Wat’er They Thinking?
Smallholder farmers’ attitudes towards the provision of drinking water for dairy cows in Kagera, Tanzania

Honours Bachelor of Science, Specialist (Co-op) International Development Studies

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ABSTRACT

Agriculture’s large share of Tanzanian GDP and the large percentage of rural poor engaged in the sector make it a focus for many development projects that see it as an area of attention for reducing rural poverty. Drivers of these projects include NGOs who, in theory, engage in participatory methods to incorporate the views of project beneficiaries and give them ownership of the project. This case study incorporates research from the community of Kamachumu where the international NGO, World Vision, implemented a dairy cow loan project with a limited degree of participation to foster growth in the agriculture sector. To collect data on current norms in livestock management amongst loan recipients, field visits and interviews were conducted. The study finds that despite continuation of the loans since the NGO’s departure, productivity is limited by how the cows are being managed, particularly with many animals not having ad lib access to drinking water. This study explores reasons why farmers do or do not provide their cows with unlimited access to drinking water and finds there are many barriers farmers face. A lack of education proves to be a significant barrier and the inaccessibility of water as well as inadequate water infrastructure also pose barriers. These results suggest an increase in extension services and national livestock policy that considers the specific realities of small-scale dairy farmers.
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<th>Definition</th>
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<tbody>
<tr>
<td>ADP</td>
<td>Area Development Program</td>
</tr>
<tr>
<td>AEO</td>
<td>Agriculture Extension Officer</td>
</tr>
<tr>
<td>CBO</td>
<td>Community Based Organization</td>
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<tr>
<td>FAO</td>
<td>Food and Agriculture Organization of the United Nations</td>
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<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
</tr>
<tr>
<td>HBU</td>
<td>Heifer Breeding Unit</td>
</tr>
<tr>
<td>HIT</td>
<td>Heifer-in-Trust</td>
</tr>
<tr>
<td>HIV/AIDS</td>
<td>Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome</td>
</tr>
<tr>
<td>IFAD</td>
<td>International Fund for Agriculture Development</td>
</tr>
<tr>
<td>KALIDEP</td>
<td>Kagera Livestock Development Programme</td>
</tr>
<tr>
<td>KAVIPE</td>
<td>Kamachumu Vision for Poverty Eradication</td>
</tr>
<tr>
<td>NGO</td>
<td>Non-governmental Organization</td>
</tr>
<tr>
<td>NSGRP</td>
<td>National Strategy for Growth and the Reduction of Poverty</td>
</tr>
<tr>
<td>PRA</td>
<td>Participatory Rural Appraisal</td>
</tr>
<tr>
<td>SSA</td>
<td>Sub-Saharan Africa</td>
</tr>
<tr>
<td>TLU</td>
<td>Tropical Livestock Unit</td>
</tr>
<tr>
<td>UNDP</td>
<td>United Nations Development Programme</td>
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<tr>
<td>VSO</td>
<td>Voluntary Service Overseas</td>
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CHAPTER ONE: INTRODUCTION

1.1 Problem Statement

The history of development has repeated cases of disjuncture between non-governmental organization’s (NGO) intentions and eventual outcomes during and after project implementation (Chambers, 1983). Goals are clearly stated by the organizations; for example, the provision of livestock will “create a win-win situation for everyone” (World Vision, 2014) and “enhance household food security and generate long and short term income” (Oxfam Canada, 2014). Yet the activities the NGOs engage in often fail to foster their intended outcomes. One element missing from these two examples is the livestock management required to ensure animal productivity.

This study uses the case of Heifer-in-trust (HIT) programs in Tanzania that aim to increase domestic milk production and the income of smallholder farmers, to further explore selected challenges within the NGO development model applied in farming settings in Africa. HIT’s *modus operandi* is that selected smallholder farmers are provided with a heifer (a cow that has not produced offspring as yet) at a fraction of its market value, as well as training in dairy management (See section 2.4.1). The extent to which this HIT project can contribute to commercialization, and therefore measurable growth, of the agriculture sector is dependent on cow productivity. Maximizing productivity of these dairy cows relies on the provision of many inputs but preliminary observations for this study revealed that smallholder farmers in the program had serious challenges relating to managing a dairy production enterprise; particularly the appreciation and provision of crucial inputs such as water.

There has been extensive research conducted on cattle management and resource constraints among smallholder farmers in Tanzania and Africa in general. For example, a study on calf management by Chang’a, Mdegela, Ryoba, Loken, and Reksen (2010) surveyed dairy farmers, including recipients of HIT animals, in southern Tanzania. They noted that a lack of farmer education and motivation are barriers to improved livestock husbandry, but the researchers do not identify water provision, the focus of this study, as a specific element of livestock management. Similarly, research by Amenu, Markemannm, Roessler, Siegmund-Schultze, Abebe, and Zárate (2013) in Ethiopia notes that water quality and quantity pose significant constraints to effective livestock husbandry. However these authors do not elaborate
Development projects are often drawn to ameliorating poverty in Africa, a particularly widespread occurrence in rural areas where subsistence farmers rely on the land for a significant portion of their main livelihoods (Sherbini, 1986). Though the economies of many countries have grown over the past couple decades, the reduction of poverty has not occurred at the same pace (International Fund for Agriculture Development [IFAD], 2010). The rural poor continue to be burdened by issues that include the cost of healthcare, degradation of natural resources and market volatility (IFAD, 2010). Tanzania is just one of many African nations classified as “developing” and “low income” by the World Bank (2013). In 2012 it was ranked 152 out of 187 countries in the world by the Human Development Index, and 66% of the population lives in multidimensional poverty (United Nations Development Program [UNDP], 2013). Rural poverty in Tanzania is a chronic issue, with the World Bank reporting that 86% of the population who lives below the national poverty line is in rural areas (World Bank, 2012a).

Agriculture, the production of both crops and livestock for human use, is the backbone of the Tanzanian economy, and over 80% of the country’s population is employed in this field (UNDP, 2011). The Tanzanian government is interested in expanding the agriculture sector and repeatedly promotes commercialization of smallholder farming to achieve this goal (Ministry of Agriculture and Co-operative Development, 1997; United Republic of Tanzania, 2001a; United Republic of Tanzania, 2006). Despite this commitment on paper, the sector’s growth rate of 4.4% between 2000 and 2008 was less than half the 10% target set by National Strategy for Growth and the Reduction of Poverty (NSGRP, United Republic of Tanzania, 2010a). The logic behind commercialization is that growth of the agriculture sector would increase incomes and result in decreased levels of poverty, specifically in rural areas, where many of the poor live (Ministry of Agriculture and Co-operative Development, 1997; World Bank, 2007). It is also argued that growth of the sector would contribute to the Millennium Development Goal of “halving poverty and food insecurity” by 2015 (United Republic of Tanzania, 2002, section 1.1.1).

Tanzania is not alone in its promotion of agricultural development as a poverty reduction strategy. In 2008 the theme of the World Bank World Development Report was “Agriculture for Development” (World Bank, 2007). It describes agriculture development as a crucial link in
poverty reduction across Sub-Saharan Africa through its contributions to creating jobs, increasing incomes and providing environmental services. Large private donors are also on board, an example of which is The Bill and Melinda Gates Foundation’s description of agricultural development as one of their “largest issues” (2014). Tanzania’s neighbours in the East African Community have a similar focus; with Kenya and Uganda both having current strategies for the development of their respective agriculture sectors (Government of Kenya, 2010; Ministry of Agriculture, Animal Industries and Fisheries, 2010). The agricultural sector’s growth has become a priority across the continent.

Yet pushing against these plans are the many challenges faced by smallholder farmers, including a lack of assets, increasing population densities, land degradation and poor education, all which contribute to limiting the productivity of agriculture in Sub-Saharan Africa (World Bank, 2007). Despite these challenges, new projects continue to be planned; and in 2012 the World Bank allocated 10% of its loans in Africa to the continent’s “Agriculture, Fishing, and Forestry” sectors (World Bank, 2012b, p.1). In Tanzania the government is eager to partner with other parties in their attempts to ameliorate poverty in rural areas. Thus the involvement of NGOs is seen as being particularly desirable because of the role they can play in social and economic service provision in the country (United Republic of Tanzania, 2001b).

Non-governmental organizations are also interested in projects that may fuel the agricultural sector’s growth; hence the focus of this study, which is on the extent to which smallholder farmers have adopted an agriculture development project implemented by an international NGO. The role of NGOs is described as being an intermediary between the poor, the state, and the private sector (Issa, 2004). NGOs have been development actors for over half a century, but as Bebbington, Hickey & Mitlin (2008) report, it is only since the mid-1990s that their focus has been the achievement of measurable results in the reduction of poverty on a global scale. Their activities are often funded by donors who are located in other countries and who are more interested in funding specific activities rather than doing research (Bebbington et al, 2008). As a result, NGO projects have traditionally been directed by top-down strategies that fall short in responding to local environments (Strutt & Kepe, 2010).

A popular response to top-down decisions in development organizations is the use of participatory methods that aim to empower local beneficiaries by consulting them throughout the planning and implementation process, as well as granting ownership of the development project
(Kapoor, 2005). This ownership is often in the form of local people contributing time and labour to projects that remain implemented by outsiders (Vivian, 1992). From once being seen as a threat to top-level officials, participatory development has been embraced by both government and non-governmental bodies in the development sector as a means to increase the effectiveness of development projects (Rahnema, 1992). Yet a critique has emerged that labels participation as being a process institutionalized to fit into the existing development system, often reflecting the desires of Western or local hegemonies (Kapoor, 2005). Therefore development projects that encourage participation can still fail to respond to local environments.

1.2 Aim and Objectives

Lewis and Mosse (2006) state that research is particularly interesting when it involves the study of activities that are not supposed to happen, rather than focusing on the achievement of established targets. In this present study, inadequate resource provision, specifically of drinking water, is the event that is not supposed to occur. At both the initial training for farmers and follow-up visits by extension workers, farmers are advised to provide their cows with unlimited drinking water, but this is not always what happens in practice. This study, therefore, begins by arguing that there are probably multiple reasons why smallholder dairy farmers in Tanzania fail to provide their cows with adequate water, despite receiving information at training and during visits by extension officers. Related to this, the study contends that implementing agencies (e.g. NGOs and government-sponsored agriculture extension services) do not always have a full understanding of the details of issues preventing full adoption of their proposals and advice. Within this context, the overall aim of this research is to investigate why many farmers in the community of Kamachu, Tanzania who have received a dairy cow loan from a NGO-initiated HIT project fail to provide their cows with adequate access to drinking water.

To support the research question, the following objectives have been established:

• To review the context and background of smallholder farming in Tanzania; particularly social, economic and policy dynamics of dairy farming in general, as well as in the Kagera region,
• To explore the social and economic conditions under which farmers do or do not provide their dairy cows with unlimited access to drinking water, and
• To present and discuss implications of this study for policy and research.
1.3 Significance

Research has revealed numerous examples of NGO development projects that failed to successfully transfer technology because of a lack of consideration for the local context, rapid project set-up or dependence on simple solutions (Asfaw, Kassie, Simtowe, & Lipper, 2012; Farrington & Bebbington, 1993; Tremblay et al., 2013; Vivian, 1994). This research explores how NGOs should consider rethinking their development strategies because these limitations are still relevant to NGO projects today. In this case study of a HIT project in northwestern Tanzania, farmers are provided with training on livestock management and receive a dairy cow loan. The ability of farmers, within their local context, to provide adequate care and inputs will increase the benefits of owning a dairy cow. One of these inputs is adequate access to drinking water, a critical factor in the maintenance of cow health and maximization of animal productivity. Water consumption below optimal levels lowers the feed intake of dairy cows resulting in reduced performance including a lower milk yield (Burgos, Senn, Sutter, Kreuzer, & Langhans, 2001; Salem & Smith, 2008). Sufficient drinking water may or may not be made available for livestock by the farmer, and the cost of provision is rarely considered in the design of a development project (Wilson, 2007). A lack of awareness about these issues, combined with a rapid project set-up, continues to impede the realization of development project goals today.

This study is of significance to organizations implementing development programs that include the provision of livestock to smallholder farmers. This includes small community organizations like where this study occurred, larger NGOs, and government initiatives and agriculture policy that intend to increase domestic milk supply. All stakeholders should appreciate that the mere presence of livestock is insufficient in itself to meet development targets, as the animals must be given sufficient care to be productive. Awareness of specific conditions under which farmers do or do not provide water for their livestock will only be directly applicable to environments that are endowed with the same level of resources as the Kamachumu community where this research was conducted. The wider application of this study is to highlight that barriers do exist. Despite the livestock management training provided, smallholder farmers who receive livestock through a development project may not be able to adequately manage the animal in a way that ensures the animal is productive.
1.4 Outline

The thesis is divided into five chapters as follows:

- Chapter One discusses the problem statement; provides brief context regarding the challenges of rural poverty in Africa; lays out the aim and objectives of the study, and discusses the significance for a range of stakeholders.

- Chapter Two presents an overview of participatory development processes, the social, economic and political dynamics of smallholder farming across the continent, as well as a more specific look at the response to NGOs in overcoming challenges in smallholder farming, with a particular focus on HIT projects that attempt a participatory response to smallholder challenges.

- Chapter Three describes the context of the research in regard to dairy farmers in the Kagera region of northwestern Tanzania. It then details the research design, and lays out the limitations of this thesis.

- Chapter Four presents and analyses the research data; beginning with a depiction of smallholder farming in Tanzania, as well as more specifically in the Kamachumu community. The chapter then presents and critically analyses farmer attitudes, especially relating to water provision, as they emerge through the data.

- Chapter Five presents a review and discussion of the research, along with conclusions that are potentially relevant to policy and future research options.
CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

Livestock is a significant component of the agricultural sector; and globally it contributes to 40% of agriculture production and in East Africa it is 37% (Descheemaeker, Amede, & Haileslassie, 2009). Udo et al. (2011) note that there is a growing demand worldwide for livestock products, which include milk, meat and eggs; but most production increases are happening in commercial, not smallholder, production systems. Smallholder farmers are constrained by many factors, the two most common being the high cost of inputs (most often food and improved breeds) as well as limited farming knowledge (Udo et al., 2011). Targeted support to increase smallholder production would contribute to meeting this need, while also improving farmers’ livelihoods (Udo et al., 2011).

This chapter will begin with an overview of the disconnect between development practitioners and the rural poor, presenting the critique that seemingly targeted support for people labeled as beneficiaries of development may not aid because the implementers do not understand local realities. Next, the chapter will discuss a response to this critique, namely the incorporation of so-called ‘participatory development’ approaches into the sector, which will be followed by a critique of this very approach. After this review of theoretical literature will be an exploration of the position of non-governmental organizations (NGOs) have in the development sector. Then there will be a discussion of smallholder farming in Africa, looking at the challenges farmers face and emphasizing water as one challenge, for smallholder farming is the focus of many development efforts and the the center of this thesis. Finally the chapter will conclude with describing how some development strategies have been designed to overcome the challenges faced by smallholders, one project of which is Heifer-in-Trust livestock loans that despite its participatory intentions still exemplifies the disconnect between practitioners and the rural poor.

2.2 Disconnect between Development Practitioners and the Rural Poor

A recurring theme in development critiques, and the root of this thesis, is that there is a disconnect between those people who deliver, and those who are labeled as beneficiaries of, development. Chambers (1983) describes how development professionals often prefer to situate themselves in urban centers, where healthcare, houses, and education can be accessed more
easily than rural communities. Though staff in field offices can be closer geographically to the rural poor, a social distance can still be maintained through choices in clothes, vehicles and offices, with them often preferring to interact with the less poor of the rural communities they serve (Chambers, 1983). When interactions do occur, there is often a bias towards more active, less poor, beneficiaries for whom it is easier to adopt the development project (Chambers, 1983). For example, Smith (2001) speaks of one agriculture extension worker who states a preference for working with less marginalized farmers as they are more likely to adopt new ideas. Furthermore, it is often junior staff who are sent to rural field offices where, if they prove themselves, are promoted to urban offices where their ties with the rural poor are stretched (Chambers, 1983). At this distance it becomes difficult to understand the lived realities of the beneficiaries.

This meagre understanding of the rural poor has been a contributing factor to unsuccessful development efforts since the beginning of modern-day development. In The Gambia, Carney (1993) describes how an irrigation project established by the colonial government in 1949 to achieve self-sufficiency in rice production failed because the system was inadequate in its design, and the implementers did not understand the disinterest of local men and women in securing wage labour. In Sierra Leone, Jedrej (1983) describes a scheme initiated in the 1950s where the government brought tractors to rice farmers hoping they would continue to sustain this new technology. However, despite interest in the increased production brought by the machines, farmers could not afford them and they were not purchased (Jedrej, 1983). Richards (1995) adds that both the FAO and Japan International Cooperation Agency (JICA) provided additional funding to the scheme in the four decades following the introduction of these tractors, but it still failed to become sustainable. The reason for this failure is cited by Jedreg (1983) as being due to assumptions of what actors in the capital city thought was best; and that government officials focused on minimizing public expenditure and promoting free trade without a discussion on what policy might best achieve these aims. As these two examples of agriculture development projects demonstrate, decisions made without consultation of the beneficiaries can be challenged when they do not meet the needs of the rural poor.
2.2.1 Participation as an Alternative

After Chambers (1983) identifies this development disconnect, he advocates for outsiders engaged in development to both ask and reflect on what the poor say they want. Today this dialogue, often referred to as ‘participatory development’, has become mainstream in the development process, under the belief that engagement of the poor in a project will ensure its success (Ghai & Vivian, 1992). Kapoor (2005) identifies two tenets of this process; first, that a consultation process often called Participatory Rural Appraisal (PRA) is executed to gather the opinions and preferences of the people, and second, that there is civil society ownership of projects and programs. The confidence in this process is based in the underlying assumptions, as elaborated on by Rahnema (1992), that opportunities for people to participate in their own development will help overcome the obstacles in the discipline and that participatory means are the best way possible to make sure the objectives are met in a way favourable to the people. Furthermore, participation is justified because it's the only way to ensure objectives are peacefully obtained (Rahnema, 1992).

Applying this ideology to rural areas, Chambers (1983) recommends that development practitioners first learn from farmers before decisions are made. In this way people who are not familiar with the circumstances of the rural poor may still try and support them (Chambers, 1983). In the study conducted for this thesis on a rural development project it is suggested that not enough was learned from farmers before the project was implemented, thus providing another example of a limitation of the participatory process.

2.2.2 Limitations of Participation

Critics of participation as an alternative development strategy say it has been institutionalized by decision makers who incorporate it as a means to justify their pre-determined actions (Kapoor, 2005; Rahnema, 1992). Participation is supposed to permit the poor to share their views in an unbiased manner, but as both Cooke and Uma (2001) and Kapoor (2005) argue, the process is led by a facilitator who cannot be impartial as he or she is setting the agenda. Furthermore, instead of supporting ideas of the poor, the participatory process is institutionalized, or reorganized, to fit the development system and participants often speak in ways determined by their social position (Cooke & Uma, 2001; Kapoor, 2005). As a result the participatory process can serve to reflect both local and Western hegemonies more than it
highlights the voice of the poor (Kapoor, 2004). This can lead to the replication of previous development qualms, namely that projects are implemented where they are inappropriate. It is not an eternally doomed process; Rahnema (1992) asserts that original advocates of participatory development had pure intentions and Kapoor (2005) stresses the critiques of the process do not play out in every scenario. In a similar manner, Cleaver (2001) agrees that on a small scale participation can increase the efficiency of development projects. Yet it is prone to challenges and as Chambers (1994) comments, its success relies more on the behaviours of outsiders than their methods but Cleaver (2001) stresses that improving these practices does not address the concepts that are creating them. And despite repeated critiques in the literature of the participatory process, Cleaver (2001) points out the development discourse has not drastically changed. Many agents of development, including NGOs, continue to use the participatory process.

2.3 Non-governmental Organization in Development

The familiar position of NGOs as promoters of development interventions has given people trust in them, as they are assumed to be good (Bebbington et al., 2008). Supporting this statement is Issa (2004) who, in a case study of eight NGOs in Tanzania, speaks of how many people see them as better able to help than the public sector as NGOs are more flexible, better suited to implement appropriate technology and better able to represent the poor. Furthermore they are, as Hira and Parfitt (2004) describe, often smaller organizations run by energetic staff and volunteers with grassroots experiences. As a result, NGOs are seen as stakeholders who have the legitimacy to catalyze the participatory process (Rahnema, 1992).

Yet amidst these hopes arise challenges to the planning and implementation of NGO development activities, especially when a lack of communication stifles their knowledge of the target beneficiaries. Gittinger (in Hira & Parfitt, 2004) reminds that projects must mesh with local institutions to be successfully carried out. An NGO project can suffer if it clashes with existing public and private sector initiatives in the target community, a concern raised by Farrington and Bebbington (1993), who remark that NGOs often transfer technology without considering the local context. They can use their positionality to implement projects they desire; for example, the wide international exposure of large NGOs can attract investors to fund the growth of modern agriculture systems (McCullough, Pingali, & Stamoulis, 2008). In this
position of power their focus on ‘doing good’ is called into question, with some arguing that NGOs are acting as corporate entities, operating in the market of service provision and fostering the spread of neo-liberalism (Bebbington et al., 2008). One of the groups they interact with is smallholder farmers, the realities of whom are discussed in the next section.

2.4 Smallholder Farming Across Sub-Saharan Africa

Smallholder farmers contribute to a large proportion of the African economy, for even though each farm has limited resources, they are numerous and therefore make the sector an attractive focus of development projects (Dixon, Tanyeri-Abur, & Wattenbach, 2004). Excluding South Africa, smallholder farming employs 62% of Africa’s population and contributes 27% of the continent’s Gross Domestic Product (GDP, Staatz & Dembele, 2007, in Livingston, Schonberger & Delaney, 2011). This aligns with Dixon et al.’s (2004) observation that smallholder farmers in developing countries produce the majority of food, employ the majority of the rural population, and provide a significant contribution to national export earnings. These results are being achieved by farms of a limited size. Livingston et al. (2011) argue that 80% of farms in Sub-Saharan Africa (SSA) are under two hectares in size. In East Africa, smallholders with farms of 1-2.5ha are responsible for upwards of 75% of the region’s agriculture production (African Development Bank Group, 2010).

2.4.1 Challenges Faced by Smallholder Farmers

Smallholder farmers in SSA, who are both significant in number and contribute to the continent’s economy, remain constrained by physical resource limitations, climate change, markets and health burdens that restrict the output and profits of crop and livestock production. The availability of natural resources is a primary concern. The World Bank 2008 World Development Report advocates the view that scarcity of land hinders growth in livestock production (2007). This obstacle is reiterated in Udo et al.’s (2011) discussion of contributors to livestock intensification; the authors describe how population growth in SSA is shrinking individual land holdings, thereby reducing grazing land for livestock and pushing animals to rely on more marginal fodder. Production on this land is limited by poor soil fertility (Hazell, Poulton, Wiggins & Dorward, 2007; Livingston et al. 2011), that remains a chronic problem because of insufficient access to purchased inputs (Dixon et al., 2004). The arising lack of fodder
impedes production, especially during the dry season; it restrains livestock productivity which is already limited by disease and poor animal genetics (Banda, 2012; McDermott, Staal, Freeman, Herrero, & Van de Steeg, 2010). Further exacerbating these local limitations are big agricultural companies who seize large tracts of land for food and biofuel production (Livingston et al., 2011; Mbilinyi, 2012). As a result, land constraints are limiting the productivity of smallholder farmers because of its poor quality as well as its decreasing availability due to land grabs.

A market for livestock products offers an incentive to overcome production barriers to create surplus (Livingston et al., 2011), but there are conflicting attitudes as to whether or not a realistic market exists for the agriculture products of smallholder farmers. Livingston et al. (2011) state that there are markets for agriculture products. But others identify insufficient markets as a barrier to the agriculture development that would decrease rural poverty (Hazell et al., 2007; Matshe, 2009; McDermott et al., 2010). One issue with expanding markets, as expressed by McDermott et al. (2010), is that most demand increases are from the growing urban middle class who expect safety standards smallholders cannot uphold. Yet in the dairy sector there is some hope as smallholder farmers are able to meet urban demand for raw milk (McDermott et al., 2010). African smallholder farmers are also given a competitive advantage as the low cost of labour, specifically the use of family labour in the dairy sector, inhibits economies of scale that in other cases could give large scale farms a competitive edge (Hazell, 2007; McDermott et al., 2010; Udo et al., 2011).

A third burden for smallholder, as well as large scale farmers across Africa is the potential consequence of climate change (Muller, Cramer, Hare, & Lotze-Campen, 2011). Muller et al. (2011) advocate the view that Africa is more susceptible to severe consequences from climate change-induced drought than any other region because the continent is already plagued by poverty, food insecurity, and a limited ability to adapt. Mushita and Thompson (2013) support this dismal outlook, agreeing with widespread speculation that increases in drought and temperatures will lower crop and livestock productivity. Quantifiable possibilities are offered in a model by Arndt, Farmer, Strzepek, & Thurlow, who predict decreases in precipitation and even limited increases in temperature between 2007 and 2050 will decrease GDP in livestock by up to 13% (2012, p. 388).

When smallholder farmers are able to navigate challenges of production, marketing and climate change, their profits are still at risk as medical expenses may eat up earnings (FAO,
The HIV/AIDS pandemic is further suppressing agriculture productivity as most HIV+ individuals work in farming, and death from the disease is reducing available labour, as well as the transmission of agriculture knowledge to the next generation (World Bank, 2007). Hazell et al. (2007) add that there is a decrease in available labour not only from reduced productivity of the sick individual but also from the time required to care for him or her. Agriculture based livelihoods also have specific health risks. For example, irrigation can increase malaria prevalence, and pesticide poisoning and zoonotic diseases (for example, avian flu) kill an estimated 355,000 people globally every year, the latter which are more likely to hit humans in close proximity to animals (World Bank, 2007). Furthermore, the limited provision of healthcare services in many rural development contexts further exacerbates these issues because of difficulty in accessing treatment. Under these burdens, smallholder farmers with natural resources and market access will be handicapped by health issues that burden their farm. To maintain a productive farming system farmers must overcome the above barriers and provide the resources necessary for livestock production. One of these critical resources, and the focus of this study, is water. Its place in smallholder farming is now described.

2.4.2 Water in Smallholder Farming

A sufficient supply of water is required to ensure farm productivity in smallholder systems (Descheemaeker, Amede, & Haileslassie, 2010; Peden, 2007). Across the continent the dominant use of water is for agriculture, most of which is for growing crops, but a small proportion is taken for livestock (FAO, 2006). Even in livestock systems, only 2% of the water required is for drinking while most of the remainder contributes to evapotranspiration in plants that become animal fodder (Peden, 2007). The small proportion of total water required for drinking is reiterated by the FAO (2006) who report that across SSA less than 0.1% of internal renewable freshwater resources are used for livestock drinking water.

Water, a critical component to livestock production, is available in highly variable amounts across SSA; some regions are heavily endowed while others often face shortages (FAO/AQUASTAT, 1995). Figure 1 illustrates this difference by depicting water availability in Tanzania, where this study took place, compared to East Africa and Sub-Saharan Africa. It illustrates that per capita water availability is less in Tanzania than averages across the continent or world but greater than the regional average. Precipitation averages in Tanzania are greater
than regional, continental or global averages. Within Tanzania there is also variability; as seen in Figure 2 the Kagera region can see precipitation of up to 2000mm/year, almost twice the national average (FAO, 2012; FAO/AIDSAT, 1995; Tanzania Chamber of Commerce Industry and Agriculture, Kagera, 2005).

**Comparative per capita water resources**

![Comparative per capita water resources](chart.png)

*Figure 1. A comparison of per capita water resources (m$^3$ per year) in Tanzania to elsewhere in the world (FAO, 2012; FAO/AIDSAT, 1995).*

Water for livestock is not often a consideration in water planning (Wilson, 2007) but as a cow is 65-70% water it is a necessity, required for quenching thirst and facilitating efficient production. Burgos et al., (2001) agree that along with supporting regular metabolic functions, water consumption facilitates feed consumption by maintaining the osmotic balance required to digest food. Regular water consumption is necessary as it is continually being lost through respiration, urine, faeces and if lactating, milk production (Little, Sansom, Manston, & Allen, 1984). If cattle are not given sufficient water supply to replace what is lost they cope by reducing their maintenance energy needs (Burgos et al., 2001). They are also reported to have decreased body weight, increased temperature and decreased quality and quantity of milk under conditions of restricted drinking water access (Little et al., 1984).
Figure 2. A comparison of average annual precipitation (mm/year) in the Kagera region to Tanzania and elsewhere in the world. (FAO, 2012; FAO/AQUASTAT, 1995; Tanzania Chamber of Commerce Industry and Agriculture, Kagera, 2005)

Though there is consensus on the importance of drinking water in livestock productivity discrepancies exist as to how much water is sufficient. Some authors quantify ideal amounts such as King (1983, in Wilson, 2007) who suggests livestock require between 20 and 50L daily per Tropical Livestock Unit (TLU, 250kg of body weight) or Peden (2007) who advises 25L daily per TLU (but notes this can vary). Others make reference to constant drinking water access, for example a study by Popescu, Borda, Diugan, Spinu, Groza, and Sandru (2013) of Romanian farmers notes they “are still not aware of the importance of providing animals with unlimited access to clean drinking water” (p.8). This suggests that livestock should have water access at all time. A case for the unlimited provision of drinking water can be made through noting the research design of scientific studies on livestock water restriction. A negative control is used in
studies to create samples that show no deviation from the regular state (Johnson & Besselsen, 2002). The use of ad lib water access as the negative control in three studies on drinking water restriction (Bond, Rumsey, & Weinland, 1976; Burgos et al., 2001; Little et al., 1984) illustrates that unlimited access is the norm.

The World Bank (2007) cites water as an obstacle to improved livestock productivity but fails to consider obstacles to water provision in areas where it is available. Other authors suggest answers to this question; for example, Manning (2008) notes that farm water supply for livestock activities can be challenged by domestic and other water needs. Bond et al. (1976) cite many reasons cattle may be deprived of water such as poor weather, mechanical failures, work schedule interruptions and time during transportation of cattle. However these authors speak from their position at a British agriculture training institute and the U.S Department of Agriculture and not from a developing country perspective, as is the focus of this study. In an Ethiopian study, the dominant constraint to water access is listed to be water availability (Amenu et al., 2013). This observation is reiterated in Tanzania’s Livestock Sector Development Strategy, which cites only water availability, caused by seasonal and geographic fluctuations, as a barrier to water provision (United Republic of Tanzania, 2010b). As British and American studies suggest, there are multiple barriers to water provision, however SSA sources cite only one. This study focuses on determining if there are multiple barriers to water provision in SSA. The focus is on dairy as dairy cows are heavily dependent on water provision for milk production and support for the dairy sector is valued as a focus for development projects that can reduce rural poverty while contributing to the economy.

2.5 Development Support for Smallholder Farmers

Agriculture development initiatives are promoted in economies characterized by low incomes and high agriculture dependency, such as Tanzania, because growth of the agricultural sector is twice as efficient at combatting hunger and poverty than as growth in other sectors (World Bank, 2007). This emphasis is reiterated by Tanzania’s current National Strategy for Growth and the Reduction of Poverty II which similarly identifies the country’s agriculture sector as a driver of growth to reduce rural poverty (United Republic of Tanzania, 2010a). Dixon et al. (2004) present examples in Uganda and Zimbabwe to demonstrate the capacity of smallholder farmers to benefit from incentives that generate economic growth, reduce poverty
and decrease food security, but these authors emphasize success is dependent on appropriate implementation as well as national and global policy. Other authors have similarly commented that low public investment and a poor policy environment are widely held responsible for maintaining the stagnant agriculture economy in SSA (Hazell et al., 2007; McDermott et al., 2010; World Bank, 2007). Challenges to implementing an agriculture development project and policy recommendations to facilitate the sector’s growth are made in chapters four and five.

As for where in the agriculture sector smallholder farmers are best positioned, Udo et al. (2011) suggest the dairy sector as it utilizes surplus family labour and cows consume low-value foodstuffs. Its potential is reiterated by the FAO (2010) who describe how smallholder dairying has advantages over industrial schemes as it contributes to employment creation throughout the food chain, improves food security for those producing the milk, and comes with limited production costs. The Tanzanian government’s interest in promoting growth of smallholder dairying is elaborated on in section 4.3 (Chapter 4).

Yet this justification for supporting the dairy sector does not consider the position of the smallholder farmers themselves, and upon closer examination, examples can be found of the disjuncture that Chambers (1983) observes between development practitioners and the rural poor in other sectors. In their study on dairy calf mortality in Tanzania, Chang’a et al. (2010) presents arguments to justify the high mortality of dairy calves arising from the inability of many farmers to adequately manage their dairy animals. For example, many farmers do not keep the cow’s pen clean, thus fostering the growth and spread of bacterial infections (Chang’a et al., 2010). Chambers (1983) provides further evidence of this disconnect in noting that not only do exotic cattle require special care to survive in tropical conditions, but the knowledge of extension workers is often inappropriate for meeting the needs of the poor in developing countries. He advises that the only households to consider exotic cattle should be those who have a high capacity to mitigate risk, as a cow is a concentrated investment that cannot be divided (Chambers, 1983). Yet despite these challenges, rearing exotic dairy cows continues to be a strategy for agriculture development.

2.5.1 Heifer-in-Trust (HIT) Projects

One response to support smallholder farmers has been the implementation of HIT projects which aim to overcome agricultural production barriers in a participatory manner. HIT
projects support a farmer to receive a dairy cow at a subsidized cost provided he or she meets a number of conditions that usually include the following: first attending a training session, possessing sufficient land, building a pen, being a permanent resident of the project area, and returning the first female offspring to the loan organization (Kabumbuli & Phelan 2003). The requirement that farmers have sufficient land holdings, build a pen and receive the animal as a loan aligns HIT projects with the second tenet of participatory development as described by Kapoor (2005), that communities take ownership of the project. To this, the implementing organizations often see HIT as a project they can set-up that, when they depart, will continue to run sustainably in the community.

As farmers are provided with training and dairy cows of high-yield potential, the HIT design overcomes the following two production constraints of smallholder farmers McDermott et al. identify: a lack of knowledge and the high cost of inputs (2010). In a similar manner HIT projects in southern Tanzania studied by Chang’a et al. (2010) identify their goal as empowering farmers with the education and assets necessary for smallholder dairy production. This recipe has proved beneficial; positive outcomes have been noted in a study of HIT projects in Uganda by Kabumbuli and Phelan (2003) who state the initiative increased use of zero-grazing systems, improved knowledge about dairying, created some employment, diversified farmer nutrition, and enhanced soil fertility through the application of manure as fertilizer. Their report deems the HIT project a success in the community (Kabumbuli & Phelan 2003).

2.5.2 Constraints to HIT Projects

Despite the potential of HIT projects to increase the productivity of smallholder farmers in a participatory manner, issues at the farm level constrain the improvement of livelihoods through outside-implemented livestock loans. Research conducted by Chang’a et al. (2010) on two communities, one of which received a HIT project in 1993, found that farmers did not apply what they had learned in training to the management of their livestock, evidenced in the high mortality rates, low body conditioning and poor nutrition amongst calves (Chang’a et al., 2010). An additional deficiency of HIT recognizes the high-yielding crossbred animals of projects do not have local disease resistance and therefore are susceptible to higher mortality rates than indigenous breeds (Mlote, Mdoe, Isinika & Mtenga, 2013; Wilson & Partners, 2008). Input provision can also be strained, in their study of HIT projects in Uganda, Kabumbuli and Phelan
(2003) identify 30% of farmers are more than half a kilometer from the water source and in the dry season many face constraints in collecting enough grass. This thesis discusses a further constraint observed at recipient farms of a HIT project, namely barriers in the provision of drinking water that include, and go beyond, distance to the water source. The repeated iterations of farm level challenges by recipients of HIT dairy cows suggests that the disconnect between development practitioners and their intended beneficiaries continues.

2.6 Conclusion

This chapter began by explaining that despite the intentions of development practitioners to create projects to reduce poverty, outcomes are often hindered by practitioners’ inadequate knowledge of the beneficiary community. In response to this, the institution of participatory development approaches intends to place more value on the knowledge of and ownership by project beneficiaries, but challenges remain in the implementation of this ideal. Non-governmental organizations are eager to step in and offer support for smallholders and are seen as appropriate actors for supporting smallholder farmers. Within the smallholder sector one area of focus has been dairy farmers, and support to them has often come through increasing the number of cows available with a HIT project model. However, as illustrated in poor management of the loan cows, NGOs are continuing to reiterate the disconnect between their ideas and the realities of beneficiaries. The following chapter will describe research designed to probe at the underlying gaps in one element of livestock management, the provision of drinking water, amongst HIT recipient farmers.

CHAPTER THREE: PROJECT CONTEXT AND METHODOLOGY

3.1 Introduction

The last chapter described the participatory approach valued in many development projects, including those run by non-governmental organizations (NGOs) but is under critique for its inability to meet beneficiary needs. Smallholder farmers are still facing many challenges related to production and marketing. This chapter details how the research was executed to identify the conditions of smallholder farmers in Tanzania, specifically looking at the challenges that one group of farmers, recipients of a HIT project, face in providing their dairy cows with unlimited access to drinking water. It begins by providing an overview of the Kagera region in northwestern Tanzania, an area of widespread agriculture production and rural poverty, where
data was collected. Following this is an outline of the research design with details on how the research sample was selected as well as how data was collected and analyzed, justifying the use of interviews, a focus group and review of the literature to collect the necessary information. Following this is a summary of the research limitations to affirm that despite limitations of a student researcher collecting data in a foreign environment, challenges in the language barrier and data collection logistics, the study is valid.

3.2 Case Study Location: Kagera Region, Tanzania

This study was undertaken in the Kagera Region of northwestern Tanzania. The region is bordered by Burundi and Rwanda to the west, Uganda to the north, Lake Victoria to the east and the Tanzanian regions of Mwanza, Shinyanga and Kigoma to the south (see Figure 3). According to the 2012 Population and Housing Census the region is home to 2.5 million people and the average household size is 4.7 (National Bureau of Statistics & Office of Chief Government Statistician, 2013). The dominant ethnic group is the Haya (Smith, 2001). Kagera is one of the poorest regions in the country, with 73% of the population classified as being in multidimensional poverty, and it is 14th of 21 districts on the Tanzanian mainland in this ranking (Oxford Poverty and Human Development Initiative, 2013). The region’s 2010 per capita GDP, at just over 490,000Tshs (approximately $330USD), places it 19th on the mainland (National Bureau of Statistics, 2012). It suffers from poor transportation networks both within the region and to the country’s largest city, Dar es Salaam (Smith, 2001). Additional challenges exist from a lack of regional communication networks as well as limited communication with the national government (Smith, 2001).
The area is well suited to numerous types of crop and livestock production. Rivers and springs flow through the region and there are a number of lakes (Tanzania Chamber of Commerce Industry and Agriculture, Kagera, 2005). The climate is defined by rainfall ranging from 500-2000mm per annum, and average temperatures of 20-28°C, making it suitable for numerous agricultural activities (National Sample Census of Agriculture, 2012). Bananas are a staple food and are intercropped with other food and cash crops, including corn, beans and coffee as well as a variety of vegetables (Yamaguchi & Araki, 2004). Eighty-five percent of households are engaged in crop production, livestock production or fishing, a proportion greater than all other regions in the country (National Bureau of Statistics Tanzania, 2002). The main types of livestock in Kagera are chickens, goats, sheep, pigs and cattle (National Sample Census of Agriculture, 2012).
Cattle rearing trends in the region show general increases in both the number of animals and the percentage of dairy cows as a total of all cattle kept. Between 1994/1995 and 2007/2008 there was an annual growth rate of 10% in the number of cattle in the region (National Sample Census of Agriculture, 2012). In the same period the number of dairy cattle in Kagera also grew by 3.2% annually from 16,947 animals in 1995 to 23,992 in 2008. Dairy cattle are a small but growing proportion of total cattle; in 2003 they made for 2% of all cattle in the region and by 2008 the proportion had increased by half to 3% (National Sample Census of Agriculture, 2012).

It is in this context that selected farmers from the community of Kamachumu, Kagera received dairy cow loans, to jumpstart their dairy production enterprises as a way to contribute to economic development. The present study seeks to understand why many beneficiary farmers in this program do not provide their dairy cows with unlimited access to drinking water, an important contributor to livestock productivity.

3.3 Research Design

This research incorporates a mixed methods approach for data collection and analysis, to discern attitudes towards dairy management in the case study community. Mixed methods permit the incorporation of quantitative and qualitative data to widen audience understanding of the topic (Creswell, 2009). Its focus is on developing and understanding links between approaches, using triangulation\(^1\) to compare and contrast the data to increase the accuracy of findings (Denscombe, 2007). The first stage incorporated preliminary visits to many KAVIPE members with active loans as part of regularly scheduled work with the organization. This interaction helped inform the questions asked during interviews and the focus group.

3.3.1 Sampling Strategy.

Multiple sampling strategies were employed to collect a variety of responses within the limitations of the research environment. KAVIPE member farmers with outstanding dairy loans constituted the core group of research participants. They were selected because the researcher was undertaking other work with this group before and during the study. These cows were not lactating (being milked) at the time of the study, but are still able to provide a representative

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\(^1\) Using multiple methods and/or various actors to gain more than one perspective on the same topic to improve the accuracy of understanding of that topic (Descombe, 2007).
sample of how dairy cows are being managed by farmers in the study community. Descombe (2007) justifies such convenience sampling as it can be easier to gain access to research subjects, cheaper, and within resource and time limits.

An element of random sampling was incorporated as it contributes to a more representative sample of the population (Creswell, 2009). The four administrative wards of the Kamachumu division were listed in an online randomizer and the top three results were chosen as locations for data collection. It was more convenient to limit interviews to certain wards in order to reduce transport times between selected farmers. All active program farmers in the first two wards were then randomized and the first ten were approached for an interview. If a farmer was not available or declined to be interviewed, then the next farmer on the randomized list was approached. In the first ward, two of the selected farmers no longer had cows and a third farmer was repeatedly unavailable. In their place the 11th and 12th listed farmers were interviewed, providing a total of nine interviews from farmers in this ward. In the second ward, located further from the KAVIPE office, two farmers could not be visited because the rainy season had washed out a bridge (See Figure 4) and time constraints prohibited additional farmers from being approached. As a result, a total of 17 interviews were conducted with current farmers in the KAVIPE HIT project. The ward that was listed third was chosen as the site of the focus group. The dates of upcoming farmers’ meetings in this area were obtained and one group with an accessible meeting time was chosen, out of convenience, to be the focus group.

The mixed methods design permits information gained from one method to be used to inform the selection of additional samples (Descombe, 2007). Thus, during the interviews of current HIT recipients at KAVIPE the names of two community leaders were mentioned as sources of knowledge on livestock management. These two individuals, the division Agriculture Extension Officer (AEO) and the chairperson of a local farmer’s group, were interviewed as key informants. As people tend to follow those who are in positions of authority (Cialdini, 2009) the perception of these leaders could offer useful suggestions as to why recipient farmers think the way they do regarding livestock drinking water availability.
3.3.2 Data Collection

This research incorporates four different methods to gather qualitative and quantitative data. Participant observation, interviews, a focus group, and review of the literature were undertaken to gain an understanding of KAVIPE farmers’ dairy management choices regarding drinking water for their cows. The first method, participant observation, was utilized as it emphasizes understanding of a situation while maintaining a natural environment (Descombe, 2007). Regular visits to farmers during the researcher’s co-op placement at KAVIPE became primary visits in the study. These visits always included accompaniment by a KAVIPE board member or a community volunteer. Visits were made to 71 of the 95 farmers on KAVIPE’s records. Time and resource constraints, as well as the priorities of the KAVIPE chairperson prevented visits to all the 95 farmers. Notes were taken on the availability of food and water as well as the condition of the animal and its pen. The notes were written on paper and then transferred to a computer spreadsheet at the end of the day. This participant observation provided insight into what was really happening at the farm level (Descombe, 2007).
The second form of data collection, interviews, occurred after most of the field notes had been taken. Interviews were considered relevant as they have been used in the past involving research with farmer perceptions such as Winter et al.’s (2007) study on landholder attitudes towards plant conservation. Semi-structured interviews were employed to have an open conversation with participants and listen to their opinions and experiences. This unobtrusive method placed heavy emphasis on the interviewee’s own thoughts (Denscombe, 2007). The semi-structured format allowed exploration of the topic to a greater depth than if a more formal interview structure had been used (Dolphin, 2007). Interview questions were translated by one KAVIPE volunteer and back-translated by a second KAVIPE volunteer to ensure the translation was appropriate (see Appendix 1). Confidentiality was assured and verbal consent was obtained from respondents before the interview began (see Appendix 2). Written notes and audio recordings were made during each of the 19 interviews (17 farmers, one farmer group chairperson and one AEO).

The third set of data was collected from a focus group, conducted at a dairy group meeting with 21 farmers in attendance. Time constraints prevented meetings with additional groups. A focus groups was used for it permits “group dynamics to help the researcher capture shared lived experiences” (Liamputtong, 2011, p.4). Whereas interviews provided the specific thoughts of an individual, focus groups allow the consensus, or varied opinions, of a group to be captured (Liamputtong, 2011). This was important for the present research because it was exploring the variety of social and economic conditions under which KAVIPE farmers make decisions about drinking water availability for their dairy cows. Similar to the individual interviews, confidentiality was assured and verbal consent was obtained prior to any questions being asked as part of the focus group. An audio recording was made and notes were collected during the discussion.

Finally, analysis and critical review of secondary sources was incorporated to create an understanding of what already exists on the topic (Descombe, 2007). Government documents, a project report, books, journal articles and publications by international organizations were reviewed for this component.

Using a combination of data collection procedures, as was done here, is a common in case studies (Stake, 1995 in Creswell, 2009). This data was analyzed to understand the farming styles amongst KAVIPE HIT beneficiaries and uncover trends in their livestock management
choices, especially related to water provision. The connection between the research objectives and data collection is illustrated in Table 1.

Table 1. Layout of how different data sources were used to support the study objectives

<table>
<thead>
<tr>
<th>Objective (from section 1.1 [Chapter 1])</th>
<th>Data Collected to Support Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>To review the context and background of smallholder farming in Tanzania; particularly social, economic and policy dynamics of dairy farming in general, as well as in the Kagera region</td>
<td>Literature review incorporating academic articles, books, government documents, and NGO and multilateral reports</td>
</tr>
<tr>
<td>To explore the social and economic conditions under which farmers do or do not provide their dairy cows with unlimited access to drinking water</td>
<td>Interviews with current recipients of HIT loan dairy cows, the chairperson of a farmer’s group, and the division AEO; focus group with current dairy farmers including HIT recipients</td>
</tr>
<tr>
<td>To present and discuss implications of this study for policy and research.</td>
<td>Trends emerging from answers to the first two objectives</td>
</tr>
</tbody>
</table>

3.3.3 Data Analysis.

Data from all sources were compiled and analyzed. The first step of data analysis was transcription of the interview and focus group audio files. These transcriptions along with the primary visit notes were then coded using the software TAMS Analyzer. Codes were categorized to identify frequencies and relationships (Descombe, 2007). The objective was to identify key concepts in attitudes towards livestock management, specifically water provision, that emerged from the primary visits, interviews and focus group. These concepts were then mapped to create the foundations for conclusions and synthesized with secondary literature sources to identify common themes and potential new insights (Descombe, 2007).

3.4 Limitations.

This thesis was submitted during the final year of a Bachelor of Science degree at the University of Toronto Scarborough. As an undergraduate student limited research experience
may have limited the depth of the study. Upon returning to Canada many questions emerged that were not asked during the research process. Data was collected during a 12-month co-op placement in Tanzania, and it was supported by the partner organization KAVIPE who allowed use of the organization’s motorcycle and a volunteer who was driver to the case study area and translator during the data collection process. The scope of the study was possibly limited by the motorcycle and volunteer availability. Interviews were limited in scale, as they only included smallholder farmers who are KAVIPE members. However, despite these parameters a valid case study can be used to represent a more general population (Descombe, 2007).

The depth of interviews may have been limited by the researcher’s positionality as a young Canadian student. This outsider status may have influenced respondents to say what they thought would be impressive, but alternatively it may have allowed them to be more honest in their responses. The language barrier may have reduced the detail and understanding available for the questions. Interviews were in a mix of Swahili and Kihaya, translated to English by the volunteer during the interview or by a second volunteer or the researcher during the transcription phase (both volunteers signed a confidentiality agreement, as provided in Appendix 3). It is possible these translations did not capture the full meaning of the respondent’s answer due to limitations in knowledge of the language. Despite these challenges, the use of triangulation permits data from different sources to be validated (Descombe, 2007). For example, in one interview a farmer reported providing the dairy cow with drinking water access at all times. However, upon visiting the pen it was observed that water was not available and so follow-up questions were asked. In such cases the mixed methods approach contributed to increased data validity. The listed nuances undoubtedly influenced data collection but it is thought these limitations are not significant enough to refute the results of the study.

3.5 Conclusion

This chapter outlined specifics of the research context and design. A socio-economic profile of the Kagera Region where data collection occurred gives insight on the research locale. The dominance of agriculture as a main livelihood along with increasing numbers of dairy cattle makes Kagera an appropriate setting to study why farmers do or do not provide their cattle with unlimited access to drinking water. The latter part of this chapter detailed the specifics of sampling, data collection and analysis incorporated to address the research problem. Finally,
limitations of the study were discussed. In the following chapter, the results of this research process are presented.
CHAPTER FOUR: FINDINGS

4.1 Introduction
This chapter discusses the results of the research whose wider context and methodology are presented in earlier chapters of this thesis. Following this introduction, the second section begins by providing a background of smallholder farming in Tanzania, with a specific focus on smallholder dairy farming. Next, in section three, is an overview of the country’s livestock development policies of the past forty years; honing in on milk production as a means to contribute to the national economy, as well as decrease rural poverty. One approach to meeting this goal has been the establishment of Heifer-in-Trust (HIT) projects to increase the number of crossbred, high-yielding dairy cows in rural areas. Yet as discussed in this chapter, both livestock development policies and HIT projects have been met with numerous challenges not anticipated by the Tanzanian government of development non-governmental organizations (NGOs).

Amidst these challenges, small-scale livestock development projects continue with both government and NGO support. As presented in section four, one example is in the study community of Kamachumu where the international NGO World Vision established a HIT project in 2008 through the provision of dairy cows and training to new farmers. Since World Vision left the community in 2010, volunteer community members have maintained the HIT project through the organization Kamachumu Vision for Poverty Eradication (KAVIPE). Yet at the time of this study, many farmers were observed to face barriers in the management of their dairy production enterprises, specifically with 76% of farmers failing to provide their cows with adequate drinking water. The specific challenges identified by farmers as to why they fail to provide their cows with unlimited access to drinking water are discussed in section five. Thus, this chapter focuses on the context and specific conditions under which recipient farmers of a HIT project in Kamachumu do or do not provide unlimited drinking water access for their dairy cows.

4.2 Smallholder Livestock Production in Tanzania
This section unpacks the context and background of smallholder farming in Tanzania, to respond to the first objective on this study: to create an understanding of the economic, social and policy dynamics of dairy farming nationally and in the Kagera region (See Chapter 1, Section 3). In 2010 livestock production contributed to 3.8% of Tanzania’s National Gross Domestic Product (GDP, United Republic of Tanzania, 2011). Between 37% (United Republic
of Tanzania, 2011) and 60% (Covarrubias, Nsiima, & Zezza, 2012) of rural households are said to rely on livestock production for a significant portion of their household income. The value of livestock is rooted in their provision of food products, value storage, income and employment, hides and other by-products, manure as fertilizer, draught power and cultural significance (Smith, 2001; United Republic of Tanzania, 2006).

The most common livestock type, by weight, is cattle, which are raised in production systems that vary with local climatic and agricultural conditions (Mlote, et al., 2013; United Republic of Tanzania, 2011). Over 90% of cattle are indigenous breeds (United Republic of Tanzania, 2010b) kept in pastoralist and agro-pastoralist systems where they are herded across open pastureland and graze for food (Mlote et al., 2013). The pastoralist system dominates the northern plains (Mlote et al., 2013) with some use in the central and western regions where rainfall is low and soil is largely unsuitable for crop production (United Republic of Tanzania, 2010b). Agro-pastoralism, which mixes pastoral livestock and horticulture production, is widespread elsewhere in the country (Mlote et al., 2013; United Republic of Tanzania, 2010b). Currently there is growing interest in a third system, zero-graze, where cattle, predominantly exotic or cross-bred dairy cows, are kept in pens (Swai, Karimuribo & Kambarage, 2010). The increasing use of zero-graze supports Udo et al.’s (2011) observation that a growing demand for livestock products is propelling changes to livestock production systems. The zero-graze system is present in the Kagera region, where this study is located, as well as the Northern and Southern highlands and in the vicinity of major urban centers (Chang’a et al., 2010; Kelsall & Mercer, 2003; Sumberg & Lankoande, 2013; United Republic of Tanzania, 2010b).

Zero-graze livestock rearing is encouraged because its design is well suited to the goals of increased production and reduced rural poverty rates promoted by development initiatives that will be discussed in the next section. In the Kagera region overgrazing by cattle herds has been observed to damage pasture lands; alternatively, in zero-graze systems animals are kept in pens with all their needs provided by the farmer (Smith, 2001). This system prevents overgrazing, reduces disease transmission and creates unemployment, making it a popular and ecologically sound alternative to more extensive pastoral and agro-pastoral systems (Smith, 2001). Zero-graze systems are particularly widespread in smallholder dairying; a study by Swai et al. (2010) in two regions of Tanzania report 89% of these farmers are keeping their cows in this way.
Smallholder dairy farmers are increasingly incorporating exotic dairy cows into their production systems because of the higher yield potential of these breeds (Swai et al., 2010). This statement is supported by the Government of Tanzania’s description of common breeds in dairy being a mix between indigenous breeds such as Tanzanian Shorthorn Zebu or Boran, selected for their suitability to the local area, and the exotic dairy breeds of Friesian, Jersey or Ayrshire, chosen for their yield potential (United Republic of Tanzania, 2011). Despite these crossbreds contributing less than 10% of total cattle in Tanzania, they contribute to 40% of milk production, most of which comes from smallholders dispersed across rural areas (United Republic of Tanzania, 2011). Thus, as this section explains, zero-graze dairy systems incorporating exotic breeds are constituting a growing share of cattle production in Tanzania, a sector dominated by indigenous livestock in pastoral and agro-pastoral systems. The following section explores public policies that contribute to a growing number of Tanzanian smallholders raising dairy cows in zero-graze systems.

4.3 Policy background

The Tanzanian government has long promoted crossbred dairy cows to facilitate national economic growth and reduce rural poverty rates. Tanzania’s Development Plan 1975-1980 includes a goal of national milk self-sufficiency where in-country production would meet domestic demand (Kurwijila, 2002). In the Kagera region this led to the opening of the Kikulula Heifer Breeding Unit (HUB) in 1976, to produce crossbred dairy cows with higher yield potentials than indigenous breeds (Covarrubias et al., 2012). Yet, high mortality rates meant the breeding ranch itself was not sufficient to meet the goals of greater domestic production, and marketing the cows to economically wealthier families did not directly support the rural poor (Covarrubias et al., 2012). The government’s perception that by simply providing dairy cows they would stimulate development did not consider the additional investment required to manage the cows so benefit could be derived. This limitation is recognized by McDermott et al. (2010) who pinpoint appropriate policy and development initiatives as crucial factors to ensuring smallholder farmers are able to meet growing demands for livestock products (italics added). During the 1980s these challenges in dairy production were responded to through implementing extension services to advise on livestock management and health, a seminar course at Kikulula to train farmers, and a government-sponsored HIT project to increase the accessibility of dairy
cows to the rural poor (Covarrubias et al., 2012). Government-sponsored extension services, the Kikulula ranch, and HIT projects continue to be in existence in the Kagera region at the time of this research.

Tanzanian livestock policy today continues to focus on increasing the number of productive smallholder dairy farmers as a means to meet domestic milk demand and reduce rural poverty, as stated in the country’s National Livestock Policy (United Republic of Tanzania, 2006). Targets within this goal are written in the country’s current Livestock Sector Development Programme, guiding the sector’s development from 2011 to 2016 with dairy-related objectives that include increasing genetic quality, building the capacity of extension services and farmers groups, and promoting the production of high quality animal feeds and feed additives (United Republic of Tanzania, 2011). These objectives tie into the wider Second National Strategy for Growth and the Reduction of Poverty’s (NSGRP II) identification of the agriculture sector as a driver of national growth (United Republic of Tanzania, 2010a). To achieve this, the Livestock Sector Development Programme states the reach of the public sector is limited and private sector support, including that from NGOs and Community Based Organizations (CBOs), is called on to foster growth of the livestock sector (United Republic of Tanzania, 2011). This strategy is supported by McDermott et al. (2010) who agree that increased public and private investment in smallholder livestock systems would reduce the incidence of poverty amongst these farmers worldwide. The planned trajectory for Tanzanian smallholder dairying, as outlined in the National Livestock Policy and Livestock Sector Development Programme, spells out where investment should be applied to increase dairy production and reduce rural poverty rates.

Despite decades of agricultural development initiatives, Tanzania still struggles to achieve its policy goals in the smallholder dairying sector. According to Swai and Karimuribo (2011) the sector has seen annual growth rates of six percent in recent years, but milk production remains unable to meet domestic demand, one of the earliest goals of Tanzanian dairy development. In Swai et al.’s (2010) research on smallholder dairying in central and northeast Tanzania they find milk demand continuing to exceed production, suggesting milk production remains insufficient. However this finding is contrasted by Nkya et al. (2007) who report that in northeast Tanzania the primary constraints of smallholder farmers are poor markets and prices for their milk. They also find production is limited with average daily yields of 5-7L below the
local target of 12L (Nkya et al., 2007). These limitations align with the challenges production and marketing identified as barriers to smallholder farmers in section 2.4.1(Chapter 2). These problems as they exist in Tanzania are not being solved by increasing the number of dairy cows.

To emphasize the poor results of Tanzanian agriculture policy Swai and Karimuribo (2011) highlight the following shortcomings of dairy sector development: inadequate infrastructure failing to connect farmers to markets, a limited supply of dairy cattle, poor animal health and insufficient access to high-quality feeds. Furthermore, high mortality rates in exotic dairy cows of 8.5 to 14.2 per 100 animal years (Swai et al., 2010) suggest this issue, noted since the Kikulula HBU first opened in 1976, has still not been resolved. This section describes how Tanzanian livestock policies, and subsequent investments, have promoted expansion of the country’s smallholder dairying sector but self-sufficiency in milk production remains elusive. This thesis explores one factor in dairy production, the provision of drinking water, as a case study to why dairy cows may not be receiving sufficient inputs to be productive. The following section contextualizes the research by providing background on the case study community.

4.4 Case Study of the organization KAVIPE in the Kamachumu Community

The division of Kamachumu in the Muleba district of Kagera is heavily reliant on agriculture, similar to elsewhere in the division and region (Economic and Social Research Foundation, 2005). The only industrial activity in the community is a mid-size water bottling plant employing approximately 100 people. Farmers who participated in this research were all observed to be growing crops, in addition to raising livestock, with some also engaged in small agricultural businesses such as selling tomatoes or sugarcane. In the Muleba district, where the Kamachumu division is located, 7% of cattle (4,000 head) are improved dairy varieties distributed amongst 3,000 households. (United Republic of Tanzania, 2012).

Livestock owners are able to receive support from the government-sponsored division Agriculture Extension Officer (AEO) or Ward AEOs who are educated in livestock management and health. The role of the division AEO includes advising and medicating sick animals, administering artificial insemination, and providing vaccines. The division AEO is also a member of the Kamachumu Livestock Development Programme (KALIDEP), a government-run HIT project in Kamachumu. Previously, the salary and transportation costs of the division AEO were provided by the district government, with support of international aid agencies. However,
during the time of this research only the salary of the AEO was being provided by the government, with farmers having to pay fuel costs for the AEO’s visits, thereby limiting extension services to only those who could afford it. Despite this limitation, the AEO continues to be respected by all farmers, and is called upon when finances permit or the severity of the situation requires his input.

In addition to government support for livestock, the Kamachumu community has also been the recipient of NGO development programs, the most notable of which is World Vision. From 1995-2010 they ran an ‘Area Development Program’ (ADP) with specific programs in education, agriculture, health, water and sanitation, Christian commitments, sponsorship and program management (World Vision, 2010). Community members explain that agriculture support was distributed on the condition that they first self-organized into CBOs of 10 or more members that were focused on a specific activity, such as dairy cow rearing or banana production. Support for agriculture was primarily distributed through training and inputs, such as livestock and fertilizer. One such dairy group became the focus group for this study. Livestock-in-trust schemes distributed chickens, goats and dairy cattle to area residents, with the provision of dairy cows through a HIT project being the most common. Figure 5 illustrates a HIT recipient farmer and her dairy cow in the zero-graze system required by the project. World Vision saw these projects as sustainable socio-economic development activities that could improve the quality of life in Kamachumu division (World Vision, 2010).

The timing of this study in 2013, three years after the international NGO stepped away from the community, decreases potential skewing from residual World Vision activities. Before closing the ADP in 2010, World Vision established KAVIPE to maintain what they had started. In 2013, KAVIPE no longer received funds from World Vision and was being run by five board members (3 male and 2 female) who were voluntarily maintaining the organization. From October 2011 until present (April 2014) a VSO volunteer has been present at the organization in the role of “Livestock and Business Development Advisor”, providing advice, but limited funding, towards KAVIPE’s HIT project. The limited time and finances of the KAVIPE board is predominantly spent maintaining the livestock loan program, specifically dairy cows through the HIT project. Within these limitations the HIT project continues and loans do get repaid.
4.4.1 KAVIPE HIT Project

During fieldwork for this study, the HIT project implemented by the ADP and transferred to KAVIPE in 2010 was observed to run as follows: If farmers were interested in becoming members, they vocalize their intent to a KAVIPE board member, their name is taken and they are asked to pay a sum of 100,000 Tanzanian shillings ($67CAD, which is approximately 20% of the market value of a dairy cow). Periodically KAVIPE organizes 5-day training seminars in conjunction with KALIDEP for new farmers before they receive their cow. The division AEO leads this training that prospective farmers are required to attend. Topics follow the book *Utunzaji Bora wa Ng’ombe wa Maziwa* (KALIDEP, 1997) that, in the national language of Swahili, details cattle breeds, pen structure, calving, food, nutrition and other issues relevant to rearing livestock. When a farmer has made a cash down payment and a female calf is available, a KAVIPE board member arranges the transfer of the calf to its new farm. These cows are all crossbred animals, a mix of indigenous and exotic cow genes. Once the loan cow has a female calf of six months of age the farmer is to contact KAVIPE, at which time the organization
contacts the next farmer on its list and the loan is turned over. This process aligns with Kapoor’s (2005) second tenet of participation, that the community takes ownership of the development project. However Kapoor’s first tenet of participatory processes, that the views of beneficiaries are incorporated into the project, (2005) is not met, as KAVIPE’s annual general meetings, as mandated by its constitution, are not occurring due to a lack of funds. In this way the HIT project continues in Kamachumu, lacking a space for participatory dialogue with beneficiaries.

The structure of this program is similar to HIT projects established in other regions of Tanzania. Kelsall and Mercer (2003) report on a World Vision-initiated HIT project in northeastern Tanzania that had been previously exposed to the HIT structure from the presence of the NGO Heifer Project International. In this community farmers are given two weeks of training; unlike in Kamachumu, they are required to repay the loan with the first two (not one) female offspring (Kelsall & Mercer, 2003). A study on the implementation of this project is used by Kelsall and Mercer (2003) to argue that World Vision failed to succeed in this community. For example, on paper cows are for people who cannot afford to buy their own, yet in practice the animals are often given to community elites who already own one or more dairy cows; therefore there are feelings of resentment in the community (Kelsall & Mercer, 2003). Through this study it is known that World Vision Tanzania has initiated HIT projects elsewhere, but this project has a problem, namely its preference for less-poor farmers to be beneficiaries. It describes how HIT projects are being implemented elsewhere in Tanzania by both World Vision and, in this community, Heifer Project International, but the study focus is on challenges at the organizational level whereas this study focuses on barriers at the farm level.

A major issue in the achievement of dairy development through HIT projects is recognizing, as Sumberg and Lankoande (2013) describe in their assessment of such projects in Tanzania and Ethiopia, that the provision of a dairy cow is a necessary step to making a farmer a milk producer, but is itself insufficient to improve the livelihood of the beneficiary. The recipient requires knowledge of livestock management and the agency to supply inputs including food, water and shed materials to reap the cow’s benefit (Banda, 2012; Sumberg & Lankoande, 2013). Veterinary services, if available, can be prohibitively expensive (Kabumbuli & Phelan 2003). Ultimately, a heifer placed where it cannot receive adequate support is more a liability than an asset (Sumberg & Lankoande, 2013). These limitations add up to suggest that the benefit to the farmer and the success of the project will be limited if the farmer does not have the means or
motivation to fully provide for his or her cow. The study in this thesis on drinking water provision is fitting as it contributes to a better understanding of why farmers may not be proving one of their cow’s many needs.

Rearing a dairy cow may still prove beneficial even if milk marketability is low. One of the main benefits of rearing cattle in the Kagera region, as articulated by Smith (2001), is the contribution of manure to increasing local soil fertility. Furthermore, owning a dairy cow is valued for its social prestige as well as the nutritional value of family milk consumption (Smith, 2001). These benefits suggest the promotion of smallholder dairying may be justified in the Kagera region even if milk cannot be marketed; however, this discounts the potential for greater economic gains through milk commercialization.

Yet it is unlikely that World Vision was aware of these realities as it implemented the Kamachumu HIT project at their ADP in 2008 as they did not first test it through a pilot (personal correspondence with World Vision staff member, October 30, 2013). The decision to start a program with little or no solid situational analysis mirrors Bebbington et al.’s (2008) observation that donors have a preference for funding activities over research. World Vision’s (2010) final report on their activities in the ADP highlights measured results that include “222 farmers were trained on improved methods of livestock keeping” and “106 farmers were supported with dairy cows” (p. 7). This exemplifies the tendency of NGOs to focus on achieving measurable results (Bebbington et al., 2008). Yet these numbers are not able to capture the specific contributions of smallholder dairying or challenges faced by farmers in maintaining HIT systems.

4.4.2 Dairy Farming by KAVIPE Beneficiaries

Norms amongst current HIT beneficiaries at KAVIPE reflect their position as rural smallholder farmers in a climatic zone suitable for numerous types of agriculture. Respondent farmers started raising dairy cows as far back as 1998, and as recent as 2013, the year this study was conducted. Most respondent farmers (11 out of 18) began dairy farming since 2010, the year World Vision transferred its livestock loan program to KAVIPE. Raising livestock fits in with the subsistence agriculture activities widely practiced. Respondents say it is rare that they are away from their cow for more than 6 hours, and that during their absence another member of the family is often available to provide for the cow. Thus, the rearing of the KAVIPE loan dairy cow
is a communal affair for all respondents, with their spouse and, for 13 of the 18 current recipients interviewed, between one and four children contributing to meeting the needs of the loan cow.

Understanding the lived experiences of HIT beneficiaries is important for pinpointing how the program can succeed. The provision of dairy cows is a necessary but not sufficient factor to increase milk production and reduce rural poverty rates, which are the goals of government policy related to increasing the number of crossbred dairy cows. As success in the early years of the Kikulula HBU was limited by high cow mortality and inefficient distribution systems, the success of this HIT project in Kamachumu is restrained by the additional investments required to fully activate the benefits of dairy cows. Limiting the number of cattle per recipient would increase the likelihood farmers would have the time and resources to provide for the loan animal. KAVIPE only officially permits one adult animal to be kept, in addition to the loan cow, along with any male offspring produced before the birth of a female replacement heifer. During field visits, two farmers were found to be keeping additional cattle, demonstrating this rule was not being enforced. At KAVIPE, board members do make intermittent visits to farmers in the program to offer advice and give warnings. However, time constraints of the volunteer board members and a lack of transportation funds prevent regular follow-up that could encourage farmers to quickly repay the loan. Furthermore, there appears to be no set system or documentation by the board members of their farm visits. Therefore, it is difficult to monitor changes or provide appropriate follow-up that would ensure the cow was managed in a way to ensure its productivity.

Loan animals are all kept in a zero-graze system which requires the farmer to bring it food, water, medicine and minerals among other needs. However, various barriers exist to the farmer’s provision of these needs, as will be demonstrated through this study of water provision. Repayment is imperfect, as the death of cows on loan decreases the number of active farmers in the program. From the 106 cows recorded by World Vision in 2010, there were 95 active loans in 2012, and by July 2013 a further four of these animals had died. If the animal died due to poor management by the farmer, he or she is expected to purchase a replacement animal but no evidence could be found of this occurring. The HIT project at KAVIPE continues but investments by KAVIPE and individual farmers that could improve repayment rates and animal health are weak. The best opportunity for KAVIPE to disseminate information to HIT recipients is at the mandatory training sessions, which are discussed in the next section.
4.4.3 Training for New HIT Recipients

The mandatory training session for new farmers is to prepare them to raise a crossbred dairy cow in a zero-graze system. All interviewed farmers reported that they or their spouse have attended a formal seminar on livestock rearing. Many received this education specifically at KAVIPE-organized seminars led by the division AEO and often attended by a local ward AEO. One farmer noted attendance by both the division and ward AEOs. A former Voluntary Service Overseas (VSO) volunteer reported that the seminar in January 2012 was five days, four of which were in a classroom setting and included sessions that were up to two hours long (Personal communication with Margaret Graves, January 6, 2013). For a few farmers training was delivered in other locations in the region offering specific courses of between three days and three weeks duration. The training provided the basics of livestock rearing, as one farmer reports, “They showed us how to feed it, how to wash it, and how to provide it with water and food.”

For the two respondents whose husbands attended the training, they report learning how to care for the cow from their spouses. Yet the chairperson of a farmer’s group stated that there is a difference in knowledge between himself, who attended the training, and his family, who did not. This farmer emphasized how he was the bearer of information; stating, “If I am not around she (the cow) gets water only once a day, for it is I who have learned about providing unlimited drinking water for the cow.” Though knowledge transfer within the recipient household cannot be assured, at least one member of the family has received formal education on livestock rearing.

In addition to attending formal trainings, a few of the farmers also report learning from informal visits by the AEOs in their area. One farmer in the Bulyakashaju ward notes, “A friend of mine was a livestock officer and he taught me.” In the Ibuga ward, a farmer had similar sentiments, noting, “My neighbour is a retired livestock and agriculture officer who normally comes here every now and then to give me training and advice.” More formal information sessions after the required HIT training are described by one Ibuga farmer to have only occurred

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2 Male farmer. Ibuga ward. Interview May 23, 2013
3 Male farmer. Ibuga ward. Interview May 24, 2013
4 Female farmer. Buyakashaju ward. Interviewed May 29, 2013
5 Female farmer. Buyakashaju ward. Interviewed May 29, 2013
6 Interview June 24, 2013
7 Ibid.
9 Female farmer. Ibuga ward. Interview June 24, 2013
in the past: “Formerly, when people were going to group meetings and talking about cattle keeping, they were met with the AEOs who presented workshops reminding them on what they learnt previously but now that procedure has changed.” The AEOs continue to be present in the community but as this respondent described, they were now less active. This aligns with the decrease in government funding to support AEOs as their transportation costs are no longer provided by the government. These three farmers who reported follow-up knowledge transfer from an AEO also cited their understanding of the importance of unlimited drinking water access. Knowledge from an AEO outside of the formal HIT training is a valuable educational source for recipient farmers.

For some HIT recipient farmers, advice comes from outside the required seminar or visits by the AEO. One interviewee reported the chairperson of his farmer’s group as a source of advice: “He is the first person I go to for advice on rearing cattle. If you are stuck somewhere you ask him.” A second explained that, “My group members are giving me advice and VSO is also giving advice.” These farmers identified how they learn from those around them but the quality of this knowledge can vary no matter what source it is from as not everyone is aware of the importance of ad lib drinking water access for dairy cows.

Though the majority of farmers were observed to not provide their dairy cows with unlimited access to drinking water, it remains important to consider the one case where a farmer does make this happen. First, the water source was closer for this female farmer than most of the interview respondents. Furthermore, she did not report being away from her cow for long periods of time. Caring for the cow was a family activity as her husband and four children all contributed. Yet as this thesis is focusing on what is not supposed to happen, namely a widespread lack of ad lib water provision, the other cases will now be the focus.

4.5 Barriers to Water Provision for Dairy Cows

To understand what barriers are faced in the provision of ad lib water access for dairy cows farmers were asked, “What prevents you from providing your cow with unlimited access to drinking water?” This question was inspired by the observation on field visits that 76% of active KAVIPE farmers did not have water nor were water troughs present at the time of the visit (See

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10 Female farmer. Ibuga ward. Interview May 24, 2013
11 Male farmer. Ibuga ward. Interview June 24, 2013
12 Female farmer. Ibuga ward. Interview June 24, 2013
13 Female farmer, Ibuga ward. Interview June 24, 2013
Figure 6. If farmers were found to be providing their cows with unlimited access, or as a follow-up question to increase the variety of responses, they were asked why they thought other farmers might struggle with water provision. There was a wide variety of responses that can be separated into deficiencies in water availability, education, water infrastructure (including capital), security issues, and negligence. The frequency each of these categories was mentioned during the research process is illustrated in Figure 7 below and will now be further described.

**Drinking water availability**

![Drinking water availability diagram]

- Water always available: 10%
- Water sometimes available: 10%
- Water trough but no water: 4%
- Water never available: 76%

*Figure 6. Prevalence of drinking water availability as observed during field visits to 71 current KAVIPE recipients*

**4.5.1 Water Accessibility**

The Livestock Sector Development Strategy (United Republic of Tanzania, 2011) cites water accessibility as the only barrier to insufficient procurement of the resource, therefore it is not surprising that one third of the respondents in this study identified it as a challenge. One farmer collected water from a well, while others went to a spring or stream. Five out of 18 farmers, as well as the focus group identified the distance to fetching water as prohibitive in provision of the resource. Typical responses were comments such as, “When we go to fetch water it is far,”14 “Because it is far, so you’ll find thirst remains,”15 or “Water is a bit of a

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14 Female farmer, Ibuga ward. Interview May 23, 2013
15 Female farmer, Bulyakashaju ward. Interview July 23, 2013
problem, because to get it is far.” Such remarks suggest that these farmers could have more water available to provide to their dairy cow if the distance to source it was not so great.

**Frequency of Deficiency Categories**

![Frequency of Deficiency Categories](image)

**Figure 7**: Frequency of different reasons cited by farmers as to why drinking water is not always available for dairy cows.

The variation in distance that farmers travel to source water suggests that water access limitations resulting from distance are greater barriers for farmers who live further from water than for farmers who are closer. At thirteen farms the distance was measured from the cow’s pen and the water source. Distances, measured using a GPS watch, ranged from 0.02km to 0.96km, with an average distance of 0.42km. Figure 8 provides graphical representation plotting the availability of drinking water (always, sometimes, or never) as a function of distance. It was thought that an excessive distance to water may be a barrier to access. The one farmer who was found to regularly provide her cows with drinking water was in fact closer to their water source, having to travel only 0.08 kilometers to collect water. The three farmers who were found to have water available on only one of multiple field visits are all in the near to mid distance at 0.15,

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16 Male farmer, Bulyakashaju ward. Interview May 29, 2013
0.30, 0.39, 0.40 and 0.47 kilometers. The eight measured farmers who did not provide their cows with unlimited access to drinking water are found across the distance spectrum, including the farmer who is nearest to his water source at 0.02km away. There is a slight trend suggesting farmers who are closer to water are more likely to have it regularly available for their cow. Yet this does not represent all farmers as those found to never provide water for their cows are present across the distance spectrum.

**Accessibility of Drinking Water as a Function of Distance**

![Graph](image)

Distance between cow’s pen and water source (km)

- △ Always
- ● Sometimes
- × Never

*Figure 8: Line graph depicting availability of water as a function of the distance (in kilometers) between the cow’s pen and water source.*

The farmers’ other activities tended to constrain the time available for collecting and providing water, therefore limiting how much was available for the cow to drink. Farmers required time for collecting grasses, especially during the dry season when they must travel further to ensure their cow has sufficient fodder. In one interview conducted during the dry season the farmer said, “We are going a very long distance to get grasses so water delivery is delayed.”17 At another farm, unexpected visitors, specifically people applying an anti-malarial pesticide in each home, distracted the family from thinking about the cow. This farmer explained, “Today those people came to fumigate and disturbed us so we forgot to get water because we were taking everything outside the house so it could be sprayed.”18

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17 Female farmer, Ibuga. Interview July 1, 2013
18 Female farmer, Bulyakashaju ward. Interview May 29, 2013
interview, the farmer had expressed an understanding of the importance of drinking water and claims if a field visit was made on a different day water would be there from morning until night but due to the anti-malarial spraying this was not observed at the time of the interview.  

Furthermore, unlimited water provision relies on the farmers’ continued presence to refill what is often a small trough, noted by the farmers’ group chairperson who commented, “You have to be present if you are going to give it water all the time.” Respondents in the focus group similarly expressed the importance of continued presence, stating, “For instance, he has put water and then he goes away. While he is away is when you (the researcher) come and you find there is no water.” Using this rationale a farmer who is absent, if only for a short period of time, would be unable to fulfill the requirement of ad lib water access for his or her dairy cow.

This description of farmer absence as the root cause of water deficiency can be ruled out through triangulating these responses with another question in the interview. Farmers were asked, “Are there times when you are away from your cow for more than six hours?” One third of farmers cited that they, or a member of their family, was always present nearby the cow. It is not surprising that the subsistence livelihoods of Kamachumu residents would equate with at least one member of the family always being at home and working on the farm. Sentiments expressed by one farmer and shared by others were that, “If I leave, my wife and children are here and they love the cow a lot,” suggesting there are other people to provide for the cow if the farmer is absent. A further third of respondents described how only on rare occasions do they leave the farm to meet people or buy and sell goods. One farmer explained she is absent only, “if there is something that is beyond my reach, for instance a funeral or if my neighbour has passed away.” Another farmer remarked, “if I go to Kamachumu for business I am away but if I go in the morning, I return at night.” Though regular absences, such as this farmer’s business activities, were only described by four of the 18 interviewed farmers they are activities that explain how the cow would not have water because the farmer is not present to provide it.

While still taking this into account, the correlation between farmer presence and water availability is challenged by one respondent who, despite being responsible for the cow, did not

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19 Ibid.
20 Male farmer and leader of farmer’s group, Ibuga. Interview June 24, 2013
21 Interview July 20, 2013
23 Female farmer, Ibuga ward. May 23, 2013.
carry water from the spring. His identification of cultural reasons, though not mentioned by others, was agreed with by the interview translator. This farmer stated, “As a man we are not allowed to fetch water from the river. So, I have to wait for my children, when they come from school, to go to the river.” This farmer was observed pouring water from the jug into a basin for his cows but said it would not be appropriate to go to the spring himself. This was confirmed when he agreed to walk to the source of water so that the distance from his farm could be measured. Along the way a young woman joined the path and asked him why he was carrying a water jug, before commenting that it was not appropriate for him to be doing so. This farmer was furthest of all measured distances, living 0.96km from the family’s water source, and he was raising three adult cattle along with one calf. The added cultural circumstances dictating he not fetch water contributed an additional obstacle to water availability.

The issue of water accessibility was articulated by six current beneficiaries of the HIT project, a well-respected farmers’ group chairman and members of the focus group. It was brought up by a diverse group of respondents but they total less than half of all interviews conducted. In their Livestock Development Strategy (2010b) the Government of Tanzania is incorrect to identify water availability as the only obstacle to farmers in providing unlimited drinking water access. This section has described that farmer absence is also an issue, and the next sections elaborate on other reasons why water provision fails to occur.

4.5.2 Education and Training

In fact, the most commonly cited reasons for water deficiency centered not on water accessibility but on education; as twelve of the eighteen interviewed farmers (17 current farmers plus one group chairperson) did not see the provision of unlimited access to drinking water as a priority. The formal training attended by new farmers includes information on the importance of unlimited drinking water access for dairy cows, following the textbook used for the seminar which states:

> Water is the most important food for all living things, plants and animals. Water aids in digestion and excretion. The cow’s body is 65% water. For a dairy cow, water is very important in the production of milk. The amount of water a cow is supposed to take varies or is determined by kind of food it takes and the weather. For example, if a cow

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25 Male farmer, Bulyakashaju ward. Interview May 29, 2013
eats fresh green moist grass it will need a less amount of water comparing to a cow that ate hay, maize brand and minerals, so farmers are advised to keep a water in the trough at all times for the cow to drink at any time it feels thirsty (KALIDEP, 1997, p. 17).

The Kamachumu division AEO, who currently conducts the training for KAVIPE beneficiaries and makes on-call visits, similarly asserted, “We teach them water should be there always, all the time.” Participants in the focus group agreed, “Trainers taught us to give our cow water at all times. Then when it is thirsty, it can drink.” These responses suggest information on regular drinking water access was being transferred from the AEO as a source of knowledge to recipient farmers. Yet this knowledge was not always translated into adequate water for the cows.

The comments of select interviewees affirm that knowledge of the importance of unlimited drinking water access is being disseminated to farmers. A farmer who has attended multiple training sessions over fifteen years confirmed, “Water, they say water is to be there all the time.” This sentiment was also noted by farmers who have more recently entered smallholder dairying. A farmer who received a HIT animal three years prior described what was taught about water availability: “It is required all the time, every day, so if she feels like it, she can drink.” A more recent farmer who only joined the HIT project one year prior explained how ad lib water provision is justified: “It has water to drink because I have been told there are consequences if the cow eats food without drinking water.” Interestingly, none of these three farmers were observed to have water available for their cows at the time of field visits. These three examples illustrate how applying knowledge of the importance of unlimited water access is a barrier.

Other farmers did not express knowing that their cows should have unlimited water access. Four out of 18 farmers indicated an understanding that their cows only require water at certain times and not others. As a result they only allowed the cows to drink at these times. One proposed, “A cow has its times for drinking water so if you try putting water at ten or eleven it

26 Focus group, July 20, 2013  
27 Female farmer, Buyakashaju ward. Interview July 23, 2013.  
28 Male farmer, Ibuga ward. Interview May 23, 2013  
29 Female farmer, Buyakashaju ward. Interview May 29, 2013.
Another interviewee had similar reasoning and remarked, “The challenge is that during the rainy season my cow does not drink water. I do not put water over there because the cow does not drink.” As a result of seeing their cows drink at specific times these farmers saw no reason to provide their cows with *ad lib* drinking water. The division AEO recognized this issue and explored a possible root cause:

> “Finishing the water does not mean the cow has drank enough as it might need water again later on. You see, that is the problem. You have gone through the booklet which we follow during the training seminar. Possibly we are teaching them for too short a time, and they don’t have any time to go through what they have jotted down.”

When farmers do not know, or remember, to provide *ad lib* drinking water for their cows they will not do so. Furthermore, the booklet mentioned by the AEO may not be taken into consideration over other knowledge sources. One farmer, who was only providing drinking water one hour a day, admitted, “I heard it from the other farmers. They are saying that when the calf is very young do not give it very much, too much water.” In another situation, the respondent’s spouse, who was noted to contribute to rearing the cow, was blamed for the absence of water. This farmer argued, “It was present. Maybe my wife has taken it, but there was water.” The responses of these farmers suggest their knowledge, or in one case the spouses’ knowledge, of dairy management does not include awareness of the importance of unlimited access to drinking water and therefore education is identified as a barrier to *ad lib* drinking water access for the HIT project cows.

### 4.5.3 Water infrastructure

For some farmers who have water available and know the importance of constant water provision there still may be barriers arising from a lack of water infrastructure. A third of the 18 interviewed farmers described how the cow tips over or breaks its water trough and so the farmer does not leave the trough unattended. A rationale shared by multiple farmers was expressed by one who stated, “I remove it because if the basin stays he tips it over. Now if I leave the basin he

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32 Interview July 16, 2013
33 Male farmer, Bulyakashaju ward. Interview May 28, 2013
34 Male farmer, Ibuga ward. Interview May 23, 2013
will hit it, I will see it in the pen or he will step on it."\textsuperscript{35} One type of basin used in such scenarios is depicted in Figure 9. It is small and not secured to the pen, making it easy to the cow to tip over. As no respondents have a water source right at their home it is understandable that they would act to prevent wastage of this precious resource, in this case by not leaving it unattended.

\begin{figure}
\centering
\includegraphics[width=0.5\textwidth]{image.png}
\caption{A farmer provides drinking water for his cow using a tip-able plastic basin.}
\end{figure}

Other respondents elaborated on specifics as to why farmers did not have sufficient water infrastructure in place. The farmers’ group chairman proposed, “They have not built the pen so how is the water trough supposed to stay put? For when you place the metal basin there are times the cows will knock it over.”\textsuperscript{36} Secure positioning of the water trough, as used by this farmer, is illustrated in Figure 10. Beyond positioning of the water trough, the material of the trough can cause further burden. The division AEO stated, “They are afraid that a plastic container may be broken.”\textsuperscript{37} Theft is also a problem as quality materials may not remain in the pen unattended. One farmer noted, “If I buy the expensive trough there are people who can steal it.”\textsuperscript{38}

\begin{flushleft}
\textsuperscript{35} Female farmer, Buyakashaju ward. Interview July 23, 2013.
\textsuperscript{36} Male farmer, Ibuga ward. Interview June 24, 2013.
\textsuperscript{37} Interviewed July 16, 2013.
\textsuperscript{38} Male farmer, Buyakashaju ward. Interview May 28, 2013.
\end{flushleft}
may recognize the benefits of spill- and damage-proof troughs but financial barriers prohibit their installation. As shared by one farmer, “If I was able to do this I would, because I know water is important. If I could get cash I would build the block of concrete where the cow can’t break it or splash away the water.”

The use of cheaper trough materials was discounted by a farmer who remarked, “The materials which are not expensive smell of plastic and if you put water in them the cow cannot drink well.”

Financial resources are not the only limitations preventing water trough installation. The farmer with this concern commented, “It needs those trees, those small pieces of wood for building the water trough. For now I have not built it.”

The HIT-recipient farmers quoted above were not observed to have drinking water available at the time of the field visits. The lack of a spill-proof or permanent water trough is, as stated by these farmers, a prohibitive factor in the provision of unlimited access to drinking water.

![Figure 10](image.png)

*Figure 10.* A pen constructed so that the water trough cannot be easily tipped over by the cow.

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40 Male farmer, Buyakashaju ward. Interview May 28, 2013
41 Female farmer, Buyakashaju ward. Interview July 23, 2013
Farmers’ hesitation to leave the water trough unattended, as noted above, to prevent spillage or theft, led them to provide water at times when they can observe its consumption. Six farmers had similar, time-specific, answers to the question, “How often does your cow have water?” For example, one farmer stated, “Twice. I give it one jug of water at 1pm. Then 4pm I give it half a jug.” Another one similarly replied, “10am and 3pm. I place it and remove it. I give it water and if she has already finished I remove it.” A third respondent similarly asserted, “I give it water at noon, and then 4pm.” Such farmers comprised one third of respondents who explicitly stated that they offered their cow water and then removed the watering trough when the cow finished drinking, to ensure water was not wasted through spillage and the trough was not broken. The lack of appropriate water infrastructure, as described in the above section, prevented farmers from being able to leave their cow with water.

4.5.4 Negligence

The theme of negligence is the dominant response as to why other farmers may not provide unlimited drinking water access. Four respondents cited laziness, carelessness, negligence or indifference as to why water lacks on other farms. A fifth farmer elaborated on specific circumstances and described,

“The father of the family may sell the milk and take all the money, go to the bar, and spend that money on another woman. All the money is used for him and that can give a bad impression to the family to such an extent that there is nobody else who takes care of the cow. You will find other farmers with water that passes near their fields but the cow does not have water. They are careless towards their work. In other cases you may hear that somewhere they are beating the drum so you forget about your cows you rush to the dance.”

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42 Female farmer, Ibuga ward. Interview May 23, 2013
43 Female farmer, Ibuga ward. Interview May 24, 2013
44 Male farmer, Bulyakashaju ward. Interview May 28, 2013
45 Female farmer, Ibuga ward. Interview June 24, 2013
46 Female farmer, Ibuga ward. Interview June 24, 2013
47 Female farmer, Ibuga ward. Interview May 24, 2013
48 Female farmer, Buyakashaju ward. Interview May 29, 2013
49 Male farmer, Buyakashaju ward. Interview May 29, 2013
The responses of these farmers illustrate that negligence towards the well-being of the cow was a further reason water was not always available. An interesting scenario appeared on one farm where water was available at the time of the interview and the farmer cited negligence and indifference as reasons why other farmers would not act in a similar manner with the provision of water for their own dairy cows. However, during two separate field visits to this farmer, water was not observed to be available. The contradiction between the farmer’s words and actions question the validity of taking comments from any farmers as a way to understand the reasons why drinking water was not available. However this category of negligence is different from other categories such as accessibility, education or water infrastructure as the theme of negligence cannot be validated through a measurement of distance, test of knowledge or observation of trough quality. Therefore it may not be best considered an outright cause of water deficiency but rather a symptom of other processes that are occurring at the farm level.

4.5.5 Security

Security is the final thematic category of why farmers do not provide their cows with unlimited access to drinking water. Though only mentioned by one current KAVIPE loan recipient, this point was also brought up by the chairperson of a farmer’s group as well as the focus group. A concerned farmer commented, “You can have an enemy who at night can put poison in the water and kill your cow.” The chairman of a local farmers’ group stated that water is removed because, “During the night, anybody can come and poison it.” Removing the water trough at night is also justified by the focus group in their comment, “We do not give them water during the night because someone might come and poison it.” Due to the identification of poisoning as a threat by these three parties, the AEO was asked to share his experience. He insisted such cases are rare and assured, “It is a minor point actually,” but then remembered a situation in the community last year and recalled, “There was a typical sign of poison in the post-mortem. So, actually, a few cases happen but they are not very common.” The realistic possibility of poisoning leads farmers to take preventative measures to reduce their risk, one of which is to remove their cow’s drinking water at night.

50 Female farmer, Ibuga ward. May 23, 2013
51 Male farmer, Buyakashaju ward. Interview May 28, 2013
52 Interview June 24, 2013
53 Focus group July 20, 2013
54 Interview July 16, 2013
Farmers noted other precautions taken to reduce security risks associated with raising their dairy cow. The chairperson of the farmers’ group stated, “She is inside a good fence” so his cow’s safety is increased. By keeping the cow in a fenced-in area connected to his homestead, it is less likely that outsiders will tamper with the cow. Another farmer described a community watch program where neighbours take turn looking out for each other’s livestock. These examples propose that the safety of the cow was a concern for farmers and suggest there is a real possibility someone could tamper with the cow’s drinking water if left out.

4.5.6 Other factors
Apart from these emerging themes, two other reasons were listed by farmers as to why drinking water was not always provided. One farmer commented that, “There are certain insects; when that insect falls into the water, the cow does not drink at all.” Another farmer explained, “I think it is that there is a lot of work and no work schedule.” These responses do not fit into existing themes but are worthy of recognition if they emerge in further research in the subject.

It is very likely that other justifications could be given by beneficiaries of this HIT project as to why their cows are denied ad lib drinking water access, and this ‘Other factors’ section would grow. The language barrier contributed to difficulties in articulation of the questions and limited further probing into the farmers’ responses. Furthermore, the small sample size restricted the diversity of respondents to only seventeen active project farmers, one group chairman, the division AEO and a single focus group. Yet even within this study it was possible to categorize trends and graph frequencies. The most common reasons are ideal points of entry as a means to increase cow health and productivity by ensuring the provision of ad lib drinking water access.

4.6 Conclusion
Livestock have a significant contribution to the Tanzanian economy with cattle, especially indigenous breeds, dominating the sector. There is a small but growing smallholder dairy sector with crossbred cows raised in zero-graze systems. This growth is promoted by the Tanzanian government and supported by NGOs who see smallholder dairying as a means to

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55 Interview June 24, 2013
56 Female farmer, Ibuga ward. Interview May 24, 2013
57 Male farmer, Buyakashaju ward. Interview May 29, 2013
increase national milk production and reduce rural poverty. In the Kagera region HIT projects have been promoted by both government and NGO actors to bring dairy cows to rural smallholders who might otherwise not have access to such animals. Located in the Kagera region, the community of Kamachumu was the recipient of a HIT project initiated by the international NGO World Vision and continued by a local NGO, KAVIPE, since 2010. Once receiving subsidized animals the farmers are required to further invest in the loan dairy cows to meet their needs, one of which is drinking water.

Through reviewing the data collected during field visits and interviews, it was observed that 24% of KAVIPE recipient farmers were found to have a water trough, though not always with water, present in the cow’s pen at the time of the field visit. The remaining three-quarters of recipient farmers were constrained by a myriad of factors stifling the provision of this resource. Issues of water availability, education, water infrastructure, negligence and security operated independently and with other elements to prevent these farmers from making drinking water available to their cows on an *ad lib* basis. The research identifies multiple reasons why recipients of KAVIPE dairy cow loans do not provide their cows with unlimited access to drinking water. Ameliorating these issues would improve animal health and productivity, contributing to a more robust smallholder dairying sector that can use dairying as a means to reduce their poverty. The following chapter discusses broad themes in the issues as they emerged in the study and looks at potential policy options for thwarting their repetition.
CHAPTER FIVE: DISCUSSION AND CONCLUSION

5.1 Introduction

In Tanzania, as is common elsewhere in Sub-Saharan Africa (SSA), the high proportion of the poor engaged in agriculture and the sector’s growth potential has led both government and non-governmental organizations (NGOs) to implement development projects to foster increased production (see Chapter Four, Section Three and Chapter Two, Section Three). However, as discussed in Chapter Two, Section Two, the popularity of participatory development approaches, that strive to incorporate the perceptions of project beneficiaries and grant them ownership of development activities, has not been able to overcome a chronic disconnect between perceptions of implementing organizations and the realities of beneficiaries. One such example is the provision of livestock to people who may struggle to provide the necessary inputs to manage the animals and therefore hinder it from reaching its high production potential. The goal of this thesis, as articulated in Chapter One, Section One, is to investigate why many farmers in the community of Kamachumu, Tanzania who have received a dairy cow loan from a NGO-initiated Heifer-in-Trust (HIT) project fail to provide their cows with adequate access to drinking water.

To address this research problem a literature review was presented in Chapter Two that discussed how development issues are approached under the participatory framework as well as what challenges are faced by smallholders, some of which development activities attempt to address. Current Tanzanian policy in favour of agriculture development is presented in Chapter Four, Section Three, which justifies the goal of increased dairy production promoted by HIT projects described in Chapter Two, Section Four. However, recipient farmers of HIT projects can struggle to adequately manage their dairy cows and as presented in the empirical evidence of this case study, the provision of sufficient drinking water is a widespread issue (Chapter Four, Section Five).

This concluding chapter highlights key issues that emerged from the literature review, policy analysis and the case study. One by one, it discusses the implications of this research on wider applications in development projects, and specifically on the disconnect between development practitioners and the lived realities of beneficiaries. Following the presentation of these issues will be policy recommendations from the local to national level that would improve the poverty-reducing potential of HIT projects in particular and agriculture development projects.
in general. Finally, suggestions for additional research will be presented, highlighting gaps emerging in this study that could be ameliorated by future inquiry.

5.2 Issues Arising from the Research

This research highlights multiple reasons why recipient farmers in a HIT dairy project struggle to provide their cows with unlimited access to drinking water. Issues at both the farm and organizational level are found through this research to contribute to a lack of water availability. An understanding of how these obstacles are limiting water provision, and therefore hindering livestock productivity, can then be used to guide livestock policy and the improved implementation of future development projects in the agriculture sector.

5.2.1 Lack of Adequate Extension Support

The most common reason farmers fail to make ad lib drinking water available for their dairy cows is because they do not know the importance of its provision. This suggests, as illustrated in Chapter 4, Section 5.2 of this study, that there is a lack of knowledge transfer between the knowledge holders and smallholder farmers. Despite both the textbook and the division Agriculture Extension Officer (AEO) articulating the importance of unlimited access to drinking water this was not being applied by farmers. Extension services, as they are currently provided, are not sufficiently training new farmers and no monitoring in the study community, apart from this research, appears to be conducted to gauge how farmers are doing. This observation aligns with the recommendation by Chang’a et al. (2010) that more education be provided for smallholder farmers in Tanzania’s southern highlands.

All interviewed farmers reported attending formal training seminars, suggesting they have heard of the importance of unlimited drinking water provision but fail to remember what they have learned. This suggests the quality or quantity of extension services should increase so to ensure this knowledge is widespread. In a review of the training provided to new farmers in February 2012, the VSO Livestock Advisor Margaret Graves who was working at KAVIPE reports the majority of instruction was carried out in a classroom environment with only one day incorporating a practical component (Personal communication with Margaret Graves, January 6, 2013). Furthermore, Margaret reported observing a decrease over time of the patience of both facilitators and participants in the week-long training. The AEO in his review of the training discussed in Chapter 4, Section 5.2 stated that participants may not be reviewing the notes they
take during training. Improving the quality of education, for example through more engaging practical sessions or time for review, could increase the dissemination of knowledge about water provision to farmers.

A lack of extension services is also apparent in the limited follow-up provided for farmers once they receive their loan cow, as noted in Chapter Four, Section 4.2. The recurring explanation for this is that there is no money to cover transportation costs to visit farmers. One of the tasks of the Livestock and Business Development Advisor is to visit farmers; however, this is a short term solution dependent on a partnership being maintained between VSO and KAVIPE. It does not ensure sustainable follow-up of HIT cow recipients by local community members nor does it ensure long-term monitoring of the state of farmers.

5.2.2 Cultural Factors

The cultural norms of the study community construct barriers to the knowledge and action of providing ad lib drinking water access. This parallels Cleaver’s (2001) observation that culture can be a constraint to development when local norms hinder certain development practices. Knowledge shared by the division AEO, that water should be freely available, conflicts with some attitudes of farmers towards drinking water themselves. During one walk between a farm and the river and elderly farmer, after hearing about this research, challenged the idea of drinking water by saying he had not consumed water in years but instead always drinks beer. His statement aligns with an observation made by Carlson (1989) in his dissertation ethnography of the Haya people, the dominant ethnic group of this study location, who notes it is not common for them to drink fresh water. As it is not culturally common for the Haya people themselves to drink water it is unsurprising that they may not think of it necessary for their livestock to regularly drink water.

Farmers reported that they were most often around their cow but as Chapter Four, Section 4.2 described, situations could arise unexpectedly that call the individual away from his or her cow. These issues can arise quickly, for example the unexpected death of a relative can call the main provider for the cow away from the home for multiple days. In other cases employment opportunities quickly arose that required the farmer to leave his or her home. On the morning of one interview, the visit of fumigators distracted the family from providing water for their cow (Chapter Four, Section 5.1). As Chapter Four, Section 4.2 illustrated, multiple family members
are noted to contribute to the cow’s well-being. Yet as the section goes on to describe, a hasty departure by one individual or distraction of the household can impede the provision of drinking water.

The collection of water was observed to be dictated by cultural norms, specifically in one example in Chapter Four, Section 5.2 of a male farmer who described the inappropriateness of him fetching water. It is interesting that men are able to be recipients of HIT dairy animals if it is inappropriate for them to source one of the cow’s major needs, drinking water. Possibly World Vision did not understand this norm when they implemented the HIT project, nor has KAVIPE considered it as they maintain the livestock loan program. Caring for the dairy cow is a family affair, yet as one farmer described, in some cases family members are unwilling to help because the male head squanders the profits from the cow. Such circumstances would exacerbate the difficulty of providing drinking water.

5.2.3 Multiple Inputs Required

There are numerous inputs that farmers must provide in the management of their HIT dairy cows, the deficiency of which creates an environment of poor livestock management and negatively impacts the health and productivity of the animal (Dixon et al., 2004; McDermott et al., 2010). Before the animal arrives, a pen must be built and regular cleaning and maintenance is then required. Food, minerals, and de-wormer need to be regularly provided and illness of the animal, happening more regularly than for indigenous breeds (Chambers, 1983) can lead to paying for the AEO to visit and purchasing medicine. When the cow is ready to be bred, payment is required for insemination by either a neighbourhood bull or through Artificial Insemination, and multiple visits may be required if the cow is not impregnated the first time. Within each of these needs is a subset of requirements, which will now be explained in relation to water provision.

Interviews with farmers revealed that multiple inputs are required to facilitate the provision of ad lib water access as availability of the resource itself was not a sufficient factor. Special infrastructure, as described in Chapter Four, Section 5.2 is required to ensure the water trough is not tipped over. This may be through installation of a cement trough or building the pen in such a way that a plastic or metal trough cannot be spilled. Security issues, exemplified in farmers’ fear the drinking water will be poisoned, as described in Chapter Four, Section 5.5 can
be minimized through construction of a fence but this requires the investment of time and purchase of building materials. To decrease the time and energy required to collect water, the use of rainwater harvesting infrastructure is an option but the financial burden of constructing such a system puts it out of reach.

HIT projects are implemented with the assumption that providing a subsidized dairy cow as a sole physical input is sufficient to start smallholder farmers in dairy production and subsequently reduce the incidence of rural poverty. In agreement with Kelsall and Mercer’s (2003) questioning of the ability of external interventions to foster internal changes, this thesis remarks the HIT project implemented by World Vision struggles due to insufficient interest at the organizational level of local realities. In this case World Vision implemented the project without first testing their design as a pilot, removing a valuable opportunity for the NGO to learn about how it was being adopted. Thus, their design was not able to consider the ensuing inputs required of farmers to ensure their cows are productive.

5.2.4 Impermanence of NGOs

The challenge with NGOs in this situation does not only relate to their ignorance of the additional inputs required by farmers but also their impermanence at the project location. In this case study, World Vision was in Kamachumu from 1995 until 2010 but only started the HIT project in 2008, giving it just two years to implement their idea (see Chapter Four, Section 4.1). As farmers raise dairy cows for multiple years this short period of implementation did not give the NGO sufficient time to observe how dairy cows were being managed by the farmers who received them.

A short project time frame is a reality of many development projects that aspire to contribute to government policy goals, arguably to ensure future funding sources. World Vision did just that; the government of Tanzania is interested in increasing the number of dairy cows in the country and the final report for activities in Kamachumu illustrates a quantifiable increase in the number of cows (United Republic of Tanzania, 2011; World Vision, 2010). Through this they exemplified one of Farrington and Bebbington’s (1993) motivations of the existence of NGOs, that NGOs support the achievement of development goals, which in Tanzania is an increase in the number of dairy cows. Yet the NGO left before it was able to see the long term adoption rates, and arising issues, from the HIT project.
5.3 Policy Recommendations

To follow the above section that explained many of the barriers faced by smallholder farmers in water provision the following paragraphs make suggestions for policy recommendations to incorporate this newfound knowledge. Current policy from the local to national level is failing, hence the barriers to water provision illustrated in Chapter Four. Yet from the outside the HIT project appears to be a success; since World Vision departed from the community there has been a continuation of the loan program and in January 2012 a training was held for new farmers. Yet the potential for farmers to profit from their cows is notably hindered by poor management and a lack of research and monitoring has impeded awareness of these obstacles by development practitioners and policy makers.

At a national level, appropriate policy would first recognize the importance of quality livestock management, not just quantity of livestock available, especially as it relates to dairy cattle. The Livestock Sector Development Programme discusses the use of improved breeds in smallholder dairying, yet it does not recognize the provision of drinking water as a challenge to production (United Republic of Tanzania, 2011). It only suggestion for intervention in dairy production is fostering the use of Artificial Insemination to increase the number of cows (United Republic of Tanzania, 2011). In terms of water provision the only identified problem across livestock keepers is the lack of available water, and the suggested intervention is to promote sustainable water sources for livestock (United Republic of Tanzania, 2011). Despite the government’s continued interest in increasing national milk production, and recognition of the importance of improved breeds in achieving this goal, the current policy does not reflect the lived realities of livestock water provision as identified in this thesis. Furthermore, the Programme’s idea for improving extension services is to foster the formation of farmers’ groups, saying nothing to the quality of information available to farmers or how they are choosing to adopt what they hear.

The government may have not chosen to make more specific policies because of the increased effort in implementation and monitoring that would be thus required. However, this thesis demands different policies because an increase in the number of dairy cows, water sources or farmers’ groups will not resolve the many barriers farmers face in water provision. In agreement with Chagunda, Munthali, Gondwe, Wood, and Roberts’ (2013) study on smallholder
extension services in Malawi and Chang’a et al.’s (2010) review of calf management in southern Tanzania, this thesis also advises more training for farmers to improve their livestock management skills and therefore increase dairy productivity. Policy to promote improved dissemination of information (to overcome barriers in education) through extension services, as well as credit opportunities (for farmers who can not afford water infrastructure) are two ways the government could facilitate improved management of dairy cows in smallholder zero-graze systems.

Appropriate policy at the local level, implemented by the NGOs starting and maintaining HIT projects, would be most applicable to serving individual farmers. One step would be to add the provision of ad lib water access as a requirement of keeping a HIT animal. This would then have to be followed up with regular monitoring which documents the state of each farm. Currently the other HIT project in Kamachumu run by the government program, Kamachumu Livestock Development Programme (KALIDEP) requires quarterly reports. KAVIPE and other HIT implementors could do well to follow suite. Yet the quality of information is just as important as what is there - a report must not just add to the shelves of documents at the KAVIPE office but rather make a meaningful contribution to understanding the state of farmers. For example, the report from the end of World Vision’s stay in the community only includes the number of farmers and lacks more specific information about the state of the farmer (World Vision, 2010). As a result neither World Vision nor KAVIPE know how the farmer is doing.

5.4 Areas for Future Research

The focus of this study of determining why farmers do or do not provide unlimited drinking water access for their dairy cows not only provides suggestions for how national policy design and HIT project structure can be more appropriately tailored to supporting increased productivity amongst smallholder farmers. The research also illustrates disconnect between the knowledge of NGOs and the realities of project beneficiaries. Further research is required to create understanding of the situation at a national level, root causes of the barriers identified in this study, and the realities of water quality, which are important to drinking water in livestock production.

This case study was conducted in the Kagera region of Tanzania where annual precipitation averages can surpass national averages, as described in Chapter Two, Section 4.3. It
is also home to the Haya people, one of many ethnic groups in the country. Further research is required to understand if the challenges to water provision experienced in this study are also happening elsewhere so that national policy can appropriately reflect the realities of smallholder dairy farmers across Tanzania. Studies on HIT projects elsewhere in Tanzania by Chang’a et al. (2010) as well as Kelsall and Mercer (2003) highlight challenges at both the farm and organizational level, suggesting deficiencies in HIT implementation occur across the country. However these studies do not specifically discuss the provision of drinking water.

The most commonly cited response when farmers were asked why others fail to provide their cows with unlimited access to drinking water, as cited in Chapter Four, Section 5.4, is that of negligence. Additional research would support further understanding of the root of this negligence. It would be useful to find out what is the cause of farmers’ motivation to join the HIT project, if they are unable to provide adequate inputs to support a productive dairy cow. Did the farmer not anticipate the additional burden of caring for the cow? Is there prestige associated with keeping a dairy cow that motivates farmers to participate in the program? Has the farmer lost motivation due to the long time frame between when they joined the HIT project and when their cow is productive? Is the provision of manure sufficient profit that the farmer is not interested in reaping other benefits from the cow? Further research into the motivations and current circumstances of farmers would facilitate an understanding of why farmers would be negligent towards the management of their livestock.

A second area of further research would involve an analysis of the quality of water, as the benefits of *ad lib* water access are discounted if the water contains pathogens or other contaminants that will make the cow sick (Amenu et al., 2013) Both the cleanliness of the water at its source as well as the trough it is provided in would need to be considered. As noted by one farmer in Chapter Four, Section 5.6, insects falling into the water stop his cow from drinking it. If water is provided in a cement trough, as suggested by some farmers who want to provide their cows with unlimited access to drinking water, the trough will need regular cleaning to prevent bacteria from growing or dirt from making the water unpalatable or harmful for the cow.

5.5 Conclusion

This chapter discussed the essence of the research, the aim of which has been to depict the many unconsidered factors in livestock management limit the production of smallholder
farmers. Yet most of these barriers can be overcome, and the research recommends a shift in focus from current targets of increasing the number of cattle towards a greater priority of how the existing cattle are being reared. Focusing on effective livestock management would foster increases in milk production and a reduction in rural poverty, both government goals for the livestock sector. In their support of these goals NGOs may say they encourage participation and act in a manner to reflect beneficiaries’ needs, but on the contrary this research is suggesting the implementation of a HIT project has created new needs (required inputs for the dairy cows) that farmers struggle to meet. These micro-components of livestock management contribute to the overall health and productivity of the animals but are often not considered in development projects. Ultimately this investigation agrees with the words of the famous detective, Sherlock Holmes (Doyle, 2001, p.33), who declares, “It has long been an axiom of mine that the little things are infinitely the most important.”
REFERENCES


APPENDICES

Appendix One: Interview/Focus Group Question Guide

Thank you very much for agreeing to participate in my research! Your responses to the questions I am about to ask are most appreciated. There are no ‘right’ or ‘wrong’ answers but instead I am just very interested in learning what you think and what your experiences are!

1. To begin with, how long have you had a dairy cow?
2. Where/how did you learn how to care for your cow?
3. Do you have a job away from your home?
4. Other than employment, are there other reasons you may be away from your cow for long periods of time (more than 6 hours)?
5. You keep your cow in a zero-graze system so have to supply all its needs to her. What are the most important things you supply your cow with?
6. Who supplies your cow with these needs?
7. How often does your cow have water?
8. Where do you source the water you give your cow to drink?
9. What difficulties do you face in providing your cow with drinking water?
10. How much water does your cow drink in a day?
11. Ideally, how much water do you think a cow should drink in one day?
12. Ideally, how often do you think a cow should have water access?
13. If you have water available, what prevents you from supplying it to your cow at all times?

14. Kwa kuanza, kwa muda gani una ng’ombe wa kufugwa?
15. Wapi/jinsi gani ulijifunza jinsi ya kumuhudumia ng’ombe wako?
16. Una kazi nyingine mbali na nyumbani kwako?
17. Mbali na ajira, kuna sababu nyingine zinazokusababisha utoke nyumbani na uendeseheme ya mbali na ng’ombe wako kwa muda mrefu (zaidi ya masaa sita)?
18. Unamtunza ng’ombe wako kwenye mfumo wa kufungiwa kwenye zizi ili kumpa kila kitu anachokihitaji. Vitu gani muhimu sana unavyompa ng’ombe wako?
19. Anayemuhudumia ngombe wako ni nani?
20. Mara ngapi ng’ombe wako anapata maji?
21. Ni wapi unapotoa maji ya ng’ombe wako ya kunywa?
22. Ni changamoto gani unazokumbana nazo pale unapompa ng’ombe wako maji ya kunywa?
23. Ni maji kiasi gani anakunywa ng’ombe wako kwa siku?
24. Kwa mawazo yako, ni kiasi gani cha maji anachotakiwa kunywa ng’ombe?
25. Kwa mawazo, ni mara ngapi ng’ombe hupashwa kunywa maji kwa siku?
26. Kama maji yapo, kinachokuzuia kumpa maji ng’ombe wako mda wote ni nini?
Appendix Two: Interview/Focus Group Consent Form - English

Verbal consent from research participants will be obtained by reading the following to them in English, Swahili, or Kihaya.

My name is Barbara Forbes and I am a student at the University of Toronto in Canada. I am writing a report for my university about the management of dairy cows by KAVIPE members. I am asking if you would agree to voluntarily participate in my research by responding to a few questions.

The interview will be approximately 20 minutes in length./The focus group discussion will be approximately 45 minutes in length. If you do not want the interview recorded it will not be recorded.

I see no risk in you participating. You do not have to participate at all, or, even if you agree now, you can terminate your participation at any time. You also do not have to answer individual questions you don’t want to answer. Your responses will be kept confidential - your name will not be linked with what you say. Notes and voice files will be stored on my password-protected computer and in my locked home.

I can tell you that your responses will be included in a paper and presentations at my university. They may also be used to inform the training and workshops KAVIPE provides.

If you have any questions or concerns, please feel free to contact me at +255 759 421 556. If you have further questions about the research the contact details of my professor, Ken MacDonald, will be left with KAVIPE.

Thank you for considering to be a part of my report. Are you willing to participate?
Interview/Focus Group Consent Form - Swahili

Verbal consent from research participants will be obtained by reading the following to them in English, Swahili, or Kihaya.

Jina langu ni Barbara Forbes na ni mwanafunzi katiki chuo cha Toronto huko Canada. Ninaandika faarifa kwa chuo changu kuhusu uendeshaji wa ng’ombe wa kufugwa na wanachama wa KAVIPE. Ninauliza kama utakubali kujitolea kushiriki katika uchunguzi wangu kwa kujibu maswali machache.

Majadiliano yatachukua dakika 20 kwa makadirio na majadiliano ya kikundi yanakadinwa kuwa dakika 45. Kama hutaki majadiliano yarekodiwe, basi hayatarekodiwa.


Naweza kukwambia kuwa majibu yataorodheshwa katika karatasi na kuwasilishwa chuoni kwangu. Yanaweza kutumiwa kujulisha mafunzo na semina zinazotolewa na KAVIPE.

Kama una swali lolote, tafadhali jisikie huru kuwasiliana na mimi kwa namba 0759 421 556. Kama una maswali mengine kuhusu uchunguzi, mawasiliano ya Professa wangu, Ken MacDonald yataachwa KAVIPE.

Ahsante kwa kuwa mmoja kati ya taarifa yangu. Je, uko tayari kushiriki?
Appendix Three: Confidentiality agreement for research translators and transcription assistants

The following consent form will be signed by each individual translator or transcription assistant.

Thank you very much for agreeing to assist Barbara Forbes in the research she is conducting for her university. To protect the individuals who will participate in interviews or focus groups it is important that we keep confidential the information they supply.

Translator(s)
Agrees not to reveal any of the information conveyed during interviews or focus groups to anyone other than the principle researcher, Barbara Forbes.

Transcription Assistant(s)
Agrees not to reveal any information transcribed to any other than the principle investigator, Barbara Forbes.

To safeguard transcribed data by the use of a password protected computer.

To destroy any computer files associated with the research (eg. interview voice data files or documents of transcribed text) that are not returned to the researcher once transcription has been completed.

I have read the above form, and, with the understanding that I will keep confidential the information I come into contact with through the assistance I provide the researcher, sign my name below.

_________________________________________  ____________________________
Research assistant’s signature              Date

_________________________________________  ____________________________
Primary researcher’s signature              Date