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Determinants of Choosing a Particular Dairy Marketing Arrangement and Assessing Its Impact on Household Livelihood
Evidence from Northern Ethiopia, Tigray

By:

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Declaration

I, Mr. Gashaw Alemye, Id. No.CBC/PR101/02   hereby declare that this thesis entitled *"**Determinants of Choosing a Particular Dairy Marketing Arrangement and Assessing its Impact on Household Livelihood in Tigray Region (The Case of Degua Temben, Enderta, Hintalo Wajirata and Kiliteawulalo"** submitted as a partial fulfillment of the requirements for the award of the degree of MA, in Development Studies (specialized in Business and Development) to the College of Business and Economics, Mekelle University, through the Department of Management is my original work and has not been presented for a degree in any university. All sorts of materials used for this thesis have been dully acknowledged.

Name of the student: Gashaw Alemye

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Date: 24/06/11

Certification

This is to certify that this thesis entitled **"Determinants of Choosing a Particular Dairy Marketing Arrangement and Assessing its Impact on Household Livelihood in Tigray Region (The Case of Degua Temben, Enderta, Hintalo Wajirata and Kiliteawulalo"** submitted as a partial fulfillment of the requirements for the award of the degree of MA, in Development Studies (specialized in Business and Development) to the College of Business and Economics, Mekelle University, through the Department of Management, done by Mr. Gashaw Alemye, Id. No. CBC/PR101/02 is an authentic work carried out by him under my guidance. The matter embodied in this work has not been submitted earlier for award of any degree or diploma to the best of my knowledge and belief.

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ABSTRACT

This study aims at identifying determinants of choosing a particular dairy marketing arrangement and assessing the impact of the arrangement to household livelihood. 387 households in four woredas of Tigray were administered through structured questionnaire. Descriptive statistics and multinomial logit models were employed to determine the significance of the factors affecting selection of a particular marketing arrangement. The three methods of coordination implemented in the areas were spot, contracts and cooperative market, but cooperative was dominantly exercised in the dairy chain. Propensity Score Matching was also employed to examine the impact of marketing arrangements on household livelihood in terms of asset formation, milk production and human capital. Free riding and lack of commitment were the problems in cooperative marketing as indicated by focus group discussion. Long Fasting dates and feed constraints have identified as a negative impact for milk selling and production in the selected sites. Model results indicated that cooperative marketing arrangement in general, provides higher prices, stable market, producing larger volume of milk and higher income to producers than other marketing arrangements. Price volatility was high in spot marketing arrangement as compared to contract and cooperative marketing. The results of this study showed amount of milk production, price flexibility, active local administrative participation and distance to main market significantly affecting the producer's choice for cooperative marketing in relative to spot and contract marketing arrangement. Among the three marketing arrangements, contract marketing arrangement offered higher buyer access in the market. Volume of milk production, price flexibility, distance to the main market and active local administration participation were significant and positively related for the choice of cooperative marketing arrangement. The model result also indicated vertical coordination was a mechanism for enhancing producer's livelihood in terms of asset accumulation and milk production for the market. The study has a potential policy implication for improving dairy marketing arrangement and livelihood of producers through promotion of large private investment in the area, which at the end will introduce new technology in the sector such as improved cross breed cow, feed and veterinary service.

Keywords: *Marketing arrangement, determinants, spot, contract and cooperative household livelihood and vertical coordination*

Acronyms

ATT	Average Treatment Effect on the Treated
BoFED	Bureau of Finance and Economic Development
CIA	Conditional Independence Assumption
CSA	Central Statistics Authority
ETB	Ethiopian Birr (The legal currency of Ethiopia)
FAO	Food and Agriculture Organization
FGD	Focus Group Discussion
GDP	Gross Domestic Product
ha	Hectare
HH	Household
ILRI	International Livestock Research Institute
masl	Meters above see level
MU-IUC	Mekelle University-Institutional University Cooperation
NGOs	Non Governmental Organizations
PSM	Propensity Score Matching
PSNP	Productive Safety Net Program
REST	Relief Society of Tigray
UNRRA	United Nations Relief and Rehabilitation Administration
VC	Vertical Coordination

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CHAPTER ONE

INTRODUCTION

1.1. Background of the Study

Ethiopia stands first in its livestock population in Africa and at the same time it has the largest potential for dairy development that contributes to the livelihoods of 60- 70% of Ethiopian population (Ayele et al. 2003). However, this income contribution to the economy is limited as compared to the immense potential that the country has (Tesfaye et al. 2008; Holloway, et al, 2000; Staal, 2001; Ahmed et al, 2004).

Moreover, despite its largest cattle population, the quality and the amount are not sufficient (Mohammed et al, 2004).

> In Ethiopia the dairy supply chain entailed about 500,000 smallholder rural farmers who produce about 1,130 million litters of milk of which 370 million liters of raw milk, 280 million liters of butter and cheese and 165 million liters is consumed by the calves (Mohamed et al, 2003). The remaining 315 million liters was marketed through both informal and formal retailers via cooperatives and farmers' organizations.

Therefore, we can understand from this finding only small amount of milk is marketed.

The development of market- oriented smallholder dairy in developing countries, for instance, Ethiopia has an important role for the mitigation of poverty and it is also a tool for sustainable rural household income and welfare (Staal, 2001, Mohamed, et al., 2004 and Tesfaye et al., 2010). In addition to the above roles, the dairying has the potential to increase employment opportunities in Ethiopia (Staal, 2001).

According to Muriuki et al. (2001), Ethiopian smallholder dairy producers are important when they are close to formal marketing facilities, for instance government enterprise or milk groups. Ironically, those who are far from formal marketing outlets prefer to produce other dairy products instead, such as cooking butter and cottage cheese. That is why the dairy sector did not contribute what the country expected from it.

Ethiopian smallholders face significant problems, for example, lack of inputs (credit), and technical and other supports to respond what the market demands. Unless they have sound strategies to overcome these problems, they can seldom participate in markets and as a result of this they cannot grasp benefits which will emanate from participation fully.

But, according to Mohamed et al, (2003), these problems can be reduced if the producer is well organized and coordinated through high value chains. Because well coordinated market structure has the power to increase market access and in turn income to the smallholder producers. At this point, in recent years some people have focused on concept of vertical coordination[1] to mitigate the marketing problems.

The demand for vertical coordination is increasing in developing countries and also mentioned as new engine for economic growth, rural development and poverty reduction (Swinnen and Maertens, 2006).

Lack of sufficient market coordination between buyers and sellers, lack of market information, the lack of trust among market actors and risk result in high transaction cost to the farmers and finally they are motivated to participate in vertical coordination to minimize it (Davis and Gillespie, 2007).

Smallholder dairy producer could adopt a range of coordination mechanisms from open market (zero coordination) to full coordination (contract and cooperative market).

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[1] Vertical coordination refers to "synchronization of successive stages of production and marketing with respect to quality, quantity and timing of product flows" (Martinez (2002:2). Methods of vertical coordination include open (also referred to spot market), contract and cooperative market.

Spot markets refer to "a large number of buyers and sellers, which meet at a certain time and place with imperfect information about product quality, quantity and price, which gives rise to opportunistic behaviour" (Williamson, et al. 2004).

Spot marketing arrangement has the following characteristics: Self-interest, short-term relationships, opportunism, limited information sharing, flexibility and independence (Peterson *et al*, 2001).

Peterson *et al*, (2001) also identified the characteristics of managed coordination(contract and cooperatives) such as; mutual interest, long term relationships, shared benefits, open information sharing, stability and interdependence.

However, their adoption depends on the searching costs, negotiation costs, and monitoring costs emanating from product characteristics, level of asset-specific investment, uncertainty, frequency of transactions and their access to credit, farm inputs, technology (Hobbs 1977 and Boger, 2001).

Smallholder dairy producers engage in contract marketing; to manage risks in production and marketing, to share risk and to access credit (Glover, 1994 and Ayelech, 2010).

The well-known work of Swinnen (2005*)* discussed the most important reasons why producers are motivated to engage in contract marketing, such as higher prices, guaranteed sales, stable prices, pre-payment, access to credit and access to inputs and assistance.

On the contrary contract marketing, according to Swinnen and Maertens (2006) has a negative effect to the producer, such as long payment delays, non-payments for delivered products or non-delivery.

According to Travis (2008), factors that make producers form a cooperative business or engage in a cooperative marketing arrangement are economies of scale, bargaining power, flow of product, preserving markets, access to professional assistance/expertise (hire support) and maintaining more of the retail income.

Ironically, he also stated that, cooperative marketing arrangements has its own challenge to the producers, for instance, agreeing on one common mission, trust and sharing of information problem, group dynamics (democratic group decision making and costs), lack of commitment from members/free rider. However, according to him, these challenges are not to discourage the farmer from joining a cooperative marketing arrangement, but rather to make them aware that with benefits come challenges for the producers.

The researcher believed that the study of the determinants and effects of cooperative marketing at household level gives a good insight to policy implementers. With such consideration, the study was critically assessed the determinants for choosing vertical coordination and livelihood effects of cooperative marketing participation on household in Tigray, Northern Ethiopia.

1.2. Problem Statement

Ethiopia stands first in its livestock population in Africa. Unfortunately, the livestock sector in Ethiopia has paradoxical characteristics. This is true because on the one hand, the livestock size that the nation has is so high on the other hand the role that the livestock sector plays for the economy (to the national and individual household income) is low and below potential (Azage et al. 2006 and CSA, 2006).

A number of fundamental constraints underlie these outcomes; prevalence of poor marketing infrastructure, high transaction cost, lack of marketing support services, imperfect market information, limited credit services and insufficient facilities for storage and transportation and lack of knowledge about the market (Ellen, 2010).

Smallholder dairy farmers in rural areas like, Tigray confronted with many dairy marketing problems inherent in their undeveloped economy. So, analyzing dairy market arrangements were expected to play a major role in improving the productivity and marketing capabilities of farmers then this in turn results good income. Multiple factors determine the success or failure of these marketing arrangements. In order to realize full potential of dairying marketing system in Ethiopia marketing problems that interlock with each marketing arrangements must be analyzed.

In spite of the benefits vertical coordination offer, a large percentage of today's dairy producers remain independent (spot marketers) in Ethiopia for instance; in Tigray Region. Some past researchers argue that vertical coordination is more important than individual producers (spot), in the contrary other also said that spot market is better than vertical coordination. Why? This paper answered such basic questions scholarly in Tigray region. Then, answering these questions assisted policymakers in designing appropriate policies for intervention and also assists to producer for right decision for adopting the right marketing arrangements and so as to make each party better off.

The ability of a country to achieve growth in dairy production system depends on its ability to make an efficient and reasonable choice among vertical coordination. The choice of every action or approach has to be appreciated according to the specific situation, and there is no standard rule on that matter. However, in order to identify which alternative is appropriate channel in the selected region, it needs critical analysis of determinant factors of vertical coordination.

Now a days greater attention is given on making agricultural production better off. This helps as springboard for rural development. However, without sound, healthy and well coordinated market, it will be very difficult to get agricultural production which the market demands.

There are a number of studies specifically examining the motivations of farmers/ producers to engage in vertical coordination in other parts of the world but Ethiopia. However, to the researcher best knowledge, no empirical study has been done to explore determinants of marketing arrangement choice and their impact on household livelihood in Tigray Region. Therefore, this paper, therefore, attempted to provide evidence on the determinants for choosing vertical coordination and its impact on household livelihood Tigray, Northern Ethiopia.

1.3. Research Questions

The research addressed the following key research questions:

- ☝ What are the determinant factors that influence milk producers' choice among different types of marketing arrangements? and
- ☝ What are the effects of marketing arrangements on household livelihood in Tigray Regions, Geba Catchment?

1.4. Objectives of the Study

The general objective of the study is to assess the determinants of choosing marketing arrangements for dairy products and its effect on household livelihood.

Specific Objectives:

- ✈ To identify the determinants that influence dairy producers' choice among different types of marketing arrangements
- ✈ To measure the effects of marketing arrangements on household livelihood
- ✈ To identify key dairy production and marketing constraints in the study area
- ✈ To suggest suitable strategies to improve the productivity and household livelihood

1.5. Significance of the Study

Identifying, analyzing and understanding of the effects of diary marketing arrangements on household income and identifying the factors that determine dairy producer participation in different marketing arrangements will contribute to the sustainability and improvement of household income and helps to the government to develop better strategy on dairy marketing system.

Analysis of the dairy marketing system and identifying clearly the challenges will benefit policy makers and implementers in indicating the area of advantage for what will be done to improve

dairy production and marketing. Therefore, it is hoped that, results from this study will have practical use mainly to this area and can serve as a base for any further studies to be conducted in other similar areas within this line of study. Consequently, dairy product marketing studies become essential to provide vital and valid information on the operation and efficiency of dairy product marketing system for effective research, planning and policy formulation.

The study will generate valuable information on dairy marketing that will assist policymakers in designing appropriate policies for intervention. Governmental and nongovernmental organizations that are engaged in the development of livestock sub-sector will benefit from the results of this study.

The findings of this study will also useful to dairy producers, traders and marketing agents to make informed decisions to choose different marketing arrangements. Besides, it will be a useful reference for researchers and other interested persons in the area of study.

1.6. Scope and Limitation of the Study

This study was based on the data which was collected by MU-IUC project for the time period June, 2010 G.C. This study conducted on marketing arrangements determinants and income effects from four purposively selected woredas in Tigray region namely, Degu Temben, Enderta, Hintalo Wajirata and Kiliteawulalo.

With regard to the variables understudy, the researcher focused only on the following issues: spot, contract and cooperative marketing arrangements which are categorized as zero coordination (spot/ open) and some coordination arrangements (contract and cooperative marketing) from producer's point of view. To conduct this paper all potential dairy producers who have exotic cows in the selected woredas were included under the study which was census based.

Since the study is to be conducted in only four woredas of Tigray region, Northern Ethiopia, its results may not represent national and/or regional marketing arrangements and cooperative marketing participations.

1.7. Organization of the Thesis

This thesis consists of five chapters. Chapter one deals with the background, problem statement, objectives, scope and significance of the study. Chapter two reviews literature related to the research topic. Methodological issues including the study area description are presented in chapter three. The fourth chapter presents the results of the study and their interpretation. The final chapter summarizes the thesis, concludes and presents policy implication and recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1. Historical Developments of Dairy Development and Marketing System in Ethiopia

According to Ahmed et al. (2003), *in the first half of the 20th century, dairying in Ethiopia was mostly traditional. Modern dairying started in the early 1950s when Ethiopia received the first batch of dairy cattle from United Nations Relief and Rehabilitation Administration (UNRRA).*

According to Feleke and Geda (2001), "the livestock sector contributed about 40% of agricultural GDP or 18% national GDP, and 30% of agricultural employment". The income contribution of this sector is still not exploited in spite of the fact that the amount of the livestock.

Now days, a number of smallholder and commercial dairy farms are emerging mainly in the urban and peri-urban areas of the capital (Felleke and Geda, 2001) and Smallholder rural dairy farms are also increasing in number in areas where there is market access to sell the product what they produced if not the rural system is non-market oriented and most of the milk produced in this system is retained for home consumption.

Like other countries, Ethiopian milk production is marketed through both formal and informal marketing system. According to Muriuki and Thorpe (2001), only small amount of milk marketed through formal market.

Recently, private businesses have begun collecting, processing, packing and distributing milk and other dairy products. Still, the proportion of total production being marketed through the formal

markets remains small (Muriuki et. al 2001). Formal milk markets are particularly limited to peri-urban areas and to Addis Ababa.

The informal market involves direct delivery of fresh milk by producers to consumer in the immediate neighborhood and sale to collectors or traders nearby towns. In the informal market, milk may pass from producers to consumers directly or it may pass through two or more market agents. The informal system is characterized by no licensing requirement to operate, low cost of operations, high producer price compared to formal market and no regulation of operations. The informal (traditional) market has remained dominant in Ethiopia. The traditional processing and trade of dairy products, especially traditional soured butter, dominate the Ethiopian dairy sector.

2.2. Vertical Coordination

Peterson and Wysocki (1997) define the term of a vertical co-ordination continuum that moves from external mechanisms to internal mechanisms with three transitional stages (contracts, strategic alliances and formal co-operation) between two extreme polar forms. Since agricultural markets become more differentiated, spot market transactions does not always prove to be the most appropriate form for the exchange of goods. Thus in turn the producers to see more vertical coordination for the products they produce.

Vertical coordination is an important part of a competitive strategy and is defined broadly as various methods used to manage vertical stages in a marketing channel that includes open/ spot, contract and cooperative marketing. Now days literature has distinguished vertical coordination in to two extreme co-ordination mechanisms: spot markets (external co-ordination) and vertical integration (internal co-ordination).

Firms and producers using such a competitive strategy will need to be as cost efficient as possible by operating at the lowest average cost, if they are to succeed in marketing products to these customized market segments. This competitive strategy requires firms to focus on particular market niches and provide differentiated products. This strategy also requires tremendous coordination,

from identification of end-user needs to selection of genetic traits that may satisfy these needs most profitably Michael and David, (2002).

The emergence of vertical coordination will be referred to as the insufficient capital hypothesis reflecting that vertical linkages arise predominantly as a response to farmers' insufficient financial capital endowments.

"*Vertical coordination has been an important topic in the agricultural marketing literature since the beginning of the industrialization of agriculture including, the developing countries (*Gulati*, 2007;* Gabor and Krisztina, 2005*).

Consequently, if the community is in need of getting potential benefit from dairy production, the transfer of the dairy sector from its traditional form to its modern form (a market -oriented approach should be done. Because well-organized market structure provides an important way in which smaller producers can farm in a commercial manner (Arzu et al. 2006).

> *Farmers in developing and transition countries face major constraints in realizing high-quality, consistent supplies. These include financial constraints as well as difficulties in input markets, lack of technical and managerial capacity etc. Specifically for high-standards products, farmers might lack the expertise and have no access to crucial inputs such as improved seeds. To guarantee consistent and quality supplies, traders and processors engage in VC to overcome farmers' constraints (Swinnen and Maertens, 2006).*

According to the work of Swinnen and Maertens (2006), producers engaging in vertical coordination, to increase output, product quality and ultimately incomes through better access to inputs, timely payments, and improved productivity with new investments.

Moreover, the study finds that farm profits are higher through lower production and marketing costs for contract farms compared to independent smallholders in VC schemes for milk.

Bijman (2008), also smartly identified vertical coordination highly needed when products are: highly perishable, the production requires specific investments, and the production involves special skills and inputs.

As said by Ayelech (2010), market liberalization and globalization are the very driving force to shift in consumer tastes and the change in the role of government towards more market-based solutions and which in turn the importance of vertical coordination.

Many problems of market failure and missing markets often arise due to asymmetric information and an array of product and transaction characteristics that raise transaction costs (Minot, 1986; Hobbs and Young, 2001).

Thus, as various consumer demands become more specific, products require greater differentiation and this leads to vertical coordination.

Firms/ producers accomplish this by either fully vertically integrating, or by engaging in contracts with farmers. For the purpose of this study, the researcher will focus on zero coordination (spot) and some coordination (contract and cooperative marketing) arrangements.

Vertical coordination arrangements can reduce transaction costs related to inefficient measuring and sorting, and leave more gains from exchange to be distributed among contracting parties. If measuring output quality were cost free, spot-market production would provide effective price incentives for performance. On the other hand, if measuring output quality were costly, parties would be encouraged to shirk, cheat, and engage in other types of opportunistic behavior.

Hobbs and Young (2000) explain the trend towards increased vertical coordination by examining its technological, regulatory, and socio-economic drivers. Liability and traceability are examples

of regulatory drivers. Perishability, product differentiation, and biotechnology are examples of technological drivers. Changes in consumer lifestyles and preferences are examples of socio-economic drivers.

Hobbs (1996) explained that vertical coordination as a tool for establishing long-term and stable relationships with suppliers so as to minimize transaction costs associated with sourcing raw agricultural products. In this case, one may see VC as a tool to generate mutual loyalty between transacting parties in the market.

Swinnen, (2007) identified two main reasons have been provided in the agricultural economics literature for the emergence of vertical coordination in the food supply chain. On the one hand, it has been argued that after the implementation of quality standards downstream food companies lack sufficient supplies of high quality raw agricultural commodities. As a result of that, their processing capacity cannot be fully utilized.

On the other hand side, while engaging in closer co-operation with farmers, downstream food firms reduce the risk of losing their already modernized suppliers to competitors who either have larger financial resources or are less engaged in supporting changes at the farm level. In this regard, vertical coordination counterbalances potential advantage of competitors being able to offer farmers higher monetary bonuses. Consequently, close vertical linkages between downstream and upstream sectors may be seen as a tool to create new (dis)incentives to both transacting parties in the market so as to generate mutual dependability. This study focused on spot, contact and cooperative marketing arrangements.

2.2.1. Spot/open Marketing Arrangement

Spot markets refer to "a large number of buyers and sellers which meet at a certain time and place with imperfect information about product quality, quantity and price, which gives rise to opportunistic behaviour" (Williamson, et al., 2004). Spot marketing is the traditional method used by many producers/ farmers to sell their commodities as price takers.

The "do-it-all" philosophy still characterizes the goals of many independent producers. All production expenses/profits generated through the production and sale of dairy products are incurred/realized by the producer. Those farmers/ producers who are engage in spot marketing arrangements have the power to control over firm decision making. Therefore, spot marketers would have a higher associated level of autonomy than contract production in this case.

> *While spot markets are efficient at distributing homogenous commodities, as agricultural products become more differentiated, buyer preferences more heterogeneous and the requirement for improved information flow along the supply chain increases, methods of vertical coordination which allow closer buyer-seller relationships are emerging (Hobbs and Young 1997).*

According to Welsh and Bryan (1999), "an independent producer secures all of his or her production inputs, and makes all decisions concerning the production and marketing dairy products". Milk is sold on the open market by the producer. All production expenses/profits generated through the production and sale of milk are incurred/realized by the producer and producers only.

Lawrence *et al*, 1997, argue that spot markets are only very limitedly able to transmit quality-related information in food chains. Therefore, farmers favor other marketing arrangements like, contract and cooperative to minimize transaction cost which arise form being spot marketer. Because this types marketing arrangements has the power to minimize transaction cost and coordination cost by settling a premium for higher quality with a one-time negotiation.

The transactions usually take place at market centers, but buyers looking for milk can also approach sellers in their homes. Most of the transactions involve spot cash payments and prices may be negotiated during the transaction.

According to Peterson et al., (2001) and Arzu et al., (2006), in spot marketing arrangement all economic transactions are governed by price and the producers does not commit to selling its product before they are completing the production.

Peterson et al., (2001) also added that in spot marketing arrangement the control intensity and the ex- ante control is focusing on price negotiation. But, their may be ex-post decisions whether or not the parties repeat the transaction. If the producer produce high quality product and at the same time the producers may suited the products this in turn frequency of transaction may be high.

Kirsten and Sartorius (2002) argue that efficient transactions using spot markets are usually applicable when the conditions approach that of perfectly competitive markets (i.e., many buyers and sellers dealing with homogeneous goods, perfect information, unrestricted mobility of inputs and outputs).

Sometimes spot market cannot govern whole or part of the marketing channel effectively and efficiently. This in turn results in the actors in the market to incline to other marketing arrangements for instance contract and cooperative (Gabor and krisztina, 2005). This problem is high especially in agricultural market because these markets are more differentiated and the participants in the market are vulnerable in most cases.

Spot markets may not work properly for quality coordination when the frequent change in feed and base hog prices erodes optimality of quality price, and timely adjustments of quality price contingent on the price change are fairly costly.

2.2.2. Contract Marketing Arrangement

Contract marketing is not a recent phenomenon. But currently, because of liberalization agricultural of market and stricter supply chain coordination the need has increased (Kirsten and Sartorius, 2002; Da Silva, 2005).

Different authors defined contract farming as "an agreement between one or more farmer(s) and a contractor for the production and supply of agricultural products under forward agreements, frequently at predetermined prices, quantity, and time by known buyer" (Eaton and Shepherd 2001, Singh 2002).

Contract marketing ranges from simple verbal agreement (shaking hands) to detailed written agreements on amounts, quality, timing, input specification, method of delivery, price formula, payment method and so on to be delivered (Ayelech, 2010). However to be effective in contracting marketing written contract is the most useful.

Contract marketing can provide a plenty of benefits to smallholder farmers. Different authors confirmed this idea (Eaton and Shepherd, 2001; Kliebenstein and Lawrence ,1995 and Rhodes 1994) for instance: access to output markets; access to inputs; access to technological assistance; lower market risk; lower innovation risks; and access to credit. Moreover, contacting allows producers to stabilize their income adopt a new technology (Rhodes (1994).

Farmers/ producers can reduce market imperfections if they are engaging in contract marketing arrangements as compared to spot marketing arrangements (Minot, 1986). According to Minot's work (1986), a market-specification contract has the power to reduce the cost of gathering and exchanging information about demand, quality, timing and price, thus reducing uncertainty and the concomitant market risks. As a result this in turn increasing information exchange reduces coordination costs (as compared to spot market trading). Increasingly, he has also discussed the importance of resource providing contract: for instance it can reduce the costs of obtaining credit, inputs and extension services, including the cost of screening and selecting these services.

Finally, he specified the production management contract which helps to the producers to achieve quality, timing and least-cost production, thus even more economizing on coordination costs. It may also support skills development of the producer, and thereby reduce future transaction costs.

Some authors argued that contract marketing is sometimes being viewed in a negative light to the producers. In some regard it as a means of exploitation of farmers by agribusinesses/contractors due to unequal power relations (Singh, 2002). However it has been widely practiced in many countries as *it* prevails over the negative effects.

According to Bijman (2008), smallholders engage in contract marketing for the following reasons: access to markets and market information, access to technical assistance, access to credit and inputs, higher income and status and reduction of market and production risk.

He also examined the demerits of contract marketing for producers such as, loss of autonomy / flexibility, lack of transparency (Particularly in price determination), contractors might renege on contract, risk of indebtness and adverse gender effect.

Finally Bijman (2008) confirmed that, if producers engage in contract marketing, they will get sound returns which improve their lives and incomes.

There are two basic types of contracts: marketing contracts and production contracts. For the purpose of the study the researcher focused on marketing contract only. Marketing contracts identify a buyer, seller, and product, and have two main provisions: 1) quantity and 2) price.

Marketing contracts are used to set a price and market for a crop to be sold at a future date. Producers have a guaranteed buyer and price for their production, but supply most or all crop inputs, retain ownership until time of sale, and have sole management responsibility. Price is determined by current supply and demand conditions.

Quality is also becoming more important in marketing contracts which may be a specified provision of the contract or part of a pricing mechanism. There are a number of pricing mechanisms used in marketing contracts. Some contracts use a flat price, which is a single, specific price set at time of contract. This is the only type of marketing contract that alleviates price risk. Many marketing contracts use a base price, often determined from a cash market or

futures exchange, plus or minus economic incentives for quality attributes Michael and David, (2002).

2.2.3. Cooperative Marketing Arrangement

Center for Cooperatives (2004) defined cooperative as "a private business organization that is owned and controlled by the people who use its products, supplies or services".

The different principles that govern cooperatives include: voluntary and open membership, democratic member control, member economic participation autonomy and independence, education, training and information cooperation among cooperatives and concern for community.

To be a member of a cooperative it is also necessary to be committed to the organisation and be an active user of the cooperative's services and products. There is no value in having non-committed (free riders) members, who are not active users. Inactive members undermine the cooperative and should not participate.

Koopmans (2006) also defined "a cooperative as a member-controlled association for producing goods and services in which the participating members, individual farmers or households, share the risks and profits of a jointly established and owned economic enterprise".

risk sharing, profit sharing, to supply good quality at reasonable price to supply the sufficient and cheap credit were the benefits derived of being members of cooperative marketing (Mohamed et al., 2004 and Eshetu, 2008).

As said by Staal (2001), producers engage in cooperative marketing to respond the fundamental problems in the market and when there is inconvenience of small quantities of milk to market.

According to Travis (2008), factors that make producers form a cooperative business or engage in a cooperative marketing arrangement are economies of scale, bargaining power, flow of product, preserving markets, access to professional assistance/expertise (hire support) and maintaining more of the retail income.

Cooperatives are the best institutional intervention for attaining food security in any Country and playing a crucial role in attaining food security through; the provision of agriculture input and output marketing, facilitating irrigation for crop production, value addition, creation of employment the establishment small and micro enterprises.

The theory of cooperative organization provides several reasons why farmers/ producers join the cooperatives. According to Schroeder (1992), cited in Tefera, (2008) cooperatives provide quality supplies and service to the farmers at a reasonable cost. By purchasing supplies as a group, the farmers offset the market power advantage of other private firms providing those supplies.

According to Staal (2001), dairy co-operatives have typically been formed in response to a fundamental farmer problem: The inconvenience of small quantities of milk to market. Milk is perishable which requires special handling to insure quality and shelf life. Holding milk where infrastructure may be lacking can be costly and risky that needs quick market.

On the other hand, the rapid delivery of small quantities of milk to market may not be practical or economic; some smallholder producers may market no more than 1 to 2 L of milk in a given day. The practical collection and transport of milk to market therefore usually requires some bulking, and the need for speed and reliability requires good organization of that bulking. Consequently, there is strong incentive for smallholder producers to try to form collective organizations to meet these needs, which are dairy cooperatives.

According to Tanguy and David (2008), trust of organization's management is one of the determinant factors that limit the producers being a member of cooperatives.

In the work of Tsehay (1998), Producers/ farmers join a marketing cooperative to gain more control in marketing their products so they can: increase the price they receive for their products, reduce the costs of marketing for their produce and for obtaining agricultural inputs such as seed and fertilizer; and make the market for their goods more secure.

According to his work, the marketing cooperative accomplishes these objectives by: performing certain functions such as processing, packing, storing, cooling, shipping, promoting, and selling; negotiating for better market terms because of volume and variety offered by their members; and buying production supplies (seeds, fertilizer, feed, containers, etc.) in large volumes at lower prices.

Eshetu (2008) added that, producers/ farmers participation in cooperative marketing increased farmers bargaining power in the market places.

Marketing on a cooperative basis permits farmers to combine their strength and gain more income by involving in input and output marketing. The farmers can lower distribution costs, conduct joint product promotion, and develop the ability to deliver their products in the amounts and types that will attract better offers from purchasers.

According to Folsom (2002), having a businesses owned and controlled on a cooperative basis helps farmers' entire community. Cooperatives generate jobs and business earnings for local residents. They pay taxes that help to finance schools, hospitals, and other community services.

According to Koopmans (2006), farmers may have several specific reasons for starting an agricultural cooperative: to mobilize more resources than they can individually supply, to create attractive alternatives for purchasing goods and services, to operate a business more efficiently than can be done on an individual basis, because they recognize that the benefits outweigh the duties of membership and because they recognize that as members of a cooperative they are part owners and not only clients. By becoming a member of a cooperative, each farmer can make use of the advantages of the cooperative: a good market price for their product and access to other goods, services, markets and credit.

In the well known work of Koopmans (2006), cooperative enterprise can offer a range of economic benefits for producers. For instance; the costs of farm inputs and supplies for members are lower, since these can be purchased in bulk, enabling the cooperative to negotiate lower

prices than individual farmers have to pay. Moreover, good farm-gate prices to the members for selling their produce through the cooperative can be achieved, thus increasing farmers' incomes. He also added that Availability of sufficient and good quality inputs can be improved, since the cooperative negotiates a guaranteed supply and quality of inputs. Lastly frequent price fluctuations can be further reduced.

2.3. Conceptual Framework

The independent variables in the conceptual frame work are selected after extensive literature reviews which portrayed that out of many other factors that affect dairy producer choice for vertical coordination/ marketing arrangements. First, the framework assumes that choice is a net result of the positive and negative effects exerted by all the explanatory variables on the dependent variable. Second the conceptual framework shows the impact of marketing arrangement on household livelihood. To this end, the following diagram clearly shows the relationship among variables and indicators that the researcher intends to study and analyze.

A livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stress and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base (Chambers & Conway, 1991). Livelihood includes; social capital, human capital, physical capital, natural capital and financial capital. However, for this study the researcher focused only human capital (education), physical capital (asset formation and total milk production).

Figure- 1 Conceptual Framework of the Study

Determinant:

.Age	.Volume of milk
.Sex	.Land size
.Family size	.Price
.Education	.Price flexibility
.Experience	.Enough buyer
.Active local adm.part.	.Distance

Spot Market

Contract Market

Cooperative Market

Household Better livelihood:

.Asset accumulation

.Total amount of milk

.Human capital
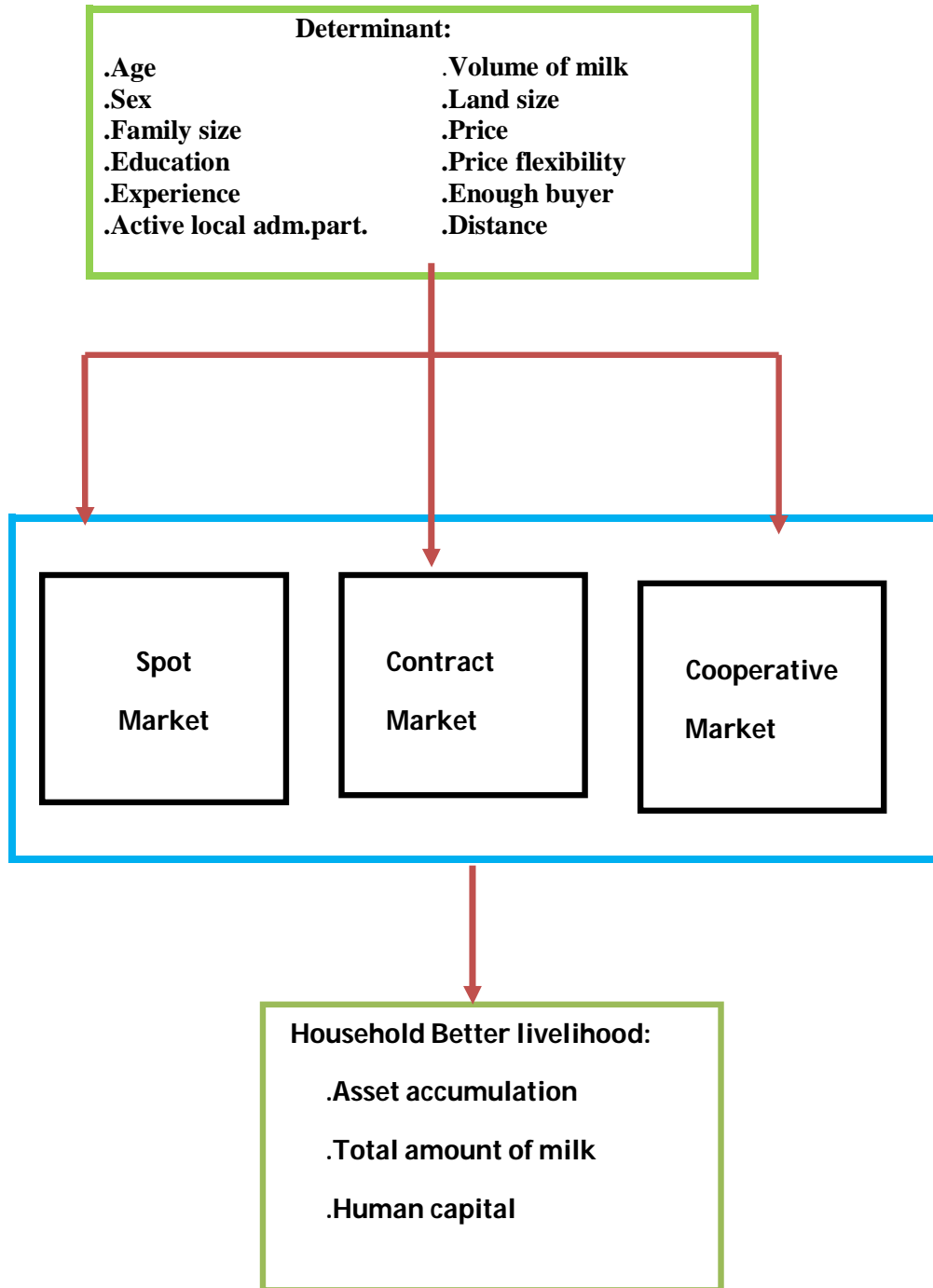
Source: Authors' Creation

CHAPTER THREE

MATERIALS AND METHODS

3.1. Site Selection and Description of the Study Area

Tigray is located in the northern part of Ethiopia. It covers an area of approximately 54,572 square km. The altitude of the region varies from about 500 meters above sea level (masl) in the north-east to almost 4000 masl in the south-west. The agro-ecology of the region is broadly categorized into lowland (Kola – less than 1500 masl), midland (Woina-degua – 1500 to 2300 masl), and highland (Degua – above 2300). About 53 percent of the region is lowland, 39 percent medium highland, and 8 percent upper highland (BoFED, 2008).

The research site is located in the Geba catchments[2] in Tigray region[3] of northern Ethiopia. The livelihood of the study areas is characterized primarily by mixed farming (crop and livestock farm economy, primarily dependent on rain-fed production (there are some small 'traditional' irrigation systems where small perennial rivers are diverted). For the purpose of the study from Geba Catchments four woredas namely: Degu Temben, Enderta, Hintalo Wajirata and Kiliteawulalo were selected.

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[2] The Geba catchment, located in the eastern, southern and central zones of Tigray (Northern Ethiopia), covers about 5180 km and has a semi-arid climatic condition with erratic and torrential rainfall that often lasts for 2- 3 months, end June to beginning of September(Fekadu et.al, 2007)

[3] Region is an administration territory equivalent to province

Fig.2 Locational Map of the Study Areas [4](Green Paint)

3.2. Data source

The source of data for this study was a survey made to study marketing and rural livelihood (Household Survey on the Milk Production and Marketing) in Tigray Region, Ethiopia as part of MU-IUC project conducted by Candidate of PhD, Abebe Ejigu. The data was collected from 387 diary producers from four woredas or thirteen tabias[5]. All the surplus fresh milk producers in the selected four districts and thirteen tabias were subject for interview.

The survey was conducted in June, 2010 covered information on the nature of marketing arrangements (cooperative, spot/open and contract marketing systems), volumes milk marketed,

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[4] The map is extracted from the site: http://www.nationmaster.com/encyclopedia/Mek'ele
[5] Tabia is the smallest unit of local government in rural communities in the present day Tigray region

price of milk , total volume of butter produced and dairy product produced in the farm, expenditure on inputs of production, households socio-economic, demographic and household asset of the milk producers. In doing so, four villages with the dairy farming namely, Degu Temben, Enderta, and Hintalo Wajirata and Kiliteawulalo woredas were selected.

A detailed questionnaire containing transaction cost components, and socio-economic characteristics were prepared and distributed. In addition to this, data on dairy production and marketing of milk, exchange arrangements, system of storage, transport facilities and supporting institutions were collected from sample respondents using questionnaire. Moreover, the survey data contain detailed information on total asset and livestock ownership of households.

Purposive sampling design was used to select the Geba Catchments. First, the study areas (Geba Catchments) were selected purposively based on the basis of milk production potential, the presence of various dairy marketing actors that contribute to value addition of the dairy commodities. Lastly, all 387 surplus fresh milk producers in the selected four districts and thirteen tabias were subject for study.

Focus Group Discussion: to substantiate the structured questionnaire and to examine some issues that are not included in the model result, Focus Group Discussion (FGD) was conducted with key communicators for getting in-depth information about their situations and issues with problems for dairy producers. A focus group discussion was conducted on specific topics with two groups of people (that consists 9 experts each) who have intimate knowledge about the topic under consideration. A focus group discussion was conducted to get information regarding market access, input supply, constraints and other issues. The investigator facilitated all the FGDs in Tigrigna. Short hand notes and tape recorder were used to document the content of the discussions. At the end of the discussion the tape record transcribed; cross checked with the shorthand notes and translated in to English. The FGDs were conducted at suitable times and places chosen by the participants.

Secondary information that could supplement the primary data was collected from published and unpublished documents obtained from different sources.

3.3. Methods of Data Analysis

The researcher employed both descriptive and econometric data analysis techniques.

3.3.1. Descriptive Statistics:

This method of data analysis refers to the use of percentages, and means, minimum, maximum, standard deviations.

3.3.2. Empirical Model Specifications for the Choice of Marketing Arrangements (Multinomial Logit model)

This study utilized a polychotomous choice framework to determine the factors that influence producers' decisions for accepting certain marketing arrangements. Polychotomous models such as the multinomial logit consist of many alternative choices, of which one is chosen (Kennedy, 1998).

The researcher used multinomial logit to determine the factors influencing producers' marketing arrangement decisions. Three marketing arrangements which are commonly used in the areas were considered: spot, contract and cooperative constituting the dependent variable. The researcher derived the multinomial logit model from a random utility function that determines the probability associated with a producer's adoption of marketing arrangements.

The multiple logistic techniques make use of the maximum likelihood estimation method when the dependent variable can take more than two categorical values. In this model, dairy producer participation in the diary marketing arrangements was assumed to be based on different determinant factors. The dependent variables were marketing arrangements chosen by the producer. The independent variables were factors hypothesized to influence their decisions to opt specific marketing arrangements.

Multinomial logit models are applied if the nominal dependent variables have multiple categories that cannot be ordered practically. One category of the dependent variable is considered as the base category and the relationship of independent variables to all other categories are compared with the base outcome. For this study, the researcher considered cooperative and spot marketing arrangement as a base of comparison.

The multinomial logit model has been used to study choice of transportation modes (Theil, 1969), automobiles (Cragg and Uhler, 1970), the determinants of occupational choice (Schmidt and Strauss, 1975b. In this study, the probability associated with the individual's choice of the marketing arrangement is assumed to follow an underlying multinomial logistic distribution and can be described as (Greene, 1997):

$$P_{ij} = \frac{\exp^{B_j X_i}}{1 + \sum_{k=1}^{J} \exp^{B_j X_i}} \quad j = 1, 2..., j, \beta = 0$$

Where P_{ij} represents the probability that $Y = j$, for $j = 1, 2...j$, j is the number of choices(spot, contract and cooperative), X represents the set of characteristics for individual/ households i, and β is a set of parameters that describe the influence of X on the probability of preferring a given item (Greene, 1997).

3.3.2.1. Definition of Dependent Variables for the Multinomial Logit

Dependent variable of this model is dairy producers choice for marketing arrangements dummy variable where: 1= households participant in spot, 2= households participation in contract and 3= households participated in cooperative marketing arrangement. Therefore, the dependent variables are marketing arrangements chosen by the household milk producer.

Table 3.1 Description of the Marketing Arrangements Analyzed (Dependent Variables)

Marketing Arrangements (Vertical coordination)	Descriptions
Cooperative Marketing Arrangement	A jointly owned farm enterprise consisting of two or more farmers who aggregate their resources and expertise to finance, produce and/or market products.
Contract Marketing Arrangement	Contract (formal/ informal) marketing arrangements: Contract production is the production of goods and services for future delivery. Contracts can be classified as marketing contracts or production contracts.
Spot Marketing Arrangement	All inputs involved in the production process are owned and managed by the producer. The producer incurs all risk and transaction costs through the production and marketing of dairy products.

Source: Davis (2002)

3.3.2.2. Exogenous Variables Used in the Multinomial Logit Analysis

Independent variables: refers to a host of explanatory variables assumed to influence the respondent's decision for the choice of marketing arrangements. Twelve hypothesized explanatory variables (8 continuous and 4 discrete variables) were included in the model and used in the logistic analysis. The independent variables were factors hypothesized to influence their decisions. These variables were selected on the basis of theoretical explanations and the

result of various empirical studies. The researcher also included some context[6] specific variables. The Independent variables selected for the study is as follows:

Marketing Arrangement Choice = f (sex, age, schooling, household size, distance, price, price flexibility, active local participation, land size, experience, volume of milk).These variables were the same for all choices, but their effects on the probability allowed differing for each outcome. The selected independent variables expected to affect the individual's probability of being in a given marketing arrangement choice.

Age (Agehh): Age is measured as a continuous variable. The age of household producers were obtained by simply asking them their present age. It is expected that young or beginning producers are more apt to accept contracts to help establish steady cash flow and to enhance chances for loan eligibility.

Sex of household head (Sexhh): represents to the characteristics of the members in terms of masculine and feminine. It is dummy variable. Hence male score 1 and otherwise zero.

Household size (hhsize): Family size is number of persons in the family. It is a continuous variable. The larger the family members, the more the labour force available for production purpose, the less the probability to be weak in participating in input/output marketing of the society. On the contrary to this fact large family size may imply self-insufficiency because large households consume more than do the small households. Therefore, the coefficient of this variable may show negative or positive sign.

Education (Atndsch)*:* This is continuous variable that measured in the no of families attending school currently (school enrolment). Those household with high number of children attending school was expected to participate in contract and cooperative marketing arrangement over spot.

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[6] Variable which is not discussed by previous scholars but now such as active local administration participation , land size volume of milk

Milk volume (amtprod): It is continuous independent variable. It is measured in litters and represents the actual supply of milk per litter by household to the market. Therefore, those with lesser milk stock are more likely to participate in contract farming to reduce the cost of transactions in procuring inputs and selling milk and it is hypothesized that the larger volume the higher participation in cooperative marketing.

Distance from the main market (distmkl): This is a continuous variable and measured in kilometers to move to the main market center/ Mekelle. If the main market is far away from households' residence, they may lack information regarding the market price and quantity which makes the worse off. Hence, it was hypothesized households nearer to the main market are more participated in spot marketing arrangements and households more farther from main market center may join cooperative.

Price change (priceflex): This is a discrete variable and measured in (1= fixed, = 0 flexible). Price volatility also believed to play a positive role to adopt contract and cooperative marketing arrangements in favor of spot marketing arrangement.

Better price (priceltr): This is continuous variables and measured the actual price of milk/liter (in birr). It was expected that higher price in cooperative and contract marketing arrangements.

Experience (expeprod): Producers were asked for how many years they have been producing milk and milk products. On the basis of experience in milk marketing it was hypothesized that the more experienced producers would participate more eagerly in the contract and cooperative marketing arrangement over spot marketing arrangement.

Enough buyers (enghbur): It was measured as dummy variable. Household were asked that "did you get enough buyers in the market"? The possible answers were "yes=1"or "no=0". It was hypothesized enough buyers in the market has a positive impact for the choice of cooperative and contract marketing over spot.

Land size in (landsirt): This is the total land holding measured in hectares. No sign could be expected with regard to this variable for spot Vs contract and cooperative Vs contract it can have either direct or inverse relationship. But, it was hypothesized that producers with larger land size prefer to be spot marketer in favor of cooperative marketing.

Active local administration participation: Household active participation in local administration including political membership. It was measured as a dummy variable (1= active participant, 0=otherwise)

Table 3.2 Hypotheses' Attributes Used in Multinomial logit

Variables	Expected sign(*[7],+[8], -[9])			Variable Type[10]
	Spot	**Contract**	**Cooperative**	
Household head	*	*	*	d
Household head age	+	-	-	c
Family size	*	*	*	c
Education	-	+	+	c
Market distance	-	*	+	c
Better price	-	+	+	c
Land size	+	-	-	c
Volume of milk	*	+	+	c
Price flexibility	-	+	+	d
Active local participation	*	*	+	d
Enough buyers	-	+	+	d
Experience	*	+	+	c

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[7] Impacts of variables of concern yet to be explored from this study

[8] Hypothesized positive impact by the variable of concern on the specific dependent variable

[9] Negatively predicted impact by the variable of concern on the specific dependent variable

[10] d= discrete, c= continuous

3.4. Empirical Model Specifications for Impact of cooperative participation on Household Livelihoods

In impact assessment, the major objective is to measure the difference in outcomes between cooperative participants and non-participants. However, one cannot observe, both outcomes from a single unit at the same time. Due to this fact, having a control group with similar features to the participant units is essential (Ravallion, 2001).

The appropriate evaluation of the impact of the program requires identifying the average treatment effect on the treated (ATT) defined as the difference in the outcome variables between the treated households and their counterfactual.

Counterfactual refers to what would have happened to the outcome of program participants had they not participated (Rosenbaum and Rubin, 1983; Gilligan *et al.*, 2008; Gonzales *et al.*, 2009).

Following Gonzalez *et al.* (2009) and Rosenbaum and Rubin (1983), if Y represents the outcome variable and if D is a dummy variable that takes the value of 1 if the individual participated and 0 otherwise. The ATT is given by:

$$ATT = E\big[Y(1)/D = 1\big] - E\big[Y(0)/D = 1\big]$$ 1

The evaluation problem is that we can only observe $E[Y(1)/D = 1]$; however the counterfactual

$(E[Y(0)/D = 1])$ does not exist in the data, since it is not observed. A solution to this problem is to create the counterfactual by matching program participants and non-participants to estimate ATT.

Using the mean outcome of non-participants which is more likely observed in most of the cases, do not solve the problem given that there is a possibility that the variables that determine the participation decision also affect the outcome variables. In this case, the outcome of participant and non-participant individuals might differ leading to selection bias. To clarify this idea the

mean outcome of non-participant individuals has to be added to (1) from which the following expression can be easily derived:

ATT = {E[Y (1) / D = 1] − E[Y (0) / D = 0]} − {E[Y (0) / D = 1] − E[Y (0) / D = 0]}   2

Here, $E[Y(0) / D = 1] − E[Y(0) / D = 0]$ represents the selection bias which will be equal to zero if the program was given randomly, that means, in the case where participants and non-participants did not differ before the program was implemented.

Given the structure of the available data and that there are only ex-post observations for one period; we use propensity score matching to assess the impact of cooperative participation on household livelihood.

The propensity score is defined by Rosenbaum and Rubin (1983) as the conditional probability of participating in the program given pre-participation characteristics:

$$P(X) = \Pr(D = 1/ X)$$ 3

Where, D denotes the participation indicator equaling one if the individual participates, and zero otherwise.

The method of propensity score matching (PSM) is based on conditional independence and common support assumptions. As Rosenbaum and Rubin (1983) indicate, conditional independence assumption (CIA) states that given a set of observable covariates (X) which are not affected by participation (in this case, extension package), potential outcomes (per-adult consumption expenditure) are independent of participation assignment (independent of how extension package participation decision is made by the household).

Y (0), Y (1) $\perp^{11}$D/ X   4

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[11] Conditionally independent

This conditional independence assumption indicates that the selection is exclusively based on the vector of observables X that determine the propensity score. Under the CIA, ATT can be computed as:

$$ATT = E[Y(1)\text{-}Y(0)/X, D=1] = E[Y(1)/X, D=1] - E[Y(0)/X, D=1] \qquad 5$$

On top of this, in order to ensure randomized selection the common support condition needs to be applied. It guarantees individuals with identical observable characteristics to have a positive probability of belonging both to the participants and the non-participant groups (Rosenbaum and Rubin, 1983).

$$0 < P(D = 1|X) < 1 \qquad\qquad\qquad 6$$

Simultaneous adoption of both assumptions ensures that participation is strongly ignorable and implies that:

Simultaneous adoption of both assumptions ensures that participation is strongly ignorable and implies that:

$$Y(0), Y(1) \perp D/P(X) \qquad\qquad\qquad 7$$

As long as outcomes are independent of participation given observables, then they also do not depend on participation given propensity score.

Matching individuals based on observed covariates might not be desirable or even feasible when the dimensions of the covariates are many. To overcome the problem of dimensionality, instead of matching along X, we can match along P(X). Given that the propensity score is a balancing score, the probability of participation conditional on X will be balanced such that the distribution of observables X will be the same for both participants and non-participants. Consequently, the differences between the groups are reduced to only the attribute of participation assignment, and unbiased impact estimates can be produced (Rosenbaum & Rubin, 1983). Gonzalez *et al*.(2009)

shows that if the conditional independence assumption holds the "average treatment effect on the treated" may be estimated as the mean difference in outcomes weighted by the propensity score distribution of participants:

$$ATT = E_{p(x)/D=1} \{E[Y(1)/D=1, P(X)] - E[Y(0)/D=0, P(X)]\} \qquad 8$$

The intuition is that two individual households with the same probability of adoption will show up in the participants and non-participants samples in equal proportions. Based on the definition of propensity score in equation (3), the probability of participation can be derived by binary response models. Although there are various methods to predict propensity score, following Liebenehm *et al.* (2009), for the sake of computational simplicity, this study uses a binary logit model. The propensity score can then be defined as:

$$P(x) = Pr(D=1/X) = F(\beta_r x_1 + ... + \beta_{i\,Xi}) = F(X\beta) = e^{\mathbf{x\beta}} \qquad 9$$

Where *F (.)* produces response probabilities strictly between zero and one

Once the propensity score is estimated, the data is split into equally spaced intervals of the propensity score. Within each of these intervals the mean propensity score of each covariate does not differ between participants and non-participants. This is called the balancing property.

3.4.1. Matching Estimators of the ATT Based on the Propensity Score

Upon the estimation of the propensity score, a matching algorithm must then be defined in order to estimate the missing counterfactual outcome for each treated observation. In this respect, there are different matching estimators, the most commonly used are the nearest neighbour, kernel matching, stratification matching and radius matching. Each matching estimator varies depending on the definition of a closeness criterion used. In this study the approach adopted to match cooperative participant with counterfactual individuals from non participant cooperative was via the nearest neighbour with replacement, radius and kernel matching estimator methods. With replacement, which implied that each control individuals in the sample was allowed to be used

more than once, this is done to minimize the propensity score distance between the matched control units and the treatment unit (Smith and Todd, 2005).

For this study, the researcher examined the impact of the participating in dairy cooperative marketing on household livelihood using propensity score matching by taking participant and non-participant households. To do this, asset accumulations, human capital and amount of milk production were used as basic livelihood indicators.

Propensity Matching developed in Rosenbaum and Rubin (1983). In recent times, matching econometric estimator is becoming increasingly popular among economists as a method to measure the impact of a programme (Ravallion, 2004; Heckman et al., 1998).

Various matching methods have been proposed in the literature to estimate the ATT based on propensity score and four of the widely used are Stratification matching, Nearest-neighbor matching, Radius matching and Kernel matching. The researcher were employed these all matching estimators for the robustness of the result.

i. *Stratification Matching Method:* The dataset is divided into intervals having, on average, the same propensity score. The treated and control groups within that interval are placed under one block, and the mean difference of the outcome between the treated and control groups provides the average treatment effect of program participants on household impact indicator (ATT) (Becker and Ichino, 2002).

ii. *Nearest Neighbor Matching Method:* Each treated observation is matched with an observation in the control group that shows the closest propensity score. In nearest neighbor matching, it is possible that the same household in the control group can neighbor more than one household in the treated group. Therefore, after matching, the difference between their outcomes is calculated as the average treatment effect on the treated (ATT) (Becker and Ichino, 2002).

iii. *Radius Matching:* Each treated unit is matched only with the control units whose propensity score falls into a predefined neighborhood of the propensity score of the

treated unit. If the dimension of the neighborhood (i.e., the radius) is set to be very small, it is possible that some treated units are not matched because the neighborhood does not contain control units. On the other hand, the smaller, the size of the neighborhood, the better the quality of the matches (Becker and Ichino, 2002).

iv. *Kernel Matching Method:* All treated observations are matched with households in the control group based on the weighted average that is inversely proportional to the distance between the propensity scores of the treated and control groups (Becker and Ichino, 2002).

The kernel matching estimator identify for a household the closest propensity score from the control groups; then it subsequently computes the impact of cooperative participation as the mean difference of households' total asset accumulation, total milk production and human capital of treated and control matched households. In this study the approach adopted to match cooperative participants with counterfactual individuals from non cooperatives was via the nearest neighbour, radius stratification and kernel matching estimators with replacement methods. Finally, T-statistics were estimated based on bootstrapped standard errors with 100 replications.

It is important to note that each matching method has its own strengths and limitations. Although one may consider any of them alone for impact estimation, their utilization in combination has the advantage of testing the robustness of impact estimates (Becker and Ichino, 2002). This study therefore, used all the four matching estimators so as to ensure robust result of the cooperatives' impact on household livelihood.

3.4.2. Description of Variables

1**.** *Impact indicators:* the impact/ livelihood indicators used in this study were:

A. Household Assets Formation*:* Households were asked detailed questions about
current ownership both livestock and productive assets (hammer, sickle, plow, axe,
spade, shovel, motor pump). This impact indicator was assumed that cooperative
participant households improve their asset ownership.

B. Human Capital: schooling enrollment of families in the households. It was hypothesized
participating in cooperative market increase human capital for the household.

C. Volume of milk production: the actual amount of milk per liter produced at house hold
level and it was expected that those households who are a member of cooperative
produced larger volume of milk due to different reasons.

In general it was hypothesized that cooperative participation has an impact in increasing
household's livelihood.

2. *Treatment Variable:* the treatment variable used in this study is household participation in the
in cooperative market. It is a binary response (1=participate in the cooperative, 0= not
participating in the cooperative which).

3. *Independent Variables:* In this regard, the researcher reviewed carefully various literatures and
theoretical backings to identify variables to be used to estimate the propensity score matching. To
ensure that variables are not affected by participation in the program, they should either be fixed
over time or measured before participation Rosenbaum and Rubin (1983). These variables are
believed to be time invariant control variables and are commonly used in most impact literatures
(see table 3.3).

Table 3.3: Description of Variables Used to Estimate the PSM Using Logit Model Analysis

Variables	Description	Variable Type
Agehh	Age of the household head	c
Sexhh	Sex of household head	d
Hhsize	Family size of the household	c
Distwordmkt	Distance to the woreda market in kilometers	c
Landsi	Land holding size in hectare	c
priceflex	Price volatility	d
Expeprod	Number of years staying in milk production	c
T_asset	Values of total productive asset in ETB	c
V_livestock	Values of livestock in ETB	c

CHAPTER FOUR

RESULTS AND DISCUSSIONS

This chapter depicts the descriptive and empirical findings of the study. In this chapter, the determinants for choosing vertical coordination findings from descriptive and econometric analyses are presented and discussed. Focus group discussion was also held to supplement findings of the descriptive statistics and the empirical model. In addition focus group discussion was conducted to see some variables that were not included in the model and descriptive analysis.

The descriptive analyses were made in terms of mean, percentage, frequency, minimum, maximum and standard deviation. Additionally, the results of focus group discussion are presented and discussed in this chapter. Econometric analysis was employed to identify the major factors that determine the producer's choice among different types of marketing arrangements and the impact of cooperative participation on household's livelihood.

4.1. Major Constraints of Dairy Production and Marketing from Focus Group Discussion Result

To answer the third objective, the researcher conducted focus group discussion. The discussion was held with members of three dairy marketing cooperatives namely, Da'aro, Selam and Shewit[12] in Kilite –Awlaelo woreda. The Focus Group Discussion was held with 18 producer participant cooperative members from the selected dairy cooperatives. Discussion was held in two groups with 9 cooperative members each. Fifteen of them were male cooperative members while the remaining were female members. Most focus group discussion participants were leaders in the cooperatives to which they belong. Dairy production and marketing was found to

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[12] Shewit dairy marketing cooperative was among the dissolved ones. Reason raised were lack of commitment and the existence of free riding problems in the cooperative members.

be constrained by a number of factors related to production and marketing as explained by the focus group participant.

In spite of the benefits cooperative marketing offers, some FGD participants mentioned that the net profit earned from cooperatives are not performing well as it is expected. This is because of the fact that costs of fodder have increased at an alarming rate. Therefore, lack of fodder and its cost are the major problems that threaten the existence and productivity of dairy co-operatives in the selected sites.

There are a number of highlighted constraints that hamper further development of dairy sector in the elected areas. Given the current production level, there appears that the producers have had market problems due to long fasting dates. As it was noticed from the discussion, Fasting dates have a downbeat impact for milk selling in the selected sites. This is mostly because Orthodox Christianity is predominant religion in the areas. Religion among the Orthodox followers has impact on milk and milk products marketing.

Many rural communities were strongly influenced by traditional dairy practices/taboos. There were great disparities in cultural attitudes towards selling and buying of milk. According to participants, selling of milk and breeding of exotic cows were used to be cultural taboo which was a significant impediment to the commercialization of milk in the selected sites. This means that milk commercialization was constrained by culture in the selected sites.

However, now they have mentioned there is a change in attitude and practice towards milk selling and exotic bread cows because people understood the economic benefits and they are openly selling and buying milk. Therefore, market oriented dairying activities have increased from time to time because of the attitudinal change of the society at large. They further replied, before the cooperative, "we were producing milk mostly for home consumption but now we are producing milk mainly for the market i.e. the cooperative helped us in changing our mind to relate dairy production with market.

In addition to the above problems, in rare case, lack of commitments in the dairy production and marketing activities were also being experienced. For instance; sell milk for individual purpose out of the consent of the members and the legislation (by – law). Lack of market for milk, technology, feed for cattle were discussed as the major roadblocks for dairy cooperatives expansion. Promise breaking and delay payment were other problems that experienced in the in rare case of contract marketing.

4.2. Determinants of Marketing Arrangement Choice: Descriptive Analysis

The following section presents comparisons of descriptive statistics on survey data for each marketing arrangements, in addition to discussing the model results.

The data used in this study collected from four woredas[13] (Kiltie- Awlaelo, Enderta, Hintalo wajerat and Dega Temben) with the total of 387 households/ producers. Producers were asked to indicate the structure of their marketing arrangements.

Literature in the field of vertical coordination in other parts of the world verify that Socio-economic and demographic characteristics of households are amongst the major determinants which influence household choice for vertical coordination. To this end selected household socio-economic and demographic characteristics of the sampled population are described as follows for the three marketing arrangements. The list and descriptive statistics of the dependent and independent variables included in the various regression analyses are given in Table 4.1 for discrete and in Table 4.2 for continuous variables.

Sex of household: As it can be seen in table 4.1, of the total sampled milk producer households (N= 387) 103 were from spot marketing, 98 where from contract and the remaining 186 were cooperative marketing arrangement.

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[13] is an administrative division of Ethiopia (managed by a local government), equivalent to a district

Moreover, as it can be seen from (table 4.1), there were striking gender differences as well. The researcher found that most households under the study were headed by males and overall, it can be concluded from this trend that male headed household are better in milk marketing activities among the respondents in the three marketing arrangements.

As it can be vividly seen from table 4.1 of the 387 producers/households, 186 (48 percent) participated in cooperative marketing. The study identified that 147 (79.03 percent) households were headed by male producers. Whereas 39 (20.97 percent) households were female headed that produce and sell milk through dairy cooperative marketing arrangement.

Table 4.1 also illustrates that 98 (25 percent) of households participated in contract marketing arrangement and from this 69 (70 percent) were male headed households and the rest 29 (30 percent) were female headed households.

Finally, the result clearly shows that out of the total 387 households, 103 (27 percent) households participated in spot/ open marketing arrangements. From this, 76 (74 percent) were male headed participant and the rest 27 (26 percent) were female headed household participants.

This result signifies that the majority of sampled household respondents participated in cooperative marketing arrangement. The reasons for cooperative membership are to get input, credit, training and fodder for cattle. The results of FGD revealed that the provision of material inputs, credit and training to producers are important features of cooperative marketing in the selected sites. Both men and women FGD participants have confirmed that they were provided with input, credit, exotics breed cows and training by REST, especially while they were joining the cooperatives. They also added that the provision of such inputs helped them promote their profits from their dairy products.

Moreover, participants confirmed that in order to get fodder for their cattle, organizing into groups is a prerequisite so that they would have sufficient purchasing power for buying the fodder. Put differently, because of the reason that the cattle fodder sellers do not allow buyers to

purchase any quantity of cattle fodder fewer than 50 quintals, and milk producers were not able to bear this amount on individual basis, organizing in cooperative marketing was a very strong precondition to tackle this problem. By providing extra services (input, credit, training etc), marketing cooperatives may become attractive to households that are otherwise uninterested in its marketing activities.

Age: The survey result indicates that the sampled producers were on average 44 years old for the three types of marketing arrangements. However, the average ages of the respondents for spot producers were 44.6 years which were older than cooperative producers (44.23 years) and contract producers (42.83 years old) see table 4.2.

Family size: As results of the study revealed, the average household size of the total sampled households for the three marketing arrangements were 6.3 per household. The minimum number of family member in a household was 1 person and the maximum accounts 12 persons in the household. The average household size for cooperative, contract and spot producers were 6.2, 6.5 and 6.4 per household respectively.

Education: As results portrayed in the table 4.1, the average number of school attendants in the in cooperative household was 3.13; those households participating in the contract and spot were 3.15 and 2.97 respectively.

Experience of production: Refers to the number of years that dairy product producers stayed in the dairy product production activity. The survey results in table 4.2 showed that, the average number of years cooperative producers have been producing milk was 4.3 years. On the other hand, spot and contract producers had been producing milk for averages of 3.4 and 4.02 years, respectively. On average, cooperative producers had been producing milk longer than producers under any other marketing arrangements.

Distance from main market center (Mekelle): The average kilometer taken to move to the market place (Mekelle city[14]) for the sample household is 38.03 kilometers away from the main marketing center for those participants in spot marketing, 39.63 kilometers for those participants in contact marketing and 40.95 kilometers for those participants for cooperative marketing arrangement.

Land holding (ha): Land size differs across the three marketing arrangements and table 4.2 showed that the average land holding of the sampled households were 1.03 hectare for spot, 0.88 hectare for contact and 0.79 hectare tsmidi for cooperative producers. Spot produces demonstrated large amount of land than contract and cooperative producers.

Volume of milk produced: According to the study noticed in table 4.2, the average milk production is found to be 3090.312 for cooperatives and the average milk produced by the contract and spot were found to be 2002.194 and 1744.784 in liters/ per household.

Then with reference to table 4.2 the average volumes of milk produced by households /year in cooperative producers were much more than contract and spot marketing arrangement. Therefore, Cooperative producers produced more than the spot and /or contract producers did.

Price of milk: According to the study, the average price of milk was found to be 4.87, 4.86 and 4.98 Birr for those households participating in spot, contract and cooperative producers respectively. The researchers observed that the cooperative producers were being offered relatively higher prices than the spot and contract producers.

Price flexibility: Producers were asked the question, "what was the degree of price flexibility in the market?"They were requested to characterize themselves into one of two sub-groups, fixed (1) flexible (0). Table 4.1 illustrated, 31(30.39%) of spot producers, 53 (54.08%) of contract and 161(86.56%) of cooperative producers rated degree of price flexibility as "fixed".

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[14] A capital city of Tigray region and it is considered as the main market centers for the selected sites, because of high milk demand (including the Christian fasting day).

Similarly, the table clearly showed that, 71(69.61%), 45(45.92%), 25(13.44 %) producers were rated as "flexible". Statistical test performed using Pearson chi- square confirmed the wide difference in price flexibility among marketing arrangement.

Enough buyers: The results presented in table 4.1 shows that around 135 (72.58 %) cooperative producers confirmed that there were enough buyers in the market while selling milk through cooperative marketing arrangement. Moreover, the table clearly showed that contract and spot producers can access 84(85.71 %) and 72(69.9%) buyers in the market respectively.

From this figure, households/ producers in contract marketing arrangement demonstrated larger numbers of buyers in the market followed by cooperative marketing producers. Similarly there was a significant difference in access of buyers in the market among the three marketing arrangement.

Local active participation: With reference to table 4.1, 58(56.31%), 73(74.49%) and 164(88.17%) spot, contract and cooperative producers were participated in local administration issues including political participations. The result depicted that, of the 387 producers, 234(60.47%) producers have been participating in local administration. Finally, the difference in mean participation among the three marketing arrangement were found to be significant at 1% level.

Table -4.1 Summary of Descriptive *Statistics of Exogenous Variables for the Multinomial Logit Model (Discrete Variables)*

Variables	Spot (N=103)		Contract (N=98)		Cooperative (N= 186)		Chi^2
	Freq.	Perc.	Freq.	Perc.	Freq.	Perc.	
Sex							*0.248*
Female	27	26.21	29	29.5	39	20.97	
Male	76	73.79	69	70.41	147	79.03	
Enough buyers							0.018 **
No	31	30.10	14	14.29	51	27.42	
Yes	72	69.90	84	85.71	135	72.58	
Price flexibility							0.000**
Fixed	31	30.39	53	54.08	161	86.56	
Flex	71	69.61	45	45.92	25	13.44	
Active in local ad.							0.000 **
Yes	58	56.31	73	74.49	164	88.17	
No	*45*	*43.69*	25	25.51	22	11.83	

***, ** and * indicate significance at 1, 5 and 10 % respectively.

Table 4.2— Summary of *Descriptive Statistics of Exogenous Variables for the Multinomial Logit Model (Continuous Variables)*

	Spot(N=103)		Contract[15](N=98)		Cooperative(N=186)	
Variables	**Mean**	**Std. Dev**.	**Mean**	**Std. Dev**	**Mean**	**Std. Dev**
Price	4.878641	0 .9802611	4.867347	0.9097157	4.983871	0.5057861
Household size	6.194175	2.048712	6.540816	2.168986	6.397849	2.09576
Education	2.970874	1.665429	3.153061	1.928367	3.134409	1.821256
Age of household	44.60784	11.57084	42.83673	11.19987	44.23118	12.13061
Experience	3.407767	3.851246	4.027143	4.342411	4.297043	4.327568
Land size	1.03165	0 .7156213	0.8781633	.5831802	.7912634	0.8007049
Distance	38.02913	16.86536	39.63265	16.23563	40.9457	10.16275
Volume of milk	1744.784	1118.181	2002.194	1193.152	3090.312	2663.652

4.3. Results of Econometric Analysis for Determinants of Marketing Choice

This section is devoted to the econometric results. The purpose is to identify key variables that affect marketing arrangement choice at household level. There are three types of dependent variables: the dummy variables are equal to 1 if the household has sold given milk through spot, 2 if the household has sold given milk through contract and 3 if the household has sold given milk through cooperative marketing arrangement. This means marketing arrangement choice was dependent variables. The researcher specified, multinomial logit model to identify the factors behind different marketing arrangements. A multinomial logit was fitted to estimate the hypothesized explanatory variables on the probability of being spot or contract or cooperative producers. These variables were entered in to the model by taking cooperative marketing and spot as base outcome variable.

A multinomial logistic model, as indicated above, estimated to identify the factors that affect the likelihood of the household producers becoming spot, contract or cooperative.

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[15] Includes both households/ producers selling milk through written and oral contract arrangements

Table 4.3 below presents the regression results. The results in general were plausible. The results shown associated with each exogenous variable. The results reported include the coefficient estimates and the associated p- values. Marginal effects are also reported in the Appendix part. Three asterisks by the coefficient estimate indicate that the variable is significant at the 1 % significance level, two asterisks by the coefficient estimate indicate that the variable is significant at the 5 % and one asterisk indicates that the variable is significant at the 10 percent level.

Prior to the estimation of the model parameters, multicollinearity or associations among the potential candidate variables were checked. Variance inflating vector (VIF) was used to test the degree of multicollinearity among the continuous variables (See Appendix G).

The values of VIF and 1/VIF for the estimated variables were found to be small (i.e. VIF less than 10). To avoid serious problems of multicollinearity, it is quite essential to omit the variable with value 10 and more from the multinomial logit analysis. Based on the VIF result, the data have no serious problem of multicollinearity. As a result, all 12 variable explanatory variables were retained in to multinomial logistic analysis.

4.3.1. The Spot- Contract - Cooperative Model (Cooperative Marketing Arrangement as abase Comparison)

A multinomial logistic model, as specified in chapter three (3.3.2), estimated to identify the factors that affect the likelihood of the household becoming spot, contract or cooperative marketing. As mentioned in the specification part, the advantage of using this model is ease of specification and estimation.

It was hypothesized that age, sex, schooling and experience of milk production determinant factors for the choice of marketing arrangements. However, the model result showed that these variables as in significant.

From table 4.3 below we can see active local administration participation, distance to main market, price flexibility and amount of milk produced per liter negatively influence both spot and contract marketing arrangement in relative to cooperative marketing arrangement.

Active local administration participation: Cooperative participants as prior expectation had a higher participation in local administration than contract and spot marketer sampled households did and it was significant at 1 percent for both. Active local administration participation significantly influences the choice for cooperative over spot and contract marketing arrangements. In other words, producers who are active in local administration had a lower likelihood of choosing contract and spot in relative to cooperative marketing arrangement or producers who are active in local administration prefers to participate in cooperative marketing.

This may be because the producers can get information about the advantages of being cooperative members while meeting for different purposes.

An increase in participating in local administration reduces the probability of choosing spot market by 12 percent and reduces the probability of being contract marketer by 42 percent in relative to cooperative marketing arrangement.

Price flexibility: price flexibility was highly associated with contract and spot than cooperative marketing arrangement. The likelihood of being members of cooperative increases when there is high price flexibly in the market. This variable was found to be significant at 1 % probability level for both contract and spot marketing arrangements with negative sign.

This means that the higher the price flexibility is in the market, the higher the likelihood for the choice for cooperative over contract and spot. Therefore from this we can understand that high price flexibly in the target market leads the producers to prefer cooperative market to secure such price volatility. In fact, discussions by the dairy producers have shown that market assurance and guaranteeing of payments for the milk they sell to consumers are the two primary reasons why they joined the cooperative marketing.

The discussion also revealed that guaranteed markets and fixed pricing structures are benefits that milk producer cooperative marketing members gain from participation in dairy cooperative marketing as compared to selling the product in spot market. The marginal effect of this variable indicates that, if price is flexible in the market household's participation in spot decrease by 44 percent as compared to cooperative marketing arrangement. Similarly, when price changes from fixed to flex probability of choosing contract marketing arrangement decrease 8 percent as compared to cooperative marketing arrangement.

This finding also consistent with the findings of Koopmans (2006) that stated that frequent price fluctuations can be further reduced if producers join cooperative marketing arrangement.

Amount of milk produced: With regard to the amount of milk produced, the mean amount of milk produced at contract and spot producers in relative to cooperative producers were found to be significant at less than 5% probability level. This means that those households who produce large volume of milk daily, more likely prefer to be cooperative producer and less likely to be contract and spot producers. This is mostly because milk producers who were in cooperative marketing arrangement get input such as training, feed, selected exotic bread cows which results in higher volume of milk production. This result also confirmed by FGD results that cooperative producer produce larger amount of milk in the market because they were provided with input, credit, exotics breed cows and training by REST. Participants of the focus group discussion reflected that the provision of such inputs helped them promote to produce high amount of milk production to the customers. A one-litter increase in the volume of milk production per household decreases the likelihood of choosing spot and contract by 14.5 % and 7.7 % respectively.

Distance to the main market: it was hypothesized that the farther the producers to the main market the higher the chance the producers to select cooperative and contract marketing arrangement as compared to spot market. As expected, distances to the main market were found to be a significant impact on determining the choice for cooperative over contract and spot marketing arrangement at less than 5 % and 1% of the probability level respectively. This

possibly because milk is highly perishable and, thus, requires rapid transportation to consumption centers or for processing into less perishable forms and this problem can be reduced if the producers well coordinated through cooperative. On the one hand**,** those households farther away from the main marketing center/outlets prefer to join cooperatives for the sack of transportation cost, market information and marketing opportunities, this is because of the fact that, dairy cooperative market has the power to increase market access.

Ironically, the closer the distance to main market outlets, the higher the number of market exchanges taking place, then producers may prefer to sell their product through spot/ open marketing base as compared to cooperative. This is because; shorter distances to markets increase producers' access to market information, improving their relative position as well and no need of joining cooperative membership. In addition, the proximity of commercial services offers producers a means of acquiring key production inputs.

In general sense, those producers farther away from main market outlets prefer to join cooperative marketing as compared to contract and spot marketing arrangement.

The marginal effect also indicates that, when the household is farther to the market center, the probability of participating in the spot and contract marketing decreased by 0.5% and 0.2% percent as compared to cooperative market respectively (Appendix, table 6 and 5) . From the result we can conclude that those households who are situated in near by market places an access to get different information's about the market, therefore they quickly decide to participate in the spot and contract marketing with out joining cooperative.

Moreover, multinomial logit result also showed that land size, price and household size e as the major determinant factors for the choice of cooperative over spot market, but not cooperative over contract market.

 Price**:** As expected, the coefficient of price observed to be negatively associated with spot market and significant at 5% probability level. This means that producers prefer to join

cooperative marketing in favor of spot because the price is high in cooperative marketing arrangement. This might be because milk producers in groups are able to access better market for their milk than spot marketers. In addition, cooperatives can help producers to obtain higher prices for their output through reduced transaction costs and through bargaining power vis-à-vis spot marketers, or the ability to reach more attractive markets. The interpretation of marginal effect implies that, if other things keep constant, the probability of being spot producer decreased by 38 percent in relative to cooperative producer as price increase by one birr. This result is already confirmed by focus group discussion that guaranteed pricing structures are benefits that milk producers gain from participation in dairy cooperative marketing as compared to selling the product in spot market.

This result is also similar to the findings of Davis and Gillespie (2007) which stated cooperative farmers generally are independent farmers who have elected to join or form a cooperative to more competitively obtain inputs or market hogs at higher prices. However, the model result does not show the price difference between cooperative and contract marketing arrangements and the variable is found to be insignificant.

Land size: As one would expect, the model result reveals that this variable has significant (at 10%) and positive influence on the participation of household for spot as compared to cooperative marketing arrangement. This means that larger land size per household positively affect the likelihood of being spot producer. Ironically, the smaller the land size, the higher likely the choice of cooperative in relative to spot. This may be because producers prefer cooperative to get land for sustainable dairy development. More importantly one hectare extra land owned by household head increase the probability of spot participation by 70 percent in relative to cooperative market (see table 4.3).

Family size: The other determinant variable in the regression coefficient analysis was family size. The result shows negative and significant at 5 percent which indicates family size has its own impact on the choice decisions for cooperative than spot marketing arrangement. The marginal effect depicts that an increase in family size by 1% decreases the probability of being spot by 5

percent. This means that each additional member of a household increases households to participate in cooperative over spot. This may be because, dairying is labour intensive activity and then larger family size provides higher labour to undertake dairy production and marketing activities easily.

4.3.2. The Spot- Contract - Cooperative Model (Spot Marketing Arrangement as abase of Comparison)

In this part the researcher discussed marketing arrangement choice by considering spot marketing arrangement as a base outcome. Since cooperative – spot has been discussed earlier, now the researcher devoted to compare spot and contact marketing arrangements only. After running the same variables the following variables found to be significant for the choice of contact over spot marketing arrangement and vise-versa.

Enough buyers: As hypothesized this variable was found to be a significant determinant of choosing contract marketing instead of spot marketing arrangement. It was positively significant at 5 percent probability level. This means that the contract producers can access a large number of buyers in the market as compared to the base outcome spot market. The coefficient of the variable shows that when the household has an accesses of enough buyers in the market, the choice of contract market increases by 12 percent in relative to spot market.

Active local participation: The regression result shows that this variable has negative sign for contract market and it was significant at less than 5 percent probability level. The negative relationship indicates that in the study area those households who are active participant in local administrations including political membership don't want to participate in contract marketing arrangement rather they are becoming spot marketer. Loosely speaking this may be because, those households who are actively participating in local administration may be in a better position to access information about the market and the price while they are meeting for different purposes than passive local participants. Hence, signing a contract may not be that much advantageous for active local participants.

The coefficient of the variable showed that when the household has actively participated in local administration, the likelihood of participating in contract marketing decrease by 42 percent.

Household size: this variable is statistically significant at less than 5 percent probability level and showed a positive relationship with participation of contract. The positive relationship tells us that the larger the household family size, the higher the probability of being contract marketers as compared to spot marketer.

The marginal effect indicates that when the household size increases by one person, the probability of choosing contract marketing system increased by 3 percent.

Price flexibility: The regression result showed that this variable has the expected positive sign and it was significant at 1 percent probability level. This means that the higher the price volatility in the market, the higher the probability of the household for choosing contract over spot marketing arrangement by 8 percent.

Table-4.3 Results of the Multinomial Logit Analysis of Marketing Arrangement Choice (Cooperative as a base out come)

Explanatory Variables	Dependent Variable: Dummy variable=1 if Spot, 2 if Contract and 3 if Cooperative			
	Spot		Contract	
	Coef.	P>|z|	Coef.	P>|z|
Atndsch	.1644154	0.279	.0266852	0.853
Sexhh	.1029213	0.812	-.3203218	0.432
Enghbur	-.3292183	0.401	.49297700	0.248
Activeparti	-2.061186	0.000***	-2.926544	0.000***
Landsirt	.6894535	0.087*	.1426157	0.712
Priceltr	-2.774453	0.034**	-1.935971	0.113
Agehhrt	-.049494	0.805	-.2646314	0.188
Hhsize	-.2717843	0.049**	.0422759	0.752
Distmkl	-.0389361	0.006***	-.0265078	0.054**
Priceflex	-3.075209	0.000***	-1.856551	0.000***
Expeprod	-.0527299	0.229	.0083028	0.820
Amtprod	-1.058655	0.000***	-.7551377	0.002***
_Cons	17.95494	0.000	13.44714	0.000

Number of obs = 384   *Log likelihood = -270.61847*

LR chi2(24) = 265.19 ***   *Pseudo R2 = 0.3288*

*** indicates significance at the 0.01 level, **indicates 0.05 level. * indicates significance at the 0.10 level.*

Table-4.4 Results of the Multinomial Logit Analysis of Marketing Arrangement choice (Spot as a base outcome)

Explanatory Variables	Contract		Cooperative	
	Coef.	P>|z	Coef.	P>|z|
Atndsch	-.1377302	0.328	-.1644154	0.279
Sexhh	-.423243	0.278	-.1029213	0.812
Enghbur	.8221952	0.042**	.3292183	0.401
Activeparti	-.8653579	0.012**	2.061186	0.000***
Landsirt	-.5468377	0.174	-.6894535	0.087
Priceltr	.8384823	0.470	2.774453	0.034**
Agehhrt	-.2151374	0.263	.049494	0.805
Hhsize	.3140602	0.014**	.2717843	0.049
Distmkl	.0124283	0.302	.0389361	0.006***
Priceflex	1.218658	0.000***	3.075209	0.000***
Expeprod	.0610327	0.170	.0527299	0.229
Amtprod	.3035171	0.143	1.058655	0.000***
_Cons	-4.507799	0.105	-17.9549	0.000

Number of obs   =   384
LR chi2(24)   =   265.19***
Pseudo R2   =   0.3288
Log likelihood =   -270.61847

*** indicates significance at the 0.01 level, **indicates 0.05 level. * indicates significance at the 0.10 level.

4.4.   Econometric Results for the Impact Analysis

Here the researcher devoted to the descriptive analysis and econometric analysis of the variables used for the impact analysis.

4.4.1. Summary of Variables Used in the Impact Analysis

Descriptive statistics of different variables used in the analysis measured in terms of some demographic and other wealth indicators. There are some differences between cooperative participant and non-participant households (spot marketers). The average household size and age of the household head of the total sample were 6 and 44 years respectively. 292 (75.45 percent) of the survey households is male headed and the remaining 95(24.55 percent) is female headed. As it is indicated in table 4.4, 216(76 percent) of the participant households is male headed while the remaining 68(24 percent) is female headed.

With regard to amount of milk production, on average the participant household produced around 2761 litters of milk per household per year. And those households who are not participating in cooperative marketing produce on average 2121 litters per year. A two sample t test also confirmed that the mean annual production for participants is greater than that of non-participants and is statistically significant at 5 percent.

The study reveals that the average total land size of the respondents is 5 hectare. It varies from households with no land to 5.25 hectare. The mean total land size for non participant households is found to be 1.032 hectare where as for participant ones it accounts 0 .82 hectare. This indicates that the size of land holding of non participants is found to be larger than that of participants by about 0.2104 hectare. A two sample t-test shows a significant mean land size disparity between cooperative participant and non- participant at 1 % probability level.

Similarly, the value of livestock holding for participants is higher than that of non-participants amounting by 1891.45ETB. However, non – participant is higher in productive asset holding than participants by around 69.318 ETB. As it can be seen in table4.4, participant households have been producing milk for about four years and the non- participants have been producing for about three years.

The distance from woreda market of the total sampled households on average takes seven kilometers which varies from 0 kilometers(those who live in the place where the woreda market

is located) to 31 kilometers. The average woreda market for participant households is located
six kilometers away from their home and for non- non participants is nine kilometers.

Table 4.5: Summary of Descriptive Statistics for Impact Analysis

Variables	N=387 Full sample		N= 284 Participants		N = 103 Non-participant	
	Mean	Std.Dev	Mean	Std.Dev	Mean	Std.Dev
t_asset	1959.228	4037.465	1940.779	3895.304	2010.097	4425.638
v_livestock	21392.11	34789.09	21895.52	37277.9	20004.07	26867.37
Totasset	23628.26	35141.09	24103.75	37370.33	22317.21	28216.18
amtprod	2590.357	2664.344	2760.468	2422.65	2121.311	3205.753
expeprod	3.992016	4.21544	4.203908	4.326927	3.407767	3.851246
agehh	43.97416	11.72811	43.75	11.81651	44.59223	11.51507
landsi	.8772481	.7334791	.82125	.7330729	1.03165	.7156213
distwordmkt	6.929953	6.363898	6.335711	6.245677	8.568447	6.429466
agehh2	2072.602	1090.506	2053.201	1099.017	2126.097	1070.151
atndsch	3.095607	1.806338	3.140845	1.85553	2.970874	1.665429
hhsize	6.379845	2.100557	6.447183	2.118577	6.194175	2.048712

Source: Own computation based on survey, 2010

4.4.2. Empirical Results and Discussions for the Effects of Dairy Cooperative Marketing on Household's Livelihood

In this part the researcher focuses on the second objectives of the paper which is the effects of dairy cooperative market on the household's livelihood. To see the impact, the researcher used Propensity Score Matching (PSM). Analysis was all about the propensity score matching and average treatment effect on the treated (ATET) by focusing the most influential factors which affect for both the probability to participate and not to participate on cooperative marketing.

4.4.2.1. Propensity Score Matching Results

In order to address the second objective of this study the researcher intended to use an econometric technique which is the propensity score matching approach (PSM) commonly employed in the impact evaluation (Rosenbaum et al. 1983, 1985). Under this approach the researcher matched cooperative market participant households (treated groups) with other households as much as possible that they share similar characteristics but do not participate in cooperative marketing (untreated groups).

The dependent variable in the impact assessment analysis takes the value of 1 if a household participates in cooperative marketing and 0 otherwise. Logit model using STATA software version 10 was employed to construct the propensity scores used to match cooperative participant with non cooperative participants. In propensity score matching, it is important condition to match those variables that affect for both the probability to participate in cooperative market and that are highly associated with the outcome variables, households' education, total asset and total amount of milk produced.

Table- 4.6 below shows the estimation results of the propensity score matching, logit model, using logistic regression. The common support option has been selected and the balancing property is satisfied. See the STATA program output of the logit estimate in appendix VI.

There are six variables found to be significant out of the ten explanatory variables. The result reveals that households' age and land size affect the probability to participate in cooperative marketing significant at less than 10 percent significant level with negative, and its price flexibility, household size, distance to woreda market and experience of milk production also affect at less than 5% significant level, however, positively (see table 4.6).

Table -4.6 Logit estimates for Participation in the cooperative marketing

Variables	Coefficient	P>|z
Sexhh	.055468	0.765
Landsi	-.4965801	0.008**
Agehh	-.62875	0.097*
Hhsize	.1204122	0.006**
Priceflex	1.162558	0.000**
Expeprod	.2373736	0.041*
Distwordmkt	.0207325	0.079*
agehh2	.0004348	0.145
t_asset	-5.86e-06	0.753
V_livestock	9.53e-07	0.756
_cons	2.716323	0.756

Number of obs = 387   R2 = 0.1963
LR chi2(10)= 88.05
Log likelihood = -180.20022

Source: Own computation based on survey 2010

*** indicates significance at the 0.01 level, **indicates 0.05 level. * indicates significance at the 0.10 level

4.4.2.2. ATT Estimation Results

Household Asset accumulation Results

This section presents and discusses the estimation results of matching estimators of household livestock and productive assets simultaneously (total asset accumulation). The result of each of the indicator is obtained using the same approaches as above and all estimations are

bootstrapped[16] standard errors. The researcher used "ATT and t- value" columns to evaluate the impact indicators.

It was hypothesized that, participating in cooperative marketing improve household wellbeing and asset ownership. By and large, these results do support the hypothesis that participation in dairy cooperative marketing has the power to increase the asset ownership and livestock for households. ATT based on nearest-neighbor and Kernel estimators were positive and significant (at 10 and 5 percent level of significance) respectively. Taking into account the significant estimators, the mean difference in fixed asset ownership between cooperative participant and non-participant households ranges from ETB[17] 3461 to ETB 5986.

This result is a clear indication that participants are benefiting from being cooperative members thereby improving their livelihood. Once again, it is possible to deduce that participants are enjoining considerable benefits from the participation in terms of livestock and asset ownership.

Focus group discussion also confirmed this idea that participation in dairy cooperative market helps them to improve their livelihood, asset ownership and education enrolment over the past few years after joining dairy cooperatives. Moreover, dairy cooperative marketing is the most important source of income for the milk producer cooperative marketing members. They added that monthly on average, members generate ETB 2000 to ETB 5000.

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[16]Bootstrapping is the practice of estimating properties of an estimator (such as its variance) by measuring those properties when sampling from an approximating distribution. In the case where a set of observations can be assumed to be from an independent and identically distributed population, this can be implemented by constructing a number of resamples of the observed dataset (and of equal size to the observed dataset), each of which is obtained by random sampling with replacement from the original dataset, Davison and Hinkley (1997).

[17] Ethiopian Birr, which is equivalent to $16.78 as of May 30, 2011

This result is consistent with the finding of Ahmed et al, (2003) that stated smallholders' dairy production and marketing system is a powerful means of raising farm/ producer's incomes and welfare.

Amount of Milk Production Results

This section presents and discusses the estimation results of matching estimators of household volume of milk produced. The result of each of the indicator is obtained using the same approaches as above and all estimations are bootstrapped standard errors. Hypothesis for this variable stated that participation in cooperative marketing has a positive impact on amount of milk production to the market. As expected the researcher found that, on average, cooperative members produced between 920 and 1092 litters amount of milk than did their nonmember counterparts. This effect was statistically significant at 5% probability level and robust across both matching techniques.

This result is also consistent with finding of Mohamed et al, (2004) that dairy cooperatives increase the participation of smallholders in fluid milk markets in the Ethiopian highlands.

Human Capital Results

In this part, estimation results of ATT of household on schooling/ human capital is discussed. In table 4.7 the same analysis is done for household human capital for the same treatment variable. It was hypothesized that participation in cooperative marketing has positive impact on human capital. Though human capital was not statistically significant, it has been identified that the model result showed the existence of positive impact between human capital and cooperative marketing participation. All the matching estimators show that the mean differences in household human capital (schooling) between cooperative marketing participant and nonparticipant households were not statistically significant. This may be because, educational service in the study areas in particular, and in Ethiopia in general, is free of fees.

Table- 4.7 ATT Estimation Results Impact Indicator (Total Asset, Amount of Milk Produced and Human Capital)

Outcome Variables	Matching methods	No. participant households	No. non participant households	ATT	t-value
Total Asset	Nearest-neighbor	284	63	5986.941	1.750*
	Radius	284	101	3461.838	1.592
	Stratification	284	101	3835.481	1.267
	Kernel	284	101	4198.527	2.352**
Amount of Milk Production	Nearest-neighbor	284	63	1092.141	2.983**
	Radius	284	101	920.014	3.981***
	Stratification	284	101	1020.169	5.050***
	Kernel	284	101	1004.209	4.252***
Human Capital	Nearest-neighbor	284	63	0.014	0.037
	Radius	284	101	0.068	0.288
	Stratification	284	101	0.003	0.009
	Kernel	284	101	0.013	0.052

Source: Own computation based on survey 2010
* Significant at 10% level; ** =significant at 5% level; ***= significant at 1% level

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1. Conclusions

Understanding the reasons why milk producers opt for certain types of marketing arrangements in favor of others and its livelihood effect were what this study sets out to accomplish. The overall objective of the study is to identify the factors influencing producers' choice of marketing arrangement and what impact does cooperative marketing arrangements have on household's livelihood in selected woredas; namely Dega Temben, Enderta, Hintalo Wajirata and Kilite Awlaelo, in Tigray region, northern Ethiopia. To answer these objectives focus group discussion and structured questionnaire were a method of data collection. To analyze the collected data descriptive analysis and econometric model were employed.

Three commonly used marketing arrangements (spot, contract and cooperative marketing) were identified which is in the selected areas. Then after identifying these marketing arrangements the next step was identifying potential determinants that influence producers' choice among different types of marketing arrangements by using multinomial logit model. A number of conclusions are drawn from focus group discussion and econometric findings (multinomial logit model) of the study regarding the determinant factors as well as impact of cooperative marketing on household livelihood (PSM).

Quality control and consistency were high in cooperative than spot marketing arrangement and these high quality controls in the dairy marketing cooperatives restrain some individual producers from being cooperative member and this made them idiosyncratic/spot sellers for all they produce.

Assured markets, regular and attractive incomes encouraged farmers to make long-term commitments for choosing cooperative marketing than spot marketing arrangement.

The major constraints for dairy cooperatives in the area included unavailability and costs of feeds, absence of technology, lack of market and high transportation cost.

In addition to the above problems, lack of commitments and free- rider were also being experienced in cooperative marketing arrangement.

Fasting seasons have also a negative impact on milk production system in the selected areas. This in turn affects the prices of dairy products because of low demands for dairy products during these days.

Overall, distance to main market, quantity of milk produced per day per household, active local participation and price flexibility variables seem to be the dominant variables explaining household participation in cooperatives. This means that those households who are farther to the main market, produces large volume of milk, active participants in local administration and those households who are highly affected by price flexibility in the market prefer to participate in cooperative market rather than being spot and contract marketers.

The width of price fluctuation in the local market is highly correlated with the selection of cooperative as compared to spot and contract and at the same time selection of contract over spot marketing arrangement. This means that cooperative has the power to make the price stabilize in local market than other marketing arrangements did.

Active local administrative participation, enough buyers, price flexibility and household size were the determining factors for the choice of spot or contract marketing arrangement.

Price, land size and household size were found to be the major determinant factors for spot over cooperative marketing arrangement and vise-versa.

Cooperative marketing arrangements offer higher price than spot marketing arrangement. This is because cooperatives are able to provide reduced transaction costs to their members, through

bargaining power over traders, to benefit from economies of scale in commercialization, or to reach more attractive markets.

Resource shortage (land) is the driving factors that motivated households to participate in cooperative marketing. This is because of the fact that cooperatives provide land to run diary development activities.

Cooperative marketing provides higher prices, more stable prices to producers, reduce marketing costs, improve hygiene and quality of products to producers as well as produce large amount milk in the market more than other marketing arrangements provide.

For the impact analysis the following results were found. The hypothesis was that cooperative participation has an impact in increasing household's livelihood, in terms of asset holding, total milk production and human capital. Matching econometrics modeling approach was used to analyze the empirical data.

Upon the evaluation of the effectiveness of the participation, it is found that the participation positively and significantly improved the livelihood of cooperative participants as measured by the total asset accumulation. After matching participants in the cooperative market with nonparticipants on the basis of their propensity score, the gains from participation range from ETB 3461 to ETB 5986.

The positive and significant impact of the participation of cooperative marketing on asset accumulation and household livelihood are inspiring indication of the importance of the participation towards improving the livelihood of the poor. This is because of cooperatives have the power to increase the producers bargaining power in the market places and permits producers to combine their strength and gain more income. The producers can lower distribution costs, conduct joint product promotion, and develop the ability to deliver their products in the amounts and types that will attract better offers from purchasers.

Similarly, results of volume of milk production validate that being participant has positive and significant impact on household livelihood. The average gains, as a result of participation in the cooperative market, range from litter 920 to litter 1092.

The researcher did not nevertheless find any significant evidence of a positive impact on human capital investment as signified through all specified matching estimators.

Generally, the findings in this study concluded that the participation of cooperative marketing is economically viable and an important tool to increase household livelihood effort and development process in Ethiopia.

5.2. Recommendations

Having reviewed the major findings of the empirical studies, the following are the policy implications:

The researcher has identified significant changes on those households who have been organized in cooperatives. In order for participants of cooperative marketing to gain more benefits in a sustainable way, the cooperative policy makers should promote the managerial capacity of existing cooperatives through providing capacity building, and technical support mainly on input and output markets. In addition, cooperative policy makers should encourage those households who are not participants in cooperative marketing yet to make them cooperative participants.

The research finding showed that price instability and better price were the major determinant factors for choosing cooperative over spot marketing arrangement. Therefore, in order to protect producers from selling their products at unfairly low prices and to minimize price flexibility in the market; engaging in cooperative marketing might be one of the issues requiring future consideration. To make this come to an end, cooperative policy makers that found at different levels should do much on awareness creation to get them in cooperative marketing arrangement.

Fasting dates have identified as a negative impact for milk selling in the selected sites. In this regard, the Christian fasting day is mentioned as a constraint that needs to be addressed in order to sell the milk that they produced. Otherwise, the producers could and cannot be fully benefited from the dairy market. As one of the ways to solve the problems they have been facing so far due to the Ethiopian Orthodox fasting periods, establishing Milk Preserving technology, as in the case in Debrezeit, Oromiya region, deserves a special attention by cooperative policy makers that are found at different levels. Thus, as technology adoption continues, we can expect to see more contract production and more independent/spot marketers becoming members of cooperatives in order to be effective and efficient in milk production and marketing.

Moreover, encouraging the producers to market milk products to Muslim dominating areas (non-fasting areas) by promoting linkages for access to services and marketing will be another solution that the cooperative policy makers should do at the long fasting dates.

Efforts to scale up cooperative marketing activities and enhance local capacity for smallholder dairy development requires continuous assessment and cooperative policy initiatives should do more to acknowledge, identify and leverage alternative mechanisms that respond specifically to the needs of milk producers.

The researcher has been identified that there were free -riders in the cooperative marketing arrangement. This highly affects the business growth and sense of ownership of the cooperative members. Therefore, it is necessary to establish a strong regulatory framework (standard rules and procedures, by-law) that provide incentives to committed members and disincentives to free-rider members in the cooperative to minimize the problems.

It has been identified that quality control is high and strict in cooperative market as compared to spot marketing arrangement. Since this quality control mechanism is important tool to provide high quality milk products to the customers/demanders, cooperative policy makers should promote and scale up this activities in a sustainable manner to improve milk quality management through incorporating in the existing extension services and different interventions done by different development organizations (NGOs).

The major constraints for dairy cooperatives in the area included unavailability and costs of feed, absence of technology, lack of market, veterinary service and high transportation cost. Therefore, cooperative policy makers and practitioners should aim at addressing and removing such shackles that constrain producers from exploiting marketing opportunities by providing training, advisory services, animal health services, feed and veterinary to producers. Accordingly, external actors, such as public agencies and NGOs, may have a role to solve these problems.

5.3. Implication for Future Research

The determinants of marketing arrangement choice and its impact were studied only on four woredas of Tigray Region. However, the situation may be different in other areas of the country. So, to conclude to the whole parts of the country, it will be worth enough if a research which considers the remaining part of the country.

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APPENDIX

Annex A. Multinomial logistic regression (Cooperative as a Base Outcome)

```
. mlogit coord    atndsch sexhh      enghbur activepart landsirt lpriceltr agehhrt    hhsize dist
> l  priceflex    expeprod  amtprodd, baseoutcome(3)

Iteration 0:    log likelihood =-403.21403
Iteration 1:    log likelihood =-282.24876
Iteration 2:    log likelihood =-271.51049
Iteration 3:    log likelihood =-270.62936
Iteration 4:    log likelihood =-270.61847
Iteration 5:    log likelihood =-270.61847
```

```
Multinomial logistic regression              Number of obs   =      384
                                             LR chi2(24)     =   265.19
                                             Prob > chi2     =   0.0000
Log likelihood =-270.61847                   Pseudo R2       =   0.3288
```

coord	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
1						
atndsch	.1644154	.1519108	1.08	0.279	-.1333242	.4621551
sexhh	.1029213	.4327906	0.24	0.812	-.7453328	.9511753
enghbur	-.3292183	.3916526	-0.84	0.401	-1.096843	.4384067
activeparti	-2.061186	.3823978	-5.39	0.000	-2.810672	-1.3117
landsirt	.6894535	.4029712	1.71	0.087	-.1003557	1.479263
lpriceltr	-2.774453	1.310779	-2.12	0.034	-5.343534	-.2053724
agehhrt	-.049494	.2000933	-0.25	0.805	-.4416697	.3426817
hhsize	-.2717843	.1378738	-1.97	0.049	-.542012	-.0015565
distmkl	-.0389361	.0141838	-2.75	0.006	-.0667358	-.0111364
priceflex	-3.075209	.3823215	-8.04	0.000	-3.824545	-2.325873
expeprod	-.0527299	.0438404	-1.20	0.229	-.1386555	.0331957
amtprodd	-1.058655	.2471924	-4.28	0.000	-1.543143	-.5741666
_cons	17.95494	3.405492	5.27	0.000	11.2803	24.62958
2						
atndsch	.0266852	.1438477	0.19	0.853	-.255251	.3086215
sexhh	-.3203218	.4076225	-0.79	0.432	-1.119247	.4786037
enghbur	.492977	.4266747	1.16	0.248	-.34329	1.329244
activeparti	-2.926544	.3596249	-8.14	0.000	-3.631396	-2.221692
landsirt	.1426157	.3862788	0.37	0.712	-.6144767	.8997082
lpriceltr	-1.935971	1.222918	-1.58	0.113	-4.332847	.4609054
agehhrt	-.2646314	.2009072	-1.32	0.188	-.6584023	.1291395
hhsize	.0422759	.1337628	0.32	0.752	-.2198943	.3044461
distmkl	-.0265078	.0137731	-1.92	0.054	-.0535027	.0004871
priceflex	-1.856551	.37907	-4.90	0.000	-2.599515	-1.113588
expeprod	.0083028	.0365908	0.23	0.820	-.063414	.0800195
amtprodd	-.7551377	.2405064	-3.14	0.002	-1.226522	-.2837538
_cons	13.44714	3.214161	4.18	0.000	7.147504	19.74678

```
(coord==3 is the base outcome)
```

Annex B. Multinomial Logistic Regression (Contract as a Base Outcome)

```
. mlogit coord   atndsch sexhh      enghbur activepart landsirt lpriceltr agehhrt   hhsize dist
> l  priceflex   expeprod amtprodd, baseoutcome(2)

Iteration 0:    log likelihood =-403.21403
Iteration 1:    log likelihood =-282.24876
Iteration 2:    log likelihood =-271.51049
Iteration 3:    log likelihood =-270.62936
Iteration 4:    log likelihood =-270.61847
Iteration 5:    log likelihood =-270.61847
```

Multinomial logistic regression		Number of obs	=	384
		LR chi2(24)	=	265.19
		Prob > chi2	=	0.0000
Log likelihood = -270.61847		Pseudo R2	=	0.3288

coord	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
1						
atndsch	.1377302	.1408367	0.98	0.328	-.1383047	.4137651
sexhh	.423243	.3901167	1.08	0.278	-.3413716	1.187858
enghbur	-.8221952	.4052368	-2.03	0.042	-1.616445	-.0279456
activeparti	.8653579	.3457451	2.50	0.012	.18771	1.543006
landsirt	.5468377	.4024706	1.36	0.174	-.2419902	1.335666
lpriceltr	-.8384823	1.159288	-0.72	0.470	-3.110644	1.43368
agehhrt	.2151374	.1920404	1.12	0.263	-.1612548	.5915296
hhsize	-.3140602	.1280692	-2.45	0.014	-.5650712	-.0630491
distmkl	-.0124283	.0120442	-1.03	0.302	-.0360346	.0111779
priceflex	-1.218658	.332669	-3.66	0.000	-1.870677	-.5666384
expeprod	-.0610327	.0445038	-1.37	0.170	-.1482584	.0261931
amtprodd	-.3035171	.2074235	-1.46	0.143	-.7100598	.1030255
_cons	4.507799	2.783409	1.62	0.105	-.9475821	9.96318
3						
atndsch	-.0266852	.1438477	-0.19	0.853	-.3086215	.255251
sexhh	.3203218	.4076225	0.79	0.432	-.4786037	1.119247
enghbur	-.492977	.4266747	-1.16	0.248	-1.329244	.34329
activeparti	2.926544	.3596249	8.14	0.000	2.221692	3.631396
landsirt	-.1426157	.3862788	-0.37	0.712	-.8997082	.6144767
lpriceltr	1.935971	1.222918	1.58	0.113	-.4609054	4.332847
agehhrt	.2646314	.2009072	1.32	0.188	-.1291395	.6584023
hhsize	-.0422759	.1337628	-0.32	0.752	-.3044461	.2198943
distmkl	.0265078	.0137731	1.92	0.054	-.0004871	.0535027
priceflex	1.856551	.37907	4.90	0.000	1.113588	2.599515
expeprod	-.0083028	.0365908	-0.23	0.820	-.0800195	.063414
amtprodd	.7551377	.2405064	3.14	0.002	.2837538	1.226522
_cons	-13.44714	3.214161	-4.18	0.000	-19.74678	-7.147504

(coord==2 is the base outcome)

Annex C. Multinomial Logistic Regression (Spot as a Base outcome)

```
. mlogit coord   atndsch sexhh      enghbur  activepart  landsirt lpriceltr agehhrt   hhsize dis
> kl   priceflex   expeprod  amtprodd, baseoutcome(1)

Iteration 0:    log likelihood =-403.21403
Iteration 1:    log likelihood =-282.24876
Iteration 2:    log likelihood =-271.51049
Iteration 3:    log likelihood =-270.62936
Iteration 4:    log likelihood =-270.61847
Iteration 5:    log likelihood =-270.61847
```

```
Multinomial logistic regression                    Number of obs   =      384
                                                   LR chi2(24)     =   265.19
                                                   Prob > chi2     =   0.0000
Log likelihood =-270.61847                         Pseudo R2       =   0.3288
```

coord	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
2						
atndsch	-.1377302	.1408367	-0.98	0.328	-.4137651	.1383047
sexhh	-.423243	.3901167	-1.08	0.278	-1.187858	.3413716
enghbur	.8221952	.4052368	2.03	0.042	.0279456	1.616445
activeparti	-.8653579	.3457451	-2.50	0.012	-1.543006	-.18771
landsirt	-.5468377	.4024706	-1.36	0.174	-1.335666	.2419902
lpriceltr	.8384823	1.159288	0.72	0.470	-1.43368	3.110644
agehhrt	-.2151374	.1920404	-1.12	0.263	-.5915296	.1612548
hhsize	.3140602	.1280692	2.45	0.014	.0630491	.5650712
distmkl	.0124283	.0120442	1.03	0.302	-.0111779	.0360346
priceflex	1.218658	.332669	3.66	0.000	.5666384	1.870677
expeprod	.0610327	.0445038	1.37	0.170	-.0261931	.1482584
amtprodd	.3035171	.2074235	1.46	0.143	-.1030255	.7100598
_cons	-4.507799	2.783409	-1.62	0.105	-9.96318	.9475821
3						
atndsch	-.1644154	.1519108	-1.08	0.279	-.4621551	.1333242
sexhh	-.1029213	.4327906	-0.24	0.812	-.9511753	.7453328
enghbur	.3292183	.3916526	0.84	0.401	-.4384067	1.096843
activeparti	2.061186	.3823978	5.39	0.000	1.3117	2.810672
landsirt	-.6894535	.4029712	-1.71	0.087	-1.479263	.1003557
lpriceltr	2.774453	1.310779	2.12	0.034	.2053724	5.343534
agehhrt	.049494	.2000933	0.25	0.805	-.3426817	.4416697
hhsize	.2717843	.1378738	1.97	0.049	.0015565	.542012
distmkl	.0389361	.0141838	2.75	0.006	.0111364	.0667358
priceflex	3.075209	.3823215	8.04	0.000	2.325873	3.824545
expeprod	.0527299	.0438404	1.20	0.229	-.0331957	.1386555
amtprodd	1.058655	.2471924	4.28	0.000	.5741666	1.543143
_cons	-17.95494	3.405492	-5.27	0.000	-24.62958	-11.2803

(coord==1 is the base outcome)

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Annex D: Marginal Effect for Cooperative Marketing Arrangement

```
. mfx, predict(p outcome(3))

Marginal effects after mlogit
      y  = Pr(coord==3) (predict, p outcome(3))
         = .45634275
```

variable	dy/dx	Std. Err.	z	P>|z|	[	95% C.I.	]	X
atndsch	-.0226205	.03219	-0.70	0.482	-.085712	.040471		3.11198
sexhh*	.0330116	.09125	0.36	0.718	-.145832	.211856		.760417
enghbur*	-.0163741	.08748	-0.19	0.852	-.187831	.155082		.75
active~i*	.5413764	.05165	10.48	0.000	.440149	.642604		.604167
landsirt	-.0989081	.08383	-1.18	0.238	-.26321	.065394		.809974
lprice~r	.577709	.27854	2.07	0.038	.03178	1.12364		1.58227
agehhrt	.040661	.04366	0.93	0.352	-.044905	.126227		6.57925
hhsize	.0259959	.02946	0.88	0.378	-.03174	.083732		6.40104
distmkl	.0080202	.00312	2.57	0.010	.001915	.014126		39.932
pricef~x*	.5221028	.05347	9.76	0.000	.417307	.626899		.635417
expeprod	.0050303	.00828	0.61	0.543	-.011194	.021255		3.97633
amtprodd	.2226047	.05447	4.09	0.000	.115846	.329364		7.57659

```
(*) dy/dx is for discrete change of dummy variable from 0 to 1
```

Annex E: Marginal Effects for Contract Marketing Arrangement

```
  mfx, predict(p outcome(2))

Marginal effects after mlogit
      y  = Pr(coord==2) (predict, p outcome(2))
         = .28909055
```

variable	dy/dx	Std. Err.	z	P>|z|	[	95% C.I.	]	X
atndsch	-.0066155	.02527	-0.26	0.793	-.056138	.042907		3.11198
sexhh*	-.0759478	.07577	-1.00	0.316	-.224447	.072551		.760417
enghbur*	.1178766	.06514	1.81	0.070	-.009795	.245548		.75
active~i*	-.4206203	.05417	-7.77	0.000	-.526782	-.314458		.604167
landsirt	-.0214288	.07009	-0.31	0.760	-.158794	.115937		.809974
lprice~r	-.1936954	.20986	-0.92	0.356	-.605012	.217621		1.58227
agehhrt	-.0507439	.03545	-1.43	0.152	-.120224	.018737		6.57925
hhsize	.0286898	.02345	1.22	0.221	-.017264	.074644		6.40104
distmkl	-.0025824	.00232	-1.11	0.265	-.007128	.001963		39.932
pricef~x*	-.0804244	.05485	-1.47	0.143	-.187924	.027075		.635417
expeprod	.0055869	.00687	0.81	0.416	-.007885	.019059		3.97633
amtprodd	-.0772844	.04048	-1.91	0.056	-.156628	.002059		7.57659

```
(*) dy/dx is for discrete change of dummy variable from 0 to 1
```

Annex F: Marginal Effect for Spot Marketing Arrangement

```
. mfx, predict(p outcome(1))

Marginal effects after mlogit
      y  = Pr(coord==1) (predict, p outcome(1))
         =  .2545667
```

variable	dy/dx	Std. Err.	z	P>|z|	[95% C.I.]	X
atndsch	.029236	.02457	1.19	0.234	-.018911 .077383	3.11198
sexhh*	.0429362	.06453	0.67	0.506	-.083545 .169418	.760417
enghbur*	-.1015024	.07184	-1.41	0.158	-.242306 .039301	.75
active~i*	-.1207561	.05315	-2.27	0.023	-.224935 -.016577	.604167
landsirt	.1203369	.06699	1.80	0.072	-.010968 .251642	.809974
lprice~r	-.3840136	.20882	-1.84	0.066	-.793287 .02526	1.58227
agehhrt	.0100829	.03244	0.31	0.756	-.053496 .073661	6.57925
hhsize	-.0546857	.02192	-2.49	0.013	-.097655 -.011716	6.40104
distmkl	-.0054378	.00221	-2.46	0.014	-.009768 -.001108	39.932
pricef~x*	-.4416784	.05426	-8.14	0.000	-.548019 -.335338	.635417
expeprod	-.0106172	.00766	-1.39	0.166	-.025626 .004392	3.97633
amtprodd	-.1453203	.03814	-3.81	0.000	-.220082 -.070559	7.57659

(*) dy/dx is for discrete change of dummy variable from 0 to 1

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Annex G: Variance Inflation Factor Test for Multinomial Logit
Results

Variables	VIF	1/VIF
Household size	2.92	0.343587
Education	2.60	0.382692
Price	1.43	0.699319
Distance	1.32	0.766668
Volume of milk	1.22	0.825889
Land size	1.21	0.829173
Sex	1.20	0.837083
Active local admi.	1.19	0.844896
Age	1.19	0.845097
Experience	1.15	0.882596
Price flexibility	1.12	0.890783
Enough buyers	1.12	0.891228

Annex H: Summary Statistics of Selected Variables Used in the Impact Analysis

Variables	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]		t-test	chi2
Sexhh	.055468	.1852967	0.30	0.765	-.3077068	.4186428		0.647
Landsirt	-.4965801	.1867812	-2.66	0.008**	-.8626645	-.1304957	0.0030**	
Agehh	-.62875	.379232	-1.66	0.097*	-1.372031	.114531	0.5331	
Hhsize	.1204122	.0433804	2.78	0.006**	.0353882	.2054361	0.2956	
Priceflex	1.162558	.1547847	7.51	0.000***	.8591858	1.465931		0.000**
expeprod	.2373736	.1161565	2.04	0.041*	.0097111	.465036	0.0067**	
Distwordmkt	-.0207325	.0118035	-1.76	0.079*	-.0438669	.0024019	0.0368*	
Agehh2	.0004348	.0002984	1.46	0.145	-.0001501	.0010197	0.5618	
t_asset	-5.86e-06	.0000186	-0.31	0.753	-.0000424	.0000306	0.8816	
v_livestock	9.53e-07	3.06e-06	0.31	0.756	-5.04e-06	6.95e-06	0.6370	
_cons	2.716323	1.826067	1.49	0.137	-.8627029	6.295349		

Number of obs = 387   *R2 =   0.1963*

LR chi2(10)   = 88.05   *Log likelihood = -180.20022*

Annex I: STATA Program Output of the Estimation of the Propensity Score and ATT results

```
. pscore copmeb sexhh  landsirt  agehhrt hhsize priceflex logexpeprod
> e2) blockid(blockid2) comsup numblo(5 ) level(0.005)
```

```
****************************************************
Algorithm to estimate the propensity score
****************************************************
```

The treatment is copmeb

coopertive	Freq.	Percent	Cum.
0	103	26.61	26.61
1	284	73.39	100.00
Total	387	100.00	

Description of the estimated propensity score
in region of common support

Estimated propensity score

	Percentiles	Smallest		
1%	.2440621	.2187817		
5%	.3216673	.2340152		
10%	.4128724	.2429348	Obs	385
25%	.5929277	.2440621	Sum of Wgt.	385
50%	.8150321		Mean	.7366388
		Largest	Std. Dev.	.2056666
75%	.9051536	.9770578		
90%	.9395122	.9771978	Variance	.0422988
95%	.9554177	.9803135	Skewness	-.8020059
99%	.9770578	.9949887	Kurtosis	2.425986

```
****************************************************
Step 1: Identification of the optimal number of blocks
Use option detail if you want more detailed output
****************************************************


The final number of blocks is 5

This number of blocks ensures that the mean propensity scor
is not different for treated and controls in each blocks



**********************************************************
Step 2: Test of balancing property of the propensity score
Use option detail if you want more detailed output
**********************************************************


The balancing property is satisfied


This table shows the inferior bound, the number of treated
and the number of controls for each block
```

Inferior of block of pscore	coopertive 0	1	Total
.2	21	10	31
.4	39	32	71
.6	21	60	81
.8	20	182	202
Total	101	284	385

```
Note: the common support option has been selected


*******************************************
End of the algorithm to estimate the pscore
*******************************************
```

ATT estimation with Nearest Neighbor Matching method (random draw version) ,Bootstrapped standard errors

----

N. treat.	N. contr.	ATT	Std. Err.	t
284	63	5986.941	3421.1091	1.750

ATT estimation with the Stratification method , Bootstrapped standard errors

----

N. treat.	N. contr.	ATT	Std. Err.	t
284	101	3853.481	3041.385	1.267

ATT estimation with the Kernel Matching method ,Bootstrapped standard errors

----

N. treat.	N. contr.	ATT	Std. Err.	t
284	101	4198.527	1785.088	2.352

ATT estimation with the Radius Matching method ,Bootstrapped standard errors

----

N. treat.	N. contr.	ATT	Std. Err.	t
284	101	3461.838	2174.370	1.592

ATT estimation with Nearest Neighbor Matching method (random draw version)

Bootstrapped standard errors

N. treat.	N. contr.	ATT	Std. Err.	t
284	63	1092.141	366.111	2.98

ATT estimation with the Kernel Matching method Bootstrapped standard errors

----

N. treat.	N. contr.	ATT	Std. Err.	t
284	101	1004.209	236.177	4.252

ATT estimation with the Stratification method, Bootstrapped standard errors

----

N. treat.	N. contr.	ATT	Std. Err.	t
284	101	1020.169	202.006	5.05

ATT estimation with the Radius Matching method, Bootstrapped standard errors

----

N. treat.	N. contr.	ATT	Std. Err.	t
284	101	920.014	231.076	3.981