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**COMMUNITY-BASED NATURAL RESOURCE MANAGEMENT:
EXPLORING COLLECTIVE ACTION IN LAMURIA, KENYA**

A Thesis in

Agricultural and Extension Education

by

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ABSTRACT

Climate change continues to affect the availability of water around the world, with agro-pastoral communities in East Africa being particularly hard hit. Effective, targeted water management strategies are desperately needed if such populations are to continue thriving. Community-based natural resource management (CBNRM) represents a bottom-up approach in which local people from various social fields act collectively to address water scarcity concerns. This qualitative case study sought to explore and describe the factors that lead to the emergence of collective action within the context of CBNRM. The four research concepts that guided the study were: water access and use; common issues within the community; levels of interaction; and sociodemographic characteristics. Seventeen interviews were conducted through purposive sampling of residents in Lamuria, an agro-pastoral village in Laikipia County, Kenya from March - July 2011. The study looked at collective action from an interactional field theory perspective and employed an interpretative phenomenological analysis (IPA) to analyze and synthesize the findings. The findings indicate that access to water is a significant concern for participants particularly during the dry seasons and in times of drought. Most of the participants retrieve their water from local rivers, although results varied when it came to boiling and treating the drinking water. Water groups do exist though it remains to be determined how closely they embody the principles of CBNRM. Participants were engaged in other forms of collective action through self-help groups focused on a variety local issues including agricultural enterprises, general health and welfare, education, and financing. Church and sports were the most popular events through which participants interacted with other community members. The participants were deeply rooted in the community with an average length of residence of 21.5 years and an average household size of 4.5 persons. Participants' level of education and employment status varied. This study concludes with a series of implications and recommendations for applied work and research.

Keywords: water, collective action, community, natural resource management, Kenya

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Chapter 1

INTRODUCTION

Climate change, population growth, agriculture, and other land use demands continue to affect the availability of water for much of the world population (FAO, 2011a), ensuring water security will remain a top priority for people living in the arid and semi-arid regions of East Africa and around the world. While the exact changes to the hydrological cycle cannot be predicted, it is certain that communities whose livelihoods depend on the availability of water will need to adapt and become more resilient in the future (FAO, 2011a). Identifying how communities address water scarcity at the local level should be of the utmost concern to researchers, policy-makers, and resource users if they are to address the impending changes in water availability worldwide.

Water resources such as streams, rivers, lakes, and aquifers are examples of a common natural resource. As such, water presents a unique management challenge in which resource ownership and allocation are difficult to control (Burke, 2001; McCay, 1995; Quinn, Huby, Kiwasila, & Lovett, 2007). With common resources in general, users incur individual benefits and collective costs (Burke, 2001; Hardin, 1968). Collective costs, such as degradation and depletion, occur when common resources are left unmanaged (Hardin, 1968). Management of the common water resource is important to ensuring the sustainability of a vital life source for individuals and their livelihoods (FAO, 2011a; Hardin, 1968; Ostrom, 1990; Walker, 2009).

The three main forms of natural resource management (NRM) are state-based, market-based, and community-based (Bardhan, 1993; Uphoff, 1998; Lein & Tagseth, 2009). Community-

based natural resource management (CBNRM) has emerged as an increasingly popular alternative to state-based (top-down) and market-based (privatization) models of NRM (Meinzen-Dick, Raju, & Gulati, 2002). The study of CBNRM provides insight into how local users can collectively manage the resources upon which they depend. It also sheds light on the emergence of community as a social process where individuals interact with one another to address place relevant matters such as water management (Wilkinson, 1991; Kaufman, 1959; Theodori, 2005). Using a case-study approach to investigate CBNRM and the emergence of community in East Africa, this research study seeks to add to the existing academic literature and provide new ideas for application to address water resources in rural agro-pastoral communities. This research has particular relevance to many countries in Sub-Saharan Africa, where climate change and water scarcity continue to have a significant impact on rural communities.

Context of the Problem

Water Scarcity

Water scarcity is a term that can be defined differently depending on the method used to evaluate water resources (e.g. water stress index, criticality ratio, International Water Management Institute (IWMI) measurement, and water poverty index) (White, 2012). Due to the difficult nature of calculating the exact amount of water resources within a country and the ability to classify the same country on different scales, it is more practical to view water scarcity as a relative term. Water scarcity occurs when demand cannot be fully satisfied due to inadequate access or supply (IWMI, 2007; UN Water, 2007).

Water scarcity can be shaped by social, environmental, and economic factors and often affects those living in poor, rural areas the most (IWMI, 2007; Stikker, 1998; UN Water, 2007).

Social water scarcity is caused by both social norms and structural conditions that prohibit equal access to the water supply. Environmental scarcity is often caused by an inadequate supply of water in the natural, hydrological cycle. It may also be caused by an unsustainable demand placed on the water supply. Climate change plays a major role in environmental water scarcity by altering both seasonal and long-term hydrological trends (Faurès & White, 2011). Economic water scarcity is caused by the inadequate investment in water infrastructure and the lack of human capacity (i.e. money) to satisfy the demand. Populations that cannot access safe sources of water face significant challenges. These challenges include increased poverty, food insecurity, malnutrition, water-related disease, loss of livelihoods that depend on water such as agriculture, and the inability to fulfill their basic water requirements (i.e. drinking, cooking, and hygiene) (FAO & IFAD, 2008; IWMI, 2007; Gleick, 1996; Oluoko-Odingo, 2011; Stikker, 1998; Sullivan et al., 2003; UN Water, 2007; UN WWAP, 2006a). The African continent is one area where climate change and water scarcity pose serious challenges to sustainable development (ACSD-5, 2007; Climate Change Synthesis Report, 2007; FAO, 2007).

Many populations in Sub-Saharan Africa primarily rely on rain-fed agriculture for their livelihoods (FAO & IFAD, 2008; IWMI, 2007). As climate change affects the variation and distribution of precipitation across the African continent, some areas will be hit harder than others (UNWWAP, 2006). Kenya is one example that is currently dealing with water scarce conditions that are predicted to get worse with climate change (Climate Change Synthesis Report, 2007). The Kenyan population is predominantly engaged in rain-fed agriculture and livestock (Gichuki, 2002; KARI, 2007). Agro-pastoral communities living within the arid and semi-arid lands (ASAL) of Kenya are currently experiencing a scarcity of water resources which presents several challenges which threaten local water resources and the people that depend on them for their livelihoods (FAO, 2011a; Gichuki, 2002; Oluoko-Odingo, 2011).

Problem Statement

People living in the rural, agro-pastoral County of Laikipia, Kenya currently face a number of water related challenges. A majority of the population relies on crop production and raising livestock to earn a living and provide for their families (KARI, 2007). These livelihoods are highly dependent upon water (FAO & IFAD, 2008; Gichuki, 2002; KARI, 2007). At the most basic level, water is necessary for drinking, cooking, and hygiene (Gleick, 1996). Repeated years of diminished and non-existent seasonal rains have forced residents to rely more and more on surface and groundwater resources (Gichuki, 2002; KARI, 2007). The streams and underground sources of water in Laikipia represent a common resource for the local people. Common resources are characterized by individual benefits and collective costs (Hardin, 1968). If not managed properly, individual users have the potential to degrade and deplete the resource for all. Water scarcity is a very real threat for the local people in Laikipia (Gichuki, 2002; KARI, 2007). Water scarcity can result in a loss of livelihood, increased poverty, food insecurity, malnutrition, disease, and conflict (FAO & IFAD, 2008; IWMI, 2007; Sullivan et al., 2003; UN Water, 2007; UN WWAP, 2006a). In many cases, proper water management can significantly contribute to addressing water scarcity by improving access and controlling use (UN WWAP 2006a).

Solution to the Problem

Community-based natural resource management (CBNRM) represents the most appropriate solution to the water scarcity problem experienced by the people in Laikipia, Kenya. The goal of CBNRM is the equitable and sustainable management of natural resources through broad participation of local residents based upon their values, experiences, and capabilities (Blaikie, 2006; Uphoff, 1998; Matta & Alavalapati, 2006). The top-down and market-based NRM

approaches have been heavily criticized for failing to effectively and equitably manage and allocate common resources at the local level (Matta & Alavapati, 2006; Bardhan, 1993; Lein & Tagseth, 2009; Uphoff, 1998). Alternatively, CBNRM has been favored for its ability to account for the complex and unique attributes of natural resources and their users at the local level (FAO & IFAD, 2008; Lein & Tagseth, 2009; Meinzen-Dick et al., 2002; Meinzen-Dick, DiGregorio, & McCarthy, 2004). Today, many international research and development agencies including the United Nations, the International Fund for Agricultural Development, the International Water Management Institute, and the Food and Agriculture Organization are calling for water management strategies to be more locally based and inclusive of water users (FAO, 2007; FAO, 2011a; FAO & IFAD, 2008; IWMI, 2008; UNWWAP 2006a).

Need for the Study

There exists a need to better understand the factors that shape the emergence of collective action within the context of community-based natural resource management. As governments and development organizations look towards local users for more effective and sustainable water management, it is important to understand how and why local people come together to address common general needs such as water scarcity (Meinzen-Dick et al., 2002; Meinzen-Dick et al., 2004). A major critique of CBNRM is that the degree of success varies widely across cases (Meinzen-Dick et al., 2002). In order to increase the chances of CBNRM success, there is a need to better understand how individuals act collectively to address natural resource concerns (Brunckhorst, 2010; Meinzen-Dick et al., 2004; Quinn, Huby, Kiwasila, & Lovett, 2007; Uphoff, 1998). Identifying the common values and experiences around which local individuals converge will help increase the effectiveness and support of locally based NRM strategies (Adams et al.,

2003; Meinzen-Dick et al., 2002). Lastly, the factors that lead to the emergence of CBNRM can be used to assess the potential for CBNRM to emerge elsewhere.

Purpose of the Study

The purpose of this research study was to explore and describe the factors that shape the emergence of collective action in the context of community-based natural resource management. A case study was conducted of Lamuria, a water scarce agro-pastoral locality in Laikipia County, Kenya. Four research hypotheses were developed to guide the study. Each hypothesis describes the relationship between four independent concepts - water access and use; common issues within the community; levels of interaction; and sociodemographic characteristics - and the dependent concept, collective action.

H1. An inadequate supply of water within the community increases the likelihood that collective action will occur to ensure that basic water needs are met.

H2. Individuals who face common needs are more likely initiate collective action to address common needs.

H3. As levels of interaction increase, so does the likelihood that collective action will occur.

H4. As household size, employment status, level of education, and length of residence increase, so does community members' participation in collective action.

The remaining thesis chapters will proceed as follows. Chapter 2 – Review of Literature discusses in detail how community emerges, the role of social fields and interpersonal ties, the importance of agency and collective action, the problems associated with common natural resources and a discussion of natural resource management solutions. The chapter concludes with a theoretical framework, which rationalizes the research concepts based on the literature using an interactional field theory approach. Chapter 3 – Methodology describes the research design and methods used to collect and analyze the data. Chapter 4 – Findings presents an analysis of the

data using an interpretative phenomenological approach. Chapter 5 – Conclusions, Implications, and Recommendations synthesizes the findings into applied suggestions for stakeholder (relevant community leaders, community development organizations, aid agencies, and academic research institutions) programming, application, and future research.

Chapter 2

REVIEW OF LITERATURE

Background Information on Africa

Sub-Saharan Africa

Sub-Saharan Africa (SSA) represents one of the most vulnerable parts of the world in terms of water scarcity. Approximately 220 million people, or one quarter of the world's rural poor, live in the region. These rural populations are closely tied to agriculture. Of the top 20 countries most reliant upon agricultural livelihoods, 16 are from SSA. Agriculture still holds the most promise for economic growth in the region (IWMI, 2007). Agriculture is also heavily dependent upon water, accounting on average for seventy percent of all freshwater use (FAO, 2007). Water is an essential input for both crop and livestock production. When precipitation is insufficient, farmers turn to surface and groundwater resources to sustain crops and livestock (UN Water, 2007). Without sufficient rain, surface and groundwater resources cannot keep pace with user demand. Therefore, rural agro-pastoral populations are particularly sensitive to changes in the hydrological cycle, making them susceptible to the potential effects of climate change (FAO, 2011a; FAO, 2012; FAO & IFAD, 2008; KARI, 2007).

Climate change is predicted to affect the amount and variability of precipitation within the African continent (IWMI, 2007). It is predicted that by 2020 between 75 and 250 million of people will experience a reduction in available water resources and related agriculture (Climate

Change Synthesis Report, 2007). East Africa could see a decrease in maize yields by 19.0 percent and beans by as much as 47.0 percent (Climate Change Synthesis Report, 2007). Arid and semi-arid lands are predicted to increase by 5.0 to 8.0 percent by 2080 (Climate Change Synthesis Report, 2007). While climate change will affect the supply of water, population growth will affect the demand for water. It is predicted that the SSA population will increase from 700 million in 2007, to 1.1 billion in 2030 (FAO & IFAD, 2008). The effects of climate change, population growth, and poor water management can already be seen in places like Kenya (FAO, 2012; Gichuki, 2002; KARI, 2007; Oluoko-Odingo, 2011).

Kenya

The Republic of Kenya lies at the heart of East Africa and embodies many of the challenges facing the region. According to Kenya's 2009 census, the total population was 38,610,097 people, of which 67.6 percent were considered to be living in a rural residence (UNSD Demographic Statistics, 2012). The population growth rate is currently estimated at 2.44 percent (CIA World Factbook, 2012). Kenya also has a large number of refugees living within its borders, many of whom have come from neighboring areas of conflict and famine including Somalia (351,773), Ethiopia (21,253), and the former Sudan (20,528) (FAO, 2012; UNHCR Statistical Database, 2011). Kenya is considered by the UN's Food and Agriculture Organization (FAO) to be water scarce and has recently been subject to a prolonged drought in the northern half of the country (FAO, 2012). In addition to a lack of precipitation, Kenya's existing water resources and infrastructure have been degraded by overuse, pollution, and siltation (UN Water WWAP, 2006). Kenya also suffers from a lack of up to date information about its water resources. Poor water monitoring practices, an inadequate number of monitoring stations, and incomplete reporting have contributed to the lack of information (KARI, 2007; UN WWAP,

2006). Without accurate, up to date information regarding water demand and the available supply, it is difficult to manage the country's water resources effectively (Gichuki, 2002; KARI, 2007; Oluoko-Odingo, 2011). Water scarcity has also affected Kenya's socioeconomic activity by disrupting hydroelectric power production and hindering agricultural and industrial output (Oluoko-Odingo, 2011; UN Water WWAP, 2006). These national water challenges can also be seen at the local level.

Laikipia County

Kenya's Laikipia County is an appropriate place to observe the impact of water scarcity on food security and individual livelihoods. Laikipia County lies within the Arid and Semi-Arid Land (ASAL) region and falls within the Upper Ewaso Ng'iro North river basin (Gichuki, 2002; KARI, 2007) Laikipia is primarily characterized by agro-pastoral livelihoods (i.e. crop production and raising livestock) (Gichuki, 2002; KARI, 2007). Laikipia has experienced high population growth from an influx of small-scale farmers and pastoralists from the neighboring counties (Gichuki, 2002). Farmers grow crops including cassava, maize, beans, sweet potatoes, yams, cowpeas, cashews, green grams, and other vegetables. Livestock include beef cattle, sheep, goats, poultry, donkeys, and camels (KARI, 2007).

As a whole, the basin experiences four different seasons including the long rains (mid-March to mid-June), continental rains (mid-June to mid-September), short rains (October to December), and dry season (January to mid-March). Due to its location, Laikipia does not receive the continental rains, leaving only the short and long rains with dry seasons in between (Gichuki, 2002). The crops and pasturelands are therefore highly dependent upon the bimodal rains each year. When the short and long rains fail to provide adequate amounts of water, a greater demand is placed on surface and groundwater resources (FAO & IFAD, 2008; UN Water, 2007). Streams

and rivers now represent the greatest sources of freshwater for a majority of the population (Gichuki, 2002). Surface water monitoring has shown a reduction in stream flow over the past few decades and has been attributed to increased rates of upstream withdrawal and drought cycles (Gichuki, 2002).

Drought has been a significant concern in recent years. In a 2007 survey of the ASAL region by the Kenyan Agricultural Research Institute, 31.2 percent of respondents were unable to produce enough food on their own due to low rainfall and drought, forcing them to buy food, receive food aid, or borrow from others. In addition, 12.6 percent of livestock owners reported selling off livestock due to drought. The failure of the short rains in 2009 caused crops to fail in Laikipia. This has been followed by years of minimal rainfall in the ASAL region, worsening the situation for farmers, herders, and residents alike (Kenya Food Security Meeting, 2011). The evidence from Laikipia and greater Kenya highlights a growing problem that must be addressed.

Literature

In order to explore the emergence of CBNRM in response to water scarcity within Kenya's agro-pastoral populations, a thorough review of literature must be presented. The study of CBNRM is inherently an exercise in the study of community. Therefore, one must begin with an understanding of what community is and how it emerges. A synthesis of the existing literature on community and CBNRM will be presented with specific attention paid to concepts including community, social fields, community agency, collective action, common natural resources, and natural resource management. The concepts will be discussed from an interactional field theoretical perspective. A theoretical framework will conclude the chapter where the above concepts will be linked to the concepts and variables utilized by the research study.

The Emergence of Community

Community is a dynamic social process that emerges when individuals in a given locality interact to exercise agency and collectively address common general needs (Bridger, Brennan & Luloff, 2011; Kaufman, 1959; Wilkinson, 1991). Community is rooted in a physical place where people live and work to fulfill their daily needs (Bridger et al., 2011; Kaufman, 1959; Wilkinson, 1991). People within a community interact with one another and form interpersonal ties based on mutual values, interests, and needs (Granovetter, 1973). Social fields are groups of people that are united by a common value, interest, or need. The interest pursued by a social field sets it apart from other social fields (Wilkinson, 1970). Linkages and channels of communication are formed between social fields through the social interaction of individuals (Bridger et al., 2011). Social interaction aids in building awareness of place-relevant issues that affect multiple social fields. When a need exists that cuts across a variety of social fields, there is an opportunity for a new overarching field to emerge, the community field (Wilkinson, 1970; Wilkinson, 1991).

The community field is where various social fields exercise community agency and collective action. Interaction within the community field allows multiple social fields to identify, mobilize, and utilize the resources at their collective disposal (Bridger et al., 2011). This process of building adaptive capacity is called community agency (Wilkinson, 1991). When local people from multiple social fields act to address a common, general need, they engage in collective action (Wilkinson, 1991). Taking broad-based, collective action to address locally based needs completes the process from which community emerges.

Community as a Place

Community, first and foremost, is a social process through which people interact with one another. Based on the conceptualization of community by Wilkinson (1991) and Kaufman (1959), the process of social interaction occurs most visibly and substantially in a physical space, as opposed to a virtual space such as the Internet. When studying community and natural resource management, geographic space plays an important role; however researchers define this space differently. Theodori (2005) and Wilkinson (1991) use the term locality to mean the territory or geographic area in which people live and meet their daily needs. Furthermore, Theodori (2005) uses the term local society to describe a locality with institutions or patterns of behavior that shape human (social) interaction.

Uphoff (1998) discusses three terms (locality, community, and group) to describe local level decision-making in natural resource management. A *locality* is made up of several communities in close proximity to one another that have some degree of common identity and cooperate through relationships based upon social interaction, economic transactions, or mutual dependence on local natural resources (Uphoff, 1998). *Community* is defined as a residential unit ranging in size (anywhere from a half dozen to several thousand households) that can be fairly homogenous, but is typically more diversified in terms of language, ethnicity, socioeconomic status, and other characteristics (Uphoff, 1998). Community can also resemble a tight-knit settlement or be broadly dispersed along a road or natural boundary such as a river. Community is made up of subsets or groups. A *group* is usually smaller than a community and membership, whether formal or informal, is based on a common trait or characteristics held by its members (Uphoff, 1998).

Community emerges within a locality where people live and meet their daily needs (Bridger et al., 2011; Wilkinson, 1991). The needs of the people ultimately dictate the size of the

locality in which community emerges. Physical boundaries may shape the geographic territory of a locality, but it has minimal effect on the emergence of community as a process of social interaction. While such boundaries may remain fixed, community is constantly changing and evolving over time. The diverse groups of people interacting within a place contribute to the dynamic nature of community. These groups of people identify with specific interests and it is those interests that separate them into different social fields.

Social Fields

A social field is a process of interaction over time that is directed toward a relatively distinct outcome or interest and involves constantly changing direction and structure (Wilkinson, 1970). Social fields are manifested in the organization of people into groups or associations whose interaction has both direction and structure (Theodori, 2005). Direction is based upon the mutual interests, values, goals, or needs held by the group of people (Kaufman, 1959; Wilkinson, 1991; Bridger et al., 2011). Direction is determined through social interaction and forms the basis for distinguishing different social fields (Wilkinson, 1970). The direction of a social field changes over time as the mutual interests, values, goals, and needs of its members respond to changes within the locality such as local politics, the environment, and economy. Structure, on the other hand, includes the positions of actors and the relationships among them as they interact (Wilkinson, 1970). Culture plays a role in determining how members interact with one another. Like the direction of a social field, the structure is also subject to change. For example, people are constantly entering and leaving the field, resulting in changing positions within the social structure (Wilkinson, 1970). Social fields are dynamic and boundless, primarily because they rely on social interaction in which the behavior of individuals can never fully be predicted (Wilkinson,

1972). Despite the unpredictable nature of human interaction, there are some observations that can be made about human interaction and how it contributes to the emergence of social fields.

Social fields are made up of people who share a common interest or characteristic and take repeated action over time in pursuit of those interests (Theodori, 2005). Individuals may in fact be quite different from one another based on other characteristics, but there is at least one subject that unites them (Wilkinson, 1991). Examples of social fields include local education, economic, environmental, recreational, social service and religious interests (Bridger et al., 2011; Kaufman, 1959; Wilkinson 1970). Social fields can exist as formal organizations and informal groups (Theodori, 2005; Wilkinson, 1970). However, formality (i.e. structure) is only important to the degree that it enables the group to establish consensus and act (Wilkinson, 1970).

The same interest or characteristic that unites a particular social field also sets it apart from other social fields. Within community, there are multiple social fields or groups of people concerned with addressing a relatively specific, but shared need. When a need or interest transcends a broad number of social fields throughout the locality, a new type of social field begins to emerge called the community field.

Community Field

The community field is a “locality-oriented social field through which actions expressing a broad range of local interests are coordinated” (Wilkinson, 1972, p. 44). The community field is locality-oriented, meaning it involves local people concerned with local issues where they live. Setting aside their respective differences, people interact in a “generalization across interest lines” (Wilkinson, 1972, p. 45) to identify and address local concerns affecting multiple social fields within the community. The community field includes both formal and informal groups, organized

and unorganized activities, and may or may not include local government (Wilkinson, 1972). As with other social fields, the community field is constantly changing in structure and direction.

Individual social fields concern themselves with specific interests in the community. There is the potential to engage in the community field when multiple social fields share common interests facing the local society. Common interests may include the basic necessities of life such as food, water, clothing, and shelter, but may also include other concerns such as education, the environment, healthcare, and politics. Revisiting the initial definition of community, the community field concerns itself with issues that affect people's ability to live and meet their daily needs. Figure 2-1 visually depicts how the community field encompasses different social fields within a given locality.

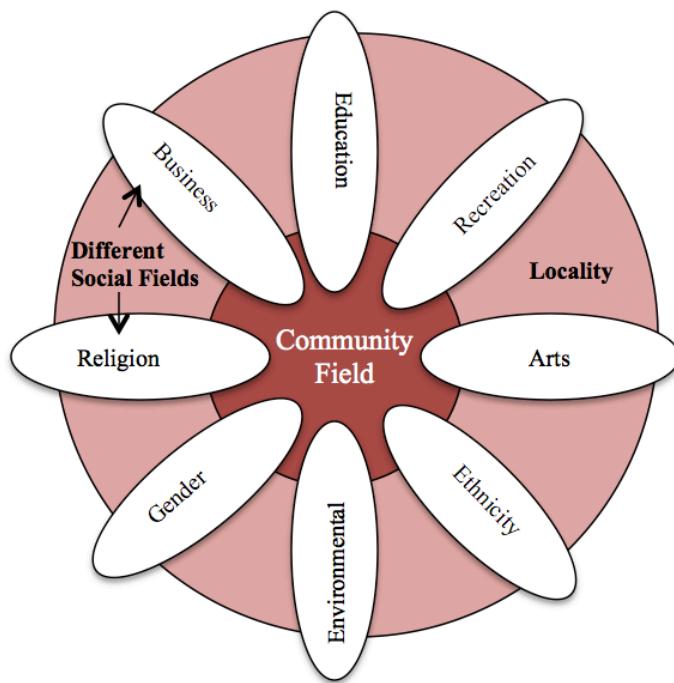


Figure 2-1: The Community Field and Other Social Fields

The community field relies on a generalization process to bring multiple groups of people (i.e. social fields) together to address a common interest (Wilkinson, 1972). While the community field is dynamic and emerges from other social fields, its existence must also be marked by a degree of continuity with persisting social and cultural structures (Kaufman, 1959). The community field requires a culture of understanding as to how different social fields can interact with one another to identify and address common concerns. The community field structure must also include individuals who are committed to participating in the generalization process, irrespective of their own social fields and interests (Kaufman, 1959). These individuals are often leaders within their respective social fields. They are recognized for their position and actions taken in pursuit of their social fields' interests (Kaufman, 1959). Community leaders rely upon a social network consisting of both individuals and groups. The relationships that make up a social network can be described in terms of interpersonal ties.

Interpersonal Ties

Social fields, including the community field, rely on social interaction. Social interaction is the basis for human relationships. Granovetter (1973) refers to the relationships or connections between people as interpersonal ties and classifies them in terms of strength as either strong, weak, or absent. In this case, ties are viewed as being solely positive, though negative relationships do exist as well. Granovetter (1973) defines interpersonal ties by stating, "the strength of a tie is a combination of the amount of time, the emotional intensity, the intimacy, and the reciprocal services which characterize the tie" (p. 1361). Frequency of interaction plays a significant role in establishing interpersonal ties and is generally characterized by a positive relationship (Homans, 1950). In addition, the more similar two individuals are, the stronger the tie between them (Granovetter, 1973).

The frequency of interaction and the degree of similarity between individuals can be seen in the development of social fields and the emergence of the community field. Individuals within the same field share at least one similar interest in common and depending on the level of group organization, interact with one another with some degree of frequency. Based on the logic presented by Granovetter (1973), there is a greater chance for individuals to exhibit stronger ties with members of the same social field, and conversely, weaker or absent ties with non-members. It is also proposed that strong ties can promote the development of new ties, enhancing channels of communication where there were previously none, as demonstrated by Figure 2-2 below (Newcomb, 1961; Granovetter, 1973).

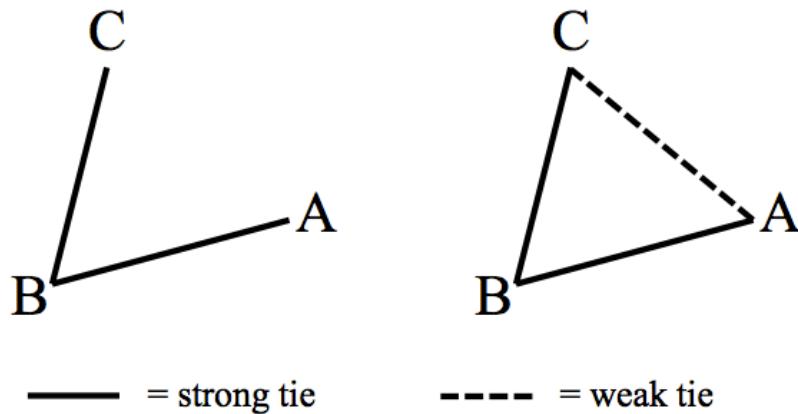


Figure 2-2: The Forbidden Triad (adapted from Granovetter, 1973, p. 1363)

Each configuration represents a triad or a network of interpersonal ties among three individuals. The configuration on the left represents a scenario where two individuals, A and C, each share a strong tie with a mutual friend B but do not share a tie with one another. While Davis (1970) proved that this configuration is possible and does in fact exist in limited cases, Granovetter (1973) argues the likelihood is quite rare and refers to it as the forbidden triad. Instead, Granovetter (1973) states that it is more likely that A and C share at the very least, a

weak tie as depicted by the configuration on the right. Granovetter (1973) and Newcomb (1961) argue that as the interpersonal ties between B-A and B-C become stronger, so does the tie between A-C.

Weak or bridging ties form the basis for the emergence of the community field by linking different social fields (groups) that would otherwise remain disconnected from one another. Weak ties are formed through the overlapping social networks of individuals with strong ties as demonstrated by Figure 2-3 (Granovetter, 1973). Strong or bonding ties form close-knit bonds between similar individuals, but weak ties form bridges to different individuals and groups. These bridges represent paths through which communication and diffusion of information can occur (Granovetter, 1973).

In the context of diffusion, where information is passed from one individual to another through communication and interaction, individuals often possess social networks in which there is more than one path for information to travel (Granovetter, 1973). The likelihood that information will travel between two points (e.g. individuals or groups) along a particular path is dependent upon the length and positivity of that path. The likelihood of a path is indirectly proportional to the number of interpersonal ties through which it must pass (shorter lengths preferred over longer lengths); and it is directly proportional to the positivity of those interpersonal ties (friendships preferred over non-friendships) (Davis, 1969). However, Harary, Norman, and Cartwright (1965) note that there may be some distance by which two individuals are separated that does not feasibly allow for communication and the diffusion of information to occur. Still, there is a tendency for communication and the diffusion of information to travel along the shortest, most positive path between two points and weak ties play a significant role in this process (Granovetter, 1973; Harary et al., 1965). Therefore, weak ties are essential to Wilkinson's (1972) generalization process and the emergence of the community field, as illustrated by Figure 2-3.

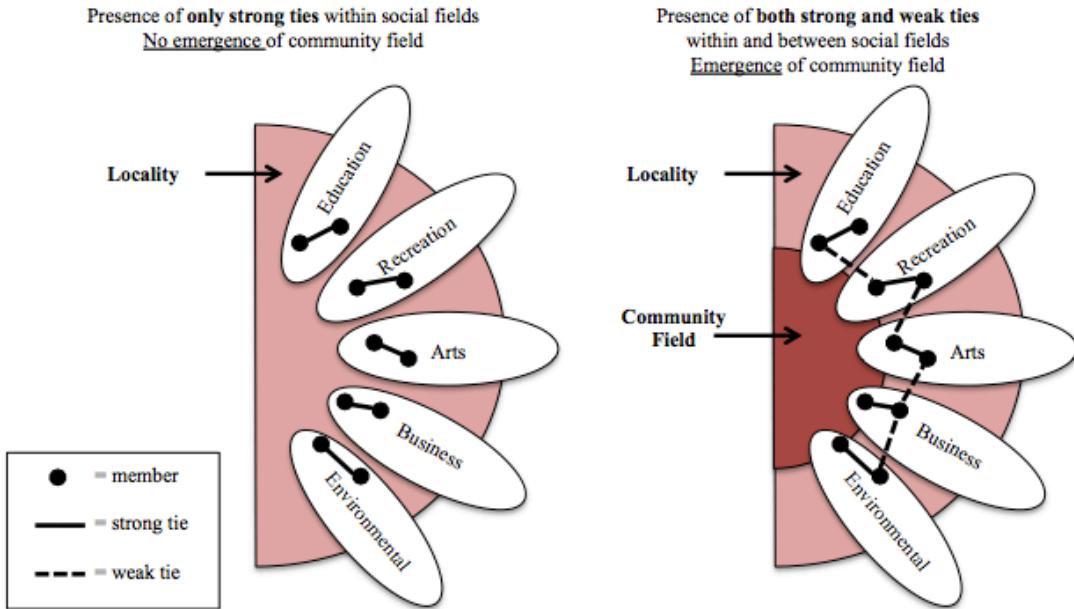


Figure 2-3: Presence of Strong and Weak Ties Among Social Fields

Figure 2-3 depicts on the left a locality with various social fields each containing their own internal strong ties. However, due to the lack of weak ties or bridges between social fields, there is limited communication and diffusion of information. Alternatively, the diagram on the right depicts that when bridges (weak ties) are formed between individuals of different social fields, the community field is more likely to emerge. Social interaction helps to establish both strong and weak ties between individuals, groups, and beyond. Greater social interaction and interpersonal ties help individuals within the local society become aware of common, general needs as well as ways to address them. Promoting awareness and acting on local needs are vital to the emergence of community.

Community Agency and Collective Action

Social interaction aids in building awareness of common interests, issues, or needs that cut across different social fields. Interaction enables individuals to identify and utilize local resources to collectively address an issue or need (Bridger et al., 2011; Wilkinson, 1991).

Awareness and opportunities to act are made possible through interaction and social networks made up of strong and weak ties (Kaufman, 1959; Wilkinson, 1972). By establishing new relationships and channels of communication, local people are able to enhance their adaptive capacity (Bridger et al., 2011; Wilkinson, 1991). Community agency emerges from adaptive capacity when local people are able to “manage, utilize, and enhance those resources available to them” (Bridger et al., 2011, p. 90). Adaptive capacity and community agency are exercised within the community field, enhancing the field by establishing new ties and strengthening existing ones.

When community agency is exercised, social fields are able to collectively leverage resources that would otherwise be utilized by the individual social fields for their respective interests (Luloff & Bridger, 2003; Theodori, 2005). Community agency allows local people to address a wider range of issues than they would otherwise be capable of addressing on their own or within their individual social fields. Bridger et al. (2011) state that “as long as people care about each other and the place they live, there is the potential for agency and the development of community” (p. 90). Local people must not only have the capacity to act, but also the will to act. Community agency must be complemented by collective action.

Collective action is the process of addressing common concerns and improving the well-being of local people (Kaufman, 1959; Wilkinson, 1991). Collective action is a positive, purposeful attempt to improve or enhance a specific aspect of local life (Brennan, 2005; Meinzen-Dick, DiGregorio, & McCarthy, 2004; Wilkinson, 1991). Collective action can be identified using a list of key dimensions.

Kaufman (1959) states the six dimensions of collective action as:

1) The degree of comprehensiveness of interests pursued and needs met; 2) the degree to which the action is identified with the locality; 3) relative number, status, and degree of involvement of local residents; 4) relative number and significance of local associations involved; 5) degree to which the action maintains or changes the local society; and 6) extent of organization of the action. (p. 13)

The success of a particular collective action is not determined by the outcome, but by the process. (Bridger et al., 2011). The attempt (i.e. action) to initiate positive change within the locality has positive implications for the emergence of the community field, regardless of the action's outcome (Wilkinson, 1991). When community and collective action are viewed as a process, the degree to which individuals and groups coordinate resources and action within the community field determines success. Successful collective action not only strengthens the community field but it also enhances the adaptive capacity to address other interests in the future.

Natural resources are an example of a common, general interest that can energize community agency, elicit a collective action response, and strengthen the community field. Rural and agriculturally based populations rely heavily upon natural resources such as water, forests, and land to secure their livelihoods (FAO, 2011; FAO & IFAD, 2008). It is therefore in the general interest of the population to maintain the quality and availability of the natural resources upon which they depend. This task becomes even more important when dealing with common resources.

Common Resources

A common resource as “any natural resource from which individuals directly accrue benefits while sharing costs collectively” (Burke, 2001, p. 453). Common resources are shaped

by both the social or biophysical world, which lead to similar but distinct definitions. The social and biophysical worlds help determine resource ownership, access, and the degree to which a resource's boundaries can readily be determined and thus managed (Burke, 2001). *Open access* refers to a resource of non-property in which no one owns or regulates access and thus is open to everyone (Burke, 2001). *Common property* refers to a resource that is owned by a group of people who manage and regulate access to the resource (McCay, 1995). Open access and common property represent common resources that are shaped by the social world where ownership and access are more easily regulated. Alternatively, *common pool resources* are resources that lack a fixed set of boundaries, making it difficult to manage access and use such as large bodies of water, fish, wildlife, and the atmosphere (McCay, 1995; Quinn, Huby, Kiwasila, & Lovett, 2007). Sometimes, the term *non-common pool resource* is used to describe resources, which can be more easily delineated such as land, pastures, or forests (Burke, 2001). While each term draws its differences from social and biophysical contexts, it is important to focus on the concepts that unite them.

Each term (common resource, open access, common property, and common pool resources) has at its core, the concepts of individual benefits and collective costs. Each user gains an individual benefit from utilizing the resource. Each person's use has an effect or cost on the resource (e.g. pollution or over-use) and is thus shared by all users, regardless of their individual use. The term common resources will be used within this research study to refer to natural resources in which users experience individual benefits and collective costs. Common resources are vital to fulfilling basic daily needs and supporting livelihoods (FAO, 2007). For localities and groups of people relying upon common resources for their livelihoods, ensuring resource availability and sustainability represent general needs that are shared by all. These shared needs can be the catalyst for interaction within the community field. Threats to common resource availability and sustainability stem from its defining concepts, individual benefits and collective

costs. In his 1968 article, “The Tragedy of the Commons”, Garrett Hardin explains how individual actions can lead to the collective demise of a common resource.

The Logic and Tragedy of the Commons

Hardin (1968) viewed common resources, referred to by Hardin as simply *the commons*, as an exercise in game theory. This view of the commons represents a zero-sum game where utility of the commons is finite and thus one person’s use comes at the expense of another (Burke, 2001). He argued that each rational user of the commons has an incentive to maximize their individual gains or risk losing out to competition from other users (Hardin, 1968). Hardin (1968) contends that each user’s decision to exploit the commons for their own benefit can be explained by calculating the positive and negative utility that results from their actions.

Hardin (1968) illustrates his theoretical exercise using an example of a common pasture where each herdsman reviews the value of adding an additional animal to his herd in the pasture. Positive utility is represented by the value gained from having an additional animal to sell in the future. This positive utility is accrued by the individual herdsman. Negative utility is represented by the added strain put on the pasture from an additional animal grazing. The additional animal takes forage away from all other herdsmen and their animals in the commons. Therefore, an individual’s decision to add another animal carries with it a cost (one animal’s worth of forage) that is shared by everyone who uses the commons. When a herdsman expands his herd by an additional animal to the commons, he receives an individual benefit while incurring a fraction of the cost of additional grazing because it is distributed among all users. Therefore, every herdsman has an incentive to add additional animals to their herds because it results in a net individual benefit; this rationale is referred to as Hardin’s *logic of the commons* (Burke, 2001; Walker, 2009).

The logic of the commons can lead all users to pursue individual benefits despite collective costs. Hardin's (1968) *tragedy of the commons* occurs when users are aware of their actions' potential to degrade and deplete the commons, yet they still act to maximize their individual gains (Feeny, Berkes, McCay, & Acheson, 1990; Quinn et al., 2007). In the case of the pastureland example, Hardin (1968) states, "each man is locked into a system that compels him to increase his herd without limit - in a world that is limited" (p. 1244). Hardin's discussion of the commons stemmed from his concerns of overpopulation. Hardin (1968) postulated that there is a threshold (i.e. carrying capacity) at which the use of a common resource becomes unsustainable.

Hardin (1968) concludes by offering two ways in which the commons can be maintained, and thus the tragedy prevented. One solution is to divide and sell off the common resource as private property to individual users. The second solution involves social arrangements in which the state controls access and use through "mutual coercion, mutually agreed upon by the majority of the people" (Hardin, 1968, p. 1247). Hardin explains coercion as a method of making it increasingly costlier for individual users to over-utilize a common resource. While there is still a collective cost to the commons, users face greater individual costs aimed at prohibiting their exploitative behavior. Hardin (1968) uses the example of a parking meter, where users are free to park as long as they want but they will face increasingly costlier fees and fines for doing so (Hardin, 1968, p. 1247). Mutually agreed upon coercion means that each user agrees upon the rules of the established social arrangement that govern the commons. However, Hardin's description of the commons, the logic that leads to its tragic fate, and his proposed solutions to the commons dilemma have not gone without criticism.

Critique of Hardin's Commons

Hardin's (1968) article on the commons has generated significant debate about how researchers view humans' interaction with each other and the environment. The critiques of Hardin can be separated into four points: the existence of the unmanaged commons; users' awareness of collective costs; the interpretation of rational choice theory; and solutions for solving the commons dilemma. Despite these critiques, it is worth noting that Hardin's 1968 work has proven to be "one of the most influential scientific articles of the 20th century" (Walker, 2009, p. 283). The debate over Hardin and the commons has spawned a host of scientific works focused on addressing how users can manage the commons more sustainably (Brunckhorst, 2010; Burke, 2001; Cousins, 2000; Dietz, Ostrom, & Stern, 2003; Feeny et al., 1990; McCay, 1995; Ostrom, 1990; Walker, 2009).

The pastureland scenario depicted by Hardin (1968) assumes a state of anarchy where each herdsman is acting alone in his own rational self-interest (Andelson, 2004). Hardin neglects to specify that his pastureland is a hypothetical example of an *unmanaged commons*, though he later states this in a follow-up article (Hardin, 1998). Nevertheless Hardin's initial omission of the term *unmanaged commons* has prompted critiques of his failure to account for historical examples of the common agro-pastoral lands such as those that comprised England prior to the Enclosure Movement (Andelson, 2004; Reader, 1988; Walker, 2009). However, others argue that Hardin's approach to the commons is intentionally designed to be theoretical rather than empirical (Andelson, 2004; Walker, 2009).

The second critique is Hardin's assumption that users are aware of the collective costs to the common resource that result from their individual benefits (Burke, 2001). Hardin (1968) describes a process in which users rationally weigh the costs and benefits of their actions in deciding to add an additional animal to their grazing herd. Hardin's *logic* assumes that users are

able to recognize the collective costs that result from their individual actions. If users are unable to perceive the consequences of their actions (i.e. collective costs), then they are unable to complete the cost-benefit calculation that Hardin (1968) describes in his logic of the commons (Burke, 2001). Hardin's *tragedy* assumes that users are aware of the collective costs and subsequent consequences (degradation and depletion) yet they still continue to maximize their individual use. If users are unable to associate their individual use (i.e. individual benefits) with the consequences of degradation and depletion, then the situation cannot be described as a tragedy because users are unaware of their impact on the resource (Burke, 2001).

The third critique of Hardin is his use of evolutionary game theory to characterize the rationality of individuals. Hardin's (1968) logic of the commons is based on rational actors who seek to maximize their individual benefits through resource consumption. Burke (2001) argues that there are two distinctly different ways to view rational choice: evolutionary game theory and sociological RC theory. Evolutionary game theory directs an actor to make the most logical choices that lead to a specific goal, such as maximizing utility or consumption of a resource (Burke, 2001). Evolutionary game theory focuses on finding the best strategy for an actor to optimize their benefits in pursuit of a goal. Sociological RC theory does not dispute the assumption that actors are rational, but instead it defines rationality in a different way.

According to sociological RC theory, rationality is "individuals pursuing what they value as effectively as they can, with the information they have available, and within the opportunities and constraints they face" (Burke, 2001, p. 455). Burke (2001) argues that when characterizing rationality, it is important to take into consideration the values, beliefs, and other social factors that influence an actor's decision-making. Ostrom (1990) supports the case for a more sociological approach to RC theory by stating "it may be rational for common resource users to forgo individual benefits to cooperate toward collective goals" (as cited in Burke, 2001, p. 457). Irrespective of the debate over the rationality and the intentions of users, there is a clear need for

mutual understanding among users about the common resources upon which they rely. Hardin (1968) argues common resource users alone cannot achieve such an understanding.

The fourth critique of Hardin is of his solutions to the commons dilemma. Hardin (1968) argues that common resources must either be divided and sold off as private property or placed under state control with the power to allocate access and use. Hardin fails to acknowledge the ability of users to sustainably manage the commons by coordinating around a mutually understood set of rules governing access and use (Dietz, Ostrom, & Stern, 2003; Ostrom, 1990; Quinn, Huby, Kiwasila, & Lovett, 2007). Some have referred to this model of self-management as *new institutionalism*, whereby individuals and groups use formal rules (laws) and informal rules (codes of conduct) to ensure the viability and vitality of their common resources. (North, 1990; Quinn et al., 2007).

Common resources such as surface water, groundwater, grazing and communal land are characteristic of many rural, agro-pastoral communities (Dietz et al., 2003; Ostrom, 1990). These communities represent opportunities for user-based resource stewardship, with successful cases having already been documented (Dietz et al., 2003; Lauber, Decker, & Knuth, 2008; Quinn et al., 2007; Ostrom, 1990). Overall, critics of Hardin argue that more consideration should be given to local, user-based resource management models (Adelson, 2004; Dietz et al., 2003; North, 1990; Ostrom, 1990; Quinn et al, 2007; Walker, 2009). This concept of local people governing the common resources upon which they rely has gained traction in recent years and is the basis for the following discussion of different approaches to natural resource management.

Approaches to Natural Resource Management

Natural resource management (NRM) seeks to control resource access and use in a sustainable manner that ensures sufficient resource availability for both current and future users

(Faurès & White, 2011; Lein & Tagseth, 2009; Meinzen-Dick et al., 2004; Uphoff, 1998). NRM can be applied to a variety of natural resources, but it is particularly relevant to common resources, which are highly vulnerable to degradation and depletion (Hardin, 1968; Burke, 2009; Ostrom, 1990).

Private, state, and community management approaches have all been proposed as potential solutions to the problems associated with natural resource management (Bardhan, 1993; Blaikie, 2006 Brunckhorst, 2010; Lein & Tagseth, 2009; Matta & Alavalapati, 2006; Quinn et al., 2007; Uphoff 1998). Some NRM approaches to common resources are more appropriate than others. The large scale and degree of variation of some common resources makes equitable distribution through privatization difficult to achieve (Cousins, 2000; Quinn et al., 2007). Common resources that are owned and allocated by the state can quickly be exploited if they are not properly monitored and the rules strictly enforced (Quinn et al, 2007). Advocates of the community approach believe local users can more successfully manage the common resources because they depend on them to meet their daily needs and can more closely monitor access and use (Armitage, 2005; Gruber, 2010; Uphoff, 1998).

Finding the most effective strategy for managing common resources is essential for individuals living in agro-pastoral localities. In places like Laikipia, Kenya, water is the most vital resource upon which farmers, pastoralists, and residents rely. In order to determine the most appropriate method for managing water in these areas, the strengths and weakness of each approach must be weighed. In the field of NRM, there are slight variations in terminology. For the purposes of this discussion, the three NRM strategies are identified as market-based (referring to private ownership or privatization), state-based (government ownership), and community-based (shared ownership). In this section, the term *natural resource management* will be used in specific reference to common water resources. In other literature, the term *water management* is sometimes used (Lein & Tagseth, 2009; Perry, 2001).

State-Based Natural Resource Management

The state-based or top-down approach to NRM is carried out by the national government through initiatives, policies, and regulations that are imposed upon the entire country down to the local level (Uphoff, 1998; Matta & Alvalapati, 2006). This strategy is based on “the notion that the state, through its administrative and political institutions, can and should plan and allocate scarce water resources in the interest of the common good” (Lein & Tagseth, 2009, p. 205). The state-based approach assumes that the government has the greatest capacity and knowledge to act on behalf of its population at all levels. The government enacts policies and carries out mobilization and allocation in a top-down manner through its regional and local governing bodies (Lein & Tagseth, 2009; Uphoff, 1998).

State-based NRM approaches have been criticized for failing to take into account the concerns and interests of local residents when mobilizing and allocating water resources (Matta & Alavalapati, 2006; Conroy, Mishra, & Rai, 2002; Meinzen-Dick, Raju, & Gulati, 2002; Bardhan, 1993; Lein & Tagseth, 2009; Uphoff, 1998). The top-down approach has been shown to be inadequate at establishing and enforcing sufficient rules and regulations regarding the responsible NRM at the local level (Meinzen-Dick et al., 2002). As a result, there has been a growing trend to decentralize NRM by transferring greater responsibility and control from the national to the local level (Meinzen-Dick et al., 2002). Reasons such as diminishing financial resources at the state level and increasing political pressure for more public participation may also help explain the growing support for alternatives to the state-based model (Meinzen-Dick et al., 2002).

Market-Based Natural Resource Management

The market-based approach to NRM views water as an economic good or commodity, capable of being privatized. Thus, water should be managed and allocated through the markets (Lein & Tagseth, 2009). As Lein and Tagseth (2009) phrase the argument, “while markets may not be perfect, they are certainly better than bureaucrats and politicians in allocating scarce resources. Perry (2001) cites a few reasons for why water resources should be dealt with economically through the use of water charges. Water charges help fund the cost of water provision, maintenance, and operation; they provide incentive for efficient use of a limited resource; they invest in future water services to benefit society (Perry, 2001). In a market with tradable rights to water access and use, the primary responsibility of allocation no longer rests with the state, but instead relies on a decentralized market system (Lein & Tagseth, 2009).

A broad critique is that private market systems fail to sustainably manage natural resources (Bardhan, 1993). In a market-based NRM scheme, the state management authorities have little control over the long-term, strategic planning of natural resources. Instead, the state is assigned the responsibility of enforcing the market rules and rights through the state’s judicial system (Lein & Tagseth, 2009). Another critique is that water is much more than a commodity, and the over-simplification of such a life-sustaining resource undervalues the symbolic nature held by cultures and communities (Gleick, 1998; Lein & Tagseth, 2009; Stikker, 1998).

The way in which water is viewed and valued has major implications for how it should be managed. Gleick (1998) argues, “access to a water requirement is a fundamental human right implicitly supported by international law, declarations, and State practice” (p. 488). How much water should an individual be granted under such a declaration? The basic water requirement for an individual is defined by the amount of water need for drinking, cooking, and hygiene (cleaning and sanitation) purposes (Gleick, 1996). However Gleick (1996) found that the amount of water

used on a daily basis depends on the degree of access. Gleick's (1996) study individuals with a private water connection in their home used more than those who retrieved their water from a public standpipe and that daily water use was reduced even further when the public standpipe was located farther away from the home. It has been argued that basic water requirements should also be considered for ecosystem health (Gleick, 1996). The amount of water needed by both humans and the ecosystem is dependent upon factors such as livelihoods, climate, temperature, industries, and wildlife (Gleick, 1996; Gleick, 1998). Therefore, an individual's daily water requirement is determined not only by their basic physiological, but also by the specific environment in which they live and work (Gleick, 1996). What this means for NRM is that context matters and a market-based system of allocation cannot capture the nuances of water resource use. Community-based NRM is an alternative approach that is purposely rooted in the local context to better account for users needs.

Community-Based Natural Resource Management

Community-based natural resource management (CBNRM) seeks to achieve sustainable management of the community's natural resources through broad participation of local residents based upon their values, experiences, and capabilities (Blaikie, 2006; Uphoff, 1998; Matta & Alavalapati, 2006). Blaikie (2006) adds that natural resource management should not just be sustainable but also efficient and equitable. Brunckhorst (2010) adds that a key aim of CBNRM is to join citizens together in collective action. This community-based management approach has been used in a variety of common resources including water (watersheds and irrigation), forests, fish and other wildlife (Armitage, 2005; Beyene, 2009; Lauber et al., 2008; Matta & Alavalapati, 2006; Meinzen-Dick et al., 2002). This bottom-up NRM approach supports the notion that local

users have the most at stake and are intimately aware of the resources upon which they rely.

Meinzen-Dick et al. (2002) succinctly states the argument as such:

Local users who live and work in the area are seen to have a comparative advantage over government agents in monitoring resource use and, because their livelihoods depend on the resource, are assumed to have the greatest incentives to maintain the resource base over time. (p. 650)

From the beginning, CBNRM must be characterized by local ownership and participation (Morrow & Hull, 1996; Quinn et al., 2007; Uphoff, 1998). The specific rules, laws, institutions or social arrangements that characterize a CBNRM strategy are a product of the values, beliefs, and needs of the local people and their environment (Lein & Tagseth, 2009; Uphoff, 1998).

CBNRM requires local people who have the capacity to act. Building local capacity can be achieved through the development of linkages. Linkages form the basis for community agency and collective action (Brunckhorst, 2010; Granovetter, 1973; Lauber et al., 2008; Uphoff, 1998; Wilkinson, 1991). Linkages include informal relationships and formal partnerships (Lauber et al., 2008). Linkages can exist horizontally and vertically (Brunckhorst, 2010; Uphoff, 1998). Linkages are made up of interpersonal (strong and weak) ties and are the result of social interaction (Granovetter, 1973, Wilkinson, 1991). Horizontal linkages build community agency by connecting local actors (e.g. individuals, groups, and social fields). Vertical linkages enhance community agency by connecting local actors with extra-local actors such as the regional and state government, research centers and universities, development organizations, and funding agencies (Uphoff, 1998).

Local users decide if and when to partner with extra-local actors. Resources such as capital, labor, knowledge, and physical materials may all be required to implement a CBNRM strategy (Lauber et al., 2008; Uphoff, 1998). Community agency is the process of local people managing, utilizing, and enhancing the resources available to them (Bridger et al., 2011). If the

resources necessary to implement CBNRM cannot be obtained locally, then they must be sought from extra-local actors (Uphoff, 1998). Securing the necessary resources to act is why developing strong networks comprised of horizontal and vertical linkages is key to successful CBNRM efforts (Lauber et al., 2008). The social ties and linkages that help to build community are based on the interaction among local people. Studying the emergence of community through social interaction is the basis for the interactional field theory.

Interactional Field Theory

From an interactional field theory perspective, community is fundamentally a social process built upon the interaction of individuals, groups and social fields in pursuit of locality-based general needs (Bridger et al., 2011; Bridger & Luloff, 1999; Wilkinson, 1991).

Interactional field theory uses the concepts of fields and interaction to explain the emergence of community. A field is an emergent, dynamic, unbounded whole (Wilkinson, 1972; Bridger and Luloff, 1999). A field is unbounded because the boundaries of a field are difficult to define as different fields overlap with one another (Kaufman, 1959; Wilkinson, 1970). However, a field is also distinguishable from other fields by the core characteristics that unite its components. A field is dynamic based on its direction and structure, which changes over time (Wilkinson, 1970). Fields can exist within a physical, biological, psychological, cultural, and social context (Wilkinson, 1972).

The study of community from an interactional field theory perspective focuses on the concept of social fields (Wilkinson, 1970). Social fields are made up of individuals that are socially organized into groups and associations. Social fields are unbounded as individuals participate in multiple groups simultaneously. Social fields are dynamic in nature because of their changing direction and structure (Wilkinson, 1970).

The direction of a social field is characterized by a relatively distinct interest or need that unites its members while simultaneously differentiating it from other social fields (Kaufman, 1959; Wilkinson 1972). Individuals' interests, needs, and participation change over time, altering the direction of the social field. The composition of social fields also changes as new members join and others leave. The structure of a social field is made up of the network of relationships among its members (Wilkinson, 1970). Relationships connect individuals both within and between social fields. Social interaction is the mechanism through which social fields are developed (Kaufman, 1959; Wilkinson, 1970; Wilkinson, 1972; Bridger and Luloff, 1999).

Social fields emerge when individuals form relationships based upon a common interest and interact over time in pursuit of that interest (Bridger & Luloff, 1999; Wilkinson, 1970; Wilkinson, 1991). Social interaction promotes an awareness of common interests and identifies opportunities to act in pursuit of those interests (Bridger et al., 2011). Interaction enables individuals to form and maintain interpersonal relationships (Granovetter, 1973; Wilkinson, 1972). Interpersonal relationships represent strong and weak ties between individuals (Granovetter, 1973). When individuals participate in multiple social fields, they have the potential to form linkages between the different social fields. These linkages represent opportunities for different social fields to interact. When social fields interact over common, locally based interests, there is the potential for a new, community field to emerge.

Theoretical Framework

CBNRM is a form of collective action taken by individuals to address locally based water needs. Using an interactional field theoretical approach, this research study explores the factors that lead to the emergence of collective action and community within the context of CBNRM. This study follows the conceptual model shown in Figure 2-4. The relationships between the independent concepts and dependent concept are explained from an interactional field theoretical perspective.

Independent Concepts

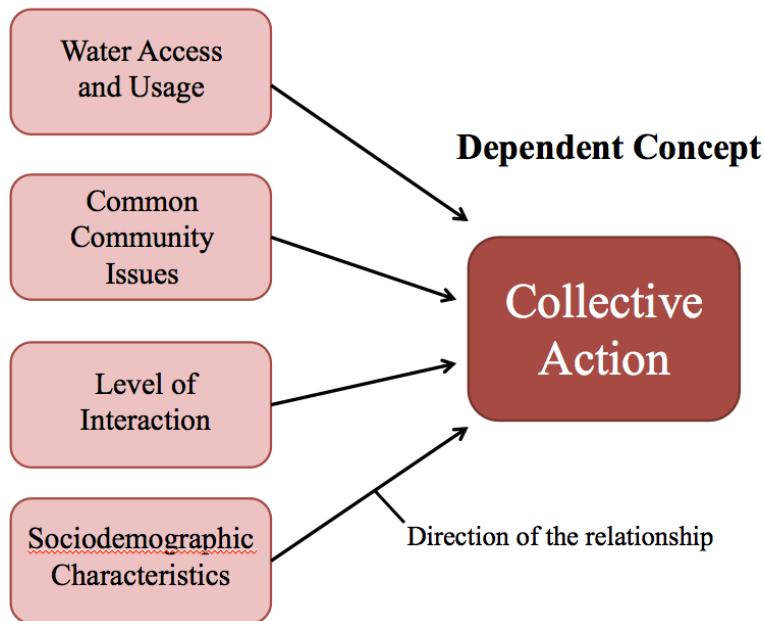


Figure 2-4: Conceptual Model

Each independent concept in Figure 2-4 has been documented in the community and natural resource management literature to have an influence in promoting the emergence of the dependent concept, collective action.

Water Access and Usage

In the locality of Laikipia County, Kenya, water scarcity represents a threat to all who rely on the local common water resources including surface and groundwater (IWMI, 2007; KARI, 2007; UN Water, 2007). Water basic domestic use including drinking, cooking, and hygiene is a common general need felt by all individuals (Gleick, 1996). Water for agricultural and livestock use is also of great concern to individuals in Laikipia that are predominantly engaged in agro-pastoral livelihoods (Gichuki, 2002; KARI, 2007). Individuals require access to water (supply) in order to fulfill their daily water needs (demand). The amount of water needed by an individual depends on their water usage. A farmer can require significantly more water for both domestic and agricultural use than a non-farmer (KARI, 2007). The inability of individuals to access sufficient amounts of water can be cause for action. Through interaction and communication, local individuals can build awareness of their common water needs and exercise agency to mobilize resources (Bridger et al., 2011). Collective action emerges when local individuals interact across social fields in an attempt to fulfill their common water needs (Wilkinson, 1991). Although water represents a common general need felt by all, local individuals may face other common issues that span across different social fields.

Common Community Issues

Collective action is the culminating step in the process of social interaction and the emergence of community (Kaufman, 1959; Wilkinson, 1991). The process of local individuals interacting to address common, locality-based concerns is repeated over time as new issues arise (Kaufman, 1959). As this process is repeated over time, patterns and norms of behavior are developed which help give structure to the community field. The community field structure

strengthens adaptive capacity and agency, allowing individuals to more readily address local concerns in the future (Bridger et al., 2011). Therefore, the more common issues that exist within a locality, the more opportunities there are to engage in collective action and strengthen the community field (Wilkinson, 1991). A common community issue can be anything that affects individuals within a given locality. However, in order to elicit a collective response, the issue must be recognized as a concern across the various social fields. Awareness of common issues among social fields is dependent upon individuals' level of the interaction.

Level of Interaction

From an interactional field theory perspective, social interaction is the foundation of community and collective action (Kaufman, 1959; Wilkinson 1991). Social interaction involves both individuals and social fields. Individuals interact with others through their networks of interpersonal ties (Granovetter, 1973). Social fields interact through individuals within the community field (Wilkinson, 1970). The degree to which individuals interact has a direct effect on the emergence of community and collective action. Social interaction opens up channels of communication for spreading awareness and disseminating information (Kaufman, 1959; Wilkinson, 1970). Communication is essential to discovering the common general needs that face local people. The more social interactions a person has with other people, the more likely they are to be informed and aware of issues that mutually affect one another. The same logic can be applied to social fields, which represents aggregates of people interacting around a distinct interest. Through these social interactions, individuals and social fields can recognize and enhance their collective resources to address common concerns (Wilkinson, 1991; Bridger et al., 2011). Interaction therefore builds the capacity among individuals necessary for collective action.

The degree of interaction present within a given locality can also be affected by the individual characteristics of its residents.

Sociodemographic Characteristics

An individual's sociodemographic characteristics play a role in determining his or her level of interaction. Before joining social fields, exercising agency, and acting collectively, individuals must first be able to interact with one another. Characteristics that increase the individuals' opportunities for interaction are seen as having a positive effect on the emergence of collective action and community (Brennan, 2004b). These characteristics include age, household size, employment status, level of education, and length of residence (Bridger et al., 2011; Theodori, 2005; Wilkinson, 1991).

Water access and usage, common community issues, level of interaction, and sociodemographic characteristics are influential concepts that promote the emergence of collective action and community. When viewed in the context of water scarcity, these concepts ultimately enable individuals to collectively address their water needs through CBNRM.

Chapter 3

METHODOLOGY

A cross-sectional case study was conducted to explore and describe the factors that lead to the emergence of community-based natural resource management (CBNRM) within Lamuria, a rural, water stressed locality in central Kenya. Four research hypotheses were developed to guide the study. Each hypothesis describes the relationship between collective action and the following four concepts: water access and usage, common community issues, levels of interaction amount community members, and sociodemographic characteristics.

Field research took place during the spring and summer of 2011. An initial one-week site visit was made to Laikipia County, Kenya in March 2011. The purpose of the visit was to establish in-country contacts, conduct initial background information interviews, and identify the specific site and population for the research study. The main data collection period took place in-country over the course of four weeks from late May until late July of 2011.

A mixed methods approach was used to collect data with an emphasis placed on qualitative methods. Data collection methods included in-depth interviews, personal observations and field notes by the researcher, and the use of archival data. Mixed methods were used to triangulate participants' responses and strengthen understanding of participant's experiences.

Data analysis was conducted using interpretative phenomenological analysis in order to better understand participants' experiences concerning water and collective action in Lamuria. These experiences were then woven into a larger narrative using the researcher's personal

observations and field notes, along with archival data to convey a more complete understanding of the factors that lead to the emergence of collective action in the context of CBNRM.

A proposal for research involving human participants was submitted to Penn State University's Institutional Review Board (IRB). IRB approval was received on March 23, 2011. The study was deemed to be exempt from further IRB review according to Category 2: research involving the use of *interview procedures* whereby participants were not at risk of being directly identified and the disclosure of responses presented minimal risk to participants. The IRB approval letter can be found in Appendix A.

Research Philosophy and Strategy

As a research philosophy, phenomenology believes that individuals make sense of phenomena by translating their experiences into consciousness (Patton, 2002). Phenomenology seeks to better understand a particular phenomenon or concept through the eyes of those individuals who directly experience it (Hays & Wood, 2011; Laverty, 2003). Phenomenological research is used to convey the specific, subjective experiences of individuals and therefore is not intended for generalization or theory-building (Patton, 2002). The purpose of phenomenological research is to explore and describe, not explain and predict (Sadala & Adorno, 2001).

As a research strategy, phenomenology is characterized by several common attributes. Phenomenological research is often conducted in the form of a case study (Hays & Wood, 2011; Yin, 2009) and uses a variety of data collection methods to tell a complete narrative about a phenomenon or concept (Hays & Wood, 2011; Morse, 1994; Yin, 2009). Phenomenological studies are primarily qualitative in nature; however they can also be quantitative to gain a more thorough understanding of phenomena (Hays & Wood, 2011; Morse, 1994; Patton, 2002).

Phenomenological studies typically employ purposive sampling and involve a smaller number of research participants (Hays & Wood, 2011; Morse, 1994; Patton, 2002).

Research Hypotheses

Four research hypotheses guided this study. Social scientists use hypotheses to help describe and explain the relationship between the dependent and independent variables (Sullivan & Feldman, 1979). The hypotheses were developed from the previously proposed causal relationships of interactional field theory using deductive reasoning (Tashakkori & Teddlie, 1998; Yin, 2009). The hypotheses describe the relationship between four independent concepts and collective action. Due to the exploratory nature of this study, concepts were emphasized over variables. Each concept represents a grouping of variables. By exploring the emergence of collective action and CBNRM through concepts, the findings may provide future studies with a platform from which to study specific variables. The hypotheses are:

H1. An inadequate supply of water within the community increases the likelihood that collective action will occur to ensure that basic water needs are met.
(Beyene, 2009; Sullivan et al., 2003; Wade, 1988)

H2. Individuals who face common needs are more likely initiate collective action to address common needs.
(Brennan, 2006; Bridger et al., 2011; Kaufman, 1959; Luloff & Swanson, 1995; Wilkinson, 1991;)

H3. As levels of interaction increase, so does the likelihood that collective action will occur.
(Brennan, 2006; Bridger et al., 2011; Kaufman, 1959; Wilkinson, 1991)

H4. As household size, employment status, level of education, and length of residence increase, so does community members' participation in collective action.
(Brennan, 2004b; Theodori, 2005; Wilkinson, 1991)

Type of Study

Field research was conducted using the guiding principles of a descriptive case study. A case study is an idiographic examination of an individual, group, or society (Babbie, 1998). Case studies are often used to better understand phenomena (Hays & Wood, 2011; Merriam, 1998; Yin, 2009). Case studies look at complex social units consisting multiple variables that can play a significant role in understanding a particular phenomenon such as CBNRM (Merriam, 1998). Case studies present rich, holistic information about the subject and give context and understanding to theory (Yin, 2009).

The study of community looks at society within the local setting, where people experience the core elements of community on a daily basis (Wilkinson, 1999). Empirical research on collective action is often conducted using a case study approach (Meinzen-Dick et al., 2004) Case studies have consistently been used to study collective action in the context of natural resource management (Abdullaev, Kazbekov, Manthritilake, & Jumaboev; 2010; Beyene, 2009; Brennan et al., 2005; Brunckhorst, 2010; Conroy et al., 2002; Gichuki, 2002; Lauber et al., 2008; Luloff & Swanson, 1995). This case study focused on individuals living within the locality of Lamuria, in Laikipia County, central Kenya. The field research was conducted using a cross-sectional research design, in which simple observation and investigative inquiries were made at one point in time (Schutt, 2009). A cross-sectional research design simplifies the research and analysis process (Meinzen-Dick et al., 2004). Given the exploratory nature of the study and limited resources available for a longer-term study, the research design was deemed appropriate.

Unit of Analysis

Individuals are both the unit of observation and the unit of analysis for this research study. The unit of observation is the level of social life from which the data is collected; the unit of analysis is the level of social life upon which the research is focused (Schutt, 2009).

Individuals are the most popular unit of analysis studied by social scientists (Babbie, 1998).

Individuals also form the basis of interaction within the community field (Kaufman, 1959; Wilkinson, 1991). Phenomenological research relies on gathering rich data from those who have experience with the phenomenon of interest, making individuals a logical unit of observation and analysis (Groenewald, 2004). CBNRM strategies require cooperation among individuals and therefore, studies on collective action regarding natural resource management should focus on the individual (Beyene, 2009; Matta & Alavalapati, 2006; Knox & Meinzen-Dick, 2001).

Site Selection

Lamuria sublocation (referred to herein as Lamuria) was selected as the research site for this case study. Lamuria is located within Laikipia East District, within the larger Laikipia County in central Kenya (Figure 3-1). Lamuria is situated on a plateau just northwest of Mount Kenya within the Ewaso Ng'iro North catchment basin where it receives an average rainfall of 370mm annually (UN WWAP, 2006b). The low rainfall places Lamuria within the arid semi-arid lands (ASAL) of Kenya.

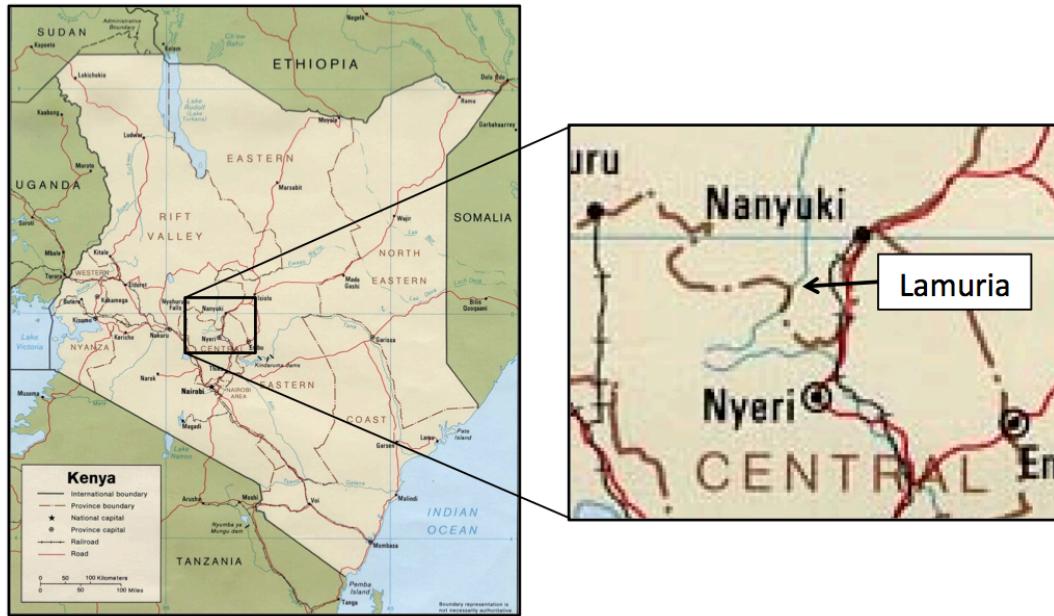


Figure 3-1: General Location Map of Lamuria

Lamuria was selected as the case study site for several reasons including the restructuring of Kenya's national water policies, limited water resources in Kenya's ASAL region, the predominant number of individuals relying on common water resources, the presence of water resource user associations, and the existence of a pre-established network of local contacts.

The 2002 Water Act transformed Kenya's water sector by reforming the government bodies, national water policies, and overall approach to water management (GOK, 2002). The Ministry of Water and Irrigation (MOWI) was created along with a hierarchy of agencies to monitor water resource quality and quantity, issue water and irrigation permits, and fund water projects at the local level (GOK, 2002). The most significant change was the MOWI's effort to decentralize water management to the catchment and sub-catchment levels. The new policies within the 2002 Water Act provided a mechanism for local users to direct development and manage their water resources. Local water management was transferred to water resource user

associations (WRUAs) (GOK, 2002). The ability of local users to manage their water resources is particularly important in the catchment and sub-catchment water basins of Kenya's ASAL.

The water resources in the ASAL of Kenya are limited and highly variable (UN WWAP, 2006b). Major drought periods occur in the region approximately every ten years with the previous drought occurring from 1998-2000 (UNWWAP, 2006b). It is believed that the failure of the short rains in 2009-2010 signaled the return of the cyclical drought period (Oluoko-Odingo, 2011). Collecting data in summer 2011, the ASAL provided an opportunity to study individuals as they sought to address returning water scarcity concerns through local management.

Individuals living within the ASAL rely primarily on rain fed agriculture and raising pastoral livestock (KARI, 2007; UN WWAP, 2006b). In times of low rain or drought, agro-pastoral populations of the ASAL rely more and more on common water resources including surface and ground water (KARI, 2007). The population of Laikipia County falls within the Upper Ewaso Ng'iro North river basin (Gichuki, 2002; UNWWAP, 2006b). Individuals within the basin rely heavily upon its streams and underground water sources to sustain their livelihoods (see *Laikipia East – rural* and *Lamuria Sublocation* in Table 3-1).

Total Number and Percentage of Households by Main Source of Water			
<i>Main Source of Water</i>	<i>Laikipia East - Urban</i>	<i>Laikipia East - Rural</i>	<i>Lamuria Sublocation</i>
Pond/dam	0.2%	1.3%	0.1%
Lake	0.0%	0.0%	0.0%
Stream	8.5%	44.9%	40.2%
Spring/well/borehole	3.2%	25.1%	46.7%
Piped into dwelling	24.4%	7.3%	2.3%
Piped	57.2%	17.7%	5.1%
Rain/harvested	0.4%	1.2%	0.7%
Water vendor	6.0%	2.4%	4.8%
Other	0.1%	0.0%	0.0%
Total Number	14160	26516	4105

Source: Kenya Open Data Project, 2011b

Table 3-1: Percentage of Households by Main Source of Water

The surface water and ground water within the Ewaso Ng’iro North river basin represent common resources that are prone to degradation, depletion, and conflict from water users (Gichuki, 2002; KARI, 2007). The need to mitigate these challenges through improved water management practices would appear to be a common, locally felt need. A visit was made to Laikipia East in March 2011 to further investigate the presence of water user groups (specifically WRUAs) working to address local water concerns. Two specific WRUAs were identified as working within the locality of Lamuria, managing two small tributaries of the Ewaso Ng’iro North river.

The early trip in March was made possible through an existing network of local contacts within central Kenya. Two faculty members within Penn State’s College of Agricultural Sciences had on-going projects in the country for several years prior to and including 2011. There existed a strong partnership between the two Penn State faculty members and the director of youth center in Nyeri, Kenya. Nyeri, located approximately 30 minutes south of Laikipia County, was deemed to be an ideal place from which to investigate the environment, water resources, and population in the Laikipia region.

Ultimately, Lamuria was identified as the research site for this case study. It is a rural, agriculturally based locality whose population relies heavily upon natural precipitation, local streams, and ground water. A ten year cyclical drought was beginning to return, placing further pressure on Lamuria’s water resources. Based on the existence of WRUAs in the area, water resources appeared to represent a general need that was felt by the local people. Therefore, the locality of Lamuria was selected to further explore the concept of collective action.

Population

Population & Area Data - County, District, & Sublocation			
	<i>Laikipia County</i>	<i>Laikipia East District</i>	<i>Lamuria Sublocation</i>
Total Population	398,992	142,034	12,214
% Male	49.8 %	50.4 %	51.6 %
% Female	50.2 %	49.6 %	48.4 %
Total Area	8,312 km ²	2,970.4 km ²	440.9 km ²
Population Density	48.0/km ²	47.8/km ²	27.7/km ²

Source: Kenya Open Data Project, 2011c; Kenya Open Data Project 2011g

Table 3-2: Population Figures From Laikipia, Laikipia East, and Lamuria Sublocation

The population of Lamuria consists of 12, 214 individuals with a relatively even composition of male (51.6%) and female (48.4%) residents. The distribution of male and female residents is similar at the county, district, and sublocation levels (Table 3-2).

Laikipia East Population - Rural vs. Urban			
	<i>Total Population</i>	<i>Area</i>	<i>Population Density</i>
Rural	95,343	2,846.8 km ²	33.5/km ²
Urban	46,691	123.6 km ²	377.7/km ²
Total	142,034	2,970.4 km ²	47.8/km ²

Source: Kenya Open Data Project, 2011g

Table 3-3: Laikipia East Population - Rural vs. Urban Population

Laikipia East is predominantly a rural district with a majority of the population living in rural areas (67.1%) as compared to urban areas (32.9%) (Table 3-3). The district's average population density (47.8/km²) is misleading. Urban populations occupy a significantly smaller area of land and as a result have more than ten times the population density of rural areas, 377.7/km² as compared to 33.5/km².

Laikipia East Employment (age 5 and over) - Rural vs. Urban		
	<i>Rural</i>	<i>Urban</i>
Employed	35,957	20,046
Seeking Work/No Work Available	6,199	2,126

Economically Inactive	36,941	16,004
Employment Status Unclassified	3,275	1,405
Total	82,372	39,581

Source: Kenya Open Data Project, 2011b

Table 3-4: Laikipia East Employment (age 5 and over) - Urban vs. Rural

Employment within Laikipia East also reflects the more rural nature of the area (Table 3-4). Significantly more residents are employed in rural areas than urban areas. However, the number of inactive individuals and those looking for work is significantly greater in rural areas. Poverty rates at the county level are estimated at 48.1% (Kenya Open Data Project, 2011a) Employment in Laikipia is predominantly based in agriculture with 85.5% of all households engaged in crop farming (Gichuki, 2002; KARI, 2007; Kenya Open Data Project, 2011f). For individuals working outside of agricultural, employment includes manufacturing (11.8%), wholesale, retail, and trade (54.3%), financial insurance services (3.3%), electricity, gas, and water (9.2%), and community and social services (21.3%) (Kenya Open Data Project (2011e).

Sampling

Purposive, non-probability, sampling procedures were used for this case study. Non-probability sampling is often used when studying one specific location with a small sample size, such as with case studies (Schutt, 2009). Meinzen-Dick et al. (2004) note that achieving a large sample size through qualitative data collection methods requires considerably more time and money than an equivalent sample size achieved through quantitative methods. As a result, qualitative studies typically involve smaller sample sizes. This case study included a sample size of 17 (3 key informants, and 14 general community participants). This sample size is within the range of 6-25 participants for phenomenological research suggested by Morse (1994) and Patton (2002). Given the small sample size, collecting data from unrepresentative sources was a

significant threat to validity in this research study. In order to address the threat to data validity, purposive sampling criteria was used to select both key informants and general community participants (Meinzen-Dick et al., 2004).

Three key informants were purposively selected based on their leadership positions within two water resource user associations (WRUAs) (2 participants) and the regional water services board of the Ministry of Water and Irrigation (1 participant). Purposive sampling criteria were also used to target general residents in Lamuria. An extensive effort was made to incorporate participants using the criteria of gender, occupation, and geographic location within Lamuria. These criteria reflect the sociodemographic and employment characteristics of the population as described in the previous section. Purposive sampling was achieved by working closely with institutional partners in Nyeri, Kenya, as well as a local resident guide in Lamuria.

Data Collection

Data collection for the research study followed a mixed methods approach with an emphasis on qualitative methods, as guided by the phenomenological research philosophy. The mixed methods approach is a research strategy that uses both quantitative and qualitative data to investigate a research topic (Creswell, 2009; Tashakkori & Teddlie, 1998). Phenomenology relies on collecting rich, descriptive data to tell a larger narrative about how individuals' experience a particular phenomenon. Phenomenology primarily uses qualitative methods to explore and describe participants' experiences. Phenomenological data collection methods include semi-structured and unstructured interviews, personal observations and experiences of the researcher, and archival data use to triangulate data collection (Bergum, 1991; van Manen, 1990).

Interviews help researchers to better understand participants' thoughts, feelings, and experiences (Wolcott, 1995). Interviewing provides insight into individuals' perceived

explanations of events (Yin, 2009). A thorough understanding is necessary to accurately describe community life and the mutual identity shared by community members (Wilkinson, 1970).

Interviews were conducted through the use of a semi-structured interview instrument containing both qualitative and quantitative measures. Interviews were conducted with general community members as well as key-informants (subject matter experts). Interviewing is a qualitative research method that has consistently been used in collective action and community-based natural resource management studies (Brennan, 2005; Brennan, Luloff, & Finley, 2005; Beyene, 2009; Matta & Alavalapati, 2006; Meinzen-Dick et al., 2004).

The procedure for conducting interviews went as follows. 1) Individuals identified as potential research participants were approached asked if they would participate in an interview. 2) Upon initial agreement to participate, the implied informed consent statement was read to the participant in their native language through aid of translation. This statement advised participants of the purpose of the research and their right to decline participation at any time. This statement can be found in Appendix B. A copy of the statement was then given to the participant to keep for their records. 3) A semi-structured interview script was used to guide the conversation with participants. Some participants had little to no English language skills; in these cases, translators aided in delivering questions and conveying participants' responses to the researcher. 4) The researcher wrote down brief notes during the interview while listening to participants' responses in order to maintain a more conversational nature. 5) Immediately following the interview, the researcher went back and filled in detailed notes about participants' responses as well as post-interview thoughts about the participant and their responses.

Qualitative and quantitative data were also collected through the use of direct observations and secondary data. Direct observations provide real time, contextual information about the case's environment, people, and social behavior (Yin, 2009). Direct observations include descriptive and reflective notes (Creswell, 2009). Direct observations by the researcher

were recorded by taking extensive field notes throughout the site visits and research period. Secondary data was used to complement the primary data collection instrument and direct observations. Secondary data sources included documents received in the field, government archival data, and historical data including census and water resource information. Direct observation and secondary data aid the researcher in understanding the complete story of individuals' experiences (Schutt, 2009). Direct observations and the use of secondary data has been proven effective in eliciting information on collective action and sociodemographic characteristics in previous natural resource management research (Meinzen-Dick, Raju, Gulati, 2002).

Case studies benefit from the use of mixed methods and multiple sources of data (Creswell, 2009; Tashakkori & Teddlie, 1998; Yin, 2009). Mixed method case studies often employ the use of *triangulation* (Greene, Caracelli, & Graham, 1989). Triangulation is the practice of using multiple sources of data to confirm the research conclusions (Brewer & Hunter, 1989; Tashakkori & Teddlie, 1998; Merriam, 1998; Yin, 2009). Triangulation aids in qualitative analysis by building a coherent justification for reported themes (Creswell, 2009). Triangulation allows for a broader investigation of a phenomenon from multiple sources of information. The purpose of using triangulation is to gain a more holistic and balanced understanding of the community. It can also help place individual responses within the larger context of the community's social experience (Brewer & Hunter, 1989). Direct observations and secondary data were used to verify interviewees' responses. Interviews are often subject to bias, poor recall, and inaccurate articulation (Yin, 2009). Triangulation helps to address the weaknesses of interviewing by utilizing the strengths of direct observation and secondary data (Yin, 2009).

Interview Instrument Development

A semi-structured, interview instrument was developed using the guiding principles of the Tailored Design Method (TDM) (Dillman, Smyth, & Christian, 2009). The instrument consisted of 24 open-ended questions. Lead and follow up questions were developed for each of the four research concepts along with two additional questions concerning additional comments and references. Open-ended questions allow researchers to record in-depth, detail rich information from research participants (Babbie, 1998; Merriam, 1998; Schutt, 2009). Using the TDM as a guide, questions were designed to be relevant to the population, accurately based on existing literature, single topic in nature and worded using simple, easy to understand language (Dillman et al., 2009). Simple wording was particularly important because of the language barrier. While a majority of the key informants and subject matter experts had a strong command of the English language, most of the general respondents did not. Translation into Kiswahili and the local dialect Kikuyu was therefore required for many of the general participant interviews. In order to ensure the ease and accuracy of translation, questions were kept simple and brief. Interviews were semi-structured in nature.

A semi-structured instrument guided the interview process. This interview instrument can be found in Appendix C. The semi-structured instrument allowed questions to be asked in a more flexible, conversational manner. By conducting interviews in a more natural way, participants are more comfortable in sharing their thoughts, opinions, and experiences (Merriam, 1998). The order of questions was able to be change based on the direction of the conversation. The semi-structured nature allowed for a deeper investigation of some topics over others based on the particular relevance to each respondent. Open-ended questions and semi-structured protocols are particularly useful when exploring concepts that may be defined differently by participants (Merriam, 1998). The flexibility provided by this research method allows participants to describe

concepts from their own individual perspective (Merriam, 1998). Responses were recorded throughout the interview using shorthand notes. At the conclusion of the interview, more detailed notes were filled in along with general reactions from the interviewer.

A panel of experts reviewed the interview instrument to ensure content and face validity prior to data collection. The panel included Dr. Mark Brennan (Penn State University) whose expertise lies in collective action, community development, natural resource management, and field research; Dr. Rama Radhakrishna (Penn State University) whose expertise lies in research methods and field research in developing countries; and lastly, Paul Maina (Director of the Children, Youth Empowerment Centre) whose expertise lies in his experience as a native Kenyan and his familiarity with issues in central Kenyan communities.

Operationalization of Concepts, Variables, and Indicators

While this exploratory study emphasizes relationships at the concept level, further operationalization is needed to identify research indicators for data collection. Abstract concepts by their nature are not capable of being observed directly (Sullivan & Feldman, 1979). In order to test the relationships between each independent concept and the dependent concept, as postulated by the research hypotheses, measurable variables must be established. These “empirically grounded characteristics” of the concepts are called indicators (Sullivan & Feldman, 1979, p. 9). Indicators allow researchers to determine the presence or absence of concepts (Babbie, 1998). The following explains the operationalization from concept to variable to measurement indicator, which takes the form of a question within the interview instrument (see Table 3-5).

Dependent Concept

Collective Action

Collective action involves local people from across social fields that voluntarily take action to address place-relevant matters (Luloff & Bridger, 2003; Meinzen-Dick et al., 2004; Theodori, 2005; Wilkinson, 1991). With collective action as the dependent concept, this case study seeks to explore the independent concepts and variables that play a role in the emergence of collective action in the form of community-based natural resource management (CBNRM).

Due to the pressures of climate change, land use practices, and population movements, individuals living within Laikipia County and Kenya at large, must contend with diminishing water resources. Increased water scarcity has had significant impacts on the livelihoods and quality of life in agro-pastoral communities of the region (Beyene, 2009; Gichuki, 2002; Oluoko-Odingo, 2011). Community-based natural resource management, as a form of collective action, has been shown to be an increasingly popular response by communities concerned with the use and conservation of water and other natural resources (Abdullaev et al., 2011; Armitage, 2005; Beyene, 2009; Brennan, Bridger, & Luloff, 2005; Lauber et al., 2008; Matta & Alavalapati, 2006; Meinzen-Dick et al., 2002; Theodori, 2005).

Independent Concepts:

A significant number of independent variables were included in the study to better understand local individuals' thoughts, feelings, and experiences regarding collective action in Lamuria. Based on the literature, four main concepts were identified as contributing to the emergence of collective action. These concepts include water access and usage, common community issues, level of interaction, and sociodemographic characteristics. Each concept is

broken down into variables, which are measured by specific indicators (questions) within the interview script.

Concept: Water Access and Usage

Variables: access; reliability; quality; quantity; use; and cost

These variables are directly related to sources of water scarcity cited within the literature. Water scarcity can be shaped by social (access and use), environmental (reliability, quality, and quantity), and economic (cost) factors (IWMI, 2007; Stikker, 1998; UN Water, 2007). These variables have also been used consistently as measurements for various indices and equations to calculate water stress/scarcity including the water stress index, criticality ratio, IWMI measurement, and water poverty index (Garriga & Foguet, 2011; Gleick, 1996; Sullivan et al., 2003; White, 2012). Populations that cannot access safe sources of water face significant challenges including increased poverty, food insecurity, malnutrition, water-related disease, loss of livelihoods that depend on water such as agriculture, and the inability to fulfill their basic water requirements (i.e. drinking, cooking, and hygiene) (FAO & IFAD, 2008; IWMI, 2007, Gleick, 1996; Oluoko-Odingo, 2011; Stikker, 1998; Sullivan et al., 2003; UN Water, 2007; UN WWAP, 2006a). Affordable and reliable access to a quality water supply is needed not only to ensure basic physiological needs but also to sustain livelihoods that depend on water.

Measurement Indicators:

Do you have access to water at home or do you have to retrieve it?

How often are you able to access water?

Do you feel the water is safe to use for drinking, cooking, cleaning?

What do you use most of your water for: inside the home (drinking, cooking, cleaning); outside the home (farming and livestock)?

Are you able to receive enough water for your daily needs?

How much does it cost to receive or retrieve your water?

Variable: *past water projects*

A one-time, cross-sectional case study has the potential to neglect previous examples of collective action within the locality (Meinzen-Dick et al., 2004). Collective action occurs in stages at both the macro (formal community organizations) and micro (small informal groups) levels over time (Kaufman, 1959; Wilkinson, 1991). Data collection may fall within a period of low-activity (Kaufman, 1959; Meinzen-Dick et al., 2004). Therefore, to help extend the temporal reach of the this one-time case study, the variable *past water projects* was included. The timeframe, as indicated in the question below, was set up to 10 years in the past.

Measurement Indicator:

In the past 10 years, have there been any community-based projects to improve the local water supply?

Concept: Common Community Issues

Variable: *community issues*

Common, general needs are the basis for uniting diverse groups of people within the community field to undertake collective action (Brennan et al., 2005; Bridger et al., 2011; Wilkinson, 1991). Issues related to water scarcity likely to be felt throughout the population because water is a resource upon which all people rely (Gleick, 1996). Collective action however is not limited to water or natural resource management concerns; other local concerns can initiate a collective action response (Bridger et al., 2011; Theodori, 2005; Meinzen-Dick et al., 2004). Matta and Alavalapati (2006) concluded in their study on joint forest management that community members' held divergent opinions on the greatest issues facing the community. Specifically, developmental issues such as roads, health, and employment were viewed as equally important issues as compared to drought and water scarcity. Understanding the different

perceptions of issues facing the community is key to forming an understanding of collective action efforts (Songorwa, 1999; Conroy, Mishra, & Rai, 2002).

Measurement Indicator:

What are the three greatest issues in general, facing your community?

Variable: community voice concerning issues

Community voice refers to the ability of local people to exercise community agency by voicing their concerns over local issues. Specifically it allows local people to enhance the resources necessary to take action in addressing their local concerns (Brennan & Luloff, 2007; Luloff & Bridger, 2003; Theodori, 2005;). When local people do not possess the necessary resources to take action, they may decide to form linkages with extra-local actors to acquire these resources. Voicing their desire to take local action is important as community agency represents not only the ability, but also the will to act.

Measurement Indicator:

Do you feel community members' voices are heard regarding those issues?

Variable: past efforts to address community issues

One-time, cross-sectional case studies are at risk of omitting past or periodical occurrences of collective action within the community (Meinzen-Dick et al., 2004). Based on the similar logic presented for *past water projects*, this variable was added to extend the reach of the study. Previous examples of action to address other, non-water issues can help explore how and why local people act in response to locally-based concerns. The timeframe of the measurement indicator is up to 10 years in the past.

Measurement Indicator:

In the past 10 years, have there been any community-based efforts made to address or solve these issues?

Concept: Level of Interaction

Variables: types of events; event locations; event organizers; awareness of events; frequency of event participation; frequency of individual interaction; types of community groups; trust in community groups; participation in community groups; role in community group; and reasons for participation in community groups.

Useful measures of the concept of community include the “frequency, interconnection, and other characteristics of community actions” (Wilkinson, 1991, p. 34). This study uses several variables pertaining to individuals’ participation in community groups and events measure their level interaction. Participation in the locality can range from assuming a major role in policy-making to no more than identification with the locality from “residence and sustenance” activities (Kaufman, 1959, p. 11). Interaction among members increases through participation in community events and organizations (Brennan, 2004b). Increased exposure to others (i.e. interaction) within the community, allows individual members to become aware of shared interests and common needs (Brennan, 2005; Kaufman, 1959; Wilkinson, 1991). Interaction forms the basis of social fields, which are organized around mutual interests and often take the form of informal and formal associations, institutions, groups, and events (Kaufman, 1959; Theodori, 2005; Wilkinson, 1970). Social fields, groups, and opportunities for interaction can occur around cultural, educational, religious, recreational, and local government interests (Bridger et al., 2011; Kaufman, 1959; Theodori, 2005; Wilkinson, 1972). Interaction also builds the capacity to act collectively by enhancing community agency among local people (Brennan & Luloff, 2007).

Measurement Indicators:

What kinds of cultural, religious, recreational, and educational events take place in the community?

How often do you participate in such events?

How often do you get to see other community members?

Do you participate in any community organizations or groups?

What kinds of other community groups exist in the community?

In your opinion, can you depend on these groups to address local issues?

What is the most important reason for your participation?

Concept: Sociodemographic Characteristics

Variables: occupation; level of education; household size; and length of residency

Sociodemographic characteristics including occupation, level of education, household size, and lengthy of residency have been consistently used in community and natural resource management research (Araral Jr, 2009; Beyene, 2009; Brennan, 2005; Brennan et al., 2005; Lauber et al., 2008; Matta & Alavalapati, 2006). From an interactional approach, sociodemographic characteristics often appear as independent variables (Kaufman, 1959).

Measurement Indicators:

What would you say is your main job or profession?

How long have you been in this profession?

How far did you go in school?

Who lives with you in your household (number of adults and children)?

How long have you lived here in the local area?

Concept	Variables	Question(s)
Level of Interaction	Opening Question - General Community	1.A
	Types of Events	1.B
	Frequency of Event Participation	1.C
	Frequency of Individual Interaction	2.A
	Participation in Community Groups	3.A
	Types of Community Groups	3.B
	Trust in Community Groups	3.C
	Reason for Participation	3.D
Common Community Issues	Community Issues	4.A
	Community Voice Concerning Issues	4.B
	Past Efforts to Address Issues	4.C-D
Water Access & Usage	Access	5.A
	Reliability	5.B
	Quality	5.C
	Usage	6.A
	Quantity	6.B
	Cost	6.C
	Past Water Projects	7.A-C
Other Comments About the Participants		8.A
Recommendations for Additional Interview Participants		9.A
Sociodemographic Characteristics	Employment Status	10.A-B.
	Level of Education	11.A
	Household Size	12.A
	Length of Residency	12.B

Table 3-5: Concept-Variable Instrument Index

Validity, Generalizability, and Reliability

Construct validity, internal validity, external validity, and reliability are four criteria that are commonly used to evaluate the rigor of empirically based, social science research (Creswell, 2009; Merriam, 1998; Yin, 2009). These criteria have implications for the accurate measurement of variables, determining causal relationships among variables, generalizing the findings to larger populations, and replicating the research study (Creswell, 2009; Merriam, 1998; Schutt, 2009; Yin, 2009).

To ensure construct validity, the research concepts were investigated using established measures of the individual variables. Variables and indicators were operationally developed and linked to previous research studies on water management and community (see *Operationalizing Concepts, Variables, and Indicators*).

Internal validity has fewer implications for this exploratory case study because it does not seek to infer causality among concepts, such as in explanatory research (Yin, 2009). The causal links among the four research concepts and collective action have been previously proposed in the literature based on interactional field theory. As such, this case study does not seek to establish new causal links. Instead, it seeks to explore previously proposed links through the use of empirical field research. However, validity of data collection was addressed by triangulating the data through multiple data sources and collection methods (Merriam, 1998; Yin, 2009).

External validity is the ability of the findings to be generalized to a larger population (Babbie, 1998; Schutt, 2009). As a case study, the findings are more generalizable to theory than to a population (Yin, 2009). As Yin (2009) states the goal of a case study is “to expand and generalize theories (analytical generalization) and not to enumerate frequencies (statistical generalization)” (p. 15). The findings of this research study build upon the existing theoretical propositions (research hypotheses) found within the community and interactional theory literature.

The use of non-random sampling and small sample size restrict the ability to generalize the findings to a larger population. Purposive sampling was used to select potential respondents that reflected the sociodemographic characteristics of the Lamuria Sublocation. However, the lack of a statistically representative sample prohibits the generalization of findings beyond that of the individual interview respondents.

In order to maximize reliability, the interview instrument was field tested in May 2011, prior to the main research period in July 2011. Responses to several core questions were

compared among May and July respondents. Both sets of responses were of a similar nature, indicating the interview instrument's reliability. (Cresswell, 2009; Yin, 2009).

Data Analysis

Interpretative phenomenological analysis (IPA) was used to interpret the data and report the findings in Chapter 4. IPA is the systematic use of interpretation to understand and describe phenomena through the experiences of individuals (Crist & Tanner, 2003). Interpretation is the effort made by individuals to construct meaning from life experiences and translate that meaning into consciousness (Laverty, 2003). Interpretation stems from a person's thoughts, feelings, beliefs, and values (Hays & Wood, 2011; Laverty, 2003). IPA is based on the belief that scientific observation is inherently based on interpretation at both the researcher and participant level (Gallagher & Sørensen, 2006). Participants use interpretation to translate their experiences with phenomena into conscious thought that can be shared with others. The researcher records participants' thoughts through the use of in-depth interviews. The researcher then uses interpretation to analyze participants' responses and develop conclusions about how participants experience a particular phenomenon.

IPA is used to construct a more holistic narrative about a phenomenon by aggregating individual participant experiences with other forms of data including imagery, archival data, field notes, and personal observations made by the researcher (Hays & Wood, 2011; Laverty, 2003; Patton, 2002). Four key steps are used to perform the IPA: 1) bracketing; 2) horizontalization; 3) textual description; and 4) structuring. For this research study, the four steps were performed for each of the four research concepts.

Bracketing

Bracketing is the practice by which the researcher identifies and sets aside their personal views or preconceptions towards the phenomenon. The researcher brackets their existing understanding and theoretical conceptualizations in order to view the phenomenon from the unique perspective of the individual participant (Groenewald, 2004; Hays & Wood, 2011; Moustakas, 1994). Bracketing helps prevent the researcher from inappropriately inserting their subjective judgments during the remaining steps in the IPA (Hays & Wood, 2011). Bracketing means the researcher must assume that they do not know anything about the phenomenon about which they are inquiring (LeVasseur, 2003).

Horizontalization

Horizontalization involves separating out all non-similar and non-overlapping responses relevant to the phenomenon (Groenewald, 2004; Hays & Wood, 2011). Clearly redundant statements are eliminated until the researcher is left with distinct “units of meaning” or statements that describe participants’ experience with the phenomenon (Groenewald, 2004, p. 19). Horizontalization was performed for each of the participant interviews.

Textual Description

Textual description involves clustering participants’ responses into themes within each of the research concepts. Themes emerge based on the grouping of similar units of meaning previously identified during horizontalization (Moustakas, 1994). Similar responses among participants represent shared experiences of the phenomenon (Hays & Wood, 2011). As researchers work through the data, they not only look for shared experiences, but also unique

experiences of the phenomenon. Referred to as imaginative variation, the goal of this method is to consider the phenomenon from several different perspectives (Moustakas, 1994). The cluster themes and unique responses represent the breadth and depth of participants' experience with the phenomenon (Hays & Wood, 2011).

Structuring

Structuring arranges the clustered themes and unique responses into a structure that represents the larger narrative surrounding the phenomenon (Moustakas, 1994). This structure can take the form of a visual model or listing (Hays & Wood, 2011). Collectively, the emergent themes, both clustered and unique, represent the essence of how participants experience the phenomenon (Starks & Trinidad, 2007). After structuring the participants' responses, the researcher then enhances the larger narrative with additional sources of information pertaining to the phenomenon. These sources include archival data, the researcher's observations and field notes, and imagery where relevant.

Lastly, a composite summary is written in order to translate participant's everyday language into the appropriate terminology that characterizes the scientific literature (Sadala & Adorno, 2001). The composite summary demonstrates how the research concepts are represented in the lives of individuals who experience the phenomenon of collective action.

Limitations of the Study

Conducting field research brings with it certain challenges that can arise unexpectedly. One such challenge to this study was the breakdown in communication with an in-country contact. The research initially intended to involved members of local WRUAs in Lamuria. The

researcher coordinated with a representative from one of the WRUAs to interview several of the group's members. However, shortly before the primary research period began, the researcher lost contact with the representative and did not hear back until one week later. Upon reconnecting, the representative expressed that it would take an additional two weeks to arrange interviews with the other WRUA members. This made it unfeasible to interview a significant portion of the intended population. In response, the researcher made the decision in the field to focus primarily on general participants living within Lamuria instead of WRUA members.

During the interview process, audio was not recorded and therefore no audio transcripts were used during data analysis to interpret the findings. Initial reactions from participants lead the researcher to believe that the practice of conducting research was foreign to these individuals. The presence of the researcher in Lamuria was a curiosity to local residents and as such the participants were already in a heightened state of awareness. The researcher did not want to add any undue discomfort to the situation by audio recording the participants' responses. Therefore, the researcher decided in the field to avoid audio recording in an effort to maintain the informal conversational nature of the interviews.

The use of translators in the field was a necessary component of this research study. While many of the participants had decent English speaking skills, others spoke little to no English. Two translators accompanied the researcher, a primary translator (Alex) and a local guide/translator (Paul), both of whom spoke English, Kiswahili, and Kikuyu (the local tribal dialect). The use of translators had the potential to invite bias into participants' responses. The researcher made a concerted effort to express the goals of the research and the need to collect honest accounts from participants. The researcher briefed both translators on the interview script and protocol. However, the researcher also acknowledges the potential for bias in this research study from incompatible English-Kiswahili/Kikuyu translations and personal bias from the translators.

Lastly, it should be stressed that this research study was exploratory in nature. The purpose was to explore and describe, not to explain or predict. The small sample size of 17 individuals involved in this study is characteristic of a descriptive case study, particularly from a phenomenological approach. As such, the findings can only be applied directly to those individuals that participated in the research study. All conclusions, implications, and recommendations should be understood in this localized context.

Chapter 4

FINDINGS

The findings from the research study are presented using the steps and methods defined by an interpretative phenomenological analysis (IPA) strategy. This process of analyzing and reporting the data is defined by four key steps 1) bracketing; 2) horizontalization; 3) textual description; and 4) structuring and composite summary. These steps provide the format for reporting the research findings in this chapter.

Bracketing

In order to review the data and report the findings in an impartial and unbiased manner, the researcher must first identify the assumptions and preconceptions that they hold regarding the research concepts and research participants. My personal background and the environment in which I live are considerably different than those individuals living in Lamuria. I have grown up in eastern and central Pennsylvania with a constant in-home access to water that is safe to drink. Where I live, water resources are not scarce nor have I experienced severe drought. Where I live, private and public utility companies manage the water resources in residential areas. However, many residents also rely on private wells to retrieve their water. I do not rely on farming or raising livestock to sustain a livelihood. I work at the Pennsylvania State University as a graduate assistant and earn a livable wage that allows me to fulfill all of my basic daily needs. I am not married, nor do I have any children to support in my household. I am generally unaffected by any serious issues within my community. I participate in different events and groups than exist in

Lamuria, though similar activities such as church and football (soccer) also take place in my hometown and around Pennsylvania.

Over the course of the research period, I spent a total of seven weeks living primarily in Nyeri, Kenya. Nyeri is the major city located approximately forty-five minutes south of Lamuria. During my time in Kenya, I lived and worked with the Children and Youth Empowerment Centre (CYEC) in Nyeri. The CYEC is a place for former street youth and children whose homes may not be suitable to live in. The children live at the CYEC, go to local primary and secondary schools, and receive training in a variety of vocational skills. During this time in Kenya, I became acclimated with the living conditions and daily life of Kenyans in the urban center of Nairobi, large cities including Nyeri and Nanyuki, the smaller mountain town of Chogoria, as well as the small village of Lamuria. As a result, I sought to conduct research with an open mind by listening to participants as they conveyed their personal experiences in Lamuria.

Horizontalization

Each participant interview was thoroughly examined for non-overlapping responses. Identical responses were only reported once during this step. The purpose of horizontalization is to examine all perspectives surrounding a given concept or phenomenon. Non-similar responses from all of the interview participants were extracted for each research concept.

Under the research concept, levels of interaction, research participants were asked to identify events that take place within the community as well as groups that exist within the community. The responses are reported in Tables **4-1**.

Venues for interaction in the community	Groups in the community
Church	Welfare groups
Catholic Church	WRUA (water resource user association)
Gospel Celebration Center	Growers' Association
Full Gospel Church	Self-help group for disabled people
Independent Church	School's harambee
SPK Church	Women's groups
Baptist Church	Bird shooting club
Football	Merry-go-round groups
Youth sports	Lending group
Volleyball	Village elders
Nursery schools	Self-help group for illness and funerals
Primary schools	Football teams
Secondary schools	Beekeeping group
Funerals	Self-help group for shopkeepers and market vendors
Meetings about how the village can develop in general	Self-help group for skilled trades
Pool hall	Youth group
Weddings	Transport group
	Rabbit keeping group
	Beekeeping cooperative

Table 4-1: Horizontalization - Levels of Interaction: Events and Groups

Participants who mentioned that they were part of a group in the community were then asked to specify the reasons why they participate. Their responses are reported in Table 4-2.

Why do you participate in these groups?
WRUA because I can use water freely without WARMA (Water Resource Management Authority)
WRUA because it will ensure water for everyone
Growers' Association because they help us farmers export our products to markets in the big cities
Beekeeping cooperative makes it easier to find markets, funds, and resources
Self-help for disabled people because they can call on the government for help and support
Rabbit keeping group to find markets and be supported
Self-help funeral group helps when someone dies by using the money raised from group member fees (250Ksh per person; 80 members)
Youth group helps to contribute to people in need by using the money raised from 72 members paying 300Ksh per person each month.
Transport group helps with repairs, accidents, and trouble with the law
Self-help group for illness; 200 Ksh from each member when someone dies
Pioneer rabbit keeping group has 30 members and uses MPESA as a bank to give out loans to members from a total of 10,000 Ksh in funds
Merry-go-round groups because they enable members to purchase more things
Lending group because they provide lower loan rates than the bank

Table 4-2: Horizontalization - Levels of Interaction: Reasons for Participation

The research participants were also asked about how frequently they participated in the different events and groups that they mentioned. They were also asked how often they interacted with other members in the community. The non-overlapping responses are reported in Table 4-3.

How often do you participate in these community events?
Once a week
Three times a week
How often do you see other members of the community?
Once a week
Couple of times a week
Almost daily
How often do you participate in these community groups?
Once a week
As needed
Once a month

Table 4-3: Horizontalization - Levels of Interaction: Frequency of Participation and Interaction

Next, the research participants were asked to identify the three greatest issues in general facing their community, in no particular order. A few participants only listed one or two issues, while many others went on to list more than three. The issues raised are presented in Table 4-4.

What are the three greatest issues in general facing your community?	
Not enough water	Education
Drought	Secondary education for young people
Degradation of riparian areas	Corruption
Overgrazing	Unemployment
Not enough food/hunger	Improper sanitation
Power supply being rationed	Land is sub-divided into plots that are too small to be profitable
Government taking back the land because I do not own it	Poor roads to bring goods to market
Not able to sell enough trees to make up for the cost of materials	Infrastructure
Other jobs for young people than farming	Cost of living keeps rising

Table 4-4: Horizontalization - Common Issues Facing the Community: Greatest Issues

After identifying the greatest issues facing their community, participants were asked whether or not there had been any community-based efforts in the past ten years to address the issues they mentioned. Only a few participants were able to cite specific examples; these are presented in Table 4-5.

Have there been any community-based efforts to address these issues?
Farming groups to share information about crops and animals and markets to sell at
Beekeeping groups to find best ways to make honey and ways to make money
A group has a water dam that is under construction
Gatarakwa water project
Catholic Church - Father Romano's water project
School harambee to raise money for a student to go to secondary school
Village elders meet with each other to spread awareness in the community and consult with those in other villages

Table 4-5: Horizontalization - Common Issues Facing the Community: Community Efforts

In addition to asking about community-based efforts, participants were also asked whether or not they felt that community members' voices were being heard regarding these issues. Again, only a few participants were able to provide specific examples; these are reported in Table 4-6.

Are community members' voices being heard regarding these issues?
WRUA members are being sensitized about issues in Nanyuki
People feel like the government is snatching water from them
The government is not listening
No, the people have to build projects on their own
The government tries to help with schooling but they only have two award spots so many youth do not get it

Table 4-6: Horizontalization - Common Issues Facing the Community: Community Voice

Participants were then asked a series of questions regarding their access to water and how they use that water. Participants were first asked about the sources and methods used to get water. The responses are presented in Table 4-7.

Do you have access to water at home or do you have to retrieve it?
Access water from river using a petrol pump
Walk cattle to river to drink
Borehole well on property
In-home tap (1/2 inch pipe) from Gatarakwa water project
Harvest rainwater in tanks
Fill cans with water from river and travels by car
Fill water storage tanks with water from the river via petrol pump
Buy 20L (liter) jerry cans of water from donkey and cart vendor
Retrieves water from river himself with 20L jerry cans, donkey, and cart
Walks to river and fills 20L jerry cans by himself

Table 4-7: Horizontalization - Access and Use: Source and Method

The next question related to the cost of that water access. Participants reported costs involved with water access regardless of method or source. The results are shown in Table 4-8.

How much does it cost to receive or retrieve your water?
Fees for WRUA (water resource user association) members
200 Ksh per month for water payment as part of water group
Water group in Lamuria with annual subscription of 1000 Ksh for registration and office costs
Petrol pump (5hp) costs 30,000 Ksh (Kenyan Shillings) to buy and 10,000 Ksh per month for fuel and maintenance costs
Petrol pump (7hp) costs 60,000 Ksh and fills a 2000L in 35 minutes using 1/2L of fuel
Petrol pump cost him 20,000 Ksh and uses 5L of fuel per week
100 Ksh to hire a donkey and cart used to fill 20L jerry cans
20 Ksh per 20L jerry can
Borehole well cost 10 million Ksh to install (5 years ago); today due to inflation, it would cost 20 million Ksh
Costs 5 Ksh per 20L jerry can to fill and sells it at 10-15Ksh per can depending on how far he has to deliver it
15 Ksh per day to hire a donkey and cart
50 Ksh for 4 jerry cans (20L) by donkey and cart

Table 4-8: Horizontalization - Access and Use: Cost of Water

The research participants were then asked about how safe they thought the water was to drink and to elaborate why or why not. Participants' responses are presented in Table 4-9.

Do you feel the water is safe to drink?
Yes - drinks harvested rainwater
Yes - piped water comes from the Aberdares
Yes - drinks water from borehole well but has some taste due to salts and fluorides
No - have to treat with chemicals bought from Nanyuki or Nyeri
No - have to boil the water first for cooking and drinking
No - river is used by farmers and livestock but drinks it anyways because treatment chemicals are not available in Lamuria

Table 4-9: Horizontalization - Access and Use: Safe to Drink

The participants were then asked to recall any community-based water projects that had been established in the area in past ten years. Their responses are shown in Table 4-10.

Have there been any community-based efforts to improve the local water supply?
There are local water associations that are forming
Lamuria WRUA
Nykao school water project funded by the Bird Shooting Club
Government started to build dams in the area but have not been completed them in 8 years
JICA (Japanese International Cooperation Agency) installed a public stand pump
Mutitu water project
Gatarakwa water project
Karameno water project
We are forming a group to ask Father Romano to build a 2 inch pipe from the water point north of Lamuria to our community to give access for domestic water; the project would benefit more than 2000 people
There were lots of dams built on old property but they broke down and were never repaired

Table 4-10: Horizontalization - Access and Use: Community-Based Water Projects

Lastly, a series of sociodemographic questions were asked of the interview participants. All of the fourteen participants' responses are displayed in Table 4-11.

Employment	Level of Education	Total Household Number	Length of Local Residence	Gender	Approximate Age
Farmer - crops and cattle	Form 4 in KCP system	5	17 years	Male	Mid 40s
Housekeeper at tourist lodge	Form 4	2	8 years	Female	Early-mid 30s
Owns a roadside tree nursery	Standard 2	5	18 years	Male	Mid - late 40s
Owns and runs a horse safari and lodge	Got kicked out of school in the UK at age 14	2	8 years	Male	Late 40s - early 50s
Farmer - crops and cattle	Primary	3	14 years	Male	Late 30s - early 40s
Business owner - bar	Form 4	3	20 years	Female	Late 30s
Carpenter	Standard 7	13	34 years	Male	Early 50s
Farmer	Graduate degree (Egerton University)	4	10 years	Male	Late 40s
Butcher	Standard 8	4	28 years	Male	28 (told in interview)
Veterinarian	University degree (Egerton University)	4	10 years	Male	Late 40s
Water cart vendor	Form 4	7	20 years	Male	Late 30s
Motorbike transport	Form 4	1	25 years	Male	25 (told in interview)
Farmer	Form 4	5	40 years	Male	Late 40s
Personal driver	Form 4	5	49 years	Male	49 (told in interview)

Table 4-11: Horizontalization - Sociodemographic Information

Descriptive statistics for the remaining sociodemographic characteristics, excluding gender, are presented in Table 4-12.

	Total Household Number	Length of Residence (in years)
Mean	4.5	21.5
Median	4	20
Mode(s)	5	8, 10, and 20

Table 4-12: Descriptive Statistics of Sociodemographic Information

Due to the approximation of ages, descriptive statistics were not calculated for this information.

Textual Description

After presenting all non-overlapping data from participants, the responses were then grouped into common themes, which emerge from within each of the research concepts. Shared experiences are discovered as similar responses are grouped together. In this step, overlapping responses are also highlighted as emerging themes. These themes form the basis for common experiences among participants. The findings are organized around the research concepts.

Levels of Interaction

Events in the community were clustered into five themes: church, sports, education, special occasions, and unique events. Church was repeatedly stated as a community event, though the specific denominations vary. Sports, primarily football (soccer) was another type of event that participants often mentioned within the interviews. Participants also referred to several different types of schools including nursery, primary, and secondary schools in the local area. Funerals and weddings were grouped under the theme special occasions, while the meeting of the village elders was considered to be a unique event.

Groups within the community were also clustered into five themes: self-help, agricultural and environmental, recreational, financial, and unique groups. It was learned during the course of interviewing participants that the term *harambee* is actually a Kiswahili word that means *everyone pulls together to help*. This is why many events are referred to as harambees, as one of the participants demonstrated by citing the *school's harambee*. The self-help theme also included groups that work toward easing hardship such as for general welfare or illness and funerals. The self-help group for disabled people, shopkeepers, market vendors, skilled trades, and the transport group represented more specific interests. The second cluster of agricultural and environmental groups represented individuals concerned with water resources and agricultural enterprises such as farming, beekeeping and rabbit keeping. The third cluster is represented by a theme of recreation and included both the local football teams and a specific Bird Shooting Club. The financial theme consisted of a money-lending group, which gave out loans to its members at lower interest rates than the commercial banks. This theme also included groups that utilized the *merry-go-round* system of money lending. It was explained in the interviews that *merry-go-rounds*, as they are referred to, involve a group of people agreeing to pool money together and distribute the total sum to a specific number of people, typically one individual. Each member pays an agreed-upon amount at a given interval in time, usually once a month. The total amount from the group is then given to a single recipient, which rotates around the group over time until each person has benefitted. This system allows individual members to purchase items they would not normally be able to afford on their own at a given point in time. It also avoids the need for banks and the burden of loans and interest payments. Lastly, the group of village elders was placed into a unique theme again because of the exclusivity of the group. While any person may be able to join one of the other examples, only select individuals are considered to be village elders.

The frequency of participation and interaction among the participants was more difficult to cluster into themes. Participation in events and groups resembled more of a routine schedule, often once a week or once a month. The frequency of interaction between participants and other members in the community varied from almost daily to once a week.

Common Issues Facing the Community

The common issues reported by participants were grouped into five themes: agriculture and the environment, land ownership, future work and livelihoods, infrastructure, and unique issues. The theme, agriculture and the environment, consisted of several issues related to water including a lack of water, drought, and the degradation of riparian areas. Overgrazing was an issue also associated with the environment. Many of the participants who also farm crops and raise livestock cited drought as being closely linked with a food shortage.

Future work and livelihoods was a theme that focused particularly on young people. Participants cited their inability to send their children onto secondary education as a major concern. The chairman of a local WRUA had a distinct opinion of the state of education in the area. He believed that education was not a problem since President Kibaki made education free up to Standard 8. Instead, higher education was lacking in his opinion, citing the need for more universities and polytechnical centers. The chairman himself held a degree in general agriculture from Egerton University in Nakuru, Kenya. Still, a majority of respondents reiterated that those who cannot further their education go back to the shamba (farm) for work. One man who sold trees at roadside nursery explained the increasing difficulty to sell enough trees to cover the cost of his materials and supplies. Another participant cited a sharp increase in inflation in recent years and the rising costs of living in the area. Corruption was the basis of the unique theme. While

only one participant mentioned it, the person was adamant about the role corruption played in contributing to local problems.

The examples of community-based efforts to address the issues raised by participants were grouped into two themes: targeted projects and general efforts to aid. The theme of targeted projects includes the water dam that was under construction by an unspecified group, as well as the Gatarakwa water project, Father Romano's (Mutitu) water project, and the Karameno water project. These efforts were specific and have specific plans carried out by registered groups of individuals through the use of government and outside funds. The theme of general efforts to aid includes the agricultural groups that share information on how to improve their practices and better ways to market their products. It was unclear whether or not the school's harambee was directed towards a specific student or if it was in general support of the school and its financial and material needs. Lastly, the group of village elders was considered general because they were cited as simply spreading awareness of local issues, rather than a targeted effort to address a specific concern.

Access and Use

Access to water was clustered into four themes: restricted access to river, open access to river, rainwater harvesting, and unique access. The theme, restricted access to river, was characterized by water collection methods that required a participant's property to be along a river. The primary method used to collect water in this theme was a petrol pump. These pumps would need to remain stationary and therefore would be placed on the person's property where they could directly water their fields or fill a storage tank. However, one participant did cite that some individuals share a petrol pump. Open access refers to sections of the river that are easily accessible by anyone who can collect water and leave. This theme included the several different

examples of using 20 liter (L) cans to collect and transport water either by hand, by donkey and cart, or by car. Rainwater harvesting included several overlapping examples of participants using plastic tanks to collect water at their homes. The unique theme included two participants. One participant had a borehole well installed on their property, while the other had a half-inch pipe in their home. The borehole well was explained to be a very costly project and therefore not a typical means of water access for most of the participants. The piped water was made possible based on the individual's proximity to a local water project, which piped in water collected from the Aberdare mountains.

The responses for the cost of receiving and retrieving water was clustered into four themes: prohibitively expensive, expensive, affordable, and unique. The prohibitively expensive theme included the one and only borehole well mentioned by the participants. The owner mentioned that based on inflation, the same well would cost 20 million Ksh (USD \$234,604.10) today. The cost of installing such a well puts it well above the other options. The expensive theme included two examples of petrol pumps costing 30,000 Ksh and 60,000 Ksh. As demonstrated by the two participants with pumps, the ability to purchase such equipment is attainable if not common. One participant stated that sometimes, individuals would share a petrol pump. Most of the participants' responses fell into the affordable theme which involved paying for water to be delivered by someone with a donkey and cart. The prices for a 20L can of water ranged from 10 to 20 Ksh per can. One participant quoted 100 Ksh as the cost of hiring a donkey and cart to fill cans. A water cart vendor admitted that he buys water at 5 Ksh per 20L can and sells it at 10 to 15 Ksh per can depending on how far he had to travel to the customer. Lastly, the unique theme included fees for WRUAs, which ranged from 1000 Ksh per year to 200 Ksh per month. These fees represent a different type of financial transaction. Rather than a one-time delivery cost or a large installation cost, these fees are routine membership fees paid each month to withdraw water from the WRUAs' respective rivers.

Safety of the drinking water varied among participants. Themes included: safe to drink, need to treat, and need to treat, but drinks water anyways. Of the participants who stated the water was safe to drink, the water source was either a borehole well, rainwater collected in tanks, or piped in from the Aberdare mountains. The theme, need to treat, was characterized by participants explaining the need for either chemical treatments or boiling before use. Two participants shared that chemical treatments were not available in the local area and instead needed to be purchased in the larger cities. The inability to buy chemical treatments and the lack of boiling resulted in the last theme of need to treat, but drinks water anyways. One participant specifically cited the safety hazards of drinking water from the same river that livestock and farmers use. Despite such hazards, they stated that they drink the water anyways because they have no other options.

Lastly, efforts to improve the local water supply were clustered into two themes: local efforts and outside efforts. Local efforts included the formation of local water associations, a water project at a school funded by the local Bird Shooting Club, the locally-based Mutitu Water Project. Outside efforts included the government's dam construction described by a few participants as a failure after being left incomplete for eight years. Alternatively, a successful outside effort was the public stand pump installed by the Japanese International Cooperation Agency (JICA).

Together, the various clusters or themes help to provide a more complete narrative of the research participants' shared experiences with the phenomenon of collective action and community-based natural resource management (CBNRM). The last step in the IPA strategy structures the individual themes into a comprehensive structure to help tell that narrative. The textual description themes are structured along with a composite summary in Figure 4 -1.

Sociodemographic Characteristics

The sociodemographic characteristics were not grouped into themes. Instead, the findings are discussed in general highlighting similarities and differences among the interview participants. Many of the participants identified themselves as farmers or involved in farming small shambas (fields for growing crops) and raising a small number of livestock for subsistence. Other participants represented a broad range of employment opportunities in Lamuria including small business owners, transportation drivers, laborers, and a local veterinarian. Participants also possessed varying levels of education.

The Kenyan education system is comprised of primary education (Standard 1-8 equivalent to grades 1-8 in the United States), secondary education (Form 1-4 equivalent to grades 9-12 in the United States), and post-secondary education in the form of colleges, technical schools, and universities. Participants' level of education varied widely from one participant completing Standard 2 and two participants achieving university degrees from Egerton University near Nakuru, Kenya. Seven out of the seventeen participants reported an education level of Form 4, having fully completed secondary education.

The total household number reported by participants included the number of adults and children living in their household. The only true outlier was a gentleman who reported having eleven children in his household between him and his wife. All of the participants reported living in Lamuria for eight or more years. Some of the participants specifically mentioned growing up in the area their entire lives. The longest resident was a personal driver who grew up in the area and reported his age to be forty-nine years old. The specific age of participants was not asked during the interview, however three participants did mention their exact ages. Age was approximated and noted by the researcher during the course of the interview.

Structuring

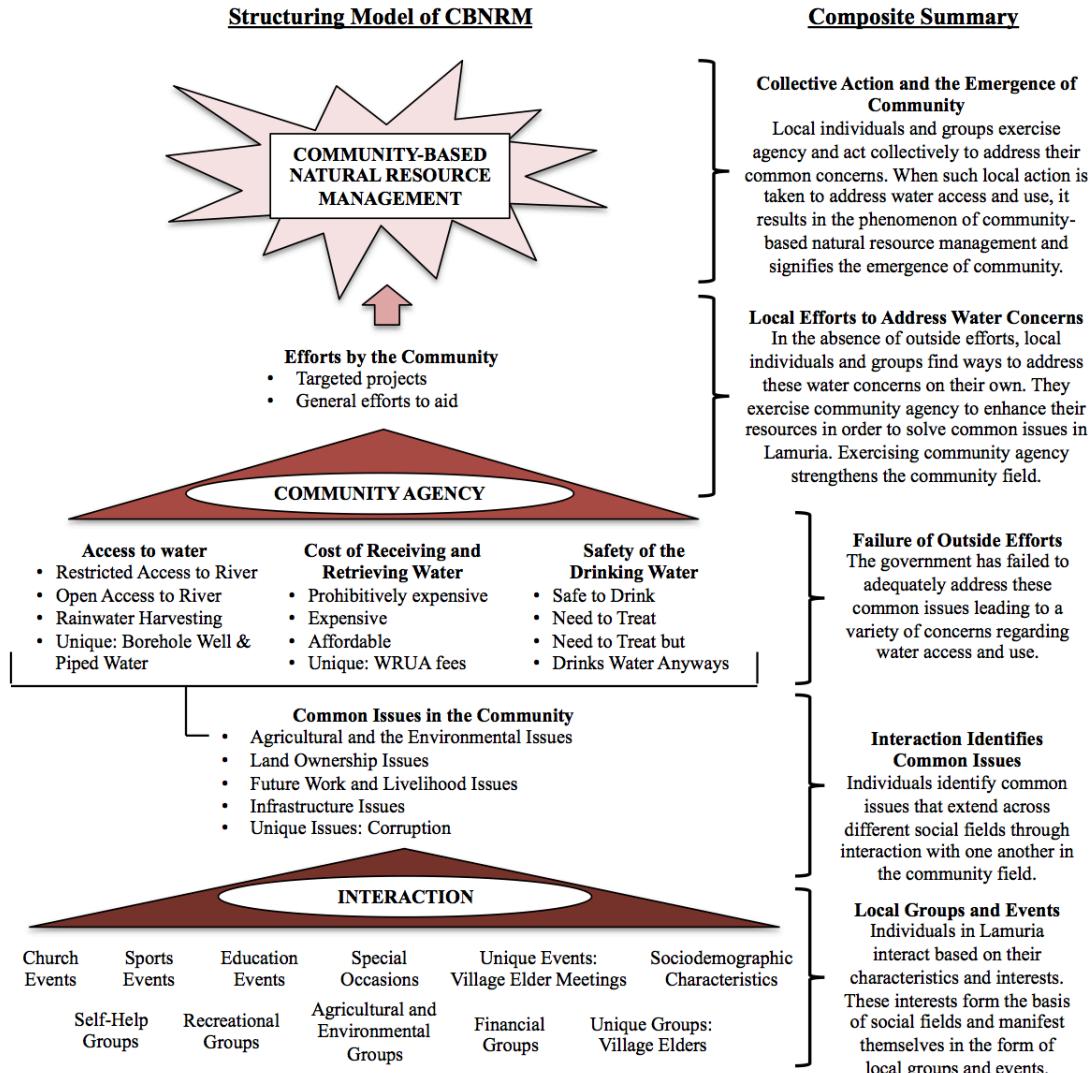


Figure 4-1: IPA Structuring of Emergent Themes and Composite Summary

In order to better describe the larger narrative of collective action within Lamuria, the emergent themes were complemented with insight from three key informants, two members of local WRUAs and an officer in the Tana Water Services Board. Personal observations and field

notes also add to this description by providing details that enhance the understanding of how themes exhibit the conditions and setting of Lamuria.

Lamuria is primarily an agriculturally based area with a majority of people engaged in farming either to sell their products or for subsistence. The predominance of rain-fed agriculture has made it difficult in times of drought. I saw only a handful of petrol pumps being used to irrigate the fields. The river as it was repeatedly referred to by the local residents resembled more of a small stream which at some points was no more than a few feet wide and did not appear all that deep. Another branch of the Ewaso Ng'iro in Lamuria was even more diminished and yet there were still remnants of irrigation pipes leading from the river to the fields. I saw owners of livestock bringing their cows and goats to this same river and letting them drink and defecate right along the banks. This direct pollution of the water supply was a common occurrence.

The fact that some participants chose not to or are unable to afford to treat this water before drinking and cooking demonstrates the difficult balance between the need for water and the risks of waterborne diseases. I specifically recall sitting down in a local restaurant for lunch and the hostess set a pitcher of water on the table. The water was a pale murky brown with tiny, yet still visible solids suspended. Both my translator (Alex) and local guide (Paul) vehemently warned me not to drink the water and suggested I get a bottled soda instead. Afterwards, Paul proceeded to pour himself a glass from the pitcher saying that it was alright, his body was used to it. I noticed that Alex, who is from Nyeri, did not drink it. Perhaps the local people have adapted to the local water conditions; still, many of the participants did note that they boil or treat their water with chemicals when possible, leading me to believe that they are well aware of the potential for waterborne diseases in their drinking water.

Health hazards are just one consequence from the current state of water in Lamuria. Many participants cited concerns over drought and its relation to hunger. The 2009 drought was mentioned by many of the participants and rightfully so, given the heavy reliance upon rain-fed

agriculture. Poor crop yields result in hunger and loss of revenue for residents in Lamuria. Men and women alike cited the effect that hunger can have on school children when the schools can no longer afford to provide meals during the day and families struggle to produce enough food at home. Loss of crop revenue due to a lack of water makes farming a risky and challenging business to pursue. This last point resonated with participants' concerns over youth and their prospects for future employment.

Several participants stated that without greater opportunities for continuing education and alternative opportunities for employment, many of the young people would inevitably return to the farm to work in the fields. Though the government aims to provide free primary education for all, the opportunities for youth become quite limited after that. While secondary schools did exist locally, several participants cited the school fees and lack of materials as major barriers to furthering their children's education. The government did provide one to two scholarship awards a year, but it was not enough in one participant's opinion. Another participant's story of local people enacting a *harambee* to help support their nearby school demonstrates the value that people in Lamuria place on education.

The concept of *harambee* was a fascinating term to discover in the course of conducting the research. The Kiswahili word for people all pulling together embodies the notion of collective action and community-based efforts to address local needs. Participants repeatedly mentioned the support they received from participating in self-help groups. The merry-go-round system of financing was also deeply rooted within these groups. The monetary support was often used to invest in individual enterprises related to agriculture as well as plastic storage tanks for collecting rainwater. There was a general dissatisfaction with the government regarding projects to improve the local water supply and in its absence, local people were left to rely on themselves. Forming groups under the concept of harambee was shown to be a popular way of addressing a variety of common concerns. With the respect to the issue of water, these local groups tended to be more

formally organized. The call for greater organization seems to reflect the restructuring of Kenya's Ministry of Water and Irrigation (MOWI) as a result of the 2002 Water Act.

An officer at the Tana Water Services Board by the name of Peter explained how MOWI was structured and how it sought to serve the water needs of local people. He stated that MOWI provides funding for local water projects through the Water Services Trust Fund (WSTF). Local residents must first form a water resource user association (WRUA), which is an officially registered community-based organization (CBO). The establishment of a WRUA allows its members to petition the WSTF for funding to carry out a proposed sub-catchment management plan. Such a plan can involve projects including the construction of dams, irrigation schemes, borehole wells, and ecosystem rehabilitation projects to enhance local water resources. The WTSF reviews and approves applications for funding submitted by WRUAs. An application must include a detailed description of how the WRUA is organized and what mechanisms are in place to monitor progress and the distribution of funds. The sub-catchment management plan will lay out in detail all of the proposed actions to be taken and the corresponding budgetary costs for each action. Once a plan has been accepted for funding, the Water Service Board requires WRUAs to report their progress throughout the year to ensure that the plan is being implemented in a timely and fiscally responsible manner. However there are problems that still exist.

Peter spoke about a few existing WRUAs that were currently being funded within the Tana Water Service Board's jurisdiction. He stated that poor management is a major issue within WRUAs and can result in failed projects and wasted funds. He also highlighted the need for better conflict resolution between WRUA members and non-members. He referred to a few pending legal cases in which members brought non-members to court over the misuse of water within their sub-catchment area. To better understand the organization of WRUAs, a meeting was held with the vice-chairman of the local Karameno WRUA.

The vice-chairman, also named Peter, spoke about how the Karameno WRUA was created and the current organizational structure of the group. The MOWI made an effort to educate the public on new opportunities for funding to aid local water management as part of Ministry's overall decentralization strategy. Peter recalled that a MOWI representative came to Lamuria and spoke about the new funding mechanisms for supporting local water groups. Shortly after, a group of local individuals in Lamuria came together to combat pollution and overuse within the Karameno branch of the larger Ewaso Ng'iro north catchment basin. The Karameno branch serves the water needs of residents and farmers alike, but overuse, pollution, and the degradation of the riparian areas around the stream threaten the water resource for all. Local management was needed to monitor and combat these harmful activities. The group of local individuals went through the formal registration process and established the Karameno WRUA in 2009.

Peter went on to describe how the WRUA is structured, where particular attention is paid to fair representation along the entire Karameno branch. The leading officers each come from different parts of the stream to ensure equitable geographic representation. The chairman is from downstream, the vice-chairman (Peter) is from mid-stream, and the treasurer is from upstream. They also make an effort to incorporate women and youth into leadership roles. For example, the current Karameno treasurer at the time was a woman. The WRUA has three sub-committees for monitoring, financial, and procurement activities. The management committee oversees the implementation of the sub-catchment management plan and has 13-15 members representing the water interests of agriculture, livestock, and domestic use. The group operates on a system of water usage fees, presented in Table 4-13.

Cost	Description
2000 Ksh	Annual subscription fee for projects
2000 Ksh	Annual fee for institutions (government schools)
100 Ksh	Annual fee for using portable petrol pumps
100 Ksh	Annual fee for riparian owners
20 Ksh	Annual fee per household for domestic users
20 Ksh	Annual fee per household for livestock users
*Possible addition of water fees for fisheries in the future	

Table 4-13: WRUA Water Usage Fees

Peter explained that the WRUA is trying to combat the general attitude held by local people that water is a social good and should be free for all. When people use water within the WRUA's management jurisdiction without paying, they have the power to call on MOWI's Water Resources Management Agency (WARMA) to take legal action and bring the accused violator to court. Another member from a different WRUA confirmed the practice of using WARMA to crack down on illegal water use within their territory. However, he mentioned that this is often used a last resort because they prefer to handle things outside of the courts. Peter mentioned that between the user fees and WARMA, people are now becoming aware of the policies surrounding their shared water resources. Still, enforcement can be difficult, particularly when people share and use pumps illegally at night. In times of drought, the Karameno WRUA rations water among its members and restricts non-members from using any water. The other WRUA member personally felt that as long as water still can flow past, you should be allowed to pump water from the stream. However, he did say that in times of drought, his WRUA restricts water withdrawals to domestic use only.

The WRUAs discussed here were just two examples from Lamuria of how local people can work together to address local issues. The existence of these WRUAs and other self-help groups make a compelling case for the existence of collective action and the emergence of

community in Lamuria. To further illustrate this case, conclusions surrounding the four research hypotheses, implications of the research findings, and recommendations for future action and research are presented in Chapter 5 – Conclusions, Implications, and Recommendations.

Chapter 5

CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

Through in-depth interviews with local people, this research study sought to explore and describe the factors that lead to the emergence of collective action in the context of CBNRM. The study of the phenomenon, collective action, ultimately involved a study of community.

Community is a dynamic and ever changing process whereby local people interact to address local issues that are important to them. This complex process is best described through the descriptive experiences of those individuals who actively seek to address concerns within their locality. Each of the four research hypotheses represents a concept that was shown in the literature to be linked to collective action and CBNRM. The research conclusions, as well as the implications and corresponding recommendations are presented for each of the four hypotheses.

Research Hypothesis #1

An inadequate supply of water within the community increases the likelihood that collective action will occur to ensure that basic water needs are met.

Conclusions

An overwhelming majority of participants cited water as a primary concern facing residents in Lamuria. The water needs of Lamuria fell into two categories, quantity and quality.

Farmers referred to the 2009 drought and described how the lack of rain negatively affected their crops and livestock. Those who used water primarily for domestic purposes had different water needs. Domestic water users were not as concerned with a diminished quantity of water, but by the lack of quality water available for drinking and cooking. A majority of the participants used water collected from the local rivers, while a few participants harvested rainwater whenever possible. Almost all of the participants acknowledged the hazards of drinking unpurified river water but also noted that water treatment chemicals were not locally available.

Implications and Recommendations

Without an adequate supply of water, residents who primarily rely on rainfed agriculture will continue to struggle during the dry seasons and in times of drought. Livestock and crops are not only a source of sustenance for individuals in Lamuria, but they also represent an important form of revenue. Further research is needed to identify more water-efficient and drought-tolerant varieties of locally grown crops as well as better soil management practices to increase water retention and soil health. Livestock represent an important symbol of wealth to agro-pastoral communities. Greater support must also be shown towards livestock owners, particularly in times of drought. Individuals must be assured they can receive sufficient revenue for their livestock. Otherwise, they will continue to over-exert the local water resources in order to prolong livestock health with diminishing returns. Priority of water resources should be directed to people over livestock; however the value of livestock cannot be neglected and should be fairly compensated with financial assistance. Registering livestock for a small fee may help the Government of Kenya develop a type of animal insurance fund for times of drought.

Without adequate access to quality water for drinking and cooking, residents will continue to face health risks associated with water-borne diseases. Complications from drinking

unsanitary water can result in children being unable to attend school, parents unable to work and provide for their families, and potentially life-threatening illness. A significant effort should be made to provide increased access to clean drinking water. This ultimately involves providing residents with a source of water other than the local rivers. More public stand wells should be installed across Lamuria to prevent residents from having to drink surface water that is polluted by agricultural runoff and livestock waste. A more immediate solution is to provide greater access to water treatment chemicals that residents can use to make the river water safer to drink. Increasing access means encouraging water treatment producers to establish retail shops or distribution facilities locally within Lamuria. Residents would also benefit from having access to low-cost water filtration/treatment systems that could be managed and maintained using locally available materials.

Additional Conclusions

Some residents of Lamuria sought to address their water needs through the formation of water resource user associations (WRUAs). The WRUAs represent organized efforts to bring individuals together to address local concerns about the availability of water. However, these water user groups were primarily concerned with maintaining the quantity of water available for agriculture, including livestock and irrigation. Participants that represented these WRUAs were not only engaged in agriculture, but also lived along their WRUA's respective source of water (i.e. a river). The close proximity to these water resources made irrigated agriculture more feasible for these individuals as compared to other residents who lived farther away. The sub-catchment basin management plans developed by each WRUA ultimately indicate where each group's priorities lay in the effort to address local water concerns. While it was not possible to receive a copy of the proposed management plans, one WRUA member cited several dams and

riparian restoration projects within his respective group's management plan. These projects were cited to help preserve the availability of water (i.e. water quantity). It remains to be said whether or not their future proposed projects would specifically seek to address issues of water quality in addition to water quantity. Despite the presence of WRUAs, many of the interview participants were not apart of these water groups. Non-members did not see the value of participating in WRUAs. One participant specifically cited the potential legal consequences of using water within a WRUA's jurisdiction without paying the proper memberships fees. A few participants cited the prohibitively expensive WRUA fees as the main reason for their non-participation.

Additional Implications and Recommendations

Unless a greater percentage of Lamuria residents are included in local WRUAs, many will continue to feel disenfranchised and be left to cope with water issues on their own. This lack of participation also has the potential for conflict as WRUA members and non-members struggle to utilize the same water resources. As WRUAs develop their water management plans, greater attention should be given to the needs of water users who do not live directly next to the water resource. Since many residents still retrieve their drinking and cooking water from local rivers, WRUAs should develop management plans that improve water quality in addition to preserving the quantity of water available.

A comprehensive recommendation would be for WRUAs to incorporate water treatment into their proposed management plans. WRUAs could submit plans to build a water treatment facility at popular river access points, such as the open embankment by the bridge, located just down the road from the main intersection in Lamuria. Such a facility would withdraw water from the river and treat it through the use of filtration, chemicals, or ultraviolet light. Residents could then retrieve water directly from this facility. A nominal fee could be charged per 20L jerry can (a

common container for water retrieval) that would go towards maintaining the facility. In return, it would help WRUAs to sensitize the community about the costs of ensuring an adequate supply of safe water. Residents would also benefit by having a source of clean water for drinking and cooking, which would reduce the risks of waterborne diseases. This water treatment facility would work well with the existing system of water distribution whereby residents pay to have their water retrieved and delivered by a donkey and cart. Universities and technical centers within Kenya would play an important role in developing low-cost, effective water treatment technologies that could be maintained by WRUA members with locally available materials.

Research Hypothesis #2

Individuals who face common needs are more likely initiate collective action to address common needs.

Conclusions

Water was not the only issue of concern for residents in Lamuria. Participants raised a variety of concerns including agricultural enterprises, education and future livelihoods for young people, and infrastructure development. There were numerous examples of residents who organized themselves into self-help groups to address these concerns.

Residents engaged in agriculture and animal keeping cited the importance of participation in self-help groups in improving their practices and finding new markets for their products. The merry-go-round system of financing was frequently embedded within these self-help groups.

The fate of young people in Lamuria was an important issue to participants. Education beyond the primary level was a concern because many of the residents could not afford to send

their children to secondary or post-secondary schools. Employment opportunities for young people was also a major concern because without sufficient alternatives for work, many of the youth will be forced to return to the shamba to perform manual labor.

Infrastructure was also reported to be lacking by participants. Infrastructure concerns included poor roads connecting Lamuria to other towns and major markets. Without sufficient roads and access to areas outside of Lamuria, it was difficult for many residents to enhance their business endeavors.

Implications and Recommendations

One improvement that would have a significant impact in Lamuria is infrastructure development. Specifically, the main road leading into Lamuria is dirt and gravel and often is poor condition. The lack of a paved tarmac road prevents many opportunities from reaching the residents of Lamuria. Improved roads would provide greater access to the locality for both people and goods. Lamuria is surrounded by several game reserves and national parks. Improved roads would make local accommodations more attractive options for tourists and would help bring business to the area. Improved roads would also enable farmers and individuals with livestock to transport their produce and animals to larger markets in cities such as Nyeri, Nakuru, and Nanyuki. Developing and maintaining the physical infrastructure in Lamuria represents an issue that cuts across all interest groups. It has the potential to benefit members in a variety of self-help groups as well as non-members. What is missing is the necessary leadership to coordinate these various groups and residents into one cohesive development effort. To help begin this process, leaders of individual self-help groups should meet to discuss the general goals that they share in common, including infrastructure needs.

Self-help groups were repeatedly mentioned as a form of interaction and support for participants. This notion of people working together reflects the Kiswahili concept of *harambee*, and is heavily rooted within the Kenyan psyche. These groups often involved membership fees and regular meetings whereby participants met to discuss their respective issues. The fact that members recognize the benefits of pooling together their resources indicates their willingness and ability to act collectively to address local issues. The merry-go-round system of financing clearly shows that members recognize can pursue individual interests by collectively cooperating with one another. Greater efforts should be made to encourage self-help groups to join together in addressing their mutual interests. Harnessing the power of these self-help groups is key to fostering local development through the participation and contribution of local residents.

Research Hypothesis #3

As levels of interaction increase, so does the likelihood that collective action will occur.

Conclusions

Individuals with greater participation in local events and groups were often more knowledgeable about issues affecting not only themselves, but also other residents as well. Increased participation meant that individuals interacted with their fellow residents more often and naturally discussed issues affecting the local area. Two of the most common cited events in which individuals participated were church services and local youth football games. Church services often occurred on the weekends while football games happened throughout the week.

Implications and Recommendations

Church plays a very large role in the lives of many Kenyans. As a result, church services are a regular source of interaction for residents living within Lamuria. There are numerous denominations and affiliated churches scattered throughout the locality, but all represent the same opportunity for interaction. Therefore, information and awareness can most efficiently be shared among residents at church. Groups that are looking to improve the local area should partner with local churches to maximize their potential impact. This is particularly why Father Romano and the local Catholic Church's Mutitu water project was consistently cited by participants as an example of a local effort to improve the water supply. Churches such as the Catholic Church also represent vertical linkages that connect local people with outside groups and resources. Churches are known for their commitment to charity and as such can fundraise for local projects by reaching out to a national and global network of support. Local sporting events also played an important role in bringing people together for social interaction. Groups working to spread awareness and gain support could host football games or sponsor local teams to encourage more opportunities for interaction.

Another recommendation would be to establish a central venue for groups to interact. A simple structure resembling a town hall with a community announcement board would provide a forum for discussion of special and collective interests. Such a facility would best serve local residents by being centrally located within the collection of shops and businesses along the main road in Lamuria. Local government officials could be invited to join such meetings to understand the issues that are affecting local people and offer ways to help or direct groups to the appropriate government resources. Such a venue should have facilities that entice local groups to use the location for their meetings. Members may have to travel some distance to participate and therefore should have incentive to do so. Musical or other social events could also take place in

the structure. The overall goal of building a town hall or similar venue should be to reduce the barriers to interaction. After all, efforts to enhance community and strengthen the community field should begin by enhancing social interaction.

Research Hypothesis #4

As household size, employment status, level of education, and length of residence increase, so does community members' participation in collective action.

Conclusions

All of the participants that were interviewed had been living in Lamuria for at least eight years. Many participants in fact had been residents for much longer, living upwards of several decades in the local area. A majority of the participants also had families in which they were raising children. Participants represented a variety of livelihoods that contribute to the local economy by providing products and services to their fellow residents. Clearly, these participants have a long history in Lamuria and thus have strong ties to the local area. As a result, these participants care about the locality in which they live and have a strong incentive to preserve and enhance local conditions.

Implications and Recommendations

If the conditions in Lamuria become unfavorable or inadequate to live and raise a family, residents will seek opportunities elsewhere. The fact that many of the participants are involved in local groups means they care about staying in the place in which they reside. In order to maintain

their respective livelihoods and the ability to raise their families, residents in Lamuria must continue to have opportunities for employment and education for their children. Many of the participants discussed the difficulties in finding work at times. Lamuria is still a relatively new area with an increasing population. As a result, there will not only be greater needs for employment, but more opportunities to provide goods and services to those individuals. The investment in infrastructure can aid in this development by providing greater access to major cities as well as hiring laborers to build the necessary building, roads, and utilities. While there is certainly a ready and willing workforce, outside investment is needed to help fund local development.

The Government of Kenya would be wise to invest in not only developing the physical infrastructure but also the intellectual infrastructure as well. Providing students with advanced technical education would also be a wise investment. However, many participants worried about their children's ability to attend even the most basic levels of education. While primary education is in theory free, many of the schools suffer from a lack of materials and the necessary facilities to carry out their educational mission. Local residents are trying to support the local schools through harambees and other means, but more aid is needed. Therefore, investments in education should be of the utmost concern to the government and outside aid organizations. Investments in an educated populace will bring new ideas and innovations to development efforts within Lamuria. As a result, local livelihoods will continue to be supported and residents will be able to provide for their families. This kind of comprehensive investment will help increase the length of residency, raise the level of education, increase household size, and raise the employment status of individuals, thereby increasing the likelihood for collective action.

Final Summary

Several insights were discovered through this qualitative investigation of individuals living within the agro-pastoral locality of Lamuria, Kenya. Participants have spent significant periods of time living, working, and raising families in Lamuria and thus have a strong connection to the local area. The participants care about a variety of issues and share their concerns with other residents in and across social fields through interaction. They work collectively in self-help groups to address their concerns and enhance their individual and collective well-being. They pool resources to address common issues and support one another, thereby exhibiting the concept of agency. The research participants in Lamuria demonstrate not only the factors that lead to collective action, but also the core components of community.

This research study seeks to add to the existing body of literature by exploring and describing the factors that lead to the emergence of collective action in Lamuria, Kenya. The findings from this study provide contextual evidence to support the emergence of community from an interactional field theory perspective. This research study demonstrates the potential for local capacity building in a water scarce agro-pastoral community. The research findings have the potential to be applied beyond the scope of natural resource management to other areas of community development. The conclusions, implications, and recommendations are put forth to be applied by community members, researchers, community development practitioners, aid agencies, and Kenyan government officials . It is the researcher's hope that this study will ultimately serve to benefit the research participants and other community members in Lamuria, Kenya.

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Appendix A

Institutional Review Board Approval Letter

PENNSTATE



Department of Agricultural Economics, Sociology, and Education

College of Agricultural Sciences
 The Pennsylvania State University
 Agricultural Extension Education Program Area Phone: 814-865-1688
 114A Ferguson Building Fax: 814-863-4753
 University Park, PA 16802 <http://aese.psu.edu>

Bradley Olson,

The Office for Research Protections (ORP) has reviewed the eSubmission application for your research involving human participants and determined it to be exempt from IRB review. You may begin your research. This study qualifies under the following category:

Category 2: Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observations of public behavior unless: (i) information obtained is recorded in such a manner that human participants can be identified, directly or through identifiers linked to the participants; **and** (ii) any disclosure of the human participants' responses outside the research could reasonably place the participants at risk of criminal or civil liability or be damaging to the participants' financial standing, employability, or reputation. [45 CFR 46.101(b)(2)]

PLEASE NOTE THE FOLLOWING:

The principal investigator is responsible for determining and adhering to additional requirements established by any outside sponsors/funding sources.

Record Keeping

The principal investigator is expected to maintain the original signed informed consent forms, if applicable, along with the research records for at least three (3) years after termination of the study.

This correspondence will also be available to you in PRAMS at www.prams.psu.edu.

Consent and Recruitment Document(s)

The exempt consent form(s) will no longer be stamped with the approval/expiration dates.

The most recent consent form(s) that you uploaded for review is the one that you are expected to use.

Follow-Up

The Office for Research Protections will contact you in three (3) years to inquire if this study will be on-going.

If the study is completed within the three year period, the principal investigator may complete and submit a **Project Close-Out Report:**

<http://www.research.psu.edu/orp/areas/humans/applications/index.asp#other>

Revisions/Modifications

Any changes or modifications to the study must be submitted through the eSubmission application for this protocol in PRAMS (www.prams.psu.edu).

Please do not hesitate to contact me if you have any questions or concerns.

Thank you,

Amanda E. Brown, CIP

Research Compliance Coordinator II
The Pennsylvania State University
Office for Research Protections
The 330 Building, Suite 205
University Park, PA 16802
Telephone (814) 865-7986
Email: aeb29@psu.edu

Appendix B

Implied Informed Consent Statement



Implied Informed Consent Form for Social Science Research The Pennsylvania State University

Title of Project: Community Based Water Management in Central Kenya

Principal Investigator:

Bradley L. Olson
009 Ferguson Building, University Park, PA, 16802
*(215) 206-4220 *Add country code 000-1 when dialing to the US from Kenya

Advisor:

Dr. Mark A. Brennan
204C Ferguson Building, University Park, PA 16802
*(814) 863-0387 *Add country code 000-1 when dialing to the US from Kenya

1. **Purpose of the Study:** The purpose of this research study is to assess the issues of water scarcity, use, and management by communities in and around the city of Nyeri, located in central Kenya. The study will assess community members' attitudes, thoughts, and opinions of water issues such as quantity, quality, and access. It also aims to measure members' awareness of community based water management strategies as well as the existence of such practices in Central Kenya. The goal is to identify what impact communities have on water management.
2. **Procedures to be followed:** You will be asked to answer approximately 15 questions in an interview based on your opinions, attitudes, experiences, and familiarity of water management within your community. You can choose to take part or decline participation at any time. The audio portion of the interview will be recorded, however it will only be used by the researcher afterwards to fill in any gaps in the interview notes.
3. **Duration/Time:** If you agree to take part in an interview, it will take approximately 30 to 60 minutes of your time to complete. The interview will take place at a time and place of your convenience.
4. **Statement of Confidentiality:** Your participation in this research is confidential. In the event of any publication or presentation resulting from the research, no personally identifiable information will be shared. The principal investigator (Bradley Olson) and his advisor (Mark Brennan) will be the only people who have access to the interview notes and other research materials. These materials will be secured in a locked file cabinet in 204C Ferguson Building, when not being analyzed. The materials will be held until 2014 for research verification

purposes. Upon January 1st, 2014, all data and materials will be promptly and securely destroyed.

5. **Right to Ask Questions:** Do not hesitate to ask questions or voice any concerns you may have about the research study. Please contact the researcher, Bradley Olson, either by phone at *(215) 206-4220 or by email at blo5014@psu.edu . *Add country code 000-1 when dialing to the US from Kenya
6. **Voluntary Participation:** Your participation in this research study is completely voluntary. You do not have to participate in this research if you do not want to. You can end your participation at any time by telling the researcher, Bradley Olson. You do not have to answer any questions that you do not want to answer.

You must be 18 years of age or older to take part in this research study.

Agreement to participate in the interview implies that you have read and/or been read the information in this form and give your implied consent to take part in the research. Please keep this form for your records and/or future reference.

Appendix C

CBNRM Interview Instrument

Community:

Date:

Time:

Place:

Phone:

Name:

Title:

Levels of Interaction

1.A. What can you tell me about the local community?

Community & Events

B. What kinds of events take place in the community?

Cultural	Religious	Recreational	Educational
----------	-----------	--------------	-------------

Who, what, when, where, why, how often?

C. How often do you participate in such events?

Daily	Often	Sometimes	Never
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Interaction

2.A. How often do you get to see other community members?

Daily	Often	Sometimes	Never
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Who (family, friends, neighbors), when, where?

Organizations & Participation

3.A. Do you participate in any community organizations or groups?

Who, what, when, where, why, how?

B. What kinds of [other] community groups exist in the community?

Who, what, when, where, why, how?

C. In your opinion, can you depend on these groups to address local issues?

Why or why not?

D. What is the most important reason for your participation?

Can you explain?

Common Issues Facing the Community

4.A. What are the 3 greatest issues in general facing your community?

1)

2)

3)

B. Do you feel community members' voices are heard regarding those issues?

Why or why not?

C. In the past 10 years, have there been any community-based efforts made to address or solve these issues? Or other issues?

Who, what, when, where, how, why?

D. In your opinion, were these efforts beneficial to the community?

Why or why not?

Use and Access

What can you tell me about the local water?

5.A. Do you have access to water at home or do you have to retrieve it?

What is the source? Who is the provider, if not yourself?

B. How often are you able to access water?

Approximate hours/day _____ Continuous (24-hours/day)

C. Do you feel the water is safe to use (drinking, cooking, cleaning)?

Why or why not?

6.A. What do you use most of your water for?

Inside the home

Agriculture

Industry/business

(Cooking/Cleaning)

B. Are you able to receive enough water for your daily needs?

Yes

No

If No, how do you cope with the difference?

C. How much does it cost to receive or retrieve your water?

7.A. In the past 10 years, have there been any community-based projects to improve the local water supply?

Who, what, when, where, how, why)?

B. In your opinion, how did the project turn out?

Successful

Unsuccessful

Why or why not?

C. Did you directly benefit from the project?

Why or why not?

Other Comments & Recommendations

8.A. Is there anything else you would like to tell me about the community?

9.A. Can you think of anyone else that you think I should talk to about the community or water related issues?

Demographics

10.A. What would you say is your main job or profession?

B. How long have you been in this profession?

11.A. How far did you go in school?

Primary Secondary Bachelors Graduate

12.A. Who lives with you in your household? (spouse, kids, relatives)

of adults (including yourself) _____

of children _____

B. How long have you lived here in the local area?

Thank you very much for your time and assistance.

I have enjoyed talking with you very much.

May I contact you again if I have any more questions?

Post-Interview Comments & Summary (for researcher only)

Note any impressions or comments you have about the interview

Gender:

Approximate Age:

Education Level:

Person's attitude:

Person's role in the community:

Major issues covered:

Distinct impressions: