The sustainability of dairy development in Tanzania: adoption of a Participatory Market Chain Approach System

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Abstract

This study looked at the sustainability of dairy development in Tanzania. Ongoing dynamic changes in the global dairy industry have progressively put a strain on smallholder farmers. Changes in competition patterns, consumer preferences and market requirements are likely to see smallholder farmers further marginalised in the dairy production. The question remains how to ensure these smallholder farmers remain competitive and agile in the fast moving industry. This research looks at the adoption of an intervention program that aims to include smallholder farmers in rural Tanzania into modern value chains.

A survey of 96 participants (65 input providers and 31 traders) was done and analysed using Partial Least Squares regression to determine the effects of the harsh market conditions on the participants’ behavior control and intention as well as on the new programs incentives. In one sample-set, the harsh market conditions positively influenced the incentives indicating an awareness of likely gain from the harsh market. In the second sample-set, the harsh market conditions positively influenced motive indicating an expectation from participants that the conditions will be addressed by the intervention program. Both motive and incentives influenced intention to participate in sample 2 while only incentives influenced intention in sample 1.
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1 Introduction

This study looks at the sustainability of dairy development in Tanzania. Ongoing dynamic changes in the global dairy industry have progressively put a strain on smallholder farmers. Changes in competition patterns, consumer preferences and market requirements are likely to see smallholder farmers further marginalised in the dairy production. The question remains how to ensure these smallholder farmers remain competitive and agile in the fast moving industry. This research looks at the adoption of an intervention program that aims to include smallholder farmers in rural Tanzania into modern value chains. The outline covers five main headings: 1) Introduction; 2) Review of Literature; 3) Methodology; and 4) Research Findings & finally 5) Discussions.

The introduction covers a background to dairy development as well as aims of the study. Definition of terms used is also covered under introduction.

The literature review looks at the role of smallholder in agriculture, the issues and approaches used to include the smallholder farmers in modern value chains. The second part looks at factors that enable the smallholders to commercialize their operations. Thirdly, a case study of India's smallholder agriculture is discussed with key lessons outlined. Finally, the review looks at the proposed dairy intervention in Tanzania in light of the existing dairy industry challenges in the country. Research objectives are consequently outlined.

The methodological procedure used Partial Least Squares Regression (PLS) to determine if the construct measures in the hypothesis are consistent with the research findings and to also show the interaction between variables. A survey of 96 respondents were personally administered using both scaled (Likert) and open-ended questions to capture adoption construct measures as well as attitudes and opinions of respondents respectively. The respondents included market chain actors (input and service providers) from three districts i.e. Kilosa, Handeni, and Lushoto in rural Tanzania.

The final paragraphs present the research findings and discussions as well as giving recommendations on interventions that could be carried out to encourage adoption of the intervention program.
1.1. Aims of the Study

The goal of the study was to engage small-scale market actors (input providers and milk traders) of dairy service hubs being introduced in rural Tanzania. The aim of the engagement was to seek the actors participation in the hub. The hub is as a consortium of businesses providing their products or services to farmers in an integrated way (Jaleta, et al 2013).

Specifically, the study seeks to evaluate the innovative dairy hub idea and answer questions on factors that influence adoption of the same. When evaluating programs, innovation studies are critical because they help answer questions of why programs are accepted or rejected as well as what factors influence adoption of a program to a local context (Ashley, 2009).

The concept of dairy hubs is very new and few literatures have been published on the same (Jaleta et al 2013). Specifically, adoption studies of the dairy hub in East Africa are unknown. The following study therefore sought to initiate this by looking at adoption patterns of the dairy hub by dairy chain actors in Tanzania. The research questions that sought to be answered were:

- What factors would facilitate or impede adoption of the dairy hub by input providers and milk traders?
- What interventions should the program have in place to ensure high use and participation by small-scale chain actors?

The study used surveys as a way of evaluating the market actors’ perceptions of the hub. The surveys were later analyzed to provide guidance on interventions that could be made to encourage participation of the market actors. Surveys have been shown (Paul in Smith 1998) to inform positive interventions that improved the design of numerous World Bank projects.

1.2. Definitions of Terms

Dairy development programme: We define dairy-industry development as activities that ensure milk and dairy products are available, affordable, nutritious and safe by assisting small- and medium-scale dairy producers, processors and service providers to maximize their capacities to meet demand.
A business hub could be “defined broadly either as a single business entity supplying inputs and providing services, or the existence of several business entities supplying inputs and/or providing services in a specific geographic area serving beneficiaries’ needs” (Jaleta, et al 2013)

Business Development Services (BDS) approach: Just as large private sector actors are recognized as potential catalysts to provide services to producers and upgrade value chains, ILRI looks at opportunities within small scale local markets to improve informal markets and market actors’ capacity to upgrade value chains, provide better services to clients and deliver higher quality and safer products to consumers
2 Background

Tanzania's livestock industry contributes an estimated 18% to the nation’s GDP and 30% to agricultural GDP. The country has an estimated cattle population of 21 million heads (NBS, 2007), with about 37% of that population kept by 1.7 million rural households (Kurjiwa et al 2012). This rural sector mainly feeds the rural population which totals to 80% of the country’s population (Kurjiwa et al 2012). The livestock industry therefore plays a significant role in promoting Tanzania’s economic and social security.

The Tanzanian dairy industry is divided into two Sections: the modern dairy sector and the traditional sector. The traditional sector consists of 14 million Zebu cattle (96% of the dairy cattle population) and mainly feeds the rural population due to poor marketing systems characterised by little or no infrastructure such as roads and services. In the dairy sector for example over 70% of the milk is produced by the small scale farmers (Ndanu et.al 2012).

2.1 Challenges Facing Tanzania’s Dairy Industry

Low productivity is the main challenge in this sector. Compared to the cross-bred cattle, the traditional zebus produce an average 3 litres of milk during the wet season and 2 litres or less during the dry season while their counter-parts produce up to 10 times more (NBS, 2007/2008). Low productivity in the traditional sector is caused by a blend of many reasons.

Studies (Lundy et.al 2007; Willingham et.al 2003; Njombe and Msanga 2009; Ndanu et.al 2012) show that typical traditional sectors would be characterised by overlapping government and private sector roles, land issues, financing and access to credit, lack of agriculture extension and innovation, poor infrastructure, drought, floods, language barriers and remoteness that make marginal areas difficult for private businesses to operate in. For example in some of these areas, input and services are usually some 2-58kms away from farmers hence making it very costly for farmers to access (Ndanu et.al 2012). In addition, marginalization and poor infrastructure would mean that this informal sector is cut off from structured milk marketing systems and is denied access to product and services inputs that would increase its milk production (Willingham et.al 2003; Njombe and Msanga 2009; Ndanu et.al 2012).
Another challenge with the traditional sector is its fluctuating seasons. The traditional relies entirely on the seasonal availability of pasture and water (NBS, 2003). Seasonality makes the sector unreliable to businesses depending on it.

Poor or lack of investment incentives (Kurjiwa et al, 2012); lack of infrastructure for input and output markets (Swai & Karimuribo, 2011) as well as lack of good-quality animal feeds in sufficient quantities (Swai & Karimuribo, 2011) have also been named as key challenges facing the traditional dairy sector in Tanzania.

Low seasons mean low productivity and assumedly no attention from the farmers since the returns are low. Subsistence farming automatically becomes the only option for a sector that is characterised by lack of health and vaccination services; no training in care, feeding and breeding; and no money for maintaining the livestock (Rutherford, 1987).

2.2 Incorporating Tanzania’s Smallholders in Modern Value Chains

The Tanzanian government is facilitating the development of the pro-poor informal sector through interventions aimed at integrating this sector into structured milk value chains. This development seeks to increase the country’s milk production to meet an increasing demand for milk caused by rapidly growing urban populations (Nkya et al, 2007; Hayes, 2011). The Tanzanian government under partnership with the Irish government funded a research for development program dubbed ‘MoreMilkIT’ aimed at implementing dairy market hubs in the pro-poor areas. The dairy development program will see a number of hubs implemented in four districts of Tanzania namely Kilosa, Mvomero, Handeni, and Leshoto.

2.3 The Proposed Intervention Program

The introduction of dairy hubs is seen as an intervention mechanism aimed at addressing the issue of smallholder inclusion in modern value chains. In this program, opportunities within small scale local markets are sought to improve informal markets and market actors’ capacity to upgrade value chains. This further enables the small scale market actors to provide better services to clients and deliver higher quality and safer products to consumers.
2.4 **The Business Development Hub Approach (BDS)**

A business hub could be “defined broadly either as a single business entity supplying inputs and providing services, or the existence of several business entities supplying inputs and/or providing services in a specific geographic area serving beneficiaries’ needs” (Jaleta, et al 2013). The hub concept was borrowed from the industrial sector. The concept is that a joint approach in accessing inputs and services significantly lowers producers’ marketing costs (Jaleta, et al 2013). By collectively accessing inputs for example, producers are able to get better prices, negotiate on delivery terms (such as free delivery) and even get credit terms. In addition, output marketing costs become favorable such as the cost of receiving training. A hub is therefore a consortium of businesses providing their products or services to farmers in an integrated way (Jaleta, et al 2013).

2.4.1 **How It Works**

A BDS approach recognizes the small-scale market actors as instrumental in achieving program sustainability long after the NGO’s have left (Jaleta, et al 2013). Small-scale market actors mainly include the informal sector that provides inputs, feeds, credit, etc. A BDS approach would therefore target these actors in a bid to improve their capacity and enable them to take on the business opportunity presented by the project.

Just as large private sector actors are recognized as potential catalysts to provide services to producers and upgrade value chains, ILRI looks at opportunities within small scale local markets to improve informal markets and market actors’ capacity to upgrade value chains, provide better services to clients and deliver higher quality and safer products to consumers (Pursukar et al 2010)
2.4.2 Target Intervention Areas

The dairy intervention program targets extensive/pre-commercial rural producers who predominantly sell milk to rural consumers (R-to-R) and intensive/more commercial rural producers who predominantly sell milk to urban consumers (R-to-U), usually via bulk traders. Our research covered two extensive/pre-commercial areas and one intensive/more commercial area. The extensive/pre-commercial areas are mainly the traditional dairy system where the majority cattle are indigenous and are kept under the sedentary/extensive management system.

<table>
<thead>
<tr>
<th>Region</th>
<th>District</th>
<th>Market access classification</th>
<th>Cattle population*</th>
<th>% improved dairy breeds</th>
<th>Dominant production system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morogoro</td>
<td>Kilosa</td>
<td>R-to-R</td>
<td>215,100</td>
<td>1</td>
<td>Extensive/Agro-pastoral (zebu)</td>
</tr>
<tr>
<td></td>
<td>Mvomero</td>
<td>R-to-U</td>
<td>187,350</td>
<td>5</td>
<td>Extensive/Agro-pastoral (zebu) with significant semi-intensive &amp; intensive (improved)</td>
</tr>
<tr>
<td>Tanga</td>
<td>Handeni</td>
<td>R-to-R</td>
<td>126,780</td>
<td>1</td>
<td>Extensive/Agro-pastoral &amp; Extensive/Sedentary (all zebu)</td>
</tr>
<tr>
<td></td>
<td>Lushoto</td>
<td>R-to-U</td>
<td>119,492</td>
<td>24</td>
<td>Extensive/Sedentary (zebu) with significant semi-intensive &amp; intensive (improved)</td>
</tr>
</tbody>
</table>

*Most recent cattle figures available from district profile reports
3 Literature Review

Small holder agriculture is facing great challenges from the dynamic changes going on in agribusiness today. From globalisation, to urbanisation to income growth to weather changes and increase in use of technology; this changes are threatening to leave the smallholder farmer on the side road as the field is left to large multinationals who have the capacity to adapt and meet the ongoing changes (Pingali 2010; Boehlje et al. 1995; Jayne T S et.al 2010; Feder 2011; Umali & Schwartz 1994). The demands on smallholder agriculture are getting more stringent as the market place changes (Jayne T S et.al 2010; Feder 2011). These pressures have led to a shift from resource-based to knowledge-based farming systems majority of which cannot be afforded by the small holder farmers (Umali & Schwartz 1994; Birner & Anderson 2007; D’silva & Bysouth 1992; Shiferaw 2011).

The following literature review looks at the challenges facing small-holder agriculture and discusses solutions that are being used to ensure successful incorporation of the small-holders into modern value chains. The review also looks at the case study of India in a bid to find practical solutions that can be used to ensure the success of smallholder intervention programs.

3.1 Introduction

The consumption of meat, dairy and livestock products has grown immensely in developing countries; with milk consumption almost doubling between the year 1961 and 2007 (FAO, 2013). The factors driving this are a mixture of incomes, urbanisation, social and cultural factors. Yet as consumption increases, productivity in livestock products has not grown in tandem. In developing countries for example the dependence on dairy imports has been growing as shown in fig 1 below.
The majority of these developing countries depend on small scale farmers for milk production. In Kenya for example, 85% of milk is produced by smallholder farmers (Staal, Pratt and Jabbar, 2008; FAO, 2009). The ‘traditional’ milk production systems are characterised by low levels of inputs and outputs as well as nutrient deficient livestock and households (Staal et al 2008).

The key issue in this traditional set-up is that these small-holder farmers are resource poor hence have poor animal management skills specifically lacking access to quality forage and having low levels of concentrate supplementation (Staal et al 2008).

It has been fairly argued that there exists a large potential for increasing milk production in these traditional sector if feeding was improved (Mlay, 2001; Madsen, Weisbjerg and Hvelplund, 2007). The major road-block has been the ability to design and implement livestock development programs that are able to sustainably keep the small-scale farmer in business.
3.2 The Role of Smallholders in Agriculture

Small holder farmers support numerous industries yet remain among the world’s poorest populations. In Tanzania for example, up to seventy percent of milk production is produced by the rural and semi-rural informal dairy sector. This sector which is served by the low producing indigenous Zebu cattle, is much marginalized with proximity to urban areas being anywhere between one and fifty-eight kilometers (Ndanu et.al 2012). Marginalization and poor infrastructure means that this informal sector is cut off from structured milk marketing systems and is denied access to product and services inputs that would increase its milk production (Willingham et.al 2003; Njombe and Msanga 2009; Ndanu et.al 2012).

Accordingly, the participation of small farmers into markets can contribute to higher output and income growth, which in turn can enhance food security, poverty reduction efforts, and overall economic development (Barrett, 2008; Bernard & Spielman, 2009; Fafchamps, 2005). This is especially important in Africa where the population is dependent on agriculture and governments are mainly supported by earnings from farm produce. Here agriculture constitutes 30–50 percent of national incomes, and has a potential to be the driver of economic growth on the continent (Toenniessen, Adesina, & DeVries 2008).

3.3 Issues in Smallholder Agriculture

Smallholder farmers worldwide face the possibility of deep poverty, hunger and greater social strains if their inclusion in modern value chains is not secured. In 1990, rural development became a focus of development practitioners and with it came the restoration of agriculture in development (D’silva & Bysouth 1992; Feder 2011). Before then, these practitioners had gotten disappointed by the poor performance of agriculture productivity albeit consuming huge amounts of funding (Feder 2011; World Bank 2000). As a result, majority of the funding started being channeled through the private sector (Umali & Schwartz 1994; Umali-Deineger 97; E. Crawford et.al 2003; D’silva & Bysouth 1992; Anderson & Feder 2004; Dogbe et.al 2012; Temu & Temu 2006; Markelova & Mwangi 2010).

The private sector in agriculture development continues to face numerous challenges. Firstly, agriculture extension had been provided by the governments for the longest time due to the role it plays in developing agriculture (Umali & Schwartz 1994). This meant that in most countries,
agriculture extension sector did not exist and would require support in order to be able to function successfully (Umali & Schwartz 1994; Umali-Deineger 97; E. Crawford et.al 2003). Furthermore, Crawford (2003) argues that the private sector would not have the resources to invest in market development strategies.

Secondly, small holder farming is known to be in areas that discourage private sector participation. Poor infrastructure, lack of market competition, lack of credit, and complementary services all contribute negatively to efforts of getting the private sector involved (Jayne T S et.al 2010; Feder 2011; E Crawford 2003).

Thirdly, today’s’ agriculture requires knowledge-based systems which majority of small holder farmers cannot afford. In addition, knowledge-based agriculture would demand a certain level of literacy to be able to adopt and most small holder farmers are not highly educated. Anderson & Feder (2011) argue that small holder farmers are faced with low levels of literacy as well as limited access to mass media which would be a channel of providing information. Dogbe et.al (2012) also argues that it would be impossible to boost production without boosting input use through training and knowledge transfer.

Fourthly, production of high-value goods as with the case of dairy requires specialized as well as embodied knowledge which can only be provided by the private sector. Markelova & Mwangi (2010) and Temu & Temu (2006) argue that the perishability of a product increases risk and therefore requires more sophisticated handling systems. Umali & Schwartz (1994) add that a product such as milk would require high degree of extension information especially when one is to consider things such as feeding, breeding, and management. Also as argued by Jayne T S et al (2010), extension services for livestock would have high externalities therefore increasing their knowledge needs.

All these challenges have created the need for more innovative ways of ensuring the small-scale farmer is linked to modern chains. Through encouraging private sector participation, innovative programs have been designed and are discussed in detail below.
3.4 The Smallholder in Modern Value Chains

Numerous development programs are today aimed at incorporating the smallholders into modern value chains. Strategies used involve collective action and value chain approaches.

3.4.1 Collective Action Approaches

Studies show that collective action for farmers presents many benefits. Smallholder farmers stand to benefit from increased liberalized output and input markets (Bingen, et al., 2003, World-Bank, 2002); access to services (Peacock, et al., 2004) and a formal economic organization that replaces government agencies phased out by structural adjustment programs (Collion and Rondot, 2001). When acting collectively, smallholder farmers may also benefit by gaining the necessary market information, securing access to new technologies, and tapping into the high-value markets, thus giving them an edge over large farmers and agribusinesses (Key, Sadoulet, & de Janvry, 2000; Kruijssen, Keizer, & Giuliani, 2009; Stockbridge, Dorward, & Kydd, 2003). In addition, producer groups can help farmers negotiate better terms and lower integration coordination costs through linking farmers directly to markets and circumventing intermediaries (Barrett, 2008; Bernard & Spielman, 2009; Shiferaw et al., 2008). All these benefits come at a cost of ensuring the collective action is governed and run sustainably.

Most collective action approaches have a ‘producer-driven’ approach with focus being on empowering these groups to optimize economies of scale though mass production. These approaches have mainly been successful with large farmer groups. Smaller groups are unable to raise the volumes needed to enjoy economies of scale and in most instances are in areas prone to many challenges. Numerous studies (Lundy et.al 2007; Willingham et.al 2003; Njombe and Msanga 2009; Ndanu et.al 2012) show how small holder agriculture is laden with many constraints such as overlapping government and private sector roles, land issues, financing and access to credit, lack of agriculture extension and innovation, poor infrastructure, drought, floods, language barriers and remoteness make marginal areas difficult for private businesses to operate in. The solution for small scale farmers is therefore more innovative approaches; many of which are discussed below.
3.4.2 Value Chain Approaches: Towards Commercial Smallholders

These approaches have been used to achieve collaborations with the profit-making private sector. The approaches argue that smallholder agriculture needs to be commercial in order to survive in the changing market environment. By so doing, value chain approaches then connect the commercial smallholders with markets and suppliers in order to achieve greater project sustainability. Value chain systems in development seek to increase productivity of the producers through strengthening and encouraging networking along the value chain (Rich et.al 2010; Weber & Lebaste 2010). However, critiques argue that the programs rely on the mediators whose role is questionable in a free market environment (Dinar & Keynan, 1998). Others argue that projects collapse with the exit of this development partners (Umali-Deininger 1997). Nonetheless, numerous programs have been implemented in Africa, Asia and Central America under this model and majority of these programs have recorded success (Weber & Lebaste 2010).

3.4.2.1 Value-Chain Collective Action

Value-chain types of collective action are new participatory approaches that seek to develop group innovations through structured processes that stimulate interest, trust and collaboration among chain members (Bernet, 2006). The approaches as with the case of Andes based Participatory Market Chain Approach (PMCA) involves small farmers coming together with market agents and agriculture service providers to produce value-added products that are demanded by the market (Devaux et al. 2009). Such approaches are flexible and can be used in various contexts such as in smallholder farming: the size of farmer group is irrelevant as the farmer groups are linked to immediate markets and immediate input providers. PMCA has been used in potato value chains in Latin America (CAPRI, 2007) and also recently in Uganda (Horton et.al 2013). Value-chain collaborations have also been widely used around the world to foster pro-poor market development (Springer-Heinze, A. 2007; Kamplinski and Morris, 2001).
3.5 **Challenges Facing the Innovative Approaches**

A challenge faced by value chain approach is the attraction of the private sector. As seen above, most of the smallholder areas are characterised by numerous challenges that make it unattractive for the private sector. Obviously, attracting the private sector would require great interventions. Such interventions have been done before and have included safety nets, cost recovery programs (Umali –Deininger 1997) as well as involvement in infrastructure and training delivery (Paskia, 2012).

Engaging the private sector would therefore require the respective governments to make conditions bearable for the private players. The fact that the private sector is driven by profit creates the challenge of balancing profit with affordable value to all. How would the government ensure that the private sector’s profit motive doesn’t replace its own mandate to provide services to all; rich and poor alike?

3.6 **Proposed Solutions**

Two ways have been suggested to approach this (Gautam et al 2010). First, have the private sector fully involved without changing the business climate such as with the case of ITC’s e-choupals in India. Such moves are not common and would need to depend on a private sector that is intrinsically driven by a desire to help the poor more than one to maximize profit.

The other approach is promoting public-private partnerships. Here, the government modifies the investment climate through regulations and policies while the private sector bears the commercial risk of doing business. An example would be the provision of institutions and frameworks that control behavior and enforce contracts (Gautam et al 2010).

However, even with the modification of the business climate, there has to be demand that attracts the private sector. Small holder agriculture has been condemned to lack the necessary demand (Agren 2005; Dinar & Keynan 1998). This poses a great challenge to development agencies targeting the resource poor. The debate for creating mechanisms to attract public-private partnerships is far from over. The following case study of India seeks to offer an example for Tanzanian dairy sector in engaging small-holder farmers.
3.7 Case Study of India’s Operation Flood

Like many developing countries, India’s dairy sector relies significantly on small-holder dairy farmers. These small scale farmers produce more than 60% of the country's milk (Chand, cited in Rakotoarisoa & Gulati 2006). Similarly, the sector’s key producers consist of a traditional dairy system where 80% of milk produced is handled in an un-organized through private organizations (Rajendran & Mohanty 2004).

The difference in India is that the country has been able to capitalize on this system and ensure that milk does contribute significantly to the national economy. Today, milk is said to contribute more to India’s national economy than any other farm commodity; to the tune of 10.5 billion dollars between 1994 and 1995 (Dairy India cited in Rajendran & Mohanty 2004). Much of this success has been attributed to the Operation Flood program.

Operation flood has been cited (FAO 2009) as one of the most successful dairy programme interventions in enabling smallholder dairy farmers access urban markets. As a result of the program, milk production more than tripled in the last three decades, from 21 million tons in 1968 to an anticipated 80 million metric tons in 2001 (Rajendran & Mohanty 2004). The dairy development programme was able to achieve this success through the creation of an integrated milk web that brought together rural, small-scale dairy farmers to urban populations through high level procurement systems. This was achieved through the formation of village-level cooperatives and strong support systems that introduced cross-bred cows along with other processing inputs.

3.7.1 Key Success Factors

A number of studies (Huria & Achaya 1980; Shah 1987; Rakotoarisoa & Gulati 2006; Rajendran & Mohanty 2004) show the key success factors of Operation Flood to include:

- Strong marketing channel as a pre-requisite to development
- Attractive market prices to stimulate growth
- Introduction of technological interventions for raising productivity
- Success is pegged in strong implementation strategies where technology reaches all through a closely knitted infrastructure
- Identification of clusters of villages where the environment is most promising for technological change;
- The creation of a system of delivery of technical inputs which is close to farmers, easily accessible and cost effective;
- The establishment of a support structure to ensure wide-scale and effective absorption of technology by farm families with varying resource endowments and risk absorbing capacities.

- Dairy policies to protect the smallholder dairy producers from cheap imports as well as targeting to ensure only safe dairy products reached the consumer (Rakotoarisoa & Gulati 2006)
- Formation of dairy cooperatives to enable consolidation of milk production and marketing (Rajendran & Mohanty 2004)

### 3.7.2 Operation Flood’s Key Lessons

Input markets and technology played a significant role to growth in milk production (Staal et al 2008). Co-operatives that improved access to inputs and services were able to enhance dairy growth. By encouraging the use of genetics, improved feed and management along with improving market access for inputs and services; dairy development projects were able to contribute to dairy growth (Staal et al 2008).

Another contributing factor to dairy development was a prior development of the crop sector (Staal et al 2008). With the development of crop sector came improved input and market infrastructure that was necessary to the growth of dairy and livestock development. Staal et al (2008) seems to say that the crop sector had what it takes to have the infrastructure built as opposed to dairy which is mainly driven by the desire of farmers to improve their diet. The crop sector would be energized by the demand from a poor urban consumption.
3.7.3 The Future of Operation Flood

Today, the industry still faces challenges of infrastructure facilities for collection, storage, transportation and processing; as well as a lack of global market access (Rajendran & Mohanty 2004; Rakotoarisoa & Gulati 2006). With the opening up of its market, India saw some millions of small scale dairy farmers lose market to imported dairy products and end up lose an opportunity to increase their incomes (Rakotoarisoa & Gulati 2006)

Despite these challenges, India is still the world's largest milk producer - production was at 92 million tonnes in 2004 (FAO cited in Rakotoarisoa & Gulati 2006). For Tanzania whose dairy market is already liberalized, it will be important to consider the effects of the liberal market on the program’s activities.

3.8 Private Sector Role in Smallholder Agriculture

In India’s flood gate operation programme for example, Ahluwalia (2005) argues that a critical change was the realization that the private sector would be the driver for growing the industry. Private sector involvement in India grew tremendously throughout the programme period; a clear testament to the role private sector played in the success of the dairy development programme. For example in Punjab, it was partnerships between both public and private sectors that helped built co-operatives and farmer groups to aid in provision of inputs (Staal et al 2008).
Operation flood policy on inputs was the emphasis on provision of inputs like animal health care, vaccination, improved feed and fodder, breed improvement through artificial insemination. This policy was a back-bone of the programme’s success. As discussed above input provision plays a very critical role in developing agriculture.

Another role for the private sector has been proposed in disease control and animal health provision. Such a role would involve clinical treatments, breeding services, drug supply, production of vaccines, certain laboratory services feed analysis, certain diagnostic tests (Schillhorn van Veen, C. de Haan, 1995). In Ethiopia for example the private sector was greatly involved in the distribution of drugs to prevent the spread of the contagious bovine pleuropneumonia (CBPP) disease. The critical factor would be whether the private sector is facilitated to provide such services.

3.9 Conclusion

In conclusion, linking small-holder farmers requires innovative approaches that take into account the whole value chain as opposed to just collective action. As seen in the PMCA model, collective action can be successfully linked to value chain approaches. For Tanzania, the BDS approach should consider incorporating the whole value chain as opposed to the current three chain actors. In addition, the role of the private sector underlies the value chain approach and is also a key factor in the success of India’s Operation Flood. Tanzania’s program should therefore take great strides in planning the private sector’s incorporation into the program. The chain actors being targeted by the program are privately owned businesses and their intergration is therefore critical in determining the success of the program. Their perceptions and views should therefore be used to redesign the program in ways that accommodate them. This perceptions and views are unknown.
4 Research Objectives

The study sought to understand factors that would lead to high use, participation and investment of the milk hubs by the input and service providers. Specifically, the study sought to evaluate the innovative dairy hub idea and answer questions on factors that influence adoption of the same. When evaluating programs, innovation studies are critical because they help answer questions of why programs are accepted or rejected as well as what factors influence adoption of a program to a local context (Ashley, 2009).

The research questions that the research sought to answer were:

- What factors would facilitate or impede adoption of the dairy hub by input providers and milk traders?
- What interventions should the program have in place to ensure high use and participation by small-scale chain actors?

From the above literature review, it is clear that the challenges facing the Tanzanian dairy industry are similar to those facing smallholder agriculture worldwide. Furthermore, the characteristics of the target intervention areas compare similarly to places such as rural India and other smallholder areas discussed in the literature.

The challenge of smallholder commercialization therefore persists even in the case of rural Tanzania. Consequently, the harsh market factors play a significant role in influencing the intention of the participants to adopt the hub idea.

- H1: Market effects will negatively affect intention to adopt the hub idea

The motive to adopt the hub idea will be as a result of assessing the strength of the harsh market factors.

- H2: Market effects will negatively affect the motive of the participants to adopt the hub idea

The respondents are only likely to adopt if the motive is stronger than the harsh market effects.
• H3: Motive will have a strong positive effect on intention to adoption of the hub idea

Whether people will adopt the hub idea will depend on how strong the incentives are in comparison to the market effects.

• H4: Market effects will have a negative effect on the incentives to participate in the hub idea

If incentives are strong, then one can expect there to be a motive as well as an intention to adopt the program

• H5: Incentives will positively affect intention to adopt the program
• H6: Incentives will positively affect the motive to adopt the program

In the following chapters, the above hypotheses are tested and discussed. Finally, the research questions are answered and future research studies proposed.
5 Methodology

In order to gather facts and prove the hypothesis formulated, the research adopted a post-positivist methodology that is a much "milder form of positivism" (Willis, 2007). This methodology is similar to positivism but lets the researcher to interact more with his/her participants. It uses methods such as survey research and qualitative methods e.g. participant observation (Creswell, 2008).

5.1 Data Collection Method

Data was collected using face-to-face interviews and was done mainly using quantitative likert scale questions that sought to measure the hypotheses test questions. Data was further prepared and analysed using both uni-variate and multivariate analysis tools.

5.2 Study Sampling Procedure and sample size

The study used systematic sampling procedure that was guided by the area of the proposed hub locations. The procedure involved targeting 8 villages where the hub were to be established. The procedure for input provider’s differed from that of the traders (milk and cattle) in a number of ways. First, for the input providers, all the total 8 villages were targeted and the procedure involved visiting and collecting data from all the respondents serving the villages. Official gatekeepers were used to gain access to the villages as well as to escort the researchers. In addition, respondents in small towns serving the villages were also targeted. These respondents all served farmers from the target villages and some served as wholesalers to the village input providers.

Milk and cattle traders procedure took into account the occupation of the village residents. Unlike the input provider’s sample that targeted all the 8 villages, the traders procedure involved visiting and collecting data from milk traders in 4 villages and cattle traders in 2 villages. Official and informal gate keepers were used to access the traders.

A total of 96 respondents were sampled with 65 being input providers and 31 being milk and cattle traders.
5.3 **Administration of survey instrument**

The survey instrument was with the help of two enumerators along the researcher. The researcher began by training the respondents on the survey instrument. After which, face to face interviews were carried out. The mode of administration was selected to accommodate the relatively low literacy levels of the respondents.

5.4 **Questionnaire Design**

The questionnaire was designed to fit the medium. The design involved an introduction and consent form as well as an explanation of the proposed hub program. A mixture of agreement scale and multiple choice questions were used.

5.5 **Translation of Questionnaire to Swahili**

The questionnaire was further translated into Swahili to accommodate the national language of the respondents. The translation followed

5.6 **Scale Items relating to Research Hypothesis**

The scale items relating to the research hypothesis were designed from literature as well as an elicitation study. The scales captured four themes.

The first was the market effects which were represented by four items namely costs, risk, poor roads, and distance. Secondly, the incentive theme was captured by expectations of increased volume, revenue and societal capital. Anticipated payment guarantee and labor efficiency were also captured under business incentives.

Thirdly, motive covered the respondents’ perceived ability in their ability to take on the increased business as a result of joining the hub. The final theme, intention covered the respondents’ likelihood to join the hub.

5.7 **Data Preparation and Data Analysis Techniques**

The collected data was first manually entered into an Excel sheet and transferred into an SPSS file. The data was then screened for validity. Some parts of the cases with incomplete responses as well as means and standard deviations that were unreasonable or unbelievable; were deleted
and treated. The screening aimed to check the pattern of missing data and establish why it was missing (Hair et. al., 2006).

Consequently, a total of 90 returned responses were uploaded from the total 96 sampled. The data was then uploaded into SPSS.

5.7.1 Univariate Analysis

The frequency and mean of the descriptive variable in the data were analysed using univariate analysis. These variables formed section one and three of the questionnaire and are discussed in chapter 4.

5.7.2 Multivariate Analysis

The study used confirmatory factor analysis (CFA) and structural equation modeling (SEM) methods of multivariate analysis. CFA was performed using the statistical package SmartPLS to determine whether the scale items correspond to the latent constructs. Internal consistency and measurement reliability of the model were tested using Cronbach’s alpha reliability coefficient (Werts et al., 1974). This coefficient evaluates how well as group of items converges on a single construct with an index of 0.7 being the preferred minimum (Hair et al., 2006). Convergent validity was also measured using composite reliability which is argued to be more reliable in assessing convergence since “it takes into account the relative weights of the indicators of latent constructs” unlike Cronbach alpha which “assumes equal weight” (Gyau & Spiller, 2007, pg. 10). In addition, the Average Variance Extracted (AVE) was also calculated to check if the construct variance can be explained by the indicators (Fornell & Larckner, 1981). The recommended smallest value for each construct is at least 0.5 meaning that the indicator explains at least 50% of the variance (Bagozzi & Yi, 1988)

Structural Equation Modelling (SEM) was used for testing and estimating causal relations by using quantitative statistical data (Hair et al., 2006). The SEM starts of with model creation supported by academic theory and research (Hair et al., 2006). In our case, the details of the theoretical model are provided in chapter…; the model was created following reviews of different literatures.
The model testing was done using a Partial Least Squares (PLS) SEM technique through the use of SmartPLS software 2.01. The PLS,SEM technique enabled the researcher to gain an understanding of the relationship between the latent variables. In addition, the technique was suitable due to the ability of PLS to handle small sample sizes in the SEM; the technique applies more lenient distribution assumptions than others such as LISREL or AMOS (Chin, 1998; Joreskog & Wold, 1982; Ringle et al., 2005; Gyau & Spiller, 2007). It was consequently a more effective prediction-oriented variance based approach to SEM (Liljander et al., 2009).

In addition, PLS is a soft modeling form of SEM meaning that it “…iteratively estimates the parameters of latent variable” (Gyau & Spiller, 2007, pg. 9). A soft modeling approach considers the manifest as well as the latent variables. Simply stated, latent variable are those identified in the literature such as market effects, incentives, motives, intention; manifest variables on the other hand are the likert-scale items used to test the latent variables. The soft modeling approach works by allowing for the removal of manifest variables that fail to make a considerable contribution to their respective latent variables. Significance is assessed by looking at AVE, Cronbach alpha and composite reliability. This process is repeated until all the manifest variables are significant.

Consequently, a bootstrapping technique was performed. This technique is used to test the significance of the paths between latent variables. A re-sampling of 500 cases was used as suggested in this type of SEM (Gyau & Spiller, 2007). One other reason for choosing the PLS,SEM technique for this study was because it is able to estimate a model even when only two manifest variables are used to measure the latent variable (Dibben & Chin, 2005; Gyau & Spiller, 2007; Herath & Rao, 2009); other reasons for choosing the technique have been discussed above and include the fact that it accommodates for a small sample size and its leniency in the assumptions on distribution.

Testing of the SEM model was done be evaluating the inner and outer models. The outer model’s evaluation was done by analysing the individual items reliabilities. Minimum factor loadings of 0.4 are considered significant for the model (Hair et al., 2006; Gyau & Spiller, 2007). Internal consistency of the model was established by measuring at least a loading of greater than 0.7 from the Cronbach Alpha and 0.5 for the composite reliability (Werts et al., 1974, Hair et al., 2006).
AVE of minimum 0.5 was used to indicate the convergent validity of the latent variables (Bagozzi & Yi, 1988).

Evaluation of the outer model was done using discriminant validity which seeks to understand if each latent is different from the other latent variables. This was done using a loading and cross-loading matrix where the loadings must be higher than the cross loadings (Gyau & Spiller, 2007). This loadings were the Pearson correlation coefficients of their own latent variables. Discriminant validity was also measured by a process of evaluating whether the square root of the AVE was higher than the correlation between the latent variable and other latent variables (Chin, 2001). In addition, it is suggested that correlations between the different constructs in the model be smaller than 0.8 (Bagozzi, 1984).
6 Results and Analysis

6.1 Descriptive Statistics of Respondents

The total number of respondents was 96 with 60 input providers and 36 traders (both milk and cattle). A large majority (84%) of the respondents were from Handeni and Kilosa; predominantly extensive/ pre-commercial producers with traditional dairy production system. The respondents also mainly came operated within the districts and villages; only 20% of the respondents operated from major towns.

Table 6-1: Number of respondents from districts with traditional dairy production system

<table>
<thead>
<tr>
<th>District</th>
<th>No. Of villages targeted</th>
<th>% of Improved Cattle</th>
<th>No. of Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Handeni</td>
<td>8</td>
<td>2%</td>
<td>32</td>
</tr>
<tr>
<td>Kilosa</td>
<td>7</td>
<td>2%</td>
<td>49</td>
</tr>
<tr>
<td>Lushoto</td>
<td>8</td>
<td>69%</td>
<td>15</td>
</tr>
</tbody>
</table>

Over 60% of the respondents had less than 10 years experience in their respective occupations and 96% of the total respondents were operating in a business that had less than 5 employees. 48% of them were sole proprietors. In addition, about 60% of the respondents were below the age of 40.

Table 6-2: Summary of descriptive statistics

- Age – Majority were below 40 years
- Experience – less than 10 years experience
- Business location – mainly located in district and village
- Number of employees in business – less than five employees
6.2 Theoretical Model of Hub Adoption

Human behavior is guided by beliefs about the likely consequences of behavior, the normative expectations of others, and the presence of control factors that may facilitate or impede performance (Aizen, 2011). Our conceptual framework is based on human behavior change theory, the Theory of Planned Behaviour (TPB). The framework is first discussed before proceeding to look at the TPB.

6.2.1 Conceptual Framework

From the literature review discussions, market effects were expected to influence the motive, the intention as well as the incentives to participate in the hub. Consequently, market effects were independent factors. Motives and incentives were expected to have a direct influence on the intention to participate in the hub depending on the influence of market effects; the two were therefore dependent factors. Intention was dependent on all three i.e. incentives, motives, and market effects.

- Dependent factors: Motives, Incentives, Intention
- Independent factor: Market Effects

![Figure 6-1: Conceptual framework](image)
6.2.2 Theory of Planned Behaviour

According to the Theory of Planned Behavior, intention is the immediate antecedent of behavior. Intention is influenced by attitude toward the behavior, subjective norm, and perceived behavioral control. These direct predictors are themselves a function of the underlying behavioral outcome, normative, and control beliefs respectively (Ajzen, 1985, 2013d).

The theory further states that the most immediate antecedent to behavior is intention to perform the behavior. A person can only perform a behavior that they have strong intentions to perform. The intention to perform is a factor of attitudinal beliefs, normative beliefs and behavior control beliefs:

Attitudinal beliefs relate to the beliefs of how positive or negative the consequences to perform a behavior are. Attitudinal beliefs cannot be general beliefs but must conform to the principle of compatibility where the target, action, context and time are assessed at identical levels of generality and specificity.

Normative beliefs on the other hand, relate to the social pressure (from significant others) to perform a certain behavior.

Finally, Perceived Behavior Control refers to the perceived ease or difficulty of performing the behavior and it is assumed to reflect past experience as well as anticipated impediments and obstacles.

6.2.3 Application of the TPB Model

Belief constructs were designed following the Theory of Planned Behavior Questionnaire design guide (Ajzen & Fishbein, 1980). These included beliefs about the behavior control and attitudinal beliefs. Attitudinal beliefs relate to the beliefs of how positive or negative the consequences to perform a behavior are. Furthermore, this study adopted existing validated items to assess predictor constructs participation intention, and behavior control (e.g., Ajzen & Fishbein, 1980).

1. Perceived Behavior Control Beliefs

Control beliefs are things likely to impede or facilitate behavior, plus the strength of the control beliefs (Ajzen & Fishbein, 1980). This included constraining and facilitating belief constructs.
Constraining belief constructs are things likely to impede are perceived risk i.e. how much I think performing the behavior will expose me to the risk; as well as the perceived strength of control factors i.e. how strong these factors are. On the other hand, facilitating belief constructs are things likely to facilitate included the perceived strength of facilitating factors i.e. how much strength they have in facilitating the behavior.

2. Attitudinal Beliefs to Perform the Behavior

Attitudinal beliefs were derived by conforming to the principle of compatibility where the target, action, context and time are assessed at identical levels of generality and specificity (Ajzen & Fishbein, 1980).

3. Perceived Behavior Control

Perceived Behavior Control refers to people’s perception of their ability to perform a behavior (Ajzen & Fishbein, 1980) i.e. how much do I perceive that I have the ability to perform the behavior.

6.2.4 Measurement Model of Constructs

Reliability measures are provided in the table below. The data show that the measures are solid in regards to their internal consistency as indicated by the composite reliability. The composite reliabilities range from; which are well above the recommended value of 0.70 (Fornell and Larcker, 1981).
6.2.4.1 **Outer Model Evaluation**

Secondly, as per Fornell and Larcker (1981), the AVE exceeds 0.50 for each measure.

<table>
<thead>
<tr>
<th>Variables &amp; Indicators</th>
<th>Factor Loadings</th>
<th>Composite Reliability</th>
<th>Cronbachs Alpha</th>
<th>AVE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Incentives</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INC1</td>
<td>0.7337</td>
<td>0.8348</td>
<td>0.7519</td>
<td>0.5052</td>
</tr>
<tr>
<td>INC2</td>
<td>0.7694</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INC3</td>
<td>0.7473</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INC4</td>
<td>0.5681</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INC5</td>
<td>0.7174</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Market Effects</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ME1</td>
<td>0.6499</td>
<td>0.8015</td>
<td>0.6982</td>
<td>0.5095</td>
</tr>
<tr>
<td>ME2</td>
<td>0.5764</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ME3</td>
<td>0.9072</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ME4</td>
<td>0.6905</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Motive</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MOT1</td>
<td>0.7639</td>
<td>0.762</td>
<td>0.3765</td>
<td>0.6157</td>
</tr>
<tr>
<td>MOT2</td>
<td>0.8049</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Intention</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INT1</td>
<td>0.9367</td>
<td>0.9579</td>
<td>0.9413</td>
<td>0.8505</td>
</tr>
<tr>
<td>INT2</td>
<td>0.8892</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INT3</td>
<td>0.9408</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INT4</td>
<td>0.9214</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 6-3: Summary of outer model evaluation
6.2.4.2 Evaluation of Inner Model

Convergent validity was also tested using PLS-Graph by extracting the factor and cross loadings of all indicator items to their corresponding latent constructs. The results are shown in the Table 6-4 below and represent figures between 0.7047 and 0.9447; with them registering highly in their respective construct than any other.

<table>
<thead>
<tr>
<th>Incentives</th>
<th>Intention</th>
<th>Market Effects</th>
<th>Motive</th>
</tr>
</thead>
<tbody>
<tr>
<td>INC1</td>
<td>0.7328</td>
<td>0.4481</td>
<td>0.1694</td>
</tr>
<tr>
<td>INC2</td>
<td>0.7694</td>
<td>0.4256</td>
<td>0.0674</td>
</tr>
<tr>
<td>INC3</td>
<td>0.7471</td>
<td>0.3737</td>
<td>0.0283</td>
</tr>
<tr>
<td>INC4</td>
<td>0.5697</td>
<td>0.5095</td>
<td>0.0398</td>
</tr>
<tr>
<td>INC5</td>
<td>0.7172</td>
<td>0.477</td>
<td>0.236</td>
</tr>
<tr>
<td>ME1</td>
<td>0.0904</td>
<td>0.1331</td>
<td>0.6554</td>
</tr>
<tr>
<td>ME2</td>
<td>-0.0136</td>
<td>0.0983</td>
<td>0.5764</td>
</tr>
<tr>
<td>ME3</td>
<td>0.2225</td>
<td>0.2324</td>
<td>0.9005</td>
</tr>
<tr>
<td>ME4</td>
<td>0.0279</td>
<td>0.1272</td>
<td>0.6823</td>
</tr>
<tr>
<td>MOT1</td>
<td>0.3576</td>
<td>0.2003</td>
<td>0.1715</td>
</tr>
<tr>
<td>MOT2</td>
<td>0.2812</td>
<td>0.3614</td>
<td>0.0616</td>
</tr>
<tr>
<td>INT1</td>
<td>0.614</td>
<td>0.9366</td>
<td>0.1397</td>
</tr>
<tr>
<td>INT2</td>
<td>0.5463</td>
<td>0.8892</td>
<td>0.2332</td>
</tr>
<tr>
<td>INT3</td>
<td>0.5665</td>
<td>0.9408</td>
<td>0.2158</td>
</tr>
<tr>
<td>INT4</td>
<td>0.6065</td>
<td>0.9214</td>
<td>0.2459</td>
</tr>
</tbody>
</table>

Table 6-4 : Factor loadings (bolded) and cross loadings

Table 6-5 below further indicates the results of testing the discriminant validity of the measure scales. The components of the matrix diagonal are the square roots of the AVEs, and are in all cases greater than the off-diagonal elements, in their corresponding row and column; these to support the discriminant validity of the scales.

<table>
<thead>
<tr>
<th>Incentives</th>
<th>Intention</th>
<th>Market Effects</th>
<th>Motive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incentives</td>
<td>0.7108</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Intention</td>
<td>0.6334</td>
<td>0.9222</td>
<td>0</td>
</tr>
<tr>
<td>Market Effects</td>
<td>0.1655</td>
<td>0.2261</td>
<td>0.7138</td>
</tr>
<tr>
<td>Motive</td>
<td>0.4047</td>
<td>0.3619</td>
<td>0.1456</td>
</tr>
</tbody>
</table>

Table 6-5 : Discriminant validity (intercorrelations) of variable constructs
6.3 Results of Structural Models

Figure 6-2: Structural model for sample I (Input Providers)

Figure 6-3: Structural model for sample II (Traders, milk and cattle)

6-6: Table showing structural models for the separate sample sets
6.4 Hypotheses and Outcomes

The table below shows the hypotheses and outcomes.

<table>
<thead>
<tr>
<th>Hypotheses</th>
<th>Constructs</th>
<th>Expected Sign</th>
<th>Traders Sample</th>
<th>Input Providers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Beta Coefficient</td>
<td>T-Statistic</td>
</tr>
<tr>
<td>H1</td>
<td>ME – INT</td>
<td>-</td>
<td>0.037</td>
<td>0.935</td>
</tr>
<tr>
<td>H2</td>
<td>ME – MOT</td>
<td>-</td>
<td>0.169**</td>
<td>1.407</td>
</tr>
<tr>
<td>H3</td>
<td>MOT – INT</td>
<td>+</td>
<td>0.160***</td>
<td>1.819</td>
</tr>
<tr>
<td>H4</td>
<td>ME – INC</td>
<td>-</td>
<td>0.218</td>
<td>0.127</td>
</tr>
<tr>
<td>H5</td>
<td>INC – INT</td>
<td>+</td>
<td>0.623***</td>
<td>2.919</td>
</tr>
<tr>
<td>H6</td>
<td>INC - MOT</td>
<td>+</td>
<td>0.547</td>
<td>1.239</td>
</tr>
</tbody>
</table>

Table 6-7: Hypotheses Outcome: Significant at ***p<0.05, **p<0.1

The results in Table 6-7 show the confirmation of H2, H3 and H5 for the traders sample and rejection of H1, H4 and H6. For the input provider’s sample H4, H5, and H6 were confirmed while H1, H2, and H3 were rejected. A graphical representation of the hypotheses results is presented below.

The structural model elucidated several results. Three out of the 6 hypotheses for both case samples were confirmed while 3 were rejected. Of interest were the rejected hypotheses and the basis for their rejection. The rejection was because the links between the constructs were not statistically significant (i.e. p>0.05 and p>0.10). Both the rejected and confirmed hypotheses are discussed in the discussion section that follows.
Table 6-8: A graphical representation of the hypotheses results with Input providers graph above and traders’ below
7 Discussion

7.1 Summary of the Research Process

The researcher sought to measure the intention of small scale traders to participate in the dairy hub program being introduced in Tanzania. The research showed that models of two sample sets accounted for 44% (Figure 6-2: Structural model for sample I (Input Providers)) and 55% (Figure 6-3: Structural model for sample II (Traders, milk and cattle)) of the variances in behavioral intention.

First, the researcher reviewed literatures on development programs aimed at small-scale producers, looking at the factors that facilitate or impede dairy developments. In addition, the literatures sought to establish the role of private sector in dairy development in a bid to establish what incentives would lead to high participation by private sector into dairy development programs.

Consequently, the researcher extracted hypotheses that explained reasons for and against private sector participation in the dairy hub. The theoretical framework used followed the Theory of Planned Behavior model. This model was used to test the hypotheses using structural equation modeling, a partial least squares approach to determine the strengths and relationships.
7.2 Hypothesis Discussion

H1: Market effects will negatively affect intention to adopt the hub idea

The first hypothesis path was testing the influence that market-effects had on the intention for both case samples. It appeared that the influence was not direct but a moderating effect through incentives in the case of input providers and through motivation in the traders’ case.

H2: Market effects will negatively affect the motive of the participants to adopt the hub idea

For the case of input providers, H2 was rejected. H2 sought to test the influence market-effects had on motivation. For H2, it was expected that the market effects would have a negative influence on the participants’ motive to adopt the hub. The argument was that the harsh market was going to deter motivation due to issues such as risk, poor roads, distance, etc. The study proved that this was not the case.

Market traders on the other hand interact with the environment on a day-to-day basis and were therefore confident enough to make decisions based on these market-effects. It is also possible that the trader’s perceive the hub as an answer to their market problems; whereby by pooling farmer’s together, the traders would be able to increase their economies of scale in-terms of managing the logistics of the milk purchase and delivery.

H3: Motive will have a strong positive effect on intention to adoption of the hub idea

For the case of input providers, H3 was also rejected. H3 looked at the influence motivation had on intention. For H3, motives were expected to have a positive effect on the intention to adopt the hub idea. This was based on the fact that the hub’s incentives would be strong enough to motivate participants towards intention to adopt.

The trader’s motive exemplified a strong influence on intention. For input provider’s were not sure about the market effects and therefore did not exhibit commitment based on their perceived behavior control.
H4: Market effects will have a negative effect on the incentives to participate in the hub idea

For input providers’ market effects were influencing incentives in a positive way as opposed to the expected negative effect. It is possible that the market was seen as lucrative enough to warrant this? This would mean that the producers are not perceived as high risk but rather a high gain market.

For the case of traders, H4 was rejected. H4 postulated that market effects would have a negative effect on the incentives to participate in the hub. The argument was that the harsh market environment would water down the incentives to adopt the hub. The study showed this to be untrue. Traders didn’t think that market effects would affect the incentives provided by the hub. This confirms the theory of planned behavior model (Ajzen, 1985, 2013d) that does not provide for any link between attitudinal beliefs (incentives) and perceived behavioural control i.e. motive.

H5: Incentives will positively affect intention to adopt the program

Both traders and input provider’s see the hub as allowing them access to the benefits of a large untapped market. Both sample sets confirm the theory of planned behavior model (Ajzen, 1985, 2013d) that shows a direct relationship between attitudinal beliefs and intention to adopt a behavior.

H6: Incentives will positively affect the motive to adopt the program

For the case of traders, H6 was rejected. H6 postulated that incentives would positively affect the motive to adopt the hub. The argument here was that since the hub idea proposes a better way for the participants to carry out their businesses; it was expected that this would motivate the participants. The study showed this to be untrue. Traders don’t think that incentives would motivate them to adopt the idea of the hub. This confirms the theory of planned behavior model (Ajzen, 1985, 2013d) that does not provide for any link between attitudinal beliefs (incentives) and perceived behavioural control i.e. motive.
7.3 **Research Questions Summary**

*What factors are likely to influence adoption or rejection of the program?*

To the extent that the innovation/intervention program is able to address the market effects of the traders; then adoption is likely. Market effects are influencing the motive of the traders. Traders want the program to help them address issues such as storage and transport challenges. These are issues presented by the market in terms of poor roads, long distance and lack of access to credit.

Incentives will make input providers to adopt the program. These include things such as sales, volume, payment guarantee, and business networks. In addition, market effects are affecting incentives. This goes against the norm of harsh market is a threat to be avoided. The likely reason is the perceived gain from the harsh market. In other words, the input providers are aware that the harsh market conditions are a road-block to the wealth of traditional markets.

Their experience in the environment causes the traders motive to be stronger than that of the input providers. Unlike the input providers, the fact that the traders are in day-to-day contact with the market effects; makes it possible for them to be driven to participate as a way of collectively resolving the market effects issues.
7.4 Conclusion

In one sample set, the research confirmed the theory of planned behavior theoretical framework (Ajzen, 1985, 2013d) which does not provide for any link between attitudinal beliefs (incentives) and perceived behavioural control i.e. motive. Traders didn’t think that incentives would motivate them to adopt the idea of the hub. This confirms the theory of planned behavior theoretical framework (Ajzen, 1985, 2013d) that does not provide for any link between attitudinal beliefs (incentives) and perceived behavioural control i.e. motive. Further confirming this is the observation that traders didn’t think that market effects (behavior control beliefs) would affect the incentives (attitudinal beliefs) provided by the hub.

In the other sample set, it was interesting to observe that the input provider’s motive did not affect their intention to adopt the hub idea. The only construct affecting intention was incentives. The market effects were expected to negatively affect incentives, motivation and intention. The effect on incentives was positive; and the effect on motivation and intention was a moderating one. The moderating effect on intention was reflected in a positive effect of incentive to intention. However, the moderating effect on motive did not result in any effect of motive to intention.

In addition, input providers only saw the hub as allowing them to access a large untapped market. This however did not seem enough to motivate them to want to participate. The question to answer would be whether incentive is enough to sustain participation by the hub; considering the perceived gains will not be realized instantly.
7.5 **Recommendations/ Future Study**

Business development approaches should be aimed at all the chain actors. This would ensure that the chain is effective by including the smallholder farmers in the value chains. Successful value chains map out their key players and seek to strengthen the weak links within the chains (Bonney et.al 2007). If the small scale actors are not developed to tackle the market effects, there is bound to be a weak link in the smallholder value chain. Further studies could explore the adoption of business development approaches along the whole chain to further increase smallholder inclusion in modern value chains. Such approaches include participatory market chain approaches that have been discussed in the literature review.

In addition, it would be necessary to study the type of engagement approaches likely to influence high participation by the smallholder input providers. According to Pretty’s participation typology, the type of participation sought above is participation by consultation. In this type of consultation, the traders only participated by answering questions. Obviously, such a consultative process would fail to concede any share in decision making (Pretty, 1995). This type of participation doesn’t in any way give power to the respondents and could pass as a weak form of participation unless the surveys are used to initiate interventions that improve the design of the program (Smith 1998). Stronger forms of participation that eventually lead to sustainability of projects could be explored. These could be through interactive participation or self-mobilisation (Smith 1998). Sustainability of projects dealing with external change actors has been questioned as dependence is created if ownership is not achieved (Umali-Deininger 1997). For the mediator’s role to succeed, they must be seen to be a product of free market environment (Dinar & Keynan 1998).
8 References


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Ndanu H.L., Onyango F., Massawe L. and Matiko G Participatory epidemiology: Dairy value chain assessment in eight villages in Tanzania Safe Food, Fair Food project July 2012


Nkya R. Kessy B. M. Lyimo Z. C. Msangi B. S. J. Turuka F. Mtenga K.


9 Survey Questionnaire

This research is about a farmer group that is being started in .................village. The farmer group is formed with an aim of collecting milk to sell and at the same time provide its members with input services such as extension services, feeds, health products, as well as other farm inputs. Provision of these inputs is the reason the investigator approaches you.

The purpose of this research is to record your experience and perceptions in providing input products and services to farmers and specifically farmer groups in your location.

You are invited to participate in this interview. The questionnaire consists of 25 questions and will take approximately 30 minutes to complete. Please answer the questions to reflect your opinions and experiences as accurately as possible and to the best of your knowledge. If you would like clarification on any of the questions, please do not hesitate to ask the interviewer. If you wish not to answer any particular question(s), please say so and the interviewer should be able to proceed to the next question. In participating please answer the questions as read to you by the interviewer who will enter your responses in the questionnaire’s blank spaces and tick where appropriate. The interviewer should be able to inform you when the interview questions are complete.

Your participation in this survey is entirely voluntary. You may withdraw from participating in this survey at anytime at which point your data will be destroyed. Your name will remain anonymous in all publications produced from this study. This survey questionnaire and all the raw data related to this research project will be stored securely and only accessible to the researcher, his supervisor and by the examiners of the thesis if need arises. The data and all other information collected, in all circumstances, will solely be used for educational purposes.

This study adheres to the Guidelines of the ethical review process of The University of Queensland. While you are free to discuss your participation in this study with the researcher (contactable in person during fieldwork or through phone +61412913750 or e-mail: rmuchichu@gmail.com), if you would like to speak to an officer of the University not involved in the study, you may contact Prof. Helen Ross (ph. 0408-195324) or Helen.Ross@uq.edu.au.

I understand that by submitting this survey questionnaire I indicate my consent to take part in this research project. The researcher has agreed not to reveal my identity and personal details in any reports that might be produced. (Please tick the box if you accept)
1. Introduction & Awareness

The functions of hubs i.e. provision of inputs and services on Check-off

The background is that farmers can increase their productivity if they were able to access inputs/services. Most of these farmers have no capital and hence cannot afford the inputs/services. However, these same farmers have either cattle/milk that they sell everyday or every market day. The objective of the hub is to allow the farmer, through his sale of produce to be able to pay for inputs/services. So, the hub allows the farmer to access inputs/services through a check-off system between the milk trader and the input/service provider. In the end:

- The farmer is able to access inputs/services
- The farmer’s productivity goes up hence his income levels
- More demand for inputs/services is seen as he grows and expands

What we would like is to engage input/service providers and milk traders/ cattle traders; and link them to each other and to farmer groups. So, we would be looking to sign up these people for later discussions on the agreements formulation.

Please take a few minutes to tell us what you think about the possibility of being part of this arrangement.

1) I think selling my inputs/services using this arrangement will be:

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<th>Strongly Agree</th>
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<th>Undecided</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
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<tr>
<td>a) Will be financially benefiting:</td>
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<td>b) Will be risky (I could lose money):</td>
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<td>c) Will be career fulfilling:</td>
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<td>d) Will be demanding:</td>
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2) Would you agree with the following statements?

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<th>Strongly Agree</th>
<th>Agree</th>
<th>Undecided</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
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<tbody>
<tr>
<td>a) Selling through this arrangement will allow me to increase my sales</td>
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<td>b) Serving the dairy hub will</td>
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increase my costs due to training, input finance, travelling to the hub

c) The arrangement will be too risky as traders may fail to honor their contractual obligations

d) I would have no problem extending credit to the dairy hub

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<th>How much do you agree with the following statements?</th>
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<tbody>
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<td><strong>Strongly Agree</strong></td>
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<td>a) Other people (livestock officers) important to me would approve of me selling through these arrangement</td>
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<td>b) My competitors would be envious if they discovered I am selling through the hub</td>
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<td>c) My suppliers would approve (support) of me selling through these arrangement</td>
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<td>d) My customers (retailers for distributors) would approve of me selling through these arrangement</td>
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To what extent are the following statements true?

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<th>To what extent are the following statements true?</th>
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<tr>
<td><strong>Strongly Agree</strong></td>
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</tbody>
</table>
a) I am financially able to supply inputs to the arrangement

b) I have the labor capacity to sell through the arrangement

c) Supplying inputs through the hub is not entirely up to me

d) Other uncontrollable factors would make it difficult to sell through the arrangement

3) Would you agree with the following statements?

<table>
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<tr>
<th>Statement</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Undecided</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
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<tbody>
<tr>
<td>a) The cost margin structure (due to unavailable products) would make it difficult for me to sell through these arrangement</td>
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<td>b) Poor roads (esp during floods/etc) would make it difficult for me to supply my products to the hub</td>
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<td>c) Distance would discourage me from selling to the hub</td>
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<td>d) Security (maybe cattle rustling) would make it difficult for me to serve the hub appropriately</td>
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<td>e) Lack of credit would make it difficult for me to sell through the hub</td>
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<td>f) High volume of order would determine if I was to sell through</td>
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the hub

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<th>Strongly Agree</th>
<th>Agree</th>
<th>Undecided</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
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<tr>
<td>g) Guarantee of payment would determine if I was to sell through the hub</td>
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4) I believe I do NOT have control over the following factors:

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<th>Strongly Agree</th>
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<tr>
<td>a) The cost margin structure (due to unavailable products)</td>
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<td>b) Poor roads</td>
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<td>c) Distance</td>
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<td>d) Security (maybe cattle rustling)</td>
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<td>e) Weather climate e.g. drought, floods</td>
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<td>f) Credit</td>
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5) How much do you agree with the following statements?

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<th>Strongly Agree</th>
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<td>a) If a dairy hub approached me to supply them inputs, I would be willing to work with them</td>
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<td>b) If I knew of a new dairy hub in the area, I would approach them for business</td>
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<td>c) Based on what I know about dairy hubs, I would be committed to do</td>
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<td>d) I am ready to sign up for the arrangement</td>
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**Information on Extension Service Provision:**

6) Do you provide farmers with extension services? Yes ( ) No ( )
   a. Where does this take place? Farmers farm ( ) Own Shop ( ) Field Day ( ) Others ( )
   b. Do you charge for these services? Yes ( ) No ( )
   c. If yes, how much?

7) **Personal Information: The following questions regard your experience, knowledge and skills as an input/service provider.**

Professional Training: ........................................................................................................

Years in current role: ........................................................................................................

Number of employees: ........................................................................................................

Inputs Provided:
   a) Extension Services ( )
   b) Farmer Training ( )
   c) Agro-vet Chemicals ( )
   d) Feeds ( )
   e) Artificial Insemination ( )
   f) Other ( )

Gender: □ Male □ Female
Age: □ 18-30 □ 31-40 □ 41-50 □ 51-60 □ over 60
Education (highest level): □ Primary school □ Junior school □ High school
   □ Technical or trade certificate □ University □ Postgraduate
Business Turnover (annual): □ 1-20,000 □ 20,001-40,000 □ 40,001-60,000 □ 60,001-80,000
   □ 80,001-100,000 □ over 100,001

Thank you very much for your time and contribution.