state rule is stronger than customary rule in areas closer to cities (Mwangi & Meinzen-Dick, 2009). Right claimed based on conquest can be contested when regime changes (Toulmin, 2008). Moreover, individuals with opportunistic behaviour may call up on different sources of legitimacy at different times and space, especially when the resource is scarce and under high competition (Ostrom, 1992; Toulmin, 2008).This, in general, shows the possible influence of legal pluralism on right claim and hence on individual incentive to invest in NRM. A study in Mali (Benjamin, 2008) shows the challenge legal pluralism to decentralization of natural resource management at the local level. Another study in South Africa (communities surrounding Mkambati) also shows that while communities are legally prevented from hunting in government reserve areas some insisted on calling on customary right being backed by civic organization and their local chief (Leach *et al.*, 1999)

As indicated above, different stake holders may have different rights over the same resource at different times and space and thus, the three distinct category property right regimes may not exist neatly in practice. For instance individuals and communities frequently have access, use and even decision making rights on land that is officially government (public). Similarly individuals have use right on common property while state may have some

regulatory or decision making over it. Even on private property, others may have certain use right and the state claim regulatory rights over it (Mwangi & Meinzen-Dick, 2009). For example, a study conducted in Uganda which included forest under state private and common property regimes shows the forests degrading and also being well managed under all these regimes. The study concluded that successful management of the forests under all these regimes is associated with clearly defined rights, enforcement and monitoring (Banana & Gammbya-Sembajjwe, 2000). The same is reported from the review of over 200 forest cases across the world that monitoring and sanction resulted in better forest situation (William & Ostrom, 2005 cited in Mwangi & Meinzen-Dick, 2009).

In general, from the above works looking into the influence of tenure security from the perspective of owners on individual incentive is less precise to represent reality in contexts such as Africa. It is noted that tenure security should include several components including excludablity (the ability to exclude those without rights), duration (temporal extent of one's rights) assurance (institutional framework capable of enforcing individual rights), and robustness (the number and strength of the bundle of rights an individual processes) (Mwangi & Meinzen-Dick, 2009).

While provision of rights to resources and its enforcement is not debatable in influencing individual incentive, provision of uniform rules across different social and ecological settings by states may not bring desired change on NRM and even may result in negative consequence on the resources (Ostrom, 2004). This is due to the fact that most resource management requires collective action among resource users and enforcement

of rules may also result in some individuals to lose from law enforcement whose cooperation may be needed. To this end, the argument of Ostrom implies the need for context-based understanding of likelihood of collective action among resource users and how such provision influences incentives rather than just expecting that law enforcement would bring collective action among resource users.

In the above perspective, recent studies show that the current government of Ethiopia, regardless of continued state legacy of ownership, has made noticeable difference concerning bundles of rights unlike its predecessors (Crewett *et al.*, 2008). In brief, it is indicated that despite some problem of clarity in the proclamation and lack of detail policy guidelines, the current policy which decentralizes power to regional governments contains much improvement in bundles of right including management responsibilities as a condition to maintain rights, for example, to maintain life long right to land. Nonetheless, it has been shown that lack of full implement and monitoring mechanism weakened the provision that could enhance sound natural resource management (Adnew, 2008; Crwett & Korf, 2008).

Self-organisation Right

Provision of strong tenure and improvement of right to natural resource is perhaps not enough in ensuring sustainable NRM without coordination among resource users. Self-organisation among resource users and thus local level institutional arrangements also need to be enhanced (Roe *et al.*, 2009). This is mainly, as indicated in the previous discussions, due to the fact that ecological and intercommunity dynamics made coordination among individual resource users a necessity for its sustainable management. In this regard, the

literature shows that external institutional arrangement can facilitate or constrain resource users' / farmers' self organisation capacity (Meinzen-Dick, *et al.*, 2002; Ostrom, 1999, 2004; Williams, 1998).

Larger regime (state authority) can facilitate self-organisation by providing accurate information about the resource system, by facilitating opportunities in which resource users engage in discovery and conflict-resolution process, and providing mechanism to back up local monitoring and sanctioning efforts (Ostrom, 1999). In general Ostrom concluded that "The probability of participants adapting more effective rules in macro regimes that facilitate their efforts over time is higher than the regimes that ignore resource problems entirely, or at the other extreme, presume that all decisions about the governance and management of resources need to be made by central authorities" (p.4). Ostrom (1992) earlier indicated that recognition of right to self-organize by the state is a minimum requirement underlying individual likelihood of self-organization for NRM. Resource users with autonomy reduce cost of organising. In a situation where resource users have little autonomy, they may face those disagreeing with locally agreed rules and may impede efforts by appealing to higher-level official (Ostrom, 1999). In other words, if local organisations' autonomy is not acknowledged by state authority, its members may tend not to be accountable for decisions of its leader (Ostrom, 1992).

In brief, stronger rights to NR and state acknowledgement of self-organisation of local groups enhance both their incentives and authority for managing the resource (Kerstin *et* al., 2009; Meinzen-Dick, 2009). In this regard, the above indicated study in Ecuador pointed out that resource users'

autonomy contribute to their likelihood of collective action (Gibson & Becker, 2000) while in case Nepal absence of autonomy contributed for resource not to seek for collective management of forest (Schweik, 2000). Moreover, Ostrom (2004) emphasized along with providing autonomy, the need for short bureaucratic process for self-organisation because individuals who lived in authoritarian regime where independent action is considered as a threat to its regime may remain nervous even after the regime changes.

The need for voluntary community based self-organisation is due to lack of feeling of ownership in state initiated organisations. Studies in India show that self organised associations have more feeling of ownership and cooperation than government organised associations (Araral, 2008). The poor outcomes in most cases of community-based conservation program are mainly due to "supply-side" view of conservation – devolving to local actors only the authority to implement rules created elsewhere. Right to make rules and to mediate dispute are rights which government agencies generally reserve for themselves (Agrawal & Gibson, 1999). A recent study of sub-Saharan Africa CBNRM also showed such problem contributing to its poor performance in most cases (Roe *et al.*, 2009). Moreover, it is noted that in the situation of some countries (Cameroon, Ghana, Kenya, Namibia, Tanzania and Zimbabwe) where authority to manage natural resource is fully devolved to or jointly designed with local community notable ecological, economic and institutional achievements are brought about. For example in the case of Ghana, a study of western Ghana forest area that has been demarcated under the Community Resource Management Area Policy of 2000 reported a positive impact of devolution of authority to local community. In this case, the

participating communities are given full authority to control access and harvesting of resources within their management area. The study also reported a reduction in the illegal activities in the areas under this type of management (Murphree, 2008 cited in Roe *et al.,* 2009).

The recognition of local self-organisation, however, does not mean elimination of government involvement; local community may need the involvement of national or regional government for protection against outsiders, for arbitration or enforcement of formal government agency in case of intracommunity dispute and for technical assistance on dynamic ecology (Agrawal & Gibson, 1999; Meinzen-Dick, 2009; Ostrom, 1992). For example, in northern Kenya, the role social organisation plays in negotiating differences among multiple resource users who rely on single management of the resource is noteworthy. Here social organisations, which back different users, are used in harmonizing discussions without providing any one level of social organisation exclusive decision-making authority, thus preserving aspects of flexibility without conflicting with cultural patterns. Moreover, formal institution (administrative structure), which facilitated dialogue between social actors and ratify decision, is reported contributing to the success (Haro, Doyo & McPeak, 2004).

A similar study conducted in Southwest of Ethiopia (Kafa) indicated that the 1975 Land Reform created involvement of local organisation along with state sponsored ones in tenure administration. In this case local organisations helped in adjusting the rule to the interest of local community and in assisting implementation of tenurial provision, given the limited capacity of the government (Zewdie, 2004). Another study in Eastern Ethiopia

also reported a positive outcome of the involvement of local organisations in NRM (Bogale *et al.*, 2006). Disregard to such benefit of local organisation, it is indicated that in different regimes of the country, local organisations are either discouraged or neglected in development process and replaced by state-initiated and state-controlled ones which have been mismanaged and abused (Adal, 2000; Zewde, 2000). Zewde indicate that even though the degree differs, institutional building in the country has been top-down in all the three regimes (i.e. Feudal, *Derg* and current EPRDF government).

Endogenous Institution

The endogenous institutional support in this research is what is implied in wider literature as internal or grass root level institutional environment defining resource system in terms of area and members, allocation, inputs, and contributions; monitoring and sanctioning; and mechanisms of conflict resolution (Meinzen-Dick, 2009); rule-being in use by individuals to organised repetitive activities that produce outcomes affecting those individuals and potentially affecting others (Ostrom, 1992). Other scholars (Leach *et al.*, 1999) also noted that institution contains not only formal written rules but also informal institution such as "regularized pattern of behaviour" which emerges as a result of underlying structure or sets of rule in use.

Working rules may have multiple sources including informal and formal institutions (Mwangi & Meinzen-Dick, 2009; Ostrom, 1992). They may or may not closely resemble formal laws that are expressed in national legislation, administrative regulation and court decision. In addition, as they are not equated to written laws or regulations, they are not observable

phenomena but they can be observed through the activities organized by these rules (Ostrom, 1992).

Working rules are used to determine ranges of issues concerning the interaction between natural resource and resource users – for example, individual access to resource which in turn influences incentives to contribute for its management (Ostrom, 1992; Leach *et al.*, 1999). These rules may assign *de facto* rights and duties that are contrary to the *de jure* rights and duties of a formal legal system in situations where formal rules are not enforced (Schalger & Ostrom 1992). In other words, if the legal regulations specifying access rights are not enforced and the rule-in-use allow free access to the resource for all (Ostrom, 1992). This may imply that there is no difference between those putting effort to resource management and those who are not.

Similar to the ideal rationale of the formal institution, the rule-in-use (which actually derived from formal and informal institution) can also carry incentive for a particular group in a community (say an association of farmers group based common interest) while excluding others by determining access to resource and penalties for those violating the rule of the association (example, social disapproval to be member of the association) (Ostrom, 1992). Furthermore, Ostrom (1994) indicated the availability of low cost conflict resolution mechanism and supportive local leader to enhance the incentive for collective action.

It is also indicated that changing the formal institution (regulation) may not automatically bring a change in rule-in-use and thus incentive for those being affected by rule-in-use (Leach *et al.*, 1999; Ostrom, 1992). For example,

Ostrom noted that in irrigation system, a new regulation that greatly increases the penalty for illegally diverting water may produce entirely different changes in incentives than presumed. The threat to heavy fines may be used by officials to collect bribes from farmers violating rules (ignoring the irrigation infrastructure). As a result, the rule-in-use may change so that diversions considered illegal by formal regulations may continue in practice as long as payments are made to the appropriate officials.

In light of the above, it can be concluded that incentive facing individuals in resource management cannot be determined based on proclaimed laws and regulations without examining how those regulations are perceived by resource users and how they fit into the physical, economic, and social context of a particular system (Meinzen-Dick *et al.*, 2009; Ostrom, 1992). Moreover, different individuals' claim of legitimacy of right to the resource as well as effective use of the claim can be based on different institutions – formal and/or informal (Leach *et al.*, 1999, Ostrom, 1992; Toulmin, 2008). For example, case study in South Africa (communities surrounding Mkambati) shows that while communities are legally prevented from hunting in government reserve area, but some insisted calling on customary right being backed by civic organization and their local chief (Leach *et al.*, 1999).

Conceptual Framework

The conceptual framework developed for this study (Figure 1) is informed by the theory of collective action (Baland & Platteau, 1996; Ostrom, 1990; Varughese & Ostrom, 2001), antithesis of early social theory-influenced view of community in NRM as static and homogenous social entity sharing

common interest (Agrawal & Gibson, 1999; Coombes, 2007; Leach *et al.*, 1999) and institutional analysis (Meinzen-Dick, 2009; North, 1990; Ostrom, 1992).

A considerable amount of literature suggests conditions associated with community's likelihood of collective action in natural resource management and its sustenance. Analysis of individual incentives to contribute to collective action for common-pool resource management has been the most dominant approach to study determinants of likelihood of collective action and its sustenance in management of this resource. Underlying these incentives is individual perception of costs and benefits of contributing towards collective action, which in turn can be influenced by factors related to attributes of the resource and resource users, institutional arrangements mediating interaction between resource users and the resource and among themselves, and other external factors such as market opportunities and availability of alternative off-farm income sources (Agrawal, 2001; Baland & Platteau, 1996; Coombes, 2007; Hussain & Bahattacharya, 2004; Ostrom, 1990, 1999; Varughese & Ostrom, 2001).

The empirical literature (for example, Hussain & Bahattacharya, 2004; McCarthy *et al.*, 2004) further claims that what constitute collective action and its determinants vary in different settings and thus the need for exploring collective action and its determinants in specific local economic, social, political and ecological context is equally emphasized. Moreover, analysis of likelihood of emergence of collective action where it is missing (Meinzen-Dick *et al.*, 2004) and analysis of collective action in natural resource system

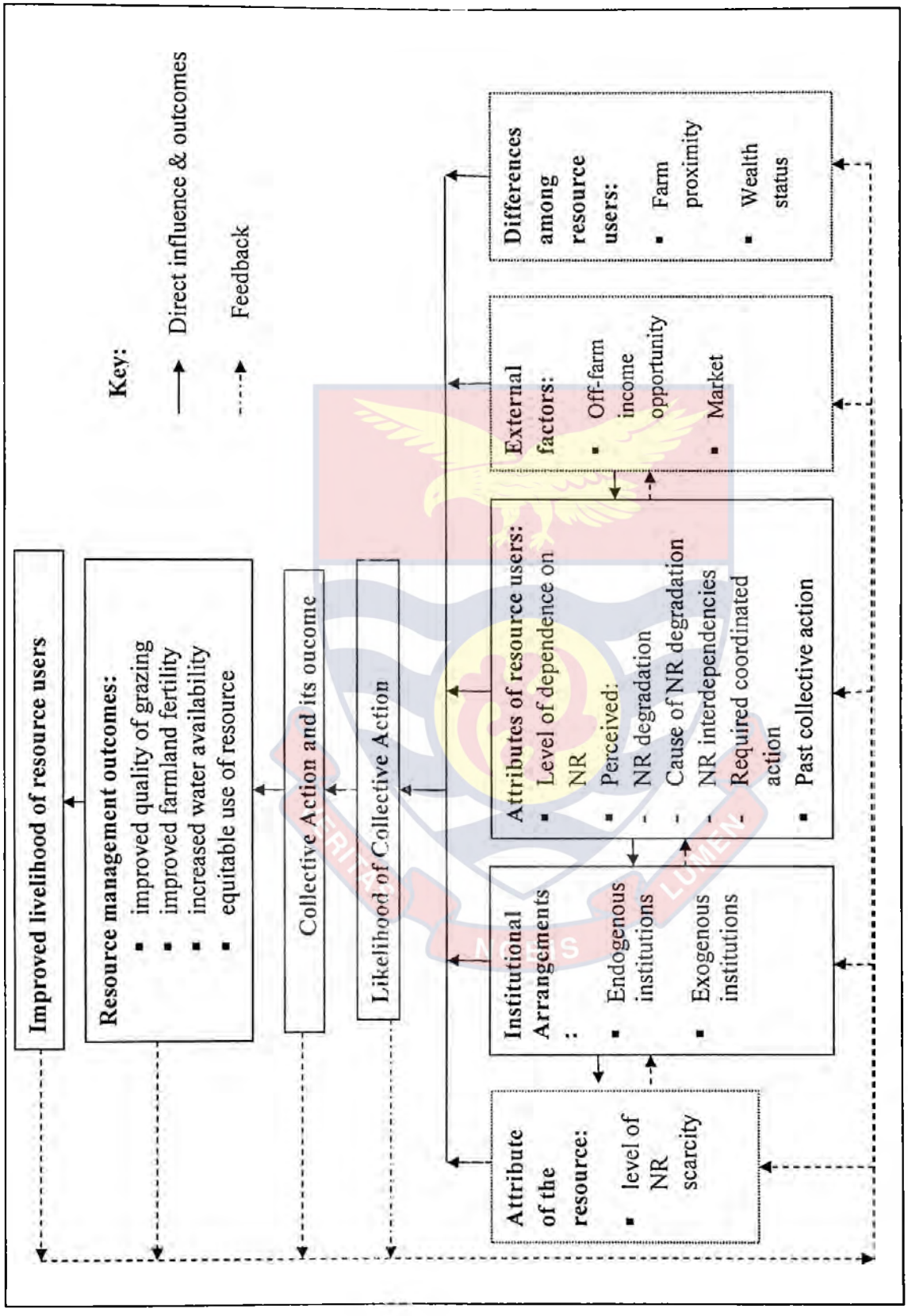

Figure 1: Likelihood of Collective Action Framework for NRM (Source: Authors construct)

in watershed facing typical collective action problem like that of common-pool resource are overlooked (Kerr, 2007).

In light of the above, there is a need for a context-specific and comprehensive alternative framework that can accommodate the likelihood of the emergence of collective action and determinants underlying incentive for collective action in specific local settings. In brief, this alternative framework, which is developed based on past achievement should explicitly and specifically account for local level and remote factors that influence households' incentive for collective action in NRM and should not assume the presence of collective action. It considers mainly five major groups of variables assumed to condition individual's cost benefit analysis to take part in collective action and in turn decision to collective management of resource at local level by the community. These are variables related to:

- Attribute of the resource:
  - Level of natural resource scarcity
- Attributes of resource users:
  - Level of dependence on natural resource,
  - Perception on natural resource degradation,
  - Perception on cause of NR degradation,
  - Perception on NR interdependencies,
  - Perception on required coordinated action,
  - Past collective action experience,
  - Social capital (trust on cooperation of others).
- Institutional arrangements:
  - Endogenous institutions,

- Exogenous institutions.

- External factors:
  - Off-farm income opportunity,
  - Market

- Differences among resource user:
  - Farm proximity to commons,
  - Wealth status

It also contains the ultimate outcomes of collective action in terms of:

- Resource management outcomes:
  - Improved quality of grazing,
  - Improved farmland fertility,
  - Increased water availability,
  - Equitable use of resource.
- Improved livelihood of resource user/households.

The attribute resource in the study mainly refers to level of natural resource scarcity faced by resource users based on situation 10 years ago. The attributes of resource users refers to their level of dependence of natural resource, their perception on NR degradation, causes of NR degradation, NR interdependencies, required action to overcome NR degradation, past collective action in NRM and social capital (trust on other resource users cooperation for collective NRM).

Institutional arrangements are endogenous and exogenous institutions. Endogenous institutional arrangements constitute regularized practices (rules-being in use) with respect to access to the resource and conflict resolution

mechanisms. Exogenous institutional arrangements constitute bundles of rights to the resource, rights to self-organise and enforcement of these rights.

Differences among resource users are differences with respect to farm proximity to the common NR and wealth status.

The external factors include the influence of availability of off-farm income (participation in off-farm activities) and market. Cropping pattern (more cash crops versus more food crop production) was proxy indicator of market influence.

The variables as indicated in the figure, (for example, as indicated in feedback mechanism) re-enforce each other. For instance, attribute of the resource/level of NR scarcity, to be determinant for resource user's incentive to take part in collective action, depends on institutional arrangements, resource user's attributes, external factors and difference among resource users. In other words, a resource user may face some level of NR scarcity. The incentive for this resource user to take part in collection action can be influenced by endogenous institutional arrangements (prevailing regularized practices of resource use, conflict resolution mechanisms), exogenous institutional arrangements (poorly defined rights to the resource, rights to self-organize), his/her perception on natural resource interdependencies, availability of alternative off-farm income and farm proximity.

Summary

The review of literature considered a multitude of issues which include basic concepts of collective action problem in natural resources managements, early conventional top-down approach employed to overcome the collective action problem and its negative outcomes on the natural resources,

decentralization approach as alternative solution and its challenges in ensuring collective action among resource users, and determinants conditioning collective action among resource users. The salient points are:

- Conventional centralized approach to NRM results in further degradation of the resource than its management.
- Ensuring sustainable management of natural resources demands voluntary collective action among resource users.
- Collective action in NRM is not always a problem but it is challenging to happen everywhere.
- There is no single blue print to solve collective action problems and thus ensure collective action among resource users.
- Under certain conditions, communities/resource users have the capacity to overcome "commons dilemma" in NRM and thus initiate and develop collective action for its management.
- Resource users perceived cost and benefit of collective action influence their incentive to take part in collective action.
- The incentive to make decision to take part in collective action for NRM is influenced by factors related to attributes of the resource and resource users, institutional arrangements (exogenous and endogenous), differences among resource users and other external factors such as availability of off-farm income opportunities and market.
- The level of influence of factors underlying incentive for collective action varies in different social, political, economic and ecological contexts.

- Past collective action studies are far from being universal. This is mainly due to two reasons. On one hand, focus on a single resource mainly common-pool such as forest, grazing land or irrigation system. On the other hand, most of the studies focused on an already established group either through self-initiated or externally enforced and thus collective action problem identified based on already determined expected individual contributions for collective natural resource management. Nonetheless, rural households in contexts like this study may depend on an entire resource system (i.e. common-pool and privately owned farmland) which is also ecologically interdependent. Besides, likelihood of emergence of collective action needs to be assessed where it is missing. Hence, likelihood of collective action should be assessed while considering all natural resources in such contexts.

CHAPTER THREE

METHODOLOGY

Overview

This chapter presents study location and the methodology employed in this research. It highlights general socio-economic characteristics of the study area (Haramaya District), the research design, population of the study, sampling procedure and sample size, instrumentation and data analysis procedure.

Study Area

Haramaya District is geographically located at 508 km east of Addis Ababa, the capital of Ethiopia (Figure 2), between longitudes $41^{0}50'$ to $42^{0}05'$ East and latitudes $9^{0}09'$ to $9^{0}32'$ North covering an area of 521.63 square km. Haramaya (Figure 3) is one of the 18 districts of East Hararghe zone of Oromia Regional State. Administratively, the district is divided into 33 Areda and the headquarters is Haramaya town (East Hararghe Zone Finance and Economic Development Office [EZFEDO] 2009)

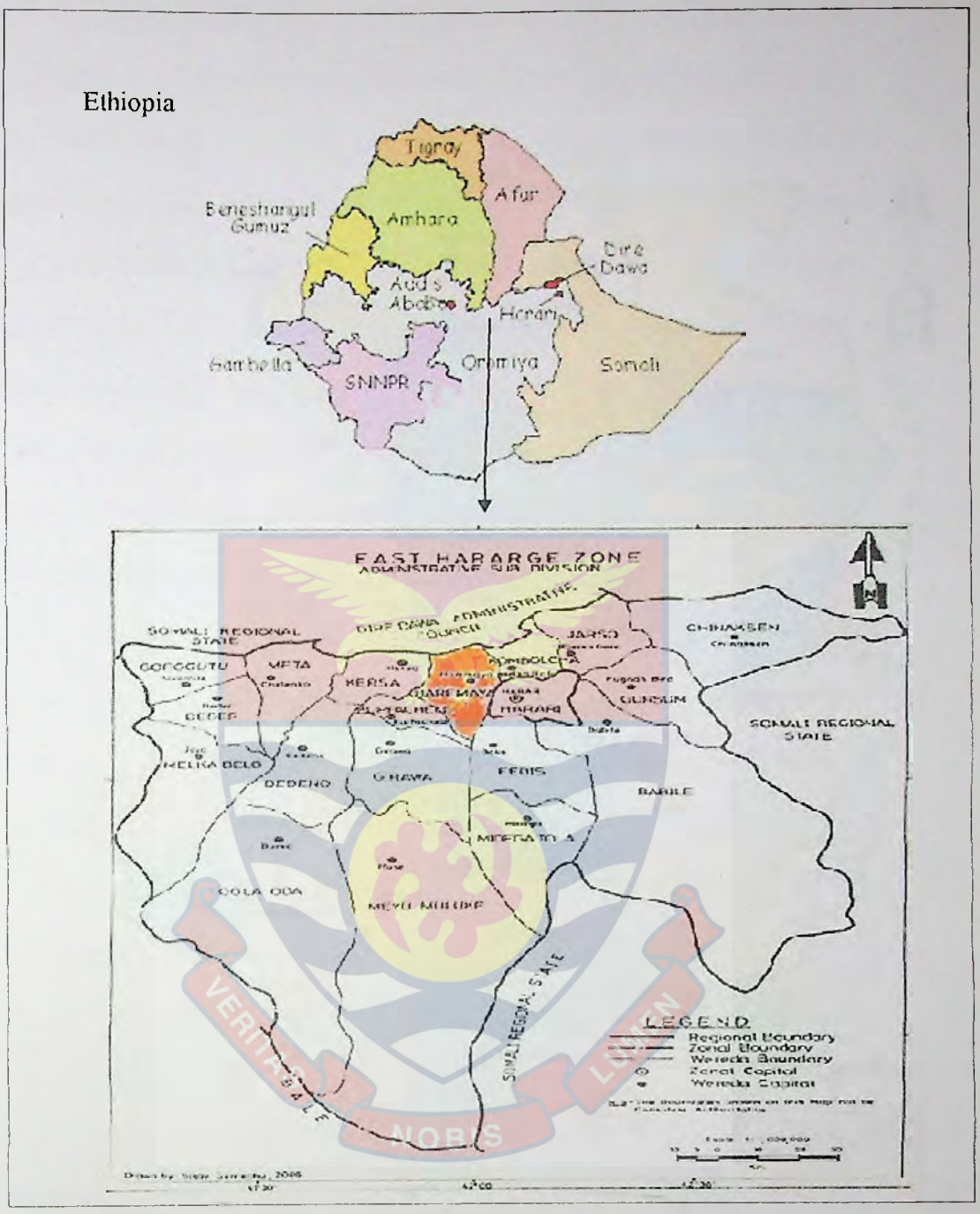

Figure 2: Regional Map of Ethiopia and East Haraghe Zone of Oromia

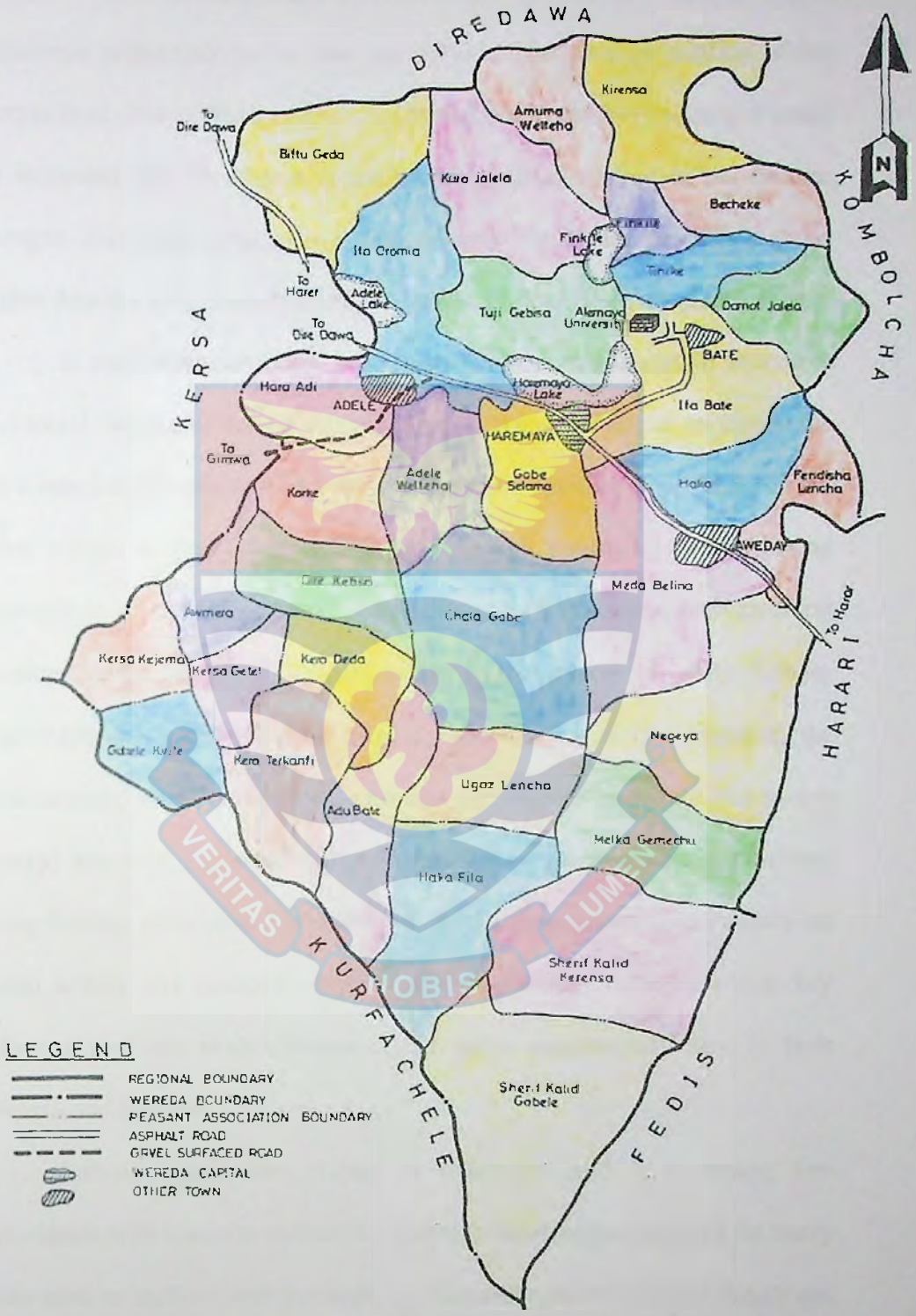

Figure 3: Physical Map of Haramaya District

According to the latest population census of 2007, the total population of Haramaya District is 271,394 comprising a male population of 138,376 (51%) and a female population of 133,018 (49%). The majority (81.2%) of Haramaya population live in the country side. The rural population of the district is of Oromo ethnic origin and Muslim. From the 2007 census, it could be estimated that the district is the most populated district in the Eastern Haraghe zone with roughly over 500 persons per square km which is far higher than the zonal density average of about 112 persons per square km.

In rural Haramaya, the community kinship entails certain economic and social obligations among the rural people. The social structures dictate the male inheritance right to land. Thus, most people establish their family in the same village as their father's lineage. Although kinship is the governing principle in residential patterns, its role in social organisation and structural relations in the society is weaker, except in the redress of injury. Labour organisations (Guza), Mendera/Afosha, women's-groups (for example, for milk selling), youth groups and voluntary associations like Qubi (for saving money) are more organised along common understanding and interest than along kinship principles. The indicated local organisations focus mainly on social affairs and economic support of one another. Informants (i.e. key informants of the study) indicated that these organisations vary in their strength and function.

Labour organisation (Guza) is temporary and it is among few individuals with common economic interest to meet labour required for heavy tasks such as shallow well development, construction of irrigation canals etc. Unlike the Guza (labour organisation), Mendera/Afosha organisation has

existed since the inception of the community and it is governed by law though the law is unwritten. It is compulsory for an individual to join this organisation right after establishing his own family. It is mainly responsible for burial followed by three days of gathering for comforting the bereaved family, redressing serious injuries (such as loss of property) within community, and resolving conflicts within community in all aspects of social-cultural life including natural resource related conflicts. With regard to the latter, the anecdotal evidence show that the role of this organization is dwindling overtime due to intrusion of formal organization in different regimes of the country.

According to Tefera (2006), farming in Haramaya District is characterized by small-scale crop-livestock mixed intensive farming. Natural resources such as farmland, water and grazing land are at the centre of rural households where livestock production remains an important component of farming. Crop production is based on rain-fed (main season production) and irrigation (off-season production) mainly for production of high value cash crops such as vegetables and chat. "Chat (*Catha edulis*) is a perennial tree crop mainly grown in Eastern Ethiopia. The people living in the Horn of Africa and in some Arab countries chew young and fresh leaves of chat as a stimulant" (Tefera, Kirsten & Perret, 2003, p. 213).

Livestock production is based both on intensive (feeding) and semi-extensive grazing on common pasture where common grazing land is still available and accessible. Maize and sorghum are the common staple crops in Haramaya. Crop production strategy has shifted from extensive farming (expansion to new area such as common grazing land and farmstead areas) to

intensive farming. The intensification is through increasing time of production by using irrigation and abandoning fallowing and production of high value crop (Tefera, 2006).

Past study (Tefera *et al.*, 2003) also reported that chat production in the region is a lucrative farming business fetching good domestic and export market with significant contribution to local rural household livelihood as well as national economy. In general, relatively better road access connecting farmers to domestic and export markets is noted contributing to farmers production of high value crop such as chat and vegetables. For example, farmers easily access the biggest chat market in the country (Aweday) which is located in the district and Dire-Dawa city having air and rail transport network for chat and vegetable export to Djibouti and Hargeisa (i.e. capital of Somaliland).

Research Design

The study employed descriptive correlational survey design. It also used both the qualitative and quantitative research approaches. Sarantakos (1998) indicated that survey provides opportunity to adjust and meet the need of qualitative and quantitative research.

The flexibility of the survey design and the combination of the qualitative and quantitative approach enabled this research to gather required data within its timeframe. It was necessity for the research to explore natural resource management-related problems such as collective action problem or identify collective action indicators and related factors prior to gathering data from the households using questionnaires. In this regard, the literature suggests that starting with qualitative approach is a necessity in studying

collective action when little is known about the problems like in the context of this research. For example, Meinzen-Dick *et al.* (2004) indicated that "qualitative data collection and analysis is a useful starting point for studying collective action, especially when all the manifestations of collective action and the key institutions are not understood" (p.15).

The combination of qualitative and quantitative methods provides the advantage of overcoming the problem associated with each type of method if only one method is used alone (Sarantakos, 1998). In this regard, the intermediate result from community level survey helped in enriching research variable, sampling criteria considered by the research and instruments used to gather information at household level. The household level intensive survey in turn helped to meet statistical requirement for quantitative data needed to empirically establish finding of the research. Besides, the qualitative approach helped to elicit information that could not be captured through household survey.

Study Population

The study population was all farm households/resource users in three sub-catchments of the three lakes in Haramaya District. These were Chaleysa, Finkele and Damota sub-catchments along Adele, Finkile and Haramaya lakes respectively. In the context of this research, sub-catchments are the minimum landscape or physical unit within which collective action is needed to happen for sustainable NRM. Accordingly, the population for the study was determined based on geographical location of households in the catchments within which collective action is needed among resource users for its sustainable management. Unlike most conventional research, political

boundaries of Aredas were of less importance for this research. This is mainly due to the fact that landscape made households within catchments ecologically interdependent regardless of the political administrative unit to which they may belong. Kerr (2007) and Meinzen-Dick *et al.* (2004) also asserted the importance of considering landscape as a sample frame in studying collective action for natural resource management.

Sample Size and Sampling Procedure

Random sampling is known for providing each and every item in the entire population equal, calculable and non-zero chance of being included in the sample which results in a sample that better represents the population (Sarantakos, 1998). The exact sample size can be determined based on certain critical parameters at an acceptable level of probability. However, in many cases estimates are based on different criteria and on factors associated with the type of population, the type of methodology employed, the availability of time and resources, the aim of research, the type of instrument used, the accuracy required and the capacity of researcher/ research team (Sarantakos, 1998).

In this study, a two-stage sampling (a combination of purposive and random sampling) procedure was followed to select study sites and sample households. First, three representative sites (Chaleysa, Finkile and Damota sub-catchments) were selected purposively based on severity of resource degradation. Households from these locations were stratified based on their farmland proximity to communal resource and location (i.e. upstream, downstream) in the catchments. Then a total of 180 representative sample households (90 from upstream and 90 from downstream location) were drawn

using systematic random sampling technique. Out of the 90 households selected from the upstream location, 45 of them were having a privilege of being closer/ proximate to commons while the remaining 45 had no such privilege. Similarly out the 90 sample households selected from downstream location equal number of households (i.e. 45 each) were with and without privilege of being closer/ proximate to commons. In general, the total sample size as well as the number of respondents in each stratum was considered to enable the research to employ valid statistical analysis.

The importance of considering farm proximity to common resources among sampling criteria was realized based on intermediate result from community level survey. That is, households having farmlands sharing a boarder with common grazing land and/ or having access to common water points, and those without this privilege were found to be households with contrasting interest in natural resource use and thus containing different levels of externalities influencing their incentives to take part in collective natural resource management.

Anecdotal evidence from an interview with key informants at different locations showed that equal proportions of households were found in the strata considered by this research. As mentioned above, representation of sample households in this context was based on physical location and proximity to communal resource. The upstream and downstream locations were not mainly for comparison purpose or they may not be comparable in all aspects. But it was rather to get a representative sample of respondents in the catchments. Besides, the two groups of households are ecologically interdependent due to downstream effects. In general, the sampling procedures followed enabled this

research to obtain comprehensive and representative data in the ecological context of the study area, while also considering important differences among households in terms of access to common resource.

Four key informants and six to eight participants for focus group discussions were selected purposively at different geographical locations to back up information from the households and for first phase exploratory community level survey. The key informants for this study were Areda leader, knowledgeable village elders and leaders of local organisations such as Melaqa and Afosha/Mendera. Areda/kebele is the lowest formal administrative unit in Ethiopia. Melaqa is a common water point used by groups of farmers and it has been common tradition in Haramaya. Afosha/Mendera is an informal organisation whose central function has been to serve in funeral and to comfort bereaved families during periods of mourning (commonly three days) and assisting the needy in case of calamities. Selection of participants of focus group discussion considered proportional representation of age groups, sex, education and location with respect to common resources. This enabled the research to capture as much of the historical knowledge, perception and understanding of natural resources and related problems in the area.

Instrumentation

Structured questionnaire (see Appendix F) and semi-structured interview guides (Appendix G and H) were the major instruments used to generate data at households and community level. Basically, instrumentation for both community and household levels surveys was based on the research objectives, the research questions and conceptual framework developed for the

study. Specifically, the instruments were developed by looking into variables to be studied, dividing them into a number of indicators and then translating into a number of questions. Finally, the questions were set in a questionnaire for household survey and checklist for interview with concerned local staff in the Bureau of Agriculture and Rural Development (BARD), key informants and focus groups. This process (i.e. translating research topic into variables, variables into indicators and indicators into questions) ensured that each question had a certain purpose and elicited information related to a specific aspect of research objective/question/hypothesis. In this regard, for example, the household survey questionnaire was developed to elicit information on household demographic characteristics (age, education), asset holdings, crop and animal production, access and use of available natural resources, perceived level and causes of natural resource degradation, understating of natural resource interdependencies and required coordinated action, annual income by source, perception towards support of institutional (endogenous and exogenous) arrangements for collective natural resource management, and likelihood of collective action for natural resource management among others.

Instrument Design

In designing the instruments used by the study necessary precautions was taken by the researcher including the instruments administered by researcher and enumerators. For example, the semi-structured interview checklists were designed in such a way that it allowed the researcher to develop rapport with respondents, who in turn provided in-depth information pertaining to research theme.

With regard to the format of items used in questionnaire administered by enumerators, Sarantakos (1998) noted that there are several formats of questionnaire. A common requirement for all formats is that the questions have to be listed in a logical order, allowing for transition and flow. Moreover, a particular type of questionnaire format is chosen to suit the nature of the survey, the type of respondents, length of questionnaire, and nature of administering the questionnaire.

For this research, following Sarantakos (1998), 'inverted funnel' format was used. This was in consideration of the above-mentioned requirements, especially the suspicious nature of farmers. Accordingly, the sections in the questionnaire were arranged in such a way that questions moved from general to specific, impersonal to personal and from insensitive to sensitive.

The questionnaire contained both pre-coded close ended with fixed alternatives and open-ended questions. For fixed-alternative questions, necessary methodological requirements were considered. For example, following what Sarantakos (1998) noted as the most important standard and principles required in fixed-alternative questions were considered in designing such questions. These were the responses categories accuracy, exhaustiveness, mutual exclusivity, and unidimensionality. In this regard, for instance, attitudinal types of questions (i.e. Likert-type scale) with categories responses ranging between two extreme positions were divided into five points corresponding to a verbal-numerical scale.

Instrument Validation

The research ensured different aspects of instrument validation at different stages of the research by employing appropriate methods. At the initial stage of the research, face validity was determined by the researcher based on the theoretical and empirical literature as well as the objectives and research questions of the study. Supervisors of the researcher at University of Cape Coast and experts in the study area also determined the content validity of the instrument. Moreover, intermediate results from community level survey helped to improve contents of instruments used to gather information at household level. With regard to content validity, it is noted that content validity of the instrument is determined by looking into the content of instruments in terms of appropriateness, comprehensiveness, adequacy of the question to represent the content, whether logically get to the intended variable, and consistency of the content with the definition of the variable (Fraenkel & Wallen, 2000). Following these authors, construct related validity of the instruments was determined by looking at the items the instrument measures (i.e. indicators of the variables) in line with theoretical and empirical tests showing how these measures show the difference between objects of measure.

Pilot Testing

Reliability (consistency of score obtained for Likert-type scale instruments) was determined by using Cronbach's coefficient alpha using responses obtained during field pre-testing of the instrument. The pre-testing was conducted in June 2009 as part of enumerators and field assistant training. This was conducted by selecting 40 non-sample respondents (from

neighbouring Kersa District) believed to have similar characteristics with sample respondents of the study. Pallant (2001) indicated that Cronbach's coefficient alpha is the most commonly used statistics to test the degree to which the items that make up the scale are all measuring the same underlying attributes. Accordingly, for the research variables assessed using Likert-type scale items the alpha coefficients were found to be more than minimum recommended by Pallant (i.e. 0.7) (see Table 2).

Table 2: The Cronbach's Alpha Reliability Coefficient of Instrumental Sub-scales

Sub-scale	Number of Items	Reliability Coefficient
NR interdependence	10	0.85
Past participation in collective action	6	0.71
Trust on cooperation of others for NRM	11	0.81
Endogenous institutional support	8	0.82
Exogenous institutional support	12	0.79
Likelihood of collective action in NRM	18	0.89

n = 40. Source: Field survey data, 2009.

Data Collection Procedures

Data were collected in two phases. In the first phase from knowledgeable experts of natural resource in the district BARD and development workers at different locations, key informants and focus groups. In the second phase, from sample households employing validated

questionnaire administered by trained enumerators under close supervision of the researcher.

The major part of first phase, community-level survey, was undertaken by the researcher from March to May, 2009, employing qualitative approaches mainly semi-structured interview with natural resource experts in the district BARD, key informants and focus group followed by transect walk. The first interview with experts was followed by interviews with key informants at different locations. The result of these interviews elicited further improvement of checklists used for focus groups as well in directing different types of participants needed to be included to represent resource users in sub-catchments. This was found to be the key difference among households that may affect emergence of collective action. The interview with informants and focus group discussions were conducted in participatory and informal settings that allowed respondents to express their views as freely as possible and reach consensus on many debatable issues.

Data collected at this stage related to major natural resource degradation problems, historical changes to natural resources and their causes to date, farming system, communities access and rights to natural resources under different regimes, government natural conservation interventions and their outcome to date, past and present policy environment and their influence (example, past Derg regime's cooperativization and villagization, and current government land and natural resource administration policy), role played by local organizations and its future potential in natural resource management and in resolving natural resource related conflicts, rule being in use (regularized practices) in relation to natural resource and its impact on resource

management, including its likely challenge in implementation of current land use policy, major challenges (within and outside the community) for collective management of natural resources, and types of cooperation expected from different households for effective management of the resources.

Based on insight from community level survey, the researcher also made observation with regard to interaction of households positioned in relatively advantageous locations to common resource (sharing border with common lands and water points) during land preparation time in cropping season and irrigation use.

For the second phase, household-level survey, validated questionnaire was used. The questionnaire was administered by trained enumerators monitored by field assistants under close supervision of the researcher. This was conducted from June, 2009 to January, 2010. All of the 180 sample households drawn for the survey were willing to provide the required information. In other words, the response rate for household survey was 100%.

Data Management and Analysis

The data obtained in different phases of the study were analysed separately or in combination when necessary. Qualitative data from first phase community level survey were analysed at the initial stage of the research, the intermediate result of which was used in guiding the second phase household survey. In a context such as this study where prior information is limited, the importance of starting with qualitative data collection and analysis is also suggested in the literature (Meinzen-Dick *et al.*, 2004). In the final stage of the study, both qualitative and quantitative information were analysed together.

The qualitative data obtained from key informants and focus group interview were transcribed from the audio tape. After transcription of the responses, provisional sets of categories themes of responses were developed. That is, the responses of all interviews were categorized under different headings based on the interview guide as well as categories which emerged from the interview themselves in the range of the main research questions and objectives. In general, verbal description, interpretation, appreciation of facts and highlights of observation made on the field constituted part of the qualitative analysis of this research.

The quantitative data gathered through questionnaire were analysed using SPSS version 15. The research used both simple descriptive statistical analysis and advanced econometric techniques to analyse quantitative data (see Table 3). Frequencies, mean and standard deviation were used to describe major variables of the study. In order to provide more insights, t-tests and Chi-square tests were used to test significant differences such as between location of sample respondents (upstream and downstream location) and responses to variable of the study (example present and past level of natural resource scarcity). In other words, these tests were used to give more insight and not to test hypothesis of the research and none of the research hypotheses suited these tests. Correlation was used to test research hypotheses as well as to objectively confirm indicators identified from community level survey as a measure for likelihood of collective action.

Table 3: Summary of Methods of Data Analysis Used

Specific Objective/Hypothesis	Method of Analysis
Objective 1	Mean, standard deviations, percentage and paired t-test significance between two periods (current and past)
Objective 2	Mean, standard deviations, percentage and Chi-Square(χ^2) test to test significance of percentage difference
Objective 3	Description of verbal expression of respondents, appreciation of facts and observation on the field.
Objective 4	Mean, standard deviations, independent t-test to test difference between locations.
Objective 5/Hypotheses 1 to 8	Pearson product moment correlation, Pearson product moment correlation (biserial), Kandall's tau_b
Objective 6 and 7	Mean, standard deviations
Objective 8/Hypotheses 9 and 10	Percentage, Pearson product moment correlation (biserial)
Objective 9 /Hypotheses 11 and 12	Pearson product moment correlation (biserial), Pearson product moment correlation
Objective 10	OLS regression model

Note: Pearson product moment correlation, Pearson product moment (biserial) and Kandall's tau_b are used to assess relationships between the dependent variable (measured on interval scale) and independent variables measured on interval, nominal (artificial dichotomy) and ordinal scale respectively. Source: Field survey data, 2009/2010.

Advanced econometric technique, OLS regression model, was used to identify and test relative importance in terms of statistical significance among variables under study. This research preferred the OLS model to the tobit regression model. This was mainly because while both operate from same assumption about error distributions, the tobit model is much more vulnerable to violation about error distribution. In the OLS model with heteroskedastic error, the estimated standard error can be small, but this is not the case for tobit model as it estimates the probability of censoring. As a result, coefficient for the tobit model can be highly biased (Madigan, 2007 cited in Araral, 2008).

The OLS model and its specifications are given as follows:

$$Y_i = \beta_0 + \sum_{i=1}^{n} \beta_i x_i + \varepsilon_i$$

Where Y_i = the value of dependant variable, Likelihood of collective action

x_i = explanatory variable

β_0 = intercept /constant

β_i = parameter to be estimated

ε_i = disturbance term/error

The OLS method was used for parameter estimation and the standard t- and F-statistics were used to test significance of individual variable and goodness of fit of the model respectively.

Of all the methods available in the social sciences for multivariate explanatory analysis, multiple regressions such as OLS model is the most widely used model. It is a method for analyzing the relationship between a

single, dependent variable and two or more predictor (independent) variables. Predictions can be made about the dependent variable, based on the observed values of the predictor variables (Blaikie, 2003).

It is worthy of note that some problems in using OLS model is that the OLS estimation does not guarantee that an estimate of particular predictor (βx_i) lies in the unit interval , so estimated dependent variables value and predicted dependent value may not lie in that interval. The latter problem can be mitigated, to a degree, by applying inequality-restricted least square but it is unclear whether this would be advantageous (McDonald, 2009). Notwithstanding this problem, "OLS estimates of β are consistent and asymptotically normal under general conditions, and hypothesis tests can be validly carried out if allowance is made for heteroskedasticity" (McDonald, 2009 p. 795). Accordingly test for heteroskedasticity and other theoretical assumptions (such as misspecification, normality of predicted variable) underlying in the use the OLS model was considered in later analysis.

CHAPTER FOUR

RESULTS AND DISCUSSION

Overview

This chapter of the thesis presents and discusses the results of the study. First, the socioeconomic characteristics of the respondents and attributes of the resource are presented and discussed to provide the context for the discussion of other variables of the study. Then identified collective action problems in the study context and likelihood of collective action indicators are presented. This is followed by sample households' likelihood of collective action outcomes and its association with variables related to attributes of the resource and resource users, institutional arrangements, external factors and differences among resource users. Finally, the chapter ends by presenting and discussing the determinants of likelihood of collective action for natural resource management in the study context, Haramaya District.

Socio-economic Characteristics of Sample Households

Demographic profile (family size and age structure), level of education of household members, land holdings, livestock and others agricultural assets holdings were considered in the analysis of sample households socio-

economic characteristics. This analysis intended to provide insights concerning sample households and to facilitate subsequent analysis.

Family Size and Age Structure

Household demographic profile of the 180 sample respondents surveyed is presented in Tables 4 and 5. From the results presented in Table 4, the average family size of 7.12 (SD = 1.79) was found to be higher than the national and regional (Oromia) averages of 4.9 and 5 persons per household respectively (CSA, 2007). The average household size in the context of this study refers to the number of individuals who were living under one roof and share the same farmland as major source of livelihood.

The study shows that the majority (58%) of the households who participated in the study was in the conventional working age category of 15 to 64 years of age. The young age group (i.e. less than 15 years of age) was 41.2% of the total population of the sample households. The number of persons aged 65 years and older was only 10 (0.8%). The working age dependency ratio was calculated and found to be 72.3%, which is composed of 71% young-age dependency ratio and 1.3% old-age dependency ratio.

Table 4: Mean Value of Family Size

Family size	Mean	SD
Number of persons in the household	7.12	1.79
Family size (in adult equivalent)	4.2	1.52

n= 180. Source: Field survey data, 2009/2010.

Table 5: Households Age Structure and Level of Education

Socioeconomic characteristics	Frequency	Percent
Age group (n= 1287)		
0 – 14	530	41.2
15 – 64	747	58.0
≥ 65	10	0.8
Level of Education (n = 1164)		
Illiterate	160	13.7
Religious education	38	3.3
Write and read	54	4.6
Primary	521	44.8
Junior Secondary	168	14.4
Secondary	197	17.0
Post Secondary	26	2.2

Note: The total sum (n) of age group and level of education is different because the latter includes only those household members who have reached the minimum age of schooling by the date of the survey.

Source: Field survey data, 2009/2010.

Education

From anecdotal evidence, 7 years of age is the minimum age by which rural children start schooling in rural Haramaya. Accordingly, the total population of sample households with household member above the age of 6 years was 1,164, which includes household members who have attained particular level of education or being enrolled by the time of the survey. 44.8% of the sample household members have attained or were enrolled in

primary schools followed by secondary (17%) and junior secondary levels (14.4%). Only 26 persons (2.2%) have attained or were enrolled in post secondary level (i.e. pre-university, diploma or first degree level). More than 20% of the population never attended formal schooling; of which 13.7% were illiterate, 3.3% were attending or had attained religious education and 4.4% could read and write.

Land Holdings

Table 6 presents the land holding size per household and per adult equivalent by household location. From Table 6 and the interviews (i.e. from key informants and focus groups), a rapid decline in farmland holding size cultivated per household or per adult equivalent was more the rule than the exception in the study area. The average sample households' farmland landing holing of 0.9 ha was found to be less than the 2006/2007 CSA national sample survey estimate of 1.21 ha (CSA, 2007).

Table 6: Mean Size of Farmland(s) Owned by Sample Households

Land holding	Location	n	Mean	SD
Total farm size (ha)	Upstream	90	0.93	0.61
	Downstream	90	0.83	0.53
	All households	180	0.90	0.59
Size per adult equivalent (ha)	Upstream	90	0.26	0.25
	Downstream	90	0.21	0.10
	All households	180	0.24	0.18

Source: Field survey data, 2009/2010.

The average land holding of the sample households per adult equivalent was 0.24 ha. This figure is just around the minimum considered adequate for subsistence. Tefera (2006) based on a previous study, reported that 0.23 ha is the minimum required for subsistence in the study area. He further noted that the minimum cut-off size is subject to change depending on technology, crop mix and price over-time.

In order to get more insight, the analysis of this study further considered fragmentation of parcel of lands operated by the households. Table 7 presents number of parcel of farm plots/farmlands cultivated by sample households. The result from the table shows that only 7.8% of sample households operate one parcel of farm plot. Most of the households cultivated farmlands that were fragmented into two, three or four parcels, at different distant locations. Due to variation of plot quality (soil fertility, slope and water access) shares for new emergent family units are given from each plot at different locations, contributing to land fragmentation.

It is worthy of note that fragmentation has negative impact on intensive utilization as well as management of farmland. For instance, fragmentation causes cropland to be reduced to a narrow corridor running down slope. Such land strips will be inconvenient to apply structural soil and water conservation measures. In most settings of the study area, as found in the interview with key informants and focus groups, the way parcels of land were fragmented among individual owners in the hilly slope dictated plowing to be carried out along the slop rather than across. This, in turn, increased the magnitude of erosion by high run-off. In general, these very small and fragmented holdings are neither conducive for optimization of agricultural practices nor for the application of

land management measures unless coordinated efforts are made among individual owners. On the contrary, the interview with key informants and focus group discussions revealed that coordination efforts among individual owners have been going down over time.

Table 7: Land Holding by Number of Farm Plot(s)

Number of farm plots	Upstream (n=90)		Downstream (n=90)		Overall sample (upstream and downstream, n=180)	
	n	%	N	%	n	%
1	2	2.2	12	13.3	14	7.8
2	40	44.4	29	32.2	69	38.3
3	32	35.6	32	35.6	64	35.6
4	16	17.8	17	18.9	33	18.3
Total	90	100	90	100	180	100

Source: Field survey data, 2009/2010

Livestock and other Agricultural Asset Holding

Like in all parts of the Ethiopian highlands, livestock are an integral part of rural households in the study area. From the community level survey, it was found that livestock ownership and other agricultural assets such as motor pumps were important indicators for socio-economic status of the household. This study in later section of analysis of the relationship between wealth status and likelihood of collective action in natural resource management used the monetary estimate value of livestock and motor pump among proxy estimate of household wealth.

Livestock are a source for draught power, cash, soil nutrient (manure), meat and milk, a means of saving and a hedge against the risk of food insecurity. The composition of livestock owned by a household usually includes cattle, sheep/goat, donkey and poultry. Table 8 presents the mean size of livestock owned by sample households in terms of number of head size and tropical livestock unit.

Table 8: Mean Livestock Holding of the Households

Livestock Size	Mean	SD
Number of livestock head	12.93	5.99
Tropical Livestock Unit (TLU) size	3.84	1.98

n= 180. Note: one head of cow, heifer, ox or bull = 1 Tropical Livestock Unit (TLU), calf = 0.2 TLU, sheep and goat = 0.1, donkey = 0.4TLU, chicken = 0.05. Source: Field survey data, 2009/2010.

Ownership of livestock such as a pair of oxen and motor pump is not only important for effective use of the resource they have i.e. timely land preparation and irrigation of land but also in attraction of other factors of production. There is local arrangement where those who do not own a pair of oxen or a motor pump exchange their labour service for oxen and/or motor pump service. Table 9 presents sample households ownership of oxen and motor pump. As already indicated, motorized irrigation pump is the known valuable asset in the area. This asset can be worth up to Birr 10,000. The well-off households can own up to three irrigation pumps. Among the sample households, majority of the households (53.3%) had at least one motor pump while the remaining 46.7%, which of course is a significantly high figure, had

no motor pump. With regard to oxen ownership, 31.1% were without a single ox while the majority (68.9%) had at least one ox.

Table 9: Motor Pumps and Oxen head Owned per Households

Asset Owned	Upstream (n=90)		Downstream(n=90)		Total(n=180)	
	n	Percent	n	Percent	n	Percent
Motor pump						
0	51	56.7	33	36.7	84	46.7
1	35	38.9	51	56.7	86	47.8
2	4	4.4	6	6.7	10	5.5
Oxen head						
0	35	38.9	21	23.3	56	31.1
1	25	27.8	28	31.1	53	29.4
2	26	28.9	39	43.3	65	36.1
3	4	4.4	2	2.2	6	3.3

Source: Field survey data, 2009/2010

Attributes of Natural Resources: Level of Degradation and or Scarcity

The result of this section addresses the first research objective, and facilitates subsequent analysis to test the first hypothesis stating direct relationship between likelihood of collective action and natural resource scarcity. Natural resource scarcity is computed for later analysis of the hypothesis testing based on change in farmland size/fertility status, irrigated area and livestock kept in common pasture as an indicator to compute composite index for level of natural resource scarcity faced by the households. (See note of Appendix A for detailed computation of composite NR scarcity index).

Table 10 presents a summary of the status/profile of natural resource during the 2009/2010 production season (hereafter referred to as current) and the situation 10 years ago (i.e. 1999/2000). From the result presented in this table, it is worthy of note that there is a high variation between the two periods and among sample households. The average size of farmland per household cultivated 10 years ago by sample household was 1.88 ha (SD = 1.07) and the current average size is 0.9 ha (SD = 0.59). The change in size of farmland cultivated by the sample households, (refer to Table 11), is statistically significant (MD = 0.89 ha, $p<0.01$).

From the anecdotal evidence, the impact of reduction in size of farmland may not be noticed fully in indicating the level of scarcity faced by a household as a household may have relatively larger farm size but poor soil fertility status. The study, thus, considered further analysis of farmland quality. In this regard, the average level of farmland fertility rated by sample respondents for the period 10 years ago was 4.8 (SD = 0.39), which is very fertile on the 5-point scale used, and 2.87 (SD = 0.61), i.e. medium for current period (see Table 10). The difference in fertility status between the two periods, i.e. current fertility level as compared to the past, is statistically significant (MD = 1.93, $p<0.01$) (see Table 11).

Table 10: Current Situation of Natural Resource as Compared to the Past

Natural Resource	Time period	Mean	SD
Farmland (size in ha)	10 years ago	1.88	1.07
	Current, 2009/2010	0.90	0.59
Farmland fertility (scale 1= very poor 5= very fertile)	10 years ago	4.80	0.39
	Current, 2009/2010	2.87	0.61
Common water points (land area irrigated in ha)	10 years ago	0.57	0.35
	Current, 2009/2010	0.28	0.31
Grazing land (livestock grazed/grazing in TLU	10 years ago	7.29	1.36
	Current, 2009/2010	2.13	2.23

Note: 10 years ago refers to period around 1999/2000 when dramatic change in NR such as extinction of lakes were experienced. In order to get meaningful insights, only the number of livestock kept in the commons (i.e. of all the total holdings of the households) was used for both periods. Source: Field survey data, 2009/2010.

Table 11: Paired t-test of Change in Natural Resource Situation

Natural Resources	Time period	Mean	MD	t-value	Sign.
Farmland (size in ha)	10 years ago	1.88	0.89	16.02	0.00
	Current	0.90			
Farmland fertility (scale	10 years ago	4.80	1.93	39.75	0.00
1= very poor 5= very	Current	2.87			
fertile)					
Common water points	10 years ago	0.57	0.29	15.93	0.00
(land area irrigated in	Current	0.28			
ha)					
Grazing land (livestock	10 years ago	7.29	5.16	33.30	0.00
grazed/grazing in TLU	Current	2.13			

n= 180. Source: Field survey data, 2009/2010.

The sample mean of livestock accessing common grazing land 10 years ago and those accessing currently is 7.29 TLU (SD = 1.36) and 2.13 TLU (SD = 2.23) respectively (see Table 10). The change in the average size of the TLU unit per households accessed/accessing common grazing is also found statistically significant between the two periods (MD = 5.16 TLU, $p<0.00$) (see Table 11).

The interview with key informants and focus groups also revealed that due to increasing scarcity of animal feed/grazing land some households are forced to adopt the strategy of renting a pair of oxen for sowing period and or buying only during this period rather than keeping it for the whole year. A

study in the region also revealed that the same strategy adopted by households to overcome scarcity of animal feed (Tefera, 2006).

The sample households, the average mean size of land irrigated/ and being irrigated using water from common water point was 0.57 ha (SD =0.35) and 0.28 ha (SD = 0.31) for the past (10 years ago) and current period respectively (see Table 10). This change, i.e. difference in size of land area irrigated, is statistically significant (MD = 0.29 ha, p<0.00) (see Table 11).

From the result presented in Table 10 and 11 the contribution of population pressure on natural resource scarcity, especially to the decline of farm size, is appealing. In this regard, it is worthy of note that the result in this section is concerned with facilitating later analysis of empirical exploration of whether and to what extent the increasing resource scarcity in the study area influence sound NRM (i.e. collective action for NRM). The study is not disregarding the contribution of population pressure and other factors such as climate change to declining NR situation. It rather assumed that declining situation of NR should have encouraged sound NRM. Substantial level of natural resource scarcity encouraging resource users' likelihood of collective action for its management is widely favoured in literature (Araral 2008; Meinzen-Dick *et al.*, 2002; Poteete and Ostrom, 2004b).

Moreover, as stated in Chapter 1, the research delimited its scope with regard to population pressure in cognisant of the fact that the influence of population pressure on sound NRM is contentious in sub-Saharan Africa in general (Leach *et al.*, 1999; Kabubo-Mariara, 2007) and Ethiopia in particular (Tefera, 2006; Chisholm, 2003). Nonetheless, capturing the influence of population pressure in collective action study is more appropriate when

landscape/catchment is considered as unit of analysis that enables to consider group size within a catchment as proxy of population pressure. For example, Gebremedhin *et al.* (2002) considered village as a unit of analysis to estimate influence of population density on collective action. In general, within its scope, neither the sampling frame nor sample size was to enable this study to estimate the influence of population pressure on collective action.

Besides the reduction in the size of farmland irrigated, the research considered the importance of looking into change in terms of strategies/means of accessing water for irrigation over time. In this regard, Table 12 presents the mechanisms used by sample households to access water for irrigation from the common water point for the two periods. Here it is worthy of note that the means of access is to show relative change in accessibility of water points regardless of sample households' ownership of motor pump. The total number of farm plots of sample respondents is 475. Out of these plots, 10 years ago, 45% were irrigated without using motor pump (i.e. just with human labour/hand-pumping and or diversion of water flows), 31.4% of the farm plots could be irrigated using one motor pump and very few numbers of plots (10 plots) needed more than one motor pump. The current condition is found to be the reverse. For most of the farm plots, the water point was not accessible without motor pumps and therefore, large numbers of plots which had access 10 years ago had lost access to the water point completely.

In general, natural resource scarcity was apparent in the study area although the degree varied among households. Conclusions from interviews with key informants and focus group discussions supported the above result. The informants stated that investment on fertilizer and water (i.e. digging well

and purchasing motor pump) had become more of a principle than exception to meet household needs. Farmers' innovative exploration of water to overcome increasing scarcity by digging borehole/well and making use recent rural electrification opportunity to pump water from deep well for irrigation was observed (see Plate 1). Further, the informants emphasized that due to limited financial capacity to invest on these inputs, it had become a challenge for some households to meet household needs based on one time main season (i.e. based on rain-fed) yield harvest and from unfertilized farmlands.

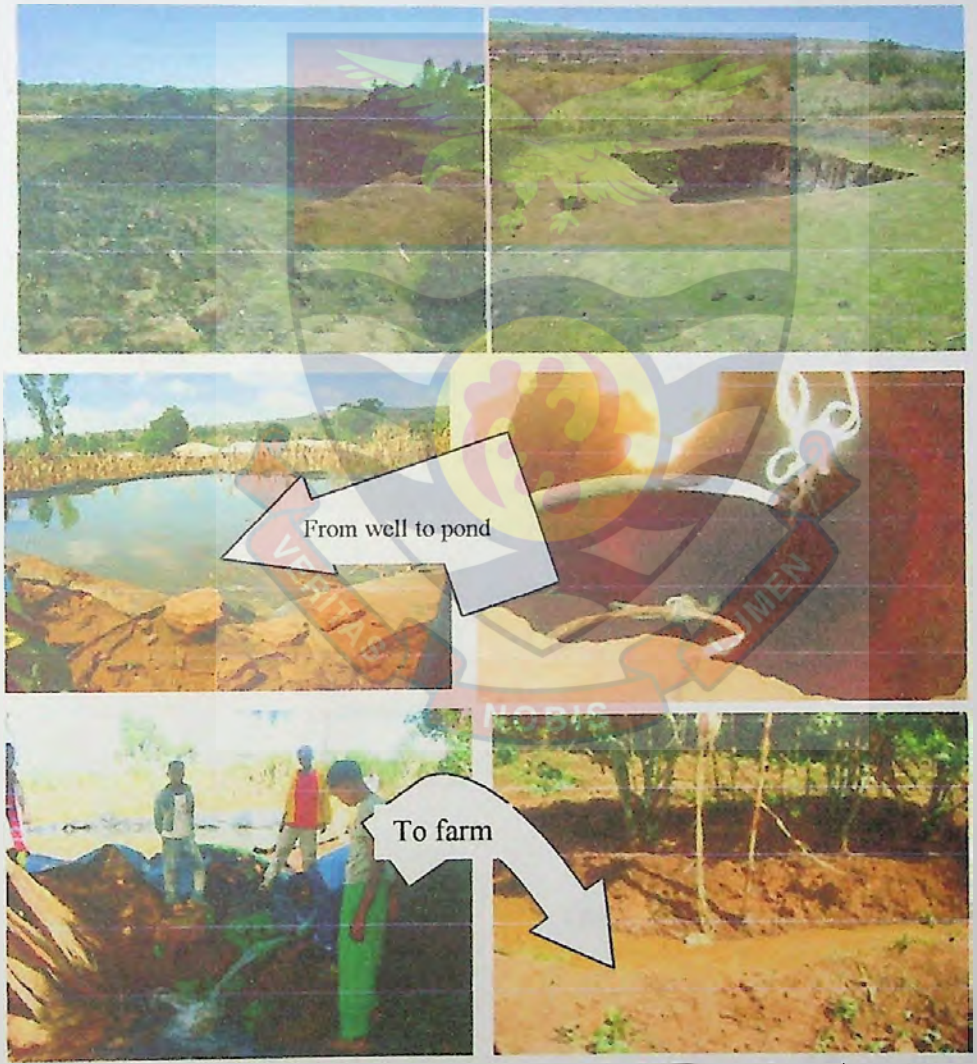

Plate 1: Wells and Borehole Dug by Farmers in Different Locations (top two plates downstream, bottoms are upstream location). Source: Field survey, 2009/2010.

Table 12: Current Change in Access to Common Water Points as Compared to the Past

Means of access	Time period	No. of farm plots (n= 475)	% of total plot
Human labour	10 years ago	214	45.0
	Current (2009/010)	4	0.8
	% Difference		44.2
One motor pump	10 years ago	149	31.4
	Current (2009/010)	176	37.1
	% Difference		5.7
Two motor pumps	10 years ago	38	8.0
	Current (2009/010)	97	20.4
	% Difference		12.4
Three motor pumps	10 years ago	2	0.4
	Current (2009/010)	89	18.7
	% Difference		18.3
Plot with no access (lost access)	10 years ago	72	15.2
	Current (2009/010)	109	23.0
	% Difference		7.8

Source: Field survey data, 2009/2010.

Attributes of Natural Resource Users

The results of this section address Specific Objective 2. Specifically it describes respondents' perceptions on the level of dependence on the resource, natural resource degradation, causes of natural resource degradation, natural resource interdependencies, required coordinated action to overcome NR degradation, the level of participation (experience) in collective action in natural resource management, and social capital. The results of this section also facilitate subsequent testing of hypotheses related to attributes of resource users (i.e. Hypotheses 2 to 8), and related discussion on Research Questions 2 and 5.

Households' Level of Dependence on Natural Resources

It is widely acknowledged that farmers or rural households are dependent on natural resource either directly or otherwise for a very wide range of their livelihoods. For example, in Haramaya, it is obvious that without harvesting yields from farmlands (through rain-fed and or employing irrigation) and rearing livestock, rural households cannot subsist in their environment. To this end, the interest of the research is not to re-establish the known fact concerning households' dependence on NR, but to describe the relative variation among resource users in this regard prior to assessing the relationship between the likelihood of collective action and level of dependence on NR. Accordingly, for the study, per capita (adult equivalent) land area cultivated and irrigated area of farm plot using common water points as source of water were proxy indicators used for level of dependence on farmland and common water points respectively. The analysis (refer to Table 13) shows that mean per capita dependence of sample households on farmland

and common water points is 0.24 ha (SD = 0.18) and 0.08 ha (SD = 0.11) respectively.

Similarly, livestock unit in TLU grazed in common grazing land was indicative of households' level of dependence on common grazing land and the mean was 0.58 TLU per capita (in adult equivalent) (SD = 0.69) (see Table 13).

Table 13: Sample Households' Level of Dependence on Natural Resources

Natural Resources	Mean	SD
Farmland (land area per adult equivalent in ha)	0.24	0.18
Common water points (irrigated area ha per adult equivalent	0.08	0.11
Common grazing land (livestock grazing in TLU per adult equivalent)	0.58	0.69
Overall dependence on NR (adult per capita in US $)	112	95

n= 180. Source: Field survey data, 2009/2010.

Cumulative average per capita monitory estimate of annual yield from farmland (using both irrigation and rain-fed) and livestock unit kept in common grazing land is indicative for sample households overall level of dependence on natural resources. The results show that the overall mean per capita level of dependence is approximately US $ 112 (SD = 95), indicating variation among sample households which could influence their incentives for collective action.

The study also considered the importance of variation among households' level of dependence on common natural resources. In this regard, sample respondents were asked whether they had or intend to have alternative sources to common water points and grazing lands. The results are presented in Table 14.

Table 14: Availability of Alternative Private Sources to the Common Resources and χ^2 test for Difference by Household Location

	Upstream (n=90)	Downstream (n=90)	All sample (n=180)
Alternative to common	n (%)	n (%)	n (%)
Have private source of water	30 (33.3)	59 (65.5)	89(49.4)
Intend to have private	10 (11.1)	9 (10)	19(10.6)
Have no private source	50 (55.6)	22 (24.4)	72(40)
Chi-square (χ^2) value= 17.18, df=2, p = 0.00			
Have patch of grazing land	31 (34.4)	34 (37.8)	65(36.1)
Afford purchase of feed	6 (6.7)	21 (23.3)	27(15)
No alternative grazing	53 (58.9)	35 (38.9)	88(48.9)
Chi-square (χ^2) value= 12.15, df=2, p = 0.02			

Source: Field survey data, 2009/2010

The majority (55.6 %) of the sample households in the upstream had no or did not have the intention to seek alternative private water points. The remaining 44.4 % of households in upstream neither had nor had intention of having private alternative water sources. In downstream, unlike in the upstream, majority (75.6 % = 65.5 % + 10 %) had or intended to have

alternative private water sources and the remaining 24.4 % neither had nor intended to have alternative private water sources. The difference in proportion of sample households with and without alternative to common water points is statistically significant ($\chi^2 = 17.18$, df =2, p = 0.000).

Regarding common grazing land, refer to Table 14. Among households in the upstream, while majority (58.9 %) had no alternative to common grazing land, the remaining 41.1% (34.4 % + 6.7 %) had an alternative patch of grazing land or could afford purchase of feed. In the case of downstream, majority (61.1 % = 37.8 % + 23.3 %) had alternative patches of grazing land or could afford purchase of feed, and the remaining 38.9 % had neither patch of grazing land nor could afford purchase of feed. The difference in proportion of sample households is statistically significant ($\chi^2 = 12.15$, df =2, p = 0.02).

The above result clearly indicates relative variation among resource users' overall dependence on NR as well as difference regarding the alternative they have besides the common resources. Concerning the latter difference, the result from key informant interview implies this could be due to lack of institutional support enforcing equitable access to the common. Specifically, the informants indicated that claims of having patches of private grazing land and most cases of private water source were illegitimate claims denying others access to the resource mainly based on their farm location. This could be witnessed during transect walk with the informants (see Plate 2 illustrating sample cases of such claims).This kind of claim is based on long duration of monopoly in the absence of institutional mechanisms to enforce common use right of the resource similar to what Toulmin (2008) noted as common claim in Africa: right to claim by long occupation and/ or first

settlement.

Plate 2: Monopolized Common Grazing Land by Individuals and Water Points Developed for Private Use. Source: Field survey, 2009/2010.

Perceived Level of Natural Resource Degradation

Table 15 presents average mean responses of sample households' perceived level of natural resource degradation. The mean perceived level of farmland, common water points and common grazing land was 3.26(SD=0.69), 3.98(SD=0.82), and 4.16(SD=0.76) respectively. This shows farmland, common water point, and common grazing land as being somewhat degraded and degraded respectively as perceived by respondents. The overall mean is 3.79 (SD=0.66), suggesting a reasonable level of natural resource degradation perceived by the respondents though the level of perception varied among respondents.

Table 15: Respondents Perception of Natural Resources Degradation

Natural Resource	Mean	SD
Common grazing land	4.16	0.76
Common water points	3.98	0.82
Farmland	3.26	0.69
Overall response	3.79	0.66

n= 180. Note: Degradation is measured on perception scale (1= not degraded at all, 2= not very degraded, 3 = somewhat degraded, 4= fairly degraded, 5= very degraded). Source: Field survey data, 2009/2010.

The result from interviews with key informants and focus groups also asserted growing awareness of natural resource degradation. In general, informants noted that natural resource degradation resulted in a number of losses which include social, economic and environmental losses. In brief, the informants, for instance, depicted degradation of hillside resulting in erosion on farmlands, degradation of water stock due to siltation which in turn costs

households in terms of loss of yield or cost incurred from purchase of commercial fertilizer to improve farm plot fertility, shallow-well development and employing motorized pump. Besides, frequent conflicts were noted by informants as being associated with degradation of natural resources. For instance, the informants could mention a number of conflicts in use of common water points.

Perceived Cause of Natural Resource Degradation

Table 16 presents respondents perceived causes of natural resource degradation; namely 97.8%, 50% and 32.8% of the respondents replied in favour of soil erosion through high run-off, lack of coordination among farmers and cropping patterns respectively as main causes for farmland degradation.

Siltation topped the list of causes (92.8%) for common water point degradation. This suggests consistency of the result with perceived causes of farmland degradation (i.e. high level of soil erosion). The contribution of excessive use of municipality among the causes of water point degradation was favoured by 66.1% of the respondents. Less than half of the respondents (43.3%) replied in favour of excessive irrigation contributing to degradation of common water points.

Over-grazing/deforestation was the commonest cause (83.3%) for common grazing land degradation, followed by absence of clear right to common grazing land (76.1%). Expansion for crop cultivation was a close third (68.8%). This shows that some of the respondents admitted their expansion (which is illegitimate) to commons for crop cultivation caused its degradation.

Conclusion drawn from interview with key informants and focus group discussions also shows that strategy employed by different households that caused in NR degradation is the outcome of intertwined social, political, economic and ecological problems. For example, the absence of institutional support enforcing legitimate use of common pasture in hillside and near the lakes made the land prone to encroachment for crop cultivation fuelled by the need for more land for family heirs and growing market incentives. This, in turn, resulted in serious degradation of water stock including extinction of lakes mainly due to erosion from hillside and farmlands. See Plate 3 below showing continued encroachment for crop cultivation and extinction of Lake Haramaya covered with pile of soils eroded from farmlands and hillsides.

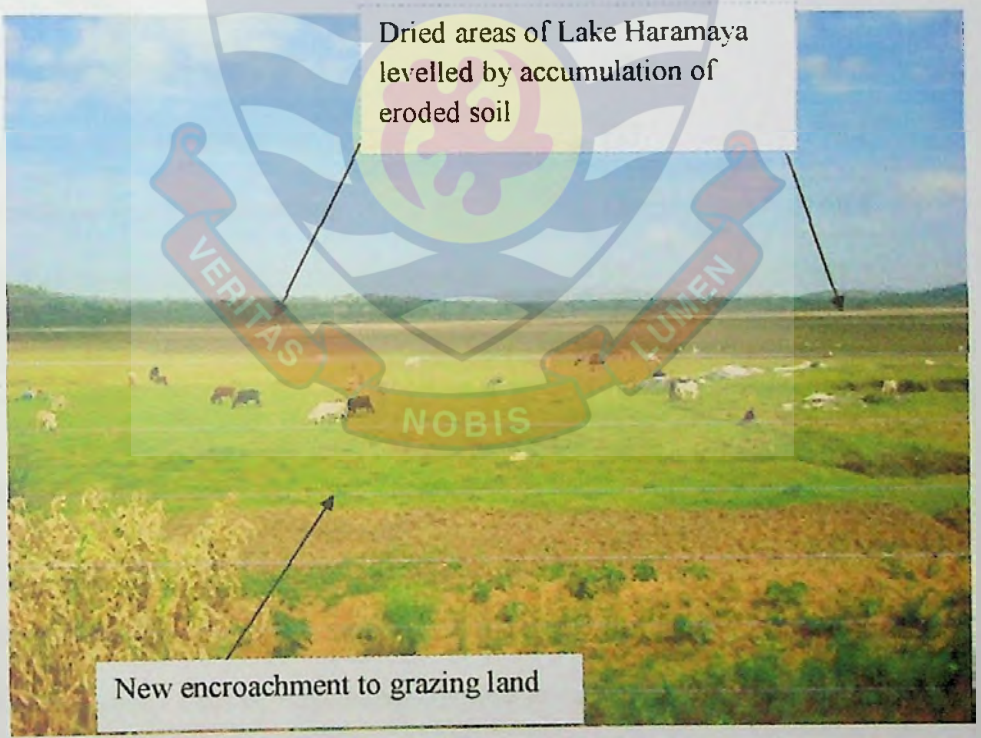

Plate 3: Dried Area of Lake Haramaya Filled with Eroded Soils and Encroachment to Common Grazing Land. Source: Field survey, 2009/2010

Table 16: Responses to Causes of Natural Resource Degradation

Causes	Frequency	%
Farmland:		
Soil erosion through high run-off	176	97.8
Lack of coordinated action among farmers	90	50.0
Cropping pattern	59	32.8
Common water points:		
Siltation	167	92.8
Excessive use by municipality	119	66.1
High level of irrigation	78	43.3
Grazing land:		
Overgrazing/deforestation	150	83.3
Absence of clear right to the resource	137	76.1
Expansion for crop cultivation	124	68.8
Lack of coordinated action among farmers	87	48.3

n=180. Note: Due to multiple responses the total response and percentage is not summed to 180 and 100 % respectively. Source: Field survey data, 2009/2010.

Perceived causes of natural resource degradation were considered as a dummy variable in further analysis of its association with likelihood of collective action. That is, respondents replied in favour of 60% and above of the causes indicated for farmland, common water points and common grazing land as being relatively well aware and respondents replied in favour of less

than 60% of the causes as being not well aware of causes of natural resource degradation.

The result of difference in overall composite value of perceived causes of natural resource degradation is provided in Table 17. The majority of the sample respondents (53.3%), of which 47.9% were from upstream and 52.1% from downstream, replied in favour of at least 60% of the causes for natural resource degradation. The other 46.7% of respondents, of which 52.4% from upstream and 47.6 % from the downstream, replied in favour of less than 60% of the causes. The difference in proportion is found statistically insignificant (χ^2 =0.35, df=1, p = 0.55).

Table 17: Chi-square test of Difference in Perceived Cause of NR Degradation by Location

Perceived cause	Upstream	Downstream	All sample
Responded in favour of ≥60% of causes	46 (47.9%)	50 (52.1 %)	96 (53.3%)
Responded to < 60% of causes in favour	44 (52.4%)	40 (47.6%)	84 (46.7%)
Total	90	90	180

χ^2 = 0.357, df=1, p = 0.55. Source: Field survey data, 2009/2010.

Perceived Level of Natural Resource Interdependencies

Table 18 presents average mean value of natural resource interdependencies as perceived by sample respondents. The mean response to all items and overall composite/aggregate mean value of these items are almost on the mid point value (3) of the scale measure. In general, the

respondents somehow perceived interdependence of natural resource improvement within a sub-catchment.

Table 18: Responses to Natural Resource Interdependencies

Description	Mean	SD
Improvement on hillside common has impact on improvement on own farms	3.08	0.71
Improvement on hillside common has impact on improvement of water stock in the catchments	3.07	0.67
Improvement of common land partly depend on my contribution	3.05	0.72
Improvement of water stock in the catchments partly depends on erosion control on others farm	3.05	0.63
Soil erosion control on others farm partly depends on erosion control on my farm	3.04	0.70
Improvement of water stock in the catchments partly depends on erosion control on own farms	3.03	0.67
Overall improvement of water stock in the catchments depends on erosion control on all farms in the catchments	3.03	0.66
Soil erosion control on own farm partly depends on erosion control on others farm	3.02	0.71

Table 18 continued

Overall improvement of natural resource situation depends on contribution of all farmers in the catchments	3.0	0.65
Overall soil erosion control on farms depend on erosion control on all farms in the catchments	2.97	0.61
Overall responses	3.03	0.47

n=180. Note: Scale 1= strongly disagree, 2= disagree, 3= somewhat agree, 4= agree, 5= strongly agree. Overall perceived NR interdependencies is summated mean value of the eight items used to measure interdependencies
Source: Field survey data, 2009/2010.

Perception towards Required Coordinated Action

Table 19 provides sample respondents' perceived required action to overcome natural resource degradation problems. From the result presented in Table 19, the variation among sample respondents is apparent concerning their responses to required action to overcome natural resource degradation. While the majority (51.1%) of respondents indicated the need for voluntary cooperation among farmers to overcome degradation of farmlands, almost an equal number of respondents (48.9%) indicated independent private action to overcome the problem. For common water points, it is found to be the reverse. While the majority (51.1%) indicated independent individual action to overcome the problem of common water point degradation, almost equal number of respondents (48.9%) asked for voluntary cooperation among individuals to overcome the problem.

Table 19: Response to Required Action to Overcome NR Degradation

Natural Resources	Required action	Responses	
		n	%
Farmland (n=180)	Voluntary cooperation	92	51.1
	Private action	88	48.9
Common water points (n=180)	Private action	92	51.1
	Voluntary cooperation	88	48.9
Common grazing land (n=180)	Voluntary cooperation	68	37.8
	State conservation (safety-net program)	63	35.0
	State hire guard	24	13.3
	Don't know	25	13.9

Source: Field survey data, 2009/2010

With regard to common grazing land, more respondents (37.8%) indicated the need for voluntary cooperation than those (35%) who were in favour of the need for state conservation through Safety-net Program. A reasonable number of respondents (13.3%) also indicated the need for government intervention by hiring guards to protect the common land. The rest (13.9 %) did not know what could be done to overcome the problem of common land gradation.

From interview with key informants it was found that government intervention through Food-for-Work during the previous regime of the Derg and current government's Safety-net Program established the habit or notion

of dependence on government intervention for natural resource conservation whereby grain is paid for labour contribution. Surprising enough, the respondents noted that none of the conservation structures (terraces) and planted trees was properly maintained. Past study (Shiferaw & Holden, 2001) asserted that this kind of intervention in the country resulted in unintended negative outcomes to the extent that some farmers intentionally were removing conservation measures to continuously receive payment for labour contribution in reconstruction of removed structure.

Collective Action Experience in Natural Resource Management

Regarding voluntary collective action experience in natural resource management, the results show that respondents rarely shared information and labour for on-farm and off-farm conservation of natural resources (Mean < 3; Table 20). Accordingly, the overall sample mean of 2.58 indicates low level of voluntary collective action experience of the respondents.

The community level survey results also confirmed the above finding. Informants asserted that long traditions of collective action among individuals in the form of sharing labour for different farming activities, commonly known as guza, is dwindling over time. For instance, the respondents noted that in the past, individuals used to construct soil conservation structures (mainly terraces) jointly at least with the neighbourhoods to the extent of taking run-off out of farmlands to commonly known waterways. They asserted that this tradition has been on the decline over time and this could be observed (Plate 4) during the transect walk with key informants from newly emerging gullies between farmlands of individuals.

Table 20: Mean Value of Voluntary Collective Action Experience

Description	Mean	SD
Labour sharing for common water point enhancing activities	2.71	0.72
Labour sharing for different farming activities	2.65	0.90
Consulting with neighbouring farm owners about on-farm soil erosion control	2.60	0.93
Labour sharing with neighbours for on-farm soil erosion control	2.58	0.92
Off-farm conservation of communal lands	2.49	0.93
Involvement in gully control	2.43	0.90
Overall responses	2.58	0.68

n=180. Note: Scale 1= never participated, 2= rarely participated, 3= participated sometimes, 4= fairly participated, 5= highly participated/whenever needed. Source: Field survey data, 2009/2010.

Plate 4: Gullies between Farm Plots Owned by Different Households Taking Run-off Carrying Eroded Soil Downstream to Lake Area (Adele Lake) Source: Field survey, 2009/2010.

Further analysis was on reasons for lower level of collective action experience and/or deterioration of common traditions of collective action indicated by the informants. In this regard, the respondents were inquired what constrains they faced in contributing to collective natural resource management and whom collective NRM would benefit. The majority (66.7%) of the respondents indicated less contribution of others followed by lack of institutional support (28.9%) enforcing rights to the resource and responsibility for its management (Table 21). Only 4.4% indicated labour shortage as a constraint. Notwithstanding the fore-mentioned constraints, majority of the respondents (68.9%, 60.6% and 53.3% in case of farmland, common land water points respectively) indicated collective action would benefit all households equally (see Table 22).

Table 21: Response to Major Constraints Faced by Households to Contribute to Collective NRM

Constraints faced	Frequency	Percent
Others contribute less/lack of cooperation of others	120	66.7
Lack of institutional/Gov't support	52	28.9
Labour shortage	8	4.4
Total	180	100

Source: Field survey data, 2009/2010.

Table 22: Summary of Response to Whom Would Voluntary Collective Action in NRM Benefits

Beneficiary of collective action	Frequency	Percent
Farmland (n=180)		
Benefit all households equally	124	68.9
My household benefit more	53	29.4
Others benefit more than my household	3	1.7
Communal land (n=180)		
Benefit all households equally	109	60.6
My household benefit more	56	31.1
Others benefit more than my household	15	8.3
Common water points (n=180)		
Benefit all households equally	96	53.3
My household benefit more	53	29.4
Others benefit more than my household	31	17.2

Source: Field survey data, 2009/2010

Trust on Cooperation of Others in Natural Resource Management

Table 23 presents mean average sample responses regarding trust on cooperation of others in natural resource management. Level of trust was assessed using items related to contribution of labour, allocation of land area for conservation measure, maintenance of conservation measure, distribution of benefit from the resource, and cooperation for establishment of voluntary organisation. The result shows an overall mean below 3 (Mean = 2.70; Table 23) suggesting ambivalent situation of individuals in trusting others. Moreover, the result is found to be consistent with the interview result of community level survey and consistent with responses on constraints faced by individuals in contributing to collective action which indicated lack of cooperation of others as a major constraint.

Table 23: Mean value of Trust on Cooperation of Others

Description of expected trust on others cooperation	Mean	SD
Fair distribution of benefits from communal land	2.86	0.84
Reciprocating cooperation being at different location	2.81	0.77
Labour contribution for joint water conservation/enhancing activities	2.79	0.82
Contributing all required for establishment of community self-initiated organisation for NRM	2.77	0.88
Maintenance of border /conservation structure of communal lands	2.73	0.89
Fair allocation area needed on own farm for enhancing or conserving common water points	2.72	0.91

Table 23 continued

For fair use of water	2.72	0.80
Labour contribution for joint management of communal land	2.70	0.75
Fair allocation of area needed on own farm for joint on-farm soil erosion control	2.59	0.74
Maintenance of conservation structure on farmlands	2.54	0.76
Labour contribution for joint on-farm soil erosion control	2.48	0.88
Overall responses	2.70	0.58

n=180. Note: Scale 1= none/can not be trusted at all, 2= very little, 3= some, 4= fair, 5= very high/highly trusted. Source: Field survey data, 2009/2010.

In general, the result on trust and interview with informants suggests prevalence of uncertainty that if one contributes towards collective action others may free ride on individual contribution without contributing their part. Marshall (2004) described this as an assurance problem in contributing towards a collective good. Moreover, the informants indicated that unlike the past, natural resource related conflicts had become common. In this regard, the research further explored for any available documentation of natural resource related conflict and filed cases were obtained from Haramaya District Court. These are presented in Table 24. The informants indicated that minor conflicts were handled at the village level by elders. However, the documentary evidence shows that the number of conflicts related to natural resource registered at the district court is generally increasing over the years (refer to Table 24). For instance, between 1995 E.C. (2002/2003) and 2002 E.C. (2008/2009) the conflict increased by 335.2%.

Table 24: Reported NR Related Conflict in Haramaya District over the Last 8 years

Year	Number of cases reported	Percent change over years
2002/2003	386	-
2003/2004	471	122
2004/2005	591	125.5
2005/2006	756	127.9
2006/2007	934	123.4
2007/2008	1096	117.3
2008/2009	1294	118
Total	5528	-

Source: Computed from filed cases at Haramaya District Court, January 2010.

Collective Action Problems

This section presents and discusses the collective action problems of the study area (i.e. findings related to Specific Objective 3 and Research Question 3). The section also facilitates subsequent discussion.

As indicated in Chapter 2, collective action is well-recognized in the literature as being an important component of rural development and local-level NRM. However, it remains a difficult issue to address empirically due to wide ranges of disagreement with regard to indicators of successful collective action and its measures (Meinzen-Dick *et al.,* 2004; McCarthy *et al.*, 2004). As a result, Meinzen-Dick *et al.* (2004) suggested that prior to assessing the level of collective action/likelihood of collective action in a particular context,

collective action problem or indicators of collective action need to be defined clearly. Accordingly, in most theoretical and empirical literature, collective action problem is determined based on already agreed/expected contribution of resource user(s) enforced either by an external agency or through self-initiated community interest. For example, contribution for collective action may include labour and money and accordingly, collective action problem is defined as labour free-riding and monitory free-riding respectively (Araral, 2008; McCarthy *et al.*, 2004).

In the study context, besides the above mentioned disagreements, the absence of a clearly defined group and thus expected collective contribution brought another challenge. In such situations, where collective action problems and institutional context (endogenous institutional support) are not well known, qualitative approach is recommended to explore key collective action problems conditioning effective natural resource management (Meinzen-Dick *et al.*, 2004). This study, therefore, first explored key collective action problems or indicators of likelihood of collective action by employing qualitative approach, using semi-structured interviews with key informants and participants of focus groups. Then, these indicators were used for household level survey the result of which is reported in the next section.

Collective action in the context of this study refers to voluntary cooperation of resource users with neighbours and others at far distance by contributing all that is required for effective and sustainable management of natural resources. As emphasized in the literature, it was difficult to obtain straight forward responses from the survey. This confirmed the argument of McCarthy *et al.* (2004) that such reasons justify why elements constituting

collective action among resource users have been contentious in the wider literature. Interviews of key informants and focus group revealed a wide range of collective action problems, which were categorized generally in two aspects, problems associated with coordination in investing in natural resource management and institutional building (voluntary self-organisation to establish sanctioning rules and monitoring mechanisms). Both aspects demand overcoming negative externalities and developing positive externalities. This was found basically to be important for collective action to happen in the study area as informants asserted that different households were at different strategic locations in the catchments, containing different levels of externalities. Manifestation of externalities contained by different households as stated by informants includes:

- aggressive expansion to common land for crop cultivation,
- monopolizing common water point for private use denying others,
- increasing number of water ways growing to gullies being associated with less consideration of off-farm impact in downstream coupled with growing neglect of joint conservation measures among neighbourhoods.

In light of the above-mentioned collective action problems, the required collective action noted by informants includes coordinated investment in conservation measures demanding agreements among neighbourhood and beyond with others by sharing information and allotting land area needed for conservation measures. This, however, would not happen without developing institutional mechanisms through which opportunistic behaviour is checked. The latter is justified based on frequently indicated

problems of competitive use of natural resource by different households in different locations, for instance, private use of common grazing land and monopolizing common water points for private use. Moreover, the deterioration in collective activities in terms of ranges of scope for collective actions reported in the above section also support the opinion of having institutional mechanisms to ensure collective action expected from different individuals.

Specifically, the identified collective action problems imply required collective action or are indicatives of likelihood of collective action for natural resource management to happen in Haramaya. In this regard, the likelihood of collective action among farmers in Haramaya demands:

- sharing information among resource users,
- contribution of labour,
- allocating land area needed for conservation measure,
- initiating voluntary community and/or participating meeting organized by others, and
- providing all necessary support such as money for establishment of voluntary association at sub-catchments level.

Resource Users' Likelihood of Collective Action in NRM

The above section presented identified collective action problems and thus implied the likelihood of collective action indicators. Accordingly, resource users' likelihood of collective action (LHCA) is an aggregate index of key indicators as presented in Tables 25, 26 and 27. The results show that the mean value of each item as well as aggregate index were below 3 indicating some what likely contribution for collective NRM in all cases of the

resources. This suggests that respondents were ambivalent with regard to their likelihood to take part in collective natural resource management.

Table 25: Resource Users' Likelihood of Collective Action for Farmland Management

Description	Mean	SD
Participate in voluntary community meeting initiated by others	2.89	0.99
Provide necessary support for establishment of voluntary farmers organisation at sub-catchments level for collective soil erosion control on farmlands	2.82	0.97
Share information with/ encourage others concerning collective soil erosion	2.78	0.97
Contribute labour required for collective soil erosion control	2.76	0.93
Allocate area on own farmland needed for conservation measure and/or maintain the measure	2.67	0.97
Initiate voluntary community meeting for collective soil erosion control	2.62	0.93
Overall responses	2.76	0.81

n=180. Scale 1= very unlikely, 2= unlikely, 3= somewhat likely, 4= likely 5= very likely. Source: Field survey data, 2009/2010.

Table 26: Resource Users' Likelihood of Collective Action for Common Water Point Management

Description	Mean	SD
Allocate area on own farmland needed for conservation measure contributing towards common water point management.	2.88	0.92
Initiate voluntary community meeting for collective common water point management	2.81	1.01
Contribute labour for collective common water point management	2.78	0.98
Participate in voluntary community meeting initiated by others	2.69	1.02
Share information with/encourage others concerning common water point enhancing activities and its conservation (management)	2.65	1.09
Provide necessary support for establishment voluntary farmers organisation at sub-catchments level for collective common water point management	2.63	1.0
Overall responses	2.74	0.88

n=180. Scale 1= very unlikely, 2= unlikely, 3= somewhat likely, 4= likely 5= very likely. Source: Field survey data, 2009/2010.

Table 27: Resource Users' Likelihood of Collective Action for Communal Land Management

Description	Mean	SD
Share information with/ encourage others concerning collective management of communal land	2.74	1.0
Provide necessary support for establishment voluntary farmers organisation at sub-catchments level for collective management of communal land	2.74	1.05
Allocate area on own farmland and/or maintain boarder communal land needed for conservation of communal land	2.67	0.97
Initiate voluntary community meeting for collective management of communal land	2.67	0.94
Contribute labour for collective management of communal land	2.64	0.84
Participate in voluntary community meeting initiated by others	2.59	0.97
Overall responses	2.68	0.84

n=180. Scale 1= very unlikely, 2= unlikely, 3= somewhat likely, 4= likely 5= very likely. Source: Field survey data, 2009/2010.

Table 28 presents aggregate mean values of sample households' likelihood of collective action for natural resource management and independent t-test of difference by household locations.

Table 28: Mean and Independent t-test of Households' Overall LHCA by their Location

	Mean	SD	MD	t	Sign.
Likelihood of collective action for NRM					
Upstream (n=90)	2.71	0.835	0.04	0.34	0.74
Downstream (n=90)	2.75	0.841			
Overall sample	2.72	0.83			

Note: Scale, 1= very unlikely, 2= unlikely, 3= somewhat likely, 4= likely, 5= very likely Here LHCA for NRM is summated composite average mean value of LHCA for all the resources (farmland, common water points and common grazing land). Source: Field survey data, 2009/2010.

Table 28 reveals that in both locations (i.e. upstream and downstream), the intent of sample respondents to take part in collective natural resource management is less likely. Moreover, the difference between the two locations is not statistically significant ($p = 0.74$). In general, the analysis of likelihood of collective action so far elicited sample respondents' decision concerning their likely contribution towards collective natural resource management. The factors underlying their incentives for likelihood of collective action are discussed in the next section.

Relationships between Selected Resource Users Characteristics and Their Likelihood of Collective Action in Natural Resource Management

This section presents findings related to Specific Objective 5 and test Hypotheses 1 to 8. The result presented in the above section, in general, shows the likely emergence of collective action for NRM in Haramaya is low. Literature pointed out that attributes of resources and resource users are among widely agreed factors influencing individual likelihood of collective action in natural resource management. However, the influences of factors associated with these attributes as suggested are better explained in social, political, economic and ecological contexts of a particular locality. This is mainly in response to the underlying debate in the literature concerning factors associated with effectiveness of collective action and likelihood of collective action among resource users.

The testing of the hypotheses related to attributes of the resource and resource users was found apparent step given the model the research intended to use for establishing empirical relevance of the conditioning factors hypothesized by the research. Moreover, studies on collective action (McCarthy *et al.*, 2004) suggested that for the factors to explain likelihood of collective action there should be significant correlation between collective action and the associated factors.

Table 29 presents a summary of the research's expected association between attributes of resource and resource users and likelihood of collective action. In other words, it is a summary of alternative hypotheses of the research.

Table 29: Summary of Expected Associations between Attributes NRs and Resource Users, and LHCA

Variable	Sign	Variable measure
Level of NR scarcity	+	Scarcity index score – cumulative score of change in cropland fertility, irrigated area in ha and livestock size grazing in the common based on situation 10 years ago (see Appendix A for detail)
Level of dependence on NR	+	Adult equivalent per capita value of yield and livestock accessing grazing land in Birr/US $
Perceived level of NR degradation	+	Scale 1= not degraded at all, 5= very degraded
Perceived cause of NR degradation	+	Dummy, ≥60% favourable answer =1, otherwise = 0
Required action to overcome NR degradation	+	Rank on favourable response (see Appendix B for detail)
NR interdependence	+	Scale 1= strongly disagree, 5= strongly agree
Past Participation in collective activities	+	Scale 1= very low, 5= very high
Trust on cooperation of others	+	Scale 1= not trusted at all, 5= highly trusted

Note: Signs (+) and (-) represent direct and inverse relationships between independent variables and LHCA respectively. Source: Field survey data, 2009/2010

Natural resource scarcity is negatively correlated with likelihood of collective action which is opposite to the research's expected positive relationship (r= - 0.544, p= 0.00). This is, however, found to be apparent given the marginal mean likelihood of collective action value which is also consistent with information from the community level survey indicating the decline of collective action over time while significant level of scarcity faced by sample households' (i.e. current level as compared to the situation 10 years ago indicated in the above description section). Notwithstanding the negative relationship of natural resource scarcity and likelihood of collective action, the null hypothesis of Hypothesis 1 is rejected.

All variables related to attributes of resource users were found to be in research expected direction and significant except level of dependence on NR which was found to be negative (see Table 30). Thus, the null hypotheses of Hypotheses 2 to 8 are rejected.

Table 30: Result Summary of Correlation between Households' Likelihood of Collective Action and their Characteristics

Household characteristics	LHCA	
	Coefficient (r)	Sign.
Level of dependence on the resource	- 0.381**	0.00
Perceived level of NR degradation	0.762**	0.00
Perceived cause of NR degradation	0.492**	0.00

Table 30 continued

Required action to overcome NR degradation	0.634** (Kendall's tau_b)	0.00
Perceived ecological interdependence	0.694**	0.00
Prior participation in collective activities	0.633**	0.00
Perceived level of trust on cooperation of others	0.822**	0.00

n = 180 **, - ** Correlation is positive, negative and significant at 0.01 level (1-tailed). Source: Field survey data, 2009/2010.

The negative association between likelihood of collective action and level of dependence on natural resource outcome may hold, given the marginal mean value of likelihood of collective action indicated in the above section and the established fact that rural households dependence on natural resource for their livelihood. However, this may not necessarily mean increase in level of dependence will result in negative likelihood of collective action. To this end, in brief, the research further looked into the possible description based on two facts. First, the anecdotal evidence obtained from the interview with key informants and focus group that households sharing border with common grazing land and water points may tend to be reluctant to take part in collective action due to the relative advantage they have been obtaining from the resource in the short run. For instance, claiming private use of common water point and grazing land by fencing it or encroaching for crop cultivation. Second, the research measured relative dependence on NR using monetary estimate for ease of standardization which might obscure the difference

between households sharing border with common grazing and water points and those not having this privilege. That is, the former households obviously have more level of dependence as monetary estimate of livestock kept in common and yield obtained is higher than households without such access.

In light of the above-mentioned evidence, the research further analyzed the relative difference between households with alternative to common resources in their likelihood of collective action. Table 31 presents difference in likelihood of collective action between households with and without alternative common grazing land and water points. The difference is found to be significant (MD=0.34, p = 0.006 and MD=0.73, p= 0.000 for water resource and grazing land respectively).

Table 31: Independent t-test of likelihood of Collective Action by Availability of Alternative Source to the Commons

Alternative to the common NR	Likelihood of collective action				
	Mean	SD	MD	t-value	Sig.
Water resource					
No alternative (n= 72)	2.97	0.84	0.34	2.8	0.006
Have/intent to have alternative (n=108)	2.63	0.77			
Grazing land					
No alternative (n= 88)	3.14	0.72	0.73	6.7	0.00
Have alternative/afford purchase of feed (n= 92)	2.41	0.74			

n = 180. Source: Field survey data, 2009/2010.

Level of Support of Endogenous Institutional Arrangements for Collective Action in Natural Resource Management

Table 32: Level of Support of Endogenous Institutional Arrangements for Collective NRM

Prevailing Regularized Practices	Mean	SD
Role played by elders/local organisation in resolving conflict related to NR is encouraging	2.82	0.85
Patterns common water point use is encouraging to cooperate in its conservation	2.77	0.84
Role played by elders in mediating fair contribution and sharing of benefits from the NR is encouraging	2.74	0.77
Areda administration has been working to the interest of all community members	2.74	0.76
Peer/neighbours pressure is always encouraging to cooperate in conservation of farmlands	2.73	0.97
Areda administration has been effective in resolving NR related conflicts	2.70	0.78
Patterns communal land use is encouraging to cooperate in its conservation	2.68	0.80
Procedures involved in Areda administration is fair with respect to cost involved including time	2.65	0.75
Overall responses	2.73	0.65

n=180. Note: Scale 1= strongly disagree, 2= disagree, 3= some what agree 4= agree, 5= strongly agree. Source: Field survey data, 2009/2010.

The mean value of all aspects of endogenous institution arrangements and cumulative mean value were found to be marginal, all falling below 3 (Table 32). This shows that endogenous institutional environments have been discouraging to the respondents. It is noteworthy to state that the results were consistent with results from community level survey and interview with key informants. The informants indicated that unlike the past, joint conservation measures on farmlands have been dwindling.

With regard to patterns of common grazing land and water point use, the mean response was 2.68 and 2.77 respectively, implying a discouraging pattern of resource use. Interviews with key informants and focus groups revealed consistent results with those of the households. They stated that the common resources (i.e. grazing land and water points) have been misappropriated by individuals using location advantage. That is, individuals sharing borders with common land have been encroaching to the commons for crop cultivation at the expense of others losing grazing land. The informants could show the original border of common grazing land. In most locations, larger proportions of common land converted to cropland became private farm land. In some locations, it was almost completely converted to farmlands and the remnant patches were claimed by individuals denying others access for grazing.

The situation of common water point was not different from the communal land. Individuals with farm location advantage claimed private use denying others access at most locations. The informants pointed out that this had become serious after significant degradation of water stock in the area, that is, after extinction of lakes and streams. Informants emphasized that

households with farm locations sharing borders with common water points, most of whom invested in exploring waters (mainly shallow wells), neither allowed others to access the water point nor were ready to jointly invest and use the water point. Moreover, the informants stated the growing conflicts on water use among individuals. The above mentioned scenario indicated in the literature that in the absence of enforcement of rules *de jure* common becomes *de facto* open access (Hess & Ostrom, 2001). The informants noted such trends in the past that individuals have been accessing common resource without any sanction of responsibilities of its management. Presently in most cases, the regular practice in the area was found going beyond the stated de facto open access situation as individuals were denying others to access the common.

In the above section, it is presented that exogenous institutions, i.e. in this case the Regional Government of Oromia's land use proclamation, promulgated collective rights to common grazing land and water points. However, as already reported enforcement of the rights is not in place. Schalger and Ostrom (1992) asserted that in contexts such us this study, i.e. in the absence of enforcement of formal rules, rule-in-use assigns de facto rights to the resource which are often contrary to de jure rights as was the case in this study, where individuals claimed private use of commons based on location of their farmland.

The role of elders and local organisations (*Afosha)* in mediating resource use and conflicts among resource users were also found to be discouraging (refer to Table 32) with mean value of 2.74 and 2.82 respectively. This contrasts with the strong social role of such organisations

(for example, comforting bereaved family, redressing serious injuries within community). Yet, such outcome in NRM is apparent given the deprived arenas which could enhance capacity of elders or leaders of local organisations in the country's regimes to date. For example, studies in the country (Adal, 2000; Dieninger *et al.*, 2008; Zewdie, 2004) as well as interview with key informants in the study area revealed that the state legacy of excluding local institutions began during imperial regime and continued to date.

Exclusion of local organisations by state organs contributed to dwindling of the leadership skill they could develop as well as the role they could play in NRM. In this regard, for instance, the informants emphasized the fragile situation in some areas where local elders were still leading collective water sharing from common water points commonly known as Malaqa. Malaqa is an inherited traditional system of common water point management and use which was revived after dissolution of the past Derg regime Producer Cooperative.

Informants, however, stated that in areas where Malaqa is operational its survival is under a challenge mainly due to the absence of legal support from the state organisation. They specifically pointed out that few individuals who declined from decisions made by leaders of Malaqa had been taking charge of conflict to district court and this in turn affects bonds between members of the organisation. Ostrom (1992) also asserted the influence of lack of autonomy to self-organise on individual incentive for self-organisation in natural resource management. That is, individuals appeal to higher state authority disrupts incentive for self-organisation where legitimacy of the organisation is not acknowledged by state authority. Figure 4 presents a

summary of a key informant's description of the prevailing situation with regard to the role of elders and local organisations (Afosha) in NRM.

> Disapproval of membership to local organisation (Afosha) is strong. A person excluded from Afosha is equal to dead! but lack of acknowledgment of decision made by such organisation and elders is fading away the role it had in the past. This has been fuelled by little opportunistic behaviour which seeks to meet immediate selfish benefit from misappropriating natural resources. Moreover, contesting the role of local organisation to sanction such behaviour (i.e. by excluding from Afosha) can be interpreted politically, 'a person who saw a snake in the day light gets frightened when he sees a thread in the dark' (*'namni guya bofa arke halken tepha dheysa'*). Thus, the role of elders and local organisation is quietly fading. However, the role and strength of Afosha with regard to social affairs (burial and comforting bereaved and supporting needy in case of calamities) is still there and will continue to be so no matter how disappointing it is with regard to natural resource management

Figure 4: Text Box – Weakening Elders and Local Organization's Roles in NRM (Source: Face to face interview with Informant 1, March 20, 2009)

For instance, with regard to what Ostrom (1992) indicated, the incentive of social disapproval to membership of local organisation to sanction individuals with opportunistic behaviour in NR use. As such, the expression of the key informant is consistent with the view of Ostrom (2004) that people who lived in an authoritarian regime which considers independent action as potential threat remain nervous even after the regime is changed. Moreover, informants (i.e. key informants and focus groups) maintained in general the

disadvantage of formal procedure in conflict resolution in terms of the cost involved and consequence on future peace among conflicted individuals. In this regard, respondents were in favour of the local conflict resolution mechanism. For example, they affirmed that the transaction cost is low and unlike the formal decision makers, in the local organisation, after a decision has been made, the parties are required to apologize to each other and make peace between them.

The final aspect of endogenous institutional arrangement was the role of local administration. The role of local administration was found not to be encouraging as well. The mean response to the role of the local administration in resolving conflict related to natural resources, meeting all community members' interest, and fairness and cost effectiveness of procedure involved was 2.74, 2.70 and 2.65 respectively on the five point scale measure (see Table 32).

The result of the interview with key informants and focus groups in different locations also revealed that the local administrations were often busy with political affairs and the obvious situation of misappropriation of natural resource by some individuals was evident as a weakness of the local administration. A study by Crewett and Korf (2008) also reported that lower level bureaucrat's selective implementation of the legislation attenuated rights and obligations in the policy text which in turn affected the sound management of natural resources. Moreover, the experts in the district indicated that the procedure for conflict resolution in the previous legislation (i.e. Proclamation No.70/2003) was almost not functional. Most individuals were directly taking charges to district courts contrary to what was stated in

the legislation. That is, the conflict resolution procedure starting with a social committee at the village level and then only appeal to other levels such as district court, zone court and finally, to the regional supreme court.

The recent legislation (Proclamation No. 147/2009) abolished the role of social court directing the BLEP is responsible for resolving conflict related to natural resource. However, the involvement of Areda administration was reported by informants. In general, the literature asserted that rule-in-use which may not resemble formal rules but still affect individual incentive to take part in collective action. The institutional arrangements (i.e., rule-in-use) mediate the day-to-day interaction of resource users with natural resource and among themselves (Meinzen-Dick, 2009; Ostrom, 1992).

Level of Support of Exogenous Institutional Arrangements for Collective Action in Natural Resource Management

The discussion in this section addresses Specific Objective 7 and Research Question 7. Level of support of external institutional arrangements in the study context was assessed from the perspective of granting and enforcing rights to the resource and acknowledging right to self-organize and enforcing these rights. The practical relevance of approaching external institutional arrangements from these aspects in the context of sub-Saharan Africa in general and Ethiopia in particular is well discussed in Chapter 2. Moreover, such approach to analysing external institutional arrangements and its influence on individual incentive for natural resource management is noted as lacking in the literature on sub-Saharan Africa in general (Mwangi & Meinzen, 2009) and Ethiopia in particular (Crewett & Korf, 2008; Crewett *et al.*, 2008). The exogenous institutional support was thus analysed based on

information from the community level survey (interview with key informants and focus groups), interview with experts in the district BARD and household level survey. Besides review of policy document, mainly Oromia Rural Land Use and Administration Proclamation (No. 130/2007) and information from limited studies conducted in the region and study area are also included to substantiate research findings.

Table 33: Level of Support of Exogenous Institutional Arrangements for Collective NRM

Likely Supports of Exogenous Institutions	Mean	SD
In defining rights to farmlands	2.61	0.81
In defining and enforcing collective responsibilities to conserve farmlands among neighbourhoods	2.64	0.77
Defining rights to plant different types of tree specious on own farmlands	2.69	0.66
Rights to trees on own farmlands	2.59	0.71
Defining and enforcing right to common grazing land	2.74	0.66
Defining and enforcing proper use of common grazing land	2.61	0.66
Defining and enforcing collective responsibilities to conserve common grazing land	2.52	0.62
Defining and enforcing right to common water points	2.53	0.70

Table 33 continued

Defining and enforcing collective responsibilities to conserve common water points	2.49	0.63
Granting right/acknowledging independent voluntary self-initiated farmers organization for NRM	2.47	0.66
Enforcing legality of self-initiated farmers organization at different levels	2.49	0.69
Providing technical support to independent self- initiated farmers organization without influencing its goal	2.41	0.70
Overall responses	2.56	0.49

n=180. Note: Scale 1= none/ no support expected at all, 2= very little, 3= some, 4= fair, 5= expect very high level of support. Source: Field survey data, 2009/2010.

Presented in Table 33 are different aspects of exogenous institutional arrangement known for having influence on incentive for NRM and thus on collective action for NRM were considered by this research. The average sample mean value of expected external institutional support for each item and the overall aggregate of the items is found to be marginal. The marginal level of expected supports is revealing when considered with provision in policy text. As discussed below, there are good provisions in the policy with regard to bundles of rights to natural resources. It provides individual and collective rights to the resource and also sanctions responsibilities to conserve the resources as a condition to maintain rights to the resources.

The Oromia regional government has provided a series of land proclamations (No.56/2002, No.70/2003, No.103/2005). The pervious ones were recently amended by proclamation No. 130/2007. With regard to right to farm land, the provision states lifelong use rights (Regional Government of Oromia [RGO], 2007 Article 6.1) including granting of certificate for holdings (Article 15) and transfer right to family members who have inheritance right by law (Article 9.1). That proclamation also states individual and collective responsibility to conserve farmlands (Article 19). Right to grazing land water points is also stated in Article 5.4. The Proclamation also sanctions any activity that damages water resources (Article 20). However, there are three aspects that may weaken lifelong use right to lands. These are the exclusion of irrigation and irrigable land in the article that abolished re-distribution of farmland (Article 14.1), and rights of government to expropriate land if needed for better public use (Article 6.10).

In general, the proclamation imposes a number of private and collective obligations as a condition to maintain rights to the resource such as cultivation in erosion prone areas, planting appropriate tree species and preservation of water conservation structure. This should have been an incentive for likely emergence of collective action which, however, is found to be less likely as revealed in this study. Moreover, based on written rules in the proclamation, it may be right to expect a positive response from sample respondents regarding support of exogenous institutions. However, this was not the case in this study.

The low-level of support expected from exogenous institutions by the community is in contrast with the progressive policy of the Oromia Regional

State as described by scholars (Dieninger *et al.*, 2008; Crewett & Korf, 2008; Crewett *et al.*, 2008). However, the reality on the ground differed from pertains in the literature. It is indicated in the literature that rights are meaningless without enforcement (Kerstin *et al.*, 2009; Mwangi & Meinzen-Dick, 2009). A study of forest management in Uganda asserted that successful forest management was associated not only with clarity of rights but also with enforcement of right and monitoring mechanisms of rights enforcement (Banana & Gammbya-Sembajjwe, 2000). It is noted that whilst the proclamation of Oromia Regional State has long life, i.e. proclaimed since 2003, full implementation is far from completion (Adnew, 2008; Dieninger *et al.*, 2008; Crewett *et al.*, 2008). The Haramaya situation was found not to be different from what was reported by these authors based on the study conducted at national and regional (i.e. Oromia) levels.

A study conducted in the Haramaya district (Crewett & Korf, 2008) also reported the same situation (i.e. lack of implementation of provision in the proclamation). Field data collection for this study was conducted in Haramaya in 2004 which was right after the start of implementation of the new proclamation in the district. They maintained that the implementation was selective, because it mainly focused on providing certificate for farmland holdings which were not even based on complete information such as actual measure of holdings and marking its boarders. Interviews with key informants, focus groups and experts revealed that none of the provisions had been implemented. Even the certification process reported in earlier study (Crewett & Korf, 2008) was found to be suspended. The key informants and experts also pointed out the start of sanctioning individuals from expansion to

communal land through local administration in 2003 was suspended soon after implementation and individuals continued misappropriation of common land. Other examples reported by experts in the district were few enclosures of hillside commons for rehabilitation using the occasion of Ethiopian Millennium celebration (i.e. 2007/2008) but due to lack of enforcement of individual and collective rights and monitoring, the usual problem of encroachment had continued. This was observed during the field visit to the enclosures in upstream and common grazing lands in downstream (see Plate 5 and Plate 6 below).

Plate 5: New Encroachment and Continued Farming in Enclosure of Hillside Common Land (Upstream). Source: Field survey, 2009/2010

Plate 6: Continued Encroachments to Common Grazing Land for Crop Cultivation around Lake Area (Downstream). Source: Field survey, 2009/2010.

In general, there is very weak support from exogenous institutions, mainly due to absence of enforcement of collective and individual rights to the resource which contributed to misappropriation of the resource by individuals at different strategic locations. In this regard, the study further looked into the likely difference among individuals located in different locations with different opportunities of misappropriating common resources for private use. Individual preferences of change to current patterns of use rights were also investigated. Tables 34, 35 and 36 provide preference for change with regard to farmland, common grazing and water points by households' farm proximity. It was found that households sharing borders preferred continuation of current situations while others preferred change. The difference between these households was statistically significant (p= 0.00 in all cases of the resources).

Table 34: Response to Tenure Preference for Farmland and χ^2 test of Difference by Farm Proximity

Tenure preference	Border sharers	Non-border sharers	Total sample
Comfortable with current tenure	67 (74.4%)	6 (6.7%)	73 (40.6%)
Prefer change	23 (25.6%)	84 (93.3%)	107 (59.4%)
Total	90	90	180 (100%)

Chi-Square(χ^2) = 85.75, df=1, p= 0.000. Source: Field survey data, 2009/2010.

Table 35: Response to Tenure Preference for Communal Land and χ^2 test of Difference by Farm Proximity

Tenure preference	Border sharers	Non-border sharers	Total sample
Comfortable with current tenure	78 (86.4%)	7 (7.8%)	85 (47.2%)
Prefer change	12 (13.3%)	83 (92.2%)	95 (52.8%)
Total	90	90	180 (100%)

Chi-Square (χ^2) = 112.4, df=1, p= 0.000. Source: Field survey data, 2009/2010.

Table 36: Response to Tenure Preference for Common Water Points and χ^2 test of Difference by Farm Proximity

Tenure preference	Border sharers	Non-border sharers	Total sample
Comfortable with current tenure	69 (76.7%)	7 (7.8%)	76 (42.2%)
Prefer change	21 (23.3%)	83 (92.2%)	104 (57.8%)
Total	90	90	180 (100%)

Chi-Square (χ^2) = 87.54, df=1, p= 0.000. Source: Field survey data, 2009/2010.

Influence of External Factors and Likelihood of Collective Action

Market opportunity and involvement in off-farm incomes were the two external factors under study. Table 37 provides households' cropping tendency and involvement in off-farm income. Variations among sample households were apparent. An overwhelming (92.2%) had plan to produce or continued producing more cash crops, less than one in 10 had plan to produce more food crop. With regard to involvement in off-farm income activities, 53.3% of the sample households were so engaged their involvement. (For detail of types of off-farm income source of sample households, see Appendix D).

Table 37: Households' Cropping Tendency and Involvement in Off-farm Income

Description	Frequency	Percent
Intent of cropping Tendency (n =180):		
More cash crop production	166	92.2
More food crop production	14	7.8
Involvement in off-farm income (n=180):		
Yes	105	53.3
No	75	41.7

Source: Field survey data, 2009/2010.

There was a variation among sample households with regard to cropping tendency and involvement in off-farm income, suggesting the likely difference among these households in their likelihood of collective action. However, the differences among them in terms of likelihood of collective action found not to be statistically significant ($p>0.05$) as shown in Table 38. The correlation result also shows that the relationship between this variable and the likelihood of collective action was not significant ($p>0.05$) as presented in Table 39.

Table 38: Independent t-test of Difference in Likelihood of Collective Action by Influence of External Factors

	Likelihood of collective action				
External factors	**Mean**	**SD**	**MD**	**t-value**	**Sign.**
Intent of cropping					
More cash crop	2.72	0.83	0.1	0.43	0.67
More food crop	2.82	0.89			
Involved in off farm income					
Yes (n= 105)	2.78	0.82	0.13	1.1	0.27
No (n= 75)	2.65	0.85			

n= 180. Source: Field survey data, 2009/2010

The study initially assumed that the likelihood of collective action was going to be negatively associated with market opportunity (Hypothesis 9) and involvement in off-farm income (Hypothesis 10). As shown in Table 39 the

relationship between likelihood of collective action and market opportunity (cropping tendency) was found to be as expected but not significant ($p>0.05$). With regard to involvement in off-farm income, the relationship was found not to be as expected, but not significant ($p>0.05$). In both cases (i.e. Hypotheses 9 and 10) rejection of the null hypotheses are not supported by the result.

Table 39: Association between External Factors and LHCA

Influence of external factors	Coefficient (r)	Sign.
Intent of cropping/market opportunity	- 0.32	0.333
Involvement in off-farm income	0.082	0.136

n= 180. Source: Field survey data, 2009/2010.

Key Differences among Resource Users that are Relevant for Collective Action in Natural Resource Management

This study considered farm proximity and wealth status as relevant heterogeneity factors. Differences among resource users (commonly known as heterogeneity factors) were mostly along socio-cultural and economic/wealth differences or heterogeneity. Socio-cultural difference was of less importance, given the fact that entire rural Haramaya is homogenous with respect to ethnicity and religion (i.e. Muslim Oromo). Rather the study found, from its first phase survey, other glaring differences (i.e. farm proximity to common resources) among resource users and considered as important heterogeneity factors along with wealth status.

Farm Proximity to Communal Natural Resources

The study noted the importance of farm proximity as an important heterogeneity factor based on intermediate result from the community level survey. This was primarily the result of the absence of enforcing legitimate rights of the communities to the common resources stated in the policy text. From the interview with key informants and focus groups in different locations, it was found that individuals with opportunities of misappropriating commons for private use may be reluctant to participate in collective action. This was mainly due to the reason that collective action would imply ensuring equal access to the resource, costing such households to forgo private selfish use of the common grazing and water points.

Table 40 shows result summary by farm proximity. That is households sharing border with communal land and/ or accessing common water points and households without such privilege. The two groups of households vary in their average mean likelihood of collective action. The mean values of likelihood of collective action were 1.98 and 3.46 respectively. This implied the likelihood of collective action of households with privileges of sharing border and/ or accessing the common was unlikely, while others without this privilege were likely. The mean difference was also statistically significant (MD=1.48, p = 0.00).

Table 40: Independent t-test of Likelihood of Collective Action by Farm Proximity to Communal NR

Farm proximity	Likelihood of collective action				
	Mean	SD	MD	t-value	Sign.
Yes (n= 90)	1.98	0.25	1.48	25.9	0.00
No (n= 90)	3.46	0.48			

N= 180. Source: Field survey data, 2009/2010.

The correlation result also shows a significant negative association between likelihood of collective action and farm proximity in the research expected direction (r = - 0.89, p = 0.00) (see Table 41). Thus, the null hypothesis of Hypothesis 11 (i.e. Resource users' likelihood of collective action does not have any relationship with their farmland proximity to the common resources) is rejected.

Table 41: Association between Heterogeneity Factors and LHCA

Heterogeneity factors	Coefficient (r)	Sign.
Farm proximity	- 0.89**	0.000
Wealth status (per capita adult equivalent in monetary value)	-0.302**	0.000

n= 180. Note: Farm proximity dummy = 1, if shared border with common land and or have at least one farm plot accessible to common water points and 0 otherwise. Wealth measured by monetary value of agricultural and non-agricultural assets holding of the households. – **, **Correlation is negative, positive and significant at 0.01 level (1-tailed). Source: Field survey data, 2009/2010.

Wealth Status of the Households

Interviews with key informants revealed that differences in wealth status of rural households in Haramaya reflected in agricultural and non-agricultural asset holdings. Thus, the study used sample respondents' assessment of monetary estimate of their holdings of these assets as indicators of difference in wealth status. In this regard, the variation among sample households was apparent, that implied heterogeneity among households in wealth status. The correlation result presented in Table 41 shows negative and significant ($p = 0.000$) relationship between likelihood of collective action and wealth status in the expected direction ($r = - 0.302$). Thus, the null hypothesis of Research Hypothesis 12 is rejected). This was found to be consistent with generally suggested relationships between wealth heterogeneity and collective action in the literature, while possible contextual variation (either positive or negative relation) is also underlined (Ruttan, 2008; Baland & Platteau, 1999).

It is interesting to note that the correlations of both heterogeneity factors being negative and significant, suggesting consistency with information obtained from community level survey. That is, the informants emphasized the possibility of individuals with the privilege of having farms closer to the common were indifferent to collective action as this implies costs at least in the short run in terms of forgoing monopolizing or misappropriation of common for private use. Moreover, with respect to the above mentioned criteria of wealth, households with farms closer to the common were found to be relatively more endowed than the others. The noted cost implication for wealthy households in this context also confirms past finding in the literature. For example, Ruttan (2008) reported that more endowed resource users tend to

provide collective good for management of the resource if this provision is to their advantage.

Best Predictors of Likelihood of Collective Action in Natural Resource Management

This section presents the results and discussion of the best predictors of likelihood of collective action in natural resource management in the context of the study area. To do this, the study employed an econometric model, ordinary least square (OLS) regression model, to assess the empirical significances and level of influence of factors associated with likelihood of collective action in the study context. As noted in Chapter 3, OLS is an unbiased and consistent estimator, provided that heteroskedasticity is allowed for (Macdonald, 2009). In OLS model, all variables related to attributes of the resource and resource users, institutional arrangements and external factors were included (Table 42).

From the result presented in Table 42, the F-Regression (F= 194.30) and its significance (p = 0.000) show that the model fits the data set at 0.001 alpha level (99% confidence interval). Moreover, the model was checked whether it fits the data set inline with theoretical assumption recommended in literature (Gupta, 1999; McDonald, 2009). In this regard, McDonald (2009) noted two useful misspecification tests as a test for normality and a test for heteroskedasticity. Misspecification of the regression model can occur due to incorrect functional form, omission of relevant independent variable, and/or measurement error in the variables. Heteroskedasticity implies unequal variance of residual around expected mean of zero for different observations

suggesting that the reliability of each observation used in the regression analysis is unequal (Gupta, 1999).

In order to test the existence of misspecification and/or heteroskedasticity, scatter plot of regression standardized predicted value (i.e., for the dependent variable LHCA) versus its residual; and partial residual plot of the dependent variable LHCA versus each predictor were used. Following suggestion of Gupta (1999), from the graphical inspections (i.e., of the scatter plot and partial plots) no discernible patterns were observed hinting existence of misspecification and/or heteroskedasticity.

With regard to the theoretical assumption of normal distribution of the residual (unexplained estimate) value of the dependent variable, LHCA, the normal probability plot (Figure 5) shows that the residual is normally distributed. Values on the X-axis are observed cumulative probabilities; and those on the Y-axis are expected cumulative probabilities. According to Gupta (1999) the thick curve should lie close to the diagonal, as the case of this plot, to ensure that the residual (i.e. unexplained estimate of LHCA) is probably normally distributed. Following McDonald (2009) suggestion, if both heteroskedasticity and non-normality were detected, a transformation of the dependent variable had been apparent. None of them were detected in the case of the dependent variable of the study, LHCA.

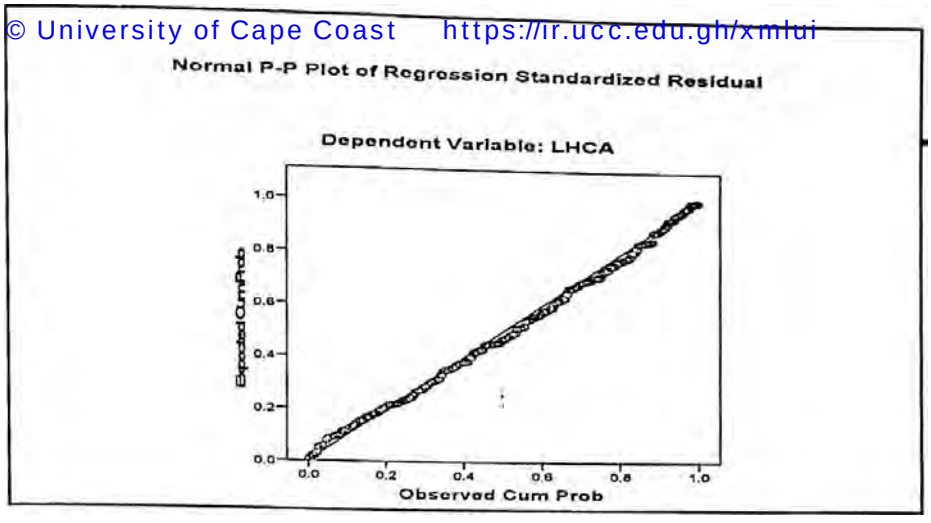

Figure 5: Distribution of Explained and Unexplained Variance in the Dependent Variable, LHCA. Source: Field survey data, 2009/2010.

Coming back to interpretation of the result, the R^2 value of 0.911 in the study tells us that 91.1% of the variation was explained by the predictors. The model result also establishes the relative magnitudes of the contributions of each predictor variable. It is assumed that using more than one predictor variable leads to better predictions (Blaikie, 2003). Accordingly, the result (refer to Table 42) presented under column heading R^2 show better prediction with addition of more predictors. That is, the R^2 value increased from 0.790 (when only X_1 is considered) to 0.911 (when a set of all the nine predictors are considered).

The possible problem of multiple collinearity that could bias such a high value of R^2 (0.911) was checked for the set predictors of the study. In this regard Blaikie (2003) noted that when there are more than two predictors Pearson's r value may not provide a reliable indicator of the degree of collinearity. In such cases as in this study two diagnostic, namely tolerance and variance inflation factor, are suggested. Accordingly, the diagnostic result

for all predictors of the study was found within the recommended value suggesting low or no collinearity.

The adjusted R^2 or R^2 adjusted for number of predictors is noted to be superior to R^2 as it is sensitive to additional irrelevant variables (Gupta, 1999). The results show that the adjusted R^2 to be 0.907 which means the model estimated 90.7% correctly the likelihood of collective action explained by these factors. Conversely, it suggests that only 9.3% of the variance in likelihood of collective action is explained by other factors which are not captured by this research.

In addition to prediction, it is also possible to use OLS regression model for explanatory analysis. Blaikie (2003) asserted the possibility of assessing the influence of each predictor variable by statistically controlling the influence of all the others. In this regard from the result in the table it is possible to see what proportion of the variance in the dependent variable is explained by each predictor variable (i.e. adjusted R^2 change), and by a set of them together (adjusted R^2). In other words, the analysis tells us what happens when one of the predictor variables changes while all the other predictor variables remain the same. Hence, the independent influence of all the predictor variables can be established and their total influence can also be measured. For example, the adjusted R^2 of 0.79 implies the importance of farm proximity in explaining 79% variance of likelihood of collective action if other factors could be addressed or were not prevalent in the study context. In other words, this result suggests the prior importance of this factor (difference in farm proximity) for future intervention relative to other factors.

The estimated standardized coefficient of predictors (i.e. β-weight of X_1 to X_9) and the t-statistics show the effect of individual predictor on LHCA and the confidence with which we can support the estimate for each such estimate respectively. The OLS model and its specifications provided in Chapter 3 were:

$Y_i = \beta_0 + \sum_{i=1}^{n} \beta_i x_i + \varepsilon_i$. Where Y_i = the value of dependent variable,

Likelihood of collective action

x_i = explanatory variable

β_0 = intercept /constant

β_i = parameter to be estimated

ε_i = disturbance term/error.

Accordingly, the equation of the study model is $Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 \ldots \beta_9 X_9 + . \varepsilon_i$. Refer to Table 42 for the detail value of β_1 to β_9. That is Beta weight of corresponding factors (X_1 to X_9)

Table 42: OLS Estimate of Predictors for Households Likelihood of Collective Action for NRM

Predictors	β-Weight	t	Sig.	R^2	Adj. R^2	Adj. R^2 Δ	F Reg.	F Sig.
β_0 (constant/intercept)	(-1.075)	-	-	-	-	-	194.30	0.000
Farm proximity (X_1)	- 0.170	2.3	0.022*	0.790	0.79	0.79		
Support of exogenous institutional arrangements (X_2)	0.219	5.24	0.000**	0.850	0.848	0.058		
Trust on cooperation of others (X_3)	0.235	6.09	0.000**	0.878	0.876	0.028		
Support of endogenous institutional arrangements (X_4)	0.162	3.93	0.000**	0.889	0.887	0.011.		
Perceived NR interdependencies (X_5)	0.095	2.87	0.005**	0.896	0.893	0.006		
Prior participation in collective activities (X_6)	0.081	2.57	0.011*	0.901	0.897	0.004		
#Natural resource scarcity (X_7)	-0.128	3.54	0.001**	0.904	0.900	0.003		
Perceived level of NR degradation (X_8)	0.118	3.05	0.003**	0.908	0.904	0.004		
Perceived required coordinated action (X_9)	0.135	2.39	0.018*	0.911	0.907	0.003		

n= 180, ** Significant at alpha 0.01, * Significant at alpha 0.05. #Note: when NR scarcity squared, Beta = 0.35, t= 1.23, p= 0.222.
Source: Field survey data, 2009/2010.

In general, the result of the analysis confirms different contextual determinants considered (hypothesized) in the conceptual framework for this study and findings in the wider literature as discussed below. The hypotheses under the study were the following.

1. H_o: Resource users' likelihood of collective action does not have any relationship with level of natural resource scarcity.

   H_1: Resource users' likelihood of collective action has a direct relationship with level of natural resource scarcity.

2. H_o: Resource users' likelihood of collective action does not have any relationship with their level of dependence on the resource.

   H_1: Resource users' likelihood of collective action has a direct relationship with their level of dependence on the resource.

3. H_o: Resource users' likelihood of collective action does not have any relationship with their perceived level of resource degradation.

   H_1: Resource users' likelihood of collective action has a direct relationship with their perceived level of resource degradation.

4. H_o: Resource users' likelihood of collective action does not have any relationship with their perceived cause of resource degradation.

   H_1: Resource users' likelihood of collective action has a direct relationship with their perceived cause of resource degradation.

5. H_o: Resource users' likelihood of collective action does not have any relationship with their perceived level of natural resource interdependencies.

   H_1: Resource users' likelihood of collective action has a direct relationship with their perceived level of natural resource interdependencies

6. H_o: Resource users' likelihood of collective action does not have any relationship with their perceived required coordinated action.

   H_1: Resource users' likelihood of collective action has a direct relationship with their perceived required coordinated action.

7. H_o: Resource users' likelihood of collective action does not have any relationship with their past level of participation in collective action.

   H_1: Resource users' likelihood of collective action has a direct relationship with their past level of participation in collective action.

8. H_o: Resource users' likelihood of collective action does not have any relationship with their perceived level of trust on cooperation of others.

   H_1: Resource users' likelihood of collective action has a direct relationship with their perceived level of trust on cooperation of others.

9. H_o: Resource users' likelihood of collective action does not have any relationship with market opportunity.

   H_1: Resource users' likelihood of collective action is inversely related to market opportunity.

10. H_o: Resource users' likelihood of collective action does not have any relationship with availability of alternative off-farm income.

    H_1: Resource users' likelihood of collective action is inversely related to availability of alternative off-farm income.

11. H_o: Resource users' likelihood of collective action does not have any relationship with their farmland proximity to the common resources.

    H_1: Resource users' likelihood of collective action is inversely related to their farmland proximity to the common resources.

12. H_0: Resource users' likelihood of collective action does not have any relationship with their wealth.

    H_1: Resource users' likelihood of collective action is inversely related to their wealth.

From the result presented in Table 42, it is obvious that all variables that are found to be significant predictor are consistent with research expected direction as could be seen from stated hypotheses. This is with the exception of natural resource scarcity which is still, including all other variables, consistent with theoretical and empirical literature discussed below.

Natural resource scarcity, i.e. attributes of the resource, was found to become scarce over time. In this regard, the analysis revealed a statistically significant difference between the current situation of NR and the past (i.e. 10 years ago) situation (refer to Table 10). It is also significant in predicting likelihood of collective action at 0.01 alpha level (refer to Table 42) but not in research anticipated direction. Notwithstanding the negative association, the model result support rejection of the null hypothesis (i.e. H_0 of Hypothesis1). The negative association is notable given the significant level of natural resource scarcity faced by the sample households as compared to 10 years ago and low level of likelihood of collective action (Mean= 2.72, SD = 0.84). The study further considered consistency of the result (negative association) with theoretical and empirical literature as discussed below.

In Chapter 3, the wider literature (Ostrom, 1999; Varughese & Ostrom, 2001; Meinzen-Dick *et al.*, 2002; Araral, 2008) suggests inverted U-shape relationships between natural resource scarcity and resource users' likelihood of collective action for its management. That is, there is less incentive for

resource users to take part in collective action when the resource is abundant and when the resource is also extremely scarce/degraded and no return is expected from investing in collective action. In cognizance of this, the study considered scarcity squared, which is found to be positively associated with likelihood of collective action. This confirms the inverted U-shape relationship of scarcity with collective action in the wider literature (see note given under Table 42 stating positive standardized coefficient/ Beta = 0.35). A past study (Araral, 2008) considered the same procedure of squaring the scarcity variable to verify whether his finding confirms the wider theoretical argument.

In the context of Haramaya, although the level of scarcity showed a significant difference between the two periods, it has not yet impacted significantly on the livelihood of the households to the extent of survival of the households. Moreover, it is not only scarcity of natural resource but other factors are also important for households' incentive to take part in collective action. In this regard Ostrom (1999) asserted that the most important issue is not a single factor or its combination with other factors but how a particular factor or combination with others influences individual incentives to take part in collective action. Accordingly, scarcity explained only 12.8% of likelihood of collective action, suggesting the contribution of other factors.

Among the attributes of resource users considered by this research, level of dependence on the resource and perceived cause of natural resource degradation were found not to be significant in predicting likelihood of collective action. In other words, the hypothesis of direct relationship between these attributes and likelihood of collective action (Hypotheses 2 and 4) is not supported by the model. Perceived level of natural resource degradation,

required action, natural resource interdependence and trust on cooperation of others, and prior participation in collective action were found to be significant predictors and in anticipated direction (i.e. positive/direct relationships). Thus, rejection of the null hypotheses of Hypotheses 3, 5, 6, 7 and 8, which stated no relationships, is supported by results of the model.

Trust is found to be leading contributing factor (23.5%) among attributes of resource users as well as other factors. As indicated earlier in the review of literature, social capital plays a significant role in collective management of natural resource (Meinzen-Dick *et al.*, 2002; Ostrom, 1992; Pretty & Ward, 2001). For example, a study in Australia revealed that trust that others will also cooperate is among key factors influencing farmers' likelihood of collective action (Marshall, 2004).

The contribution of other factors related to attributes of resource users was also realistic but their level of contribution was closer to each other. Perceived required action, perceived natural resource degradation, interdependency and prior collective action experience contributed 13.5%, 11.8%, 9.5% and 8.1% respectively. Moreover, positive and significant association of these attributes of resource users with likelihood of collective action was found to be consistent with the literature. The argument of Ostrom (1999) emphasized that resource users shared understanding of resource situations and that required action influencing likelihood of collective action for its management. Other studies for example, in Colombia (Ravenborg & Westermann, 2002) and India (Matta & Alavalapati, 2006) also reported that resource users' understanding of natural resource interdependencies and that required coordinated action influenced perception towards collective action.

With regard to past collective action experience, the literature also revealed a positive impact on likelihood of collective action (Meinzen-Dick *et al.*, 2002; Ostrom & Varughese, 2001).

Exogenous institutional support was the second most important predictor next to trust contributing 21.9% of the explanation. Endogenous institutional support contributed 16.2% proportion of the explanation. In general, the positive and significant contributions of institutional (exogenous and endogenous) supports were consistent with the literature (Agrawal, 2001; Agrawal & Gibson, 1999; Coombes, 2007; Ostrom, 1992; Matta & Alavalapati, 2004; Thakadu, 2005). For example, Pretty and Ward (2001) asserted the likelihood of emergence of collective action, its maturity and sustainability were not without internal and external institutional supports.

None of the influence of external factors (i.e. market and involvement in off-farm income) considered by this study were found to be a significant predicator in this study. Thus, rejection of the null hypotheses of Hypotheses 9 and 10 is not supported by the study model.

Of the two heterogeneity factors, farm proximity was found to be third most important predictor contributing 17%, wealth status was found to be an insignificant predictor. This implies that the model results supported rejection of the null hypothesis of Hypothesis 11 but not that of Hypothesis 12.The literature (Ruttan, 2008; Ostrom, 1999; Varughese & Ostrom, 2001) also indicates that wealth status is a contentious heterogeneity factor to be a determinant of collective action. Moreover, it was interesting to note such level of contribution of farm proximity. The importance of this variable was realized based on the result of the first phase survey (community level survey).

That is, the qualitative survey result elicited those resource users with the privilege of farm proximity to common natural resource to be reluctant for the likely happening of collective action in Haramaya context.

In summary, it is worthy to note that trust, was the first standing predictor, followed by exogenous institutional support in determining the likely happening of collective management of natural resource in Haramaya. The likelihood of collective action was found to be less likely to happen in the prevailing setting of Haramaya. In this regard, the literature shows that trust among resource users and acknowledgement of right to self-organize by external state authority as minimum requirements for likelihood of collective action to happen among resource users (Ostrom, 1999). Thus, the low propensity of collective action to happen among resource users in Haramaya along with the result of the model indicating trust and exogenous institutional support being first and second most important predictors was consistent with the argument of Ostrom (1999).

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Overview

This chapter presents a summary of the thesis. It draws relevant conclusions and recommendations that may help to realize collective action for sustainable management of natural resource in Haramaya District of Ethiopia. The chapter is organized as follows. The summary presents the background to the research problem investigated and describes the conceptual framework and methodology employed for gathering and analysing the data. Major findings are highlighted. Finally, it presents conclusions and recommendations.

Summary

Available evidence shows the alarming rate of natural resource degradation is the problem faced by Ethiopia in general and the Haramaya District in particular. Hence, finding ways to achieve sustainable natural resource management up on which livelihoods of many people as well as the country's development depend is a formidable challenge. Local community (resource users) engagement in collective action for natural resource

management is what ensures its sustainable management in dynamic social, political, economic and ecological environment.

Contemporary literature, which successfully rebutted the inescapable dilemma of coordination problem in NRM publicized in early convention theories and conventional state centralized conservation approach it informed, predicted conditions facilitating collective action in NRM. This has been discussed in-depth that factors related to attributes of resource, resource users, institutional arrangement and other external factors such as market opportunities and availability of off-farm income being the four widely agreed determinants influencing likelihood of collective action and its sustainability. In addition, it has been discussed that collective action is a complex phenomenon and it may not happen everywhere; what constitutes collective action may vary in different contexts and the level of influence of factors related to the four widely agreed determinants varies in different social, economic, political and ecological context. For example, it was discussed that experience from successful collective action from a particular village may not replicate in other villages and even for the same resource.

It was also discussed that analysis of collective action mainly focused on common-pool resources such as forest, irrigation system and pasture; and based on a defined group where required collective activities are already determined. Moreover, it was highlighted that analysis of likelihood of emergence of collective action where it has been missing; and natural resource system in watershed or catchments – special common-pool resource – facing typical problem of common-pool resource were overlooked.

The above observations have led to the conclusion that only context-specific studies are required to ensure likelihood of collective action for NRM in dynamic social, political, economic and ecological environment. Therefore, against this background, the study accepted the challenge to assess the likelihood of collective action for sustainable management of natural resource in Haramaya District of Ethiopia.

The study explored collective action problems/likelihood of collective action indicators and then likelihood of collective action outcomes in the context of growing NR degradation and/ or scarcity while considering the prevailing ecological, social, political and economic environment; and underscores factors underlying emergence of collective action for sustainable management of NR in the district.

Analysing likelihood of collective action is a challenging task, given the complexity and variability of what constitutes collective action, its measure and its determinants in different contexts. To deal with such complex factors a framework was needed to break the complex factors into their constituent parts so that the factors are systematically dealt with. The analytical framework for this study made use of different insights from different arguments. That is, within its scope, it attempted to be comprehensive in accommodating all relevant arguments underlying resource users' incentive for managing natural resource that demand coordinated action. The advantage of different arguments was discussed in providing different insights relevant to this research (for example, contextual view of determinants, how institution should be viewed).

The research sites along the three lakes in the district (Adele, Finkile and Haramaya Lake) were selected purposively for this study. These sites were selected to capture ecological settings that represent the general situation in the district and also taking into account severity of natural resource degradation. A sample of 180 households was selected employing systematic random sampling. The sample was drawn based on intermediate result from community level survey which helped in considering important criteria (such as farm proximity) to draw a proportional sample of households with respect to farm proximity to communal resources from both households located in upstream and downstream in the sub-catchments.

The fieldwork was carried out from March 2009 to mid January 2010. A combination of conventional quantitative (enumerator assisted household questionnaire survey) and qualitative (key informant interview, focus group discussion, transact walks and observation) methods were used to gather the necessary primary data related to likelihood of collective natural resource management and associated factors. Necessary supplementary secondary data was obtained from district and zonal bureau of agriculture and rural development, zonal bureau of planning and economic development, district court, research report, review of policy documents and central statistical abstracts.

The gathered qualitative and quantitative data from community and household level surveys were analysed separately and in combination when needed. Description of verbal expression of respondents, interpretation and appreciation of facts constituted the qualitative data analysis technique used.

Simple descriptive statistics and advanced econometric technique (OLS regression model) were used to analyse quantitative data.

The major findings of the study with respect to its specific objectives are summarized as follows. The result demonstrated that natural resource scarcity (i.e. attributes of the resource) encountered by households in Haramaya in terms of farmland size and quality, land area irrigated using common water pints and livestock kept in common grazing land were significant as compared to the prevailing situation 10 years earlier. Moreover, an increasing dependence on fertilizer due to growing soil fertility problems on farmlands, change in mechanisms of accessing water for irrigation and change in strategy of keeping livestock were also found. For example, with regard to access to common water points, it was found that 10 years earlier 45% of sample household farm plots could access water with human labour while by the time of this survey only 0.8% (4 farm plots) accessed water points with human labour.

Level of dependence on natural resource was among the selected attributes of resource users considered by the study. The anecdotal evidence from community level survey and sample households' revealed that natural resources remain at the centre of livelihood of rural households in Haramaya albeit the degree of dependence varies among households being constrained by lack of institutional support which resulted in differential access to natural resources, particularly the commons.

Concerning other attributes of resource users, the result of the study demonstrated a moderate level of perceived level of natural degradation and interdependences, variation among resource users with regard to cause of

natural resource degradation and required action to overcome the problem, and low level of voluntary collective action experience and social capital. Moreover, increasing natural resource-based conflict was evident from community level surveys and results of secondary data from documented cases in Haramaya District court.

The key collective action problems in Haramaya context were found to be problems related to contribution for natural resource conservation and institutional building to ensure the required collective contribution for NRM. Accordingly likelihood of collective action was assed using indicators related to contribution for natural resource conservations and institutional building. The overall results showed a marginal mean likelihood of collective action (Mean = 2.72 on a 5 (five)-point scale measure used).

Negative and significant association was found between natural resource scarcity and LHCA which is contrary to the study anticipated positive association. Such outcome was found being realistic from marginal mean value of likelihood of collective action while significant level of natural resource scarcity was found when compared with the situation 10 years earlier. Notwithstanding the negative association the null hypothesis (i.e. null hypothesis of Hypothesis1), which stated no association between the two variables, was rejected.

The relationship between LHCA and resource users attribute were found as anticipated (i.e. positive/direct relationships) except resource users' level of dependency which was found to be negative. In general, the null hypotheses (i.e. of Hypotheses 2 to 8) that stated no association between attributes of resource users and LHCA were rejected. The unexpected negative

association, in case of level of dependence on the resource, was also explained that it could be due to standardized estimate of benefit obtained from the resource as indicator for level of dependence. This implied higher figure of level of dependence for resource users with privilege of monopolizing commons for private use who were also found to be reluctant towards collective action.

The analysis of endogenous institutional support considered regularized practices which included access to resource, peer pattern of resource use and management, and conflict resolution mechanism. The result showed a low level of support for collective NRM. Moreover, the endogenous institutional environment was found to be dominated by state introduced organization and local organizations that could play role in NRM have been marginalized to social affairs. For example, the absence of legal support for decision made by local organization such as Afosha and Malaqa leaders weaken its role in NRM.

The overall support of the exogenous institution arrangements was found to be low. This included bundles of rights expected to be provided for resource users in terms of right to resources and their enforcement, and granting and enforcing right to self-organise for natural resource management. These supports were considered in comparison with the provision in regional legislation which was found progressive at least as policy text stating ranges of condition that create opportunities for collective action. However, lack of implementation was found weakened the incentive it could provide for collective natural resource management.

The influences of market opportunity (prior intention of cash crop production) and involvement in off-farm income on LHCA was found not pertaining in the study. That is, LHCA was found to be negatively and positively correlated with market opportunity and involvement in off-farm incomes respectively but both were not significant. Thus, rejection of the null hypotheses of these variables was not supported by the study result.

The study found farm proximity to the commons and wealth status of resource users to be relevant heterogeneity factors. The relationships of these factors with LHCA were found negative and significant as anticipated by the study. Thus the null hypotheses of these factors were rejected. The result also demonstrated that the LHCA of sample respondents with privilege of sharing boarder with commons and/or accessing the common to be unlikely (Mean = 1.98), while others without this privilege was likely (Mean = 3.46). The reluctance (i.e. to collective action) of resource users with farm proximate to the common was found to be due to the implied short term benefits to be forgone (i.e. from monopolizing commons for private use) in collective NRM.

Finally the analysis of the research dealt with determining best predictors of likelihood of collective action for NRM in the study context. Among the factor under the study best predictors were determined by employing OLS regression model estimation. The model estimated 90.7% correctly that the likelihood of collective action explained by these factors. Accordingly, the factors that were found to have significant influence on LHCA and thus best predictors for likely emergence of collective action for NRM in Haramaya context (in descending order of contribution) were:

- social capital (trust on cooperation of others),

- support of exogenous institutional arrangements,
- farm proximity to the commons,
- support of endogenous institutional arrangements,
- perceived required coordinated action,
- natural resource scarcity,
- perceived natural resource degradation,
- perceived natural resource interdependences, and
- past collective action experience.

Conclusions

Based on the findings of the study, the following conclusions are drawn:

1. The influence of NR scarcity on resource users' likelihood of collective action is not always necessarily positive. If the level of NR scarcity has not yet impacted their livelihoods and while other factors (such as low level of social capital and institutional supports) are also in operation, it can actually dwindle the likely emergence of collective action.
2. The lower the level of resource users' perception about NR degradation, the lower their incentive to take part in costly collective action.
3. The lower the level of resource users' perception about NR interdependencies, the lower their incentive to take part in costly collective action.
4. The lower the level of resource users' understanding of the need for coordinated action to overcome NR degradation the lower their incentive to take part in costly collective action.

5. The lower the level of resource users' past collective action experience, the lower their incentive to take part in costly collective action.
6. Deterioration of social capital (trust in and reciprocity of others in NRM) among resource users' dwindle the likely emergence of collective action for NRM.
7. Sheer provision of bundles of collective and individual right to natural resources by exogenous institutional environment is quite far to be considered as supportive as perceived by resource users and thus to enhance their incentive for collective NRM. This continues to be so unless rights are enforced and resource users are also granted right to self-organize.
8. Endogenous institutional environments which are dominated by state introduced organization and exclusion of local organizations coupled with discouraging peer patterns of resource use can be typified as less supportive for collective NRM as perceived by resource users. Thus such endogenous institutional environments tend to lessen the likely emergence of collective action among resource users.
9. Difference among resource users with respect to farm proximity to common resources in a catchment exerts different levels of externality concerning resource degradation and thus, on their incentive for collective NRM.
10. The more resource users are proximate to commons or the more chance to defectively use commons for private use, the lower their tendency to take part in collective action.

11. Relatively endowed (wealthy) resource users are reluctant to take part in collective NRM. Because they can invest in inputs (e.g. fertilizer), purchase of animal feed and development of private water wells to overcome NR degradation/scarcity at least in the short-run.
12. Social capital (trust on cooperation of others), support of exogenous institutional arrangements, farm proximity to the commons, support of endogenous institutional arrangements, perceived required coordinated action, NR scarcity, perceived NR degradation, perceived NR interdependences, and past collective action experience are important predictors of likelihood of collective action in this order in the context of Haramaya.

Recommendations

1. Implementation and enforcement of provision in the regional land use administration proclamation through district BLEP in collaboration with local community is of urgent need to make use of good intention in policy provision.
2. In order to ensure the support of exogenous institutional environment, the newly established BLEP may need to consider arenas of participating local communities in the process of implementing the provision in the regional policy text.
3. There is a need for collaborative natural resource governance system between state organization (e.g. district BLEP, Areda administrations) and customary organization (e.g. Afosha) to harness the limited capacity of state agency and to make use of strong social capital of local organizations.

4. The roles of local organizations in NRM need to be clearly stipulated in regional natural resource policy to ensure their legality and thus their credibility among local communities.
5. In general, institutional policy reform by national and regional state that promotes community-state partnerships in NRM is of urgent need. In the prevailing situation of Haramaya, neither mere devolution of power to community level (without addressing ills at local level) nor state single handed centralized approach would be practical. For example, facilitating condition for endogenous organisation such as Afosha to grow to the level of association or cooperative and working in partnership with state authority would be more practical.
6. In the short-run, collaborative effort is needed between the agricultural extension wing of district BARD and the newly established BLEP in improving community awareness regarding seriousness of the NR degradation problem; and creating arenas whereby individuals interact, learn from one another, realize ecological and social interdependence among them and come with strategies to overcome the problem at sub-catchments level.
7. Providing information to local communities (e.g. through local level development agent) concerning rate of natural resource degradation on future viability of the resource, including the current option employed by resource users to overcome the problem, will reduce the resource users' discount rate to manage the resource and thus take part in collective action.

8. In the long run, educational curriculum is necessary for schools and young generation in addressing the natural resource degradation problem and proper use and conservation of the natural resources.

In this study, the research employed a conceptual framework that helps to identify collective action problems, assess likely emergence of collective action among resource users, and how it is related and affected by various variables related to natural resource, resource users and institutional arrangements. The arguments derived from the framework have been examined mainly based on information obtained from community level survey, 180 sample households drawn from three sub-catchments in Haramaya and review of policy document. Due to lack of information in the area of research interest, the study was forced to rely on intermediate result from community level survey to draw its sample and to shape its variables for subsequent household level survey. As a result of this, with limited time frame of the research and large number of variables involved, the research could only assess how these factors associated with and affected individual likelihood of collective action. Nonetheless, the research addressed broadly and yet critically how these variables are associated with collective action in the context of this research. To this end, based on the outcomes of this study, future research can identify and address the following issues:

1. The likelihood of emergence of collective action at sub-catchments or watershed level can be studied by increasing the sample size and considering sub-catchments as a unit of analysis. This would enable a comparison of catchments-based likelihood of collective action.

2. More detailed research by a multidisciplinary team including technical experts with a capacity of measuring resource situation besides opinion of the resource users will increase reliability of research outcomes.
3. Based on the conceptual framework of this research, long term action research can be designed, looking into effect of these variables on likelihood of collective action and its outcome on natural resource. Long term action research will enable identification of key stakeholders and negotiation process –by facilitating joint learning process using a combination of individual interview, group meetings and joint problem analysis – may enable practical understanding of these factors and their outcome on natural resources.

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APPENDICES

Appendix A: Current Level of NR Scarcity Index and Independent t-test of Difference by Location

Natural Resources	Location	Mean	MD	t-value	Sign.
Farmland	Upstream	0.42	0.06	3.26	0.001
	Downstream	0.36			
Common water points	Upstream	0.63	0.11	2.15	0.03
	Downstream	0.52			
Grazing land	Upstream	0.50	0.03	0.45	0.65
	Downstream	0.53			
Overall NR scarcity (index)	Upstream	0.52	0.05	1.35	0.18
	Downstream	0.47			

Source: Field survey data, 2009/2010. Note: The current level of natural resource scarcity index has been computed based on situation of resources 10 years ago. Accordingly:

- Farmland scarcity index (which is mean plot fertility level divided by expected maximum fertility level) is the difference between past and current farmland fertility index. That is, maximum value of 1 is indicative for high level of scarcity and minimum value of zero is indicative for no scarcity).
- Common water point scarcity index = 1 – [land area irrigated currently (ha)/ land area irrigated 10 years ago]. Grazing land scarcity = [TLU grazed in common10 years ago /total TLU holding 10years ago] – [TLU currently grazing in common/total current TLU holding].
- The overall natural resource scarcity index is the composite mean value of the three resources

Appendix B: Sample Respondents Rank Order on Perceived Required Coordinated Action for NRM

Respondents Rank Order	Frequency	Percent
0	81	45
1	7	3.9
2	35	19.4
3	57	31.7
Total	180	100.0

n=180. Note: 0 = lowest in the rank, or not replied in favour of the need for voluntary cooperation among resource users in case of all resource (i.e. farmlands, common grazing land and water points, 1 = replied in favour in case one resource, 2= in cases of two resource, and 3 = highest rank, replied in favour of voluntary cooperation in case of all of the resources. Source: Field survey data, 2009/2010.

Appendix C: Summary of On-farm Income Sources of the Households

On-farm sources of income	Frequency	Percent
Chat sale	161	89.4
Vegetable sale	131	72.2
Sale of livestock product	62	34.6
Sale of livestock	58	32.2
Sale of grain	27	15.0

n=180. Note: due to multiple responses the total frequency and percentage is summed to 180 and 100%. Source: Field survey data, 2009/2010.

Appendix D:. Summary of off-farm Income Sources of the Households

Off-farm sources of income	Frequency	Percent
Trading of chat	46	25.6
Trading of vegetables	41	22.8
Employment in Haramaya University	29	16.1
Safety net program	14	7.8
Own shop in village	11	6.1
Family remittance	10	5.6
Own shop in nearby town	4	2.2

n=180. Note: the response include only those involved in off-farm income and due to multiple responses the total frequency and percentage is not summed to 180 and 100%. Source: Field survey data, 2009/2010.

Appendix E: Result Summary from Interview with Informants

Emphasizing Discouraging Local Level Situation

Duties costing other more important duties (*dalaga dalaga miitu*):

a) Local communities overwhelmed by continuous meeting by state organization (i.e. current Areda past PA) mainly centred on political issues followed by political responsibilities in different political regimes overburdening communities not to ponder on dearer problem with meagre resource they have.

Duties that harms individuals/ societies wellbeing (*dalaga nama miitu*):

a) Government natural resource conservation campaign with pay of grain for labour contribution that never liberated society/individuals from poverty and never cured NR from being degraded and rather implanted notion of dependency on state conservation. Provision of grain of grain through the so called FFW and Safety-Net program is appreciable to keep communities asset from being eroded to meet household food demand…but once conservation structure is put in place there is no follow-up…communities are not organized in this regard and the government system encourage neither.

b) Individual-based investment on soil conservation and shallow well not lasting for long.

Obstacle personalities costing important duties (*namaa dalaga miidhu*)

a) Short vision leaders of grass root level state introduced organizations (PAs in the past and current Areda) giving blind eyes to NR degradation and rather their decision is worsening the problem. For example, endorsing fine against those whose livestock occasional crossed to farm plots of encroached area of common pasture rather than endorsing fine against encroachers.

Appendix F: Household Questionnaire

General Household Characteristics

Please, kindly provide answers to the following questions by circling, ticking, or writing where appropriate.

Household no _____ Aredaa:____Village name: _____

Enumerator's name: _____

1. Location of the household in the watershed/sub-catchments (*sulula*) _____(0= downstream, 1= upstream)
2. Respondent _____ (1= husband, 2= Wife, 3= Son)
3. Sex of respondent_____ (1=Male, 2= Female)
4. Age of respondent _____ (at last birth day)
5. Level of education of the respondent_____ (0= Illiterate, 1= Informal/Religious education 2= Write and read 3= Primary, 4= Junior secondary, 5= Secondary, 6= Post secondary)
6. Household demography

No	**Household members** (head of household, wife/husband, children – first oldest, second oldest, etc and other relatives	**Sex** 0= male 1=female	**Age in years**	**Level of Education** (0= Illiterate, 1= Informal/Religious education 2= Write and read 3= Primary (grade 1 to 6), 4= Junior secondary (grade 7 & 8) , 5= Secondary (grade 9&10), 6= Post secondary, including preparatory)
i.	Head of household			
ii.	Wife/husband of the household			
iii.	1st born			
iv.	2nd born			
v.	3rd born			
vi.	4th born			
vii.	5th born			
viii.	6th born			
ix.	7th born…..			

Land holdings, quality and water access

7. Current number of plots owned by the household _____

		Plot 1	Plot 2	Plot 3	Plot 4
i.	Slope of the plot (1= flat 2= gentle slope, 3= moderate slope, 4= steep slope, 5=partially in depression partially in steep slope, and 6= depression				
ii.	Current land area in (*qindii*/ha)				
iii.	Land area 10 years ago				
iv.	Current plot access to water source (0=can be accessed with human labour/hand pump, 1=can be accessed with one motor pump, 2= with two motor pump, 3= with three motor pump, 4= not accessible at all				
v.	Access of plot to water source 10 years ago (0=could be accessed with human labour/hand pump, 1=could be accessed with one motor pump, 2= with two motor pump, 3= with three motor pump, 4= not accessible at all				
vi.	Current level of soil fertility (1= very fertile 2= fertile 3= medium 4= poor 5= very poor)				
vii.	Soil fertility 10 years ago (1= very fertile 2= fertile 3= medium 4= poor 5= very poor)				
viii.	Is the plot currently irrigated? (1= Yes, 0=No)				
ix.	If 'yes' to viii above ,estimated area irrigated if the whole is not irrigated				
x.	Current sources of water for irrigation (0= not irrigated, 1= from common water point 2 = from private source 3= both from private & common)				
xi.	Was the plot irrigated 10 years ago? (0=no, 1=yes, from common water points 2=yes, from private source 3, yes from private &common)				

8. Future and current availability of alternative source of water to common water points?

   1. Do not have alternative private sources [ ] 2. Have private sources [ ]

   3. Intend to have private source [ ]

Crop production and households trends on cash crop

9. Current harvest in main season (Gannaa),

Crop grown	Total out put (in quintal, Kg or other local measure)	Unit price/Kg or Unit price/local measure
Sorghum		
Maize		
Chat		
Vegetables 1. 2….		
Haricot Beans		
Others (specify)		

10. Off-season harvest using irrigation (Bonaa)

Crop grown	Total output (in quintal , Kg or other local measure)	unit price/Kg or unit price/local measure
Chat		
Vegetables 1. 2. 3…		
Others (specify)		

11. How would you describe general trends of cropping pattern followed by your household at present as compared to the past10 years?

1. More towards cash crop production [ ]
2. More towards food crop production [ ]

12. Among cash the crops grown by the household, what would you say compared to 10 years ago?
    1. *Chat* is dominating year after year [ ]
    2. *Chat* domination is same [ ]
    3. Vegetable*s are* dominating [ ]

13. What is your plan for the future?
    1. Grow more cash crop – *chat* [ ]
    2. Grow more cash crop – vegetables [ ]
    3. Grow more food crop [ ]

14. Livestock, feed sources and other assets (agricultural & non-agricultural) holdings

Current livestock holdings and source of feed				**Holding 10 years ago & feed source**	
Livestock type	**No**	**Values if sold today (Birr)**	**Please tick if used common as source of feed for particular livestock**	**No**	**Please tick if used common as source of feed for particular livestock**
Oxen					
Cows					
Calves					
Bulls					
Heifers					
Sheep					
Goats					
Donkeys					
Poultry					

15. Do you have alternative source of feed for your livestock at present other than the common grazing/Gaara? .....(0= no 1= yes patch of grazing land 2= yes can afford buying concentrate feed)

16. If "yes" to above question, which is relatively important for your household? ..... (0= common 1= private 2= both are equally important)

17. Current source of fuel for household cooking is:

Source of fuel	**Please tick sources used in a year**	**Monetary estimate consumption a year if sold**
Private trees		
Crop residue (stalk and others)		
Common hill		

18. Productive agricultural assets

Type of asset	**No**	**Value if sold today (Birr)**
Motor pump		
Knapsack/backpack sprayer		
Trees (if fruit trees estimate of annual income from sale of produce		
Others (specify)		

19. Non-agricultural asset holdings

Types of asset	**No**	**Values if sold today (Birr)**
Thermos		
Radio		
Tape recorder		

Television		
Kerosene stove		
Kerosene lamp(*masho*)		
Kerosene lamp(*Fanusa*)		
Bed and mattress		
Others (specify)		

Household income

20. **On-farm sources of income**

Sources of income	**Estimate amount obtained last year**
Chat sale	
Vegetable sales	
Sales of other crops	
Sale of livestock produce (milk, butter, eggs, etc.)	
Sale of livestock	
Others (specify)	

21. **Alternative off-farm income**

Income source	**Estimate amount obtained last year (Birr)**
Casual employment (in HU or town)	
Permanent employment (in HU or town)	
Employment on others' farm	
Trading of chat	
Trading of vegetables	
Own shop in this village	

Own shop in town	
Family remittance	
Others (specify)	

Perceived level natural resource degradation

22. To what extent do you consider the following resources to be degraded? (Please encircle one as rated:1 = not degraded at all, 2= not very degraded, 3=somewhat degraded, 4= fairly degraded, 5= very degraded)

i. level of farmland degradation in terms of soil fertility	1	2	3	4	5
ii. level of water stock degradation in the catchments	1	2	3	4	5
iii. level of communal lands (pasture, vegetation cover) degradation in the catchments	1	2	3	4	5

Perceived causes of natural resource degradation

23. Which of the following do you regard as contributed to resource degradation? (please encircle appropriate answer(s) in your opinion)

Resource	**Causes of resource degradation**
Soil erosion on your farmlands	i. High run-off/soil erosion
	ii. lack coordinated action with fellow farmers in the neighbourhood
	iii. cropping pattern
	iv. others, specify
Water stocks in the catchments	i. Siltation through high run-off washing top soil down to streams
	ii. high level of irrigation
	iii. excessive use by municipality
	iv. others specify
Common land (i.e. grazing in down stream/Gaara grass and vegetation	i. expansion for agricultural land/crop cultivation
	ii. over grazing/deforestation
	iii. absence of clear right and rules regarding the resource

cover)	iv.	lack cooperation among individual households in the community
	v.	Other (specify)

Opinions on required action to avert the situation of resource degradation

24. What needs to be done to reduce degradation on your farmland? 0= I don't know 1= coordinated investment with neighbours in soil erosion control 2=independent /private investment on soil erosion control 3=other (specify).....

25. What needs to be done to reduce degradation of communal land?

0= I don't know 1= State conservation intervention (afforestation, terracing) through safety-net program 2= protection by government (hiring watchman)/ penalties for rule breaking by state (those expanding for crop cultivation) 3= voluntary conservation by community (allowing community self-organization for its management) 4= other (specify).....

26. What needs to be done to enhance water resources? 0= I don't know 2= voluntary collaborative effort among community members 3= individual household-based investment such as digging water well 4=other (specify).....

Understanding of interdependence and required coordinated action

27. How do you regard the following in natural resource management from the side of resource users? (Please encircle one as rated 1= strongly disagree, 2= disagree, 3= somewhat agree 4= agree 5= strongly agree)

i. Improvement of soil erosion control on my farmland at least partly depends on conservation measure taken by other neighbouring farmers on their farms	1	2	3	4	5

ii.	Improvement of soil erosion control on others farmland depends at least partly on conservation measures taken on my farmland	1	2	3	4	5
iii.	Overall improvement in soil erosion control on farmlands depend on cooperation of all farmers at far distance including those in upstream and downstream	1	2	3	4	5
iv.	Improvement on common water-points at least partly depends on conservation measure taken on my farmland	1	2	3	4	5
v.	Improvement on common water-points at least partly depends on conservation measure taken on others farmlands	1	2	3	4	5
vi.	Overall improvement of water resources depends on cooperation of all farmers by controlling soil erosion on farmlands	1	2	3	4	5
vii.	Improvement (control of erosion through terracing, vegetation cover) on hillside common has impact on improvement of my farm lands	1	2	3	4	5
viii.	Improvement on hillside has impact on improvement of water resources	1	2	3	4	5
ix.	Overall improvement of common lands partly depends on my cooperation/contribution (such as contribution of labour)	1	2	3	4	5
x.	Long term viability of the natural resource improves if every one contributes his part	1	2	3	4	5

Level of Endogenous institutional support regarding natural resource management

28. To the best of your knowledge and experience about current state rural land use and administration proclamation (for example, land certification), how do you regard the likely support to be expected from state legislation? [Please encircle as rated: 1= none (no support expected at all), 2= very little, 3= some, 4= fair, 5= very high /expect very high support]

Likely support in terms of clearly defining and enforcing rights and responsibilities of households/communities with regard to:						
i.	Individuals private right to farmlands	1	2	3	4	5
ii.	Required cooperation among individual farm land owners for its conservation (such as soil erosion control, gullies control around farm boarders with neighbours and other farmers in the watershed/*sulula*)	1	2	3	4	5
iii.	Right to plant different types of tree specious on own farmlands	1	2	3	4	5

iv.	Right to use trees planted on private farmlands	1	2	3	4	5
v.	Rights of individuals and communities concerning common grazing/Gaara	1	2	3	4	5
vi.	Proper use of grazing land/Gaara	1	2	3	4	5
vii.	Responsibilities of users in conserving grazing land/Gaara	1	2	3	4	5
viii.	Right of individuals in the community to use common water points (i.e. surface and ground water including the past dried common water points that can be excavated regardless of what most people commonly claim as private by virtue of their farmland location)	1	2	3	4	5
ix.	Required individuals coordinated management of water resources/common water points	1	2	3	4	5
Support for self organization: If you and other community members have intention to voluntarily self organize for natural resource management how do regard the likely support of state to be expected? in terms of:						
i.	Providing right/acknowledging voluntarily self-initiated farmers organization for natural resource management which is independent from Areda administration (e.g. organization like afosha/mendara)	1	2	3	4	5
ii.	Enforcing its legality at different level (e.g. acknowledging decisions of the organization at Areda adminstration, district and zone court.	1	2	3	4	5
iii.	Providing technical support for such farmers voluntary organization without influence	1	2	3	4	5

29. What would you say about your preference of tenure arrangement for private land?

0. Comfortable with current tenure right [ ]

1. Prefer change to current arrangement [ ]

Reason for particular response.....

30. What would you say about your preference of tenure arrangement for common/grazing land/hillside - Gaara?

1. Comfortable with current tenure right [ ]

2. Prefer change to current arrangement [ ]

Reason for particular response.....

31. What would you say about the use of common water points (including dried common water points that can be excavated for common use?

0. Comfortable with current tenure right [ ]

1. Prefer change to current arrangement [ ]

Reason for particular response.....

Perceived level of trust on other farmers contribution

32. Different households are located at different strategic places in the watershed (near water points, near grazing land, in upstream). In this light, how do you regard the following concerning fellow farmers' cooperation to voluntarily self-organize and govern natural resources in terms of the level of trust to be expected for cooperation: (please encircle one as rated 1= none (can not be trusted at all, 2= very little, 3= some, 4= fair, 5= very high/ highly trusted)

i.	For fair joint labour contribution for on-farm soil erosion control (e.g. terracing, tree planting around gullies)	1	2	3	4	5
ii.	For fair allocation of area on farmlands that may be needed for joint construction of conservation structure/tree planting	1	2	3	4	5
iii.	Maintenance of conservation structure/planted tree	1	2	3	4	5
iv.	For fair contribution of labour for water resource conservation/enhancing activities	1	2	3	4	5
v.	For fair allocation of areas on farm land needed for enhancing/conserving common water points	1	2	3	4	5
vi.	For fair use of water resource	1	2	3	4	5
vii.	For joint and fair contribution of labour for management of grazing land /Gaara	1	2	3	4	5
viii.	For maintaining conservation structure/maintaining boarder of grazing land/Gaara	1	2	3	4	5
ix.	For fair distribution of benefit form grazing land/Gaara	1	2	3	4	5
x.	In reciprocating cooperation being at different location (e.g., providing access to common water points, abstaining from inappropriate use of grazing land/Gaara as an exchange /incentive for others to control run-off or vice versa)	1	2	3	4	5
xi.	In contributing all required (e.g. participation in meeting, contributing money) for establishment of community self-	1	2	3	4	5

initiated organization for natural resource management					

Support of endogenous institutional arrangement/regularized practices

33. What is your opinion concerning regularized practices/custom and Areda administration on natural resource use and its management in terms of the level of support? (Please encircle one as rated 1= strongly disagree, 2= disagree, 3= somewhat agree, 4= agree, 5= strongly agree)

i.	Peer/neighbours pressure (i.e. investment on private farmland conservation) is always encouraging to cooperate in conservation of farmlands	1	2	3	4	5
ii.	Patterns of common grazing land use/Gaara is encouraging to cooperate in its conservation	1	2	3	4	5
iii.	Patterns of common water point use is encouraging to cooperate in its conservation (i.e. its sustenance and enhancing its potential)	1	2	3	4	5
iv.	Role played by elders in mediating fair contribution and sharing of benefits from the resources is encouraging (for example malaaqa leaders)	1	2	3	4	5
v.	Role played by elders /role of local organization (afosha/mendera) in resolving conflicts related to natural resource is encouraging	1	2	3	4	5
vi.	Areda administration has been working to the interest of all community members in matters related to natural resources	1	2	3	4	5
vii.	Areda administration has been effective in resolving natural resource related conflict	1	2	3	4	5
viii.	Areda administration's procedures has been fair in terms of cost involved (including time) in the procedure	1	2	3	4	5

Likelihoods of self-initiated household participation in collective action for natural resource management

Likelihood of collective action for farmland management

34. Which of the following do your regard as your likely future intention to cooperate for soil conservation measure on farmlands (i.e. for overall

wellbeing of farmlands and other natural resources in the catchments and thus in the watershed/*sulula*)? In terms of : (please encircle as rated: 1= very unlikely 2= unlikely 3= somewhat likely 4= likely 5= very likely)

i.	Sharing information/encouraging neighbouring farm owner and all other concerned households in the watershed on collective soil erosion control	1	2	3	4	5
ii.	Contributing required labour for coordinated conservation activities with all concerned households in the watershed/*Sulula*	1	2	3	4	5
iii.	Allocating required land area on my farm for collective conservation (tree planting/terracing), if necessary for the wellbeing of my farmland and others in the watershed/*sulula*	1	2	3	4	5
iv.	Initiate voluntary community meeting for soil conservation activities on farmlands	1	2	3	4	5
v.	Participate in voluntary community meeting (initiated by others) for soil conservation activities on farmlands	1	2	3	4	5
vi.	Provide all necessary support for establishment watershed/*sulula* level farmers association for collective soil conservation (for example money if required, abiding to rules community in the watershed may agree on)	1	2	3	4	5

Likelihood of collective action for common water point management

35. Which of the following do your regard as your likely future intention to contribute for conservation and water enhancing activities that enable wider use of communities? In terms of: (please encircle as rated: 1= very unlikely 2= unlikely 3= somewhat likely 4= likely 5= very likely)

i.	Sharing information/encourage all others concerned households the watershed/*sulula* on collective water enhancing activities	1	2	3	4	5
ii.	Contributing required labour for coordinated common water point enhancing activities (example, excavation, protection of silt accumulation/erosion control) with all concerned households	1	2	3	4	5
iii.	Allocating required land area on my farm, if necessary, for collective conservation (tree planting/terracing) to control siltation of water points	1	2	3	4	5
iv.	Initiating voluntary community meeting on common water point enhancing activities	1	2	3	4	5

v.	Participating in voluntary community meeting (initiated by others) regarding common water points	1	2	3	4	5
vi.	Providing all necessary support for establishment watershed/*sulula* level association for collective water enhancing and fair use	1	2	3	4	5

Likelihood of collective action for common grazing/Gaara management (pasture /vegetation rehabilitation)

36. Which of the following do your regard as your likely future intention to contribute common grazing land/Gaara conservation to enhance its potential to provide benefits for wider communities including your household? In terms of: (please encircle as rated: 1= very unlikely 2= unlikely 3= somewhat likely 4= likely 5= very likely)

i.	Contributing labour voluntarily for its rehabilitation–terracing/tree planting to control run-off	1	2	3	4	5
ii.	Sharing information/encouraging others (using social events) for collective conservation	1	2	3	4	5
iii.	Allocating required land area on my farm, if necessary, for collective conservation (tree planting/terracing) to communal land	1	2	3	4	5
iv.	Initiating voluntary community meeting concerning the need for collective agreement for its rehabilitation and fair use	1	2	3	4	5
v.	Participating meeting initiated by other community members	1	2	3	4	5
vi.	Contributing all required to establish self-initiated association for its management and use	1	2	3	4	5

Level of participation in collective activities (prior collective experience)

37. How do you regard you/your household member's level of participation in collective activities? Please encircle one as rated (1=never participated 2= rarely participated 3= participated sometimes 4= fairly participated 5= highly participated /whenever required?

Collective/cooperative activities						
i.	Voluntarily consulting with neighbouring farm owners concerning required cooperation among us for soil conservation on our farmlands	1	2	3	4	5
ii.	Voluntary labour sharing/*guzaa* for on farm conservation with neighbours	1	2	3	4	5
iii.	Voluntary labour sharing for different farming activities with neighbours	1	2	3	4	5

iv.	Voluntary labour sharing for water enhancing activities (such as malaaqa water or to establish such kind of water points) with neighbours	1	2	3	4	5
v.	Off farm conservation of the communal grazing/Gaara with neighbours (such as terracing/ tree planting to control erosion hill side/flood on grazing land)	1	2	3	4	5
vi.	Gully control (such as through afforestation)	1	2	3	4	5
vii.	Others voluntary cooperative activities related to natural resource management (please specify and rate----------)	1	2	3	4	5

38. What constrains do you face in contributing natural resource management (soil erosion control on farmland)? (please rank in priority if more than one constraints holds in your opinion)

1. No constraints [ ] 2. Others contribute less [ ] 3. Lack of cooperation among individuals [ ] 3. Labour shortage /labour cost is high [ ]

4. Lack of institutional/government support [ ] 5. Others [ ]

(specify).....

39. What constraints do you face in contributing to common grazing/ Garaa conservation? (please rank in priority if more than one constraints holds in your opinion) 1. No constraints [ ] 2. Others contribute less [ ] 2. Lack of cooperation among individuals [ ] 3. Labour shortage/labour cost is high [ ] 4.Lack of institution/government support [ ] 5. Others(specify).....

40. What constraints do you face in contributing to enhancing common water resource? (please rank in priority if more than one constraints holds in your opinion) 1. No constraints [ ] 2. Others contribute less [] 3. Lack of cooperation among individuals [ ] 3. Labour shortage/labour cost is high [ ] 4.Lack of institution/government support [ ] 5. Others (specify)

41. Will everyone benefit equally from voluntary cooperation in resource management or will benefit some more? (0=don't know 1= others benefit more 2=others benefit less 3=every household benefit equally 4= other specify)

i.	On farm collective conservation	
ii.	Collective conservation of the common grazing/Gaara	
iii.	Collective conservation of common water points	

42. Farmland location with respect to the common (please tick appropriate box)

i.	None of my farm plot is located within the reach of common water point even if water condition is improved	
ii.	At least one of my farm plot is within the reach of water from common water point if water condition is improved	
iii.	At least one of my farm plot is within the reach of water from common water point now	
iv.	At least one of my farm plot is sharing boarder with grazing land/Garaa	

43. How confident were you with the response you made to all the 42 questions above?

Not at all confident [ ]

Not so confident [ ]

Somewhat confident [ ]

Confident [ ]

Very confident [ ]

Thank You Very Much for Your Time and Cooperation

Appendix G: Key Informant Interview Guide

Name_____ **PA**_____
Village_____ **Special position in the community (if any)** _____

1. How would you describe historical conditions and level of degradation of natural resource (farmlands, communal land – pasture/vegetation cover, and water resources) and right of community to the resource?
    i. Prior to the 1975 land reform
    ii. After policy of land reform
    iii. During collectivization/ producers' co-operative
    iv. Current regime
2. Major causes of natural resources degradation (e.g. the lakes , grazing areas, farm plot fertility levels, vegetation cover)
3. Significance of resource degradation on economic and social well-being of the community
    i. Decrease in productivity
    ii. Lose of employment and migration for off-farm employment compared to the past
    iii. Conflict on resources as a result of degradation
    iv. How does the community resolve conflict related to natural resource currently and in the past
4. Past history of self-initiated community involvement in natural resource management (soil conservation, afforestation in hill slope, gully control, water use, use of common grazing, etc.)
    i. Challenges faced to self organize
    ii. Benefits obtained/impact on natural resources
    iii. Supported from administration

5. Present situation of the community
    i. Present impacts of past/Derg's policy(eg. conflicts in the process of implementing the policy that might affect the present cooperation among community to tackle the problem)
    ii. Communities sense of ownership of private plot of land and its impact on investment in conservations/development of conservation assets
    iii. What are key condition required for self-initiated collective resource management at community level
6. Any specific concerns of the community came across at different events about the significant degradation of the resource and required collective action
7. Community's willingness and ability to cooperate (for example at farm and sub-catchments level) in conserving the resources?
8. What can community do in future and how important is collective action, given the seriousness of the problem (especially, the common: lakes/water points, grazing land) which of the following management system would you recommend for management of the common and why?
    i. Continue with state-ownership/exclusive state control
    ii. joint management between the state and community
    iii. privatization
    iv. exclusive community control
9. Conditions that might contributes towards the effectiveness of collective action among community members

10. Availability, types and forms of incentive for community to combat natural resource degradation/what is lacking and what is needed to attract cooperation of community against the problem?

12. Policy measure that need to be changed and roles of concerned state bodies.

13. Community participation and attitude towards collective activities

i) Present government mobilized collective activities (*misom* – development day), how effective has it been? problems addressed? problems with the collective action? Possible solutions?

ii) Tell me more about regular self initiated collective activities (if any)

Appendix H: Focus Group Interview Guide

1. What do you think are the major causes of natural resource degradation in the area?
   i. Degradation of farmland fertility
   ii. Degradation of communal land (in terms of size of land and quality of vegetation cover/ pasture)
   iii. Water stock
2. Compared to the past what do you think of the level of resource degradation and its potential to support the current and coming generation?
3. Any attempt by the community to tackle the problem? If not, why not? If yes Why failed?

4. What are the key differences among community members constraining collective conservation of privately owned farmlands and common resources?
5. How do you describe level of cooperation in natural resource management (i.e. high, low, insignificant)? And what is the situation when compared to the past (i.e. increased, decreased, no change)
    i. Among neighbours in voluntary joint soil conservation activities on farmlands
    ii. Cooperation beyond the neighbourhood
    iii. In water resource conservation and fair use with all concerned
    iv. Joint conservation of communal land (control of erosion, tree planting, controlling defective users)
6. What are the major constraints of cooperation for:
    i. Joint soil conservation on farmlands
    ii. Common water point conservation/management
    iii. Communal land (vegetation cover/pasture) rehabilitation
7. what need to be done to overcome the constraints
8. Available local organization in the community? any role played in resource management? if not, why not? Any influence of policy environment on local organization?
9. How do you regard effectiveness of state-initiated natural resource conservation intervention (current land use policy) in terms of improving natural resource situation:
    i. Reducing soil erosion on farmlands
    ii. Improving water availability

iii. Improving vegetation cover

iv. Maintaining the boundaries of common resources

v. Fairness in distributing cost for conservation and benefit from the resource

10. How do regard the areda/kebele administration in tackling natural resource problem such as enforcing proper use of communal lands, water points and privately held farmlands ?

11. What would you like to comment about the current policy? What makes it different from the past?

12. What is the level of community participation in the current policy?

    i. Training of land certification program?

    ii. Election of Land Administration and Use Committee(LACs)

    iii. How different is LACs from past kebele admistration

13. what would be the likely effect of current land use policy on private land and common management in terms of tenure right and security

14. what are the challenges in effecting the policy with regard to

    i. private land

    ii. common land

    iii. common water points

15. Has any important role given to local organization in current intervention? If not, what is the likely impact of exclusion of local organization in the policy on natural resource conservation?

16. If there is no any local/community based organization targeting natural resource management, would you suggest having one? How can local

institution tackle the problems? What capacities and incentive are needed? Any support from local administration for self-organization?

17. Common conflicts on use of common resources and consequences; how do you resolve such conflict?