Participation of smallholder farmers in Zambia's dairy value chain through interlocked contractual arrangements and its impact on household income

by

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DECLARATION

I declare that this dissertation, which I hereby submit for the degree of Doctor of Philosophy in Rural Development and Planning at the University of Pretoria, is my own work and has not previously been submitted by me for a degree at this or any other tertiary institution.

Signature: 

Date: _____

DEDICATION

This work is dedicated to my mother, Peruth Kiwanuka, daughters, Elizabeth and Faith Lubinda, and husband, Calvin Lubinda. Thank you for all the patience, love and unfailing support.

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ABSTRACT

This thesis examines factors influencing smallholder dairy farmers' participation in interlocked contractual arrangements, the nature and level of participation, the role of interlocked contractual arrangements in promoting smallholder farmers' participation in markets and the impact of participation on household income. The study seeks to contribute to the ongoing debate about the prospects of these arrangements in enhancing smallholder farmers' access to restructured and liberalised agrifood markets and whether they truly benefit from participating. The study was carried out in 2014 in the milk shed areas of three districts of Zambia where interlocked contractual arrangements were present.

Key informant interviews and focus group discussions were used to collect data from representatives from two financial institutions, four milk collection centres and three milk-processing firms. Semi-structured questionnaires were used to collect data from 266 households engaged in dairy farming. A multi-stage sampling design was used to select these households.

Data analysis employed descriptive statistics and econometric regression models. Detailed analysis was carried out by employing measures of dispersion and central tendency, as well as data normality tests. The double-hurdle model was used to identify determinants of smallholder farmers' participation in interlocked contractual arrangements, while propensity score matching was used to assess the impact of participation on household income.

Determinants of smallholder farmers' decision to sell milk through interlocked contractual arrangements include ownership of improved breed animals, milk price, access to dairy

marketing information, income from other sources and landholding size. While most of these factors also affected the proportion of milk sold, the following were important as well: household head education level, cattle-rearing culture, relative supplier's dependency on buyer and existence of trust in the exchange relationship. Factors adversely affecting farmers' participation include high stock feed cost, poor breeding programmes, low milk prices, a long time lag for contract review, low participation of women and youths and inadequate involvement in decision-making and transparency in grading.

Results further show that ownership of a milk-processing plant and membership to a dairy cooperative enhance smallholder farmers' involvement in value chain activities but not in key business decision-making. Interlocked contractual arrangements have enhanced smallholder farmers' participation in the mainstream dairy value chain and access to resources and services, through reduction of information asymmetry and related costs and risks. They have achieved this through the concurrent use of contracts, transaction-specific investments, trust and relational norms. Support from development agencies and public and private sectors is also critical in addressing the multiple market and institutional failures that prevent smallholder farmers from participating in markets. Although results show that smallholder farmers are not excluded from participating in interlocked contractual arrangements, the intensity of their participation is low. Meanwhile, processors are willing to collaborate more with smallholder farmers because of their low side-selling risk. Whereas interlocked contractual arrangements offer prospects to enhance access to financial services and stock feed, much more needs to be done to increase the number of participating farmers.

Results also reveal that participation in interlocked contractual arrangements enhances milk revenue but not household income. While interlocked contractual arrangements enhance smallholder farmers' access to markets, they are not a panacea for addressing the high rural poverty rates. Thus, reorientation from overemphasis on contract farming to a mix of other strategies, such as livelihood diversification.

Key words: Contract farming, smallholders, inclusiveness, market participation, value chain finance, rural development strategy, double-hurdle, propensity score matching

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LIST OF ACRONYMS

DID	Difference in Difference
GART	Golden Valley Agricultural Research Trust
GRZ	Government of the Republic of Zambia
IFC	International Finance Corporation
LR	Likelihood Ratio
MEU	Man Equivalent Units
MFI	Micro Finance Institution
NGO	Non-Governmental Organisation
OLS	Ordinary least squares
SNDP	Sixth National Development Plan
TLU	Tropical livestock units
UNZA	University of Zambia
US	United States
USAID	United States Agency for International Development
ZANACO	Zambia National Commercial Bank
ZMW	Zambian Kwacha Rebased

CHAPTER 1

INTRODUCTION

1.1 Background

Enhancing smallholder farmers' participation in markets is critical for enhancing food security and reducing poverty. Yet it remains a challenge for most countries in sub-Saharan Africa. The inability of smallholder farmers to market their produce implies that they lack income for acquisition of production inputs and agricultural technologies to enhance their productivity and purchase consumer goods. They are also unable to accumulate assets that they can use as collateral for obtaining agricultural credit to intensify investments in their enterprises. Consequently, they fail to upgrade from subsistence production and are entrapped in a low equilibrium poverty trap. In such a situation, food consumption is limited to what can be produced on the farm or in the community, which may result in poorly balanced diets (IFAD, undated).

Therefore, enhancing smallholder farmers' access to input and output is a key policy objective for the Government of the Republic of Zambia (GRZ). Zambia's overall poverty rate is about 64%, but rural poverty rates are about 78% (Zulu et al., 2015). Moreover, rural poverty rates have remained almost static over the last decade (Hichaambwa et al., 2015; Burke et al., 2012). According to the 2016 Global Hunger Report, the global hunger index for Zambia is 39%, which is among the three highest rates of hunger in Africa and in the world (IFPRI, 2016). Most of the rural poor and hungry are smallholder farmers (Wiggins & Keats, 2013), yet they contribute 80% to the country's total food production. However, the majority participate in output markets as consumers and not as producers (Sitko et al., 2011).

Various reasons have been provided for the low participation of smallholder farmers in markets. These include limited information on production methods, low productivity, lack of credit, high transaction costs and risks and poor market linkages (Minot & Ronchi, 2014; Dorward et al., 2007). Hence, there is a need to address these market failures to improve smallholder farmers' access to markets. One of the rural development strategies being promoted by government, policy makers, development agents and the private sector is increasing smallholder farmers' participation in interlocked contractual arrangements. Interlocked contractual arrangements are a form of contract farming, where contractors not

only provide a market outlet for farmers' produce, but also provide resources or link farmers to providers of key inputs, extension and financial services, the costs of which in most cases are deducted from proceeds at the point of sale. In other words, the output, input and credit markets are interlinked. In the context of market liberalisation, globalisation, reduced government support to farmers, changing consumer preferences and procurement systems, interlocked contractual arrangements could resolve the persistent market failures for smallholder farmers (Da Silva & Rankin, 2013; Han et al., 2013; Jia & Bijman, 2013). This is because interlocked contractual arrangements can effectively address high transaction costs, information asymmetry and risks constraining smallholder farmers' access to markets.

1.1.1 Interlocked contractual arrangements in Zambia

In Zambia, smallholder farmers are linked to agribusinesses through interlocked contractual arrangements through value chains that are more or less vertically integrated, depending on the agricultural commodity. Originally, interlocked contractual arrangements were common in cotton, tobacco and sugar cane value chains. Over time, they expanded to soya, wheat, horticulture (tomato and other vegetables), agricultural retail-related seed production and dairy farming (Beggs, 2010). Usually, interlocked contractual arrangements are prevalent in the crop rather than livestock sector. While many of the interlocked contractual arrangements in Zambia help link smallholder farmers to formal markets for export crops or traditional cash crops, demand is also rising to supply other formal markets, including urban supermarkets, fast food chains and tourist hotels.

Most of the post-liberalisation literature on contract farming and interlocked contractual arrangements, in particular, simply perceive it as a private-led initiative, where agribusinesses play a key role in providing inputs, technical assistance and technology to smallholder farmers (Kirsten & Sartorius, 2002; Singh, 2002; Glover & Kusterer, 1990; Key & Runsten, 1999). In contrast, contemporary interlocked contractual arrangements comprise diverse actors, including non-governmental organisations (NGOs), the private and public sectors that collaborate and play major roles in promoting and structuring these institutional arrangements. Such collaboration helps smallholder farmers overcome the multiple market and institutional failures that prevent them from participating in mainstream value chains (Kirsten et al., 2013). Therefore, contemporary interlocked contractual arrangements represent a more holistic and sustainable approach to rural development.

An example of contemporary interlocked contractual arrangements is found in the Zambian dairy sector. Instead of perceiving smallholder farmers as risky business partners, the private sector (milk processors, input, financial and other service providers), with the help of NGOs and the government, have forged productive commercial relations with smallholder dairy farmers as suppliers and customers. The government, in collaboration with NGOs (e.g. Land O'Lakes, Heifer Project International, Agricultural Support Programme, MUSIKA Zambia Ltd, Zambia Agribusiness Technical Assistance Centre, the Herd Book Society of Zambia and World Vision) have facilitated smallholder farmers' linkages to the modern dairy value chain. They have done this by organising them into producer cooperatives, providing them with improved breed animals, technologies and extension services, and building milk collection centres equipped with milk cooling and testing facilities (CAPRA, 2013). The subsequent organisation of producers and establishment of milk collection centres has encouraged processors (Parmalat Zambia Ltd, Zambeef, Nice Product and Varun Food and Beverages), input providers (feed, milking equipment, veterinary services), formal financial institutions (Zambia National Commercial Bank, Micro Bankers Trust) and insurance companies to partner with smallholder farmers through interlocked contractual arrangements.

The case of contemporary interlocked contractual arrangements in the Zambian dairy sector is particularly interesting in that many studies on contract farming have focused mainly on the crop sector (Mwabi et al., 2016; Sokchea & Culas, 2015; Sambuo, 2014; Cahyandi & Waibel, 2013; Escobal & Cavero, 2012; Fréguin-Gresh et al., 2012; Michelson et al., 2012; Bellemare, 2012; Narayanan, 2010; Jones & Gibbon, 2011; Bolwig et al., 2009; Saigenji & Zeller, 2009; Maertens & Swinnen, 2009; Miyata et al., 2009; Minten et al., 2009; Warning & Key, 2002). The few studies that have considered contract farming in the livestock sector include those of Ramaswami et al. (2006), Simmons et al. (2005) and Narayan (2014) on poultry and Birthal et al. (2005) on dairy. Yet the dairy sector is one of the success stories in Zambia, where smallholder farmers have been integrated in the mainstream value chain through these institutional arrangements.

Moreover, the dairy value chain is an important source of income and employment to smallholder farmers and offers interesting opportunities for the agricultural sector through import substitution and export. According to Strategic Visions Ltd (2011), milk consumption (demand) in Zambia is higher than supply. Hence, the country remains a net importer of milk and milk products. The milk and milk product imports range between 2.5 million and 3 million

kg per annum. Strategic Visions Ltd (2011) further shows that, in 2010, Zambia produced between 214 and 254 million litres of milk, and about 39 to 41 million litres of milk passed through the formal marketing channels. The contribution of farmers to total milk supply in 2010 was as follows: commercial farmers with more than 50 milking animals contributed 70.1%; large emergent farmers with 21 to 50 milking animals contributed 7.5%; small emergent farmers with 11 to 20 milking animals contributed 9.6% and smallholder dairy farmers, with 1 to 10 milking animals contributed 12%.

It is anticipated that, with the recent concerted efforts aimed at enhancing smallholder farmers' participation in interlocked contractual arrangements, milk production could increase by tapping into the potential of smallholder farmers who currently produce only about two litres per cow per day. Yet, this could increase to 8 to 12 litres per cow with improved breeds and good management practices (Strategic Visions Ltd, 2011). Moreover, the share of milk passing through the formal channels/modern value chain is expected to increase as more smallholder farmers actively participate in interlocked contractual arrangements.

1.2 Research problem

Recently, much attention has been given to interlocked contractual arrangements and their role in facilitating smallholder farmers' access to markets. However, little information exists on conditions under which smallholder farmers participate, and the extent to which participation has enhanced their access to markets and impacted on household income.

Existing literature suggests that demographic, socio-economic and institutional factors affect smallholder participation in contract farming. However, the evidence is mixed (Mwabi et al., 2016; Wang et al., 2013; Bellemare, 2012; Escobal & Cavero, 2012; Fréguin-Gresh et al., 2012; Michelson et al., 2012; Wainaina et al., 2012; Wang et al., 2011; Narayanan, 2010). The varying conditions under which smallholder farmers participate in interlocked contractual arrangements could result from two possible factors. Differences in commodity types exchanged influence the form of governance structures and mechanisms that develop (Williamson, 1985; Gereffi et al., 2005). This could cause increased diversity in contractual arrangements that, in turn, could affect the significance of various variables in explaining smallholder farmers' participation.

Controversies also exist regarding the extent to which smallholder farmers participate in contract farming and markets. Some studies show that contractors prefer working with wealthier farmers than resource-poor farmers due to (i) high transaction costs of dealing with

smallholder farmers, and (ii) the fact that they are unable to make the needed investments to meet the consistency, quality and quantity requirements for the modern channels (Da Silva & Rankin, 2013; Wainaina, 2012; Reardon et al., 2009). Yet, Swinnen and Maertens (2007) note that while theory suggests that transaction costs and investment constraints imply that smallholders should be excluded from participating, empirical work suggests a much greater degree of participation. Other researchers intimate that while the absolute number of smallholder farmers participating in contract farming is high, their supply volumes are low (Anseeuw et al., 2016; Fréguin-Gresh & Anseeuw, 2013). Agribusinesses prefer working with smallholder farmers and their associations even when commercial farmers are accessible because of labour incentives, reduced threat from supplier competition and low side-selling risks (Minot & Ronchi, 2014; Sambuo, 2014; Miyata et al., 2009).

While it is generally accepted that smallholder farmers participation is important, there are doubts as to whether participation in contract farming enhances smallholder farmers' household income (Mwabi et al., 2016; Henke Jr et al., 2008).Yet recent econometric studies that have controlled for causality and selection biases found significant and positive contribution of participation in contract farming to revenue from the contracted commodity and household income (Alemu et al., 2016; Sokchea & Culas, 2015; Cahyadi &Waibel, 2013) This is because farmers are able to access inputs, credit, technology, extension and transport services, which enhance their productivity and competitiveness and receive premium prices for supplying a quality product (Dries et al., 2010; Johnston & Meyer, 2009; Reardon et al., 2009; Setbbonsarng, 2008). In addition, the increase in income from the contracted commodity could have spill-over effects on other farm and non-farm enterprises and thus enhance household income (Bellemare, 2012; Minten et al., 2009)

Although interlocked contractual arrangements are a form of contract farming, it is difficult to isolate their effects from the general contract farming literature highlighted above. Also, most of these studies have focused on the crop sector and not the livestock sector. Lastly, the majority of developing countries where these studies have been carried out are characterised by varying cost structures, development levels, institutional advancements and experiences. This suggests that the debate on the extent to which interlocked contractual arrangements enhance smallholder farmers' participation in markets and the impact of participation on household income remains open, particularly in Africa. The current study is aimed at filling these knowledge gaps.

1.3 Objectives of the study

The overall objective of the study is to assess the role of interlocked contractual arrangements in Zambia's dairy sector in enhancing smallholder farmers' participation in markets and the impact of participation on household income.

The specific objectives of the study are as follows:

i) to identify the determinants of smallholder dairy farmers' participation in interlocked contractual arrangements;
ii) to assess the nature and level of smallholder dairy farmers' participation in interlocked contractual arrangements;
iii) to examine how interlocked contractual arrangements have facilitated smallholder dairy farmers' participation in markets; and
iv) to determine the impact of smallholder dairy farmers' participation in interlocked contractual arrangements on household income.

1.4 Thesis outline

The rest of the thesis is outlined as follows: Chapters 2 and 3 provide a critical review of literature related to the study objectives. Chapter 4 presents the conceptual framework and study hypotheses. The sampling and data collection techniques are explained in Chapter 5. Data analysis, the empirical model and estimation procedures are outlined in Chapter 6. Results on factors influencing smallholder farmers' participation in interlocked contractual arrangements are presented and discussed in Chapter 7. Chapter 8 presents the study results on the nature and level of smallholder dairy farmers' participation in Zambia's dairy sector interlocked contractual arrangements. As such, it attempts to provide evidence on whether interlocked contractual arrangements are inclusive of smallholder farmers. It also highlights the extent to which interlocked contractual arrangements have facilitated smallholder farmers' participation in markets. Results on the impact of smallholder farmers' participation in interlocked contractual arrangements on household income are presented in Chapter 9. Lastly, a summary of the study, the major findings, recommendations and suggestions for future research are presented in Chapter 10.

CHAPTER 2

THEORETICAL FRAMEWORK OF CONTRACTS AND THE NATURE AND DETERMINANTS OF SMALLHOLDER FARMERS' PARTICIPATION IN CONTRACT FARMING

2.1 Introduction

This chapter highlights the new institutional economics theories underpinning contracts. This is followed by a discussion of the meaning of contract farming, the types and arrangements of contracts and how interlocked contractual arrangements in Zambia's dairy sector fit in this broader contract farming typology. Thereafter, evidence from existing literature regarding factors influencing smallholder farmers' participation and the extent of smallholder farmers' participation in contract farming is presented.

2.2 New Institutional Economics theories and contracts

This section discusses the new institutional economics theories which, when considered collectively, provide insights into the motivations for development of complex inter-firm relationships (e.g. contract farming or indeed interlocked contractual arrangements). These include resource dependency, transaction cost economics, social exchange and network theories. The theories also suggest different ways in which contract farming/interlocked contractual arrangements deal with coordination and enforcement problems arising from information asymmetry in buyer-supplier relationships and the resultant transaction costs. This is because, in buyer-supplier exchange relationships, there are elements of private incentive, resulting in the need for control (Jap & Anderson, 2003). Buyers and suppliers are usually uncertain whether their expectations will be met and if the other party will act cooperatively when bargaining pressures rise (Liu et al., 2009). Goal differences, unclear contracts, opportunistic behaviour, variances in operational routines and unanticipated market changes are highlighted as some of the factors driving conflict and underlying reasons that give rise to governance in buyer-supplier relationships (Jap & Ganesan, 2000; Birnberg, 1998; Mohr & Spekman, 1994).

2.2.1 Resource dependency

Resource dependency theory (RDT) assumes that a firm's critical resources may extend outside the firm's boundaries (Dyer & Singh, 1998). Moreover, the learning required to effectively

develop the capability to engage in certain value chain activities may be difficult, time-consuming and effectively impossible for firms to acquire regardless of the frequency of use of a resource or economies of scale (Gerreffi et al., 2005). To reduce the uncertainty associated with acquiring a critical resource and to gain power and influence over organisations that control these resources motivates the development of inter-organisational relationships (Pfeffer & Salancik in Vijayasarathy, 2010). As such, if an actor has control over a resource that is of interest to another actor, these actors will interact and create a social system (Coleman, 1990), which promotes commitment, cooperation and shapes the power, governance structures and mechanisms among supply chain partners. In Africa, Asia and Latin America, agro-enterprises use business alliances and related contracts to manage risks, gain access to resources, improve logistical efficiency, reduce inventories, and generally achieve increased control over competitiveness factors that are beyond their firm boundaries (Miller & Da Silva, 2007).

2.2.2 Transaction cost economics

The theory postulates that the motive for entering into various inter-organisational arrangements is efficiency. Therefore, within the framework of transaction cost economics theory, the buyer-supplier relationship should structure itself in such a way as to minimise transaction costs (Williamson, 1993a, 1993b). Moreover, the choice of governance structure is influenced by (i) asset specificity; (ii) frequency of transaction; and (iii) the nature and level of transaction costs arising from bounded rationality (that may result from insufficient information, limits in management perception or limited capacity for information processing, all of which can lead to the risk of being subject to opportunism) (Williamson, 2002).

According to the transaction cost economics theory, firms consider different governance mechanisms to restrain their partners' opportunism and consequently reduce transaction costs, improve the chances of cooperation and promote performance (Teimoury et al., 2010). The theory further proposes that transactional governance mechanisms arise from economic rationality and emphasise governing relationships and mitigating the risk of opportunism through monitoring and incentive-based structures. Such structures involve the use of safeguards and credible commitments such as contracts, transaction-specific investments and equity sharing (Williamson, 2002). According to Liu et al. (2009), contracts stipulate the rights and obligations of both parties through formal rules, terms and procedures and explicitly state how future situations will be handled, while transaction-specific investments refer to tangible

and intangible investments tailored to a particular long-term supply chain. In this study, they could refer to assets such as a milk-processing plant, bulking and cooling facilities, refrigerated trucks, dairy animals and extension services.

Moreover, from the transaction cost economics perspective, trust is important as contracts are unavoidably incomplete due to contracting parties (humans) being subject to bounded rationality, exposed to opportunism and the increasing complexity of contractual environments (Williamson, 1991). However, inadequate emphasis is placed on trust as a complementary governance mechanism to contracts and transaction-specific investments. Yet, the substantial transaction costs required for defining *ex-ante* the contingencies and their *ex-post* renegotiations in a contract (Segal, 1999), and the costs of enforcing the contract by an outsider make trust an important governance mechanism (Klein, 2002). Consequently, the transaction cost economics theory has been criticised for not paying enough attention to the social contexts in which exchange parties are embedded. As such, the theory does not adequately consider the complexity of inter-firm cooperation and control (Teimoury et al., 2010). For instance, it ignores the informal socially embedded relationships in producing stable contract conditions (Ring & Van de Ven, 1994).

2.2.3 Social exchange

According to the social exchange theory, relational mechanisms govern buyer-supplier exchanges because the embeddedness of social connections generates standards of expected behaviour that avoid the need for, and are superior to purely authoritative relations in discouraging opportunism and malfeasance (Granovetter, 1985). These social bonds can lead to relational/group norms that increase the exchange partners' commitment to maintaining a cooperative relationship (Seabright et al., 1992). Relational governance mechanisms in inter-firm collaboration involve social/relational norms and trust (Luo, 2007). Relational norms are expected norms shared by a group of decision makers and directed towards collective goals (Liu et al., 2009). Meanwhile, trust is the confidence or belief of one partner in the honesty and benevolence of the other partner (Kumar et al., 1995).

Relational norms restrict partners' opportunism through shared norms and values (Brown et al., 2000). These norms guide reciprocal exchanges and individual conduct (Gundlach et al., 1995). Compliance with these norms in buyer–supplier relationships is often manifested in the levels at which the buyer and supplier openly exchange information, widely share ideas or

initiatives, solve conflicts and problems through joint consultation and discussion, solidarity and participation (Liu et al., 2009; Jap & Gansen, 2000).

Inter-organisational relationships built on trust are characterised by beliefs and expectations that each party can be depended upon to deliver on its promises, care for the partnership rather than behave opportunistically to exploit it (Dyer & Chu, 2003). The more the exchange partners trust each other, the more they will be committed to each other and share information between themselves, thereby reducing information asymmetry. Commitment can encourage investments in resources, integration of processes and information sharing for the sustained benefit of all supply chain partners (Dion et al., 1992). Developing solidarity shifts the focus away from self-interest behaviour towards behaviour that nurtures unity arising from common responsibilities and interests (Rokkan et al., 2003). Meanwhile, information exchange allows both sides to have symmetric information through communication, promoting harmonisation of conflict and honesty within the exchange, while participation enables exchange partners to have common decisions and establish or re-establish the goals of the relationship (Rokkan et al., 2003).

2.2.4 Network

Network theory focuses on the relationships a firm has with other firms, and on how these relationships influence a firm's behaviour and outcomes. Value chain actors usually control opportunism and information asymmetry through the effects of repeat transactions, reputation and social norms that are embedded in particular geographic locations or social groups (Gereffi et al., 2005). Trust, reputation and mutual dependence dampen opportunistic behaviour, and in so doing enable more complex inter-firm divisions of labour and interdependence than would be predicted by transaction cost economics theory (Gereffi et al., 2005).

Network theory recognises the importance of power in influencing the actors' behaviour and outcomes. Centrality is a key concept within network theory and refers to how pivotal a firm is within a network. High centrality refers to a firm that is often sought out as a partner (Heider, 1988 in Shook et al., 2009). Such firms enjoy high regard and status amongst the network (Gulati et al., 2000). Being central within a network would seem to offer the potential to enhance the four key competitive priorities: speed, quality, cost and flexibility, within supply chains (Hult et al., 2006). For example, it is common in most agricultural supply chains that a

large buyer (processor/marketing firm) works with a variety of suppliers (typically smallholder farmers). The differences in size of the buyer and producers and the need of smallholder farmers to access the market of the buyer, places the processor (buyer) in a more powerful position. Consequently, the buyer takes the lead in establishing policies relating to the relationship's administration and distribution of rewards.

2.3 Definition of contract farming

Contract farming is an intermediate form of vertical coordination within agricultural commodity chains, falling between spot markets (where price determination is a function of supply and demand) and full vertical integration (where a firm is involved in all the nodes of the value chain, from production, through processing to marketing) (Da Silva, 2005; Kirsten & Sartorius, 2002). This is illustrated in Figure 1.

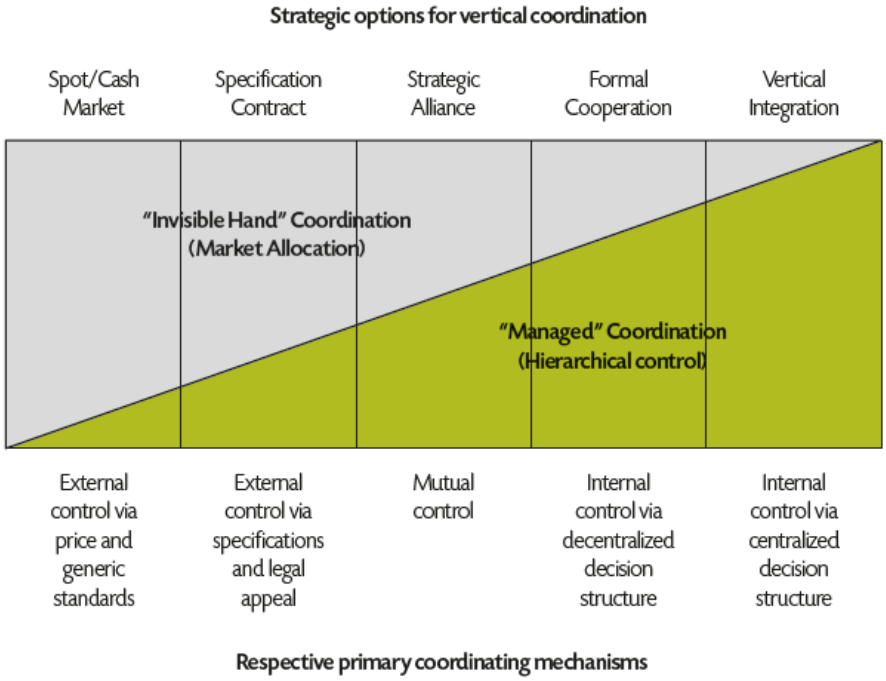

Figure 1: Strategic options for vertical coordination

Source: Catelo and Costales (2008), based on Peterson and Wysocki (1997)

Generally, contract farming is a broad concept comprising different types of contract arrangements and provisions, as well as various services that may or may not be included in the agreement (Jia & Bijman, 2013). Hence, coming up with a precise definition of contract farming is not straightforward, as evidenced by the various definitions existing in literature.

For instance, Minot (2007) defines contract farming as agricultural production carried out according to a prior agreement in which the farmer commits to producing a given product in a given manner and the buyer commits to purchasing it. Da Silva (2005), in turn, defines contract farming as an intermediate mode of coordination, whereby the conditions of exchange are specifically set among transaction partners by some form of legally enforceable, binding agreement. The specifications can be more or less detailed, covering provisions regarding production technology, price discovery, risk-sharing and other product and transaction attributes. This definition highlights the contractual terms involved in contract farming and stresses the fact that the contract is a legally binding agreement. However, the practicality of enforcing contracts is questionable when operating in a legal environment where contracts cannot easily be enforced, especially where small amounts are involved, as in the case of smallholder farmers. This is because the cost and burden associated with enforcing a contract would deter lenders from litigation (Beggs, 2010).

Meanwhile, Catelo and Costales (2008) define contract farming as a binding arrangement between a firm (contractor) and an individual producer (contractee) in the form of a "forward agreement" with well-defined obligations and remuneration for tasks done, often with specifications on product properties, such as volume, quality and timing of delivery. However, Prowse (2012) criticises the use of the term "forward contracts", since it implies that the contract is transferable, as in the case of a pure forward contract. Hence, Rehber (2007), excludes the term "forward contract" in his definition, while recognising the fact that the contract can be informal (verbal) or formal (written). He defines contract farming as a contractual arrangement between farmers and other firms, whether oral or written, specifying one or more conditions of production, and one or more conditions of marketing, for an agricultural product, which is non-transferable.

Prowse (2012), gives a more detailed description of contract farming. He describes it as a contractual arrangement for a fixed term between a farmer and a firm, agreed on verbally or in writing before production begins. The contractual arrangement makes provision for resources to be made available to the farmer and/or specifies one or more conditions of production, in addition to one or more marketing conditions, for agricultural production on land owned or controlled by the farmer, which is non-transferable and gives the firm, not the farmer, exclusive rights and legal title to the crop. It is implied in this definition that contract farming can take the form of a long-term strategic alliance, where farms and a firm collaborate closely to produce

and market a product, but where each retains its own identity. More commonly though, contract farming also takes the form of a simple, short-term specification contract, where each party not only retains its identity but also its autonomy. A limitation of this definition is that it seems to imply that contract farming only takes place in the crop sector, but cases of contract farming in the dairy, poultry and apiary sectors have been reported (Alemu et al., 2016; Wainaina et al., 2012; Dries et al., 2010).

In this study, contract farming is defined as a form of vertical coordination, involving a non-transferable verbal or written agreement between a firm and producers, through which resources are provided to producers and specifies one or more conditions for production and/marketing of an agricultural commodity produced on land owned/controlled by the farmer, while giving the firm exclusive rights and legal title to the commodity.

2.3.1 Types and arrangements of contracts in contract farming

The contract typology often used in literature is that of Mighell and Jones (1963), where they categorise contracts into (i) market-specification; (ii) product-management; and (iii) resource-providing contracts. These contracts differ in their main objective(s) and transfer of risks and decision rights from the farmer to the contractor (Jia & Bijman, 2013).

A market-specification contract is a pre-harvest agreement between producers and contractors on conditions governing the sale of the agricultural commodity. Conditions include time and location of sales, as well as product quality. Although farmers' uncertainty and the transaction costs of finding a market for their produce are reduced, they still bear most of the production risks. Minot (2007) outlines how market-specification contracts reduce co-ordination costs, particularly for perishable products or those with complex quality attributes, through addressing marketing information asymmetries.

Conversely, the production-management contract gives more control to contractors than the market specification contract, since contractors stipulate and enforce conditions of production and farm-based processing. Farmers thus surrender a considerable part of their decision rights over production and harvesting methods to contractors, which take on most of the market risks. Prowse (2012) notes that costs to the firm for ensuring compliance are recouped from the sale of higher-quality produce.

Under resource-providing contracts, certain physical or technical inputs are provided by a firm, with the requirement that produce is marketed through the same firm. Prowse (2012) argues that while farmers' cost of choosing, accessing and purchasing inputs are reduced, the firm is assured of quality produce and (usually) repayment of inputs provided on credit, since in most cases the costs are deducted from proceeds at the point of sale. He further suggests that resource-providing contracts are often used for agricultural commodities that require specific inputs or quality standards and in circumstances where farmers struggle with imperfect input markets. According to Jia and Bijman (2013), the extent to which decision rights and risks are transferred from farmers to contractors depends on the contract itself.

Eaton and Shepherd (2001), identify five different arrangements or models of contract farming, based on the intensity of contractual arrangements and the scheme's organisational structure (organisation of stakeholders within the scheme). According to the Institute of Developing Economies (undated), the contractual scheme's organisational structure depends on the nature of the product, resources of the processors and the intensity of the relationship between farmers and processors. The five types of models are discussed below.

First, the centralised model, where a firm (often a large processor) contracts a large number of farmers, with strict quality requirements and quantity targets. Eaton and Shepherd (2001) propose that products suited to this contracting model require considerable processing prior to retailing. Examples include sugar cane, tea, coffee, cotton, milk and poultry. The degree of input provision varies widely. Bijman (2008) reasons that contracts under this model are often entered into with large farms because of the large volumes required to make processing a success. However, buyers/processors are increasingly contracting smallholder farmers organised in associations or cooperatives, since among others things, these institutions reduce transaction costs and risks.

Second, the nucleus-estate model, where the firm (again, often a processor) enters the production node through an estate or plantation but also contracts with independent producers (for greater volumes, or for seed). Eaton and Shepherd (2001) suggest that this model is often used for perennial crops and utilises out-growers from a central estate.

Third, is the tripartite model, where a public entity and a private firm enter into a contract with farmers (joint venture) (Prowes, 2012). According to Eaton and Shepherd (2001), this model can involve national and/or local government, and owing to government involvement,

contracting based on this model could potentially be politicised. Bijman (2008) notes that the tripartite model of contract farming is particularly popular in China.

Fourth, the informal model, where smaller firms or traders enter into annual agreements, often on a verbal basis, with a limited number of farmers, frequently for fruit and vegetables that require minimal processing. As the firm's size is usually small, the success of such initiatives partly relies on the extent to which other providers (such as the state and/or NGOs) can offer inputs, such as extension and credit (Eaton & Shepherd, 2001). Because of its informal nature, side-selling is rampant in this model.

Lastly, the intermediary model, where the firm sub-contracts interaction with the farmers to an intermediary, such as a farming committee or a trader. Eaton and Shepherd (2001) note that this model is popular in Thailand and Indonesia and that the increased distance between firm and farm decreases the degree of control that the firm has over the process and the product (one of the main reasons for contract farming). However, Mwabi et al. (2016) have reported the existence of this type of model in avocado contract farming in Kenya.

Based on the above, interlocked contractual arrangements in Zambia's dairy sector fall under the resource-providing contracts and can take on either the centralised or nucleus model of contract arrangement.

2.4 Determinants of smallholder farmers' participation in interlocked contractual arrangement

This section presents findings from past research regarding factors influencing smallholder farmers' participation in mainstream value chains and markets through interlocked contractual arrangements. These include governance-related, demographic and socio-economic factors.

2.4.1 Governance-related factors and smallholder farmers' participation in interlocked contractual arrangements

In buyer-supplier relationships, as in other types of inter-organisational exchanges, governance is realised through both transactional (contracts & transaction specific investments) and relational governance mechanisms (Jap & Anderson, 2003; Poppo & Zenger, 2002). Governance mechanisms are methods used by different actors from within the supply chain to

influence and control the actions of other supply chain partners (Crişan, Parpucea & Ilieş, 2011).

2.4.1.1 Transactional governance mechanisms and smallholder farmers' participation in interlocked contractual arrangements

The existence of contract(s) between milk producers and buyers guarantees a market, frequent sales and a continuous flow of income for smallholder farmers (Miller & Da Silva, 2007). In addition, farmers are able to access inputs, technologies and technical assistance (Miller & Jones, 2010), which enhance their competitiveness through improved reliability, product quality and quantity. Consequently, the risks that smallholder farmers pose to value chain partners in meeting the transaction requirements for modern channels are reduced, thereby enhancing their participation in these institutional arrangements.

According to Reardon et al. (2009), households that have invested in transaction-specific assets stand a better chance of participating in interlocked contractual arrangements. This is because they can easily meet the quality and consistency requirements of the modern channel. For instance, Milczarek-Andrzejewska (2008) found that having on-farm cooling tanks is a prerequisite for farmers' inclusion in the Polish dairy sector and so is crop-specific farm equipment in the Mexican strawberry sector (Berdegué et al., 2007).

Williamson (2002) argues that when both parties to a transaction invest in an exchange relationship, the investment(s) serves as a mutual hostage, their credible commitment to a relationship. This is because assets lose considerable value if the focal relationship of both parties ends prematurely. Likewise, Liu et al. (2009) reason that it is difficult for parties to redeploy transaction-specific investments in a particular buyer-supplier relationship elsewhere. As such, the parties' opportunistic behaviour in the current transaction is inhibited. Therefore, the existence of transaction-specific investments increases mutual dependence and motivates partners to continue in vertical partnerships by controlling buyer-supplier exchanges and reducing conflict and uncertainty (Kotabe et al., 2003). It also discourages an individual party's private incentive seeking and makes one party's behaviour more observable to the other, thus promoting accountability (Liu et al., 2009).

In emerging markets such as that of Zambia, Luo (2002) suggests that contracts and transaction-specific investments are particularly complementary, where structural ordering

through transaction-specific incentives compensates for the relatively weaker contractual governance. For instance, the 2010 Doing Business Report ranks Zambia in 87th place out of 183 countries for enforcing contracts. On average, it takes 35 procedures and 471 days to enforce a contract and the enforcement cost is about 38.7% of the claim (Beggs, 2010). Thus, the cost and cumbersomeness associated with enforcing a contract discourages lenders from litigation, especially where small amounts are involved (Beggs, 2010). Moreover, most smallholder farmers lack collateral to offer as security in case of loan default. In such an environment, contracts specify important conditions and measures of governance that are not covered in transaction-specific investments, while transaction-specific investments provide extra economic incentives for ongoing relationships between exchange partners, something that contracts cannot deliver (Liu et al., 2009).

Consequently, the existence of contracts and transaction-specific investments act in a complementary manner in enhancing smallholder farmers' participation in mainstream output, input and credit markets. For instance, the existence of contract(s) and transaction-specific investments enhances smallholder farmers' access to credit through interlocked contractual arrangements in that they minimise the risks of value chain lenders stemming from smallholder farmers' inability to market their produce and repay loans (Loc et al., 2010). The risk of banks, processors or suppliers that provide credit to smallholder farmers is further reduced since repayment is discounted from sales income (World Bank, 2005). Forward contracts may furthermore serve as collateral substitutes where lead firms provide bank loan guarantees to producers, which are usually small and financially constrained firms/rural households (Schiff & Stallard, 2009; Hansel, 2007). Indeed, commercial banks regard the presence of extension services, a form of human asset specificity, as a prerequisite for their engagement in particular subsectors (Coates et al., 2011). This is because extension services improve smallholder farmers' and agribusinesses' competitiveness and productivity by enhancing quality and reducing risks and costs (Krause et al., 2007). In addition, extension services facilitate smallholder farmers' upgrading in response to market opportunities (USAID, 2005).

2.4.1.2 Relational governance mechanisms and smallholder farmers' participation in interlocked contractual arrangements

Superior relationships with other channel members are an important asset that is valuable and sustainable, while difficult to imitate, redeploy or substitute; they serve as a firm's competitive

advantage (Heide, 1994). Enhanced trust and the presence of relational norms contribute to establishing vertical and horizontal linkages in agricultural value chains or strengthening already existing ones. According to USAID (2005), the distribution of benefits along the value chain and the creation of incentives for smallholder farmers' upgrading are affected to a greater extent by the quality of relationships, levels of trust between various chain actors, volume and quality of information exchanged and services disseminated. For instance, the presence of trust in an exchange relationship eases investment in transaction-specific investments and adaptation of production processes that are sometimes prerequisites for smallholder farmers' participation in contract farming (Sahay, 2003).

Other studies stress the important role of trust in successful business-to-business relationships because it reduces the cost of conflict and other transaction costs, and is more efficient than other governance mechanisms in allowing the relationship to find and develop its potential synergies (Dyer & Singh, 1998; Aulakh et al., 1996). Sambasivan et al. (2011) find that high levels of trust, communication and commitment are valuable in creating truly productive and profitable relationships that lead to a higher level of strategic alliance outcomes.

For instance, a case study of the Cotton Clark model in Zambia reveals that its success is partially attributed to the relationship and trust that has been built between cotton producers and Cotton Clark. While Cotton Clark also benefits from limited competition, farmers know that by selling to Cotton Clark they can benefit from the technical assistance and inputs that it provides (World Bank, 2005).

Closely related to trust is the duration of the exchange relationship. The duration of the relationship indicates how important the partnership is to both exchange partners and the level of trust that would have developed over time. As such there could be a positive link between the duration of the relationship and smallholders' intensity of participation in interlocked contractual arrangements. Yet Ampaire (2013), in a study of rural producer organisations, reveals that revenue generated from these organisations tends to decrease as membership tenure increases owing to governance-related issues. When members' expectations are not fulfilled, they lose trust and commitment.

On the other hand, norms support the pooling and utilisation of talents, skills and resources from both exchange parties to achieve an advantageous position in a competitive environment and improve sales for both buyer(s) and supplier(s) in a vertical partnership (Liu et al., 2009).

It is also important to note that trust and relational norms, such as reciprocity, solidarity, participation and open exchange of information and ideas, play a key role in ensuring an effective producer organisation. Certainly, processors and other service providers prefer working with groups of farmers rather than individual farmers because they ease the delivery of services and access to markets by lowering transaction costs and risks. Through farmer groups such as cooperatives, smallholder farmers are able to collaborate in production, marketing and sometimes processing of produce, by leveraging economies of scale and synergies (IFC, 2011), consequently improving their competitiveness and bargaining power.

The impact of absence of trust and relational norms in credit markets is usually compounded when effective collateral hardly exists, which is a typical situation when dealing with smallholder farmers. However, when norms exist, reciprocal exchanges and individual conduct are guided in such a manner that failure to discharge obligations is subject to sanctions (Narismhan et al., 2009; Gundlach et al., 1995). For instance, the pressure of smallholder farmers to settle their loans is partially driven by the understanding that repeat business with the buyer/processors depends on how well they honour their obligations (Beggs, 2010).

Moreover, literature on smallholder farmers' access to micro-finance further demonstrates that social networks are exploited as a means of reducing transaction costs and malfeasance through group lending to marginalised groups that have always been considered as risky and unprofitable to deal with by the majority of financial institutions. Gomez and Santor (2001) show that in a non-collaterised market characterised by information asymmetries, social capital facilitates poor rural dwellers' access to micro-credit by addressing moral hazards and adverse selection problems involved in screening, monitoring and enforcement.

According to Liu et al. (2009), when trust and relational norms exist in buyer-supplier relationships, exchange partners may be reluctant to behave opportunistically even if they recognise the benefits of violating contracts and damaging transactional investments. This is because disregarding and violating agreed-upon terms or damaging transactional investments may seriously damage the reputation of the offender. Such damage to reputation spreads quickly through interpersonal and inter-organisational networks in society (Luo, 2002). Therefore, producers' desire to maintain a reputation for being reliable and right-standing in their communities and access future credit and/or markets, provides enforcement mechanisms and incentives to repay loans (Fries & Akin, 2004).

2.4.1.3 Incentives and smallholder farmers' participation in interlocked contractual arrangements

Incentives refer to motivations or inducements used to encourage smallholder farmers to participate in interlocked contractual arrangements. They are usually stipulated in contractual terms and play an important role in motivating actors to search for and participate in opportunities for investment and exchange. Uphoff (1993) categorises incentive systems into three broad categories. These are (i) remunerative, where actors gain from interacting with one another; (ii) coercive, where actors are forced to interact in particular ways by threats; and (iii) normative, where actors are encouraged to behave in certain ways by personal or collective norms of behaviour.

The relative price of the product offered to smallholder farmers after controlling for product quality and considering the relative costs and risks incurred in meeting the product quality and transaction requirements of the modern channel compared to the traditional channel, determines the profit levels and feasibility of a transaction (Reardon et al., 2009). Nonetheless, when buyers/processors are seeking a cost reduction solution, they usually impose heavy price reduction pressures on suppliers, thereby squeezing their margins (Henke Jr et al., 2008). This could discourage farmers from participating in interlocked contractual arrangements or lead to moral hazard problems such as side-selling or diversion of inputs from the intended contracted crop/commodity.

For instance, in Peru, Hansel (2007) found that, without a contract between the farmer and the buyer, offering more payment for better quality, farmers had no incentive to use inputs appropriately. Consequently, farmers sought loans to purchase inputs, but instead of using the inputs, they would resort to reselling them at a higher price. Consequently, Giannoccaro and Pontrandolfo (2004) are of the opinion that to encourage smallholder farmers' participation in contractual arrangements and discourage defaulting on the contract, it would help if the market is reasonably stable and the promised price is in line with that offered on the spot market.

Meanwhile, Mujawamariya and D'Haese (2011) found that delayed payment terms rather than cash payment upon delivery motivated smallholder farmers' participation in gum interlocked contractual arrangements in Senegal. This happened because farmers would make meaningful investments from lump sums of money received after a reasonable period compared to when they would get small cash amounts upon delivery. However, Beggs (2010) contends that

delayed terms of payment (30 days) become an additional challenge for cash-constrained small- and medium-scale enterprises and limit available investment capital.

Kingshott (2006) argues that anticipation of future outcomes enhances reciprocity, curbs opportunism and helps maintain stability and commitment between parties. For instance, smallholder farmers' access to a secure market, inputs and credit would have a positive influence on not only their decision to participate, but also on the intensity of participation in interlocked contractual arrangements.

Lastly, since contracts provide binding principles, terms and general procedures, major responsibilities for all parties involved and punishment for premature terminations (Luo, 2007; Williamson, 2002), they provide incentives for smallholder farmers' participation in interlocked contractual arrangements and mainstream markets. This is achieved by reducing information asymmetry, opportunism and related transaction costs and risks in the exchange relationship.

2.4.1.4 Power imbalance in buyer-supplier exchange relationship and smallholder farmers' participation in interlocked contractual arrangements

Interlocked contractual arrangements are often prevalent in agricultural value chains characterised by power imbalance between the powerful lead firm (buyer) and weak suppliers (smallholder farmers). Power asymmetry is defined as a lopsided power advantage of one firm to influence the interventions and actions of another firm in a buyer-supplier exchange relationship (Maloni & Benton, 2000).

The power of lead firms stems from the fact that they control critical resources/processes, their relative share in value added to the product or relative size/level of competition (Teng & Jaramillo, 2006; Handfield & Bechtel, 2002). As such, power asymmetry is derived from the weaker firm's dependence on and inability to replace the exchange partner in an exchange relationship (Maloni & Benton, 2000). The lead firm also acts as a channel for consumer information and tends to lower information costs and risks by clearly communicating quality grades and standards with which suppliers must comply (Oluyele & Lubinda, 2010). Lead firms also specify what is to be produced, by whom, and monitor the performance of producing firms (Johnston & Meyer, 2007; Gereffi et al., 2005).

Accordingly, power asymmetry is perceived to be "positive" because it stabilises a relationship through the clear dominance of one party over another (Thomas & Esper, 2010; Gereffi et al., 2005). Gereffi et al. (2005) further argue that, because the dominant/lead firms are able to provide enough resources and market access to subordinate firms, they are able to offer a credible threat of serious sanction in case suppliers fail to adhere to agreed-upon production/marketing terms.

However, in most cases, power asymmetry is portrayed as having a negative impact on the exchange relationship, for it results in relationship dissatisfaction (Anderson & Weitz, 1992), negative sales performance (Buchanan, 1992), threats of opportunism (Heide & John, 1990) and relationship instability (Steensma & Lyles, 2000; Kumar et al., 1995). All these could have a negative effect on smallholder farmers' participation in interlocked contractual arrangements. Moreover, the more powerful firms in a value chain usually receive the greatest benefits from business transactions (USAID, 2005). For instance, Beggs (2010) observes that in order to be competitive, smaller firms that are cash-constrained often accept delayed terms of payment of up to 30 days. Hence, they end up financing larger firms that can command better terms.

Nonetheless, Maloni and Benton (2000) take a balanced position, by showing empirically the influence of power on the buyer-supplier relationship and its subsequent effects on supply chain performance. They reason that exploitation of other supply chain partners by the powerful partner may lead to conflict and underperformance. However, the judicious use of power to create a more effective, integrated supply chain will result in better positioning of the chain as a market leader and consequently benefit both the lead firm and its suppliers. Ireland and Webb (2007) argue that when trust and power are simultaneously managed between and/or among members in strategic supply chains, firms become more fully committed to supply chain efficiency and effectiveness. Such outcomes could enhance smallholder farmers' participation in contract farming and agricultural value chains characterised by directed governance structures.

2.4.2 Demographic and socio-economic factors influencing smallholder farmers' participation in contract farming

Demographic and socio-economic factors, such as the household head's age, gender, education level and experience, farm size, household labour size, ownership of assets, access/proximity

to production-enhancing facilities (technical services, farm groups, credit, irrigation, markets, main road), value of farm and non-farm income, farmers' attitudes to risk, and the extent of specialisation and commercialisation have been explored in empirical studies. However, to a great extent the evidence is mixed.

Warning and Key (2002) state that possession of agricultural equipment and non-agricultural income significantly affect households' participation in peanut contract farming in Senegal. Ownership of agricultural equipment is associated with greater productivity and better ability to repay loans, hence increasing households' chances of participating in contract farming. However, it could also suggest that smallholder farmers are excluded from contract farming. Higher non-farm income provides an alternative source of funds with which to purchase peanut seeds and thus reduce the demand for contracting.

Simmons et al. (2005) found that irrigation, the age of the head of the household and education positively affected participation in poultry, maize and rice contract farming in Indonesia. In Cambodia, Sokchea and Culas (2015) established that the age of the household head, off-farm income, input costs and cost of market research, transportation and packaging, significantly influenced farmers' participation in organic rice contract farming. Younger farmers were more likely to participate in contract farming than older ones. Furthermore, the more farmers invested in production inputs (seed, fertilizer and irrigation) the more they were expected to participate in contract farming. In addition, a positive relationship was established between non-farm income and participation, implying the role of livelihood diversification in influencing participation in contract farming. Lastly, they found that subsidisation of packaging, market information and transportation costs enhanced farmers' participation in contract farming.

In India, Ramaswami et al. (2006) found that poultry producers who were more distant from the regional rural bank, less specialised in poultry farming and with previous occupational backgrounds in non-agriculture, were more likely to participate in contract farming. In addition, experience and schooling affected the probability of being a contract grower negatively. This was because poultry processors wished to contract with growers with weak bargaining power. Farmer's experience and the value of non-farm income were also found to be significant indicators of contract farming for the dairy, vegetable and poultry industries in India (Birthal et al., 2008).

Narayanan (2010) established a positive link between agro-ecological factors, such as climate and soil conditions, and farmers' decision to participate in contract farming, although these varied by crop. It was further noted that Indian farmers sometimes declined profitable contracts because of health and environmental risk concerns.

Guo et al. (2005) indicated that specialisation and commercialisation, along with the distance from market and government support, were significant predictors of the likelihood that farmers would engage in fruit, vegetable, tea and livestock contract farming in China. Likewise, Fréguin-Gresh and Anseeuw (2013) noted that, without public support, it seemed unlikely that smallholder farmers would engage in contract farming in South Africa.

In apple and green onion contract farming in China, Miyata et al. (2009) established that contract growers had a slightly smaller proportion of older household members, probably reflecting the labour intensity required for contract production. Contract production was more labour-intensive, given the higher quality and food safety standards that contract farmers were expected to meet, compared to independent growers. For instance, contract apple growers might be expected to prune more frequently in order to produce fewer but high-quality apples. Furthermore, the education of the household head was weakly related to contract participation, but the relationship was biased against farmers with average education, rather than those with less education. They also found that the distance to the house of the village head was a strong predictor of participation in the contract farming scheme; the probability of participation was higher for farmers living near the village head. They attributed this finding to the smaller ''social gap" between the farmer and the village leader, as well as the interest of the packer in concentrating production in a small area. The authors further noted that, overall, these results suggested that there was some form of self-selection in becoming a contract farmer, but it was in terms of availability of labour and location, rather than farm size.

Bolwig et al. (2010) identified a significant and positive relationship between the number of productive coffee trees owned, altitude above sea level of the farm and farmers' participation in organic coffee contract production in Uganda. They also found a significantly negative relationship between participation in contract farming and the ratio of non-farm revenue to total revenue.

In Tanzania, Sambuo (2014) found that the farmer's age, farming experience, ownership of agricultural equipment, access to credit and membership of a farm group significantly influenced farmers' participation in tobacco contract farming. While a negative association was established between access to credit from financial institutions and ownership of agricultural equipment and participation in contract farming, the reverse was true for the rest of the variables. The relationship established between ownership of agricultural equipment and participation was contrary to the findings of Warning and Keys (2000). According to this evidence, smallholder farmers were not excluded from participating in tobacco contract farming on the basis of ownership of agricultural equipment.

Wainaina et al. (2012) found that age, education, farm income, off-farm income, gender, distance to the main road, attitude to risk and education were predictors of participation in poultry contract farming in Kenya. The further away the farm was from the main road, the less likely it was that the farmer would participate in contract production. They attributed this finding to the fact that the contracting firm (KPCC) preferred to work with farmers who were near the main roads because of the ease of reaching such farms. Male farmers were also more likely to participate in contract farming than their female counterparts, because of the disproportionate ownership of productive assets by males in Kenya. Farmers who had access to technical advice were less likely to participate in contract farming than their counterparts who had no access to these services. Farmers who obtained technical advice from government extension agents were likely to be more aware and informed of alternative marketing channels and also production methods than their counterparts. However, the level of education of the farmer had a negative effect on his/her likelihood to participate in contract farming. More educated farmers were more likely to seek information on other marketing channels in the region, including hotels and rural assemblers. Risk-averse farmers were more likely to participate in contract farming than their counterparts, since contract farming was viewed as a means of hedging against risks. However, this finding contradicts that of Wang et al. (2011), who found that more risk-tolerant farmers preferred growing vegetables under contract in China.

Mwabi et al. (2016) found a significantly positive relationship between education, access to credit and road status and farmers' participation in avocado contract farming in Kenya. Farmers who had access to credit were able to purchase farm inputs as well as proper storage and transport facilities. This ensured that they delivered fresh quality fruit, which fetched better

prices and hence boosted their income. Likewise, education improved conceptualisation of information and helped farmers make economically viable decisions in financial markets. A weak relationship was established between road status and farmers' participation, suggesting that farmers who had access to better roads were more likely to participate in contract farming than those who did not. Good roads facilitate transportation of fruit to designated collection points and, finally, to the airport, which ensures that the fruit reaches the market in good condition and on time. Moreover, exporters could be attracted by good infrastructure, which facilitates rapid fruit transportation to the pack house, reducing post-harvest losses.

In vegetable, fruit and grain contract farming in Madagascar, Bellemare (2012) found that female-headed households were less likely than male-headed households to participate in contract farming. He also established that the older the head of the household was, the less likely he was to participate in contract farming. The more experienced the household head, the more likely he was to participate in contract farming. Likewise, households whose heads were members of peasant organisations (excluding contract farming organisations) were more likely to participate in contract farming than households whose heads were not members of such organisations. The size of a household's landholdings was also positively related with the likelihood that the household would participate in contract farming. This was because households with larger landholdings were less likely to be constrained by the availability of land in deciding whether to participate in contract farming.

Likewise, Michelson et al. (2012) noted that farmers' observed experience of participants' profits from contract farming influenced their decision on participation in contract farming. Zhu and Wang (2007) found that farmers' previous experience with contract farming influenced their decision to participate in upcoming opportunities in contract farming. Saenz and Ruben (2004) found that younger, less experienced growers were more likely to grow chayote under contract in Costa Rica. The influence of household labour size on farmers' participation was generally insignificant in most of the studies (Bellemare, 2012; Ito et al., 2012; Miyata et al., 2009).

2.5 Extent of participation of smallholder farmers in contract farming

Various scholars argue that transaction costs involved in dealing with large numbers of smallholder farmers create incentives for agribusinesses to deal with large- and medium-scale farmers or cooperatives (Da Silva & Rankin, 2013; Reardon et al., 2009; Delgado et

al., 2008; Birthal et al., 2005; Da Silva, 2005). Therefore, the majority of resource-poor farmers with limited capacity to respond to the requirements of quality, consistency, volume and transaction specifications are excluded from participation in contract farming (Maertens & Swinnen, 2009). For instance, Wainaina (2012) found that households with higher levels of financial endowments were more likely to participate in contract farming than their counterparts. This evidence suggested that poor farmers were probably excluded from participating in poultry contract farming in Kenya. Meanwhile, Anseeuw et al. (2014) suggested that contract farming could result in loss of control and decision rights over production and resources.

However, some studies have provided counter-evidence indicating that smallholder farmers are not excluded from contract farming. Swinnen and Maertens (2007) note that although theory suggests that transaction costs and investment constraints imply that smallholders should be excluded from participating, empirical work suggests a much greater degree of participation. Most studies detect no significant difference in farm size between contract farmers and other farmers in a given region, a finding that points to the role of contract farming in inclusive growth and poverty reduction (Minot & Ronchi, 2014). For instance, Sambuo (2014) found that ownership of agricultural equipment was not a significant predictor of participation, suggesting that participants in contract farming were typical smallholder rural households. Birthal et al. (2005) found that farm size and education were not significant predictors of participation in contract schemes, implying further that smallholder farmers were not excluded from contracting. Miyata et al. (2009) did not find any of preference for larger farmers in apple and green onion contract farming in China.

Prowse (2012) examined a number of ‘successful’ and ‘failed’ cases in contract farming to establish the proportion of farmers participating in these schemes by farmer category. Farm size was used to categorise farmers into small-, medium- and large-scale farmers. He established that 54% of the contracts were with small farms and 26% were with a combination of both small and large farms. There were also four contracts with large farms, and three with medium-sized farms. Importantly, he also found that ten of the 19 instances of success with small farms (53%) were through producer organisations. With regard to medium- and high-success cases, he found that six were with small farms, three with a combination of small and large farms, and one with a medium-sized farm. Among the “failed” cases, the most common farm size was small (four in total), followed by a combination of small and large farms (three

in total). Of the four initiatives that engaged smallholders, two partnered with a producer organisation and one partnered with both smallholders and a producer organisation. He further analysed whether smallholder farmers could participate successfully in contract farming. He concluded that the exclusion hypothesis might be too pessimistic regarding smallholder participation, but it might hold once land-holding inequality reaches a certain level.

Evidence from existing literature further suggests that, in many cases, firms are keen and prefer to work with smallholder farmers, even when large-scale farmers are accessible (Shankar et al., 2010; Codron et al., 2004; Dries & Swinnen, 2004). Several reasons have been given why agribusinesses would prefer contracting smallholder farmers rather than associating with large-scale farmers. First, large-scale farmers are considered a riskier option by agribusinesses, since they have a wider choice of market alternatives (Codron et al., 2004; Dries & Swinnen, 2004). Second, the low marketable surplus and limited bargaining power of smallholder farmers increase their dependency on the contractor and reduce the threat of supplier competition (Birthal et al., 2007). Lastly, smallholder farmers may have a comparative advantage over large-scale farmers, especially when they engage in more labour-intensive production systems with small economies of scale, since they are able to utilise family labour (Vorley et al., 2007; Reardon et al., 2009). Also, on large farms or plantations where labourers are employed, the cost of labourers is generally high and hired labourers may shirk job responsibilities (Eswaran & Kotwal, 1985). However, on smallholder farms, the owners are motivated to work conscientiously for the sake of their own families' wellbeing (Hayami, 2003), which may reduce monitoring and labour costs.

Reardon et al. (2009) offer a more balanced view by highlighting that, while smallholder farmers tend to be excluded in dualistic agrarian economies, there are many exceptions to this pattern. They further posit that, where small farms are common, they frequently participate and perform well within vertically integrated chains (although wealthier smallholders, unsurprisingly, tend to dominate). Similarly, Anseeuw et al. (2014) indicate that contract farming in South Africa mostly involves and benefits the already better-off farmers who have benefited from significant public support. Other studies have found that contract farmers had larger than average enterprises (Wang et al., 2011; Guo et al., 2002). These conflicting results may be partly explained by differences in commodity, in that some commodities have economies of scale that favour medium- and large-scale farmers. For

example, in Indonesia Simmons et al. (2005) found that contract seed growers tended to be larger than average farmers, while contract poultry farmers were smaller than average.

Meanwhile, Minten et al. (2009) reason that given the right incentives and contracting systems, smallholder farmers can successfully participate in emerging high-value markets. Moreover, Fréguin-Gresh and Anseeuw (2013) show that smallholder farmers may even be empowered as shareholders where they participate partially in the management of value chain activities from production to processing, transforming their position from mere "chain actors" to "chain co-owners".

Lastly, the case study literature indicates that contractors may shift strategies over time as they gain experience or as market conditions change (Minot & Ronchi, 2014). For instance, tomato contractors in Mexico shifted from large- to small-scale farmers (Runsten & Key, 1999). This shift in strategy was partly explained by the increasing difficulty firms experienced in enforcing contracts they had with larger-scale growers. Other studies give examples of buyers shifting from small- to large-scale farmers or the reverse. For example, green bean exporters in Senegal and pineapple exporters in Kenya gave up contract farming in favour of plantation production (Maertens & Swinnen, 2009; Minot & Ngigi, 2004).

2.6 Summary

This chapter reviewed existing literature related to the new institutional economics theories underpinning contracts. They include resource dependency, transaction cost economics, social exchange and network theories. It also explained the meaning, types and arrangements of contract farming and how interlocked contractual arrangements fit into the broader concept of contract farming. Thereafter, evidence from existing literature on the nature and determinants of smallholder farmers' participation in contract farming was provided.

The main conclusions are that, contract farming is one of the vertical coordination strategies falling between spot markets and vertical integration. In contrast, interlocked contractual arrangements are a form of contract farming under the centralised and nucleus models that use resource-providing contracts.

Although evidence regarding determinants of smallholder farmers' participation in contract farming is mixed, governance-related factors, such as transactional and relational governance

mechanisms, incentives, the existence of power asymmetry in the exchange relationship, demographic and socio-economic factors have been cited.

While smallholders are sometimes excluded from participating in contract farming because of transaction costs and investment constraints, there is increasing evidence showing that, in certain situations, smallholders do engage in contract farming. Some studies find no difference in farm size between contract farmers and other farms in the region, suggesting a role for contract farming in inclusive growth and poverty. Moreover, in most cases, agribusinesses prefer to work with smallholder farmers and their associations even when large-scale farmers are accessible. This is because of the labour and monitoring incentives associated with smallholder farmers. In addition, smallholder farmers can easily be controlled; they present lower risks in terms of threats posed by supplier competition and side-selling. Yet, as buyers gain experience or as market conditions change, they may eventually shift from small- to large-scale farmers or the reverse, implying that, under certain circumstances, strategies can be dynamic.

CHAPTER 3

ROLE OF CONTRACT FARMING IN ENHANCING SMALLHOLLDER FARMERS' PARTICIPATION IN MARKETS AND ITS IMPACT ON HOUSEHOLD INCOME

3.1 Introduction

This chapter examines literature on the role of contract farming in enhancing smallholder farmers' participation in markets and the impact of participation on household income. The information generated in this and the previous chapter facilitated the process of developing the conceptual framework and study hypotheses presented in the next chapter. It also helped in interpreting and making sense of the study findings and relating the results to existing research on contract farming in general and interlocked contractual arrangements in particular.

3.2 Role of contract farming in enhancing smallholder farmers' participation in markets

Contract farming has often been viewed as a solution to various constraints that limit productivity, access to markets, commercialisation and income of smallholder farmers in developing countries. These constraints include limited information about production methods, prices and markets, lack of liquidity or credit to purchase inputs, price volatility that discourages commercialisation and poor infrastructure, which raises input costs and lowers revenue from produce sales (Minot & Ronchi, 2014).

Contract farming plays an important role in addressing the above-mentioned constraints by providing smallholder farmers with a reliable output market, as well as guaranteed and stable pricing structures. It also gives them timely access to inputs (seed, feed, fertilizer and chemicals), as well as production and marketing services, such as extension, transport, and even land preparation (Dries et al., 2010; Johnston & Meyer, 2009; Reardon et al., 2009; Setbbonsarng, 2008; Hansel, 2007; Van Berkum, 2006; White & Gorton, 2006). Smallholder farmers' production and marketing risks are, therefore, reduced (Setbbonsarng, 2008). Contract farming can also open doors to new markets, including foreign markets for smallholder farmers' produce (Oluyele & Lubinda, 2010). Besides stimulating technology and skill transfer, particularly for higher-risk crops, which resource-poor farmers might typically avoid,

contract farming can also support farmers in meeting vital sanitary and phyto-sanitary standards (Prowes, 2012). Therefore, through contract farming, firms can provide the support needed for smallholders to shift from subsistence agriculture to market-oriented production (Patrick, 2004; Eaton & Shepherd, 2001). Since agribusiness firms have a vested interest in the production of high-value crops, their contractual arrangements often facilitate the introduction of new production techniques and promote measures that serve to upgrade agricultural commodities (Baumann, 2000). Lastly, contracts can be used as a form of collateral for credit, where buyers sometimes provide bank loan guarantees to their suppliers (Beggs, 2010; Hansel, 2007; Van Berkum, 2006; White & Gorton, 2006; Fries & Akin, 2004).

However, critics of contract farming contend that, while the absolute number of smallholder farmers participating in mainstream value chains through contract farming is high compared to large-scale farmers, their aggregate intensity of participation is relatively low (Anseeuw et al., 2016; Fréguin-Gresh & Anseeuw, 2013). Others argue that, when seeking a cost reduction solution, buyers/processors usually impose heavy price reduction pressures on suppliers, especially smallholder farmers with weak bargaining power (Henke Jr et al., 2008; Langfield-Smith & Greenwood, 1998). Hence, contract farming has probably not contributed significantly to the livelihood of smallholder farmers, in view of the relatively low volumes of marketed product and margins (Hellin et al., 2009; Minten et al., 2009). For instance, Vermeulen et al. (2008) estimate that almost 80% of the volume of fruit and vegetables processed by the South African processing industry and between 70 and 100% of the products sold in supermarkets, are supplied under contract. However, only 5% of these volumes involve smallholders. Thus, compared to the existing 40 000 commercial farm units and 1.2 million small farms (DAFF in Anseeuw et al., 2016), only 8% of South Africa's farmers and 2.5% of smallholders are engaged in contract farming.

In the case of Magobbo smallholder block farming in Mazabuka district, Zambia, Matenga (2017) intimates that the sugar cane out-grower scheme has radically changed agrarian relations in the area. Although there are higher incomes for some and the out-grower scheme model seems to be a success, this comes at a cost as land, livelihoods and social relations are reconfigured. Surrendering individual claims to land as part of block farming means that households have become only nominal owners. Matenga further argues that sugar cane income may not lead to accumulation of assets, as dividends are shared by an increasing number of

extended family members, while intra-household distribution of sugar cane income has exposed gender differences, as it is mostly men who are the designated shareholders.

3.3 Impact of smallholder farmers' participation in contract farming on household income

Although most studies on contract farming have acknowledged the important role it plays in enhancing smallholders' access to markets by addressing market failures experienced by farmers, transfer of technology and investment capabilities and providing higher income opportunities, the bulk of literature from the 1980s and early 1990s focuses on risks to smallholders from contract farming (Porter & Phillips-Howard, 1997; Little &Watts, 1994; Glover, 1984). These studies discuss issues such as the imbalance of power and information between transaction partners that enables agribusiness firms to impose contract terms on smallholder farmers, manipulate quality standards to reduce payments to farmers and default on agreements if market conditions change. In addition, contract farming has been perceived to engender a loss of autonomy and increase indebtedness. Many of these findings are based on case studies written by sociologists, anthropologists and political economists (Grosh, 1994), whose interest was as much in how impacts were distributed across social groups as in the mean effect across participants (Prowes, 2012).

However, a series of recent econometric studies using micro-level survey data and controlling for causality and selection bias offer a much more optimistic assessment of contract farming. These studies focus on two main issues: participation of smallholders in agricultural commodity value chains and the impact of participation, particularly on smallholders' incomes.

For instance, Minten et al. (2009) assessed contracting of almost 10 000 smallholder farmers in the highlands of Madagascar who produced vegetables for supermarkets in Europe. They found that farmers who participated in contract production had higher and more stable incomes than non-participants. Significant effects were also noticed in terms of improved technology adoption, better resource management and spill-overs on the productivity of the staple crop, rice. However, the limitation of these findings is that the study focused on only households that participated in contract farming and used the before and after intervention model to estimate the impact. The main disadvantage of the before and after model is that it does not take into account the effect of other factors that changed around the time of intervention, which could have affected the outcome(s) of interest apart from the intervention.

Singh (2002), included both participants and non-participants in his sample and used between-group mean comparisons of selected indicators to determine the income effects of contract farming. He found that contract farming in the Indian Punjab led to higher farm incomes. Birthal et al. (2005) compared the gross margins of poultry, dairy and vegetable contract farmers with independent farmers producing the same commodities. The gross margins for contract vegetable and poultry farmers, were respectively, 79% and 13% greater than those of their counterparts. Similarly, the gross margins for contract dairy farmers were almost double those of independent dairy farmers. The authors attributed the difference in gross margins to the fact that contract farmers had lower production and marketing costs. While they did not use regression analysis to control for other factors, they showed that contract farmers had higher gross margins for small-, medium- and large-scale farmers. However, selection bias was not controlled for in these two studies. Both beneficiaries and non-beneficiaries were regarded to be homogenous in all aspects, such that any difference in the outcome of interest between the two groups was attributed to the intervention (Shahidur et al., 2010; Schüring et al., 2007), which may not be true.

Recently, there has been an increase in studies attempting to address the above methodological limitations. They take into consideration the fact that contract farmers are not a random sample of the population and may, therefore, differ from the population in ways that also affect income. For instance, if farmers who are engaged in contract farming are more hard-working, entrepreneurial or more skilled than their counterparts, the difference in income between these two groups will reflect both the effect of contracting and the effect of those charcteristics. To control for this bias, recent studies have used the Heckman's selection regression, propensity score (PS) matching, instrumental variable or endogenous switching effect models.

For instance, Warning and Key (2002) undertook an empirical study of contract farming in Senegal, which involved a private company (NOVASEN) and 32 000 growers, producing about 40 000 tons of peanuts annually. They employed the Heckman selection model to assess the impact of contracting on the gross profits of farmers. They found that the increase in gross agricultural revenues associated with contracting was statistically significant and large, equal to about 55% of the average revenue of non-contracting farmers. They also showed that higher income raised the standard of living of growers and possibly created positive multiplier effects for employment, infrastructure and economic growth in the region.

Simmons et al. (2005) examined contract farming in poultry, seed maize and seed rice. They also used the Heckman model to control for selection bias. They established that poultry and seed maize contracts resulted in improved returns on capital, but not for seed rice. Contract farmers had a 71% and 160% increase in gross margin for seed corn and poultry, respectively, over the sample average. They concluded that contract farming increased income and welfare, thus reducing absolute poverty.

Empirical evidence from organic coffee producers in Uganda also indicated positive revenue effects for contract farmers compared to non-contracting farmers (Bolwig et al., 2009). The authors used a standard ordinary least squares (OLS) regression and a full information maximum likelihood estimate of the Heckman selection model. They established an increase in average revenue effect of 75% in net coffee revenue, which was equivalent to 12.5% of mean (total) household revenue. The increase was credited to enhanced incentives provided by the scheme to engage in processing of the coffee crop, which enabled farmers to access guaranteed price premiums.

Jones and Gibbon (2011) studied a contract farming scheme for organic cocoa in rural Uganda. Based on a repeated household survey, they measured the impact of the scheme on the income of participants and the economic mechanisms behind the effects. The study established that contract participation increased real net cocoa revenue by 58% to 168%, depending on the econometric model used. The substantial benefits from the scheme were primarily driven by the establishment of credible incentives for farmers to adopt technologies that improve cocoa quality. They also indicated broader trends of market deepening and increased productivity, possibly due to positive spill-over effects.

Miyata et al. (2009) compared contract and non-contract growers of apples and green onions in Shandong Province, China. Using a treatment effects model, they found a 38% increase in income associated with contract farming. For apples, the additional income was attributed to higher yields, which resulted from buyers' commitment to supplying inputs, technology and extension services. Farmers participating in contract farming were more efficient and received extension skills to manage inputs, labour and capital. In the case of green onions, prices received by contract farmers were higher than those received by non-contract growers. The conclusion was that contract farming led to better quality produce and premium prices, resulting in larger economic benefits for farmers.

Cahyadi and Waibel (2013) assessed the impact of contract farming in the palm oil industry in Indonesia on smallholder farmers' well-being and its implication for poverty reduction. Data were collected using random sampling from 245 smallholders in the province of Jambi, Sumatra. A treatment effects model was applied in order to capture endogeneity and selection bias. Participation in contract farming increased net household income by 60% (significant at the 10% level). Results showed that while contract farming had a significantly positive effect on smallholder income overall, poorer smallholders were less likely to benefit.

Sokchea and Culas (2015) determined the impact of participation in organic rice contract schemes with farmer organisations on farmers' income in a case study of the Reasmey Stung Sen Agricultural Development Cooperative in central Cambodia. Using the Heckman's selection model, they established that gross income for contract farmers increased by US$ 481.10 per annum, while their net agricultural income increased by US$ 425.88 per annum.

Ramaswami et al. (2006) reanalysed the poultry survey data from the previously cited study by Birthal et al. (2005). They used an instrumental variable regression analysis to control for selection bias. They found that contract poultry growers earned 36% more per kilogram than independent growers. They also had lower variability in gross margins between production cycles.

Bellemare (2012) also used the instrumental variable model to determine the impact of contracting using data from six regions, multiple processing firms and crops (vegetables, fruit and grain crops) in Madagascar. Empirical results showed that a 1% increase in the likelihood of participating was associated with a 0.5% in household income, implying that the average income had an upper limit of 50% of income. He further established spill-over income effects on livestock and non-contract crops.

On the other hand, Mwabi et al. (2016) obtained mixed results from their study of the impact of contract farming on household, farm and avocado income in a case study of smallholder avocado farmers in Kandara district in Kenya. Unlike most of the contract farming models reviewed, producers in this case were loosely enjoined in the contract through representation by officials of their groups or an intermediary. They employed an instrumental variable model to control for endogeneity in participation in the contract and propensity score matching methods. Results revealed that participation in contract farming had a positive and statistically

significant effect on avocado income. The increase in avocado income was attributed to the benefits derived from contract farming. For instance, contract farmers had better access to technical advice that improved their production in terms of quality, received better prices and had access to a ready market for their produce, which reduced post-harvest losses. However, they established insignificant effects of smallholder farmers' participation in contract farming on total household income. The results of this study implied that contract farming did not have spill-over effects on other farm and non-farm enterprises. Possible reasons could be that both contract and non-contract farmers had similar land sizes, implying that contract farmers could not expand agricultural production even though they had a higher avocado income. Further, owing to the advanced age of most farmers, there was a possibility that farmers might not have benefited from spill-over effects associated with an increase in avocado income, since they were unable to invest in off-farm work that required their labour, skills and knowledge. Another view is that perhaps contract farmers spent most of their time tending avocado trees and hence could not invest in other sectors, which could boost total household income.

Narayan (2014) assessed the impact of participation in high-value agriculture through contract farming in southern India. She used an endogenous switching model to estimate the impact on net profits from participation for 474 farmers in four commodity sectors: gherkins, papaya, marigolds and broiler chickens. The findings revealed that participation in contract farming increased the profits of gherkin farmers by 21%, papaya farmers by 32% and poultry farmers by 150%. Contract marigold farmers earned 49% lower profits than they would have done outside the contract farming venture.

Thus, according to these results, the average treatment effect varied widely across contract commodities. Papaya and broiler contracting offered clear net gains for participants, whereas marigold contracting left participants worse off than gherkin farmers. While contracting held net gains for participating farmers overall, this was true of contracts with some firms but not others. The standard deviations of point estimates of treatment effects were quite large, indicating variability in profit gains even within the same commodity sectors. The conclusion was that, notwithstanding the signs of average treatment effects, contract farming arrangements had diverse impacts on income for individual farmers, which could have implications for sustained participation of farmers in high-value agriculture.

Fréguin-Gresh et al. (2012) used a combination of qualitative and econometric analyses to assess fruit, vegetable and poultry contract farming in Limpopo province, South Africa. They found that contract farmers benefited from a seven-fold increase in income, better access to services and resources, and opportunities to participate in new markets. However, participation remained limited, mostly involving the better-off farmers who had benefited from specific development paths and public support.

Saigenji and Zeller (2009) found that participation in contract tea production raised household income by 40% above that of similar non-contract farmers in Vietnam. They used the propensity score matching approach to control for the effect of observable characteristics. Likewise, Maertens and Swinnen (2009) used regression and propensity score matching to determine the impact of participation in French bean export production in Senegal under contract farming and agro-industrial employment. They found that the impact on household income from participation in French bean contract farming was significantly higher than that from agro-industrial employment. Specifically, contract farming increased household income by about 3.3 million FCFA compared to 1.9 million FCFA for agro-industrial employment. Participants in French bean export production had incomes that were 60% to 110% higher than the average incomes in the research area.

Wainaina et al. (2012) analysed the impact of contract farming on smallholder poultry farmers' income in Kenya. They used data collected from 180 smallholder poultry farmers stratified by participation in contract production and the impact was determined using the propensity score matching method. They found that, on average, contracted farmers earned more net revenue per bird compared to independent farmers.

Alemu et al. (2016) investigated the impact of supply chain coordination on honey farmers' income in Tigray, Northern Ethiopia. A total of 412 honey producers in eight districts were sampled under three different types of marketing coordination arrangements. These included spot market transactions (81% of sampled producers), contract arrangements (12.5%) and marketing cooperative arrangements (6.5%). Econometric results from four alternative estimation techniques (regression on covariates, regression on PS, kernel matching and nearest neighbour matching) indicated that participating in contracts resulted in significantly higher hive productivity, higher total honey production and higher producer incomes. Taking the most conservative estimates, they established that contract production increased the productivity of

modern bee hives by 37% and the total annual amount of honey production by 76%. In addition, income from honey production increased by 85%, total household income by 28% and per capita income by 31%. However, they found that the estimated effects of participation in cooperatives on hive productivity, honey production, honey income, total household income and per capita household income were insignificant.

3.4 Summary

This chapter looked at the role of contract farming in enhancing smallholder farmers' participation in markets and its impact on household income. Contract farming is perceived as an institutional solution to various constraints that limit smallholder farmers' productivity, access to markets, commercialisation and income in developing countries. Contract farming can link farmers to domestic and even foreign markets, offer technical assistance, offer inputs on credit, reduce information asymmetry, production and market risks, and guarantee product quality and food safety standards. Whereas the proportion of smallholder farmers participating in contract farming is high compared to other farmer categories (medium- and large-scale farmers), their intensity of participation is low, as evidenced by the relatively low volumes of marketed product(s) and margins. Consequently, there have been mixed feelings results on the welfare effects of smallholder farmers' participation in contract farming, especially with regard to household income.

While evidence is still mixed regarding the income effects of smallholder farmers' participation in contract farming, there has certainly been a shift in debate. A number of recent econometric studies that have used micro-level survey data and controlled for selection bias provide a much more positive assessment of contract farming. They show that farmers participating in contract farming have significantly higher incomes than non-participants. In most of the econometric studies of contract farming reviewed, the estimated change in income for contract farming over the average income for non-contract farming ranges from negative 49% to a gain of 700%. Most found an increase of between 25% and 75%. This sizeable increase is not surprising, since contract farming ventures that do not provide farmers with higher incomes (or some other benefits such as more stable incomes), would probably lose farmers and eventually fail. Lastly, contract farming arrangements have diverse impacts on income for individual farmers, depending on the contract commodity. However, the challenge with the evidence provided is

that it is difficult to isolate the impact of interlocked contractual arrangements from that of contract farming.

CHAPTER 4

CONCEPTUAL FRAMEWORK AND STUDY HYPOTHESES

4.1 Introduction

This chapter presents the conceptual framework for the study. It focuses on determinants of smallholder farmers' participation in interlocked contractual arrangements and how these enhance their participation in mainstream dairy value chain, inputs, services and credit markets and the subsequent impact of participation on household income. The conceptual framework is based on literature on contract farming, transaction economics, social exchange, resource dependency and network theories. This is illustrated in figure 2. The chapter also presents hypotheses of the study.

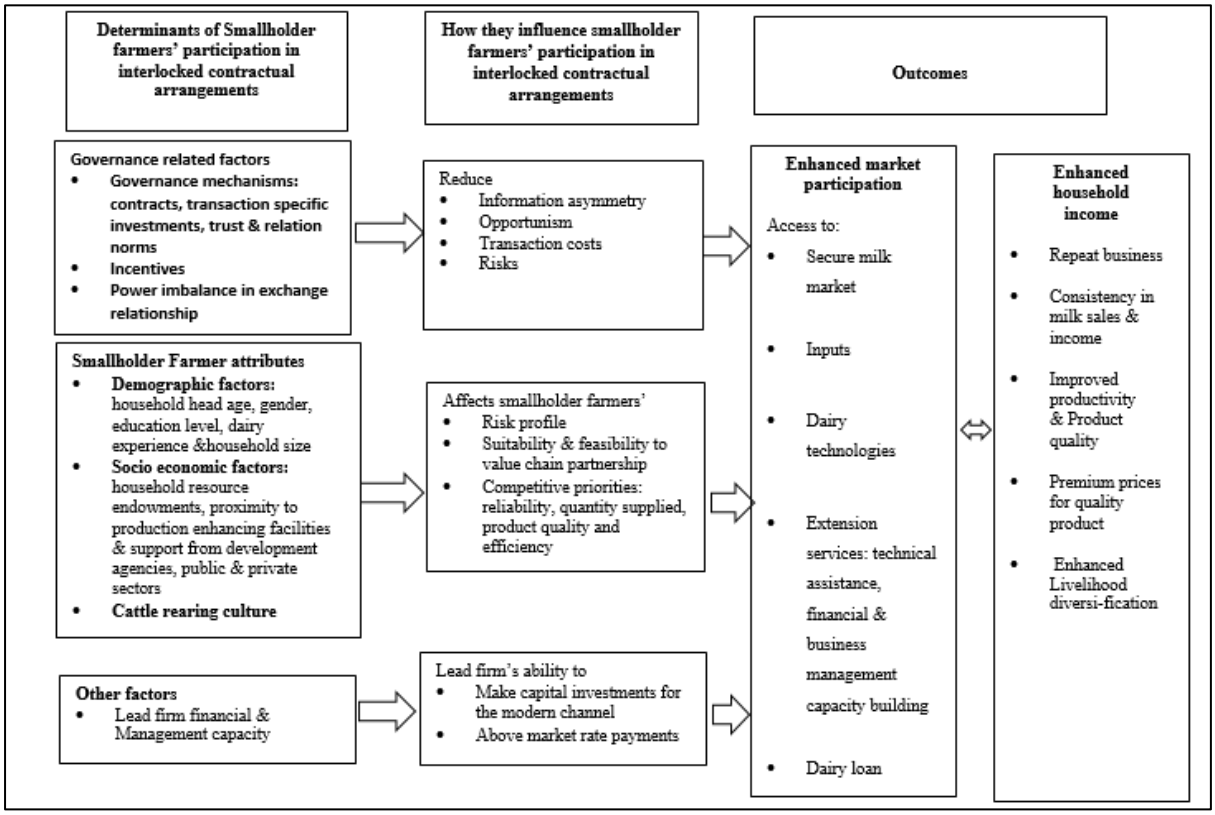

Figure 2: Determinants of smallholder farmers' participation in interlocked contractual arrangements and effects of participation on market access and household income
Source: Author

4.2 Determinants of smallholder farmers' participation in interlocked contractual arrangements

a) Governance-related factors

Various studies show that the existence of governance-related factors, such as contracts (Miller & Jones, 2010; Miller & Silva, 2007), transaction-specific investments (Milczarek-Andrzejewska et al., 2008; Berdegué et al. 2007), trust (Morgan & Hunt, 1994) and relational norms (Mugandi et al., 2012; Helin et al., 2009; Bakshi et al., 2006) enhance smallholder farmers' participation in interlocked contractual arrangements. This is because these factors reduce the effects of information asymmetry, opportunism, transaction costs and risks in exchange relationships. A positive relationship is therefore expected between the existence of a contract, transaction-specific investments, trust and relational norms in the buyer-supplier exchange relationship and smallholder farmers' participation in interlocked contractual arrangements.

Incentives, such as payment date (Mujawamariya & D'Haese, 2011) and relative price (Reardon et al., 2009) are usually stipulated in the contract. They could positively influence smallholder farmers' participation in interlocked contractual arrangements if they increase benefits and reduce costs and risks for smallholder farmers.

Smallholder farmers who depend heavily on the off-taker for selling milk and obtaining inputs/credit are likely to sell more milk through interlocked contractual arrangements than those who are less dependent. However, increased interdependence/power asymmetry could result in relationship dissatisfaction and side-selling, especially where smallholder farmers feel exploited by the milk processor/buyer. Therefore, the relationship between participation and relative dependence of smallholder farmers on the off-taker (power asymmetry) is indeterminate.

b) Demographic factors

Demographic factors, such as household size, age, gender, education level and the farming experience of the household head have been investigated in past studies. Although most studies find an insignificant relationship between household size and participation in contract farming (Bellemare, 2012; Ito et al., 2012; Miyata et al., 2009), household size could be correlated with the availability of family labour. Since dairy farming is labour-intensive, households with more members working on the farm would be able to complete farm activities on time, which is

necessary to enhance productivity and meet the demanding requirements of the modern channel with ease. However, large households may be unable to meet the volume and consistency requirements of interlocked contractual arrangements, as most of the milk would be consumed by the family. Accordingly, the relationship between household size and smallholder farmers' participation in interlocked contractual arrangements is indeterminate.

Households with older heads are more likely to participate in interlocked contractual arrangements than their counterparts (Sambuo, 2014; Simmons et al., 2005). This is because they can more easily make the needed investments in dairy farming than their younger counterparts, for they would have accumulated some level of wealth over time.

Moreover, it is expected that female-headed households would be less likely to participate in interlocked contractual arrangements than male-headed households (Bellemare, 2012; Wainaina et al., 2012). This is because women are often in a weaker position than their male counterparts to acquire resources for their businesses or seek out business opportunities. In addition, their reproductive and productive roles in the household restrict their mobility, while social and cultural rules, combined with lack of property rights, discriminate against them in terms of access to resources (e.g. land, labour, finances, production and market information) (World Bank, 2012; Morrison et al., 2007; Razavi et al., 2007).

Based on previous research, an indeterminate relationship between the educational level of the household head and participation in interlocked contractual arrangements is hypothesised. For instance, Simmons et al. (2005) and Mwabi et al. (2016) established a positive relationship between the education level of the farmer and participation in contract farming, while Ramaswami et al. (2006); Miyata et al. (2009) and Wainaina et al. (2012) found a negative relationship. Whereas household heads who are educated can easily access various information sources needed to formalise the agreement for joining formal channels, their formal education level may not correlate with participation in interlocked contractual arrangements. This is because this asset may have better returns (e.g. in salaried positions) (Wiggins et al., 2011).

Likewise, the link between dairy farming experience and participation in interlocked contractual arrangements is indeterminate. Farmers with more experience would present lower risks to the off-taker, as they would have acquired critical skills and knowledge of dairy farming. However, there is a probability of more experienced farmers contracting at a diminishing rate (Ramaswami et al., 2006). This is because processors would wish to contract

with farmers with weak bargaining power, since farmer's experience could be correlated with negotiation power.

c) Socio-economic factors

Socio-economic factors, such as a household's resource endowments and access to production-enhancing facilities, could influence smallholder farmers' participation and intensity of participation in interlocked contractual arrangements. This is because they affect smallholder farmers' suitability and feasibility for the value chain partnership by influencing competitive priorities, such as reliability, efficiency, product quality and volume. For instance, producers that have invested in land and non-land assets (e.g. dairy animals, cooling facilities, vehicle(s) and equipment) have a greater capacity to invest in new ventures and can usually bear the risk of failure (Wiggins et al., 2011). They could also easily meet the quality and consistency requirements of the modern channel (Reardon et al., 2009). Thus, a positive link is expected between land-holding size and the value of non-land assets owned and smallholder farmers' participation in interlocked contractual arrangements.

Likewise, a positive relationship is anticipated between smallholder farmers' participation in interlocked contractual arrangements and the number of lactating animals and improved breed animals owned with A similar relationship was established by Bolwig et al. (2010), when they established a positive and significant relationship between the number of productive coffee trees owned by the farmer and participation in organic coffee contract schemes in Uganda. In the context of this study, ownership of a sizable number of improved breed dairy animals is an indicator of the level of specialisation in dairy farming. Such a farmer would present lower risks and costs to the modern channel in terms of volumes produced and reliability of supply than one owning local breeds.

Meanwhile, ownership of livestock and other non-land assets such as agricultural equipment is a sign of wealth in rural communities, but its effect on participation in interlocked contractual arrangements could be indeterminate (Sambuo, 2014; Warnings & Key, 2002). Wealthier farmers may have assets such as refrigerators and vehicles to transport milk to alternative lucrative markets and hence may not be motivated to sell milk to milk collection centres. On the other hand, farmers who own agricultural equipment could be preferred by the off-taker because they may be more productive and have a lower risk profile than their counterparts (Warnings & Key, 2002).

Annual income from other sources is a proxy for livelihood diversification. While evidence from previous research shows a negative relationship between the value of households' non-farm income and participation in contract framing (Warning & Key, 2000), in this an indeterminate relationship is anticipated. This is because farmers would be willing to participate in interlocked contractual arrangements before attaining a certain level of income, but after reaching a certain level of income, they may not be motivated to sell milk to milk collection centres, for the same reasons advanced earlier regarding wealthy farmers.

A positive association is anticipated between a farmer's adoption of modern dairy-farming technology such as the use of improved bulls and intensive management practices and participation in interlocked contractual arrangements. This is because the farmer would be able to meet the quality and volume requirements of the modern channel. A similar relationship was found by Sokchea and Culas (2015) and Simmons et al. (2005), where adoption of technologies such as seed fertilizer and irrigation were strong predictors of participation in contract farming.

Households with homesteads near to production-enhancing facilities (e.g. milk collection centres and water sources) are more likely to participate in the mainstream dairy value chain through interlocked contractual arrangements than their counterparts because of lower costs incurred. Wainaina et al. (2012) found a similar relationship with regard to distance to the market and participation in poultry contract farming in Kenya. It must also be kept in mind that when dairy animals travel longer distances in search of water, their productivity is affected negatively. Thus, a negative relationship is postulated between proximity to production-enhancing facilities and smallholder farmers' participation in interlocked contractual arrangements.

Households without access to electricity are more likely to participate in interlocked contractual arrangements, since they would like to take advantage of the cooling facilities at the milk collection centre in order to maintain milk quality. In contrast, those with access to electricity may not find any need to participate, as they are able to store their milk using their own facilities. It is further anticipated that households that have access to dairy marketing information on buyers' needs, product standards, existing distribution channels and prices would be more likely to participate in interlocked contractual arrangements than their counterparts.

Lastly, smallholder farmers that receive support from government, development agencies and civil society are more likely to participate in interlocked contractual arrangements than their counterparts (Fréguin-Gresh & Anseeuw, 2013). Such support helps farmers overcome the multiple market and institutional challenges that hinder them from participating in markets (Kirsten et al., 2013).

d) Other factors

A farmer whose tradition values cattle rearing would probably not consider dairy farming as a business but rather as a store of wealth. Such a farmer would be inclined towards traditional management practices and choose "animal numbers" above productivity, and therefore would fail to meet the transaction requirements of the modern channel in terms of volume and quality. Conversely, it can be argued that a farmer emanating from a cattle-rearing culture would be motivated to participate in interlocked contractual arrangements in the expectation of increasing the herd size through dairy loans provided through interlocked contractual arrangements. Accordingly, the relationship between a farmer emanating from a culture that values cattle rearing and participation in interlocked contractual arrangements is indeterminate.

A positive relationship is hypothesised between the buyer's/lead firm's management and financial capacity and smallholder farmers' participation in interlocked contractual arrangements. According to Reardon et al. (2009), the lead firm's management and financial capacity affects the firm's (i) capability to make the needed capital investments for the modern channel, such as the distribution network and milk-processing plant, which directly affect outreach (size of catchment area) and the number of participating smallholder farmers; and (ii) ability to make above-market rate payments to induce farmers not to violate the contract (e.g. through side-selling to traditional channels). Therefore, it is hypothesised that:

Governance-related, demographic and socio-economic factors, whether a farmer emanates from a cattle-rearing culture and the lead firm's management and financial capacity determine smallholder farmers' participation in interlocked contractual arrangements.

4.3 Nature and level of smallholder farmers' participation in interlocked contractual arrangements

Because of the increased cost of doing business, it would be difficult for milk processors to buy milk from individual smallholder dairy farmers because they are small and scattered across large geographical regions. Hence, a more appropriate counter-party is producer organisations.

Well-organised farmer groups also ease the delivery of valuable extension services to raise productivity and provide an effective conduit for cost-effective access to financial services (IFC, 2011). In addition, they enable smallholder farmers to exploit economies of scale and develop common property, facilitating their access to production resources such as ownership of bulking/cooling facilities or a milk-processing plant. When smallholder farmers are empowered to own the milk-processing plant collectively, they would probably be more involved in making key business decisions and take on more responsibilities, from production and processing to marketing and distribution. However, when they do not own the milk-processing plant, their participation in value chain activities would be limited to production, bulking and storage/cooling. Consequently, membership of producer organisation(s) enhances competitiveness and bargaining power (IFC, 2011) and, as such, improves smallholder farmers' participation in interlocked market arrangements through enhanced involvement in key business decisions, value chain activities and milk sales to the mainstream dairy value chain. Based on the above argument, it is postulated that:

Involvement in value chain activities and key business decisions is positively related to ownership of a milk-processing plant and membership of a dairy cooperative which in turn enhances participation in interlocked contractual arrangements

4.4 Interlocked contractual arrangements and smallholder farmers' participation in markets

Various studies show that interlocked contractual arrangements play an important role in facilitating smallholder farmers' access to inputs, financial services (credit and insurance), new technologies and technical assistance (Beggs, 2010; Dries et al., 2010; Johnston & Meyer, 2009; Reardon et al., 2009; Hansel, 2007; Van Berkum, 2006; White & Gorton, 2006; Fries & Akin, 2004). Consequently, interlocked contractual arrangements are helping farmers increase production, raise quality standards and even penetrate international commodity chains (Oluyele & Lubinda, 2010; Hansel, 2007).

Meanwhile, concurrent use of contracts, transaction-specific investments and relationship norms in interlocked contractual arrangements reduces the effects of information asymmetry, opportunism, transaction costs and risks in the exchange relationship, thereby enhancing smallholder farmers' participation in markets. This is because relational governance mechanisms, such as trust and relationship norms, lack explicit statements and hence impose limitations in curbing partners' opportunism (Poppo & Zenger, 2002). Therefore, transactional

mechanisms, such as contracts, become a necessary complement to relational mechanisms, since they clearly specify the expectations and punishment for opportunism. Accordingly, it is postulated that

Interlocked contractual arrangements enhance smallholder farmers' participation in the mainstream dairy value chain and access to resources and services, through reduction of information asymmetry and related costs and risks.

4.5 Impact of smallholder farmers' participation in interlocked contractual arrangements on household income

Participation of smallholder farmers in interlocked contractual arrangements enhances household income. This is because farmers receive a premium price, if they supply quality milk in terms of high butterfat content and low microbial count. Paying a higher price for a quality product also helps "lock in" the farmer and reduces the buyer's risk of inconsistent supply and search costs for new suppliers (Reardon et al., 2009). Consequently, both exchange partners may experience more repeat business and less variability in sales volume, which could have a positive impact on income. The market risk of the transaction could also be lower for the farmers because of explicit or implicit contracting (Reardon et al., 2009), which assures smallholder farmers of a secure market and reduction in income variability (Miller & Da Silva, 2007). Alternatively, the off-taker may not pay a higher price, but the net price to the farmer may be higher than in spot market arrangements because, through interlocked contractual arrangements, farmers access various implicit subsidies via inputs, credit, technology, technical assistance, financial and business/management capacity building. Lastly, the extra income generated could be reinvested in the dairy enterprise or could facilitate smallholder farmers' diversification into other enterprises or expansion of existing ones, all which could have a positive impact on household income. Hence, it is postulated that:

Participation of smallholder farmers in interlocked contractual arrangements enhances household incomes.

4.6 Summary

This chapter discussed the conceptual framework used to address the study objectives and highlighted the research hypotheses. Factors considered to influence smallholder farmers' participation in interlocked contractual arrangements include governance-related, demographic and socio-economic factors, whether a farmer emanates from a cattle-rearing culture and the

lead firm's financial and management capacity. It is further anticipated that smallholder farmers' participation in interlocked contractual arrangements would enhance market participation through improved access to a secure milk market, inputs, dairy technologies, extension services and dairy loans. As a result of enhanced market participation, smallholder farmers' household income is likely to increase because of repeat business, consistency in milk sales and income, improved productivity and product quality, receiving a premium price for delivering a quality product and improved diversified livelihoods. However, as household income increases beyond a certain level, it might affect future participation and intensity of participation in interlocked contractual arrangements. This is because such farmers would have the capacity to look for and supply milk to lucrative channels other than through interlocked contractual arrangements.

CHAPTER 5

SAMPLING AND DATA COLLECTION

5.1 Introduction

This chapter discusses the sampling and data collection techniques employed in the study. Subsequent sections outline the study area, sampling procedure, data sources and data collection, entry and management.

5.2 The study area

The study was carried out in two milk shed areas of the Lusaka and Central provinces of Zambia. Milk sheds are areas of high concentration of milk production for the commercial markets in Zambia. Within the selected milk-shed areas, the study concentrated on three districts, Chibombo and Kabwe districts in Central province and Chongwe district in Lusaka province (Figure 3).

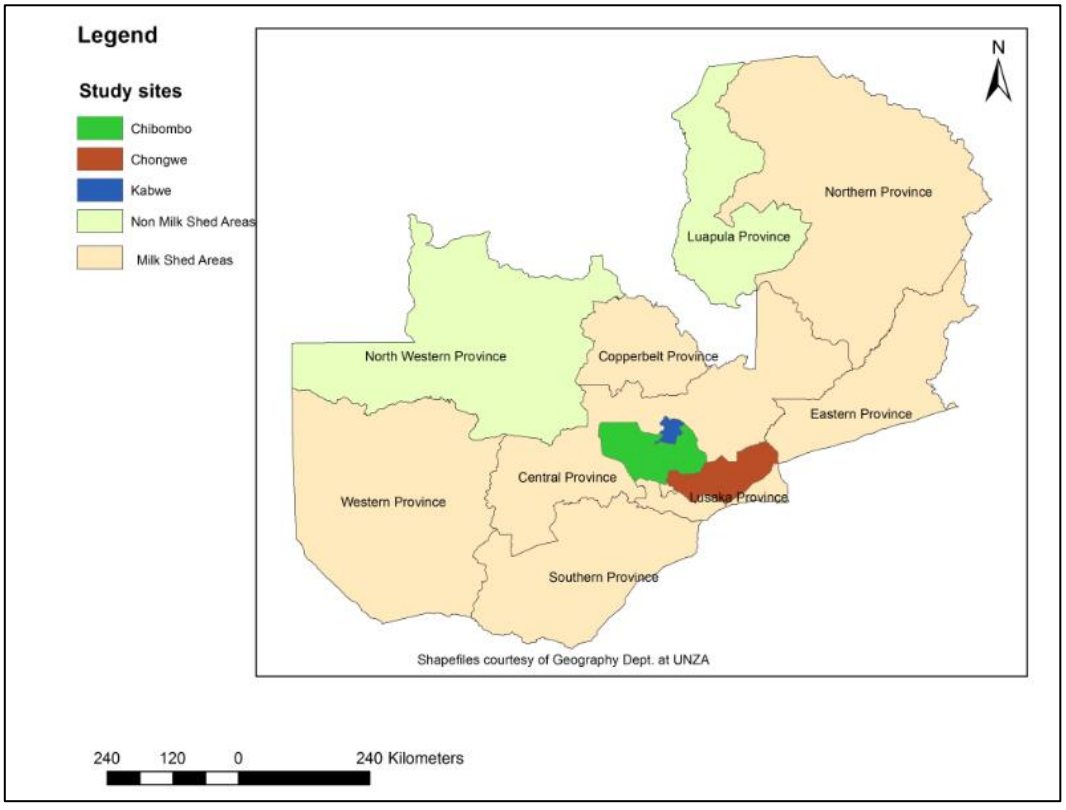

Figure 3: Map showing the milk shed areas in Zambia and study area

5.3 Sampling

A multi-stage sampling design was used for the study. The different stages are outlined below:

Stage 1: Selection of main producing areas or milk sheds by province

Milk- shed areas were identified in consultation with the Ministry of Agriculture and Livestock, the Dairy Association of Zambia, financial institutions, NGOs and from literature review. It is important to note that the country has seven milk production shed areas clustered by province. These include the Southern, Lusaka, Central, Copperbelt, Western, Eastern and Northern provinces (Figure 2). From these, two milk-shed areas, namely, Lusaka and Central provinces, were purposively selected based on (i) the presence and activity of interlocked contractual arrangements (where formal financial institutions have partnered with milk processors and other stakeholders to facilitate smallholder farmers' access to markets) and; (ii) their proximity to the researcher. The second criterion was critical for the effective use of the limited resources available for research.

Stage 2: Selection of districts in the sampled milk sheds

In consultation with the relevant stakeholders, namely, financial institutions (ZANACO and Micro Bankers Trust) and milk processors (Parmalat and Zambeef), three districts were purposively selected, depending on the existence of interlocked contractual arrangements. These were Chongwe in Lusaka province and Chibombo and Kabwe in Central province.

Stage 3: Selection of milk collection centres (strata) in each district

Purposive sampling was used to select four milk collection centres in the three districts, representing 9.3% of the 43 milk collection centres existing in Zambia. The criterion used to select milk collection centres was that they should have been in existence for more than five years. The average duration of existence of sampled milk collection centres was 9.7 years (Table 1).

Table 1: Details of sampled milk collection centres

Province	District	Milk collection centre name	Milk collection centre category	Year of establishment
Central	Chibombo	Chibombo dairy cooperative union	Main MCC	2005
		Liteta smallholder dairy cooperative union	Main MCC	2006
	Kabwe	Mpima dairy scheme	Main MCC	2005
Lusaka	Chongwe	Palabana milk collection centre	Main MCC	1999

Source: Survey (2014)

Stage 4: Sampling of primary and secondary sampling units

A two-stage cluster sampling design was used to randomly select the primary sampling units or clusters in the first stage and the secondary sampling units in the second stage. Zambia is administratively divided into ten provinces, each of which is further subdivided into districts.[1] For statistical purposes, each district is subdivided into census supervisory areas, which in turn nest standard enumeration areas. During the 1998-2000 mapping exercise, census supervisory areas were demarcated within wards, wards within constituencies, constituencies within districts and districts within provinces. Thus, for data collection purposes, the standard enumeration areas are the smallest geographical units above the household.

a) Selection of primary sampling units

In the first stage sampling frame, all standard enumeration areas within a radius of 20 kilometres from each of the five selected milk collection centres were included. This is because it would not be feasible for smallholder farmers to sell milk to milk collection centres located far off owing to the high transportation costs involved. This was accomplished by taking the global positioning system coordinates of the milk collection centres and overlaying them on the standard enumeration areas digital maps from the Central Statistical Office. The study used the standard enumeration areas frame from the 2010 Census of Population and Housing.

After grouping the standard enumeration areas into reporting domains or strata (the milk collection centres), the sample standard enumeration areas were selected using probability proportional to size, where size was defined by the number of households in the standard enumeration area. This procedure involved four standard steps:

[1] Northern province has since been split into two by the new Patriotic Front (PF) government: i) Muchinga province, and ii) Northern province

(i) Calculation of the sampling interval, *I*, for each domain/stratum, which was as follows:

$$I_h = \frac{\sum_{i=1}^{N_h} M_{ih}}{a_h}, \qquad (1)$$

where M_{ih} is the number of households in a cluster (or standard enumeration area) *i* and stratum *h*, N_h is the total number of clusters in stratum *h*, and *a* is the number of clusters (standard enumeration areas) to be selected in the stratum. Thus, the numerator in Equation (1) is the size of the stratum, which is the total number of households in the stratum. It was obtained from the 2010 Census of Population and Housing.

(ii) Calculation of the cumulated size of each standard enumeration area. This was done by first sorting the frame by key variables (Province-District-Constituency-Ward-Census supervisory area - Standard enumeration area) and then computing the cumulative total number of households.

(iii) Calculation of the sampling numbers was as follows:

$$R, R+I, R+2I, ..., R + (a\text{-}1)I, \qquad (2)$$

where *R* is a random number between 1 and *I*.

(iv) Comparison of each sampling number with the cumulated sizes of the standard enumeration areas. The first standard enumeration area (or cluster) whose cumulated size was equal to or greater than the random number generated in (iii) was selected into the sample. The next standard enumeration area to be selected was the one with a cumulated size equal to or greater than *R+I*. Each of the rest of the standard enumeration areas was selected using the same procedure, making sure that *I* was added at each subsequent selection. The optimal number of primary sampling units for the given sample size and power assumptions were determined using procedures in Stata.

The probability proportional to size procedure was implemented using a user-written program in Stata, **samplepps** (Jenkins, 2008).

b) Listing of secondary sampling units

Within each selected primary sampling unit, the frame for the second stage of sampling was arrived at through a listing exercise. Experienced field staff (veterinary camp officers and enumerators) were used to accomplish the task of listing households with one to 50 dairy animals (smallholder farmers) and ensuring that the lists were as complete as possible. Thus,

a listing form was designed that included the number of dairy animals a household possessed, milk production and marketing status and other basic household information relevant for sampling and identification.

c) Selection of secondary sampling units

Upon completion of the listing exercise, the lists of households and/or dwellings were carefully checked for completeness. In each cluster, every listed household was assigned a sampling serial number. The sampling serial numbers were assigned sequentially within each cluster, starting from 1. A cluster take that was determined through the optimal cluster computations was used as the target sample size per primary sampling unit. However, this was appropriately inflated to account for anticipated non-response.

The sample households in each selected primary sampling unit were selected using systematic sampling. This was done in four standard steps:

i) Calculation of the sampling interval for each category:

$$I = \frac{B}{b}, \qquad (3)$$

where B is the total number of households listed in the selected standard enumeration area and b is the number of households to be sampled in the sampling enumeration area;

ii) Generation of a random number (R) between 1 and the interval I; the first selection was the household with a sampling serial number that corresponded to R;

iii) Addition of the interval to the random number to get the next selection; and

iv) Repeated addition of the interval until the desired sample size was obtained.

d) Sampling weights

Because of the non-proportional allocation of the sample to the different strata, sampling weights were required to ensure that the sample was representative of the target population and that it led to unbiased estimates and standard errors. Although such adjustments are most critical for computing means and proportions, they are also important in model-based analysis of impact. By definition, a sampling weight is the inverse of the probability of selecting the secondary sampling unit in question and is the number of secondary sampling units in the target population that the sample secondary sampling units represent. In a two-stage cluster sample, the sampling weights had to be based on sampling probabilities in both stages.

At the first stage, the probability of selecting cluster or primary sampling units *i* in stratum *h*, p_{ih}, was calculated as

$$p_{ih} = \frac{a_h M_{ih}}{\sum_{i=1}^{N_h} M_{ih}} \qquad (4)$$

where M_{ih} is the number of secondary sampling units (or measure of size) in primary sampling units *i* of stratum *h*, a_h is the number of primary sampling units to be selected from stratum *h*, and N_h is the total number of primary sampling units in stratum *h*. At the second stage of sampling, the selection probability of the household in primary sampling unit i, q_i, was calculated as follows:

$$q_i = \frac{n_i}{N_i} \qquad (5)$$

where n_i is the number of households selected from primary sampling unit *i*, and N_i *is* the total number of households in the same primary sampling units.

The weight or the boosting factor, w_{ih}, was thus given as the inverse of the product of the two probabilities computed in Equations (4) and (5):

$$w_{hi} = \frac{1}{p_{hi} q_h}. \qquad (6)$$

If the census-based primary sampling unit size used in the first stage of sampling (*C*) differed from the observed size through listing (*O*), the weight in (6) was adjusted by multiplying it by the quotient of *O* and *C*. The resultant weights were also adjusted for non-response.

e) Sample size

There is generally no unique definition available for a good or desirable sample (Kish, 1995). The important issues in sample size determination are the required reliability or precision, the expected values and variability of the characteristics of interest in the population, the size of the population, the method of sampling and the levels of non-response. Resource, cost, time and operational constraints are often also important and were therefore considered. The sample size was determined using the Stata formula and the assumptions used have been indicated in Table 2 below.

The most common and important parameter that was studied across the three objectives of this study was "household income". This is because the indicator affects smallholder farmers' participation and their level of participation in interlocked contractual arrangements, and is one of the key variables used to assess the impact of smallholder farmers' participation in these institutional arrangements. Various assumptions were used to compute the sample size for the study. These included estimation of the expected mean and standard deviation of household income for the control and treatment groups of the proposed study based on statistics from a CAPRA (2013) recent household survey of dairy farmers in Zambia.

Table 2: Assumptions for sample size determination

Parameter description	**Assumed parameter value**
Statistical power	0.86
Confidence level	0.05
Mean difference in household income for non-participants (control group) and participants among smallholder farmers in milk collection centres in the recent household survey of dairy farmers in Zambia	4 741.393 ZMW
Standard deviation of household income for control group	8 834.110 ZMW
Standard deviation of household income for treatment group	14 000 ZMW
n_1/n_2 (where: n_1= Control group and n_2 = Treatment group)	3:2
Estimated response rate	90%

In addition, a ratio of 3:2 of the sample size of control group to treatment group was used in order to take care of the selection biases, since selection of participants in interlocked contractual arrangements was not done randomly. Considering these assumptions, the optimal sample sizes were 155 for the control group and 103 for the treatment group. However, to adjust the figures for non-response, a conservative response rate of 90 percent was assumed, based on a number of different surveys undertaken in the country. Therefore, the adjustment for non-response gave optimal sample sizes of 171 and 113 for the control and treatment groups respectively. Because of non-response, the final sample size came to **163** and **103** for the control and treatment groups respectively, giving a total of **266** households.

Stage 5: Sampling of buyers/processors and financial institutions

The participation criterion in interlocked contractual arrangements in the dairy value chain was used to purposively sample three milk processors, namely Zambeef Plc, Mpima dairy producers' cooperative society and Parmalat Ltd, and two financial institutions, namely ZANACO and Micro Bankers Trust. These names were identified in consultation with milk collection centre representatives. Regarding the milk processors, Zambeef Plc and Mpima dairy producers' cooperative society are vertically integrated, controlling the various value chain stages, from production to processing through distribution. However, Zambeef is a public limited company producing 52.25% of the milk it processes, while Mpima is owned by dairy cooperative members. In contrast, Parmalat Ltd is a private limited company that outsources all the milk it processes from local dairy farmers.

5.4 Data and data sources

Both qualitative and quantitative data were collected. Qualitative data from key informants (milk processors, milk collection centres and credit providers) included business organisation type, product range, geographical coverage area, smallholder farmers' selection criteria, services offered and interlocked contractual arrangements' structural design. It also included data on contract terms, price discovery and the extent to which smallholder farmers or their representatives were involved in value chain activities and key business decisions. Qualitative data from smallholder farmers included evidence of unfair treatment, if any, in the buyer-supplier exchange relationship and conflict resolution arrangements. Also, recommendations were sought from each of the respondents on how to increase participation of smallholder farmers in the dairy value chain through interlocked contractual arrangements.

Quantitative data from milk processors, milk collection centres and credit providers included the year the organisation was established. In addition, information on milk source shares by farmer category was sought from milk processors and milk collection centre representatives. Other data obtained from milk collection centre representatives involved the total number of registered members and active milk suppliers. Quantitative data from smallholder farmers involved demographic and socio-economic characteristics, distances to key production-enhancing facilities, duration of the relationship, value of assets owned, milk production, consumption, prices and sales by different distribution channels and income from other farm and off-farm activities. It also comprised of sources of funds for financing the dairy enterprise,

access to inputs, dairy technologies, extension and financial services, dairy management practices used, herd composition and land tenure system. In addition, smallholder farmers' perceptions were sought regarding the importance of various incentives in influencing their decision to sell milk to their respective distribution channels. A three-point Likert scale with end points of "Not important" and "Very important" was used to measure these items.

Information on governance-related factors such as the existence of relationship norms and level of trust existing in the buyer-supplier exchange relationship, relative dependence of smallholder farmers on the off-taker (milk buyer) and smallholder farmers' assessment of the extent to which the milk processor/buyer understood their needs and treated them fairly was solicited as well. With the exception of smallholder farmers' perception of the extent to which milk processors understood their needs and treated them fairly, multiple scale items were used to operationalise the institutional variables. These items were obtained from past research and in consultation with relevant stakeholders, and were later modified to suit the study context. A seven-point Likert scale with end points of 1 = "strongly disagree" and 7 = "strongly agree" was used to measure these items. Data on the existence of trust and relationship norms in the buyer-supplier exchange relationship were collected from both processors and smallholder farmers, while data on farmers'/suppliers' relative dependence on the milk buyer were only solicited from the smallholder farmers. Thereafter, the responses were arithmetically averaged to reach the final score for each.

Five items developed by Kumar et al. (1995) were used to measure trust. Adapted from Jap and Ganesan (2000), the scale items for measuring the existence of relational norms involved information exchange, solidarity and participation. Smallholder farmers' perceptions of their own dependence and of the buyer's (off-taker's) dependence were each measured using three items adapted from Heide and John's (1988) replaceability scale. These items captured the opportunity costs of the value that would be lost if the relationship ended and the switching costs associated with termination and replacement (Kumar et al., 1995). Power/interdependence asymmetry was calculated as the absolute value of the difference between smallholder farmer's (supplier) and off-taker's (buyer's) dependence. The difference is also referred to as the supplier's relative dependence (Anderson & Narsus, 1990) or the less dependent relative power (Frezy & Rody, 1991). See Appendix 1 for details of the constructs/items used. The Cronbach α of each multi-item variable was over 0.7, showing internal consistency for each of these variables (Appendix 1).

5.5 Data collection, entry and management

The cross-sectional survey was conducted from August to December 2014. Data were collected in three stages. The first stage involved key informant interviews with: (i) two managers from ZANACO and Micro Bankers Trust, responsible for providing credit to smallholder farmers through interlocked contractual arrangements; and (ii) three managers from the sampled milk-processing firms responsible for the buyer-supplier exchange relationship. The second stage involved focus group discussions with five board members from each of the four sampled dairy cooperatives/milk collection centres. Interviewing key informants significantly reduced the single-side, single-informant-related common method variance bias, but also facilitated gaining qualitative insights into the interlocked contractual arrangements' action domain, which helped in the interpretation of quantitative results. The third stage involved a household survey of smallholder dairy farmers who had one to 50 animals. Primary data were collected from respondents through semi-structured questionnaires (Appendix 4).

However, prior to carrying out the surveys, a training session was organised for three enumerators. It involved discussion of the survey/research objectives, review of all questions and modification of the questionnaires. Particular attention was paid to common and thorough understanding of questions, uniform interview approaches and proper recording of answers by enumerators. Thereafter, the instruments were pre-tested. Pre-testing of the questionnaires was critical for identifying questionnaire problems for both respondents and interviewers. The problems related to format, overall meaning of questions and possible misinterpretation of individual concepts. Following the pre-test, the questionnaires were revised and submitted for ethical approval to the University of Pretoria, before they were prepared for printing.

Moreover, attempts were made to ensure that the respondents were sufficiently knowledgeable to respond to the items in the questionnaires. For instance, the respondents were responsible for decision-making regarding managing or facilitating buyer-supplier/producer exchange relationships. The questionnaire further inquired about the extent to which the respondent was knowledgeable about the overall relationship, using a five-point Likert scale. To minimise the social desirability bias, full anonymity for all informants was maintained throughout the survey process. The measures suggested by Fisher (1993) were also followed by using more specific and less direct questioning to reduce the social desirability bias. Lastly, in the introduction to the interview, respondents were informed that the survey had been designed for research purposes only and that there were no right or wrong answers to the questions. Interviewing of

households involved the enumerator first asking the question in English. Where the respondent was not quite fluent in English, the enumerator interpreted the question in the local language with which the respondent was comfortable. Thereafter, the data were recorded in English.

Each day was concluded by checking the questionnaires to minimise measurement errors. Upon completion of the surveys, data were entered in an Excel template. Thereafter, data normality tests were carried out by checking for outliers and wrong entries through running descriptive statistics and physical cross-checking with questionnaires. This ensured accuracy, validity, uniformity, consistency and completeness of captured data before analysis.

5.6 Summary

This chapter described the study area, the sampling procedure, data sources and data collection, entry and management procedure. The study was carried out in three districts of Zambia where interlocked contractual arrangements in the dairy sector were in use. These were Chibombo and Kabwe in Central province and Chongwe in Lusaka province. A multi-stage sampling design was used for the study. Both qualitative and quantitative data were collected through key informant interviews, focus group discussions and household surveys where primary data were collected using semi-structured questionnaires.

CHAPTER 6

EMPIRICAL ESTIMATION PROCEDURES

6.1 Introduction

The data analysis techniques used to address the four objectives are outlined in this chapter. This is achieved by explaining the descriptive statistics, empirical models and the estimation strategies used to test the four hypotheses of the study.

6.2 Data analysis

A combination of Stata versions 12 and 14 and SPSS version 16 was used to perform several analytical procedures. Descriptive statistics were used to explain the nature and level of smallholder farmers' participation in interlocked contractual arrangements.

Descriptive statistics of factors influencing smallholder farmers' decision to participate in interlocked contractual arrangements involved identification and description of governance-related issues affecting smallholder farmers' participation in interlocked contractual arrangements. Respondents (smallholder farmers) were asked to indicate on a scale of 1 = "not important" to 3 = "very important" the extent to which various incentives, including the milk buyer's financial and management capacity, influenced their decision to participate in or sell milk through interlocked contractual arrangements. Thereafter, the modes of "very important" were used to rank the various types of incentives in descending order of importance.

This was followed by assessing the average milk prices and price ranges by grade offered to farmers by each milk buyer and the net/effective milk price received after deducting the commission charged by milk collection centres. Thereafter, the price range was compared with that received on the spot market. This analysis was done in order to establish whether the smallholder farmers' efforts to meet the product quality and transaction requirements of the modern channel were well compensated.

Next, percentages were used to assess the responses of smallholder farmers participating in interlocked contractual arrangements with regard to the existing levels of trust in the buyer-supplier relationships. A dummy variable for TRUSTLEVEL was created where trust levels of ≤ 3.5 were labelled "0", representing low trust levels; those ≥ 3.5 were labelled "1",

representing high levels of trust. Thereafter, smallholder farmers' assessment of the existence of relationship norms (open exchange of information and ideas/initiatives, solidarity and participation, joint problem-solving and conflict resolution) in the buyer-supplier exchange relationship was examined. Frequencies and percentages were used to analyse whether farmers agreed or disagreed about the existence of relational norms in the buyer-supplier exchange relationship. Likewise, smallholder farmers' assessment of the extent to which the milk buyer understood their needs and treated them fairly was analysed. Farmers were asked on a scale of 1 to 7where 1 = "completely does not understand/unfair treatment" and 7 = "completely understands/fair treatment", to indicate the extent to which the milk buyer (i) understood their needs and (ii) treated them fairly. Thereafter, two dummy variables MILKBYR_UNDSTND and MILKBYR_TRTMT were created, where scores of 1-4 were labelled "0", representing the milk buyers' lack of understanding of the farmers' needs and unfair treatment respectively. Scores of 5-7 were labelled "1", signifying the milk buyer's understanding of farmers' needs and fair treatment respectively. Percentages were used to analyse these two variables, which was followed by highlighting concerns raised in relation to unfair treatment.

Next, the criteria used by the off-takers and milk collection centres in selecting farmers eligible to participate in interlocked contractual arrangements were clarified, which was followed by characterisation of smallholder farmers' participation in these institutional arrangements. Participation in this case referred to whether the farmer sold milk to the milk collection centre or not.

This was followed by a comparison of means and percentages of selected sample characteristics between participants and non-participants in interlocked contractual arrangements, using the *t*-distribution (continuous variables) and chi-square distribution (discrete variables) at $p<0.01$, $p<0.05$ and $p<0.1$ levels of significance. This aided in the choice of explanatory variables that were included in the double-hurdle model of determinants of smallholder farmers' participation and intensity of participation in interlocked contractual arrangements (section 5.3.1), and in estimation of the PS and treatment and outcome models presented in section 5.3.2.

The second hypothesis, *"Involvement in value chain activities and key business decisions is positively related to ownership of a milk-processing plant and membership of a dairy cooperative which in turn enhances participation in interlocked contractual arrangements"*, was tested by first determining the extent to which smallholder farmers were involved in the core value chain activities and whether they upgraded within the dairy value chain or indeed

diversified into other business operations. In addition, the extent to which smallholder farmers influenced key business decisions was determined. Thereafter, the number of smallholder farmers that actively supplied milk to milk collection centres as a proportion of the total number of registered members was analysed. This was followed by comparing the percentages of active milk suppliers and milk supplies (litres per annum) across the different farmer categories (smallholder and emergent farmers) that supplied milk to milk collection centres.

Descriptive statistics were also used to test the third hypothesis, "*Interlocked contractual arrangements enhance smallholder farmers' participation in the mainstream dairy value chain and access to resources and services, through reduction of information asymmetry and related costs and risks".* A description of transaction (contracts and transaction-specific investments) and relational governance mechanisms used in interlocked contractual arrangements was given in order to explain ways in which these instruments reduced information asymmetry, transaction costs and risks, and provided incentives that enable smallholder farmers' participation in markets. The way in which the two sampled financial institutions (ZANACO and Micro Bankers Trust) use interlocked contractual arrangements to facilitate smallholder farmers' access to financial services and input markets was explained as well.

Thereafter, a comparison between participants and non-participants in interlocked contractual arrangements was made. First, percentages for selected sample characteristics related to access to inputs, technologies, financial and other support services were determined. Thereafter, the chi-square distribution at $p<0.01$, $p<0.05$ and $p<0.1$ levels of significance was established. This analysis helped in determining whether there was any significant difference between participants and non-participants regarding their access to inputs, financial and extension services and other production-enhancing facilities/services. In other words, this analysis helped in establishing whether interlocked contractual arrangements played an important role in enabling smallholder farmers' participation in markets. Secondly, the response rate (percentage) of farmers' access to various types of extension services was determined. This was followed by calculation of the range, mode, mean and standard deviation of smallholder farmers' frequency of receiving each type of extension service.

Lastly, with regard to the fourth objective, "*to assess the impact of smallholder farmers' participation in interlocked contractual arrangements on household income*", a comparison of average income from milk sales and other sources of income and t-tests of selected indicators

of wealth, such as tropical livestock units (TLU) and wealth index at $p<0.01$, $p<0.05$ and $p<0.1$ levels of significance, was undertaken.

6.3 Econometric regression models

A combination of literature on governance of buyer-supplier exchange relationships in contract farming and information from key informants from milk collection centres and processing firms was helpful in selecting the explanatory variables used in the econometric models. Two of the four hypotheses of the study were tested using mathematical models. The models used were (i) the double-hurdle model to identify determinants of smallholder farmers' participation in interlocked contractual arrangements; and (ii) propensity score matching to establish the impact of smallholder farmers' participation in interlocked contractual arrangements on household income.

6.3.1 The double-hurdle model

The double-hurdle model, originally developed by Cragg (1971), was used to assess the hypothesis *Governance-related, demographic and socio-economic factors, whether a farmer emanates from a cattle-rearing culture and the lead firm's management and financial capacity determine smallholder farmers' participation in interlocked contractual arrangements.* Smallholder farmers' participation in interlocked contractual arrangements was considered as an adoption decision of institutional arrangements in output marketing and rural finance. However, the main problem in using survey data when assessing decisions on adoption is the significant proportion of households that report zero adoption/participation. The traditional approach to deal with zero observations has been to use the Tobit model originally developed by Tobin (1958), despite its restrictiveness in that the variables and parameters determining the probability of participation also determine the levels of participation. Because of this assumption, it is implied that the direction (sign) of a given determinant's marginal effect will be the same for both smallholder farmers' participation and the intensity of their participation once they have decided to participate (Burke, 2009). However, this is not a valid assumption when modelling smallholder farmers' participation in interlocked contractual arrangements. Consequently, more flexible models are required to allow separate mechanisms for determination of factors that affect smallholder farmers' decisions on participation and intensity of participation.

To overcome these restrictive assumptions, alternative studies in agricultural economics literature have used Heckman's selection model (Heckman, 1976). Mujawamariya and D'Haese (2011) analysed determinants of choice for interlocking in the gum Arabic sector in Senegal and the effect of interlocking on gum production and market participation. Jagwe et al. (2010) examined the effect of transaction costs on smallholder farming households' participation in banana markets in the Great Lakes region of central Africa. This approach involves estimation of a probit model for selection, followed by the insertion of a correction factor (the inverse Mills ratio) calculated from the probit model into the second OLS model of interest. Whereas the Heckman procedure allows for flexibility of parameterising the probability and intensity of participation separately, it yields a less efficient estimator than the maximum likelihood Tobit estimator and performs poorly when the normality assumption is violated (Yen & Huang, 1996).

Other studies have used the double-hurdle model. According to Greene (2000), the double-hurdle model is a generalisation of the Tobit model, where the decision to participate and the intensity of participation are determined by two separate stochastic processes. For instance, Hailemariam et al. (2006) established that different factors influence the decision to adopt and intensity of adoption of poultry technology. Other studies that applied the model include those of Gebregziabher and Holden (2011) on fertilizer adoption in Ethiopia, Komarek (2010) on banana market commercialisation in Western Uganda and Bekele et al. (2008) on improved pigeon pea varieties in Tanzania.

Although in some aspects parameterisation of the double-hurdle model is similar to that of the Heckman procedure, in that two separate sets of parameters are obtained in both cases, the double-hurdle model is considered to be less restrictive. This is because in the Heckman model, non-participants will never participate under any circumstances. Conversely, in the double-hurdle model, non-participants are considered as a corner solution in a utility maximising model (Yami et al., 2013). In the context of interlocked contractual arrangements, the double-hurdle model assumes that the zero values reported in the first hurdle arise from smallholder farmers' deliberate choice not to participate in interlocked contractual arrangements, while those in the second hurdle come from smallholder farmers that would not have sold milk through interlocked contractual arrangements owing to their deliberate choice or random circumstances.

The double-hurdle model required the joint use of the probit and the truncated regression models, where it was assumed that the decision to participate and intensity of participation in interlocked contractual arrangements were determined by two separate stochastic processes. The formal model of the first hurdle or the participation decision equation was estimated with a normal probit model given below:

$$\boldsymbol{D_i^* = \alpha' Z_i + \upsilon_i}\ , \qquad (7)$$

$D_i = 1$, if $D_i^* > 0$ and 0 if $D_i^* \leq 0$.

$\boldsymbol{D_i^*}$ is a latent variable that takes the value 1 if the famer sells milk through interlocked contractual arrangements and zero otherwise; and **α** is a vector of parameters. **Z** is a vector of explanatory variables that include demographic, socio-economic, governance-related and cultural factors, while **υ** is a vector of error terms

The formal model of the second hurdle or intensity of participation equation is given below:

$$\boldsymbol{Y_i^* = \beta' X_i + \mu_i},\qquad (8)$$

$Y_i = Y_i^*$, if $Y_i^* > 0$ and if $D_i^* > 0$,

$Y_i = 0$, otherwise.

Y_i^* and Y are latent and observed levels of participation in interlocked contractual arrangements respectively. The intensity of participation in interlocked contractual arrangements was estimated by the proportion of milk sold to the milk collection centre. **β** is a vector of parameters to be estimated and X_i is a vector of variables (demographic, socio-economic, governance-related and cultural factors) influencing the household intensity of participation in interlocked contractual arrangements, while **μ** is a vector of error terms. The description, measurements and a priori expectations of variables used in the model are summarised in Table 3.

Table 3: Description, measurement and a priori expectations of variables used in the double-hurdle model

Variables	Measurement unit	Expected sign
Participation in interlocked contractual arrangements (dependent variable)	1 if farmer sells milk to milk collection centre, 0 otherwise	
Intensity of participation in interlocked contractual arrangements (dependent variable)	Proportion of milk sold to the milk collection centre (%)	
Age of household head	Years	+
Education level of household head	Years	±
Dairy farming experience	Years	±
Sex of household head	1 if male, 0 otherwise	+
Household size	Number of persons	±
Family labour size	Number of persons	±
Land holding size (ha)	Hectares	+
Value of livestock owned	Zambian Kwacha (ZMW)	±
Use of improved bull	1 if yes, 0 otherwise	+
Intensity of management practices	1 if intensive, 0 otherwise	+
Value of non-land assets owned	ZMW	±
Lactating animals owned	Number	+
Ownership of improved breed animals	1 if yes, 0 otherwise	+
Annual income from other sources	ZMW	±
Distance to nearest milk collection centre	Kilometre (km)	–
Distance to the nearest water source	Kilometre (km)	–
Access to dairy marketing information	1 if yes, 0 otherwise	+
Access to electricity	1 if yes, 0 otherwise	–
Milk collection centre milk price	ZMW	+
Relative supplier dependency on milk buyer	Absolute value of difference between supplier and buyer's dependence	±
Level of trust between milk supplier and buyer	1 if high levels of trust exist, 0 otherwise	+
Household emanates from cattle-rearing culture	1 if yes, 0 otherwise	±

6.3.2 Propensity score matching

Propensity score matching methods were used to test the hypothesis that *"Participation of smallholder farmers in interlocked contractual arrangements enhances household incomes."*

Programme impact refers to the expected value of the difference between the level of the outcome variable attained by participating households and that which they would have attained had they not participated in the programme (Wooldridge, 2002; Ravallion, 2001). That is,

$$ATT = \mathrm{E}\,(Y_{1i} - Y_{0i}\,|\omega_i{=}1), \qquad (9)$$

where *ATT* is the average treatment effect on the treated, Y_{1i} is household income (the outcome of interest) for the treatment group (participants in interlocked contractual arrangements), Y_{0i} is the outcome of interest for the comparison group, ω_i is a dummy variable equal to one if the household participates in or sells milk through interlocked contractual arrangements and zero otherwise, and *E* (.) is the expectations operator.

Household income was computed by adding the annual gross incomes of all members of the household, which included income from milk sales, other on-farm and off-farm activities. When the i^{th} individual participates in interlocked contractual arrangements his/her income would be Y_{1i} and Y_{0i} if he/she did not participate. This is the conditional mean impact, conditional on participation, also known as the treatment effect or the average effect on the treated (Wooldridge, 2002). However, if there is a difference in the mean of the outcome variable between participants and non-participants in the absence of the programme, a bias would arise and this bias is given by:

$$b = E(Y_{0i} | \omega_i = 1) - E(Y_{0i} | \omega_i = 0). \quad (10)$$

This bias could be corrected if it were known. Unfortunately, the level of participants' income had they not participated in interlocked contractual arrangements cannot be observed. If the programme had been assigned randomly, the participants and non-participants could have had the same expected income in the absence of the programme. In this case, the expected income of non-participants would correctly reveal the counterfactual. However, for most programmes, randomisation is not possible for ethical, cost and other pragmatic reasons. In the case of interlocked contractual arrangements in the dairy value chain, treatment households either self-select themselves and/or are deliberately chosen on the basis of their individual characteristics (sometimes referred to as selection on the observables), such as proximity to milk collection centres and herd size. Also, biases could arise because participants might differ from non-participants in the distribution of unobserved/intrinsic characteristics such as entrepreneurial ability, which could possibly have enabled the farmers to have superior incomes even before participating in interlocked contractual arrangements. In such a quasi-experimental design, statistical controls must be used to address the differences between treatment and control groups (Barker, 2000). Under some form of exogeneity (Imbens, 2004), most quasi-experimental impact studies estimate the conditional average treatment effect on the treated as:

$$ATT = E(Y_{1i} - Y_{0i} | \mathbf{x}, \omega_i = 1), \quad (11)$$

where **x**, is a vector of covariates. The assumption implied in Equation 5 is that conditioning on carefully selected covariates renders the household's treatment status independent of potential outcomes, such that the unobserved can be represented by the observed. This enables one to attribute any systematic differences in the outcome variables between treated and control units with the same values of the covariates to the programme in question (Tembo & Zulu, 2014). A more dimensionally appealing yet comparable version of 'selection on observables' involves replacing **x** in (Equation 5) with the estimated conditional probability of participation, or PS, defined as $\hat{p}(x) = E(w = 1|x)$(Rosenbaum & Rubin, 1983).

Programme impacts are measured by evaluating whether a programme changes the mean value of an outcome variable among participants compared with what the outcome would have been had they not participated (Wooldridge, 2002; Ravallion, 2001). The central evaluation problem then is that participants cannot be concurrently observed in the alternative state of no participation (referred to as the counterfactual) (Shahidur et al., 2010). Evaluators usually simulate the counterfactual by comparing programme participants with a control with similar characteristics. Construction of the counterfactual determines the evaluation design used, which is broadly categorised as experimental or quasi-experimental. These evaluation designs differ in feasibility, cost, clarity and validity of the results. The main characteristic of the experimental design is complete randomisation, which ensures that households in treatment and control groups are, on average, similar and that any observed systematic differences in the outcome variables after the intervention are attributable to the intervention (Tembo & Zulu, 2014). Yet randomisation is not always possible in observational studies such as this one. Nonetheless, Ravallion (2001, 2003) describes various methods used to estimate impact under quasi-experimental conditions.

The most basic designs used have been the 'before and after' intervention models (e.g. Minten et al., 2009). 'Before and after' analysis compares the performance of key variables during and after the programme with those prior to the implementation of the programme. The main disadvantage of the 'before and after' model is that it does not take into account the effect of other factors that changed around the time of intervention, which could have affected the outcome(s) of interest apart from the intervention.

A second approach is the 'with and without comparison', which compares the behaviour in key variables in a sample of programme beneficiaries, with their behaviour in a non-programme or comparison group (e.g. Singh, 2000; Birthal et al., 2005). This approach uses the experiences

of the comparison group as a proxy for what would otherwise have happened in the programme beneficiaries. The assumption of homogeneity between the treatment and control groups makes it difficult for the results of such a model to be generalised to the rest of the population. Moreover, the 'with and without comparison' approach requires strong evidence that the two groups would have been comparable over time in the absence of the treatment (Meyer, 1995).

In other studies where an appropriate counterfactual or close comparison group exists, techniques such as Heckman's selection models, instrumental variable approaches and PS matching have been used. Heckman's selection model is used to address selection bias when the correlation between the two error terms is greater than zero. Studies that have employed this model include those of, Bolwig et al. (2010); Simmons et al. (2005) and Warning and Key (2002) However, evidence from research demonstrates that the Heckman approach can seriously inflate standard errors even when the correction has been properly implemented because of collinearity between the correction term and the included regressors (Moffitt, 1999; Stolzenberg & Relles, 1990).

Consequently, other studies have included additional variables in the selection function known as instrumental variables (Mwabi et al., 2016; Bellemare, 2012; Rao & Qaim, 2011; Maertens & Swinnen, 2009; Ramaswami et al., 2006; Simmons et al., 2005). Instrumental variables are strong predictors of treatment assignment, yet uncorrelated with the outcome of interest. Models with exclusion restrictions (instrumental variables) are superior to models without them, because they lend themselves to a more explicitly causal approach to the problem of selection bias. They also reduce the problematic correction introduced by Heckman's correction factor (Bushway et al., 2007).

The effectiveness of instrumental variables approaches invariably depends on the choice of an instrument that enables identification of the parameters of the model (Narayan, 2014). For instance, Miyata et al. (2009) treat the distance between a respondent's farm and the farm of the village chief as an instrument. Rao and Qaim (2011) use farmer group membership to serve as an instrument and Simmons et al. (2005) choose the number of organisations of which farmers are members as an instrument. Other instruments include the number of female labourers in the respondents' household, as well as a dummy for whether a female in the household is a member of a women's organisation (Maertens & Swinnen, 2009) and farmer's willingness to pay for a certain return from a randomly drawn level of investment (Bellemare,

2012). Mwabi et al. (2016) use proximity to Avocado Growers Association of Kenya officials, while Bolwig et al. (2010) select the ratio of non-farm revenue to total revenue and whether the walls of the house are made of bricks. However, the key challenge with the instrumental variable approach is to find an appropriate instrument that can break any correlation between selection and the unexplained variation in welfare outcomes (Narayan, 2014).

In addition, both Heckman's selection and instrumental variables approaches tend to impose a linear functional form assumption implying that the coefficients on the control variables are similar for adopters and non-adopters (Ali & Abdulai, 2010). They also assume the constancy constraint, meaning that all observations are affected by the treatment in the same way. The implication of this assumption is that if the constancy effect is wrong, then the causal inferences about the treatment effect may be misleading (Bushway et al., 2007).

Because of the shortcomings/challenges of the two parametric methods discussed above, other studies have employed non-parametric techniques such as PS matching (Saigenji & Zeller, 2009; Maertens & Swinnen, 2009; Wainaina et al., 2012; Alemu et al., 2016) as a treatment effect correction model to reduce self-selection bias. Unlike the Heckman's selection and instrumental variables approaches, propensity score matching requires no assumption about the functional form in specifying the relationship between outcomes and predictors of outcome. Moreover, propensity score matching strategies provide a unique set of techniques for reconstructing an experimental environment out of non-random, quasi-experimental conditions. Based on these merits, this study employed propensity score matching techniques to estimate the impact of smallholder farmers' participation in interlocked contractual arrangements on household income. However, a major disadvantage of the propensity score matching is that it is only as good as the quality of the matching, therefore group overlap between the treated and control samples must be substantial. Besides, any propensity score - based models are only as good as the quality of the matching and valid only under certain identifying assumptions. The way these shortcomings were addressed in this study has been explained in section 6.3.2.1.

Where there is no appropriate counterfactual and a close comparison group, some studies have employed the endogenous switching approach (e.g. Narayan, 2014; Rao & Qaim, 2011; Cai et al., 2008). This problem arises when sometimes the decision to contract coincides with a decision to grow the contract commodity, so that all production of the high-value commodity

is contract-based and a domestic spot market is absent or too small to offer a credible comparison group. This makes it impossible to identify the impact of contracting separately from that associated with growing a high-value commodity. However, the endogenous switching approach offers a way to negotiate this difficulty because it enables comparison across distinct alternatives or regimes (Dutoit, 2007; Maddala, 1983). The rationale for this is that selection into contracting for high-value commodities puts farmers in different groups, associated with different outcome streams. Narayan (2014) proposes two options for assessing impact under the endogenous switching approach. The first is assessing the impact of growing the high-value commodity under contracts versus the status quo of persisting to grow with the traditional cropping pattern and the second, assessing the impact of growing the high-value commodity with the subject firm, relative to other options, including contracting for the same commodity with another firm or growing another crop altogether.

Lastly, other studies have used panel data and the difference in difference (DID) approach to measure the effect of an intervention on specific outcomes over a given period in time (Michelson, 2013). The DID specification makes a counterfactual assumption that in the absence of the intervention, the outcome of interest in the treatment and control groups would grow at the same rate or be the same. It is this assumption that overcomes the problem of the before and after method and makes the DID method a preferable method (Meyer et al., 1995). The DID estimator has two critical features that are particularly attractive for deriving unbiased impacts. First, using pre- and post-treatment measures allows one to difference out unmeasured fixed characteristics of the unit of analysis (the household in this case), which may affect outcomes. In addition, it allows one to benchmark the change in the indicator against its value in the absence of the treatment. Second, using the change in the control group as the comparison allows one to account for the general trends in the value of the outcome. However, the drawback of DID estimation is that it is only appropriate if the treatment and control groups grow at the same rate. DID estimations also normally use several years of serially correlated data, but ignore the resulting inconsistency of standard errors (Bertrand et al., 2004), which results in over-estimation of the statistics and significance levels.

6.3.2.1 Estimation of the propensity scores

The propensity scores, or conditional probabilities of participation in interlocked contractual arrangements (given the observed characteristics), were estimated using a probit specification:

$$\text{Prob}\ (\omega=1|\ x) = \Phi\ (\theta + \partial'\ \mathbf{x}\ + \varepsilon) \qquad (12)$$

where Φ is a standard normal cumulative distribution function, ε is an error term, θ is the intercept to be estimated, ∂ is a vector of slope parameters also to be estimated, and **x** is a vector of covariates. Equation (6) was estimated using maximum likelihood procedures in Stata (StataCorp, 2014). To ensure consistency of the propensity score matching, only covariates that exhibited significant correlation with the participation variable and/or the outcome variable were included in **x**. In addition, covariates that predicted treatment status perfectly were excluded, since distributions of covariates need to overlap between comparison and treatment groups (Starks & Garrido, 2014). Covariates that might be affected by the treatment were also excluded from consideration (Imbens, 2004; Ho et al., 2007).

After the propensity score had been calculated for each observation, efforts were made to ensure that there was an overlap in the range of propensity score across the treatment and comparison groups, known as "common support". Common support was subjectively assessed by examining a graph of propensity scores across treatment and comparison groups (Appendix 2).

Next, a check for balance of individual covariates across treatment and comparison groups within blocks of the propensity score was performed (Appendix 3). This ensured that the propensity score's distribution was similar across groups within each block and that the propensity score s were proportionally specified (Imbens, 2004). Thereafter, standardised differences of covariates across blocks of the propensity score were computed, since this takes into consideration both means and variances (Rosenbaum & Rubin, 1985).

The balancing effects of the propensity score were tested using a number of procedures, including stratification, *t* tests for the differences in covariate means between the two groups (participants and non-participants) before and after the matching (Rosenbaum & Rubin, 1985), effectiveness in reducing standardised bias and ability to drive the overall probit relationship to insignificance, as measured by a joint likelihood ratio (LR) test and pseudo R^2 (Caliendo & Kopeinig, 2008).[2]

[2] A well-balanced propensity score is necessary for artificially constructing an experimental environment from a quasi-experimental situation. The idea is that there should be no association between treatment status and each covariate once the observations have been restricted to the region of common support.

6.3.2.2 Estimation of impact

After creating a balanced score, the next step was choice of matching and weighting strategies. A number of propensity score matching strategies could be used at this stage, each using a different function to estimate impact. The result of each is an ATT value that indicates the impact of participation on smallholder farmers' household income. Two propensity score matching strategies were used, namely the nearest neighbour and kernel weighting approaches. According to Starks and Garrido (2014), the nearest neighbour matching strategy has the advantage of using all observations in the treatment group. However, information from unmatched individuals in the control group is lost, thus leading to more variance. Moreover, for some individuals in the treatment group, the nearest match in the control group may have a very different propensity score, which leads to increased bias. On the other hand, kernel weighting allows one to keep the bulk of the sample while reducing bias by giving more weight to individuals with closer propensity scores.

6.4 Summary

This chapter presented the data analysis techniques by detailing the descriptive statistics, empirical models and the estimation strategies used to test the four hypotheses of the study. Descriptive statistics were generated by employing measures of dispersion and central tendency. The empirical models and the estimation strategies used in the study included the double-hurdle model to identify determinants of smallholder farmers' participation in interlocked contractual arrangements and the propensity score matching methods to assess the impact of smallholder farmers' participation in interlocked contractual arrangements on household income.

CHAPTER 7

DETERMINANTS OF SMALLHOLDER FARMERS' PARTICIPATION IN INTERLOCKED CONTRACTUAL ARRANGEMENTS

7.1 Introduction

Factors that influence smallholder farmers' participation in interlocked contractual arrangements are presented in this chapter. First, the effect of governance-related factors on smallholder farmers' participation in interlocked contractual arrangements is explained. Thereafter, the criteria used by off-takers and milk collection centres to select farmers eligible to participate in interlocked contractual arrangements are highlighted. This is followed by a comparison of the means and percentages of selected sample characteristics between participants in interlocked contractual arrangements and non-participants. Lastly, the double-hurdle model results of factors influencing smallholder farmers' participation and intensity of participation in interlocked contractual arrangements are presented and discussed.

7.2 Governance-related issues

Particular emphasis has been placed on incentives, smallholder farmers' perceptions regarding the existence of trust and relational norms in the buyer-supplier exchange relationship, and the extent to which milk buyers understand smallholder farmers' needs and treat them fairly. These factors reduce risks and transaction costs, especially related to sourcing of information, monitoring and enforcement, and consequently affect smallholder farmers' feasibility as exchange partners and the profitability of investments.

7.2.1 Incentives

Incentives usually specified in the contract affect smallholder farmers' decision to participate and intensity of participation in interlocked contractual arrangements in that they influence rewards, costs and risks, and the subsequent profitability and feasibility of a transaction. Responses were ranked in descending order of importance using the mode of "very important," to determine the extent to which various incentives influence smallholder farmers' decision to participate in or sell milk through interlocked contractual arrangements (Table 4). Results reveal that the most important incentives are milk buyer' financial and management capacity, the possibility of selling larger quantities of milk, a guaranteed market and the regularity of

sales. Of moderate importance are lump sum payment, relatively low costs and access to extension services (business and dairy management training).

The financial and management ability of the off-taker is closely related to the firm's capability to make the needed capital investments for the modern channel, such as the milk-processing plant, distribution network and provision of extension services. These investments directly affect outreach (size of catchment area) and the number of smallholder farmers participating in interlocked contractual arrangements, while the provision of technical assistance in dairy husbandry improves productivity and lowers the risks of smallholder farmers. Moreover, the financial and management ability of the off-taker affects the firms' ability to make above-market rate payments to induce farmers to supply milk to the firm and not to violate the contract through side-selling to alternative channels once they have decided to participate in interlocked contractual arrangements (Reardon et al., 2009).

Table 4: Incentives influencing smallholder farmers' participation (n=266)

	Type of incentive	Not important		Somewhat important		Very Important	
Ranks	**Variable**	**No.**	**%**	**No.**	**%**	**No.**	**%**
1	Buyer's financial and management capacity	5	1.88	55	20.68	206	77.44
2	Larger quantities of milk sold	19	7.14	42	15.79	205	77.07
3	Guaranteed market	9	3.38	54	20.30	203	76.32
4	Regularity of sales	29	10.90	46	17.29	181	71.80
5	Lump sum payment/monthly payment	27	10.15	87	32.17	152	57.14
6	Relatively lower costs in meeting the quality and transaction requirements of channel	33	12.41	89	33.46	144	54.14
7	Access to business and dairy management training	42	15.79	86	32.33	138	51.88
8	Access to credit/inputs	42	15.79	103	38.72	121	45.49
9	Buyer pays a higher price	121	45.66	64	24.15	80	30.19

Source: Survey (2014)

The existence of a contract and milk-processing plant guarantees farmers a secure market and reduces income variability and risks, which serve as strong incentives for farmers to participate in interlocked contractual arrangements. Receiving a lump sum payment after some reasonable period instead of cash-on-delivery payment could motivate smallholder farmers to sell milk through interlocked contractual arrangements rather than the traditional channels because they are able to make a meaningful investment. This finding resonates with that of Mujawamariya

and D' Haese (2011). They gave the same reason indicated above why a lump sum payment to smallholder farmers after a reasonable period motivated them to participate in the gum Arabic interlocked contractual arrangements in Senegal.

Access to credit and inputs and the milk price paid by the buyer received the lowest scores in motivating smallholder farmers' decision to participate in interlocked contractual arrangements. Both financial institutions that were interviewed indicated that they were overwhelmed by the demand for dairy loans through interlocked contractual arrangements and only a few farmers were able to access them. Moreover, the cost of borrowing to purchase dairy animals is relatively high, as the animals are sourced from South Africa because of the inadequate local supply. Farmers also intimated that they did not have access to inputs at discounted prices.

With regard to the milk price, generally, a typical milk collection centre realises more for grade A milk at an average price of 3.43 ZMW compared to 2.38 ZMW received on the spot market. The grade A price range of 3.3 - 3.5 ZMW received by the milk collection centre is slightly higher than that of 1.25 - 3.5 ZMW/litre for ungraded milk sold on the spot market. The average price for grade B milk was 3.27 ZMW and, depending on the milk buyer, prices ranged from 3.2 - 3.4 ZMW, while that for grade C milk was 3.05 ZMW and ranged from 3.0 - 3.1 ZMW. Nonetheless, the effective price received by farmers was lower than the above reported prices. This is because the milk collection centres charge a commission of 0.1 - 0.6 ZMW for each litre of milk supplied by the farmer. The commission goes towards meeting the high costs incurred by milk collection centres in ensuring that a quality product is delivered to processors. Therefore, the effective price range for grade A milk was between 2.83 and 3.33 ZMW/litre; 2.67 and 3.17 ZMW/litre for grade B milk and 2.45 – 2.95 ZMW/litre for grade C. Implying that the effective average price of milk across the different grades received by participants in interlocked contractual arrangements was still higher than the average price of 2.38 ZMW received on the spot market. It is important to note that the relative price offered to smallholder farmers, after controlling for product quality and considering the relative costs and risks incurred in meeting the product quality and transaction requirements of the modern channel compared to the traditional channel, determines the profit levels and feasibility of a transaction (Reardon et al., 2009). If the smallholder farmers' effort is not well compensated, they will resort to selling most of their milk in traditional channels where quality is not an issue and payment is cash on delivery. This is especially true where customers buy milk from the farm, since farmers then do not incur any transportation costs in delivering the milk to the market.

Nevertheless, farmers could agree to these pricing terms because they prefer consistent pricing to the highly volatile informal market situation (Kaganzi et al., 2009). When off-takers were asked if they were willing to increase the milk price offered to the smallholder farmers, they indicated that they were financially constrained. Imported milk products land more cheaply than locally produced products, partly owing to the currently implemented tax regimes. For instance, a 16% tax is charged on raw milk and 5% on value added tax is charged on locally produced milk-blended juices, which increases throughput costs and product prices. This adversely affects the demand for and sale of these products.

7.2.2 Existing levels of trust in the buyer-supplier exchange relationship

Figure 4 presents the responses of smallholder farmers with regard to the existing trust levels in the buyer-supplier exchange relationship. Overwhelmingly, smallholder farmers participating in interlocked contractual arrangements felt that the buyer-supplier exchange relationship was characterised by high levels of trust. When exchange partners trust each other, they are more willing to share information and commit to each other (Daugherty, 2011; Sambasivan et al, 2011).

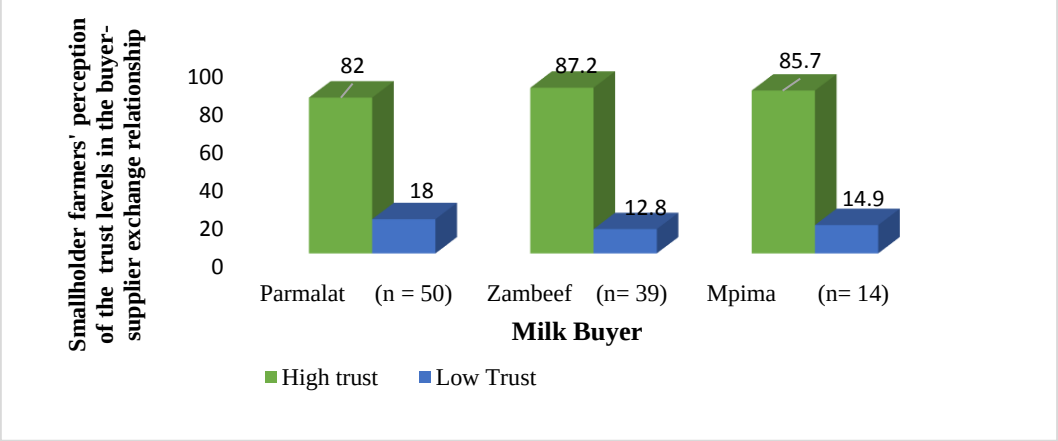

Figure 4: Smallholder farmers' perception of the existing trust levels in the buyer-supplier exchange relationship
Source: Survey (2014)

Likewise, Morgan and Hunt (1994) argue that when trust exists in an exchange relationship, transaction partners (i) work at preserving the relationship by cooperating with each other; (ii) resist attractive short-term alternatives in favour of the expected long-term benefits of staying

with current partners; and (iii) view potentially high-risk actions as prudent, because of the belief that their partners will not act opportunistically.

Consequently, transaction-specific investments and adaptation of production processes are eased when trust is present (Sahay, 2003). Often, investment in bulking and cooling facilities, dairy animals and equipment is a prerequisite for smallholder farmers' participation in interlocked contractual arrangements.

7.2.3 Existence of relational norms in the buyer- supplier exchange relationship

Majority of farmers (81%) agreed that norms such as open exchange of information and ideas/initiatives, solidarity and participation, joint problem-solving and conflict resolution existed in the buyer-supplier exchange relationships (Figure 5). These norms support the pooling and utilisation of talents, skills and resources from both parties to achieve an

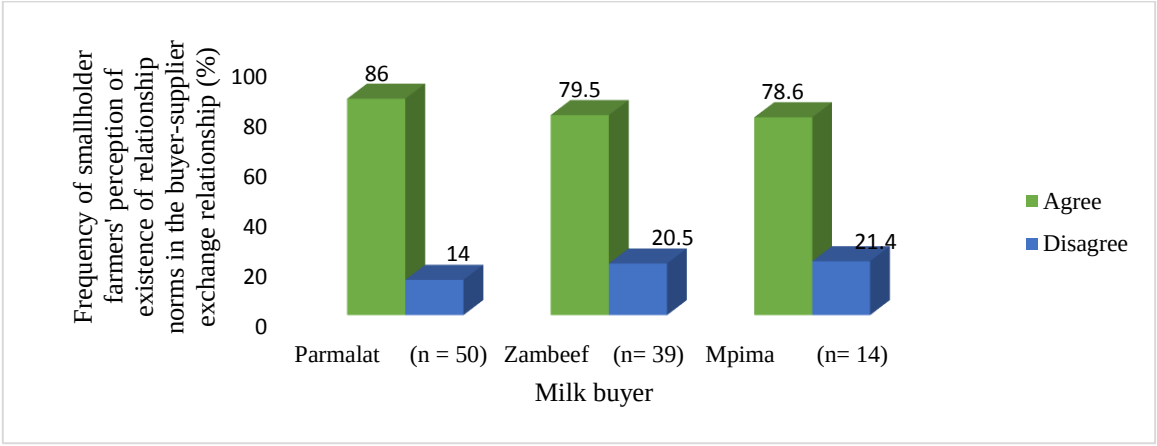

Figure 5: Perception of smallholder farmers regarding the existence of relationship norms in the buyer-supplier exchange relationship
Source: Survey (2014)

advantageous position in a competitive environment, thereby improving sales for both buyer and supplier in a vertical partnership (Liu et al., 2009). For instance, through farmer groups/cooperatives, smallholder farmers collaborate in marketing milk by leveraging synergies and economies of scale, which enhances their competitiveness and bargaining power. To overcome the moral hazard and adverse selection problems involved in screening, monitoring and enforcement in a market characterised by information asymmetries, processors and credit providers rely on the information provided by farmer groups/dairy cooperatives to select participants in interlocked contractual arrangements. Moreover, structures exist for resolving conflicts. For instance, the milk collection centre boards try to resolve most problems

that arise among their members or with the processor. In case this avenue fails, an arbitrator, usually an extension officer, is called upon.

7.2.4 Extent to which milk buyers understand smallholder farmers' needs and treat them fairly

Figure 6 shows the smallholder farmers' assessment of the extent to which milk buyers understood their needs. To a significant extent, farmers felt that milk buyers understood their needs. However, Mpima had relatively more suppliers (42.9 %) who felt that the buyer did not adequately understand their needs, followed by Zambeef (30.8%) and Parmalat (14%).

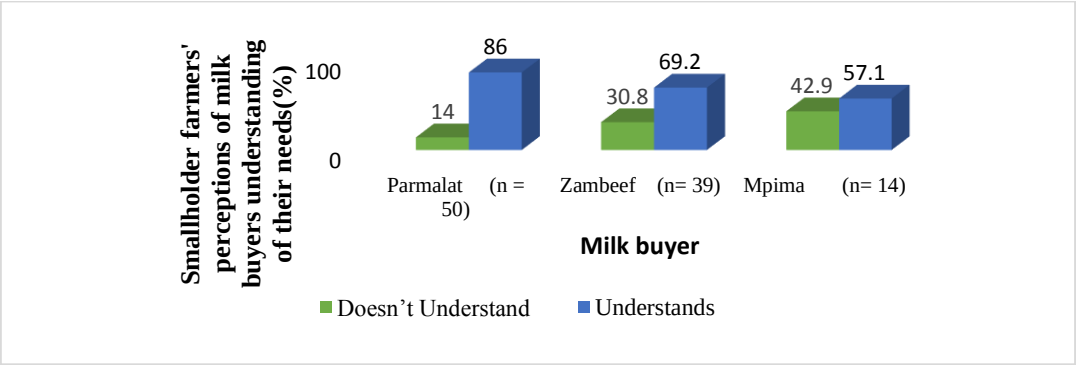

Figure 6: Smallholder farmers' perception of the extent to which milk buyers understand their needs
Source: Survey (2014)

Following from Figure 7, most of the farmers felt that the milk buyers treated them fairly.

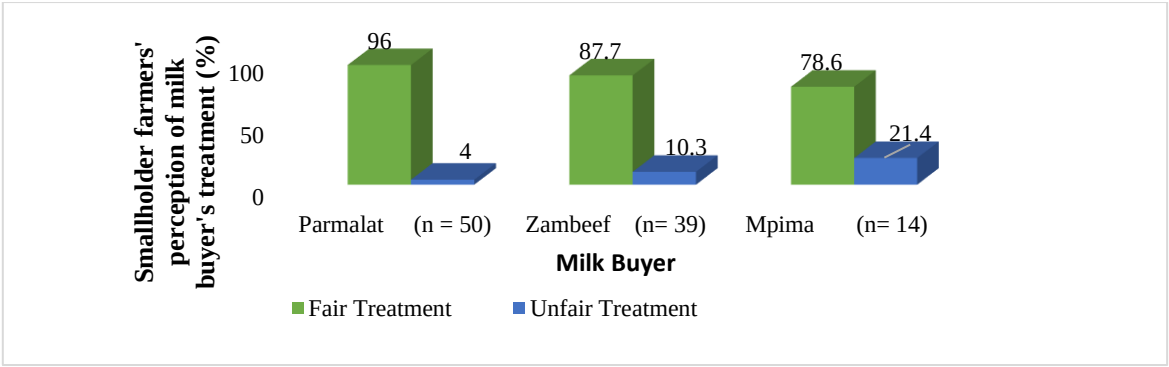

Figure 7: Smallholder farmers' perception of the extent to which milk buyers treat them fairly
Source: Survey (2014)

However, with reference to unfair treatment, the following issues were mentioned about each milk buyer:

(i) Parmalat Zambia Ltd

- *Low milk prices*. Parmalat pays ZMW 3.40/litre for grade A milk compared to ZMW 3.50 paid by its competitors.
- *Lack of involvement in making key business decisions.* Farmers are not involved in price negotiations or in reviewing of the memorandum of understanding.
- *Lack of periodic review of the memorandum of understanding.* The memorandum of understanding is not reviewed regularly, yet the business environment in which the farmers operate is dynamic.
- *Inadequate help from the processor*. Little assistance is received from the processor with regard to linking smallholder farmers to input providers.

(ii) Zambeef Plc Ltd

- *Inadequate transparency in grading*. An example mentioned was that by the time the milk is collected from the milk collection centre, it would have been certified as being of good quality. In the event it has turned sour by the time it reaches the processing plant, it is rejected. When this happens the milk collection centre is required to collect the sour milk, but milk collection centres lack transport. Therefore, farmers suspect that whereas Zambeef could be benefiting by processing sour milk, it does not pay them anything.
- *Farmers' remuneration and milk weighing mechanisms*. Milk collection centres and the processor use different milk-weighing mechanisms. Whereas the milk collection centre measures the milk volumes using buckets, Zambeef uses the weighbridge. When the milk collection centre records milk volumes that are higher or lower than those Zambeef measures, Zambeef will pay the milk collection centre according to the weighbridge measures. Therefore, the milk collection centres lose out, especially when they record less milk than they actually supplied. On the contrary, competitors like Parmalat give bonuses to farmers (suppliers) based on the observed weight differences and if they have made profits at the end of each year.
- *Cost and inconvenience of collecting pay cheques*. Farmers' representatives have to travel to Lusaka (35 km) to pick up their pay cheques and later deposit them at ZANACO Chisamba branch, which not only increases transportation costs but also contributes to late payment of farmers. Zambeef has offices in Chisamba and could arrange for the cheques to be picked up there, rather than from the Lusaka headquarters.

- *Inadequate access to quality bulls/artificial insemination*. Farmers claim that Zambeef has the capacity to improve their milk yields by facilitating their access to artificial insemination or good quality bulls from the company farm. However, the company is reluctant to do so. This makes the farmers feel that despite them being suppliers of milk to the company, Zambeef to some extent perceives them as competitors and is therefore not genuinely concerned about helping them improve their productivity or their welfare.
- *Blanket punishment of cooperatives due to loan defaulters*. When some members default on repaying the loans they got for inputs such as feed, the whole cooperative is penalised by scrapping of this credit facility rather than punishing the few culprits.
- *Low milk prices*. Farmers felt that their effort spent in supplying a quality product to the buyer is not appropriately rewarded.

(iii) Mpima Dairy Scheme

- *Lack of involvement in setting prices*. Although the processing plant belonged to the cooperative, some members claimed that decisions on setting prices were made by professional managers and cooperative board members. Consequently, they were price takers.
- *Lack of periodic review of the memorandum of understanding, despite a very dynamic business environment*. Some farmers suggested that if the processing plant made a profit at the end of the year, the cooperative should consider paying a bonus to its members or at least increase the milk price offered. This would cushion the effects of high inflation rates.
- *The dairy cooperative takes time to help when the suppliers (cooperative members) are in need.*

7.3 Criteria used to select smallholder farmers eligible to participate

Governance-related issues, such as membership of a registered dairy cooperative and the capacity to adhere to contractual terms that have been agreed upon (such as the quality and quantity of milk supplied) and having a healthy herd were the main criteria used for selection of smallholder farmers that supplied milk to the processing companies. Quality issues entailed farmers meeting the milk safety and sanitation regulations (product safety, acquisition of

tuberculosis and brucellosis certification), milk freshness, a low microbial count, lack of water adulteration and chemicals or antibiotics.

Meanwhile, the main criteria used by milk collection centres to select their members were compliance with the norms of the cooperative, such as being paid-up members, adherence to agreed delivery schedules and milk-handling and sanitation practices. In addition to these rules, Palabana Dairy Cooperative required that members supply a minimum of 11 litres per day, while Chibombo Dairy Cooperative required that farmers be trained in dairy management practices and come from a distance of ≤ 50 km from the milk collection centre.

7.4 Characterisation of smallholder farmers' participation

Table 5 presents a mean comparison of selected sample characteristics between participants in interlocked contractual arrangements and non-participants. Results reveal that there were significant differences ($p<0.01$) in the level of education of household heads, ownership of improved breed animals, number of lactating animals owned, proximity to the milk collection centre, town, milk trader, dip tank, tarmac road and source of electricity.

Likewise, significant differences ($p<0.05$) in the value of non-land assets owned and proximity to the input dealer were observed. Households participating in interlocked contractual arrangements and those that did not participate were significantly different ($p<0.1$) with regard to household labour size, landholding size and the number of local breed animals owned, as well as their proximity to veterinary camps and water sources.

Generally, households involved in interlocked contractual arrangements had household heads with two more years of education than non-participants. A similar trend was noticeable for the availability of labour, where participants in interlocked contractual arrangements had on average more household labour than their counterparts. Likewise, households taking part in interlocked contractual arrangements owned about 3.8 times the number of improved breed animals and double the number of lactating animals than non-participants.

Conversely, non-participants had about 1.5 times more local animals, 5 ha more land and the value of their non-land assets was 5.65 times that of their counterparts. Also, their homesteads were closer to town, milk traders, input dealers, tarmac roads and sources of water than those of participants. These results show that non-participants were wealthier than participants and could easily access alternative milk markets, implying that they were probably not keen in

participating in interlocked contractual arrangements. In contrast, homesteads of households participating in interlocked contractual arrangements were closer to milk collection centres, veterinary camps, dip tanks and sources of electricity than those of non-participants. These results seem to suggest that establishment of milk collection centres promotes the development of production enhancing facilities/services in the vicinity.

Table 5: Comparison of means of selected sample characteristics between participants and non-participants

Characteristic	Overall (1) (n=266)	Participants (2) (n=103)	Non-Participants (3) (n=163)
Demographics			
Age of household head	51.7 (14.0)	52.9 (13.1)	51.0 (14.4)
Household head education level (years)	8.3 (4.14)	9.7 (4.91)***	7.5 (3.35)
Dairy experience (years)	8.0 (7.82)	8.3 (7.94)	7.7 (7.77)
Total labour availability (hired and family labour)	4.2 (1.94)	4.4(2.19)*	4 (1.76)
Landholding size (ha)	10.8 (21.77)	13.8(32.12)*	8.9 (11.53)
Value of non-land assets owned (ZMW)	101 670.2 (625 618.5)	209 063.8** (1 012 164)	36 975.3 (52 181.3)
Number of improved breed animals owned	4.1(8.88)	7.6 (11.7) ***	2.1 (5.8)
Number of local breed animals owned	6.6 (8.34)	5.5 (10.15)*	7.3 (6.96)
Number of lactating animals owned	2.3 (2.76)	3.3(3.54)***	1.7 (1.93)
Annual income from other sources (ZMW)	5 167.1 (37 378.0)	3 662.8 (10 121.5)	6 073.2 (46 692.4)
Distance to nearest milk collection centre (km)	11.53 (15.37)	4.21 (5.10)***	15.94 (17.65)
Distance to nearest town (km)	15.10 (10.38)	17.98 (11.79)***	13.34 (9.00)
Distance to the nearest milk trader (km)	14.21 (17.61)	18.62 (19.69) ***	11.13 (15.35)
Distance to the nearest input dealer (km)	15.13 (12.57)	17.73 (15.76)**	13.62 (10.03)
Distance to the nearest veterinary camp (km)	8.97 (6.55)	8.05 (6.61)*	9.53 (6.47)
Distance to the nearest dip tank (km)	6.80 (6.12)	4.38 (4.96)***	8.03(6.30)
Distance to the nearest tarmac road (km)	8.1(7.00)	11.33(7.79)***	6.21(5.73)
Distance to the nearest water source (km)	0.89(2.34)	1.11 (2.42)*	0.54 (2.16)
Distance to the nearest electricity source (km)	4.30 (5.18)	2.90 (4.85)***	5.32 (5.19)

Source: Survey (2014). Significant levels: *** p<0.01, ** p<0.05, * p<0.1. Standard deviations in parentheses.

Table 6 compares percentages for selected sample characteristics between participants and non-participants in interlocked contractual arrangements. Results show a significant difference

(p<0.01) between participants and non-participants regarding access to production-enhancing facilities, extension services and improved technologies. Although interlocked contractual arrangements seem to enhance smallholder farmers' access to improved technologies and extension services, 21% of participants in interlocked contractual arrangements have never received any dairy management training. Usage of artificial insemination services is generally low. Farmers indicated that existing artificial insemination services were ineffective and costly. They were therefore discouraged from using them. Incidents were reported of inseminated cows not getting pregnant in five years, which was partly attributed to the use of dead or expired straws.

Table 6: Comparison of percentages for selected sample characteristics between participants and non-participants

Characteristic/Variable	Overall	Participants	Non-Participants	Pearson chi2 (χ^2)
	(1) (n=266)	(2) (n=103)	(3) (n=163)	(4)
Demographics	*Percentages*			
Household head is a youth (≤ 35 years)	13	11	14.5	0.653
Sex of household head (female)	0.1	12	0.5	0.900
Socio-economic factors				
Dairy cooperative member	38.7	83	12.0	132.40***
Access electricity	32.7	43	26.5	7.714***
Access to water throughout the year	69.5	67	71	1.054
Received training on dairy management practices	61.65	79	51	20.393***
Access to dairy marketing information	16.2	25	10.8	9.229***
Access to discounted inputs	3.75	6	2.4	2.223
Uses improved bull	12.8	26	4.8	25.111***
Practises artificial insemination	3.4	8	0.6	10.447***
Follows intensive dairy management practices	31.58	51	19.9	27.973***
Cultural factors				
Cattle-rearing culture	60.15	54	63.8	2.529

Source: Survey (2014). Significant levels: *** p<0.01, ** p<0.05, * p<0.1.

It is also of concern that only 6% of the households taking part in interlocked contractual arrangements reported having had access to dairy inputs at discounted prices, such as feed and dairy equipment, yet all the processors indicated that they linked them to input suppliers. One would have assumed that such linkages, coupled with economies of scale enjoyed by

cooperatives, such as bulk purchasing and transportation, would bring down the cost of inputs. In fact, respondents suggested the need to lower the cost of feed supplements in order to reduce feeding costs, especially during the dry period. Lastly, results show that there was no significant difference between households participating in interlocked contractual arrangements and their counterparts regarding access to water throughout the year and whether they came from a cattle-rearing tradition or not.

7.5 Factors influencing smallholder farmers' participation and intensity of participation

7.5.1 Factors affecting participation of smallholder farmers

Results from the first stage of the double-hurdle/probit model are presented in Table 7. Key determinants of smallholder farmers' participation in interlocked contractual arrangements are the milk collection centre's milk price, proximity to a source of water and milk collection centre, landholding size, annual income from other sources, access to dairy marketing information, number of lactating animals and value of non-land assets owned.

The marginal effects (column 3) indicate that adding an improved breed animal (pure/cross) to the herd was associated with a 58.4% increase in the household's probability of participating in interlocked contractual arrangements. Smallholder farmers with improved breed animals present lower risks and costs to the modern channel in terms of volumes produced and reliability of supply than those owning local breeds. Moreover, ownership of improved breed animals is an indicator of the level of specialisation in dairy farming and extent of use of improved management practices (both of which enhance the milk quantity and quality produced) and subsequent participation in interlocked contractual arrangements. This finding is in agreement with the prior expectation of a positive relation between participation in these institutional arrangements and ownership of improved breed animals. It is also similar to that of Guo et al. (2005), who found that farmers who specialised in fruit, vegetables, tea and livestock production were more likely to participate in the respective contract schemes in China. However, Ramaswami et al. (2006) found contradictory results in poultry contract farming in India.

As postulated, an additional ZMW to the milk price offered by the milk collection centre/processor was related to a 50.4% rise in the household's likelihood of participating in interlocked contractual arrangements. This is because the milk price offered by the buyer not only affects the revenue and profit levels of a transaction, but also its feasibility.

Table 7: Probit estimate of factors influencing smallholder farmers' participation decision

Variable	Parameter estimate (1)	Robust Std. Err (2)	Marginal effects (3)
Constant	-7.8919	4.0416	
Age of household head (years)	0.1664	0.1300	0.0600
Age of household head squared (years)	-0.0014	0.0011	-0.0005
Sex of household head (male =1, female = 0)	0.2934	0.4277	0.1058
Education level of household head (years)	0.0293	0.0427	0.0106
Household size	-0.0194	0.1582	-0.0070
Family labour size	-0.1903	0.2242	-0.0686
Landholding size (ha)	-0.0135***	0.0041	-0.0049
Value of livestock owned (ZMW)	-1.03e-07	8.21e-08	-3.73e-08
Use of improved bull (Yes=1)	0.5357	0.5274	0.1932
Intensity of management practices (1=intensive)	-0.8297	0.5551	0.0271
Value of non-land assets owned (ZMW)	6.58e-06**	2.87e-06	2.37e-06
Number of lactating animals owned	0.0750*	0.0442	-0.2712
Ownership of improved breed animals (Yes=1)	1.6937***	0.4004	0.5843
Annual income from other sources (ZMW)	-0.00005***	0.00002	-0.00001
Distance to nearest milk collection centre (km)	-0.0343**	0.0146	-0.0124
Distance to the nearest water source (km)	-0.1062**	0.0464	-0.0383
Access to dairy marketing information (Yes=1)	0.9666**	0.4536	0.3487
Access to electricity (Yes=1)	-0.6357	0.4430	-0.2293
Milk collection centre milk price (ZMW)	1.3960***	0.2042	0.5036
Household emanates from cattle-rearing culture (Yes=1)	0.5862	0.4428	0.2034
Number of observations	266		
Log pseudo likelihood	-24.9412***		
Pseudo R2	0.8584		
Predicted probability	0.3268		

Source: Survey (2014). Dependent variable: whether the household sold milk to milk collection centre (= 1) or not (= 0). Significance: *** p<0.01, ** p<0.05, * p<0.1.

Similarly, access to dairy marketing information was linked to an increase of 34.9% in the household's chance of participation in interlocked contractual arrangements. Access to dairy marketing information about distribution channels, prices, product quantities and quality creates awareness of the available market opportunities and the extent of risks involved. These results are similar to those of Sokchea and Culas (2011), regarding participation in Cambodia's organic rice contract farming and to the prior expectations.

Equally, an additional ZMW to the value of non-land assets was associated with an increase in the household's prospects to participate in interlocked contractual arrangements. Ownership of productive assets such as tools/equipment and farm buildings can be related to the producer's ability to deploy working capital and generate positive cash flows. These farmers may also be expected to commercialise faster and on a larger scale, partly because they have the means to invest in new ventures and can usually bear the risk of failure. In addition, they would probably have invested more in transaction-specific assets aimed at increasing productivity, a finding similar to that of Warning and Key (2002). These assets are also key prerequisites for farmers' inclusion in interlocked contractual arrangements. Nevertheless, Sambao (2014) states that ownership of assets is not a significant predictor of participation in tobacco contract farming in Tanzania.

Conversely, the results show that a kilometre added to the distance from the homestead to the nearest source of water was associated with a 3.8% drop in the household's probability of participating in interlocked contractual arrangements. Water is a critical resource in dairy farming. When animals travel long distances looking for water, it not only lowers their productivity but also affects the smallholder farmer's ability to meet the strict milk collection centre delivery schedules. Likewise, a kilometre added to the distance from the homestead to the milk collection centre would decrease the household's chances to participate in interlocked contractual arrangements by 1.2%. This finding is similar to that of Guo et al. (2005), Narayan (2010) and Wainaina et al. (2012), but conflicts with that of Leung et al. (2008). The negative relationship could be due to increased transportation costs. In fact, one of the milk collection centre officials indicated that one of the criteria for selection of participants in interlocked contractual arrangements was that farmers should come from a distance of $\leq$ 50 km from the milk collection centre. It is worth noting that the negative relationship between the distance to the nearest production facilities and participation in interlocked contractual arrangements is as hypothesised.

Results further reveal that adding a lactating animal to the household herd would decrease the household's chances of participating in interlocked contractual arrangements by 27%, holding other variables in the model constant. Smallholder farmers who own more lactating animals would probably produce higher volumes of milk and would therefore have the capacity to exploit other markets besides interlocked contractual arrangements or even directly forge linkages with milk processors at reduced cost per unit. This finding is contrary to prior expectations and to that of Bolwig et al. (2010), who established that participation in organic coffee contract farming was enhanced by the number of productive coffee trees a farmer owned.

A hectare added to the landholding size was associated with a 0.5% decrease in the household's probability of participating in interlocked contractual arrangements, a result that is different from the set hypothesis. This could be due to differences in the intensity of management practices, where participants in interlocked contractual arrangements tend to practise zero and/fenced or paddock grazing, which requires less land compared to extensive management practices employed by their counterparts. However, Bellemare (2012) found the reverse to be true for vegetable, fruit and grain crop contract farming in Madagascar. The size of the farm owned was significant and positively related to participation in contract farming.

Lastly, an additional ZMW to annual income from other sources was linked to a decline in the household's likelihood to participate in interlocked contractual arrangements. A similar relationship was found by Warning and Key (2002) in peanut contract farming in Senegal. This could be explained by differences in levels of specialisation, where an increase in income from other sources could be an indication of reduced specialisation in dairy farming and increased risks, since the farmer would be unable to meet the milk volumes set by the processing company.

The effect of the rest of the variables on smallholder farmers' decision to participate in interlocked contractual arrangements was insignificant. Nonetheless, male-headed households were more likely to participate in interlocked contractual arrangements than female-headed households. In addition, there was a positive relationship between smallholder farmers' participation in interlocked contractual arrangements and the use of improved bulls, the age and educational level of the household head and households coming from a cattle-rearing culture. In contrast, a negative relationship was established between smallholder farmers'

participation in interlocked contractual arrangements and household size, availability of family labour, value of livestock owned, intensity of management practices and access to electricity.

7.5.2 Factors affecting intensity of smallholder farmers' participation

Table 8 presents results for the second stage of the double-hurdle model/truncated regression regarding determinants of the proportion of milk that smallholder farmers sell through interlocked contractual arrangements. Key determinants are the education level of the household head, access to dairy-marketing information, proximity to a milk collection centre and source of water, a household coming from a cattle-rearing culture, the level of trust within the exchange relationship and relative supplier dependency on the milk buyer. This finding is similar to that of previous studies (Arumugam et al. 2011; Escobal & Cavero, 2012).

Table 8: Truncated regression estimates of factors influencing the proportion of milk smallholder farmers sell through interlocked contractual arrangements

Variable	***Parameter estimate (1)***	***Robust Std. Error (2)***
Constant	42.9616***	14.0524
Age of household head (years)	0.1082	0.1483
Sex of household head (male =1, female = 0)	7.9632	5.7706
Education level of household head (years)	2.1970***	0.4520
Landholding size (ha)	0.0592	0.0588
Intensity of management practice (1= intensive)	7.9530*	4.4740
Value of non-land assets owned (ZMW)	-2.49e-06	1.97e-06
Ownership of improved breed animals (Yes=1)	2.7307	4.4294
Annual income from other sources (ZMW)	-0.0001	0.0002
Distance to nearest milk collection centre (km)	1.1114***	0.3728
Distance to the nearest source of water (km)	-2.4375***	0.9282
Access to dairy-marketing information (Yes=1)	-12.0422***	4.3670
Access to electricity (Yes=1)	-3.3249	3.9807
Extent of supplier dependency on milk buyer	-2.9521*	1.7211
Level of trust between milk supplier and buyer	1.4066*	0.7749

Household comes from cattle-rearing culture (Yes=1)	7.2179*	3.8570
Number of observations	101	
Log pseudo likelihood	-431.1949***	

Source: Survey (2014). Dependent variable: proportion of milk sold through interlocked contractual arrangements. Significant level: *** p<0.01, ** p<0.05, * p<0.1.

Results show that a year added to the educational level of the household head would lead to a 2.2% increase in the proportion of milk that the household sells through interlocked contractual arrangements, other variables in the model held constant. It is assumed that household heads who are educated can easily understand contractual terms and access various information sources needed to enhance and sustain their levels of participation in interlocked contractual arrangements.

Results further reveal that the use of intensive dairy management would increase the proportion of milk that the household sells through interlocked contractual arrangements by 8%, other variables in the model held constant. Enhanced use of intensive dairy management practices increases productivity, which influences competitive priorities such as reliability, efficiency, milk quality and volume produced. With these competitive advantages, the smallholder farmer would gain more by selling most of the milk through interlocked contractual arrangements, since he/she would be rewarded for product quality.

Moreover, an increase in the distance from the homestead to the nearest milk collection centre would increase the milk that the household sells through interlocked contractual arrangements by 1.1%, other variables in the model held constant. Smallholder farmers who are far from milk collection centres are probably also distant from town and other alternative milk markets. Therefore, they would resort to selling their milk to the only available market, which is the milk collection centre.

Results also reveal that an increase in the level of trust in the buyer-supplier exchange relationship would increase the proportion of milk that the household sells through interlocked contractual arrangements by 1.4%. When trust exists in the exchange relationship, farmers will be committed and resist attractive short-term alternatives such as side-selling, in favour of expected long-term benefits. Besides, households that come from a cattle-rearing culture are likely to sell a higher proportion of their milk (7.2%) than their counterparts, other variables in the model held constant. People coming from a cattle-rearing culture have a keen interest in dairy farming since rearing these animals is their way of life. This coupled with enhanced skills

and knowledge of improving productivity, their intensity of participation in interlocked contractual arrangements is likely to be higher than that of their counterparts.

In contrast, an increase in the household's income from other sources is likely to decrease the proportion of milk that the household sells though interlocked contractual arrangements, other variables in the model held constant. This could be explained by differences in levels of specialisation. It is expected that farmers that are less specialised in dairy farming would have more income from other sources than from milk sales, compared to their counterparts.

Likewise, a unit increase in the level of smallholder farmer's dependency on the milk buyer would reduce the proportion of milk that the household sells through interlocked contractual arrangements by about 3%. The results seem to suggest that increased interdependence/power asymmetry could have a negative effect on the relative milk quantities smallholder farmers sell through interlocked contractual arrangements. This is probably due to relationship dissatisfaction and threats of opportunism, especially where the more powerful firms in a value chain are likely to exploit the less powerful (smallholder farmers) and receive the greatest benefits from the business transactions.

Whereas increased access to dairy-marketing information raised the chances of smallholder farmers participating in interlocked contractual arrangements, it decreased the proportion of milk that they sold through interlocked contractual arrangements. This happened because such farmers would be knowledgeable about available market opportunities and would exploit them, especially if they offered better incentives than interlocked contractual arrangements.

The rest of the variables had insignificant effects on the proportion of milk that smallholder farmers sold through interlocked contractual arrangements. However, male-headed households were likely to sell a high proportion of milk through interlocked contractual arrangements. The age of the household head, landholding size and ownership of improved breed animals had positive effects on the proportion of milk that smallholder farmers sold through interlocked contractual arrangements. A negative relationship was found to exist between the proportion of milk that smallholder farmers sold through interlocked contractual arrangements and the value of non-land assets, annual income from other sources and access to electricity.

7.6 Summary

This chapter identified the factors influencing smallholder farmers' participation in the dairy sector's interlocked contractual arrangements in Zambia. Ranking in descending order of the importance of various incentives in influencing smallholder farmers' decision to participate in interlocked contractual arrangements reveals that the most important incentives are buyer financial and management capacity, the possibility of selling larger quantities of milk, a guaranteed market and regularity of sales, followed by lump sum payment, relatively low costs, access to extension services, credit/inputs and lastly the milk price offered by the buyer.

Milk collection centres charge a commission of 0.1 - 0.6 ZMW/litre of milk supplied by farmers that goes towards meeting the high costs incurred by milk collection centres in ensuring that a quality product is delivered to the processors. Consequently, the effective average price received by farmers for grade A milk was 2.83 ZMW/litre; 2.68 ZMW/litre for grade B milk and 2.45 ZMW/litre for grade C. Nonetheless, the effective average price of milk across the different grades received by participants in interlocked contractual arrangements was still higher than the average price of 2.38 ZMW received on the spot market.

Most of the smallholder farmers felt that relationship norms such as open exchange of information and ideas/initiatives, solidarity and participation, joint problem-solving and conflict resolution and trust existed in the buyer-supplier exchange relationship. With regard to smallholder farmers' perception of the extent to which milk buyers understood their needs and treated them fairly, perceptions varied across different buyers, with Parmalat receiving the highest scores, followed by Zambeef and lastly Mpima. The key issues mentioned that needed to be addressed included low prices, late payments, lack of involvement in key business decision-making, long time lags for reviewing memorandum of understanding, inadequate transparency in grading and weighing of milk and access to quality bulls or artificial insemination services.

The criteria used by milk collection centres and processors to select smallholder farmers who participate in interlocked contractual arrangements included membership of a dairy cooperative, adherence to contractual terms such as delivery schedules, quality and quantity of milk supplied and having a healthy herd.

Comparison of participants and non-participants in interlocked contractual arrangements revealed that participants had more labour, improved breed animals and households with an

above-average level of education than their counterparts. Furthermore, their homesteads were closer to production-enhancing facilities such as milk collection centres, veterinary camps, dip tanks and sources of electricity than those of non-participants. In contrast, non-participants were wealthier (land, local breed animals and value of non-land assets) and closer to towns, milk traders, input dealers and sources of water than participants, implying that they could easily access alternative milk and input markets, and this probably explains why they were reluctant to participate in interlocked contractual arrangements.

The double-hurdle model results concerning the determinants of smallholder farmers' participation and intensity of participation in interlocked contractual arrangements revealed that these two sequential decisions were influenced by different factors, with the exception of access to dairy-marketing information, proximity to a milk collection centre and source of water. In this regard, the other factors that influenced smallholder farmers' decision on participation in interlocked contractual arrangements included ownership of improved breed animals, the milk collection centre's milk price, landholding size, annual income from other sources, number of lactating animals and value of non-land assets owned. In contrast, additional determinants of smallholder farmers' decision on the intensity of participation in interlocked contractual arrangements (proportion of milk sold) were the education level of the household head, cattle-rearing culture, extent of supplier's dependency on the milk buyer and level of trust in the exchange relationship.

CHAPTER 8

NATURE AND LEVEL OF SMALLHOLDER FARMERS' PARTICIPATION IN INTERLOCKED CONTRACTUAL ARRANGEMENTS

8.1 Introduction

This chapter discusses the nature and level of smallholder farmers' participation in Zambia's dairy sector interlocked contractual arrangements. Smallholder farmers' participation is looked at from various viewpoints. These include involvement in value chain activities, extent to which they influence key business decisions and actively supply milk to milk collection centres. A discussion of how interlocked contractual arrangements have facilitated smallholder farmers' participation in markets follows. First, the role of governance mechanisms in addressing some of the key impediments to smallholder farmers' access to markets is explained. Afterwards, a comparison of the milk source shares by farmer category for each of the milk buyers is given. This is followed by a comparison of access to inputs, financial and extension services and other production-enhancing facilities such as dairy cooperatives between participants and non-participants.

8.2 Smallholder farmers' participation in value chain activities

The value chain perspective was used to examine the extent to which smallholder farmers participate in value chain activities. Results show that smallholder farmers supplying milk to Zambeef and Parmalat participated in a few value chain activities (i.e. production, bulking and storage/cooling). Conversely, in the Mpima model, with the help of professional managers, smallholder farmers participated in all the value chain activities from production to processing and distribution. It is worth noting that, originally, Mpima was supplying milk to Parmalat through interlocked contractual arrangements before upgrading to acquire its own milk-processing plant. Through participation in interlocked contractual arrangements, smallholder farmers in Mpima dairy cooperative union upgraded their operations by adding value to their raw milk. Currently, their product range comprises pasteurized fresh milk, sour milk, yoghurt, cheese and fresh cream. Consequently, smallholder farmers in the Mpima model assume relatively more production and marketing costs and risks than those supplying to Zambeef and Parmalat. This finding is similar to that of Fréguin-Gresh and Anseeuw (2013) who found that in some models, farmers were empowered as shareholders and partially participated in the management of most of the value chain activities. Consequently, their position was transformed

from ordinary "chain actors" to "chain owners". Farmers also enjoy the resultant economic benefits for assuming more costs and risks. For instance, the price of 3.50 ZMW for grade A milk offered by Mpima to its suppliers was among the highest despite its small-scale of operation. Interlocked contractual arrangement prices ranged from 3.10 - 3.50 ZMW/litre for graded milk and 1.25 - 3.5 ZMW/litre for ungraded milk on the spot market.

Moreover, other milk collection centres (e.g. Chibombo dairy cooperative union) have diversified into other businesses such as running a hammer mill where they sell maize bran to their members. This has enhanced not only members' access to stock feed, but also the cooperative's self-sufficiency and sustainability. These findings are in line with the prior expectation that involvement in value chain activities would be positively related to ownership of a milk-processing plant and membership of a dairy cooperative.

8.3 Extent to which smallholder farmers influence key business decisions

Table 9 shows the extent to which smallholder farmers influence key business decisions. Most (88%) participants in interlocked contractual arrangements and all the milk collection centre respondents claimed that they did not have any influence on contract negotiation outcomes.

Table 9: Smallholder farmers' influence on key business decisions

Variable	**Participants (n=103)**			
	Frequency	*%*	*Frequency*	*%*
Influence key business decisions	83	78	23	22
Take part in price setting	101	98	2	2
Take part in determination of payment structure	93	90	10	10

Source: Survey (2014)

Almost all respondents indicated that they did not take part in price setting (98%) or in determination of the payment structure (90%). Even where the processing plant is owned by the farmers, as in the case of Mpima, the majority of respondents interviewed (11 of the 13) alleged that they did not have a voice in key business decisions. Despite smallholder farmers being organised in dairy cooperatives, their voice was not being heard. When the respondents were asked who was responsible for setting the contract terms, the majority (98%) indicated that it was the off-taker, while only 2% mentioned NGOs. This finding is in conflict with the hypothesis that smallholder farmers' involvement in key business decisions is positively related to ownership of a milk-processing plant and membership of a dairy cooperative.

8.4 Smallholder farmers' level of activity in milk collection centers

This section compares the number of members registered with the milk collection centres with those actively supplying milk to the centres. This is followed by a comparison of percentages of active milk suppliers and milk supplies in litres per annum by farmer category.

The total number of registered members in the various milk collection centres ranged from 38 to 106, with a mean of 76 and standard deviation of 28. A comparison of the total number of registered members and active milk suppliers by milk collection centre is presented in Table 10. The results reveal that Mpima was outstanding, as all the registered members actively supplied milk to the milk collection centre. This was followed by Palabana. Of concern though, are Chibombo and Liteta milk collection centres, where only slightly more than a quarter of the registered members were active milk suppliers.

Table 10: Comparison of the total number of registered members and active milk suppliers by milk collection centre

Milk collection centre	Registered Members	Active milk suppliers	
	Frequency	Frequency	%
Mpima	38	38	100
Palabana	80	77	96.3
Chibombo	81	28	34.5
Liteta	106	26	24.5

Source: Survey (2014)

In the case of Mpima, the milk-processing plant belongs to the dairy cooperative, which acts as a strong incentive for farmers to support it fully. Meanwhile, Palabana milk collection centre supplies to Parmalat, where the processor solely depends on milk supplied by farmers. Chibombo and Liteta supply to Zambeef, which does not depend solely on the milk collection centres for its supplies; since it produces the bulk (52.5%) of the milk it processes. This finding could imply that where there is strong interdependence between the buyer and supplier, smallholder farmers (suppliers) are more committed to the relationship, hence the high level of smallholder farmers' participation, as in the case of Mpima and Parmalat. However, where there is interdependence asymmetry, as in the case of Zambeef, smallholder participation is relatively low. This finding is similar to that in previous studies where power imbalance in the exchange relationship gave rise to relationship dissatisfaction (Anderson & Weitz, 1992), negative sales performance (Buchanan, 1992), threats of opportunism (Heide & John, 1990) and relationship instability (Steensma & Lyles, 2000; Kumar et al., 1995).

In addition, the low participation of some of the registered members could be attributed to shortcomings in governance of the milk collection centres (dairy cooperatives), ineffective breeding programmes and low productivity. In fact, some of the milk collection centre representatives indicated the existence of internal conflicts, which sometimes led to frequent change of management. When there are many disagreements and frequent change of management, cooperative members lose trust and commitment, which in turn leads to low participation and missing out on many opportunities offered through interlocked contractual arrangements. One of the processors also intimated that there were tendencies of milk collection centre leaders exploiting the rest of the members and depriving them of their hard earned money through exorbitant charges. For instance, whereas some milk collection centres charged a commission as low as 0.1 ZMW/litre of milk supplied by farmers, others charged as high as 0.6 ZMW/litre. Although the commission goes towards meeting the high costs incurred by milk collection centres in ensuring that a quality product is delivered to the processors, it lowers the effective price received by farmers and subsequently creates a strong incentive for farmers to side-sell milk to other buyers rather than the milk collection centre of which they are members. This is especially true where customers buy milk from the farm; then farmers do not have to incur any transportation costs in delivering milk to the market.

Moreover, some milk collection centre representatives indicated that the breeding programmes were ineffective. In some cases, it could take between two and five years for a cow to get pregnant, which implies that it would be dry for the same duration and that would affect smallholder farmers' active participation in milk collection centres. Farmers further intimated that the artificial insemination straws used had often expired, yet they had to pay for these services even if the cow did not get pregnant.

Figure 8 compares active milk suppliers by farmer category with milk supplies in litres per annum. Out of a total of 169 active milk suppliers from the four milk collection centres, the majority (87.6%) were smallholder farmers and on average supplied 184 950 litres of milk/year.

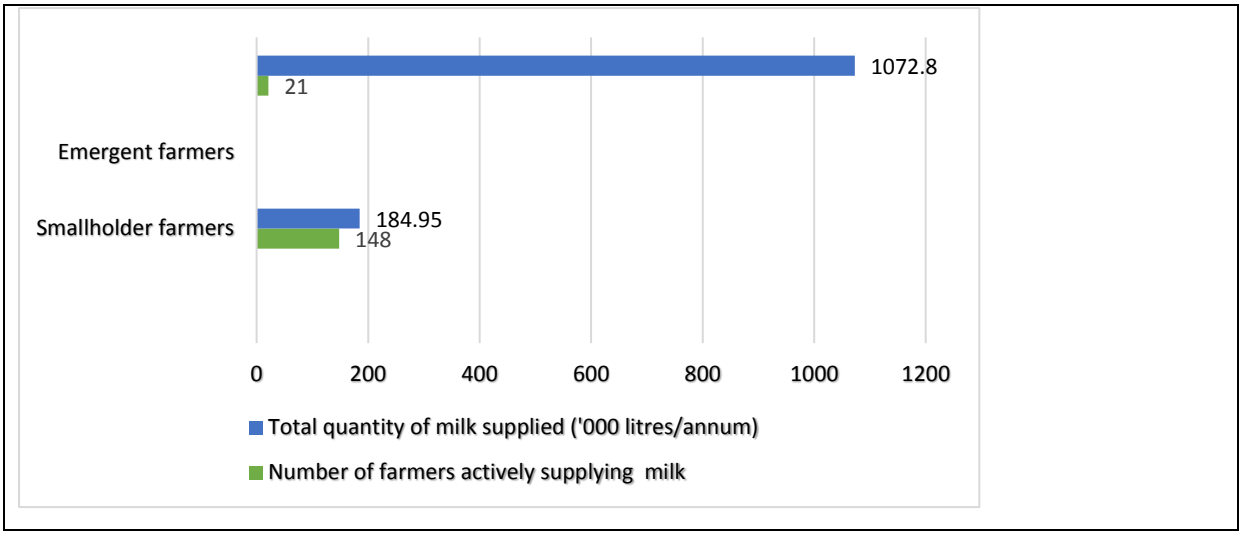

Figure 8: Comparison of active milk suppliers and milk supplies by farmer category

Source: Survey (2014)

In sharp contrast, 12.4% were emergent farmers, yet supplied the bulk of the milk, about 5.8 times that of smallholder farmers. This finding resonates with that of Fréguin-Gresh and Anseeuw (2013) and Vermeulen et al. (2008).

8.5 Ways in which interlocked contractual arrangements facilitate smallholder farmers' participation in markets: the role of governance mechanisms

This section first highlights the contractual terms between the three milk buyers and their suppliers in order to show how contracts have helped smallholder farmers participate in the mainstream dairy value chain. Next, the approach used by the two sampled financial institutions to facilitate smallholder farmers' access to financial services, particularly dairy loans, agricultural insurance, inputs and other production-enhancing services through interlocked contractual arrangements, is explained. This is followed by a discussion of the role of both vertical and horizontal relationships, and indeed relational governance mechanisms in facilitating smallholder farmers' access to markets.

8.5.1 Contract terms between the milk buyer (off-taker) and milk suppliers (smallholder farmers)

The contract specifications from the three off-taker business models investigated have been highlighted in this section. The three off-taker business models are Zambeef, Parmalat and Mpima.

The Zambeef contract is renegotiated after a year and both exchange partners are expected to give three months' notice before terminating the contract. The buyer's responsibilities include provision of extension services, high protein concentrates, biocides for washing tanks and cans and transportation of milk from the milk collection centre to the milk-processing plant. When the quality of milk is compromised by problems originating from the buyer, such as use of the wrong drug(s) for milk testing, the farmer is compensated. After 30 days of milk delivery, farmers are paid by cheque through ZANACO, Chisamba branch. Payments to individual farmers are made based on the milk supply records.

On the other hand, suppliers' responsibilities include delivering milk according to the agreed time and quality. For instance, the cooling tank should be very clean and cooling machines should be in good condition. Milk should not contain antibiotics nor be adulterated with water. The bacterial count should be between 0 and 50 000 for grade A milk, 51 000 and 200 000 for grade B and > 200 000 for grade C. When the milk collection centre supplies grade C milk, the buyer notifies the milk collection centre in writing the first time. If the problem persists, the buyer stops collecting milk for one month until the problem has been resolved. Moreover, if less than 200 litres of milk is collected by the milk collection centre, the buyer will not collect the milk. Lastly, milk collection centre representatives should collect and deposit the pay cheque within three days of issue.

The Parmalat contract is renegotiated after five years, which seems to be a very long period, especially when operating in a volatile economic environment characterised by an increase in inflation and changes in exchange rates. Nonetheless, depending on the company's profit earnings, Parmalat offers a bonus to its suppliers at the end of each year. The buyer's responsibilities include honouring suppliers' payments 30 days after milk delivery. Specifically, farmers are paid on the 10^{th} day of each month. Milk should be collected daily and properly tested. Parmalat is expected to provide milk grade information to the milk collection centres four times a month. Meanwhile, suppliers' responsibilities include selling all

milk produced to Parmalat, meeting the agreed milk quality and volume requirements of ± 20% and adhering to animal husbandry and milk-handling practices.

With regard to Mpima dairy scheme, the exchange relationship between the buyer and supplier is not formalised into a written contract. Nevertheless, unwritten rules exist that govern the exchange relationship. For instance, the terms for supplying milk to the plant are renegotiated every five years. The buyer's responsibilities include assisting milk suppliers (smallholder farmers) to source and acquire molasses and feed, paying suppliers on the 10th day of each month, which is 30 (± 3 to 4) days after milk delivery and compensating farmers in case the milk quality is compromised by problems originating from the buyer. The suppliers' responsibilities include daily delivery of milk, since if the milk collection centre does not supply milk for three days, its contract is terminated. The milk collection centre is expected to deliver 2 000 litres/day of quality milk. As noted by Luo (2007) and Williamson (2002), contracts reduce information asymmetry and opportunism risks by providing binding principles, terms and general procedures, the main responsibilities of all parties involved and punishment for premature terminations.

8.5.2 Transaction-specific investments and smallholder farmers' participation in the mainstream dairy value chain

The existence of transaction-specific investments such as bulk cooling facilities and transport (refrigerated trucks) represents high switching costs and acts as a disincentive for resource-poor smallholder farmers to sell milk to other competitors, thus curbing opportunism in the current exchange relationship. It also aids the exploitation of relation-specific opportunities from such strategic assets through enhanced coordination and cooperation between partners, which in turn could enhance smallholder farmers' competitiveness and participation in interlocked contractual arrangements. Likewise, provision of extension services (a form of human asset specificity) enhances smallholder farmers' competitiveness by increasing productivity through improved quality and reduced cost, production and market risks. These enable smallholder farmers to upgrade and exploit existing market opportunities, increase their incomes and their chances of obtaining credit through interlocked contractual arrangements. Moreover, the existence of contracts and transaction-specific investments enable both the off-taker and smallholder farmers to experience more repeat business and less variability in sales volume and income. As a result, the risk profile of smallholder farmers is lowered, which in turn increases their chances of acquiring inputs on credit and dairy loans.

8.5.3 Ways in which financial institutions exploit interlocked contractual arrangements to facilitate smallholder farmers' access to financial services

This section highlights the key stakeholders involved in interlocked contractual arrangements and the way in which they collaborate to enhance smallholder farmers' access to financial services. It also details the selection, screening, monitoring and enforcement process used to minimise transaction costs, adverse selection and moral hazard risks resulting from information asymmetry and the subsequent enablement of smallholder farmers' participation in the credit market.

a) ZANACO approach

Figure 9 shows the key stakeholders with which ZANACO collaborates to enhance smallholder farmers' access to dairy credit through interlocked contractual arrangements. The bank mainly deals with dairy cooperatives, which eases the delivery of extension and financial services by reducing the bank's transaction costs involved in searching, screening and selecting borrowers, and monitoring and enforcement of contracts. Cooperatives use milk supply records to identify active members and potential borrowers. In addition, the bank involves lead farmers to identify and select borrowers, for they know how individual farmers behave in their locality.

Furthermore, cooperatives are used as conduits for disbursement of loans and milk sales payments to members. Cooperatives consequently reduce the bank's risks resulting from information asymmetry and being subject to opportunism. The bank gives out in-kind rather than cash credit, which reduces its risks, as farmers are restricted to using the loan for the intended purpose. Input suppliers are selected by the bank.

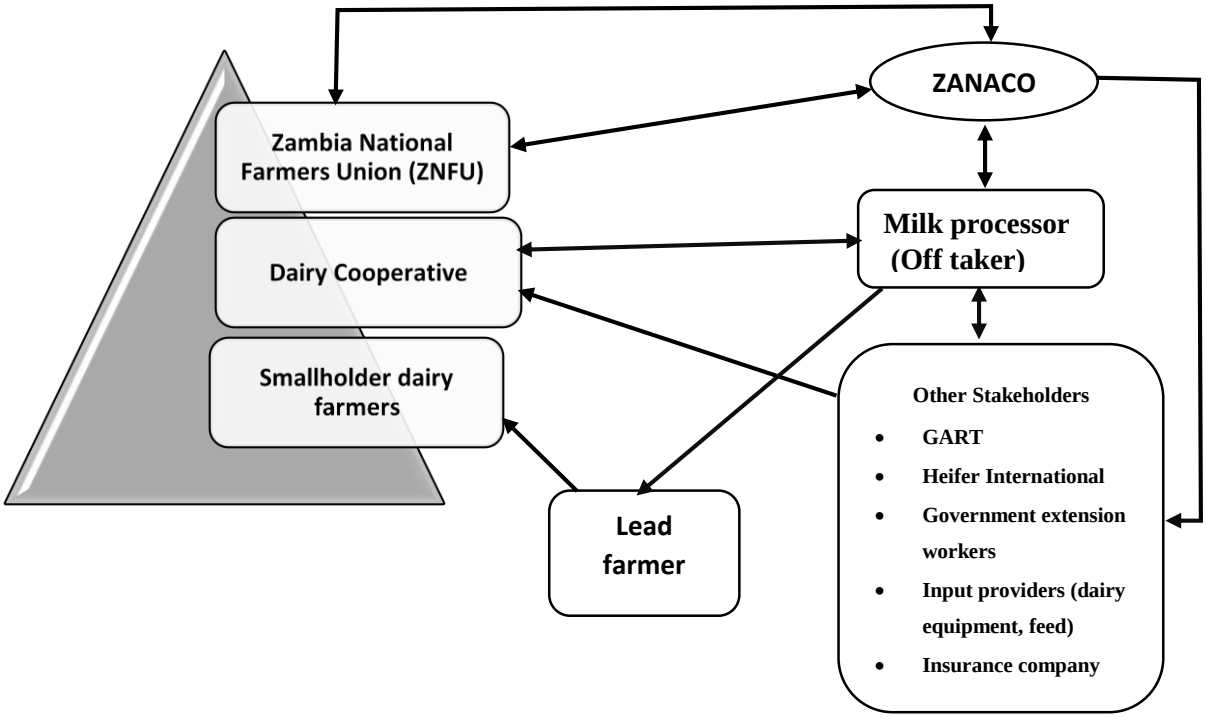

Figure 9: Key stakeholders with which ZANACO collaborates to enhance smallholder farmers' access to dairy loans through interlocked contractual arrangements

Source: Author

The off-taker (milk processor) guarantees the milk market for cooperatives and reduces the bank's transaction costs and loan default risks. At month end, the off-taker deposits what is due to farmers in the cooperative's bank account. However, the bank first deducts what is owed to it by cooperative members before crediting the cooperative account. This finding is similar to that of Hansel (2007) on interlocked contractual arrangements in Peru and India. She found that interlocked contractual arrangements reduced transaction costs and the risks of dealing with smallholder farmers, since repayments were usually made through deductions from the income source. Other stakeholders include the Dairy Association of Zambia, which uses donor finance, and Heifer International, which is contracted by the bank to offer two to three training programmes to potential borrowers. Golden Valley Agricultural Research Trust (GART) quarantines the animals imported from South Africa before they are distributed to farmers. ZANACO also links smallholder farmers to an insurance company for animal insurance and Zambia National Farmers' Union that among others plays a key advocacy role for its members.

The bank's monitoring and enforcement efforts include: (i) quarterly farm visits where the performance of randomly selected dairy farmers is determined; (ii) closely monitoring activities on the cooperatives' bank accounts, in case they are overdrawn; cooperatives are advised accordingly; and (iii) reports from key stakeholders such as the Dairy Association of Zambia and extension workers in case of disease outbreaks.

b) Micro Bankers Trust model

The structure of the Micro Bankers Trust approach has been presented in Figure 10. Before farmers are given dairy loans, Micro Bankers Trust connects them to an off-taker. Compared to the previous model, this link is weaker in that the off-taker is not obliged to deposit the milk sale payments with Micro Bankers Trust. However, farmers have to belong to a group of five members. These are the target of Micro Bankers Trust, thus making this approach somewhat different from the ZANACO model, which focuses on the dairy cooperative.

Farmer groups reduce Micro Bankers Trust's transaction costs, moral hazards and adverse selection problems related to screening, monitoring and enforcement. This is because members select themselves, depending on how knowledgeable they are about each other's character and the trust they have in one another. Group peer pressure serves as collateral, since group members are obliged to repay the loan of any member who defaults. The role of Dairy Association of Zambia is similar to that discussed in the ZANACO model, although in this model it plays an additional role of sanctioning loan(s) before they are approved by Micro Bankers Trust. In addition to technical assistance provided by Dairy Association of Zambia, Micro Bankers Trust staff provide business management skills in book keeping and credit management, while Kasisi Agricultural Technical College trains smallholder farmers in animal husbandry and health, milking and milk sanitation. Micro Bankers Trust also links the farmers to the Zambia state insurance company for animal insurance. Micro Bankers Trust's monitoring and enforcement tools used to reduce moral hazards and loan defaults include contract(s), in-kind rather than cash disbursement of loans, weekly visits to farmers by Micro Bankers Trust staff and group peer pressure.

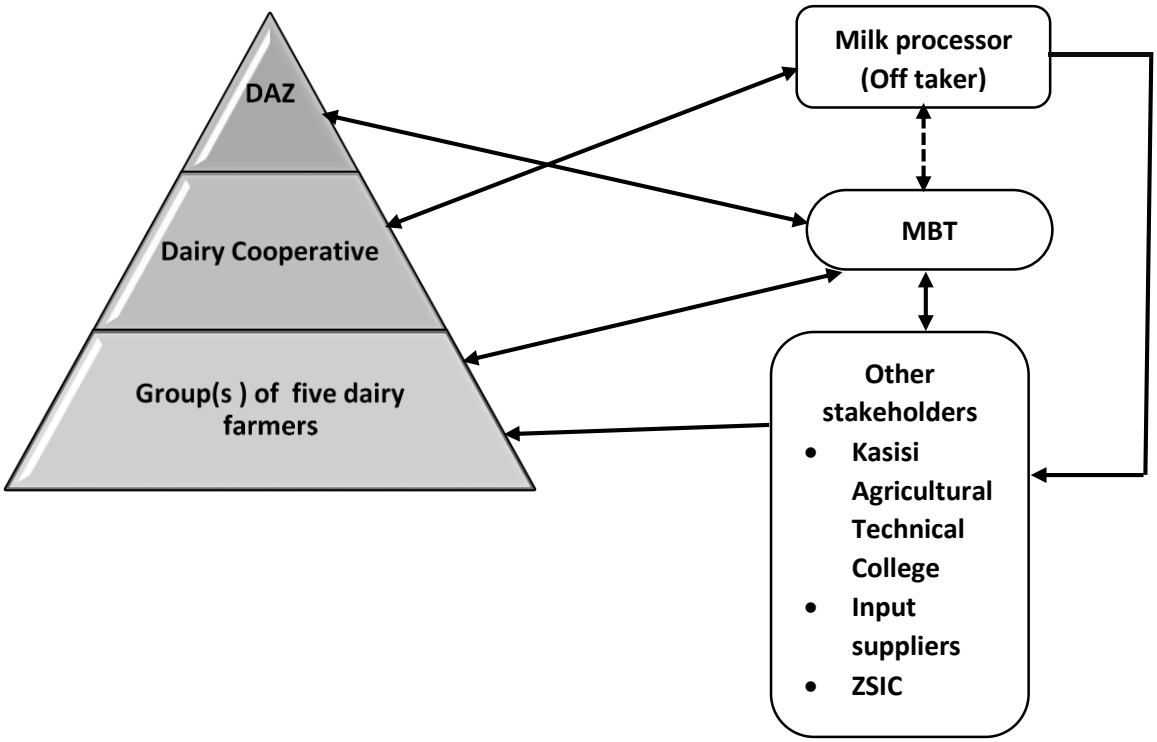

Figure 10: Key stakeholders with which Micro Bankers Trust collaborates to enhance smallholder farmers' access to dairy loans through interlocked contractual arrangements
Source: Author

Whereas some researchers (Miller & Jones, 2010; Hansel, 2007) have noted that forward contracts can be used as collateral substitutes where the off-taker provides a bank loan guarantee to producers, this was not the case in both models studied. Rather, loaned animal(s) and/or milking cans, spray races and membership of a cooperative and group peer pressure served as collateral.

8.5.4 Role of relationships and relational governance mechanisms in facilitating smallholder farmers' access to markets

Both vertical and horizontal relationships play an important role in improving smallholder farmers' access to the mainstream dairy value chain, inputs, financial and other support services aimed at improving their competitiveness and productivity. Cooperation between firms through vertical relationships is critical to (i) reducing transaction costs; (ii) getting a product from inception to the market; and (iii) transferring learning and embedded technical, financial and business services from firms up the chain to firms down the chain.

Moreover, it makes economic sense for the agribusiness to deal with farmer groups (horizontal relationships) when purchasing produce or supplying inputs. Well-organised farmer groups

reduce transaction costs and risks for both smallholder farmers and milk buyers. In addition, cooperatives enable smallholder farmers to develop collective assets, which facilitate their access to production resources such as bulking and storage facilities and even own milk-processing plants, as in the case of Mpima dairy cooperative union. Cooperatives also serve as an effective conduit for accessing services such as milk testing, transportation, dairy loans, extension services and improved technologies that increase productivity. Lastly, dairy cooperatives enable farmers to collaborate in bulking, storage/cooling and sometimes processing of milk, by leveraging synergies and economies of scale.

From the financial services delivery and access point of view, the off-taker, dairy cooperative management and farmers frequently interact and hence have the upper hand over financial institutions in knowing potential borrowers' character, cash flows, competitiveness and risks. It is this insider knowledge that reduces lenders' information asymmetry and related costs of adverse selection. Formal financial institutions' risks are further reduced because participating smallholder farmers begin saving with them while building a credit history. Besides, off-takers act as efficient financial intermediaries, for they further reduce transaction costs and risks for financial institutions by effecting payments at the point of sale. Off-takers are also able to subordinate smallholder farmers and offer credible sanctions in case farmers fail to adhere to the terms that were agreed upon. This is because the fortunes of smallholder farmers are closely tied to those of the off-takers who are key or in some cases the only buyers of their milk. The desire to maintain a reputation for being reliable and right-standing in their communities and access to future output, input and credit markets also provide incentives and enforcement mechanisms for smallholder farmers to adhere to rules.

The findings in the preceding sections are in unison with the third hypothesis that interlocked contractual arrangements enhance smallholder farmers' participation in the mainstream dairy value chain and access to resources and services, through reduction of information asymmetry and related costs and risks.

8.6 Smallholder farmers' participation in the mainstream dairy value chain by milk source shares

Table 11 compares the number of farmers and milk source shares by farmer category for Mpima and Parmalat. Results reveal that smallholder farmers' participation in terms of absolute numbers is more than that of large-scale farmers, but lower in terms of aggregate milk volumes supplied.

Table 11: Comparison of milk source shares by farmer category

Milk buyer/processor	Farmer category						Total Number of farmers
	Smallholder		Emergent		Commercial		
	Freq	*%*	*Freq*	*%*	*Freq*	*%*	
Mpima	41	85.4	7	14.6	0	0	48
Parmalat	3500	60	1167	20	1166	20	5833
	Milk supplies in Litres/annum (%)						
Mpima	64,608	39.6	98,386	60.4	0	0	162,984
Parmalat	1,750,000	19.4	525,000	5.8	6,745,000	78.9	9,020,000

Source: Survey (2014)

A similar trend is noticeable for Zambeef that produces most of the milk it processes, that is 4 045 263 litres/annum. Smallholder farmers contributed 660 000 litres/annum, while emergent and commercial farmers contributed three million litres/annum to total milk supplies (See Figure 11).

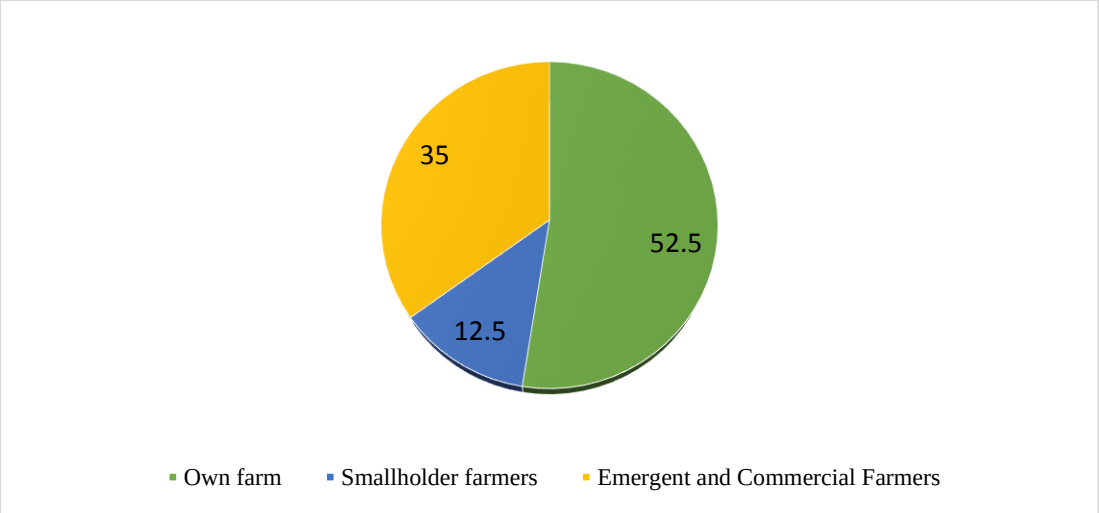

Figure 11: Zambeef's milk source shares (%)

Source: Survey (2014)

This finding concurs with the trends revealed in the 2011 Strategic Visions Ltd study on the Zambian dairy sector, the South African fruit and vegetable processing sector and supermarkets (Vermeulen et al., 2008), with regards to participation of smallholder farmers in contract farming.

It is worth noting that although emergent farmers supplied most of the milk, two out of the three processors interviewed expressed willingness to collaborate more with smallholder farmers in future since they are perceived to be less risky. This finding is similar to that of Swinnen (2007) and Birthal et al. (2007). Side-selling is more prominent among farmers operating at a larger scale because they produce high milk volumes and own vehicles, hence have the capacity to sell to alternative markets. The situation is aggravated where in some cases farmers have to give short notice of three months before terminating the contract and there is a threat of new competitors that could probably offer higher prices. The processors also intimated that Zambian large-scale farmers lacked succession plans and hence posed more risk to processors than other farmer categories.

8.7 Access to inputs and other production-enhancing services

Table 12 presents a comparison of selected percentages of sample characteristics related to access to financial services, inputs, extension services and dairy cooperatives between participants and non-participants in interlocked contractual arrangements. Results reveal that there is a significant difference ($P \leq 0.01$) between participants and non-participants regarding the use of dairy profits, advances and loans to finance their dairy enterprise. The proportion of households using these sources of funds was higher for participants than non-participants. A similar trend emerges where households participating in interlocked contractual arrangements had more access to financial services than non-participants. However, less than half of the respondents from either participants or non-participants had accessed all three types of financial services (loan, bank account and insurance). Yet, key informants from milk collection centres indicated that they had successfully linked their members to financial institutions that provided them with loans through interlocked contractual arrangements.

ZANACO, Micro Bankers Trust, Citizens Economic Empowerment Commission, Madison and Vision fund were some of the financial institutions mentioned. Overwhelmingly, all non-participants and only 6.8% of households participating in interlocked contractual arrangements accessed agricultural insurance services. One of the managers from financial institutions further intimidated that the insurance policies of the few smallholder farmers who insured their animals did not cover tick-borne diseases, one of the major causes of cattle mortality in Zambia.

All participants, compared to only 12% of non-participants, belonged to a dairy cooperative. Membership of a dairy cooperative is a prerequisite to smallholder farmers' participation in

interlocked contractual arrangements. Through these cooperatives, smallholder farmers had access to bulking/cooling facilities, milking equipment such as stainless steel cans, milk

Table 12: Comparison between interlocked contractual arrangements participants and non-participants

Characteristic/Variable	Overall	Participants	Non - Participants	Pearson Chi^2
	266	103	163	
		Percentages		χ^2
Source of funds for financing the dairy enterprise and access to financial services				
Dairy profits	43.23	60.19	32.51	19.70***
Income from other farm activities	58.65	59.22	58.28	0.02
Personal savings	44.74	45.63	44.17	0.05
Advances	13.16	29.13	3.07	37.51***
Loan	10.15	24.27	1.23	36.75***
Usage of loan to acquire dairy animals	96.30	23.30	1.23	0.08
Owns bank account	35.34	44.66	29.44	6.39**
Owns agricultural insurance policy	2.63	6.80	0 .00	11.38***
Others				
Access to discounted inputs	3.76	5.82	2.45	1.98
Access to dairy training	61.65	79.61	50.31	22.93***
Household member possesses dairy management skills	78.95	88.35	73.01	8.94***
Household uses intensive management practices	31.58	50.49	19.63	27.81***
Household owns improved breed animals	40.23	67.00	23.31	50.08***
Dairy cooperative member	43.23	100	12	129.96***

Significant levels: *** P≤0.01, ** P≤0.05, * P≤0.1.

Source: Survey (2014)

testing/grading services (for tuberculosis, mastitis, antibiotics and water adulteration), veterinary services (drugs), extension services and free transport of milk from the milk collection centre to the milk-processing plant. Whereas most of the services' costs were deducted from milk sales, there were a few exceptions where the services were offered free of charge. For instance, milk testing services were given free to members of Chibombo and Mpima dairy cooperatives, training in dairy management practices was also provided free of charge to Mpima members, while stainless steel cans were offered free to members of Liteta and Chibombo by Land "O" lakes and the government, respectively.

Results further show a significant difference ($p \leq 0.01$) between households participating in interlocked contractual arrangements and non-participants with regard to having dairy management skills and practising intensive management practices (feeding, genetics/breeding, disease control/management, and milking and calf management). This could be because participants in interlocked contractual arrangements were not only more specialised in dairy farming but also had better access to extension services than their counterparts, as evidenced in Figure 12.

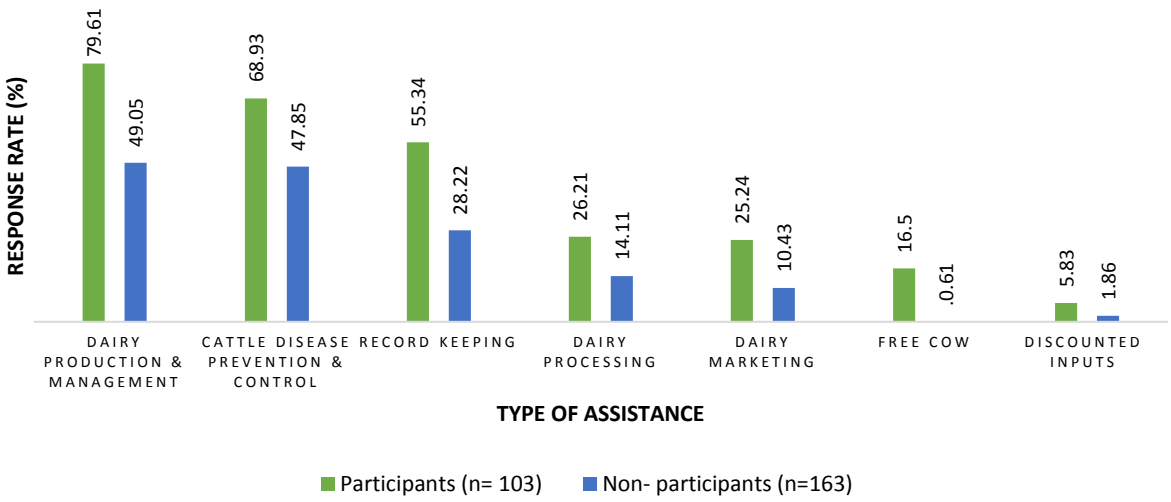

Figure 12: Response rate of farmers' access to extension services and inputs
Source: Survey (2014)

Notwithstanding the majority of households participating in interlocked contractual arrangements that indicated having accessed extension services, about 30% never received advice on dairy production and management practices or on cattle disease control and prevention. This suggests the need to increase the dairy extension service effort. Although a few farmers, 17 out of the 103 participants in interlocked contractual arrangements interviewed, reported having received a free cow from the "pass on a cow programme", only one respondent of the 163 non-participants reported having received two free cows from Parmalat. The farmer supplies milk to Parmalat directly, not through interlocked contractual arrangements. The pass-on-a-cow/heifer programme was initiated by NGOs such as Heifer International. Mpima dairy scheme adopted a similar model, for which it obtained a loan from ZANACO that it used to purchase in-calf cows that were later loaned to its members. The farmers repaid the loan by passing a heifer to another farmer who had not yet benefited from the programme.

It is also of concern that only six (5.83%) households participating in interlocked contractual arrangements reported having had access to discounted dairy inputs such as feed and dairy equipment, yet all three milk buyers indicated that they linked their farmers to input suppliers. One would have assumed that such linkages, coupled with the economies of scale enjoyed by cooperatives, such as bulk purchasing and transportation, would have brought down the costs of inputs such as feed. In fact, a number of farmers suggested that there was a need to decrease the cost of feed supplements to cut down feeding costs, especially during the dry period.

The frequency of receiving each type of assistance was used to assess farmers' accessibility to inputs and extension services. Table 13 shows that the average times and range of receiving each type of assistance are higher for participants in interlocked contractual arrangements than for non-participants.

Table 13: Farmers' frequency of receiving assistance

Type of assistance (advice, information or inputs)	Participants (n=103)				Non-participants (n=163)			
	Range	Mode	Mean	S.D	Range	Mode	Mean	S.D
Dairy production and management	0-12	1	1.27	1.80	0-4	1	0.55	1.01
Cattle disease prevention and control	0-12	1	1.10	1.22	0-14	1	1.01	2.23
Record-keeping	0-14	1	1.02	2.24	0-4	1	0.36	0.97
Dairy processing	0-14	1	0.62	1.83	0-4	1&2	0.31	0.90
Dairy marketing	0-12	1	0.68	2.00	0-4	2	0.25	0.83
Discounted inputs	0-14	2	0.35	1.88	0-3	3	0.06	0.37
Free cow	0-5	1	0.17	0.62	0-2	2	0.01	0.16

S.D represents standard deviation
Source: Survey (2014)

As revealed by the mode figures, with the exception of discounted inputs, the most common frequency of receiving assistance was once per year for households participating in interlocked contractual arrangements. A similar trend is noticed for non-participants with regard to dairy production and management, cattle disease control and prevention and record-keeping. The main provider of the dairy extension service was the government, followed by the milk-processing companies, Dairy Association of Zambia and NGOs, notably Heifer International and Land 'O' Lakes.

8.8 Summary

This chapter examined the nature and level of smallholder farmers' participation in interlocked contractual arrangements. Results show that smallholder farmers' involvement in value chain activities is positively related to ownership of a milk-processing plant and membership of a dairy cooperative. Through participation in interlocked contractual arrangements, farmers in Mpima dairy producers' cooperative society upgraded from being mere "chain actors" to "chain owners". Currently, with the help of professional managers, smallholder farmers participate in all dairy value chain activities from production to processing and distribution. In contrast, participation in value chain activities is limited to production, bulking and cooling for farmers supplying milk to Parmalat and Zambeef. Other milk collection centres such as Chibombo dairy cooperative union also diversified into other businesses, such as running a hammer mill where they sell maize bran to their members. This has not only helped farmers access stock feed, but also enhanced the cooperative's self-sufficiency and sustainability.

Whereas it was postulated that dairy cooperatives would enhance smallholder farmers' negotiation power and ability to influence key business decisions, this was not the case. Even when they owned the milk-processing plant, as in the case of Mpima, farmers intimated that they were unable to influence key business decisions. Where there was strong interdependence between the milk buyer and suppliers (smallholder farmers), as in the case of Mpima and Parmalat, most of the registered cooperative members actively supplied milk to their respective milk collection centres. However, where interdependence asymmetry existed in the buyer-supplier relationship, as in the case of Zambeef, active membership was below 35%. It should be kept in mind that Zambeef produces over 52% of the milk it processes, while Mpima and Parmalat depend totally on the milk supplied by farmers. The apparently low participation of farmers supplying milk to Zambeef could be attributed to governance-related issues in the buyer-exchange relationship and cooperatives, low productivity and ineffective breeding programmes. As was hypothesised, the percentage of smallholder farmers participating in interlocked contractual arrangements was higher (87.6%) than emergent farmers (12.4%), yet their aggregate intensity of participation was lower. Smallholder farmers contributed 40.8% to the total milk source shares, while emergent farmers contributed 59.2 %. Evidence from milk source shares by farmer category at off-taker level mirrors prior findings of smallholder farmers' participation at milk collection centre level. That is, a high proportion (absolute

numbers) of smallholder farmers participates in the mainstream dairy value chain compared to emergent and large-scale farmers, nonetheless their intensity of participation in terms of aggregate milk supplies is lower.

Results further show that transaction and relational governance mechanisms are concurrently used in interlocked contractual arrangements to reduce information asymmetry and related costs and risks. Meanwhile, processors intimated that in future, they were willing to collaborate more with smallholder farmers than emergent or large-scale farmers, since their risk of side-selling was lower. In addition, large-scale farmers lacked succession plans and therefore posed more risk to processors than other farmer categories.

A comparison of households participating in interlocked contractual arrangements with non-participants further shows that interlocked contractual arrangements play an important role in enhancing smallholder farmers' access to dairy cooperatives, extension and financial services. Dairy cooperatives (milk collection centres), in collaboration with various stakeholders such as dairy-processing companies, producer associations, extension workers (public and private), public research institutions, agricultural training colleges, financial institutions (bank, micro finance institutions [MFI], insurance companies), NGOs and input providers (dairy equipment and feed), facilitate members' access to extension services, milk bulking and cooling facilities, milk equipment, milk testing/grading, biocides, veterinary and credit services, stock feed and free transportation of milk from bulking facilities to a processing plant. With few exceptions, the service costs are deducted from milk sales. However, much more needs to be done to improve smallholder farmers' access to extension and financial services, particularly agricultural loans and insurance. The high cost of stock feed remains a critical issue that adversely affects smallholder farmers' productivity and profitability. Only a small proportion (six out of 103) of smallholder farmers who participated in interlocked contractual arrangements indicated having accessed inputs at discounted prices, yet all three off-takers indicated that they linked farmers to input suppliers. Through leveraging economies of scale, one would have expected that cooperatives would have exploited these networks to acquire discounted inputs for their members.

CHAPTER 9

IMPACT OF PARTICIPATION IN INTERLOCKED CONTRACTUAL ARRANGEMENTS ON SMALLHOLDER FARMERS' HOUSEHOLD INCOME

This chapter presents results on the impact of smallholder farmers' participation in interlocked contractual arrangements on household income. First, an assessment of household income patterns by participation is given, by comparing the average income from milk sales and other sources of income. This is followed by a presentation and discussion of the differences in means of milk production levels and selected wealth indicators between participants and non-participants. After that, descriptive statistics of selected variables that were used to estimate PSs are presented and discussed. This is followed by a presentation and discussion of results from PS estimation with the probit model and the treatment effects from PS matching methods.

9.1 Household income patterns for participants and non-participants

Figure 13 shows that the average household income for participants in interlocked contractual arrangements is relatively higher than that of non-participants. Milk revenue contributed

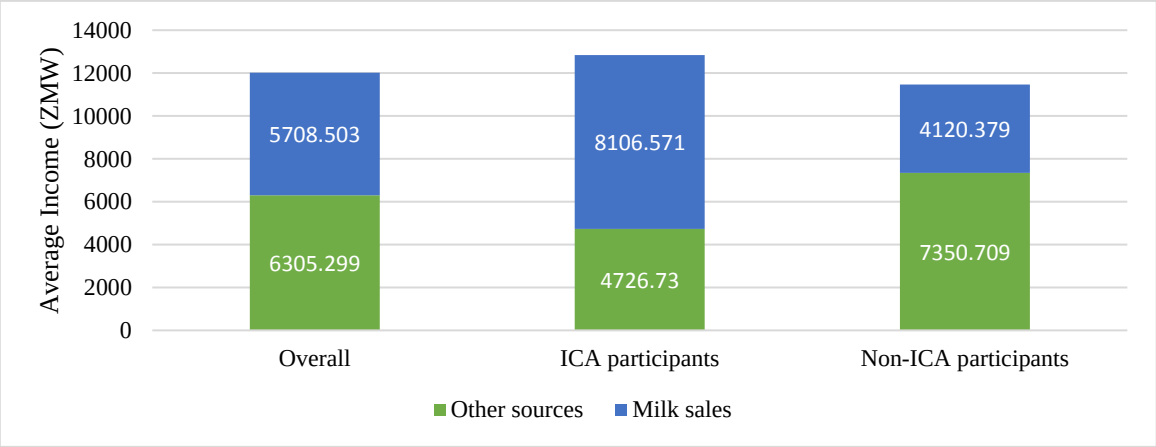

Figure 13: Income patterns for participants and non-participants
Survey (2014)

most to household income for participants, while other sources of income (farm income apart from milk sales and off-farm income) contributed most to household income of non-participants.

9.1.1 Milk production and selected wealth indicators for participants and non-participants

The t-tests (Table 14) reveal that there is no significant difference between treatment and control groups' average income from other sources, household income and tropical livestock units. However, the two groups are significantly different ($p<0.01$), with regards to milk production levels, income from milk sales and wealth index. Participants produced about 1.7 times more milk than non-participants. This could be attributed to the fact that participants

Table 14: Descriptive statistics (means) of milk production and selected indicators of wealth

Characteristic/Variable	Overall (1) (n=251)	Participants (2) (n=100)	Non-participants (3) (n=151)
Milk production (litres/annum)	2240.76 (2240.763)	3014.24 (30252.45)	1774.82 (4099. 79)***
Annual income from milk sales (ZMW)	5708.50 (10532.64)	8106.571(9015.73)	4120.38 (11174.73)***
Annual income from other sources (ZMW)	7187.65 (42572.65)	4804.62 (2734.84)	9411.8 (58399.88)
Household income (ZMW)	12007.13 (39583.75)	12816.56 (14865.11)	11471.09 (49647.64)
Tropical livestock units	9.66	10.88 (10.31)	8.85(12.74)
Wealth index (2014)	-0.25 (8.81)	-4.05 (10.90)	2.27(4.15)***

Test of statistical significance of mean differences between treatment and control/comparison households: *** p<0.01, ** p<0.05, * p<0.1. Standard deviations in parentheses. Tropical livestock units (TLU) were calculated following HarvestChoice (2011) as cattle=0.7; sheep/goats =0.1; pigs=0.2; donkeys=0.5; chickens=0.01. Using TLU helps converting livestock numbers of various types and sizes into a common unit. However, it does not account for different livestock varieties, which may differ significantly in size. Wealth index computed for household assets using principal component analysis following Langyintuo and Mungoma (2008).
Source: Survey (2014).

received more access to extension services, dairy technologies and inputs, practiced intensive dairy management practices and were more specialised in dairy farming than their counterparts. The average milk revenue of participants in interlocked contractual arrangements was 49% and 97% higher than the overall and non-participants' respectively. This could be attributed to the relatively higher milk production levels and milk price/litre received by participants but also the fact that participants were more specialised in dairy farming than their counterparts. Conversely, non-participants were wealthier than participants, as evidenced from the positive wealth index, which is an indication that interlocked contractual arrangements are inclusive of

resource-poor households. This finding is similar to that of Miyata et al. (2009), but contradicts findings from others studies such those of Cahyedi and Waibel (2013); Wainana et al. (2012) and Maertens and Swinnen (2009).

9.2 Propensity score matching estimates

The variables used in estimating the propensity score model are described in Table 15. The choice of variables was based on extensive literature review and various model-fitting attempts. Significant differences between control and treatment households were evident with respect to location of households. Households in the treated group were likely to be male-headed, older than non-participants by 1.8 years and having a smaller household size but a higher value of man-equivalent units than the control group, although these differences were not statistically significant.

Table 15: Descriptive statistics of selected variables that were used in estimating the propensity score

Characteristic/Variable	Overall (1) (n=251)	Participants (2) (n=100)	Non-Participants (3) (n=151)
		Means	
Demographics			
Age of household head (years)	51.4	52.5	50.7
Household size	5.35	5.09	5.53
Man-equivalent units	4.00	4.30	3.80
Male-headed households (%)	90.8	90.0	91.4
Location			
Households domiciled in Kabwe (%)	16.73	71.43	28.57***
Households domiciled in Chibombo (%)	50. 60	34.65	65.35*
Households domiciled in Chongwe (%)	32.67	31.71	68.29*

Test of statistical significance of mean differences between treatment and control/comparison households: *** p<0.01, ** p<0.05, * p<0.1. Man equivalent units were calculated following Runge-Metzger (1988) as: < 9 years = 0; 9 to 15 and over 49 years = 0.7; 16 to 49 = 1.
Source: Survey (2014).

The probit analysis of participation (Table 16) indicated that man equivalent units and household size were the largest determinants of participation. Dairy farming is labour-intensive and for a farmer to meet the high milk quality standards set by milk processors, much more work needs to be done. Hence, households with more man-equivalent units (labour) are more

likely to participate in interlocked contractual arrangements than their counterparts. This is contrary to findings in most studies, where an insignificant relationship has been established between household labour availability and participation in contract farming (Bellemare, 2012; Ito et al., 2012; Miyata et al., 2009). The relationship between participation in interlocked contractual arrangements and the rest of the variables (household head age and gender) was insignificant. This finding is divergent from most studies establishing that these variables are strong predictors of participation in contract farming (Sokchea & Culas, 2015; Sambuo, 2014; Bellemare, 2012; Wainana et al., 2012; Miyata et al., 2009; Simmons, 2005). Because of the possible link between household size and labour availability, one would have expected a positive link between participation in interlocked contractual arrangements and household size. However, the fact that the household has a large number of members does not imply that all of them can meaningfully contribute to family labour, especially if the majority are children. Also, it would imply more mouths to consume the milk produced, which in turn reduces the marketable volume and subsequent chances in participation in interlocked contractual arrangements.

Table 16: Propensity score estimation with the probit model

Variable	**Parameter estimate (1)**	**Robust Std. Err (2)**
Constant	-0.9225	1.3003
Age of household head (years)	0.0196	0.0480
Age of household head squared (years)	-0.0001	0.0004
Gender household head (male =1, female = 0)	0.2484	0.4641
Household size	-0.1632**	0.0756
Man-equivalent units	0.2999***	0.0975
Number of observations	203	
Log pseudo likelihood	-131.6992 ***	
Pseudo R2	0.0632	
LR chi2(11) =	17.78	

Dependent variable: Whether the household participated in interlocked contractual arrangements (= 1) or not (= 0). Significance: *** p<0.01, ** p<0.05, * p<0.1.
Source: Survey (2014)

It is worth noting that the final specification of the probit model was obtained after various specifications were attempted, until the most complete and robust specification that satisfied the balancing tests and establishment of the common support region was obtained.

The propensity score balancing test results confirm the existence of strong bias for most covariates and that balancing successfully eliminated this bias[3] (Appendix 2). In general, matching produces consistent estimates as long as the unobserved factors are equally distributed between the two groups.[4] The estimated propensity score were also inspected for the common support requirement. This was found to be satisfied, as indicated by the fact that 0 < propensity score < 1 and by a significant overlap in the distribution of the propensity score of both the treated and untreated groups (Appendix 3).

9.3 Treatment effects from propensity score matching methods

The descriptive statistics discussed earlier indicate that participants in interlocked contractual arrangements were better off than non-participants with regard to total household income but were relatively poorer than their counterparts, as indicated by total wealth (household assets). However, descriptive statistics are limited and may not imply causality, as they fail to account for other sources of the observed differences. Table 17 presents impact estimates as determined by the nearest neighbour and kernel matching methods. The two models reveal that smallholder farmers' participation in interlocked contractual arrangements makes a significant positive contribution to milk revenue. This is similar to findings in most studies that reveal that participation in contract farming has a significant positive contribution to the income from the contracted commodity (Alemu et al., 2016; Mwabi et al., 2016).

With regard to smallholders' participation in interlocked contractual arrangements and household income, both the nearest neighbour and kernel matching strategies show that participation does not enhance household income. The latter results are similar to those of Mwabi et al. (2016), but contradict findings from most studies (e.g. Alemu et al., 2016; Cahyandi & Waibel, 2013; Maertens & Swinnen, 2009; Saigenji & Zeller, 2009), and indeed contradict the fourth postulation that participation of smallholder farmers in interlocked contractual arrangements enhances household incomes.

[3] In addition to covariate *t* tests, the estimated propensity score also satisfied the balancing property within an optimally determined number of strata or blocks (Becker & Ichino, 2002). Estimation of the propensity score and generation of balancing tests were achieved through a combination of psmatch2 (Leuven & Sianesi, 2003), pscore and pstest (Leuven and Sianesi, 2003) procedures in Stata.

[4] A key identifying assumption for propensity score matching is that there should be no unobserved factors that influence both participation and the outcome variable. This is variantly called in literature the conditional independence assumption, matching on observables, unconfoundedness, etc. 'Hidden bias' would be of concern if this assumption should be violated (Rosenbaum & Rubin, 1983; Caliendo & Kopeinig, 2008; Jalan & Ravallion, 2003; Cameron & Trivedi, 2005).

Table 17: Average treatment effects of the outcome variables

Outcome Variable	ATT	Standard error	t-value	ATT	Standard error	t-value
	Nearest neighbour matching method			Kernel matching method		
Milk sales income	4463.684	2575.624	1.733	4334.470	1789.211	2.423***
Household income	3988.858	6645.515	0.600	-267.578	4607.284	-0.058
Number of treated units used = 98 and number of control units used =50				Number of treated units used = 98 and number of control units used = 103		

Standard errors of ATT were bootstrapped 1000 times.
Source: Survey (2014)

Participants in interlocked contractual arrangements are probably unable to benefit from spill-over effects associated with an increase in milk revenue because of the nature of dairy farming, which is labour-intensive. Coupled with the additional workload required to meet the stringent milk quality standards set by the processor, farmers are unable to diversify their livelihoods in order to enhance their household income. This is evidenced by (i) the levels of specialisation in dairy farming that can be measured by the contribution of dairy income to household income (see Table 14, page 11); and (ii) the fact that the milk quality supplied by farmers is more often grade B, sometimes gravitating towards grade C milk but rarely grade A. This is because at milk collection centres, grades A and B milk are mixed together, thus downgrading the high quality milk supplied by some farmers. Subsequently, suppliers of grade A milk do not receive the premium price for Grade A milk, which could have a negative impact on milk revenue and indeed household income. Also the fact that some milk collection centres charge a relatively high commission per litre of milk supplied by farmers, reduces milk revenue and negatively affects household income. Lastly, due to lack of cooling facilities coupled with long distances from milk collection centres, some farmers are forced to consume their evening milk and surplus milk above the normal household requirements, which results in lost income.

9.4 Summary

The chapter assessed the impact of smallholder dairy farmers' participation in interlocked contractual arrangements on household income. Descriptive statistics indicated insignificant differences between treatment and control groups with regard to household income. However, the two groups were significantly different ($p<0.01$) with respect to milk production per annum, income from milk sales and wealth index. Whereas participants in interlocked contractual

arrangements had a higher milk revenue and produced more milk, they had a lower wealth index than their counterparts. The PS matching approach established a significant positive impact of participation in interlocked contractual arrangements on milk revenue but not on household income. The evidence of the latter contradicted the hypothesis that participation of smallholder farmers in interlocked contractual arrangements enhances household income.

CHAPTER 10

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

10.1 Introduction

This chapter presents a summary and major findings of the study. Relevant conclusions are drawn, their implications for policy and areas of intervention are highlighted. Limitations of the study and areas for future research are outlined.

10.2 Summary of the study

10.2.1 Background and Problem statement

Smallholder farmers' participation in markets is critical to reducing rural poverty and enhancing food security, yet it remains a key challenge for most sub-Saharan countries. Of recent, policy makers and development agencies are promoting interlocked contractual arrangements as one of the rural development strategies to enhance smallholder farmers' access to markets. Interlocked contractual arrangements are a form of contract farming, where contractors not only provide a market outlet for farmers' produce, but also provide resources or link farmers to providers of key inputs, extension and financial services, the costs of which in most cases are deducted from proceeds at the point of sale. Although smallholder participation in interlocked contractual arrangements has received considerable attention in the recent past, little is known about the extent to which they facilitate smallholder farmers' access to markets and the impact of participation on household income. Whereas evidence exists on these two issues in general contract farming literature, it is difficult to isolate the interlocked contractual arrangement effects. In addition, inadequate evidence exists on interlocked contractual arrangements in the livestock sector as most studies focus on the crop sector.

10.2.2 Purpose of the study

The aim of this study was to assess the role of interlocked contractual arrangements in promoting smallholder farmers' participation in markets and the impact of participation on household income. Specifically, the study identified the determinants of smallholder dairy farmers' participation in interlocked contractual arrangements. The study also determined the nature and level of smallholder dairy farmers' participation in interlocked contractual

arrangements. It further assessed how interlocked contractual arrangements have facilitated smallholder dairy farmers' participation in markets. Lastly, the study examined the impact of smallholder dairy farmers' participation in interlocked contractual arrangements on household income.

10.2.3 Data collection

The study was carried out in the milk shed areas of three districts, namely Chongwe district in Lusaka province, and Chibombo and Kabwe districts in the Central province of Zambia. These districts were purposively selected based on information provided by relevant stakeholders on the presence of interlocked contractual arrangements. Within these districts, four milk collection centres (Liteta, Chibombo, Mpima, and Palabana) were purposively selected based on whether they had been in existence for more than five years. They represent 9.3 percent of the 43 milk collection centres existing in Zambia.

A two-stage cluster sampling design was then applied to randomly pick the primary (sampling enumeration areas) and secondary (households engaged in smallholder dairy farming) sampling units. Probability proportional to size was used to select the sampled enumeration areas, while systemic sampling was employed to choose a sample of 113 households participating in interlocked contractual arrangements and 171 non-participants. A ratio of 3:2 of the sample size of control group to treatment group was applied in order to handle the selection biases, since selection of households participating in interlocked contractual arrangements was not done randomly by the programme. Because of non-response, the final sample size came to 103 and 163 for treatment and control groups, respectively, giving a total of 266 households. In consultation with milk collection centre representatives, purposive sampling was used to select three milk-processing companies (Zambeef, Parmalat and Mpima) and two financial institutions (ZANACO and Micro Bankers Trust).

Data collection was done in two stages. In the first stage, data from representatives from milk collection centres, milk-processing firms and financial institutions were collected though key informant interviews and focus group discussions. This was followed by collection of data from households using semi-structured questionnaires.

10.2.4 Data analysis, empirical model and estimation procedures

Data analysis employed both descriptive statistics and econometric regression models. Detailed analysis was carried out by employing measures of dispersion and central tendency, as well as data normality tests. The double-hurdle model was used to examine the determinants of smallholder farmers' participation in interlocked contractual arrangements, while PS matching was used to assess the impact of participation on household income.

10.3 Major findings of the study

10.3.1 Determinants of smallholder farmers' participation in mainstream dairy value chain through interlocked contractual arrangements

Results reveal that incentives influencing smallholder farmers' participation decision in descending order of importance are milk buyer's financial and management capacity, the possibility of selling larger quantities of milk, a guaranteed market and regularity of sales, followed by lump sum payment, relatively low costs, access to extension services, credit/inputs and lastly the milk price offered by the buyer. The interlocked contractual arrangements offer a narrower price range than the wide price spread prevailing on the spot market, which when averaged, participants in interlocked contractual arrangements get a better deal than selling milk in spot markets. Even though milk collection centres charged a commission of between 0.1 and 0.6 ZMW/litre of milk supplied by farmers, which went towards meeting the high costs of supplying quality milk to the processors, the effective average price (of 2.83 ZMW/litre received by farmers for grade A milk; 2.68 ZMW/litre for grade B and 2.45 ZMW/litre for grade C milk), was still higher than the average price of 2.38 ZMW received on the spot market.

Most of the smallholder farmers (81%) felt that relationship norms such as open exchange of information and ideas/initiatives, solidarity and participation, joint problem solving and conflict resolution and trust (85%) existed in the buyer-supplier exchange relationship. The majority of smallholder farmers (71% and 87%% respectively) also felt that milk buyers understood their needs and treated them fairly. However, those that felt they were unfairly treated and their needs were not understood raised the following concerns: low prices, late payments, lack of involvement in key business decision-making, long time lags for reviewing the memorandum of understanding and inadequate transparency in milk grading and weighing and access to quality bulls /artificial insemination services.

The criteria that milk collection centres and processors used to select smallholder farmers that participated in interlocked contractual arrangements included membership of a dairy cooperative, adherence to contractual terms with regard to delivery schedules, quality and quantity of milk supplied and having a healthy herd. The double-hurdle model results of determinants of smallholder farmers' participation and intensity of participation in interlocked contractual arrangements revealed that these two sequential decisions were influenced by different set of factors. Demographic factors did not influence the participation decision, while milk price was an important institutional factor determining participation. Socio-economic factors that influenced whether a farmer sold milk through interlocked contractual arrangements included ownership of improved breed animals, number of lactating animals, land holding size, value of non- land assets owned, annual income from milk and other sources, while access to production enhancing facilities/services included dairy marketing information, proximity to milk collection centre and water. With the exception of land holding size, the rest of the variables were consistent with theory.

Determinants of the proportion of milk that farmers sold through interlocked contractual arrangements include education level of household head, cattle-rearing culture, relative supplier dependency on the milk buyer, level of trust within the exchange relationship, access to dairy marketing information, proximity to a milk collection centre and water source. With the exception of access to dairy marketing information, proximity to the milk collection centre and relative supplier dependency on the milk buyer, the relationship between the remaining variables and dependent variable was as hypothesised.

10.3.2 Nature and level of smallholder farmers' participation in interlocked contractual arrangements

Smallholder farmers' involvement in value chain activities is positively related to ownership of a milk-processing plant and membership of a dairy cooperative. Participation of smallholder farmers in interlocked contractual arrangements has enabled some farmers to upgrade from mere "chain actors" to "chain owners". For instance, in the Mpima model, with the help of professional managers, smallholder farmers participated in all dairy value chain activities from production to processing and distribution. In contrast, smallholder farmers' participation in value chain activities was limited to production, bulking and cooling in the Parmalat and Zambeef models. Involvement in key business decisions is not influenced by ownership of a

milk processing plant and membership of a dairy cooperative. Even where smallholder farmers owned critical resources such as a milk-processing plant and were organised in cooperatives, they were unable to influence key business decisions. Yet having a voice in major decisions such as price setting could significantly affect rewards. Meanwhile, participation in interlocked contractual arrangements enabled some cooperatives to diversify into other businesses, as in the case of Chibombo dairy cooperative union that runs a hammer mill where the maize bran produced is sold to its members. This has not only helped the cooperative to be self-sufficient, but has enhanced its sustainability as well.

There is a link between the level of interdependence among the off-taker (milk buyer) and smallholder farmers (milk suppliers) and active participation of smallholder farmers in milk collection centres. Participation levels were relatively low where interdependence asymmetry existed in the buyer-supplier relationship. The low active participation in some of the milk collection centres could be attributed to conflicts within the cooperatives, low productivity and ineffective breeding programmes.

10.3.3 Interlocked contractual arrangements and facilitation of smallholders' participation in markets

Results showed that interlocked contractual arrangements enhance smallholder farmers' participation in the mainstream value chain in that the absolute numbers are high. However, their intensity of participation is low (volumes of milk). Meanwhile, processors intimated that they were willing to collaborate more with smallholder farmers than emergent or large-scale farmers, since their risk of side-selling was lower. Large-scale farmers also lacked succession plans and, therefore, posed more risk to processors than other farmer categories.

Whereas access to inputs, dairy loans, and insurance policy is relatively higher than non-participants, overall access is low. Hence, much more needs to be done to improve smallholder farmers' access to extension and financial services, particularly agricultural loans and insurance. The high cost of stock feed and inadequate access to discounted inputs remain critical issues that adversely affect smallholder farmers' productivity, profitability and participation in the mainstream dairy value chain.

Results further showed that both transactional and relational governance mechanisms are concurrently used in interlocked contractual arrangements to reduce information asymmetry

and related costs and risks. Vertical and horizontal relations play an important role as well in improving smallholder farmers' access to the mainstream dairy value chain, inputs, financial and other support services aimed at improving smallholder farmers' competitiveness and productivity. This cooperation between firms through vertical relationships is critical to reducing transaction costs, getting a product from inception to the market and transferring learning and embedded technical, financial and business services from firms up the chain to firms down the chain. Also, well-organised farmer groups reduce transaction costs and risks for smallholder farmers, off-takers and other service providers

10.3.4 Relationship between participation and household income

Evidence from descriptive statistics showed that there were no significant differences between treatment and control groups' average income from other sources, household income and tropical livestock units. Nonetheless, the two groups were significantly different ($p<0.01$) with respect to milk volumes produced per annum, income from milk sales and the wealth index. Although participants in interlocked contractual arrangements had higher milk revenue, their wealth index was lower than that of non-participants. The latter results show that interlocked contractual arrangements are inclusive of poorer smallholder farmers. The drivers of high milk revenue among participants was higher milk productivity, prices and specialisation in dairy production. Evidence from the propensity score matching approach established that participation in interlocked contractual arrangements had a significant positive impact on milk revenue but not on household income. Hence, the hypothesis that participation in interlocked contractual arrangements enhances household income was rejected. This contradicts results of previous studies. The reasons advanced for the insignificant contribution of participation in interlocked contractual arrangements to household income were that dairy production is labour intensive, which coupled with the fact that famers have to carry out extra activities to meet the quality requirements of the modern channel, negatively affected the spill-over income effects from increased milk revenue as farmers fail to diversify in other income generating activities. In addition the milk quality of farmers is mostly grade B, sometimes gravitating towards grade C. Hence, they fail to earn the premium price for grade A milk. Lastly, due to lack of on-farm cooling facilities coupled with long distances to milk collection centers means that farmers are forced to consume the evening milk meaning that they lose the opportunity to enhance their incomes.

10.4 Conclusion and implication for Policy

This study has offered guidelines to stakeholders promoting smallholder farmers' participation in markets through interlocked contractual arrangements. By focusing on the identified factors that influence participation and intensity of participation in interlocked contractual arrangements in the dairy sector, stakeholders will be able to target and select potential participants, and also develop strategies to enhance the quantities of milk sold through interlocked contractual arrangements. Participation in interlocked contractual arrangements enhances farmers' participation in the formal milk channel, which in most cases could be the only reliable market in rural areas. This is because the absolute number of smallholder farmers participating in the mainstream dairy value chain through interlocked contractual arrangements is higher than other farmer categories. However, their contribution in terms of milk volumes is lower. Although participants in interlocked contractual arrangements have better access to inputs and credit markets, overall access to affordable inputs particularly stock feed and financial services is still low. Interlocked contractual arrangements could act as a training ground for smallholder farmers upgrading from 'chain actors' to 'chain owners.' Moreover, smallholder farmers do not have a voice in key business decision areas and yet it is critical to influencing rewards accrued from participation.

Although participation in interlocked contractual arrangements enhances milk revenue but not household income, interlocked contractual arrangements should be promoted to enhance the share of smallholder farmers' milk passing through the formal marketing channel as they receive are a higher average milk price than selling it through the spot market. Moreover, the nature of milk (highly perishable) necessitates that raw milk cannot just be procured from the spot market as this will affect the quality of the final processed product. The current goodwill from processors to collaborate more with smallholder farmers than commercial farmers also needs to be exploited. Hence, interlocked contractual arrangements should be promoted in order to enhance value addition in the dairy sector, job creation and growth of the rural economy. As a way forward, interlocked contractual arrangements need to be nurtured by addressing the shortcomings identified in order to benefit all actors, especially vulnerable smallholder farmers. Against this background, the following interventions are proposed.

10.4.1 Enhancing smallholder farmers' participation in interlocked contractual arrangements

a) Role of government and other supporting agencies

To enhance smallholder farmers' participation in interlocked contractual arrangements, the government, private sector and other supporting agencies should increase their efforts aimed at enhancing smallholder farmers' productivity and competitiveness. Such efforts should include improving alertness to disease and control mechanisms, investing in affordable stock feed and enhancing smallholder farmers' access to veterinary services, dairy marketing information and animal breeding programmes. Specifically, the government and other stakeholders need to invest in infrastructure such as breeding centres, water, dip tanks and milk collection centres so as to bring production-enhancing facilities closer to communities.

In order to increase local consumption of milk products, competitiveness and growth of the sector, there is a need for government to cautiously protect the infant dairy sector from milk product imports and also reduce the taxes on raw milk. When such a policy is put in place, it would probably improve the profitability of milk-processing firms and enable them to reward their milk suppliers appropriately.

b) Role of milk processors/off-takers

Processors (powerful buyers) need to use their power judiciously to create a more integrated value chain that benefits both themselves and their suppliers. Particular attention should be paid to understanding the needs of smallholder farmers. Involving them in key business decision-making processes would go a long way in understanding their needs. To cushion smallholder farmers from the effect of inflation and motivate them to sell more milk through interlocked contractual arrangements, processors have to reward smallholder farmers appropriately by offering them a net milk price that considers the fact that smallholder farmers incur additional costs in supplying a higher quality product to processors than to the spot market. There is also a need for more transparency in grading and weighing of milk, especially where the buyer and supplier use different weighing scales/tools. A parallel grading system is proposed that can be managed by Dairy Association of Zambia in conjunction with the recently developed laboratories in provincial livestock development centers. Frequent review of the memorandum of understanding is important, considering the fact that the business environment in which smallholder farmers operate is very dynamic. Another alternative would be for

processors to pay milk suppliers bonuses at the end of each accounting period when they make more profit than anticipated. It is also important that milk buyers and smallholder farmers build trust in the exchange relationship, since trust yields commitment to long-term relationships and enhances value chain performance. Moreover, off-takers should enhance smallholder farmers' linkages to input providers through interlocked contractual arrangements.

c) *Dairy cooperatives/milk collection centres and smallholder farmers' participation in interlocked contractual arrangements*

Well organised and well-managed dairy cooperatives build trust and goodwill from various stakeholders. However, when there are many disagreements and frequent changes of management, cooperatives miss out on many opportunities. Hence, there is a need for capacity building of cooperatives in governance-related issues (leadership and management) to reduce conflicts and infighting and to protect cooperative members so that they are not swindled out of their hard-earned money by their leaders, especially with regard to charging a high commission per litre of milk supplied to the milk collection centres. Enhancing the cooperatives' negotiation and business skills could also assist the smallholder farmers' voice to be heard. This would reduce power asymmetry in buyer-supplier exchange relationships and positively influence rewards that smallholder farmers derive from participating in interlocked contractual arrangements. Moreover, cooperatives should not only focus on assisting members to market their milk, but also facilitate their acquisition of relatively cheaper stock feed by exploiting economies of scale through bulk purchases and transportation or diversifying in stock feed processing.

d) *Financial institutions and smallholder farmers' participation in interlocked contractual arrangements*

Lastly, there is a need to create awareness among financial institutions about the potential of interlocked contractual arrangements in enhancing smallholder farmers' access to rural and agricultural finance. This is because interlocked contractual arrangements enable value chain participants to effectively resolve the coordination problems related to information asymmetry, high transaction costs and risks of searching, screening, selection, monitoring and enforcement. Concurrent use of transaction and relationship governance mechanisms reduces information asymmetry and related costs and risks associated with rural and agricultural finance. Moreover,

financial institutions should be encouraged to develop affordable dairy loan and insurance products that are accessible to smallholders when they need them.

10.4.2 Participation in interlocked contractual arrangements and smallholder farmers' household income

As much as the public sector and other stakeholders are promoting interlocked contractual arrangements, there is a need for reorientation of support from over-emphasis on interlocked contractual arrangements to a mix of strategies. Other strategies could include linking farmers to other formal and informal markets through the livestock development centres which are a one stop centre for information on markets and services and promotion of livelihood diversification. Moreover, much more needs to be done to enhance smallholder farmers' productivity levels. Most of the recommendations have already been highlighted in previous section on how to enhance smallholder farmers' participation in the mainstream dairy value chain through interlocked contractual arrangements.

10.4.3 Limitations of the study and areas for future research

This study was certainly not exhaustive and experienced limitations stemming from the data and time constraints and methodological approaches used. In the absence of these constraints, the value of this research could be enhanced by allowing a more comprehensive research process, as suggested below.

Future research on assessing impact of smallholder farmers' participation in these institutional arrangements could explore ways of collecting data in a systematic way from the farmers of interest over time. In other words, multi-year (longitudinal) research would provide insight on the dynamics of interlocked contractual arrangements other than the most often used cross-sectional observational studies. The quality of research could also be enhanced by using a bigger sample size and sampling farmers from other milk shed areas, even though distant, but with a high density of smallholder dairy farmers. This is especially true with regard to establishing the impact of participation on household income. Moreover, when determining the impact of participation in contract farming, most studies use household income as a proxy of welfare. However, household income is more prone to under-reporting and it does not take into account the various costs borne by the household. Instead, farm profits would constitute a much

better measure of welfare or indeed consumption expenditure, which is more reliable and less prone to under-reporting errors. Also, further research should consider the decomposition of price differentials or similarities between participants and non-participants.

Although this study attempted to obtain the views of various stakeholders, including contracting firms and financial institutions, much more focus was placed on farmers' view of interlocked contractual arrangements. Research on constraints facing contracting firms, especially how to deal with the issue of side-selling in contractual arrangements, could shed further light on the conditions for successful contract farming. In a bid to encourage financial institutions' participation in upcoming institutional arrangements, it is important to document the performance of pioneer financial institutions in interlocked contractual arrangements.

REFERENCES

Alemu, A.E., Maertens, M., Deckers, J., Bauer, H. and Mathijs, S.E. 2016. Impact of supply chain coordination on honey farmers' income in Tigray, Northern Ethiopia. *Agricultural and Food Economics* 4(9): 1-21.

Ali, A. and Abdulai, A. 2010. The adoption of genetically modified cotton and poverty reduction in Pakistan. *Journal of Agricultural Economics* 61:175-92.

Ampaire, E.L. 2013. Effectiveness of second-tier rural producer organisations in linking smallholder farmers to markets in Uganda. PhD (Rural development and Planning) thesis, University of Pretoria, South Africa.

Anderson, E. and Weitz, B. A. 1992. The use of pledges to build and sustain commitment. *Journal of Marketing Research* 24:18-34.

Anseeuw, W., Fréguin-Gresh, S and Davis, N. 2016. Contract farming and strategic partnerships: A promising exit or smoke and mirrors? In Cochet, H., Anseeuw, W. and Sandrine Fréguin-Gresh, S (eds), *South Africa's agrarian question.* Cape Town, South Africa: HSRC Press.

Aulakh, P. S., Kotabe, M. and Sahay, A. 1996. Trust and performance in cross-border marketing partnerships: A behavioural approach. *Journal of International Business Studies* 27: 1005-32.

Bakshi, K., Roy, D. and Thorat, A. 2006. Small they may be and Indian farmers they are but export they can: The case of Mahagrapes farmers in India. In plate to plough: Agricultural diversification and its implications for the smallholders in India. Report submitted to Ford Foundation by the International Food Policy Research Institute.

Barker, J.L. 2000. Evaluating the impact of development projects on poverty. Washington DC: The World Bank.

Baumann, P. 2000. Equity and efficiency in contract farming schemes: The experience of agricultural tree crops. *ODI Working Paper* No 139, Overseas Development Institute, London.

Becker, S.O. and Ichino, A. 2002. Estimation of average treatment effects based on propensity scores. *J. Stata* 2:358-77

Beggs, M. 2010. Value chain finance in Zambia: Supply chain solutions to financial constraints. United States Agency for International Development/ Zambia Production, Finance and Improved Technology (PROFIT) project. URL: http://api.ning.com/files/rI3A0gSDRPGh5ub8TD*K7EWg3LMLTPl1psSeqagRBfDr9QweqsPAwUe-pY3fAgxc-aDDn11SHkZfpmeXjvJ6UVHILsibsONg/Zam_supplychain.pdf (accessed: 16 October 2015).

Bellemare, M.F. 2012. As you sow, so shall you reap: The welfare impacts of contract farming. *World Development* 40 (7): 1418–34.

Berdegué, J. A., Hernández, R., Ortega, J. and Reardon, T. 2007. Strawberry Growers and Modern Market Channels in Mexico. Micro Report module 3 of component 1. Regoverning Market Program, London: International Institute of Environment and Development.

Bertrand, M., Duflo, E. and Mullainathan, S. 2004. How much should we trust differences-in-differences estimates? *Quarterly Journal of Economics* 119(1):249-75.

Bijman, J. 2008. Contract farming in developing countries: An overview. Working Paper, Wageningen University, May.

Birnberg, J.G. 1998. Control in interfirm co-operative relationships. *Journal of Management Studies* 35 (4):421–28.

Birthal, P.S., Joshi, P.K. and Gulati, A. 2005. *Vertical coordination in high value commodities: implications for the smallholders*. Markets, Trade, and Institutions Division Discussion Paper No. 85. Washington, D.C.: International Food Policy Research Institute.

Birthal, P.S and Joshi, P.K. 2007. Smallholder farmers' access to markets for high-value agricultural commodities in India Case Study #6-4 of the program: Food policy for developing countries, the role of government in the global food system. Cornell University, Ithaca, New York.

Birthal, P.S., Jha, A.K., Tiongco, M.M. and Narrod, C. 2008. Improving farm-to-market linkages through contract farming: A case study of smallholder dairying in India. Discussion Paper 00814. International Food Policy Research Institute. Washington, D.C.

Bolwig, S., Gibbon, P. and Jones. S. 2009. The economics of smallholder organic contract farming in tropical Africa. *World Development* 37(6): 1094–1104.

Brown, J. R., Dev, C. S. and Lee, D. J. 2000. Managing marketing channel opportunism: the efficacy of alternative governance mechanisms. *Journal of Marketing* 64:51-65.

Buchanan, L. 1992. Vertical trade relationships: The role of dependence and symmetry in attaining organizational goals. *Journal of Marketing Research* 29:65-75.

Burke, W. J. 2009. Fitting and interpreting Cragg's Tobit alternative using Stata. *Stata Journal* 9(4):584–92.

Burke, W.J., Jayne, T.S. and Sitko, N. J. 2012. Can the FISP more effectively achieve food production and poverty goals? FSRP Policy synthesis No.51. Lusaka: Food Security Research Project. URL: http://fsg.afre.msu.edu/zambia/ps_51.pdf (accessed on 13 May 2013).

Bushway, S., Johnson, B. D. and Slocum, L.A 2007. Is the magic still there? The use of the Heckman two-step correction for selection bias in criminology. *Journal of Quantitative Criminology* 23(2):151–178.

Cahyadi, E. R. and Waibel, H. 2013. Is contract farming in the Indonesian oil palm industry pro-poor? *Journal of Southeast Asian Economics* 30 (1): 62-7.

Cai, J., Ung, L., Setboonsarng, S. and Leung, P. 2008. Rice contract farming in Cambodia: Empowering farmers to move beyond the contract towards independence. Discussion Paper No.109, Asian Development Bank Institute.

Caliendo, M. and Kopeinig, S. 2008. Some practical guidance for the implementation of propensity score matching. *Journal of Economic Surveys* 22(1):31-72.

Cameron, C.A. and Trivedi, P.K. 2005. *Micro econometrics: Methods and applications*. Cambridge: Cambridge University Press.

CAPRA Limited. 2013. Milk collection centre (MCC) census report. Lusaka.

Catelo, M. O. and Costales, A. 2008. Contract farming and other market institutions as mechanisms for integrating smallholder livestock producers in the growth and development of the livestock sector in developing countries. *PPLPI Working Paper,* No 45.

Coates M, Kitchen, R., Kebbell, G., Vignon, C., Guillemain, C. and Hofmeister, R. 2011. Financing agricultural value chains in Africa – A synthesis of four country case studies. Bonn, Germany: GIZ.

Codron, J.M., Bouhsina, Z., Fort, F., Coudel, E. and Puech, A. 2004. Supermarkets in low-income Mediterranean countries: Impacts on horticulture systems. *Development Policy Review* 22(5):587- 602.

Coleman, J. 1990. *Foundations of Social Theory.* Cambridge, Harvard University Press.

Cragg, J. 1971. Some statistical models for limited dependent variables with application to the demand for durable goods. *Econometrica* 39(5):829-44.

Crişan, E., Parpucea, I. and Ilieş, L. 2011. The relation between supply chain performance and supply chain governance practices. *Management & Marketing Challenges for the Knowledge Society* 6: 637-44.

CSO (Central Statistics Office). 2012. 2010 Census of population report analytical report. Lusaka.

Da Silva, C.A. 2005. *The growing role of contract farming in agri-food systems development: Drivers, theory and practice.* FAO, Rome.

Da Silva, C.A. and Rankin, M. 2013. Contract farming for inclusive market access: Synthesis and findings from selected international experiences, in Da Silva, C.A. and Rankin, M. (eds), *Contract farming for inclusive market access*. Rome: Food and Agriculture Organization of the United Nations.

Daugherty, P. J. 2011. Review of logistics and supply chain relationship literature and suggested research agenda. *International Journal of Physical Distribution & Logistics Management* 41:16-31.

Dion, P.A., Banting, P.M., Picard, S. and Blenkhorn, D.L. 1992. JIT implementation: a growth opportunity for purchasing. *International Journal of Purchasing and Materials Management* 28 (4): 32–8.

Dorward, A.R., Kydd, J. and Poulton, C. 2007. Coordination risk and cost impacts on economic development in poor rural areas. School of Oriental and African Studies, University of London, London.

Dries, L. and Swinnen, J. F. M. 2004. Foreign direct investment, vertical integration and local suppliers: Evidence from the Polish dairy sector. *World Development* 32(9):1525–44.

Dries L., Johan, F. M. and Swinnen, J. F. 2010. The impact of interfirm relationships on investment: Evidence from the Polish dairy sector. *Food Policy* 35:121-29.

Dutoit, L.C. 2007. Heckman's selection model, endogenous and exogenous switching models: A survey. URL: http://works.bepress.com/lauredutoit/3> (accessed on 12 December 2013).

Dyer, J. H. and Singh, H. 1998. The relational view: Cooperative strategy and sources of interorganizational competitive advantage. *The Academy of Management Review* 23:660-79.

Dyer, J. H. and Chu, W. 2003. The role of trustworthiness in reducing transaction costs and improving performance: empirical evidence from the United States, Japan and Korea. *Organization Science* 14:57-68.

Eaton, C. and Shepherd. A. 2001. Contract farming: Partnerships for growth. *Agricultural Services Bulletin* 165. Food and Agriculture Organization. Rome. URL: http://www.fao.org/DOCREP/004/Y0937E/ y0937e00.htm#toc (accessed on 04 March 2016).

Escobal, J.A. and Cavero. D. 2012. Transaction costs, institutional arrangements and inequality outcomes: Potato marketing by small producers in rural Peru. *World Development* 40(2):329 - 41.

Eswaran, M. and Kotwal, A. 1985. A theory of contractual structure in agriculture. *American Economic Review* 75 (3): 352-67.

Fisher, R.J. 1993. Social desirability bias and the validity of indirect questioning. *Journal of Consumer Research* 20:303-15.

Fréguin-Gresh, S., D'Haese, M. and Anseeuw, W. 2012. Demythifying contract farming: Evidence from rural South Africa. *Agrekon* 51 (3): 24-51.

Fréguin-Gresh, S and Anseeuw, W. 2013. Integrating smallholders in the South African citrus sector, in Da Silva, C.A. and Rankin, M (eds), *Contract farming for inclusive market access.* Rome: Food and Agriculture Organization of the United Nations.

Fries, R. and Akin, B. 2004. Value chains and their significance for addressing the rural finance challenge. United States Agency for International Development. URL: http://193.43.36.16/servlet/BinaryDownloaderServlet?filename=1127740980289_Value_chains_significance_in_rural_finance.pdf (accessed 10 February 2012).

Gebregziabher, G. and Holden, S. 2011. Does irrigation enhance and food deficits discourage fertilizer adoption in a risky environment? Evidence from Tigray, Ethiopia. *Journal of Development and Agricultural Economics 3*(10): 514-28.

Gereffi, G., Humphrey, J. and Sturgeon, T. 2005. The governance of global value chains. *Review of International Political Economy* 12:78-104.

Giannoccaro, I. and Pontrandolfo, P. 2004. Supply chain coordination by revenue sharing contracts. *International Journal of Production Economics* 89:131-9.

Glover, D. 1984. Contract farming and smallholder out grower schemes in less-developed countries. *World Development* 12 (11/12): 1143–157.

Glover, D. and Kusterer, K. 1990. *Small farmers, big business: Contract farming and rural development.* New York: St. Martin's Press.

Gomez, R. and Santor, E. 2001. Membership has its privileges: The effect of social capital and neighbourhood characteristics on the earnings of microfinance borrowers. *The Canadian Journal of Economics* 34:943-66.

Granovetter, M. 1985. Economic action and social structure: The problem of embeddedness. *American Journal of Sociology* 91 (3):481–510.

Greene, W. 2000. *Econometric Analysis*, New York: Macmillan.

Grosh, B. 1994. Contract farming in Africa: An application of the new institutional economics. *Journal of African Economies* 3(2):231–61.

Guercini, S. and Runfola, A. 2004. Sourcing strategies in clothing retail firms: Product complexity versus overseas inter-organizational governance supply chain. *Journal of Customer Behaviour* 3:305-34.

Gulati, R., Nohria, N. and Zaheer, A. 2000. Strategic networks. *Strategic Management Journal* 21:203-15.

Gundlach, G. T., Achrol, R. S. and Mentzer, J. T. 1995. The structure of commitment in exchange. *Journal of Marketing* 59:78-92.

Guo, H., Jolly, R.W. and Zhu, J. 2005. Contract farming in China: Supply chain or ball and chain? Paper presented at the 15th Annual World Food and Agribusiness Symposium, IAMA, Chicago, June 25–26.

Hailemariam, T., Legesse, D., Alemu, Y. and Dana. N. 2006. Determinants of adoption of poultry technology: A double-hurdle approach. *Livestock Research for Rural Development* 18(3):1-14.

Handfield, R. B. and Bechtel, C. 2002. The role of trust and relationship structure in improving supply chain responsiveness. *Industrial Marketing Management* 31:367-82.

Han, J., Trienekens, J. H. and Xu, J. 2013. Contract arrangements in China's pork production chain, in Da Silva, C.A. and Rankin, M (eds), *Contract farming for inclusive market access*. Rome: Food and Agriculture Organization of the United Nations.

Hansel J. 2007. Risk-sharing models increase market access and financial and non-financial services to farmers. *Enterprise Development and Microfinance* 18(2-3):109-25.

HarvestChoice. 2011. Total livestock population (TLU). 2005. International Food Policy Research Institute, Washington, DC and University of Minnesota, St. Paul, MN. URL http://harvestchoice.org/node/4788 (accessed 08 September 2015).

Hayami, Y. 2003. Family farms and plantations in tropical development. FASID Discussion Paper, Series 2003-001.

Heckman, J.J. 1976. The common structure of statistical models of truncation, sample selection and limited dependent variables. *Ann Econ Soc Measure* 5:475- 92.

Heide, J. B. and John, G. 1990. Alliances in industrial purchasing: The determinants of joint action in buyer-supplier relationships. *Journal of Marketing Research* 27:24-36.

Heide, J. B. 1994. Interorganizational governance in marketing channels. *Journal of Marketing* 58:71-85.

Helin, J., Lundy, M. and Meijer, M. 2009. Farmer organization, collective action and market access in Meso America *Food Policy* 34: 16-22.

Henke Jr, J. W., Yeniyurt, S. and Zhang, C. 2008. Supplier price concessions: A longitudinal empirical study. *Marketing Letters.*

Hichaambwa, M., Chamberlin, J. and Kabwe S. 2015. Is smallholder horticulture the unfunded poverty reduction option in Zambia? A comparative assessment of welfare effects of participation in horticultural and maize markets. IAPRI Working paper No. 96. Lusaka, Zambia: Indaba Agricultural Policy Research Institute. URL: http://fsg.afre.msu.edu./zambia/wp96_rev.pdf (accessed 20 October 2015).

Ho, D. E., Imai, K., King, G. and Stuart, E. A. 2007. Matching as nonparametric pre-processing for reducing model dependence in parametric causal inference. *Political Analysis* 15:199-236.

Huang, J., Wu, Y., Yang, Z., Rozelle, S., Fabiosa, J. and Dong, F. 2010. Farmer participation, processing, and the rise of dairy production in Greater Beijing, P.R. China. *Canadian J. Agricultural Economics* 58(3):321 - 42.

Hult, G. T., Ketchen, D., Cavusgil, S. and Calantone, R. 2006. Knowledge as a strategic resource in supply chains. *Journal of Operations Management* 24:458-75.

Institute of Developing Economies. Undated. Prospect of contract farming – experiences in developing and developed economies and the current situation in China. URL: http://www.ide.go.jp/English/Publish/Download/Asedp/pdf/077_03.pdf (accessed on 17 April 2017).

International Fund for Agricultural Development (IFAD). (Undated.) Markets for the rural poor. URL: https://www.ifad.org/documents/10180/9eeb8c19-d79d-4cda-a5d7-cd233d18e289 (accessed on 12 May 2017).

International Finance Corporation (IFC). 2011. Scaling up access to finance for agricultural SMEs: Policy review and recommendations. URL: http://www.ifc.org/wps/wcm/connect/04da89804a02e2e19ce0fdd1a5d13d27/G20_Agrifinance_Report.pdf?MOD=AJPERES (accessed 17 October 2015).

International Food Policy Research (IFPRI). 2016. Global hunger index. URL: http://www.ifpri.org/topic/global-hunger-index (accesses on 31 October 2017).

Imbens, G. W. 2004. Nonparametric estimation of average treatment effects under exogeneity: A review. *Review of Economics and Statistics* 86 (1): 4-29.

Ireland, R. D. and Webb, J. W. 2007. A multi-theoretic perspective on trust and power in strategic supply chains. *Journal of Operations Management* 25:482-97.

Ito, J., Bao, Z. and Sun, Q. 2012. Distributional effects of agricultural cooperatives in China: Exclusion of smallholders and potential gains on participation. *Food Policy* 37 (6): 700-9.

Jagwe, J., Machethe, C. and Ouma, E. 2010. Transaction costs and smallholder farmers' participation in banana markets in the Great Lakes region of Burundi, Rwanda and the Democratic Republic of Congo. *AfJARE* 6 (1): 302-17.

Jalan, J. and Ravallion, M. 2003. Estimating the benefit incidence of an antipoverty program by propensity score matching. *Journal of Business Economics Statistics*. 21(1):19-30.

Jap, S.D. and Ganesan, S. 2000. Control mechanisms and the relationship life cycle: Implications for safeguarding specific investments and developing commitment. *Journal of Marketing Research* 37 (2): 227-45.

Jap, S.D. and Anderson, E. 2003. Safeguarding inter-organizational performance and continuity under ex post opportunism. *Management Science* 49:1684-1701.

Jarvis, L. S. and Vera-Toscano, E. 2004. The impact of Chilean fruit sector development on female employment and household income. Working paper no. 04-002. Department of Agricultural and Resource Economics, University of California Davis. March.

Jenkins, S.P. 2008. Stata module to draw random sample, proportional to size, of n cases. ISER, University of Essex, U.K.

Jia, X. and Bijman, J. 2013. Contract farming: Synthetic themes for linking farmers to demanding markets, in Da Silva, C.A. and Rankin, M (eds), Contract farming for inclusive market access. Rome: Food and Agriculture Organization of the United Nations.

Johnston, C. and Meyer, R. L. 2007. Value chain governance and access to finance maize, sugar cane and sunflower in Uganda *microREPORT#*. Available at: http://www.ruralfinance.org/fileadmin/templates/rflc/documents/1205146927823_Final_microREPORT_88_Value_Chain_Governa-619578901.pdf (accessed 17 October 2012).

Jones, S. and Gibbon. P. 2011. Developing agricultural markets in Sub-Saharan Africa: Organic cocoa in rural Uganda. *The Journal of Development Studies*. 47(10): 1595–618.

Kaganzi, E., Ferris, S., Barham, J., Abenayko, A., Sanginga, P. and Njuki, J. 2009. Sustaining linkages to high value markets through collective action in Uganda. *Food Policy* 34:23-30.

Key, N. and Runsten, D. 1999. Contract farming, smallholders, and rural development in Latin America: The organization of agro processing firms and the scale of out grower production. *World Development* 27(2):381-401.

Kingshott, R. P. J. 2006. The impact of psychological contracts upon trust and commitment within supplier-buyer relationships: A social exchange view. *Industrial Marketing Management* 35: 724-39.

Kirsten, J. and Sartorius, K. 2002. Linking agribusiness and small-scale farmers in developing countries: Is there a new role for contract farming? *Development Southern Africa* 19(4): 503-29.

Kirsten, J., Mapila, M., Okello, J and Sourovi, D. 2013. Managing agricultural commercialisation for inclusive growth in Sub Saharan Africa.

Kish, L. 1995. Survey sampling. NJ USA: Wiley & Sons, Inc.

Klein, B. 2002. *The role of incomplete contracts in self-enforcing relationships,* New York, NY, Cambridge University Press.

Kotabe, M., Martin, X. and Domoto, H. 2003. Gaining from vertical partnerships: Knowledge transfer, relationship duration, and supplier performance improvement in the U.S. and Japanese automotive industries. *Strategic Management Journal* 24 (4):293-316.

Krause, D. R., Handfield, R. B. and Tyler, B. B. 2007. The relationships between supplier development, commitment, social capital accumulation and performance improvement. *Journal of Operations Management* 25:528-45.

Kumar, N., Scheer, L. K., Benedict, J. and Steenkamp, E. M. 1995. The effects of perceived interdependence on dealer attitudes. *Journal of Marketing Research* (JI): 348-56.

Langfield-Smith, K. and Greenwood, M. R. 1998. Developing co-operative buyer–supplier relationships: A case study of Toyota. *Journal of Management Studies* 35:331–53.

Langyintuo, A.S. and Mungoma, C., 2008. The effect of household wealth on the adoption of improved maize varieties in Zambia. *Food Policy* 33(6): 550–59.

Leung, P., Sethboonsarng, S and Stefan, A. 2008. Rice contract farming in Lao PDR: Moving from subsistence to commercial agriculture. Discussion Paper No. 90, ADB Institute.

Leuven, E. and Sianesi, B. 2003. PSMATCH2: Stata module to perform full mahalanobis and propensity score matching, common support graphing, and covariate imbalance testing. URL: http://ideas.repec.org/c/boc/bocode/s432001.html (accessed 10 October 2014).

Little, P. D. and Watts, M. J. eds. 1994. *Living under contract: Contract farming and agrarian transformation in sub-Saharan Africa*. Madison: University Wisconsin Press.

Liu, Y., Luo, Y. and Liu, T. 2009. Governing buyer-supplier relationships through transactional and relational mechanisms: Evidence from China. *Journal of Operations Management* 27: 294-309.

Loc, V. T. T., Bush, S. R., Xuan, L. S. and Khiem, N. T. 2010. High and low value fish chains in the Mekong Delta: Challenges for livelihoods and governance. *Environ Dev Sustain* 12: 889-908.

Luo, Y. 2002. Contract, cooperation and performance in international joint ventures. *Strategic Management Journal* 23:903-20.

Luo, Y. 2007. An integrated anti-opportunism system in international exchange. *Journal of International Business Studies* 38:855-77.

Maddala, G.S. 1983. *Limited-dependent and qualitative variables in econometrics*. Cambridge, UK, New York: Cambridge University Press.

Maertens, M. and Swinnen, J.F.M. 2009. Trade, standards and poverty: Evidence from Senegal. *World Development* 37(1): 161-78.

Maloni, M. and Benton, W. C. 2000. Power influences in the supply chain. *Journal of Business Logistics* 21:49-73.

Matenga, C.R. 2017. Out growers and livelihoods: The case of Magobbo smallholder block farming in Mazabuka district in Zambia. *Journal of Southern African Studies* 43(3): 551-66.

Mwambi, M.M., Oduol, J., Mshenga, P. and Saidi, M. 2016. Does contract farming improve smallholder income? The case of avocado farmers in Kenya. *Journal of Agribusiness in Developing and Emerging Economies* 6 (1):2-20.

Meyer, B. D. 1995. Natural and quasi-experiments in economics. *Journal of Business and Economic Statistics* 13:151-61.

Michelson, H., Perez, F. and Reardon, T. 2012. Small farmers and big retail: Trade-offs of supplying supermarkets in Nicaragua. *World Development* 40 (2):342-54.

Michelson, H.C. 2013. Small farmers, NGOs, and a Walmart world: Welfare effects of supermarkets operating in Nicaragua. *American Journal of Agricultural Economics* 95 (3): 628–49.

Mighell, R.L. and Jones, L.A. 1963. Vertical coordination in agriculture. Washington, DC: Department of Agriculture, Economic Research Service.

Milczarek-Andrzejewska, D., Malak-Rawlikowska, A., Fałkowski, J. and Wilkin, J. 2008. Restructuring process at farm level: Evidence from dairy sector in Poland. Micro report module 3 of component 1. Regoverning Market Program, London: International Institute of Environment and Development.

Miller, C. and Da Silva, C. 2007. Value chain financing in agriculture. *Enterprise Development and Microfinance* 18:95-108.

Miller, C. and Jones, L. 2010. *Agricultural value chain finance: Tools and lessons*. Rome Rugby, FAO Practical Action Publishing.

Minot, N. and Ngigi. M. 2004. Are horticultural exports a replicable success story? Evidence from Kenya and Côte d'Ivoire. Markets, Trade, and Institutions Division Discussion Paper No. 73. International Food Policy Research Institute. Washington, D.C.

Minot, N. 2007. Contract farming in developing countries: Patterns, impact, and policy implications. Case Study 6-3 of the Program, Food Policy for Developing Countries: The role of government in the global food system, Cornel University.

Minot, N. and Ronchi, L.2014.Contract farming risks and benefits of partnerships between farmers and firms. Viewpoint public policy for the private sector. 102736. World Bank Group. URL:http://www.ifpri.org/publication/contract-farming-risks-and-benefits-partnership between-farmers-and-firms (accessed on 13 March 2017).

Minten, B., Randrianarison, L. and Swinnen, J. F. M. 2009. Global retail chains and poor farmers: Evidence from Madagascar. *World Development* 37:1728-41.

Miyata, S., Minot, N. and Hu, D. 2009. Impact of contract farming on income: Linking small farmers, packers, and supermarkets in China. *World Development* 37 (11): 1781-90.

Moffitt, R. 1999. Econometric methods for labor market analysis. In: Ashenfelter O, Card D (eds) *Handbook of labor economics, Vol 3A*. North-Holland, Amsterdam.

Mohr, J. and Spekman, R. 1994. Characteristics of partnership success: Partnership attributes, communication behaviour, and conflict resolution techniques. *Strategic Management Journal* 15 (2):135-42.

Morgan, R. and Hunt, S. 1994. The long-term orientation-trust theory of relationship marketing. *Journal of Marketing* 58:20-38.

Morrison, A., Raju, D. and Sinha, N. 2007. Gender equality, poverty and economic growth. World Bank Policy Research Working Paper 4349.

Mujawamariya, G. and D'Haese, M. 2011. Gum Arabic production and marketing in Senegal: Interlocked transactions and supply chain implications. Paper presented at the EAAE 2011 Congress. Zurich: August 30^{h} to September 2, 2011.

Mungandi, S., Conforte, D. and Shadbolt, N.M. 2012. Integration of smallholders in modern agrifood chains: Lessons from the KASCOL model in Zambia. *International Food and Agribusiness Management Review* 15(3):155-76.

Narasimhan, R., Nair, A., Griffith, D. A., Arlbjørn, J. S. and Bendoly, E. 2009. Lock-in situations in supply chains: A social exchange theoretic study of sourcing arrangements in buyer-supplier relationships. *Journal of Operations Management* 27: 374-89.

Narayanan, S. 2010. Contract farming as frictional equilibrium: A theoretical viewpoint with empirical evidence from southern India. Unpublished PhD thesis, Cornell University.

Narayanan, S. 2014. Profits from participation in high value agriculture: Evidence of heterogeneous benefits in contract farming schemes in Southern India. *Food Policy* 44: 142–57.

Ndenecho, E. N. and Akum, K. H. 2009. Spatio-temporal analysis of micro financing for agricultural innovation diffusion in Mezam division, Cameroon. *International NGO Journal* 4: 57-65.

Oluyele, A.A. and Lubinda, R .N. K .2010. Adding value to Africa's industry and trade through agro-industry and agribusiness: An agenda for action, Zambia's case. Report prepared for United Nations Industrial Development.

Poppo, L. and Zenger, T. 2002. Do formal contracts and relational governance function as substitutes or complements? *Strategic Management Journal* 23:707-25.

Porter, G. and Phillips-Howard, K. 1997. Comparing contracts: An evaluation of contract farming schemes in Africa. *World Development* 25(2):227–38.

Prowse, M. 2012. Contract farming in developing countries: A review. Technical report, Agence Francaise E Developpemnet A Savoir.

Ramaswami, B., Birthal, P.S and Joshi. P.K.C. 2006. Efficiency and distribution in contract farming: The case study of Indian poultry growers. Discussion Paper 91. MTID.

Rao, E.J. and Qaim, M. 2011. Supermarkets, farm household income, and poverty: Insights from Kenya. *World Development* 39 (5):784–96.

Ravallion, M. 2001. The mystery of the vanishing benefits: An introduction to impact evaluation. *World Bank Economic Review* 15(1):115-40.

Ravallion, M. 2003. Assessing the poverty impact of an assigned program, in Bourguignon F, Pereira da Silva L.A (eds), *The impact of economic policies on poverty and income distribution.* Oxford University Press.

Razavi, S. 2007. Liberalisation and the debates on women's access to land. *Third World Quarterly* 28(8):1479-500.

Rehber, E. 2007. C*ontract farming: Theory and practice*. ICFAI University Press, Hyderabad, India.

Reardon T., C. B. Barrett, J.A. Berdegué and J. F. M. Swinnen. 2009. Agrifood industry transformation and small farmers in developing countries. *World Development* 37(11):1717-27.

Ring, P. S. and Van De Ven, A. H. 1994. Developmental processes of cooperative interorganizational relationships. *Academy of Management Review* 19:90-118.

Rokkan, A. I., Heide, J. B. and Wathne, K. H. 2003. Specific investments in marketing relationships: expropriation and bonding effects. *Journal of Marketing Research* 40:210-24.

Rosenbaum, P. R. and Rubin, D. B. 1983. The central role of the propensity score in observational studies for causal effects. *Biometrika* 70(1):41-55.

Rosenbaum, P. R. and Rubin, D. B. 1985. Constructing a control group using multivariate matched sampling methods that incorporate the propensity score. *The American Statistician* 39:33-8.

Runge-Metzger, A. 1988. Variability in agronomic practices and allocative efficiency among farm households in northern Ghana: A case study in on-farm research. Nyankpala Agricultural Research Report No. 2: Tamale Ghana.

Sáenz-Segura, F. and Ruben, R. 2004. Export contracts for non-traditional products: Chayote from Costa Rica. *Journal on Chain and Network Science* (4) 2: 139-50.

Sahay, B. S. 2003. Understanding trust in supply chain relationships. *Industrial Management and Data Systems* 103: 553-63.

Saigeji, Y. and Zeller, M. 2009. Effect of contract farming on productivity and income of smallholders: The case of tea production in north-western Vietnam. Paper presented at the International Association of Agricultural Economists Conference, Beijing, China, 16-22 August. URL: http://ageconsearch.umn.edu/bitstream/51681/2/669.pdf (accessed on 7 May 2017).

Sambasivan, M., Siew-Phaik, L., Mohamed, A. Z. and Leong, Y. C. 2011. Impact of interdependence between supply chain partners on strategic alliance outcomes: Role of relational capital as a mediating construct. *Management Decision* 49:548-69.

Sambuo, D. 2014. Tobacco contract farming participation and income in Urambo: Heckman's selection model. *Journal of Economics and Sustainable Development* 5 (28):230-37.

Schiff, H. and Stallard, J. 2009. Purchase order finance in Bolivia: Innovations in financing value chains. USAID. URL: http://www.microfinancegateway.org/gm/document-1.9.36862/36.pdf (accessed 10 June 2010).

Schüring, E., Michelo, S. and Boonstoppel. E. 2007. Final evaluation report: Kalomo cash transfer scheme. MCDSS/GTZ, Lusaka, Zambia.

Seabright, M.A., Levinthal, D.A. and Fichman, M. 1992. Role of individual attachments in the dissolution of interorganizational relationships. *Academy of Management Journal* 35(1):122-50.

Segal, I. 1999. Complexity and renegotiation: a foundation for incomplete contracts. *Review of Economic Studies* 66: 57-82.

Setboonsarng, S., Leung, P. and Stefan, A. 2008. Rice contract farming in Lao PDR: Moving from subsistence to commercial agriculture. *ADBI Discussion Paper,* No 90, Asian Development Bank Institute, Tokyo.

Shahidur, R., Gayatri, B. and Hussain, A. 2010. Handbook on impact evaluation: Quantitative methods and practices. The World Bank, Washington DC.

Shankar, B., Posri, W. and Srivong T. 2010. A case study of a contract farming chain involving supermarkets and smallholders in Thailand. *Canadian Journal of Development Studies* 31: 137–53.

Shook, C. L., Adams, G. L. and Ketchen, J. D. J. 2009. Towards a theoretical toolbox for strategic sourcing. *Supply Chain Management: An International Journal* 14: 3–10.

Simmons, P., Winters, P. and Patrick, I. 2005. An analysis of contract farming in East Java, Bali, and Lombok, Indonesia. *Agricultural Economics* 33 (3): 513–52.

Singh, S. 2002. Contracting out solutions: Political economy of contract farming in the Indian Punjab. World Development pp. 1621–638.

Sitko, N.J., Chapoto, A., Kabwe, S., Tembo, S., Hichaambwa, M., Lubinda, R., Chiwawa, M.M., Heck, S., and Nthani, D. 2011. Technical compendium: Descriptive agricultural statistics and analysis for Zambia in support of the USAID mission's feed the future strategic Review Working Paper No. 52. Lusaka: Food Security Research Project. http://www.aec.msu.edu/agecon/fs2/zambia/index.htm (accessed 10 January 2013).

Sokchea, A. and Culas, R.J. 2015. Impact of contract farming with farmer organizations on farmers' income: A case study of Reasmey Stung Sen Agricultural Development Cooperative in Cambodia. *Australasian Agribusiness Review* 23, Paper 1:1-11.

Starks, H. and Garrido, M.M. 2014. Observational and quasi–experimental research methods. Paper presented at 8th annual Kathleen Foley palliative care retreat methods workshop. Park City, Utah, October, 20. URL: http://www.npcrc.org/files/NPCRC.Observational-PropensityScoreMethodsWkshop (accessed 17 August 2016).

StataCorp. 2014. Stata statistical software: Release 14. College Station, TX: StataCorp LP.

Steensma, K. H. and Lyles, M. A. 2000. Explaining IJV survival in a transitional economy through social exchange and knowledge-based perspective. *Strategic Management Journal* 21:831-51.

Stolzenberg, R.M. and Relles, D. A.1990. Theory testing in a world of constrained research design: The significance of Heckman's censored sampling bias correction for non-experimental research. *Sociological Methods and Research* 18 (4), 395-415.

Swinnen, J.F.M., and M. Maertens. 2007. Globalization, privatization, and vertical coordination in food value chains in developing and transition countries. *Agricultural Economics* 37(1): 89–102.

Strategic Visions Ltd 2011. The Dairy Value Chain Study in Zambia. Report prepared for Agricultural Consultative Forum. Lusaka.

Teimoury, E., Fesharaki, M. and Bazyar, A. 2010. The relationship between mediated power asymmetry, relational risk perception, and governance mechanism in new product development relationships. *Journal of Research in Interactive Marketing* 4(4): 296-315.

Tembo, G and Zulu, M.M. 2014. Export horticulture and household welfare: Evidence from Zambia. *Journal of Development and Agricultural Economics* 6(2):76-86.

Teng, S. G. and Jaramillo, H. 2006. Integrating the US textile and apparel supply chain with small companies in South America. *Supply Chain Management: An International Journal* 11: 44-55.

Thomas, R. W. and Esper, T. L. 2010. Exploring relational asymmetry in supply chains: The retailer's perspective. *International Journal of Physical Distribution & Logistics Management* 40:475-94.

Tobin, J. 1958. Estimation of relationships for limited dependent variables. *Econometrica* 46(1): 24-36.

Uphoff, N. 1986. Local institutional development: An analytical source book with cases. West Hartford, Connenicut, USA: Kumarian Press.

USAID (United States Agency for International Development). 2005. Value chain analysis. URL: https://www.microlinks.org/good-practice-center/value-chain-wiki/32-value-chain-analysis (accessed 7 August 2015).

Van Berkum, S. 2006. Restructuring and vertical coordination in the dairy sector in Romania *In:* Swinnen, J. F. M. (Ed.) *Case studies: the dynamics of vertical coordination in the agrifood*

chains of the transition countries of Eastern Europe and Central Asia. Working Paper No. 42, ECSSD, Europe and Central Asia. Washington, DC: The World Bank.

Vermeulen, H., Kirsten, J. and Sartorius, K. 2008. Contracting arrangements in agribusiness procurement practices in South Africa *Agrekon* 47: 198-221.

Vijayasarathy, L. R. 2010. Supply integration: an investigation of its multi-dimensionality and relational antecedents. *International Journal of Production Economics* 124:489-505.

Vorley, W., Fearne, A. and Ray, D. (eds). 2007. Regoverning markets: A place for small-scale producers in modern agrifood chains. Gower, IIED.

Wainaina, P.W., Okello, J.J. and Nzuma. J. 2012. Impact of contract farming on smallholder poultry farmers' income in Kenya. Paper presented at the 2012 Triennial Conference of International Association of Agricultural Economists: Foz do Iguacu, Brazil.

Wang, H.H., Zhang,Y. and Wu, L. 2011. Is contract farming a risk management instrument for Chinese farmers? *China Agricultural Economic Review* 3(4):489-504.

Wang, H.H.,Yu, H. and Li, B. 2013. Is dairy complex a solution to food safety for raw milk? A comparison of farmers' perceived and realized safety effects. Paper presented at the CAER-IFPRI Annual International Conference on Transforming China's Agricultural and Rural Sector:Challenges and Solutions: Wuhan, China.

Warning, M. and Key, N. 2002. The social performance and distributional consequences of contract farming: An equilibrium analysis of the Arachide de Bouche program in Senegal. *World Development* 30(2): 255–63.

White, J. and Gorton, M. 2006. A comparative study of agrifood chains in Moldova, Armenia, Georgia, Russia and Ukraine *In:* M, S. J. F. (Ed.) *Case studies: the dynamics of vertical coordination in the agrifood chains of the transition countries of Eastern Europe and Central Asia. Working Paper No. 42, ECSSD, Europe and Central Asia.* Washington, DC: The World Bank.

Wiggins, S., Argwings-Kodhek, G., Leavy, J. and Poulton, C. 2011. Small farm commercialisation in Africa: Reviewing the issues. Future Agricultures.

URL:http://www.ids.ac.uk/files/dmfile/SmallFarmCommercialisationResearch_Paper231.pdf (accessed 15 September 2012).

Wiggins. S. and Keats, S. 2013. Leaping and learning: Linking smallholders to markets. URL: https://www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-files/8407.pdf (accessed on 17 March 2016)

Williamson, O. E. 1985. *The economic institutions of capitalism*, New York, Free Press.

Williamson, O. E. 1991. Comparative economic organization: the analysis of discrete structural alternatives. *Administrative Science Quarterly* 36: 269-296.

Williamson, O. E. 1993a. Transaction cost economics and organization theory. *Industrial and Corporate Change* 2**:**107-56.

Williamson, O. E. 1993b. Calculativeness, trust, and economic organization. *Journal of Law & Economics* 36: 487-500.

Williamson, O. E. 2002. The theory of the firm as governance structure: From choice to contracts. *Journal of Economic Perspectives* 16:171-95.

Wooldridge, J. M. 2002. Econometric analysis of cross section and panel data. The MIT Press: Cambridge, Massachusetts.

World Bank. 2005. Rural finance innovations: Topics and case studies. Report No. 32726-GLB Washington, DC, USA.

World Bank. 2012. Gender equality and development. World development. URL:http://documents.worldbank.org/curated/en/340251467998214789/pdf/102736-BRI-VP-344-Contract-Farming-Box394838B-PUBLIC.pdf (accessed on 13 May 2017).

Yami M., Tesfaye, T. and Bekele, A. 2013. Determinants of farmers' participation decision on local seed multiplication in Amhara region, Ethiopia: A double-hurdle approach. *International Journal of Science and Research* 2(1):423-28.

Yen S. T. and Huang, C. L. 1996. Household demand for finfish: A generalised double-hurdle model. *Journal of Agricultural and Resource Economics* 21(2):220-34.

Zhu, H. and Wang, X. 2007. An analysis on the influencing factors of tomato growers' participation in contract farming in Xinjiang autonomous region. *Chinese Rural Economy* 7: 67-75.

Zulu, B.A.M., Sitko, N.J. and Namonje. K.T. 2015. 51 years of Zambian agriculture, in Chapoto A and Sitko, J (eds), *Agriculture in Zambia: Past present and future.* IAPRI, Lusaka, Zambia.

APPENDICES

Appendix 1: Results for the Cronbach α test for multi-item variables used in the study and measures of fit for probit model of determinants of smallholder farmers' decision to participate in interlocked contractual arrangements

Table A1.a: Construct reliability test for multi-item variables

	Cronbach α	
	Buyer (B)	Supplier (S)
Trust	0.80	0.80
TST01: We believe in the supplier (buyer) because s/he is sincere		
TST02: Though the circumstances change, we believe that the supplier (buyer) will be ready and willing to offer us assistance and support		
TST03: When making important decisions, the supplier (buyer) is concerned about our welfare or interests		
TST04: We can count that the supplier (buyer)'s future decisions and actions will not adversely affect us		
TST05: When it comes to things that are important to us, we can depend on the supplier's (buyer's) support		
Power Asymmetry	0.88	0.87
PWA01: It would be difficult for the buyer (supplier) to replace the milk sales and profits realised from your business with another supplier's milk (buyers).		
PWA02: The buyer's (supplier's) total costs of switching to another comparable supplier (buyer) would be prohibitive		
PWA03: The buyer (supplier) is strongly dependent on the milk supplied(bought) by your firm		

Notes: B stands for milk buyer (processing firms), S connotes milk supplier (smallholder farmer).

Table A1.b: Measures of Fit for Probit model of factors influencing smallholder farmers' decision to participate in interlocked contractual arrangements

Log- Lik Intercept only	-176.103	Log- Lik Full Model	-24.941
D (245)	49.882	LR (20)	302.324
		Prob > LR	0.000
McFadden's R^2	0.858	McFadden's Adj R^2	0.739
Maximum Likelihood R^2	0.679	Cragg & Uhler's R^2	0.925
McKelvey & Zavoina's R^2	0.970	Efron's R^2	0.893
Variance of y*	33.796	Variance of error	1.000
Count R^2	0.974	Adj Count R^2	0.930
AIC	0.345	AIC*n	91.882
BIC	-1318.074	BIC'	-190.654

Appendix 2: Balancing properties of covariates between treated and control units

Table A3: Balancing properties of covariates between treated and control units

Variable	Sample	Mean Treated Units	Mean Control Units	% Bias between Treated & Control	% Reduction in bias	H0: Mean (treated) = mean (control) t	p>t
		(1)	(2)	(3)	(4)	(5)	(6)
Age of household head	Unmatched	52.56	49.23	24.5		1.74	0.083
	Matched	52.56	52.64	-0.6	97.7	-0.04	0.968
Gender of household headed	Unmatched	0.9183	0.9429	-9.6		-0.69	0.494
	Matched	0.9184	0.9348	-6.4	33.0	-0.43	0.665
Age of household head squared	Unmatched	2931.7	2618.4	21.6		1.54	0.125
	Matched	2931.7	2950.1	-1.3	94.1	-0.09	0.930
Household size	Unmatched	5.1224	5.0762	2.1		0.15	0.880
	Matched	5.1224	5.0528	3.2	-50.6	0.22	0.830
Man equivalent units	Unmatched	4.3204	3.6867	34.9		2.50	0.013
	Matched	4.3204	4.0378	15.6	55.4	1.04	0.302
Marital status of household head	Unmatched	0.7857	0.8667	-21.4		-1.53	0.128
	Matched	0.7857	0.8025	-4.4	79.3	-0.29	0.775

Note: Matching reduced pseudo R^2 from 0.063 to 0.009 and the overall likelihood ratio Chi-square for the probit relationship from 17.78(p-value = 0.007) to 2.47 (p-value=0.872)

Appendix 3: Results for range of common support tests of propensity scores

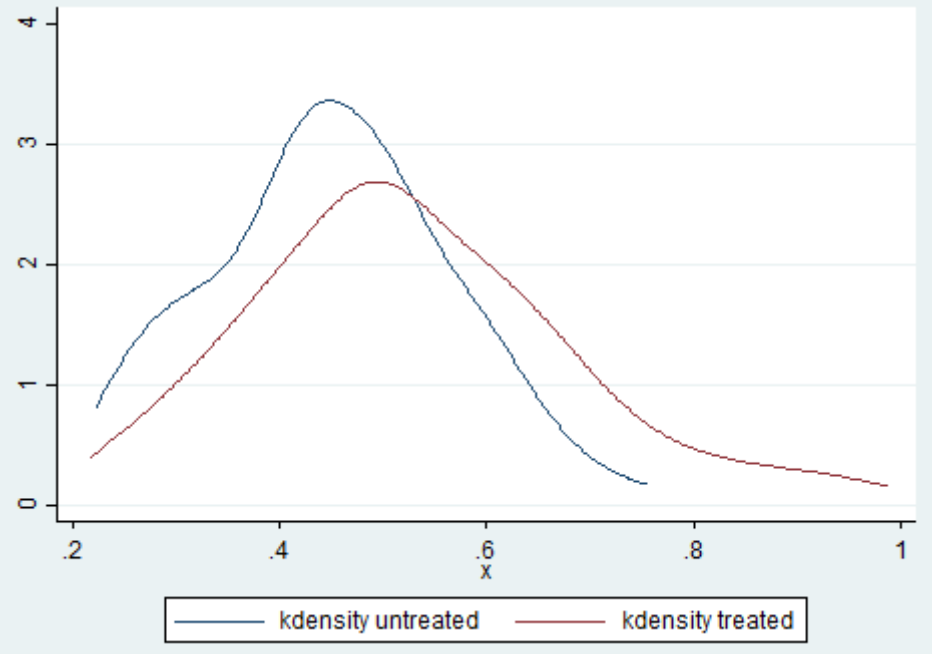

Figure A1: Density plot for propensity scores for comparison and treatment households

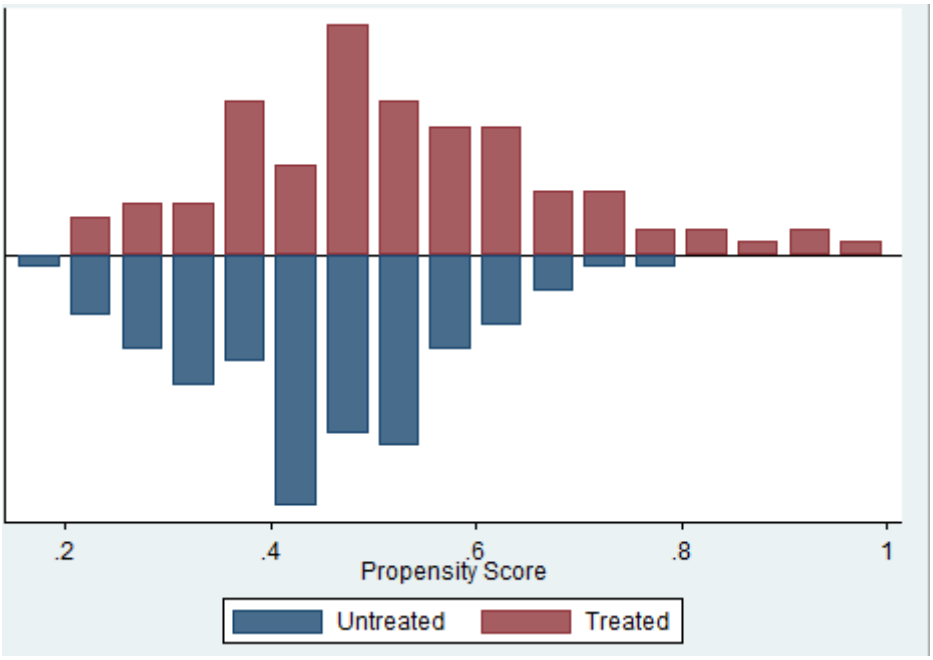

Figure A2: Distribution of propensity scores over comparison and treatment households and the common support requirement

Appendix 4: Household, milk collection centre, milk processors and financial institution questionnaires

SMALLHOLDER FARMER Dairy Farmers Survey

This survey is part of the team effort at University of Pretoria South Africa and University of Zambia aimed at understanding the extent and conditions under which interlocked contractual arrangements are inclusive of SMALLHOLDER FARMER dairy farmers and whether participation enhances their wellbeing. We hope that the information generated will enhance the process of integrating SMALLHOLDER FARMER farmers in mainstream value chains, input and financial markets. Your help in answering these questions is very much appreciated. Your responses will be kept **COMPLETELY CONFIDENTIAL.** You indicate your voluntary consent by participating in this interview: may we begin?

1. HOUSEHOLD IDENTIFICATION

1.1 Province code **PROV** | | Province name: _____

1.2 District code **DIST** | | District name: _____

1.3 Constituency code **CONST** | | Constituency name: _____

1.4 Ward code **WARD** | | Ward name: _____

1.5 Region **REGION** ***1= Rural 2= Urban*** |

1.6 Village/locality name **VIL** _____

1.7 Name of household head **NAMEHH** _____

1.8 Is the household head the main respondent? **RESPOWN** ***1 = Yes → Go to question 1.13,***

2=No |

1.9 Name of main respondent *(if different from household head)* **NAMERESP_____**

1.10 Cell phone number of respondent **CELLPHONE** _____

(Enumerator: record the best phone number at which to reach the main respondent)

Enumerator: only interview the household head, unless the dairy operations are mainly managed by another household member, in that case interview that person. Ensure that the main respondent is knowledgeable about the farm, milk production and marketing operations. If not, postpone the interview and call back when a knowledgeable person is around.

1.11 Did this household produce milk in the last 12 months? **MILK** | **(1=Yes; 2= No)**

1.12 Response status (1=Complete; 2=Refusal; 3=Non-contact; 4= HH moved out of SEA) **status** |

1.13 Date of enumeration (dd/mm/yy) **daten** | / | / **1** | **4**

1.14 Name of enumerator _____ code **enum** | |

1.15 Date checked (dd/mm/yy) **datec** | / | / **1** | **4**

2.0 DEMOGRAPHIC CHARACTERISTICS OF HOUSEHOLD MEMBERS

2.1 Tell us about each adult member of the household born in or before 2002 (12 years and above) who lived in this household between 1ST July 2013 and 30TH June 2014. If this household is part of a polygamous family, ask only about the household members in this particular household.

Table 2.1: Demographic Characteristics of Adult Members *Key variables: CLUSTER, HH, MEM* ***Reference Period: Beginning of July 2013 to end of June 2014***

ID	**Name (Enumerator: list the head first, next spouse(s) and then all adult members born in or before 2002 who lived in this household since the beginning of July 2013 to end of June 2014)**	In which **year** was **…… born?** *Note: it should be in or before 2002*	What is the **sex** of **..... ?** *1=male 2=female*	What is the **relationship** of …. to the **current head?** *(See codes below)*	What is the **marital status** of **…..?** *(See codes below)*	Is ..... **attending formal school?** *1 = Yes 2 = No (See codes below)*	What is the **highest level** of **formal education completed ?**	What is the **tribe** of the **current head?** *(See codes below)*	What is the **tribe** of the **current spouse…?** *(See codes below) (For polygamous households, ask about the most senior wife)*	Does ……have any **skills** or **knowledge** in **dairy farming?** *1 = Yes 2 = No*	**Between July 2013 and June 2014,** in how many months was …. **away** from the **household?** ***(Must be 12 or less)*** *Enter "0" if never away* ***If DA07 = 12 months → go to next HH member***	**Between July 2013 and June 2014, was ….chronically ill/disabled and unable to perform household duties for at least three (3) months?** ***1= Yes 2= No → go to next MEM***
MEM	**NAME**	**DA01**	**DA02**	**DA03**	**DA04**	**DA05**	**DA06**	**DA07**	**DA08**	**DA09**	**DA10**	**DA11**
1												
2												
3												
4												
5												
6												
7												
8												
8												
10												
11												
12												
13												
14												

Relationship to head (DA03)

1= head	5= brother / sister
2= spouse	6= other relatives
3= child (own/step)	7= unrelated
4= parent / parent-in-law	

Marital Status (DA04)

1=never married
2= monogamously married
3= polygamously married
4= divorced
5= widowed
6= separated
7= cohabit

Education levels (DA06)

00=None
01=Sub-standard A;
01=Sub-standard B;
02=Standard 1;
03=Standard 2;
04=Standard 3;
05=Standard 4;
06=Standard 5; Grade 6
Grade 1 07=Standard 6; Grade 7
Grade 1 08=Form 1; Grade 8
Grade 2 09=Form 2; Grade 9
Grade 3 10=Form 3; Grade 10
Grade 4 11= Form 4; Grade 11
Grade 5 12= Form 5; Grade12
13= Form 6 Lower
14= Form 6 Upper
15= College Student
16=Undergraduate student
17=Certificate/Diploma
18= Bachelors Degree
19= Masters degree & above

Tribe codes (DA07, DA08)

BEMBA-SPEAKING	TONGA- SPEAKING	BAROTSE LANGUAGE GROUP	NYANJA-SPEAKING	TUMBUKA-SPEAKING
13= Ambo	25= Gowa	41= Imilangu	48= Chewa	60=Senga
01= Bemba	22= Ila	37= Koma	53=Chikunda	59=Tumbuka
04= Bisa	20= Lenje	36= Kwandi	52=Kunda	61=Yombe
17= Bwile	21= Soli	35= Kwangwa	50=Ngoni	
06= Chishinga	23= Toka-Leya	43= Lozi	49= Nsenga	
09= Kabenda	19= Tonga	34= Luyana Sub-group	51=Nyanja	
03= Lala		47= Mashasha		
08= Lamba		42= Mashi		
14= Lima		40= Mwenyi	MAMBWE LANGUAGE GROUP	OTHER
18=Luano	NORTH-WESTERN GROUP	46= Nkoya	54= Lungu	63= Kaonde-Ila
02= Lunda(Luapula)	32= Chokwe	38= Nyego	55= Mambwe	62= Shona
12= Mukulu	33=Kaonde Sub -Group	39= Simaa	56= Namwanga	64=Other
07= Ngumbo	29= Luchazi	45= Subiya	58= Tambo	
15= Shila	27 = Lunda(North-Western)	44= Totela	57= Wina	
11= Swaka	26= Luvale			
10= Tabwa	31= Mbowe			
16=Unga	28= Mbunda			
05=Ushi	30= Ndembu			

2.2 Tell us about each child member of the household born in after 2002 (below 12 years) who lived in this household between 1ST July 2013 and 30TH June 2014. If this household is part of a polygamous family, ask only about the household members in this particular household.

Table 2.2 Demographic Characteristics of Child Members *Key variables: CLUSTER, HH, MEM1* ***Reference Period: Beginning of July 2013 to end of June 2014***

ID	Name (**Enumerator:** *list all children born **after 2002** who lived in this household from beginning* **of July 2013 to end of June 2014.** ***Start with the oldest child.)***	In which **year** was **…… born?** *Note: it should be after 2002*	What is **the sex** of **…….. ?** *1=male 2=female*	What is the **relationship** of **….** to the **current head?** *(See codes below)*	Is **…….. attending formal school?** *1 = Yes 2 = No*	What is the **highest level** of **formal education …. completed?** *(See codes below)*
MEM1	**NAME**	**DC01**	**DC02**	**DC03**	**DC05**	**DC06**
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						

Relationship to head (DC03)

1= head	4= parent /parent-in-law	7= unrelated
2= spouse	5= brother/sister	
3= child (own/step)	6= other relative	

Formal School education levels (DC05)

00=None	02=Standard 1; Grade 2	05=Standard 4; Grade 5	08=Form 1; Grade8
01=Sub-standard A; Grade 1	03=Standard 2; Grade 3	06=Standard 5; Grade 6	
01=Sub-standard B; Grade 1	04=Standard 3; Grade 4	07=Standard 6; Grade 7	

3.0 DISTANCES TO AND ACCESS TO IMPORTANT DAIRY PRODUCTION-ENHANCING FACILITIES

Table 3.1 Distances to key agricultural services *Key variables: CLUSTER, HH, KEYSERV* ***Reference period: NOW***

From the homestead, how far is it to the NEAREST ……?		**Distance** *(1 mile=1.6 kilometers)* *(**Enumerator**: Record in kilometers. Enter "0" if less than one km Enter "99" if do not know)*	**From the homestead, how far is it to the NEAREST ……?**		**Distance** *(1 mile=1.6 kilometres)* *(**Enumerator**: Record in Kilometres. Enter "0" if less than one km Enter "99" if do not know)*	What type of buyer is this? *Enter 1= Direct consumers 2= Shops 3= Institutional buyers 4= Traders 5= Local processors 6= Modern processors*	When did you start selling to this buyer? *(Enter year)* *Enter "-9" if did not sell*
KEYSERV		**KS02**	**KEYSERV**		**KS02**	**KS05**	**KS06**
Milk collection centre(dairy cooperative/society)	1		Feeder road	8			
Boma(main town)	2		Milk processing factory	9			
Bus stop/rail station where you can board public transport	3		Dip tank	10			
Milk trader location	4		Water source(Borehole/piped water/dam/well	11			
Agro-input dealer for livestock inputs	5		Electricity supply	12			
Veterinary camp office	6		Financial institution (Banks/Micro Finance Institutions)	13			
Tarmac/tarred road	7		Place where you can sell your milk apart from the MCC	14			

3.2 We now would like to talk about this household's access to dairy production-enhancing key services/ facilities

3.2.1 a) Are you a member of a dairy cooperative/society/association? **SR01** ☐ *(1=Yes; 2=No → go to 3.2.2)*

b) If yes, which year did you become a member? **SR02** ☐ *(1=Yes; 2=No)*

3.2.2 For how many months in a year is the nearest main road passable by motorized vehicles? **SR03** ☐

3.2.3 a) Does this household currently have access to electricity (e.g. grid, generator, solar panel)? **SR04** ☐ *(1=Yes; 2=No)*

b) Does this household sell milk to the milk collection centre (MCC)? **SR05** ☐ *(1=Yes; No =2 → go to 3.2.4a)*

c) By the time you started selling milk to MCCs did you have access to electricity? **SR06** ☐ *(1=Yes; 2=No)*

3.2.4 a) What is the major source of water available for your dairy animals? **SR07** ☐ *(1=River/Stream; 2= Well; 3=Dam/Lake; 4= Borehole; 5= Other(s) specify)*

3.2.4 *b*) Is the water available from the major source all year round? **SR08** ☐ *(1=Yes; 2=No)*

3.2.5 Does any **member** of this **household** have a **bank account**? **SR09** ☐ *(1=Yes; 2=No)*

3.2.6 Does any **member** of this **household** have an **agricultural insurance policy**? (e.g. for the dairy animals) **SR10** ☐ *(1=Yes; 2=No)*

3.2.7 Please tell us about the **dairy-related advice/information, technical assistance, training and inputs the household received from organisations, private sector** or **individual farmers**

Table 3.2.7: Advice/information, technical assistance, training and inputs provision *Key Variables: CLUSTER, HH, SRCODE* ***Reference Period: Beginning of July 2013 to end of June 2014***

Type of assistance		Has any member of the HH ever…? *1 = Yes* *2 = No → go to next **Type of assistance*** **SR10**	Who were the **suppliers/ providers** of **this advice assistance?** *(see code below)* ***Tick all that apply*** **SR11**	How many **times** did you **receive** this **assistance in the last 12 months? (*Beginning of July 2013 to end of June 2014)*** **SR12**	When did you **first receive** this **type of assistance?** *(Enter year)* **SR13**	In which **year** did you **last receive** this **type of assistance?** *(Enter year)* **SR14**
	SRCODE					
Received any advice on dairy production & management practices(breeding, feeding, milking)	1					
Received any information about prevention & control of cattle diseases	2					
Received any advice on record keeping	3					
Received any advice on dairy processing	4					
Received any information on dairy marketing(distribution channels, prices)	5					
Received any discounted /free inputs for dairy production (feed, dairy equipment, etc.)	6					
Received a free cow/female cow	7					

Suppliers/providers of technical assistance/advice/information(SR08)				
1= Ministry of Agriculture & Livestock	5= Dairy cooperative/society(MCC)	9=Suppliers of dairy equipment (SARO)	12= Zambia Agribusiness Technical Assistance Centre (ZATAC)	16= Care International
2= Livestock Development Trust(LDT	6= Dairy Association of Zambia	10=Agro feed suppliers	13= Land 'O' lakes	17= World Vision
3= Fellow farmers	7= Zambia National Farmers' Union	11=Milk processing company(Parmalat, Zambeef)	14= Heifer Project International(HPI)	19= USAID-PROFIT/MUSIKA
4= Informal sector intermediaries	8= Commercial bank/Micro Finance institution (MFI)		15= Herd Book Society of Zambia	20= Other specify

3.2.8 We now want to ask about the sources of funding that this household has used to finance its dairy production

Source of funding		In the **last 5 years (2008-2012)** did the **HH use** …… to **fund** its **dairy enterprise?** *Enter* *1=Yes* *2=No*	In the last 12 months (***Beginning of July 2013 to end of June 2014)*** did the **HH use** …… to **fund** its **dairy enterprise?** *Enter* ***1=Yes*** ***2=No→ go to next source of funding(FUND)***	Source of funding		In the **last 5 years (2008-2012)** did the **HH use** …… to **fund** its **dairy enterprise?** *Enter* *1=Yes* *2=No*	In the last 12 months (***Beginning of July 2013 to end of June 2014)*** did the **HH use** …… to **fund** its **dairy enterprise?** *Enter* *1=Yes* *2=No→next source of funding*
	FUND	**FD01**	**FD02**		**FUND**	**FD01**	**FD02**
Retained profits from dairy	1			Loan/credit	6		
Income from other farm activities apart from dairy	2			Family members/relatives	7		
Personal Savings	3			Government	8		
Informal savings group(Chilimba)	4			NGO/or project	9		
Customer advances	5			Other (Specify)	10		

3.2.9(a) Please tell us more about **any loans/credit the household** may have **acquired** to **support** its **dairy production**

Table 3.2.9(a): Sources of credit, loan amounts, usage and collateral requirements

Source of loan /credit		Did any member of your household borrow **money** (**cash or in-kind**) from … to **support dairy production in the last five years (June 2009-July 2014)** *1 = Yes* *2 = No → go to next credit/loan source(LNA)*	What was the **value** of this **loan/credit, excluding interest?** **Enumerator:** Enter(Kwacha equivalent if it was in-kind)? *(ZMW)*	What was the **loan/credit used for**? *1= acquisition of dairy animals* *2= land acquisition* *3= milking equipment/utensils* *4= fridge* *5= operational expenses(feed, veterinary services & other inputs)* *6= fencing* *7= development of paddocks/fencing* *8= other(s) specify*	Was **collateral required** to obtain this loan/credit? *1=Yes* *2=No → go to next source of loans/credit (LNA)*	What **main type of collateral** did the household use to obtain this loan/credit? *1=land title* *2=farm implements/ equipment* *3=vehicle* *4=house* *5=animals* *6=bank account* *7=salary* *8=membership in a club/ community group/ cooperative/mcc* *9=contract with milk processor* *10= bank loan guarantee* 11= *other household assets 12= insurance*
LOAN		**LN01**	**LN02**	**LN03**	**LN04**	**LN05**
Bank (specify)	1					
Micro Finance Institution (specify)	2					
Dairy Cooperative/MCC	3					
Friend/relative/informal money lender (e.g. Kaloba)	4					
NGO/project (specify)	5					
Government run programme	6					
Milk processing company	7					
Agro-input dealer for livestock inputs	8					
Other (specify)	9					

4.0 HOUSEHOLD RESOURCE ENDOWMENT

4.1 We would like to know about the household's land holding and use between the beginning of July 2013 to end of June 2014.

Table 4.1: Land holding and use *Key Variables: CLUSTER, HH, FIELDTP* ***Reference Period: 1st July 2013 to 30th June 2014.***

Types of field		During July 2013 to end of June 2014 did the **household have any** ….? *1= Yes* *2= No → go to next* ***Field type***	What **area** was under……?		What is the **tenure status** of the…..? *1= State land titled* *2=Former customary land titled* *3=Customary no title* *4= Other specify*	What **main crop or use** did the household put **this field** to in 2013/14 agricultural season? *See crop codes below*	What is the **current purchase price** of **land**?		What is the **current rented value** of **land**?	
			Area	Units *1= Lima* *2= Acre* *3= Hectare* *4=Square meters*			*ZMW*	*Units* *1= Lima* *2= Acre* *3= Hectare* *4=Square meters*	*ZMW*	*Units* *1= Lima* *2= Acre* *3= Hectare* *4=Square meters*
	FIELDTP	**FD01**	**FD02**	**FD03**	**FD04**	**FD05**	**FD06**	**FD07**	**FD08**	**FD09**
Cultivated Crop fields										
Own Crop fields	1									
Rented in cropped fields(cash/in-kind payments	2									
Borrowed in cropped fields(without payment)	3									
Other fields										
Gardens	4									
Orchards	5									
Fodder production	6									
Fallow fields (pasture/ natural/ improved)	7									
Rented out fields(received or will receive cash/in kind payment)	8									
Borrowed out fields(without payment)	9									
Virgin land(never cultivated)	10									
Other (Specify)	11									

Crop code or Use Codes (FD05)			
1= Maize	9= Irish potatoes	17=Sweet Potatoes	25= Virgin
2= Sorghum	10= Virgin Tobacco	18= Cassava	26= Newfield
3=Rice	11= Burley tobacco	19= Kenaf	27=Garden
4= Millet	12= Mixed beans	20 = Cashew Nut	28=improved fallow/natural/pasture
5=Sunflower	13= Bambara nuts	21=Paprika	29=Fodder
6= Groundnuts	14= Cow peas	22= Popcorn	30= Rented/ borrowed out
7= Soya beans	15= Velvet beans	23= Sugarcane	31= Other(specify)
8= Seed cotton	16= Coffee	24 = Orchard	

4.2 *Physical capital/assets:* Please tell us about the type and number of *functional/**repairable non-livestock and livestock assets owned by the household.***

Table 4.2: Physical Assets *KEY VARIABLES: CLUSTER, HH, ASSET*

		Has this HH **ever owned** …? *1=Yes* *2=No → go to the next ASSET*	**<u>Enumerator:</u> Only ask if HH sells milk to MCCs. If not go→AST03** How **many**…… did you **own** at the **time** you **started supplying milk** to the **MCC(s)**? *Enter "0"if none*	How **many** …….did the **HH** own **between 1st July 2013** and **30th June 2014?** *Enter "0"if none*	Enumerator: ***ASK IF AST03≠0*** Approx. what is the **total value** of … **owned between 1st July 2013** and **30th June 2014?** *Enter "99"if does not know* *(ZMW)*
ASSET		**AST01**	**AST02**	**ATS03**	**AST04**
Tractor	1				
Truck/pick up/car	2				
Motor cycle	3				
Bicycle	4				
Tractor trailer	5				
Ox/donkey cart	6				
Cattle	7				
Goats	8				
Pigs	9				
Sheep	10				
Village chickens	11				
Donkeys	12				
Milking parlor with cement floor	13				
Milking parlor without cement floor	14				
Dip tank/Spay race	15				
Paddock	16				
Feed storage tank	17				
Barn/storeroom	18				
Stable for cattle	19				
Stainless steel/ Aluminum milking canes	20				
T.V	21				
Radio	22				
DVD/VCD player	23				
Satellite Dish	24				
Cell phone	25				
Stove (Gas or elect)	26				
Refrigerator/Deep freezer	27				
Sewing machine	28				
Electric iron	29				
Non-electric iron	30				
Solar panel	31				
Generator	32				
Hammer mill	33				
Water pump	34				
Treadle pump	35				
Borehole	36				
Planter	37				
Sheller/combined harvester	38				
Plough/harrow	39				

4.3 We would now like to know more about this household's cattle herd.

Table 4.3.1 Breed and types of cattle owned *KEY VARIABLES: CLUSTER, HH, BREED*

Type of cattle		**Enumerator:** *only ask if HH supplies milk to MCC. If not → go to* **LV02** **Total number** of…. **cattle owned** at the **time** the **HH started selling milk** to the **MCC?**	**Total cattle owned** in **2009**	**Total cattle owned** between **1st July 2013** and **30th 2014 June**	**Number** of **Calves** *(male and female)* between **1st July 2013** and **30th 2014 June**	**Average Price** of **calf** *(ZMW per calf)* *Enter "99" if do not know)*	**Number** of **steers** (*male cattle 10-24 months)*	**Average price** of a **steer** *(ZMW/steer)* *Enter "99" if do not know)*	**Number** of **bulls owned** between **1st July 2013** and **30th 2014 June**	**Average price** of a **bull** *(ZMW per bull)* *Enter "99" if do not know)*	**Number** of **oxen owned** between **1st July 2013** and **30th 2014 June**	**Average price** of an **ox** *(ZMW/ox)* *Enter "99" if do not know)*	**Number** of **heifers owned today** ***Enumerator*** *please note a heifer is a mature cow that has not yet calved*	**Average price** of an **heifer** (ZMW/ heifer) *Enter "99" if do not know)*
BREED		**LV01**	**LV02**	**LV03**	**LV04**	**LV05**	**LV06**	**LV07**	**LV08**	**LV09**	**LV10**	**LV11**	**LV12**	**LV13**
Traditional/local	1													
Mixed/Cross	2													
Pure	3													
Other(specify)	4													

Table 4.3.2: Cows by breed owned by household Note: a cow is a mature female cattle that has calved before (at least once). KEY VARIABLES: CLUSTER, HH, BREED

Type of cattle		Please indicate the total **number of……. cows**				**Average Price** of **one lactating cow** *(ZMW)* *Enter "99" if do not know)*	**Average milk produced per cow per day in** the **last**….		**Average duration** of **lactation period** *Enter (Months)*	Till what **age** does the**….breed produce milk?** *Enter (Years)*	**Average calving interval** (*Number of months between 2 calf births)*
		Enumerator: only ask if HH supplies milk to MCC. *If not → go to* ***LV15*** Owned at the time the HH started selling its milk to the MCC?	**Owned** in **2009**	**Owned** between **1st July 2013** and **30th 2014 June**	**Lactating** between **1st July 2013** and **30th 2014 June**		**Rainy season (peak) (Dec-May)** *Enter the number of litres*	**Dry season (Jun-Nov)** *Enter the number of litres*			
BREED		**LV14**	**LV15**	**LV16**	**LV17**	**LV18**	**LV19**	**LV20**	**LV21**	**LV22**	**LV23**
Traditional/local	1										
Mixed/Cross	2										
Pure	3										

SECTION 5.0: CATTLE MANAGEMENT PRACTICES

Table 5.1: Enumerator: tell the respondent that we would now like to know more about the dairy management practices that this household follows

Did the household perform any of the following practices?		In the last 12 months *1=Yes* *2=No **go to**→next practice*	In which year, did you first use this practice?	What type of records do you keep? *1= Milk production* *2= Reproduction* *3= Veterinary schedules* *4= Financial* *5= Input use* *Enumerator: indicate all those that apply*
PRACTICE		MGTPRTC01	MGTPRTC02	MGTPRTC03
Keep records of production, use of inputs, sales, or profit & loss accounts	1			
Zero grazing (all dairy cows in a stable, fed daily)	2			
Fenced/ paddock grazing	3			
Free range	4			
Calf stimulus	5			
Artificial insemination	6			
Use of own improved breed bull (s) to service cows	7			
Use of hired improved breed bull (s) to service cows	8			
Suckling after milking?	9			
Bucket feeding of calves with milk and calf starter	10			
Feeding cows with concentrate during milking	11			
Using milking machine	12			
Rinsing of udder before & in between milking	13			
Use of approved lubricant for hand milking	14			
Use of stainless steel/aluminium pails for milking	15			
Use of stainless steel/aluminium containers for transportation	16			
Cultivation of pasture/fodder)	17			
Own feed production (from grass, etc.)?	18			
Fumigation	19			
Dipping/spaying /hand dressing	20			
Vaccination(s)	21			
Deworming	22			
Biosecurity measures	23			
Scheduled Veterinary visits	24			
TB testing	25			

5.1. We would like to ask now about cattle diseases and how the household manages those diseases.

5.1a). Were any of the dairy animals infected by disease in the last 12 months? L**DS01** ☐ *(1=Yes; 2=No → **go to section 6.0**)*

5.1b). Which cattle diseases were prevalent on your farm in the last 12 months? L**DS02** ☐ *(1= Fleas; 2= Ticks; 3= Worms; 4= Mastitis; 5= Other(s) specify)*

5.1c). How were these diseases treated? **LDS03** ☐ *(1= Veterinary Drugs/Vaccines; 2= Traditional medicines → **go to Section 6;** 3= Not treated → **go to Section 6.0**)*

5.1d). What was the main source of the drugs/ vaccines? **LDS04** ☐ *(1= Fellow farmers; 2=Veterinary Department, 3= MCC, 4= Agro dealer 5= Other(s) specify)*

5.1e). How many animals were lost to diseases between 1st July 2013 and 30th June 2014**?** **LDS05** ☐ ***(Enter "0" if none)***

SECTION 6.0: MILK PRODUCTION, SALES, PRODUCTION AND MARKETING COSTS

Enumerator: Tell the respondent that we would now want to know more about the **household's milk production, sales, production and marketing costs**

6.1 Did the household produce any milk from the beginning of July 2013 to the end of June 2014? ☐ *(1=Yes; 2=No →**go to 6.2***

Table: 6.1.1 Milk production and sales *Key Variables: CLUSTER, HH, MPS* ***Reference Period: Beginning of July 2013 to end of June 2014***

Milk production and sales		For which months was the ….. *0= None 1 = Low 2 = High* ***If production or sales or consumption are constant for all months, probe further.***												**In a typical high month, how much…. did the HH produce/sell/ consume?** *(litres)*	**In a typical low month, how much…. did the HH produce/sell/ consume?** *(litres)*	What was the **last price** the HH received when …… was **sold**? *(ZMW/litre)*
		2013 July	Aug	Sept	Oct	Nov	Dec	2014 Jan	Feb	Mar	Apr	May	Jun			
	MPS	**PS01**	**PS02**	**PS03**	**PS04**	**PS05**	**PS06**	**PS07**	**PS08**	**PS09**	**PS10**	**PS11**	**PS12**	**PS13**	**PS14**	**PS15**
Production of **milk** (including home consumption) **…**?	1															
Sales for **cash** and **barter** of **fresh milk …?**	2															
Sales for **cash** and **barter** of **sour milk …**?	3															
Other dairy products…? Specify	4															
Other dairy products…? Specify	5															

6.2 Enumerator: *Tell the respondent that you would like to ask about the main source of labour for key activities for dairy production and marketing during the last 12 months.*

Table 6.2 Labour for key activities for dairy production and marketing *Key variables CLUSTER HH LABOUR* ***Reference Period: Beginning of July 2013 to end of June 2014***

Activity		Who provided **most** of the **labour** for …? *(see codes below)* *Enter "0" if did not do this activity →go to next activity*	How many **people carried out** this **activity in the last……season?**		On **average** how much did you spend per month on labour for …in……month? ***Enumerator****: Only ask if response to LB01 >4* *(ZMW)*											
			Dry season (Jun-Nov)	**Rain season (Dec-May)**	**JUL 2013**	**AUG 2013**	**SEP 2013**	**AUG 2013**	**NOV 2013**	**DEC 2013**	**JAN 2014**	**FEB 2014**	**MAR 2014**	**APR 2014**	**JUN 2014**	**JUL 2014**
LABOUR		**LB01**	**LB02**	**LB03**	**LB04**	**LB05**	**LB06**	**LB07**	**LB08**	**LB09**	**LB10**	**LB11**	**LB12**	**LB13**	**LB14**	**LB15**
Milking	1															
Milk transportation	2															
Barn Scraping	3															
Feeding	4															
Calf care	5															
Breeding	6															
Calving	7															

Main source of Labour (LBO1)				
0=Did not do this activity	2=Family labour – male adults	4=Family labour – children (< 12 years)	6=Hired labour – female adults	8=Hired labour – children (< 12 years)
1=Family labour – female adults	3=Family labour – male and female adults	5=Hired labour – male adults	7=Hired labour – male and female adults	9=Mechanical power

6.3 Enumerator: Please tell us about your **purchased and non-purchased feed use** for **dairy/ lactation cows** and **non- lactation cattle** between **1ST July 2013 and 30TH June 2014**

Table 6.3.1: Purchased and non-purchased feed use during the RAIN/WET season *Key variables CLUSTER HH FEED* ***Reference Period: 1ST July 2013 to 30TH June 2014***

Type of purchased and non-purchased feed		**Dairy/lactating cows**							**All non-lactating cattle**					
		Enumerator Copy responses for **LV17 pg. 10** here. **Number of lactating cows**	**Number** of **wet months** between ***1ST July 2013 to 30TH June 2014*** **agricultural season**	What **type** of **feed** did you **use** in the wet season? *(See codes below)*	Where did this **feed come from**? *(See codes below*	On average how **much feed** did you use per month for……? *Enter "99" if do not know)*	Unit *(See codes below)*	What was the **average price per unit**? (market price) *Enter "99" if do not know) (ZMW)*	Other heads of cattle	What kind of feed did you use in **wet season**? *(See codes below)*	Where did this **feed come from**? *(See codes below)*	On average how **much feed** did you use per month? *Enter "99" if do not know)*	Unit *See codes below)*	What was the **average price per unit**? (market price) *Enter "99" if do not know) (ZMW)*
		LV17	**MTHSWET**	**FEED**	**FD01**	**FD02**	**FD03**	**FD04**	**LV26**	**FD05**	**FD06**	**FD07**	**FD08**	**FD09**
Fine/raw feed	a.													
	b.													
	c.													
	d.													
	e.													
	f.													
Additive	g.													
	h.													
	i.													

Table 6.3.2: Purchased and non-purchased feed use during the *DRY* season *Key variables CLUSTER HH FEED* ***Reference Period: 1ST July 2013 to 30TH June 2014***

Type of purchased and non-purchased feed		Dairy/lactation cows							All non-lactation cattle					
		Enumerator Copy responses for **LV17 pg. 10** here. **Number of lactating cows**	**Number** of **dry months** in *1ST July 2013 to 30TH June 2014*	What **type** of **feed** did you **use** in the dry season? *(See codes below)*	Where did this **feed come from**? *(See codes below)*	On average how **much feed** did you use per month for……? *Enter "99" if do not know)*	Unit *(See codes below)*	What was the **average price per unit**? (market price) *Enter "99" if do not know)* *(ZMW)*	Other heads of cattle	What **kind** of **feed** did you use in the **dry season**? *(See codes below)*	Where did this **feed come from**? *(See codes below)*	On average how **much feed** did you use per month? *Enter "99" if do not know)*	Unit *(See codes below)*	What was the **average price per unit?** (market price) *Enter "99" if do not know)* *(ZMW)*
		LV17	**MTHSDRY**	**FEED**	**FD10**	**FD11**	**FD12**	**FD13**	**LV26**	**FD14**	**FD15**	**FD16**	**FD17**	**FD18**
Fine/raw feed	a.													
	b.													
	c.													
	d.													
	e.													
	f.													
	g.													
Additive	h.													
	i.													
	j.													

Codes for Type of feed (FEED)				
Code: Fine feed		**Codes: Crop residues used for mixing**	**Codes: Grass mainly used for grazing, fodder production, pasture and fodder legumes**	**Codes: Additives**
1=Concentrate	7= Cottonseed cake	24= Crop residues from beans	17=Napier(elephant) grass 21=Star grass	12=Salt / cow lick stone
2=Hay/silage	8= Sorghum	25= Crop residues from groundnuts	18=Maize 22=Sun-hemp	13=Yeast
3=Molasses	9=Cowpeas	26= Crop residues from sunflower	19=Leucaena 23=Rhodes grass and buffer grass	14=Vitamins
4=Wheat bran	10=Soya bean	27= Crop residues from sweet potatoes	20=Velvet beans	15=Di-calcium phosphate (DCP)
5=Maize bran	11= other fine/raw feed, specify	28=Crop residues from maize		16=Other additives, specify
6= Sunflower cake				

Codes for Source of feed (FD01; FD06; FD10; FD15)		**Unit codes (FD08; FD17)**	
1=Just graze them	6=Bought fodder	1=kg	6=litre
2= Cut fodder from fields and bring to corralled cows	7=Purchased all ingredients and mill own feed	2=5 kg	7=5 litres
3= Grew own fodder crops and use own partly and maybe sell rest	8=Purchased milled rough feed	3=10 kg	8=10 litres
4= Grew grain feed and combined with purchased ingredients to assemble own rough feed	9= Purchased feed concentrates geared to specific types of animals and ages	4=25 kg	9=20 litres
5=Used crop residues		5=50 kg	10=roll/bale

6.4 Please tell us about your other production costs for all cattle and dairy cattle ***during the 2013/2014 agricultural season***

Table 6.3: Other Production costs Key variables: CLUSTER, HH, CHANNEL Reference period: Beginning of July 2013 to end of June 2014

Other production cost items		How much did you spend on …… *for all cattle* combined?	
		On average how **much** did you spend per month on……? *Enter "99" if do not know* *(ZMW)*	Total amount per year *(ZMW)*
	COST	**CST01**	**CST02**
Drugs(e.g. . vaccines, dewormers, dip) & scheduled veterinary services	1		
Breeding (Hire of bull/AI)	2		
Transport (for both inputs & marketing)	3		
Insurance	4		
Interest(Loans)	5		
Electricity	6		
Membership fee to dairy related organisations	7		
Other(s)specify	8		
Other (s)specify	9		

SECTION 7.0: We would now like to know more about the transactions related to the various buyers of your milk or marketing channels

Table 7.1: Transaction information *Key variables: CLUSTER, HH, CHANNEL* ***Reference period: Beginning of July 2013 to end of June 2014***

Marketing channel		Have you **ever sold milk** to…..? *1=Yes* *2=No → go to next **CHANNEL***	Did this **HH sell milk** to … in the **last 12 months**? *1= Yes* *2= No →* go to MC04	What **%** of the **HH's milk sales** in the **last 12 months went to** ….? (%)	Which **year** did the **HH first start selling milk** to ….? (*e.g. 2002;* *Enter 99 if not applicable*)	Which **year** did the **HH** last stop selling milk to …..? (*e.g., 2002;* *Enter 99 if not applicable)*	How **often** do/did you **sell milk to**…….? *1= Not often →* *Go to next channel* *2= Often* *3= Always*	What **price per litre do/did …. pay** for **milk** in the **last 12 months**?		**Enumerator**: Ask if ***MC04 ≠ 99.*** What **price per litre** do/did…. **pay** for when you **first started *(check)* selling** to **this channel?**		Approximately **how much milk** was **rejected** by …. due to **quality issues** in the **last 12 months**? *(Litres)*
								Average price in last rainy season (Dec-May) *(ZMW per Litre)*	Average price last dry season (Jun-Nov) *(ZMW per Litre)*	Average price in the rainy season (Dec-May) *(ZMW per Litre)*	Average price the dry season (Jun-Nov) *(ZMW per Litre)*	
CHANNEL		**MC01**	**MC02**	**MC03**	**MC04**	**MC05**	**MC06**	**MC07**	**MC08**	**MC09**	**MC10**	**MC11**
Milk collection centre (MCC)	1											
Directly to modern/formal processors (NOT via MCC)	2											
Directly to consumers(local community)	3											
Retailers/Traders	4											
Directly to traditional/informal processors (NOT via trader)	5											
Institutional buyers (offices, schools, prison, hospitals etc.)	6											
Urban consumers	7											
Other(s) specify: ……	8											
Other(s) specify: ……	9											

Table 7.1: Transaction information *(continued)* *Key variables: CLUSTER, HH, CHANNEL* ***Reference period: Beginning of July 2013 to end of June 2014***

Marketing channel		***Enumerator transfer the codes for MC02 here*** Did this **HH sell milk** to … in the **last 12 months**? *1= Yes* *2= No → go to next **CHANNEL***	Does the HH **participate** in **setting** of **prices for….** channel? *1= Yes* *2= No → go to **MC14***	Do you **participate** in **setting prices** as an **individual** or **cooperative?** *1= Individual* *2= Cooperative*	If No, **who is responsible** for **setting the prices?** *1= Buyer* *2= NGO* *3= Other(s) specify*	What **determines** the **price** you **receive** for the **milk sold?** ***Enumerator:** **Tick all that apply*** *1= Cost* *2= Prevailing market price* *3= Demand & supply* *4= Butter/fat content* *5= Microbial count* *6= Other(s) specify*	Do you **participate** in **determining the payment method or time?** *Enter* *1= Yes → go to **MC18*** *2= No*	If **No** who **determines how you will be paid**? *1= Buyer* *2= NGO (Specify)* *3= Other(s) specify*	How **long** does the…..take to **pay you?** *1= Immediate* *2= < 1 week* *3= 1 week* *4= 2 weeks* *5= 3 weeks* *6= 1 month* *7= > 1month*	What **method of payment** does the…… (buyer) use? *1=Cash* *2= Cheque* *3= Bank/ electronic transfer* *4= In-kind (specify)* *5= Other(s)specify*
CHANNEL		**MC02**	**MC12**	**MC13**	**MC14**	**MC15**	**MC16**	**MC17**	**MC18**	**MC19**
Milk collection centre (MCC)	1									
Directly to modern/formal processors (NOT via MCC)	2									
Directly to consumers(local community)	3									
Retailers/Traders	4									
Directly to traditional/informal processors (NOT via trader)	5									
Institutional buyers (offices, schools, prison, hospitals etc.)	6									
Urban consumers	7									
Other(s) specify: ……	8									
Other(s) specify: ……	9									

7.2 Tell us about the governance of the exchange relationship between yourself and the various buyers of your milk in terms of nature of contract/ agreement

Table 7.2 *Key variables: CLUSTER, HH, CHANNEL* ***Reference period: Beginning of July 2013 to end of June 2014***

Marketing channel		***Enumerator transfer the codes for MC02 here*** *Do you* ***supply milk*** **to……?** *1= Yes* *2= No → go to next* ***CHANNEL***	Who **initiated** the **link between you** and the **buyer**? *Enter* *1= MCC* *2=Processor* *3= Government* *4=End consumer* *5= Retailer/Trader* *6= NGO(Specify)* *7= Cooperative* *8= Institution (School, hospital, prison etc.)* *9= Myself* *10=Other farmers* *11= Other(s) specify*	On a scale where **1= Strongly disagree** and **7=Strongly agree,** please indicate with **(X)** in general the extent to which you agree with the following statement.																			Please **explain** your **responsibilities** and those of the **buyer**	What type of contract Or agreement is it? 1= Individual 2= Collective	On a scale where **1= Strongly disagree** and **7= Strongly agree,** please indicate with **(X)** in general the extent to which you agree with the following statement. **I do influence the contract negotiation outcomes**							How often is the contract renegotiated?
				Overtime we have developed ways of doing business with…..(buyer) that never need to be expressed contractually/formally							**My relationship with this…… (buyer) is governed by a written contract**							**We have a formal agreement that specifies the responsibilities of both parties.** *If 7 → go to next* ***CHANNEL***																		
CHANNEL		**GV01**	**GV02**	**GV03**							**GV04**							**GV05**							**GV06**	**GV07**	**GV08**							**GV09**
				1	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**			**1**	**2**	**3**	**4**	**5**	**6**	**7**	
Milk collection centre (MCC)	1																																
Directly to modern formal processors (NOT via MCC)	2																																
Directly to consumers(local community)	3																																
Retailers/Traders	4																																
Directly to traditional/informal processors (NOT via trader)	5																																
Institutional buyers (offices, schools, prison, hospitals etc.)	6																																
Urban consumers	7																																
Other(s) specify: ……																																	

7.3 We would now like to establish the level of trust between you and the buyer(s) of your milk

Table 7.3 Trust *Key variables: CLUSTER, HH, CHANNEL* ***Reference period: Beginning of July 2013 to end of June 2014***

Marketing channel		***Enumerator transfer the codes for MC02 here*** *Do you* ***supply milk*** **to……** *1= Yes* *2= No→ go to next* ***CHANNEL***	On a scale where **1= Strongly disagree** and **7=Strongly agree,** please indicate with **(X)** in general the extent to which you agree with the following statement.																																					
			I believe in the……. buyer)because he is sincere							**Though the circumstances change, I believe that the buyer will be ready and willing to offer me assistance and support**							**When making important decisions , I believe that the buyer is concerned about welfare and interests**							**I can count that the buyer's future decisions and actions will not adversely(badly) affect me**							**When it comes to things that are important to me I can depend on the buyer's support**																		
CHANNEL		**MC02**	**TST01**							**TST02**							**TST03**							**TST04**							**TST05**																		
			1	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**																		
Milk collection centre (MCC)	1																																																	
Directly to modern formal processors (NOT via MCC)	2																																																	
Directly to consumers(local community)	3																																																	
Retailers/Traders	4																																																	
Directly to traditional informal processors (NOT via trader)	5																																																	
Institutional buyers (offices, schools, prison, hospitals etc.)	6																																																	
Urban consumers	7																																																	
Other(s) specify: ……	8																																																	
Other(s) specify: ……	9																																																	

7.4 We would now like to know about the rules that govern your exchange relationship and level of commitment that exists with the various buyer(s) of your milk.

Table 7.4 Relationship norms *Key variables: CLUSTER, HH, CHANNEL* ***Reference period: Beginning of July 2013 to end of June 2014***

Marketing channel		***Enumerator*** ***transfer the codes for MC02 here*** *Do you* ***supply milk*** **to………** *Enter* *1= Yes* *2= No→* *Go to next channel*	On a scale where **1= Strongly disagree** and **7=Strongly agree,** please indicate**(X)** in general the extent to which you agree with the following statement.																																									
			In this relationship, both parties (you & the buyer) expect that any information that may help the other party will be provided to that party.							**In this relationship ideas or initiatives are widely shared via open communication.**							**In this relationship problems and conflicts are expected to be solved through joint consultation and discussion**							**We expect our relationship with ……(buyer) to continue for a long time**							**We want to continue working with…. buyer**							**The renewal of our relationship with ….(buyer) is virtually automatic**						
		MC02	**RNMS01**							**RNMS02**							**RNM03**							**RNM04**							**RNM05**							**RNM06**						
CHANNEL			**1**	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Milk collection centre (MCC)	1																																											
Directly to modern formal processors (NOT via MCC)	2																																											
Directly to consumers(local community)	3																																											
Retailers/Traders	4																																											
Directly to traditional informal processors (NOT via trader)	5																																											
Institutional buyers (offices, schools, prison, hospitals etc.)	6																																											
Urban consumers	7																																											
Other(s) specify: ……………………	8																																											
Other(s) specify: ……………………	9																																											

7.4.1. Please explain any arrangements that exist for conflict resolution between you and the …. (buyer)? RNM07

………
………
………

Table 7.5 Level of understanding and treatment by the buyer *KEY VARIABLES: CLUSTER, HH, CHANNEL* ***Reference period: Beginning of July 2013 to end of June 2014***

Marketing channel		***Enumerator transfer the codes for MC02 here*** *Do you* ***supply milk*** **to……** *Enter* *1= Yes* *2= No➔* *go to next* ***CHANNEL***	On a scale where **1= Completely does not understand** and **7= Completely understands,** please indicate with **(X)** in general the extent to which you think the …….buyer understands your needs as (MCC)							On a scale where **1= Treats me unfairly** and **7= Treats me fairly,** please indicate with **(X)** in general the extent to which you think the …….buyer treats you (MCC)							If you suggested any **level of unfair treatment** (***MCGV 11 = 1 to 6),*** could you please provide some examples of such treatment?
CHANNEL		**MC02**	**CGV01**							**CGV02**							**GV03**
			1	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	
Milk collection centre (MCC)	1																
Directly to modern formal processors (NOT via MCC)	2																
Directly to consumers(local community)	3																
Retailers/Traders	4																
Directly to traditional informal processors (NOT via trader)	5																
Institutional buyers (offices, schools, prison, hospitals etc.)	6																
Urban consumers	7																
Other(s) specify: ……																	
Other(s) specify: ……																	

7.6 We would now like to establish the level of power of the buyer(s) of your milk

Table 7.6 Power Asymmetry *Key variables: CLUSTER, HH, CHANNEL* ***Reference period: Beginning of July 2013 to end of June 2014***

Marketing channel		***Enumerator transfer the codes for MC02 here*** *Do you* ***supply milk to………*** *1= Yes* *2= No→ go to next channel*	On a scale where **1= Strongly disagree** and **7=Strongly agree,** please indicate**(X)** in general the extent to which you agree with the following statement.																																									
			It would be difficult for the buyer to replace the milk sales and profits realized from your farm with another supplier's milk							**The buyer's total costs of switching to another comparable supplier of milk(small holder dairy farmer) would be prohibitive**							**The buyer is strongly dependent on the milk supplied by your firm**							**It would be difficult for you (supplier) to replace the milk sales and profits realized from this company with another comparable milk buyer**							**Your (supplier's) total costs of switching to another comparable buyer of milk would be prohibitive**							**You (supplier) are strongly dependent on the milk bought by this firm**						
CHANNEL		**MC02**	**PWA01**							**PWA02**							**PWA03**																											
			1	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Milk collection centre (MCC)	1																																											
Directly to modern formal processors (NOT via MCC)	2																																											
Directly to consumers(local community)	3																																											
Retailers/Traders	4																																											
Directly to traditional informal processors (NOT via trader)	5																																											
Institutional buyers (offices, schools, prison, hospitals etc.)	6																																											
Urban consumers	7																																											
Other(s) specify: ……………………	8																																											
Other(s) specify: ……………………	9																																											

7.7 Enumerator: Tell the respondent that we would want to know the factors motivating this household to sell to a particular channel

Table 7.7: Factors motivating the household to sell to a particular channel *Key variables: CLUSTER, HH, CHANNEL* ***Reference period: Beginning of July 2013 to end of June 2014***

Marketing Channel		***Enumerator transfer the codes for MC02 here*** *Do you* ***supply milk*** **to……** *1= Yes 2= No → go to next channel*	On a scale of **1= Not important and 3= Very important** please indicate**(X)** the extent to which the following factors influenced your decision to sell to……channel																												
			Pays higher price			Secure or Guaran-teed market			Regularity of sales			Larger quantities of milk sold			Provides credit or inputs			Provides training in business skills, dairy production and marketing			You incur relatively lower costs in meeting the quality and transaction requirements of the channel			Pays upon delivery			Lump sum payment e.g. monthly payments			Buyers financial and management capacity			Trust		
CHANNEL		**MC02**	**MC03**			**MC04**			**MC05**			**MC06**			**MC07**			**MC08**			**MC09**			**MC10**			**MC11**			**MC12**			**MC13**		
			1	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**
Milk collection centre (MCC)	1																																		
Directly to modern formal processors (NOT via MCC)	2																																		
Directly to consumers(local community)	3																																		
Retailers/Traders	4																																		
Directly to traditional informal processors (NOT via trader)	5																																		
Institutional buyers (offices, schools, prison, hospitals etc.)	6																																		
Urban consumers	7																																		
Other(s) specify: ……	8																																		
Other(s) specify: ……	9																																		

7.8 <u>Enumerator</u>: Tell the respondent that we would want to know the factors influencing the household's decision regarding the amount of milk it sells to a particular channel

Table 7.8: Factors influencing the household's decision regarding the amount of milk it sells to particular channel ***Key variables:*** *CLUSTER, HH, CHANNEL*
Reference period: Beginning of July 2013 to end of June 2014

Marketing Channel		***<u>Enumerator</u> transfer the codes for MC02 here*** *Do you* ***supply milk to……*** *1= Yes 2= No → go to next* ***CHANNEL***	On a scale of **1= Not important and 3= Very important** please indicate**(X)** the extent to which the following factors influenced your decision to sell to……channel																										
			Pays higher price			Secure or guaranteed market			Regularity of sales			Larger quantities of milk sold			Provides credit or inputs			Provides training in business skills, dairy production and marketing			You incur relatively lower costs in meeting the quality and transaction requirements of the channel			Pays upon delivery			Lump sum payment e.g. monthly payments			Buyers' financial and management capacity		
CHANNEL		**MC02**	**MC03**			**MC04**			**MC05**			**MC06**			**MC07**			**MC08**			**MC09**			**MC10**			**MC11**			**MC12**		
			1	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**
Milk collection centre (MCC)	1																															
Directly to modern formal processors (NOT via MCC)	2																															
Directly to consumers(local community)	3																															
Retailers/Traders	4																															
Directly to traditional informal processors (NOT via trader)	5																															
Institutional buyers (offices, schools, prison, hospitals etc.)	6																															
Urban consumers	7																															
Other(s) specify: ……	8																															
Other(s) specify: ……	9																															

SECTION 8: OTHER FARM ACTIVITIES INCOME

Table 8.1 Seed and fertilizer expenses on crops *Key variables: CLUSTER, HH, CROP* ***Reference period: Beginning of July 2013 to end of June 2014***

What **main crop(s)** did this household **grow between July 2013 and June 2014?** *(See codes below)*		How many **Kgs** of **lime** did the **HH apply**? *(Enter "0" if they did not apply)* *(Kgs)*	For the **largest transaction**, what **type of transaction** did the HH use to acquire the seed/ planting material? *1=cash purchase 2= out-grower loan 3=seed retailer loan 4=other loan 5=barter 6=FISP 7=grant/gift/free 8=from own harvest* ***Enumerator: C02→1 go to C07***	***Enumerator: For cash purchases (C02=1), ask*** For the **largest transaction**, what was the **cost per unit** of the seed/planting material?		***Enumerator: For cash purchases (C02=1) AND distances /location away from the homestead where*** the HH got the seed/ planting material? ***Ask*** For the **largest transaction**, how much did the HH **spend** per unit to **transport** the seed/planting material from the point of sale/barter to the HH's homestead? If the HH used its own transport, **how much would the HH have charged someone to transport it**?		Did the HH **apply animal manure** and/or **compost** to this crop? *1=Yes 2=No*	Did the HH **apply any ferti-lizer to** this crop? *1=Yes 2=No* → **go to next CROP**	What **type and quantity of basal dressing** fertiliser did the HH apply?		What **price per unit** did the HH pay at the **point of purchase** for the basal dressing fertiliser?		What **type and quantity of top dressing** fertiliser did the HH apply?		What **price per unit** did the HH pay at the **point of purchase** for the top dressing fertiliser?		How much did the HH spend on **transportation of fertilizer** from the **point of purchase** to the HH's **homestead**? If own transport was used, how much would the HH have charged someone to transport it?	
				Cost *(ZMW)*	Unit *(See codes below)*	Transport cost per unit *(ZMW)*	Unit *(see codes below)*			**Type** *(See code below)* ***If "0" →go to C12***	**Amount** *(Kgs)*	**Price per unit** *Enter "-9" if HH did not purchase basal fertiliser by commercial cash terms* (ZMW)	Unit *(see codes below)*	Type *(see codes below)* ***If "0" go to next CROP***	Amount *(Kgs)*	**Price per unit** *Enter "-9" if HH did not purchase basal fertiliser by commercial cash terms* *(ZMW)*	Unit *(see codes below)*	*(ZMW)*	Unit*(see codes below)*
NAME	**CROP**	**C01**	**C02**	**C03**	**C04**	**C05**	**C06**	**C07**	**C08**	**C09**	**C10**	**C11**	**C12**	**C13**	**C14**	**C15**	**C16**	**C17**	**C18**

Crop code (CROP)					Seed Unit Code (C04)		Fertiliser codes (C08, C13)		Fertilizer unit codes (C11, C15)
1 = Maize	12 = Mixed beans	23 = Oranges	34 = Spinach	45 = Green beans	1=90 kg bag	11=5lt5 gallon	0 = None	11=Urea	*2=50kg bag*
2 = Sorghum	13 = Bambaranuts	24 = Bananas	35 = Tomato	46 = Chinese cabbage	2=50kg bag	12=MEDA	1 = Compound D	12=Ammonium Nitrate	*3=25kg bag*
3 = Rice	14 = Cowpeas	25 = Pineapple	36 = Onion	47= Cabbage	3=25kg bag	13=bunches	2 = Compound X	13=CAN	*4=10kg bag*
4 = Millet	15 = Velvet beans	26 = Guavas	37 = Okra	48 = Rape	4=10kg bag	14=MUCHUMBU	3 = Compound S	14=Allwin top	*5=20 ltr tin*
5 = Sunflower	16 = Coffee	27 = Paw Paws	38 = Eggplant	49 = Sugarcane	5=20lt tin	15=ka B.P.	4 = Triple Super Phosphate (TSP)		6= Litre
6 = Groundnuts	17 = Sweet potato	28 = Avocado	39 = Pumpkin	50=Sweet sorghum	6=90kg bag unshelled	16=crates	5 = Single Super Phosphate (SSP)		*12=Meda*
7 = Soybeans	18= Cassava	29 =Watermelon	40 = Chilies	51=Bondwe amaranthus	7=50kg bag unshelled	17=tonnes	6 = Compound R	15=Flower&Plant (foliar)	*21=5kg*
8 = Seed cotton	19 = Kenaf	30 = Mangoes	41 = Chomolia	52=Other crop(specify)	8=25kg bag unshelled	18=boxes	7 = Compound WV	16=Compound B	
9 = Irish potato	20 = Cashew nut	31 = Grapefruit	42 = Cauliflower		9=10 kg bag unshelled	20=kilogram	8 = Di-grow (foliar)	17=Do not know	
10 = Virginiatobacco	21 = Paprika	32 = Tangerines	43 = Carrots		10=20lt tin unshelled		9 =Wonder (foliar)		
11 = Burley tobacco	22 = Popcorn	33 = Lemons	44 = Lettuce		19=number/cuttings/seedlings		10=Vegetative (foliar)		

8.2 Enumerator: Tell the respondent that you would now like to get information about the type and source of power the household used and its expenses for key activities its their crop between beginning of July 2013 to end of June 2014

Table 8.2: Type and source of power, and expenses for key activities for crop production *Key Variables: CLUSTER, HH, VLABACT* ***Reference period: Beginning of July 2013 to end of June 2014***

		What **type** and **source** of **power** did the HH **mainly** use for …. their **crop(s)** between **1st July 2013 and 30th June 2014** *(See codes at right)*	How much did the HH spend on ….. **1st July 2013 and 30th June 2014** *(ZMW)*
VLABACT		**VLAB1**	**VLAB2**
Planting	1		
Fertiliser application	2		
Herbicide application	3		
Weeding without chemicals	4		
Harvesting	5		

Codes for main type and source of power (VLAB1)	
0=Household did not do this activity	6=Hired/borrowed animals with hired labour
1=Manual household labour	7=Own mechanical with HH labour
2=Manual hired labour	8=Own mechanical with hired labour
3=Own animals with HH labour	9=Hired/borrowed mechanical with HH labour
4=Own animals with hired labour	10=Hired/borrowed mechanical with hired labour

8.3 Enumerator: Tell the respondent that you would now like to get information about the household's crop production and sales between ***beginning of July 2013 to end of June 2014***

Table 8.3: Crop production and sales *Key Variables: CLUSTER, HH, CROP* ***Reference period: Beginning of July 2013 to end of June 2014***

What **main crop(s)** did this HH **grow between 1st July 2013 and 30th June 2014?** ***Enumerator****: Transfer codes for CROP in Table 8.1 here*		**How much** of this crop did the HH **harvest** from this field?		Did the **HH sell** any….. *1=Yes 2= No → go to next crop*	How much ….. did your **HH sell/barter**?		How much did your HH spend to **transport** the….. crop from your homestead to the point of sale/barter? *If you used your own transport, how much would you have charged someone to transport it*?		Was this transaction a **cash sale or barter**? *1=cash sale 2=barter If = 2(barter) → **go to** next crop*	What was the **price per unit** for the **cash** transaction? (***Try to use same unit as CP04)***	
		Quantity harvested *(if 0 → go to next crop)*	Unit *(see codes below)*		Quantity	Unit *(see codes below)*	*(ZMW)*	Unit *(see codes below)*		Price per unit *(ZMW)*	Unit ***(see codes below)***
NAME	**CROP**	**CP01**	**CP02**	**CP03**	**CP04**	**CP05**	**CP06**	**CP07**	**CP08**	**CP09**	**CP10**

8.4 **Enumerator:** Tell the respondent that you would now like to get information about the **household's livestock sales** between ***beginning of July 2013 to end of June 2014***

Table 8.4 Livestock sales *Key Variables: CLUSTER, HH, LSTOCK1* ***Reference period: Beginning of July 2013 to end of June 2014***

Livestock **Owned**		**Enumerator**: Did the HH own any … between 1st July 2013 and 30th June 2014? ***(Copy from ATS03 form Table 4.2; Asset 7 to 10)*** *1 = Yes 2 = No → go to next* ***LSTOCK1***	Did this HH sale/barter any…..? 1= Yes 2= No → *go to next* ***LSTOCK1***	How many of the …owned by the HH were **slaughtered for sale/barter** between 1st July 2013 and 30th June 2014? *(Enter "0" if none)*	How many of the ….owned by the HH **were bartered out live** between 1st July 2013 and 30th July 2012? *(Enter "0" if none)*	How many of the ….owned by the HH **were sold live for cash** between 1st July and 30th June 2014? ***(Enter "0" if none → go to next LSTOCK1)***	***Enumerator: Ask if LS04 > 0 – the last time the HH sold live for cash*** The **last time the HH sold live … for cash**, how **much** did the HH **receive in TOTAL** in **ZMW**? *(ZMW)*
LSTOCK1		**LS01**	**LS02**	**LS03**	**LS04**	**LS05**	**LS06**
Cattle	1						
Goats	2						
Pigs	3						
Sheep	4						
Village Chickens	5						

8.5 a) Did this household **sell any eggs from own production** between ***beginning of July 2013 to end of June 2014? 1=Yes, 2= No → go to 8.6*** **EG01** ____

8.5 b) **Enumerator**: Tell respondent that we would like to know more about the **household's egg sales** between ***beginning of July 2013 to end of June 2014***

Table 8.5 Egg sales *Key Variables: CLUSTER, HH, CHKN* ***Reference Period: Beginning of July 2013 to end of June 2014***

	For which months was the ….. ***0= None 1 = Low 2 = High*** ***If sales are constant for all months, probe further.***												**In a typical high month, how much …..did the HH sell?** (***Enumerator****: If no high sales, leave blank.)* *(Numbers)*	**In a typical low month, how much did…. the HH sell?** (***Enumerator****: If no low sales leave blank.)* *(Numbers)*	What was the **last price** the HH received when ……was **sold**? *(ZMW/egg or ZMW/broiler)*
	2013 July	Aug	Sep	Oct	Nov	Dec	2014 Jan	Feb	Mar	Apr	May	Jun			
CHKN	**EG02**	**EG03**	**EG04**	**EG05**	**EG06**	**EG07**	**EG08**	**EG09**	**EG10**	**EG11**	**EG12**	**EG13**	**EG14**	**EG15**	**EG16**
Egg sales from own production															

8.6 From **1ST July 2013** to **30TH June 2014** did this household **harvest any fish from fishponds owned or managed by the household*? 1=Yes 2=No→ go to SECTION 9*** **FSH01** ____

Table 8.6: Value of fish sales from fishponds *Key Variables: CLUSTER, HH, FISH Reference* ***Period: Beginning of July 2013 to end of June 2014***

FISH	2013 July	Aug	Sep	Oct	Nov	Dec	2014 Jan	Feb	Mar	Apr	May	Jun
	FSH02	**FSH03**	**FSH04**	**FSH05**	**FSH06**	**FSH07**	**FSH08**	**FSH09**	**FSH10**	**FSH11**	**FSH12**	**FSH13**
How much **revenue** did the HH receive from **selling fish** from **fish ponds in ……**?												

SECTION 9: OFF-FARM INCOME

9.1. We would like to talk ask about the **earnings (cash and in-kind)** for the **activities** of each of **the household members** who have **earned salary and or informal wage labour income and / pensions** from the beginning of **July 2013 to the end of June 2014**. Enumerator: *Do not include income from business activities, which will be captured in other* sections.

Table 9.1: Salaried Employment or Informal Wage Labour Activities or Pensions. *Key Variables: CLUSTER, HH, MEM, WACT* ***Reference Period: 1st July 2013 to 30th June 2014***

Please list the **names** of **HH members** that earned **salary and or informal wage labour income and / pensions**	**Enumerator** ***Look up the MEM number from Table 2.1(adults) and Table 2.2(children)***	What **salaried, wage and pensions activities** was …….involved in from July 2013 to June 2014? (*See codes below)*	How much cash wages did…….. receive in June 2014? *(ZMW)*	Did …. receive the **same cash wages every month** from 1st July 2013 to 30th June 2014? ***1=Yes → go to W13 2=No***	(***Enumerator**: Ask W02 through W12 if the cash wages received were not the same every month, W01B = 2*) From July 2013 to June 2014, how much **cash wages** did …. **receive in each month** from this salary/ wage/pension activity (Kwacha)? *(ZMW)* ***If he or she did not receive CASH WAGES in a certain month, enter "0" for that month***											Between July 2013 and June 2014, what was the **total value** of **maize** … received as **in-kind wages**? *Enter "0" if none (ZMW)*	Between July 2013 and June 2014, what was the **total value** of **other goods** … received as **in-kind wages**? *Enter "0" if none (ZMW)*
					2013 July	Aug	Sep	Oct	Nov	Dec	2014 Jan	Feb	Mar	April	May	
NAME	**MEM**	**WACT**	**W01A**	**W01B**	**W02**	**W03**	**W04**	**W05**	**W06**	**W07**	**W08**	**W09**	**W10**	**W11**	**W12**	**W13**	**W14**

Salaried Employment or Informal Wage Labour Activities (WACT)				
1=On a SMALLHOLDER FARMER farm <20 ha	7=Health worker (civil servant)	13=Parastatal	19= Crop input company	24= Livestock services company
2=On a commercial farm >=20 ha	8=Health worker (not civil servant)	14=Casual workers for FRA	20= Crop output company	25=Other private company
3=In a factory or other industrial work	9=Agricultural officer (civil servant)	15=Clerk in private business	21= Crop services company	26=Worker in tourism industry
4=In a mine	10=Agricultural officer (not civil servant)	16=Shop attendant	22= Livestock input company	27=House help
5=Teacher (civil servant)	11=Police/army/national service	17=Non-agricultural piece work	23= Livestock output company	28=Other (specify) _____
6=Teacher (not civil servant)	12=Other civil servant	18=Pension		

9.2 We would now like to ask about the earnings for each of the household members that were involved in business activities from beginning of **July 2013 to the end of June 2014**

Table 9.2: Formal and Informal Business Activities *KEY Variables: CLUSTER, HH, MEM, BACT* ***Reference Period: 1st July 2013 to 30th June 2014***

Person MEM name and number **Enumerator** *Look up the MEM number from Table 2.1(adults) and Table 2.2(children)*		What **business activities** was …….involved in from July 2013 to June 2014? (*See codes below)*	For which months was revenue…… (Ask none first, low second, high last) *(0= None 1= Low 2=High)* ***If earnings are constant for all months, probe further.***												**In a typical high revenue month, how much did … receive/spend (cash and in-kind) from this business?** (***Enumerator****: If no high revenue months, leave B14 andB15 blank.)*		**In a typical low revenue month, how much did … receive/spend (cash and in-kind) from this business?** (***Enumerator****: If no low revenue months, leave B16 and B17 blank.)*	
			2013 July	Aug	Sep	Oct	Nov	Dec	2014 Jan	Feb	Mar	Apr	May	Jun	Total **Gross Income** *(ZMW)*	Total **Expenses** *(ZMW)*	Total **Gross Income** *(ZMW*	Total **Expenses** *(ZMW)*
NAME	**MEM**	**BACT**	**B02**	**B03**	**B04**	**B05**	**B06**	**B07**	**B08**	**B09**	**B10**	**B11**	**B12**	**B13**	**B14**	**B15**	**B16**	**B17**

Formal and Informal Business activities (BACT)					
1=crop input trading	8=marketeer/hawker/vendor	15=butchery (all meats including game cooked or uncooked)	22=bicycle repairing	29=mushroom collecting & selling	36=hair saloon / barbershop business
2=crop output trading	9=firewood collection and selling	16=crop services (e.g., ploughing, planting, spraying)	23=weaving (cloth & reed/basketry) & selling	30=wild honey collecting & selling	37=landlord
3=livestock input trading	10=charcoal production and selling	17=livestock services (vet, vaccinations, de-worming)	24=blacksmithing	31=beekeeping & honey selling	38=transporter
4=beef trading	11=charcoal trading	18=milling	25=healing (traditional)	32=wild fruits collecting and selling	39=repairing items
5=dairy trading	12=carpentry	19=cooking oil processing & selling	26=fishing and selling (from lakes/ rivers/ streams	33=poles/timber collection & selling	40=baker
6=other livestock output trading (pigs, goats, sheep, chickens)	13=builder / construction	20=agro-processing	27= mining precious stones (small scale)	34=thatching/fencing grass collection & selling	41=other (specify) _____
7=retailer/shop owner	14=brewing (local) & selling	21=tailoring	28=ants & caterpillar gathering & selling	35=curio business	

SECTION 8: RECOMMENDATIONS

8.1 What are the critical things that have to change to increase the number of SMALLHOLDER FARMER dairy farmers selling milk to this MCC? **Sect 8_q8_1**

8.2 What are the critical things that have to change to increase the proportion of milk that SMALLHOLDER FARMER dairy farmers sell to this MCC? **Sect 8_q8_2**

8.3 What are the critical things that have to change to increase the SMALLHOLDER FARMER dairy farmers' access to credit through interlocked contractual arrangements? **Sect 8_q8_3**

8.4 If there is one initiative you would like to see the government undertake to enhance the incomes and profitability of SMALLHOLDER FARMER dairy farmers, what would it be? Please elaborate as clearly and as succinctly as possible **Sect8_q8_4**

Thank you for spending the time with us to share your ideas, opinions and information about your operations.

Questionnaire NO. | | |

MCC Survey

This survey is part of the team effort at University of Pretoria South Africa and University of Zambia aimed at understanding the extent and conditions under which interlocked contractual arrangements are inclusive of SMALLHOLDER FARMER dairy farmers and whether participation enhances their wellbeing. We hope that the information generated will enhance the process of integrating SMALLHOLDER FARMER farmers in mainstream value chains, input and financial markets. Your help in answering these questions is very much appreciated. Your responses will be kept **COMPLETELY CONFIDENTIAL.** You indicate your voluntary consent by participating in this interview: may we begin?

2. MCC IDENTIFICATION

1.1 Province code **PROV** | | Province name: _____

1.2 District code **DIST** | | District name: _____

1.3 Name of Milk Collection Centre **MCCNAME** _____

1.4 MCC category MCC_CATEGORY (1= Main MCC; 2= Satellite MCC)

1.5 Name of Respondent NOR_____

1.6 Job position of the respondent? **JOBPSTN**_____

1.7 How long have you been working in the current job position? **JOBTENURE**_____

1.8 How long have you been involved in the focal buyer –supplier (SMALLHOLDER FARMER dairy farmers) relationship? **MGMTENURE**_____

1.9 On a scale where 1= Not knowledgeable and 5 Very knowledgeable, please indicate with **(X)** the extent to which you are knowledgeable about the overall exchange relationship between this MCC and farmers that supply it with milk.	**1**	**2**	**3**	**4**	**5**
Resp_eligibility					

1.10 Cellphone number of respondent **CELLPHONE** _____

1.11 Response status (1=Complete; 2=Refusal; 3=Non-contact) **status** |

1.12 Date of enumeration (dd/mm/yy) **daten** | / | / **1** | **4**

1.13 Name of enumerator _____ Enumerator code **enum** | |

1.14 Date checked (dd/mm/yy) **datec** | / | / **1** | **4**

Questionnaire NO. | | |

SECTION 2: General Information about the MCC

2.1 In which year was this MCC established? **Sect2_q2_1** | | | | |

2.2 Why was this MCC set up? **Sect2_q2_2** *(See codes below)* | |

1= To create a market opportunity for farmers	2= Distance from the market to producer's homestead was too long	3= There was demand for the facility	4= Other(s) Specify

2.3 Who set up this MCC? **Sect2_q2_3** *(See codes below)* | |

1= GRZ/MAL/ASP	*2= GART*	*3= Land "O" Lakes*	*4= Heifer International*
5= World vision	*6= Dairy Association of Zambia*	*7= Dairy Cooperative Union*	*8= European commission(EDF)*
9= Micro Bankers Trust	*10= Parmalat*	*11= Zambeef*	*12 = ZATAC*
13= USAID/PROFIT	*14 ZANACO*	*15= Citizens economic Empowerment Commission*	*16= Livestock Development Trust(LDT)*
17=African Development Fund(ADF)	*18= Other(s) Specify*	*19= Other(s) Specify)*	

2.4 What is the form of the MCC ownership? **Sect2_q2_4** *(See codes below)* | |

1= Cooperative	*2= Joint venture*	*3= Private company*	*Other(s) Specify*

2.5 Who operates this MCC on a day to day basis? **Sect2_q2_5** *(See codes below)* | |
(1= Employed staff, 2= Volunteers, Other(s) Specify)

2.6 How many employees does this MCC have? **Sec2_ q2_6** | |

2.7 What is the physical capacity of this MCC? **Sec2_ q2_7** | | *Litres*

2.7.1 What was the physical capacity in litres of this MCC at the time it was established? **Sec2_ q2_7.1** | |

2.8 What is the size of the catchment area of this MCC? **Sect2_q2_8** _____ Km^2

2.9 In your own opinion how many dairy farmers having ≤ 50 dairy animals are within the radius of this MCC? **Sect2_q2_9** | |

2.10 How many members are registered / supply milk to this MCC? **Sect2_q2_10** | |

2.11 Please explain the requirements that dairy farmers have to meet for them to be supply milk to this MCC **Sect2_q2_11**

2.12 We would now want to know about the various active milk suppliers to this MCC by farmer category

Farmer category		Number of dairy animals	How many **active …. supplied milk** to this **MCC** between **30th July 2013 and 1st June 2014**??	How many **litres** of milk were **supplied** by……..between **30th July 2013 and 1st June 2014**?
FARMER_CATEGORY		**NODAIRYANM**	**Sect2_q2_12.1**	**Sect2_q2_12.2**
Smallholder farmers	1	1-10		
Emergent farmers	2	11-50		
Commercial farmers	3	>50		

SECTION 3: Please tell us about the services that ***this*** MCC offers to its milk suppliers

Table 3: SERVICES OFFERED TO SUPPLIERS/ FARMERS *KEY VARIABLES: MCCNAME, SERVICES*

MCC Services offered to farmers/suppliers		Since the establishment of this MCC has it ever facilitated the farmers' access to……? *Enter (1=Yes, 2=No → go to next SERVICE)*	What is the most common mode of payment that farmers use for…….? *Enter 1= Cash 2= Cost deducted from milk sales 3= Given freely to farmers*
SERVICES		**SVC 01**	**SVC02**
Veterinary services/drugs	1		
Bulking/chilling of milk before it is sold to buyers	2		
Inputs such as feed	3		
Milking equipment/ stainless steel cans	4		
Training in modern dairy management practices	5		
Transportation of milk from homestead to MCC	6		
Loans(in-kind e.g. dairy animals/cash)	7		
Milk testing/grading	8		

SECTION 4: Please tell us about the type and number of *functional/**repairable assets owned by this MCC.***

Table 4: MCC ASSET OWNERSHIP *KEY VARIABLES: MCCNAME, MCC_ASSET*

Asset type		Has this MCC **ever owned** …? *1=Yes 2=No → go to the next MCC_ASSET*	How **many** …….did the MCC own between 1st July 2013 and 30th June 2014? *Enter "0"if none*	Approx. what is the total value of … owned between 1st July 2013 and 30th June 2014? (ZMW) ***ASK IF MCCAST03≠0***
MCC_ASSET		**MCCAST01**	**MCCATS03**	**MCCAST04**
Stainless steel milking cans	1			
Milking buckets(stainless steel/plastic)	2			
Milk filters/sieve	3			
Vehicle (Van/Light truck)	4			
Bicycle	5			
Lactometer	6			
Milking pistol/gun	7			
Generator	8			
Water tank	9			
Solar panel	10			
Deep Freezer	11			
Computer/printer	12			
Other(s) Specify	13			

SECTION 5: We would now want to know more about the milk and other milk product(s) that this MCC sells

Table 5: Other milk products sold by the MCC *KEY VARIABLES: MCCNAME, MILKPDCT*

Milk product		Did you **sell**…..**between 1ST July 2013** and **30th June 2014?** ***1= Yes*** *2= No →* ***go to next MILKPDCT***	**How much**… did you **sell between 1ST July 2013** and **30th June 2014?**		Cost per Unit		Selling Price per Unit	
			Quantity	Units *1= Litre 2= Kg*	ZMW	Units *1= Litre 2= Kg*	ZMW	Units *1= Litre 2= Kg*
MILKPDCT		**MKPDCT01**	**MKPDCT02**	**MKPDCT03**	**MKPDCT04**	**MKPDCT05**	**MKPDCT06**	**MKPDCT07**
Pasteurised Fresh Milk	1							
Sour Milk	2							
Yogurt	3							
Butter	4							
Ice cream	5							
Cheese	6							
Other(s) Specify	7							

SECTION 6: We would now like to know more about the transactions related to the various buyers of milk from this MCC

Table 6: Transaction information *Key variables: MCCNAME, MCCHANNEL* ***Reference period: Beginning of July 2013 to end of June 2014***

Marketing channel		Did this **MCC sell milk** to … in the **last 12 months**? *1= Yes* *2= No → go to next MCCHANNEL*	What **%** of the **MCC's milk sales** in the **last 12 months went to** ….? (%)	How **often** do you **sell milk to**…….? *1= Not often* *2= Often* *3= Always*	*Does this **MCC** sell **grade A milk to……..?*** *1= Yes* *2= No → go to MCC09*	What **price per litre** did …. pay for **grade A milk** in the **last 12 months**?		*Does this **MCC** sell **grade B milk to……..?*** *1= Yes* *2= No →*	What **price per litre** did …. pay for **grade B milk** in the **last 12 months**?		*Does this **MCC** sell **grade C milk to……..?*** *1= Yes* *2= No → go to MCC15*	What **price per litre** did …. pay for **grade C milk** in the **last 12 months**?		Approximately how much milk was rejected by …. due to quality issues in the last 12 months? *(Litres)*	After transacting which party is responsible for transporting the milk? *Enter* *1= Buyer* *2= MCC*	How is the milk transported? *Enter* *1= Vehicle* *2= Bicycle* *3=Carried by hand in a container*
						Average price in last rainy season (Dec-May) *(ZMW per Litre)*	Average price last dry season (Jun-Nov) *(ZMW per Litre)*		Average price in last rainy season (Dec-May) *(ZMW per Litre)*	Average price last dry season (Jun-Nov) *(ZMW per Litre)*		Average price in last rainy season (Dec-May) *(ZMW per Litre)*	Average price last dry season (Jun-Nov) *(ZMW per Litre*			
MCCHANNEL		**MCC01**	**MCC02**	**MCC03**	**MCC06**	**MCC07**	**MCC08**	**MCC09**	**MCC10**	**MCC11**	**MCC12**	**MCC13**	**MCC14**	**MCC15**	**MCC16**	**MCC17**
Shops	1															
Directly to modern/formal processors (NOT via MCC)	2															
Directly to consumers(local community)	3															
Traders	4															
Directly to traditional/informal processors (NOT via trader)	5															
Institutional buyers (offices, schools, prison, hospitals etc.)	6															
Other(s) specify: ……	8															

Table 6.2: Governance *KEY VARIABLES: MCCNAME, MCCHANNEL* ***Reference period: Beginning of July 2013 to end of June 2014***

Marketing channel		***Enumerator transfer the codes for MCC01 here*** Does this **MCC** sell **milk** to……? *Enter* *1= Yes* *2= No→ go to next MCCHANNEL*	**Who initiated** the **link between** the **MCC** and the **buyer**? *Enter* *1= MCC* *2=Buyer* *3= Government* *4= NGO* *5= Other(s) specify*	On a scale where **1= Strongly disagree** and **7= Strongly agree, please** indicate with **(X)** in general the extent to which you agree with the following statement.			Please **explain** your **responsibilities** and those of the **buyer**	On a scale where **1= Strongly disagree** and **7=Strongly agree,** please indicate with **(X)** in general the extent to which you agree with the following statement. **I do influence the contract negotiation outcomes**	**How often** is the **contract renegotiated** ?
				Overtime we have developed ways of doing business with…..(buyer) that never need to be expressed contractually/formally	**My relationship with …… (buyer) is governed by a written contract**	**We have a formal agreement that specifies the responsibilities of both parties.** → *If 7 go to next channel*			
MCCHANNEL		**MCGV01**	**MCGV02**	**MCGV03**	**MCGV04**	**MCGV05**	**MCGV06**	**MCGV08**	**MCGV09**
				1 2 3 4 5 6 7	**1 2 3 4 5 6 7**	**1 2 3 4 5 6 7**		**1 2 3 4 5 6 7**	
Shops	1								
Directly to modern/formal processors (NOT via MCC)	2								
Directly to consumers(local community)	3								
Traders	4								
Directly to traditional/informal processors (NOT via trader)	5								
Institutional buyers (offices, schools, prison, hospitals etc.)	6								
Other(s) specify:	7								

Table 6.2 Governance continued *KEY VARIABLES: MCCNAME, MCCHANNEL* ***Reference period: Beginning of July 2013 to end of June 2014***

Marketing channel		***Enumerator transfer the codes for MCC01 here*** Does this **MCC** sell **milk** to……? *1= Yes* *2= No➔* *go to next MCCHANNEL*	On a scale where **1= Completely do not understand** and **7= Completely understands,** please indicate with **(X)** in general the extent to which you think the …….buyer understands your needs as (MCC)							On a scale where **1= Treats me unfairly** and **7= Treats me fairly,** please indicate with **(X)** in general the extent to which you think the …….buyer treats you (MCC)							If you suggested any **level of unfair treatment** (***MCGV 11 = 1 to 6),*** could you please provide some examples of such treatment?
MCCHANNEL		**MCGV01**	**MCGV10**							**MCGV11**							**MCGV13**
			1	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	
Shops	1																
Directly to modern/formal processors	2																
Directly to consumers(local community)	3																
Traders	4																
Directly to traditional/informal processors	5																
Institutional buyers (offices, schools, prison, hospitals etc.)	6																
Other(s) specify: ……	7																

7.2 Please explain any arrangements that exist for conflict resolution between the MCC and milk suppliers? RUL07

……
……
……
……
……

7.3 Please identify this MCC's strengths that have contributed to its success to date **Sect7_q7_4**

7.4 What are the critical things that have to change to increase the number of SMALLHOLDER FARMER dairy farmers selling milk to this MCC? **Sect7_q7_5**

7.5 What are the critical things that have to change to increase the proportion of milk that SMALLHOLDER FARMER dairy farmers sell to this MCC? **Sect7_q7_6**

7.6 What are the critical things that have to change to increase the SMALLHOLDER FARMER dairy farmers' access to credit through interlocked contractual arrangements? **Sect7_q7_7**

7.7 If there is one initiative you would like to see the government undertake to enhance the incomes and profitability of SMALLHOLDER FARMER dairy farmers, what would it be? Please elaborate as clearly and as succinctly as possible **Sect7_q7_8**

Thank you for spending the time with us to share your ideas, opinions and information about your operations.

Questionnaire NO. | | |

FORMAL/ MODERN MILK PROCESSORS SURVEY

This survey is part of the team effort at University of Pretoria South Africa and University of Zambia aimed at understanding the extent and conditions under which interlocked contractual arrangements are inclusive of SMALLHOLDER FARMER dairy farmers and whether participation enhances their wellbeing. We hope that the information generated will enhance the process of integrating SMALLHOLDER FARMER farmers in mainstream value chains, input and financial markets. Your help in answering these questions is very much appreciated. Your responses will be kept **COMPLETELY CONFIDENTIAL.** You indicate your voluntary consent by participating in this interview: may we begin?

3. FIRM IDENTIFICATION

1.1 Province code **PROV** | | Province name: _____

1.2 District code **DIST** | | District name: _____

1.3 Name of company **COMPANYNAME** _____

1.4 Name of Respondent NOR_____

1.5 Job position of the respondent? **JOBPSTN**_____

1.6 How long have you been working in the current job position? **JOBTENURE**_____

1.7 How long have you been involved in the focal buyer –supplier (SMALLHOLDER FARMER dairy farmers) relationship?

MGMTENURE_____

1.8 On a scale where 1= Not knowledgeable and 5 Very knowledgeable , please indicate with **(X)** the extent to which you are knowledgeable about the overall exchange relationship between this company and farmers that supply it with the milk	**1**	**2**	**3**	**4**	**5**
Resp_eligibility					

1.9 Cellphone number of respondent **CELLPHONE** _____

1.10 Response status (1=Complete; 2=Refusal; 3=Non-contact) **status** |

1.11 Date of enumeration (dd/mm/yy) **daten** | / | / **1** | **4**

1.12 Name of enumerator _____ Enumerator code **enum** | |

1.15 Date checked (dd/mm/yy) **datec** | / | / **1** | **4**

SECTION 2: General Information about the company

2.1 In which year was this company established? **Sect2_q2_1**

2.2 What is the form of the company's business organisation? **Sect2_q2_2** *(See codes below)*

1= Cooperative 2= Joint venture 3= Private company Other(s) Specify

2.3 How many employees does this company have? **Sec2_ q2_3**

2.4 What is the physical capacity of this company's processing plant? **Sec2_ q2_4** *Litres*

2.5 What is the current plant utilization capacity? **Sec2_ q2_5** *%*

2.6 Would you please describe your coverage area of milk collection from SMALLHOLDER FARMER dairy farmers (having ≤ 50 dairy animals) in terms number of districts and MCCs in Zambia **Sec2_ q2_6**

2.7 Please explain the requirements that small holder dairy farmers have to meet for them to be supply milk to your company **Sect2_q2_7**

2.8 We would now want to know about the various milk suppliers by farmer category

Farmer category		Number of dairy animals	How many **litres** of milk were **supplied** by……..between **30th July 2013 and 1st June 2014**?	What proportion of milk (%) was supplied by…….. between **30th July 2013 and 1st June 2014**?
FARMER_CATEGORY		**NODAIRYANM**	**Sect2_q2_8.1**	**Sect2_q2_8.2**
Small holder farmers	1	1-10		
Emergent farmers	2	11-50		
Commercial farmers	3	>50		

Questionnaire NO. | | |

SECTION 3: SERVICES OFFERED TO SUPPLIERS/ FARMERS *KEY VARIABLES: COMPANYNAME, SERVICES*

Services		Since the establishment of this company has it ever facilitated the farmers' (milk suppliers) access to……? *Enter* *(1=Yes, 2=No → go to next SERVICE)*	How has the company facilitated the suppliers/farmers' access to……..?	What is the most common mode of payment that farmers use for…….? *Enter* *1= Cash* *2= Cost deducted from milk sales* *3= Given freely to farmers* *9 = Does not apply*
SERVICES		**SVC 01**	**SVC02**	**SVC03**
Veterinary services/drugs	1			
Inputs such as feed	2			
Milking equipment/ stainless steel cans	3			
Training in modern dairy management practices	4			
Transportation of milk from MCC to processing plant	5			
Loans(in-kind e.g. dairy animals/cash)	6			
Milk testing/grading	7			
Other(s) Specify	9			

SECTION 4: We would now want to know more about the range of milk and other milk product(s) that this company produces

Table 4.1: Milk and other milk products *KEY VARIABLES: COMPANYNAME, MILKPDCT*

Milk product		Do you produce…..? *Enter* *1= Yes* *2= No →* ***go to next MILKPDCT***	Milk product		Do you produce…..? *Enter* *1= Yes* *2= No →* ***go to next MILKPDCT***
MILKPDCT		**MKPDCT01**	**MILKPDCT**		**MKPDCT01**
Pasteurised Fresh Milk	1		Cheese	6	
Sour Milk	2		Other(s) Specify	7	
Yogurt	3		Other(s) Specify	8	
Butter	4		Other(s) Specify	9	
Ice cream	5		Other(s) Specify	10	

SECTION 5: We would now like to know more about the transactions related to the various suppliers of milk to this company

5.1 What criteria does this company use to grade the milk? **Sect5_q5_1**

Table 5.2: Price per litre by milk grade *Key variables: COMPANYNAME, MCCHANNEL* ***Reference period: Beginning of July 2013 to end of June 2014***

What **price per litre** did this company pay for **grade A milk** in the **last 12 months**?		What **price per litre** did this company pay for **grade B milk** in the **last 12 months**?		What **price per litre** did this company pay for **grade C milk** in the **last 12 months**?	
Average price in last rainy season (Dec-May) *(ZMW per Litre)*	Average price last dry season (Jun-Nov) *(ZMW per Litre)*	Average price in last rainy season (Dec-May) *(ZMW per Litre)*	Average price last dry season (Jun-Nov) *(ZMW per Litre)*	Average price in the last rainy season (Dec-May) *(ZMW per Litre)*	Average price in the last dry season (Jun-Nov) *(ZMW per Litre*
Sect5_q5_2.1	**Sect5_q5_2.2**	**Sect5_q5_2.3**	**Sect5_q5_2.4**	**Sect5_q5_2.5**	**Sect5_q5_2.6**

SECTION 6: We would like to know more about the buyer-supplier exchange relationship

Table 6.1: **Buyer-supplier exchange relationship** *KEY VARIABLES: COMPANYNAME, SUPPLIER* ***Reference period: Beginning of July 2013 to end of June 2014***

Marketing channel		On a scale where **1= Strongly disagree** and **7= Strongly agree,** please indicate with **(X)** in general the extent to which you agree with the following statement.													Please **explain** your **responsibilities** and those of the **supplier**	How often is the contract renegotiated?
		Overtime we have developed ways of doing business with…..(supplier) that never need to be expressed contractually/formally							**My relationship with …… (supplier) is governed by a written contract**						**We have a formal agreement that specifies the responsibilities of both parties.** *If 7 → go to next channel*								
SUPPLIER		**RLTN01**							**RLTN 02**						**RLTN 03**							**RLTN 04**	**RLTN05**
		1	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**		
MCC	1																							
Farmers directly supplying milk to your company but (NOT via MCC)	2																							

6.2 We would now like to establish the level of trust between this company and its various supplier(s) of milk

Table 6.2 Trust *KEY VARIABLES: COMPANYNAME, FARMER_CATEGORY* ***Reference period: Beginning of July 2013 to end of June 2014***

Farmer category		Number of dairy animals	On a scale where **1= Strongly disagree** and **7=Strongly agree,** please indicate with **(X)** in general the extent to which you agree with the following statement.																																		
			I believe in the……. (suppliers)because they are sincere							**Though the circumstances change, I believe that the…..will be ready and willing to offer assistance and support to the company**							**When making important decisions, I believe that the ….. are concerned about the welfare and interests of the company**							**I can count that ….future decisions and actions will not adversely (badly) affect this company**							**When it comes to things that are important to the company, I can depend on the …… support**						
FARMER_CATEGORY		**NODAIRYANM**	**SSTST01**							**SSTST02**							**SSTST03**							**SSTST04**							**SSTST05**						
			1	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
SMALLHOLDER FARMER farmers	1	1-10																																			
Emergent farmers	2	11-50																																			
Commercial farmers	3	>50																																			

6.3 We would like to know about the values that govern the buyer-supplier exchange relationship

Table 6.3 Relationship norms *Key variables: COMPANYNAME, FARMER_CATEGORY* ***Reference period: Beginning of July 2013 to end of June 2014***

Farmer category		Number of dairy animals	On a scale where **1= Strongly disagree** and **7=Strongly agree,** please indicate with **(X)** in general the extent to which you agree with the following statement.																																		
			In this relationship, both parties i.e. company & the…(supplier) expect that any information that may help the other party will be provided to that party.							**In this relationship ideas or initiatives are widely shared via open communication.**							**In this relationship problems and conflicts are expected to be solved through joint consultation and discussion**							**We expect our relationship with ……(supplier) to continue for a long time**							**We want to continue working with…. (supplier)**							**The renewal of our relationship with ….(supplier) is virtually automatic**						
FARMER_CATEGORY		**NODAIRYANM**	**RUL01**							**RUL02**							**RUL03**							**RUL04**							**RUL05**							**RUL06**						
			1	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
SMALLHOLDER FARMER farmers (SMALLHOLDER FARMERs)	1	1-10																																											
Emergent farmers	2	11-50																																											
Commercial farmers	3	>50																																											

6.3 Please explain any arrangements that exist for conflict resolution between the company and the milk suppliers? RUL07

……
……
……
……..

6.4 Please identify this company's strengths that have contributed to the success of the buyer-supplier (dairy farmers with ≤ 50 dairy animals) exchange relationship to date **Sect6_q6_5**

6.5 What are the critical things that have to change to increase the number of SMALLHOLDER FARMER dairy farmers selling milk to modern/formal processors? **Sect6_q6_6**

6.6 What are the critical things that have to change to increase the proportion of milk that SMALLHOLDER FARMER dairy farmers sell to modern/formal processors? **Sect6_q6_7**

6.7 What are the critical things that have to change to increase the SMALLHOLDER FARMER dairy farmers' access to credit through interlocked contractual arrangements? **Sect6_q6_8**

6.9 If there is one initiative you would like to see the government undertake to enhance the incomes and profitability of SMALLHOLDER FARMER dairy farmers, what would it be? Please elaborate as clearly and as succinctly as possible **Sect6_q6_9**

Thank you for spending the time with us to share your ideas, opinions and information about your operations.

Questionnaire NO. | | |

FINANCIAL INSTITUTIONS' SURVEY

This survey is part of the team effort at University of Pretoria South Africa and University of Zambia aimed at understanding the extent and conditions under which interlocked contractual arrangements are inclusive of SMALLHOLDER FARMER dairy farmers and whether participation enhances their wellbeing. We hope that the information generated will enhance the process of integrating SMALLHOLDER FARMER farmers in mainstream value chains, input and financial markets. Your help in answering these questions is very much appreciated. Your responses will be kept **COMPLETELY CONFIDENTIAL.** You indicate your voluntary consent by participating in this interview: may we begin?

4. FINANCIAL INSTITUTION IDENTIFICATION

1.1 Province code **PROV** | | Province name: _____

1.2 District code **DIST** | | District name: _____

1.3 Name of financial institution **BANKNAME** _____

1.4 Name of Respondent NOR_____

1.5 Job position of the respondent? **JOBPSTN**_____

1.6 How long have you been working in the current job position? **JOBTENURE**_____

1.7 How long have you been involved in the focal buyer –supplier (SMALLHOLDER FARMER dairy farmers) relationship?

MGMTENURE_____

1.8 On a scale where 1= Not knowledgeable and 5 Very knowledgeable, please indicate with **(X)** the extent to which you are knowledgeable about the overall exchange relationship between this financial institution and SMALLHOLDER FARMER farmers borrowing through interlocked contractual arrangements.	**1**	**2**	**3**	**4**	**5**
Resp_eligibility					

1.9 Cellphone number of respondent **CELLPHONE** _____

1.10 Response status (1=Complete; 2=Refusal; 3=Non-contact) **status** |

1.11 Date of enumeration (dd/mm/yy) **daten** | / | / **1** | **4**

1.12 Name of enumerator _____ Enumerator code **enum** | |

1.15 Date checked (dd/mm/yy) **datec** | / | / **1** | **4**

SECTION 2: General Information about the financial institution

2.1 In which year was this financial institution established? **Sect2_q2_1**

2.2 What type of financial institution is this? **Sect2_q2_2** *(See codes below)*

1= Commercial bank	*2= Development bank*	*3= Micro finance institution*	*Other(s) Specify*

2.3 In which year did this institution start giving loans to dairy farmers through interlocked contractual arrangements (where repayment for the loan is effected at the point of milk sale)? **Sec2_ q2_3**

2.4 Would you please describe the geographical coverage area of this financial institution by province and district in Zambia?	
Province **Sec2_ q2_4.1**	District **Sec2_ q2_4.2**

2.5 Would you please describe the geographical coverage area of this financial institution with regards to offering loans to dairy farmers through interlocked contractual arrangements by province and district in Zambia?	
Province **Sec2_ q2_5.1**	District **Sec2_ q2_5.2**

2.6 What criteria do you use to select dairy farmers that are eligible to access loans through interlocked contractual arrangements? **Sect2_q2_6**

2.7 Would you please describe the interlocked contractual arrangement model/design that you use to offer loans to dairy farmers? **Sect2_q2_7**

2.8 We would now want to know more about the financial product(s) that this financial institution offers

Table 2.8: Financial products *KEY VARIABLES: BANKNAME, BANKPDCT*

Financial products		Do you offer…..? *Enter* *1= Yes2= No →* ***go to next BANKPDCT***
BANKPDCT		**FINPDCT01**
Loan products	1	
Savings products	2	
Insurance	3	
Cash remittance	4	
Other(s) Specify	5	

2.9 We would now want to know about the number of farmers that have accessed loans for dairy production through interlocked contractual arrangements in Zambia

Table 2.9 Number of farmers that have accessed loans through interlocked contractual arrangements *KEY VARIABLES: BANKNAME FARMER_CATEGORY*

Farmer category		Number of dairy animals	How many **……..** have **acquired loans** for **dairy production** since the **inception** of the p**rogramme?**	How many **……..** have **acquired loans** for **dairy production** between **30th July 2013 and 1st June 2014**?
FARMER_CATEGORY		**NODAIRYANM**	**Sect2_q2_8.1**	**Sect2_q2_8.2**
SMALLHOLDER FARMER farmers	1	1-10		
Emergent SMALLHOLDER FARMER farmers	2	11-50		
Emergent medium scale farmers	3	21-50		

Table 2.9 continued

Farmer category		Number of dairy animals	How many **……..** have **acquired loans** for **dairy production** since the **inception** of the **programme** in **Chongwe** district?	How many **……..** have **acquired loans** for **dairy production** between **30th July 2013 and 1st June 2014** in **Chongwe** district?	How many **……..** have **acquired loans** for **dairy production** since the **inception** of the **programme in Chibombo** district?	How many **……..** have **acquired loans** for **dairy production** between **30th July 2013 and 1st June 2014 in Chibombo** district?
FARMER_CATEGORY		**NODAIRYANM**	**Sect2_q2_8.3**	**Sect2_q2_8.4**	**Sect2_q2_8.5**	**Sect2_q2_8.6**
Small holder farmers	1	1-10				
Emergent small holder farmers	2	11-20				
Emergent medium scale farmers	3	21-50				

3.0 Please describe the various types of loan products that you offer to dairy farmers through interlocked contractual arrangements

Table 3.0: Loan products *KEY VARIABLES BANKNAME, LOANPRODUCT*

Name of product		Interest rate charged per annum	Grace period	Repayment period	Type of collateral *(See codes below)*	Loan disbursement system *(See codes below)*	Describe the monitoring and enforcement efforts involved
LOANPRODUCT		**LONTMS01**	**LONTMS02**	**LONTMS03**	**LONTMS04**	**LONTMS05**	**LONTMS06**
	1						
	2						
	3						
	4						

Codes: Type of collateral LONTMS04				**Codes: Loan disbursement system LONTMS05**
1=Land title	*4=House*	*7=Salary*	*10= Bank loan guarantee*	*1= Cash 2= In-kind*
2=Farm implements/Equipment	*5=Dairy animals*	*8=Membership in a club/ community group/ cooperative/MCC*	11= *Other household assets*	*3= Disbursed in instalments*
3=Vehicle	*6=Bank account*	*9=Contract with milk processor*	*12= Insurance 13= Other(s) specify*	*4= One off disbursement*

2.11 Do you offer any training to your clients? **TRAIN** ☐ ***(1=Yes; 2=No → go to question 2.12)***

2.11.1 Describe the type of training that you offer?

TYPE_TRAINING……
……
……
……..

3.1 Please identify this financial institutions' strengths that have contributed to the success of interlocked contractual arrangements achieved so far in the SMALLHOLDER FARMER dairy sector **Sect3_q3_1**

3.2 What are the critical things that have to change to increase the number of SMALLHOLDER FARMER dairy farmers accessing loans through your institution? **Sect3_q3_2**

3.3 If there is any initiative you would like to see the government undertake to enhance the incomes and profitability of SMALLHOLDER FARMER dairy farmers, what would it be? Please elaborate as clearly and as succinctly as possible **Sect3_q3_3**

Thank you for spending the time with us to share your ideas, opinions and information about your operations.