

**MARKET CHAIN ANALYSIS OF POULTRY: THE CASE OF
ALAMATA AND ATSBI-WONBERTA WOREDAS OF TIGRAY
REGION**

M.Sc. Thesis

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**January 2010
Haramaya University**

**MARKET CHAIN ANALYSIS OF POULTRY: THE CASE OF
ALAMATA AND ATSBI-WONBERTA WOREDAS OF TIGRAY
REGION**

**A Thesis Submitted to the Department of Agricultural Economics,
School of Graduate Studies
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MASTER OF SCIENCE IN AGRICULTURE
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BY

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As thesis research advisors, we here by certify that we have read and evaluated this thesis prepared, under our guidance, by Dawit Gebregziabher entitled “Market Chain Analysis of Poultry: the case of Alamata and Atsbi Wonberta Woredas of Tigray Region.” We recommend that it be submitted as fulfilling the thesis requirement.

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DEDICATION

I dedicate this thesis manuscript to my family for their moral and encouragement in the study period in particular and throughout my life in general.

STATEMENT OF THE AUTHOR

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ABBREVIATIONS

ADLI	Agricultural Development Led Industrialization
BoARD	Bureau of Agriculture and Rural Development
CC	Contingent Coefficient
CIAT	Centro Internacional de Agricultural Tropical
CR	Concentration Ratio
CSA	Central Statistical Agency of Ethiopia
DCSI	Dedebit Credit and Saving Institution
ESAP	Ethiopian Society of Animal Production
FAO	Food and Agriculture Organization of the United Nations
GDP	Gross Domestic Product
ILRI	International Livestock Research Institute
IPMS	Improving Productivity and Market Success of Ethiopian Farmers
MM	Marketing Margin
NGO	Non-Governmental Organization
NMM	Net Marketing Margin
OLS	Ordinary Least Square
PMP	Poultry Market Participation
RMA	Rapid Market Appraisal
S-C-P	Structure-Conduct-Performance
TCMMa	Assemblers' Portion of the Total Channel Marketing Margin
TCMMr	Retailers' Portion of the Total Channel Marketing Margin
TCMMw	Wholesalers' Portion of the Total Channel Marketing Margin
TCMM	Total Channel Marketing Margin
TGMM	Total Gross Marketing Margin
TLU	Tropical Livestock Unit
VPS	Value of Poultry Sales
VIF	Variance Inflation Factor

BIOGRAPHICAL SKETCH

The author was born in Axum on October 7, 1983. He attended his elementary and junior education at Axum and Abraha we Atsbaha Primary and junior secondary schools at Axum respectively, and Secondary School in Axum Comprehensive High School. Then he joined Mekelle University in 2003 and graduated with B.Sc. in Natural Resource Economics and Management in 16th July 2006.

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MARKET CHAIN ANALYSIS OF POULTRY: THE CASE OF ALAMATA AND ATSBI-WONBERTA WOREDAS OF TIGRAY

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ABSTRACT

This study was initiated to analyze poultry marketing chain in Alamata and Atsbi-Wonberta Woredas of Tigray region. The specific objectives of the study are, to analyze structure conduct and performance of poultry market, to analyze the structure of production cost and determine profitability, to identify the major constraints and opportunities of poultry production and supply, to analyze the production and marketing support service of extension, input supply, credit and marketing, and to identify the determinants of poultry supply in the study areas. The data were collected from individual interview using pre-tested questionnaire. Descriptive statistics such as t-test, chi-square, means and percentages were employed to analyze structure conduct and performance of poultry market, to analyze the structure of production cost and determine profitability, to identify the major constraints and opportunities of poultry production and supply and to analyze production and marketing support service of extension, input supply, credit and marketing. Heckman two stage econometric model was used to identify factors affecting market participation decision and value of poultry sales. The major marketing channels and main actors involving in the market were identified. Marketing channels of egg and chicken indicated shorter path as compared to other agricultural commodities. The market actors in the survey period were producers, rural assemblers, retailers, wholesalers and consumers. Significant amount of chicken and egg were channeled through the first channel, direct selling of the commodities from farmers to consumers. To evaluate poultry market performance cost, profit and marketing margins were calculated for the group of market players in different channels for egg and chicken markets.

Poultry production was constrained by diseases, health service and limited supply of exotic chicken. Some of the diseases identified by the sample households were New Castle, Salmonella and chicken flies. Traders were also constrained with permanent market place, trade license and existence diseases. Despite this, it had also opportunities such as high turnover earning, small feed requirement, lower initial cost requirement, employment opportunities for poor women, landless farmers and disadvantaged groups and being land a less limiting factor for its production. Results obtained from the first stage of the model indicated that sex of the household and distance to the woreda market; family size and education of the household head were the variables that influence the decision to participate in poultry market negatively. Results from second stage of the model shows that, value of poultry sales was influenced negatively by Alamata as compare to Atsbi woreda, and positively by poultry owned. Therefore, policy aimed to accelerate agricultural development in poultry production and marketing could be successful if the aforementioned factors are taken in to consideration.

1. INTRODUCTION

Food security is one of the most important problems for the rural population of Ethiopia, whose life is almost entirely dependent on agricultural products. The majority of the people of the country live in rural areas where agriculture is virtually the only occupation source of livelihood and also the major factor in the economy of the country accounting for about half of Gross Domestic Product (GDP), 90% of exports and 85% of total employment (Jemal,2008)

Ethiopia ranks first in Africa and tenth in the worldwide with respect to the livestock population. However, there are a number of fundamental constraints underlie these outcomes. These include traditional technologies, limited supply of inputs (feed, breed, stock, water) poor or non-existent of extension service, high diseases prevalence, poor marketing infrastructure, lack of marketing support service, lack of market information and limited credit services affect the livestock marketing conditions(Berhanu *et al.*, 2007).

The growing domestic demand, which results from increased urbanization, higher income due to economic growth, and rising population, offers significant incentive for increased market oriented livestock production (Ibid).

Poultry production as part of livestock production could be one alternative income generating mechanism for rural households. The problem, which limits farmers not to produce flock of chicken, is the market access condition in the area (Holloway and Ehui, 2002). Poultry products are highly marketable and poultry rearing as a business has high turnover rates. However, as reported by Kenea *et al.* (2003) efficient marketing system is one major component to increase village chicken contribution to the rural household economy. Poultry production is also one way of cash earning technique in the study areas, Alamata and Atsbi-wenberta woredas of Tigray region. Hence, market chain analysis of poultry was not systematically studied in the study areas. Thus, this study was initiated to address this knowledge gap. Therefore, it is worth studying market chain analysis to enhance poultry production.

1.1. Statement of the Problem

Agricultural marketing is the main driving force of economic development and has a guiding and simulating impact on production and distribution of agricultural produce. The agricultural marketing system takes on increasing importance as a traditional agrarian society is transformed in to modern industrial society. The increasing proportion of the population living in urban centers and the rising level of income requires more highly organized channels for processing and distributing agricultural products (Wolday and Eleni, 2005). Smallholder farmers in particular face an uncertain production environment, enormous constraints and high cost in accessing markets.

Research effort to increase chicken production and productivity has been underway in Ethiopia. A review of past research works indicates that the research largely concentrated on the biological aspects of poultry production such as supplementary feeding and breeding (Alemu and Tadele, 1997). Increased production, however, needs to be accompanied by efficient marketing systems. One means of investigating the efficiency of chicken marketing system is through studying and identifying factors that determine the market chain analysis of chicken (Andergachew and Brokken, 1993).

Most farmers in Ethiopia in general and in Tigray in particular do have small land holding size. This size of land limits farmers to produce surplus crop for sale and generating income after satisfying the subsistence requirement. To solve this problem other alternative agricultural production system is livestock production system, and among this poultry production can be one. Often farmers are not attracted by new technology even when it appears to be better than their current practices owing to market limitation (Diao and Hazell, 2004, as cited in Akililu, 2007). Despite the fact that, poultry products play an important direct or indirect role in the livelihood of greater portion of the Ethiopian people, its marketing and market chain aspects have not yet been studied in different parts of the country, especially in the study areas, which are Alamata and Atsbi- Wonberta woredas of Tigray region. Thus, this study is proposed to investigate poultry market chain in these two woredas, and this will help to narrow the information gap on this area of interest.

1.2. Objective of the Study

The general objective of this study is to assess the market chain analysis of poultry in Alamata and Atsbi-wenberata woredas.

The Specific objectives are:

1. to analyze the structure, conduct and performance of poultry market
2. to analyze the structure of production costs and determine profitability of poultry Production
3. to identify the major constrains and opportunities of poultry production and marketing
4. to analyze the production and marketing support service of extension, input supply, credit and marketing
5. to analyze the determinants of poultry market supply in the study area

1.3. Scope of the Study

This study was limited to the market chain analysis of poultry production in the study areas (Alamata and Atsbi-Wonberta woredas of Tigray). The sample size for this study was limited to 200 households in these two woredas and the study focuses on market chain aspects.

1.4 .Significance of the Study

This study will provide information on the determinants of poultry supply, credit condition, marketing margin and identifying opportunities and constrains of poultry production and marketing in these areas. The information could help farmers, traders and others, who need this information for different purposes.

1.5. Limitations of the Study

Time and resource availability was few among the limitations of the study. In addition to this, lack of past studies related to this area of interest in the study area in particular and in the region in general was another limitation of this study.

2. LITERATURE REVIEW

2.1. Village Poultry Production System in Ethiopia

In sub-Saharan Africa, 85 percent of all households keep poultry (Guèye, 1998). Ethiopia is representative of countries where village poultry plays a dominant role in total poultry production. The sector represents an important part of the national economy in general and the rural economy in particular. In developing countries, many rural households keep poultry in their farmyard. Poultry keeping practiced by rural households using family labor is referred as village poultry keeping. This practice is also called rural poultry or rural family poultry (Akililu, 2007). Chicken meat is relatively cheap and affordable source of animal protein (Alemu and Tadele, 1997). However, at home and restaurants chicken dishes are more expensive than other dishes constituting beef and mutton probably due to the way chicken dishes are prepared.

According to Alemu (1995), Ethiopian poultry production systems comprise both traditional and modern production systems. Ninety nine percent of poultry production consists of local breed types under individual farm household management. The latest figure available indicated that village poultry contributes 98.5% and 99.2% of the national egg and chicken meat production (Tadelle *et al.*, 2002). Village chicken production systems are characterized as mostly an indigenous integral part of the farming system with short life cycle, quick turn over, low-input production systems and accessible at both inter and intra household levels.

Modern poultry production system in Ethiopia

Modern poultry production started in Ethiopia about 30 years ago, mainly in colleges and research stations. The activities of these institutions focused on the introduction of exotic breeds and their distribution to farmers, along with appropriate management, feeding, housing and health care packages. There are a few private modern production farms around Addis Ababa city. Some state-run poultry multiplication centres have been established, with the aim of providing improved breeds to farmers through the extension service (Aklilu,

2007).

The importance of poultry production in Ethiopia

The poor rural farmers produce chickens and sell them to earn cash required for various household expenses. There is a growing demand for chicken meat in urban areas, due to substantial increase in price of beef and mutton (ESAP, 2003). Rearing chickens have several advantages; it fits quite well to the condition of poor households. Due to their requirement of small feed, space and the low cost of the animal make poultry rearing a suitable activity for the poor. Poultry products are highly marketable and poultry rearing as a business has high turnover rates (Alemu, 1987). Rearing of poultry is one of the most appropriate activities for rural women and landless farmers with marginal revenue, for whom it provides an income. It also generates employment opportunities for the poor and at the same time increases the overall supply of high quality animal protein to the community. This is particularly true in Ethiopia because there are few alternative animal protein sources available to the population, and no cultural or religious taboos of any kind relating to the consumption of eggs and poultry meat, in contrast to pig meat. Moreover, land, which is a critical production resource like in Ethiopia, is less limiting factor in village chicken production. Consequently, poor landless groups of the community can be direct beneficiaries of village chicken improvement programs (Kitalyi, 1998).

2.2. Market and Marketing

Market can be defined as an area in which one or more sellers of given products/services and their close substitutes exchange with and compete for the patronage of a group of buyers. Originally, the term market stood for the place where buyers and sellers are gathered to exchange their goods, such as village square. A market is a point, or a place or sphere within which price making force operates and in which exchanges of title tend to be accompanied by the actual movement of the goods affected (Backman and Davidson, 1962). The concept of exchange and relationships lead to the concept of market. It is the set of the actual and potential buyers of a product (Kotler and Armstrong, 2003). Conceptually, a market can be

visualized as a process in which ownership of goods is transferred from sellers to buyers who may be final consumers or intermediaries.

2.2.1. Marketing efficiency

Efficiency in marketing is the most used measure of market performance. Improved marketing efficiency is a common goal of farmers, marketing organizations, consumers and society. It is a commonplace notation that higher efficiency means better performance whereas declining efficiency denotes poor performance. Most of the changes proposed in marketing are justified on the grounds of improved efficiency (Kohls and Uhl, 1985).

2.2.2. Marketing channel

Formally, a marketing channel is a business structure of interdependent organizations that reach from the point of product or origin to the consumer with the purpose of moving products to their final consumption or destination (Kotler *et al.*, 2003). This channel may be short or long depending on kind and quality of the product marketed, available marketing services, and prevailing social and physical environment (Islam *et al.*, 2001).

Marketing chain

Market chain is the term used to describe the various links that connect all the actors and transactions involved in the movement of agricultural goods from the producer to the consumer (CIAT, 2004). A marketing chain is used to describe the numerous links that connect all actors and transactions involved in the movement of agricultural products from farmer to consumer (Lunndy *et al.*, 2004). Functions conducted in a marketing chain have three things in common; they use up scarce resources, they can be performed better through specialization, and they can be shifted among channel members (FAO, 2005).

2.3. Marketing Actors

Producer: It is the first link in the poultry market chain, the producer harvests the products and supplies to the second agent. From the moment he/she decides what to produce, how much to grow and when to grow and sale.

Consumer: It is the last link in the poultry market chain, the participants and their respective functions often overlap. The most widespread combinations are the following: Traders-whole sellers that collect the commodity and supply it to retailers, whole sellers-retailers (whole sellers that also sell directly to consumers) and whole sellers-exporters.

Rural assembler: sometimes also known as transporter or trader, he/she is the first link between producer and other middlemen.

Whole seller: He concentrates the various, intermediate sized loads and puts the product into large, uniform units. These activities all contribute to price formation.

Retailers: Middlemen that include supper market another large-scale retailer who divides large shipments of produce and sell it to consumers in small units. The basic function they provide is bulk breaking.

2.4. Marketable and Marketed Surplus

Marketable surplus is the quantity of the produce left out after meeting the farmers' consumption and utilization requirements for kind payments and other obligations such as gifts, donation, charity, etc. Thus, marketable surplus shows the quantity left out for sale in the market. The marketed surplus shows the quantity actually sold after accounting for losses and retention by the farmers, if any and adding the previous stock left out for sale. Thus, marketed surplus may be equal to marketable surplus, it may be less if the entire marketable surplus is not sold out and the farmers retain some stock and if losses are incurred at the farm or during transit (Thakur *et al.*, 1997)

The importance of marketed and marketable surplus has greatly increased owing to the recent changes in agricultural technology as well as social pattern. In order to maintain the balance between demand for and supply of agricultural commodities with rapid increase in demand due to higher growth in population, urbanization, industrialization and over all economic development accurate knowledge on marketed/marketable surplus is essential in the process of proper planning for the procurement, distribution, export and import of agricultural products (Malik *et al.*,1993).

2.5. Methods of Evaluating Efficiency of Agricultural Marketing System

Evaluation of the efficiency with which the agricultural marketing system operates forms the crux of analysis of marketing problem (Kohls and Uhl, 1985). At the same time, the analysts of the market structure, behavior and quantitative evaluation of the efficiency of the marketing system requires concept, theories, methods, data and workable frame works and extremely difficult tasks (Branson and Norvell, 1983).

Abbot and Makeham (1981) indicated that factors accounting for efficiency can be evaluated by examining the characteristics of markets such as structure, conduct and performance. These elements measure the extent of deviation from the perfectly competitive norm. The larger the deviation, the more imperfectly competitive is the market, that is on extreme case would be monopoly.

2.5.1. Market structure

Market structure is defined as, those characteristics of the organization of the market that seem to exercise strategic influence on the nature of competition and pricing within the market (Bain, 1968). The characteristics usually stressed are the number and size distribution of firms in relation to the size of the market, the presence or absence of barriers to entry facing new firms, physical or subjective and product differentiation. Kohls and Uhl (1985) bring into play as a rule of thumb, four largest enterprises' concentration ratio of 50% or more (an indication of a strongly oligopolistic industry), 33-50 % (a weak oligopoly) and less than

that (competitive industry). The problem associated with this index is the arbitrary selection of r (the number of firms that are taken to compare the ratio).

2.5.2. Market conduct

The structure and conduct of market participants have a direct implication for the nature of production price relationships between different marketing levels. Market conduct refers to the practices or strategies of traders in maximizing their profits. Among these practices are the use of regular partners, long-term relations with clients, and suppliers, the use of intermediaries, and trade within personalized networks (Wolday, 1994).

Market conduct deals with the behavior of firms that are price-searchers are expected to act differently than those in a price-taker type of industry (Cramers and Jensen, 1982). Price searchers can determine their selling prices or quantity of output they sell. In addition, they could use their market power to weaken or eliminate competitors example reducing price.

According to Abbott and Makeham (1981), conduct refers to the market behavior of all firms. In what way do they compete? Are they looking for new techniques and do they apply them as practicable? Are they looking for new investment opportunities, or are they disinvesting and transferring funds elsewhere?

Meijer (1994) said that, “conduct is pattern of behavior which enterprises follow in adopting or adjusting to the market in which they sell or buy”, in other words the strategies of the actors operating in the market.

2.5.3. Market performance

Performance of the market is reflection of the impact of structure and conduct on product price, costs and the volume and quality of output (Cramers and Jensen, 1982). If the market structure in an industry resembles monopoly rather than pure competition, then one expects poor market performance. According to Abbott and Makeham (1981), market performance is how successfully the firm’s aims are accomplished, which shows the assessment of how well

the process of marketing is carried out. Is produce assembled and delivered on time and without wastage? Is it well packed and presented attractively? Is its quality reliable and are terms of contract observed? Is the consumption of the products increasing and sales in competitive market expanding? There are such practical indicators of how well a certain marketing system is operating. As a method for analysis, the SCP paradigm postulates that the relationship exists between the three levels distinguished. One can imagine a causal relations starting from the structure, which determine the conduct, which together determine the performance (technological progressiveness, growth orientation of marketing firms, efficiency of resource use, and product improvement and maximum market services at the least possible cost) of agricultural marketing system in developing countries (Meijer, 1994).

2.6. Methods of Evaluating Marketing Performance

Market performance can be evaluated by analysis of costs and margins of marketing agents in different channels. A commonly used measure of system performance is the marketing margin or price spread. Margin or spread can be useful descriptive statistics; it is used to show how the consumer's food price is divided among participants at different levels of marketing system (Purcell, 1979 as cited in Getachew, 2002).

2.6.1. Marketing costs

Marketing costs are the embodiment of barriers to access to market participation by resource poor smallholders. It refers to those costs, which are incurred to perform various marketing activities in the transportation of goods from producer to consumers. Marketing costs includes handling cost (packing and unpacking, costs of searching for a partner with whom to exchange, screening potential trading partners to ascertain their trustworthiness, bargaining with potential trading partners (and officials) to reach an agreement, transferring the product, monitoring the agreement to see that its conditions are fulfilled, and enforcing the exchange agreement (Holloway *et al.*, 2002).

2.6.2. Marketing margins

A marketing margin is the percentage of the final weighted average selling price taken by each stage of the marketing chain. The total marketing margin is the difference between what the consumer pays and what the producer/farmer receives for his product. In other words, it is the difference between retail price and farm price (Cramers and Jensen, 1982). A wide margin means usually high prices to consumers and low prices to producers. The total marketing margin may be subdivided into different components: all the costs of marketing services and the profit margins or net returns. The marketing margin in an imperfect market is likely to be higher than that in a competitive market because of the expected abnormal profit (Wolday, 1994).

2.7. Empirical Literature on Market Supply

A number of studies were done to determine factors that affect market supply of different agricultural commodities. Some of these studies which consider two dependent variables which are market participation decision and marketed volume are stated below.

Abay (2007) conducted a study on vegetable market chain analysis in Fogera woreda. He adopted Heckman two-stage model to estimate the probability of farmer's participation in a market and market supply level.

Woldemichael (2008) conducted another Study on Dairy marketing chains analysis in Hawassa-Yergalem milk shed. He used Heckman two-stage model to estimate the probability of participating in milk market and marketed milk volume. Factors affecting market participation and volume of supply can differ from one commodity to the other depending on the nature of the commodity under consideration.

3. MATERIALS AND METHODS

3.1. Description of the Study Area

3.1.1. Alamata woreda

Location

Alamata woreda is located about 600 kms North West of Addis Ababa and about 180 kms south of the Tigray Regional State capital Mekelle.

Altitude and Temperature

Altitude of Alamata woreda ranges from 1178 to 3148 m.a.s.l and 75% of the woreda is low land (1500 m.a.s.l or below) and 25% is found in the intermediate highlands (between 1500 and 2600 m.a.s.l). The annual temperature ranges between 14.6 °c and 29.7 °c with an average of 22 °c.

Rainfall

The mean annual rainfall of the area ranges from about 498 to around 1429 mm. The district is characterized with bimodal rainfall with average annual rainfall of 963.5 mm. The rainfall pattern has drastically changed that the main rain season starts at around mid of August and stops soon after mid of September and the rain is uncertain (IPMS, 2005).

Population

The total population number of the woreda is estimated at 128,872 (CSA, 2003/2004). According to (IPMS, 2005), there are about 20,212 rural households and about 28,629 urban households in the woreda.

Soils

Eutric Vertisols, Lithic Leptosols (Cambic) and LithicLeptosols (Orthic) are the soil types covering nearly 100% of the land in the woreda (IPMS, 2005).

Crop production

Teff and sorghum are the dominant crops covering 75% of the woreda cultivated area. Currently field pea, faba bean, lentils (in high land) teff and pepper (in low land) are the most important marketable commodities in the woreda. There are other crops growing in the area eventhough their quantity is small as compared to teff and sorghum.

Livestock production

Cattle, sheep, goats, camel, poultry and bee production are practiced in the wereda. The animal population of Alamata woreda is Cattle 83589, Sheep 3822, Goats 14398, Donkeys 8527, Mules 325, Poultry 114449, Bee Hives 1751, and Camels are 1153 (CSA, 2003).

3.1.2. Atsbi-Wonberta woreda

Location

Atsbi-Wonberta woreda is located about 65 km North East of Tigray Regional State capital Mekelle. There are 16 Tabias and 2 town dwellers in the woreda.

Altitude and temperature

Altitude in the area ranges from 918 to 3069 m.a.s.l. About 75% of the woreda is upper high lands (2600 m.a.s.l or above) and the remaining 25% covers both midlands and lowlands which are found in the range (between 1,500 and 2,600 masl) and (below 1500 masl) respectively. The annual temperature ranges between 15 °c and 35 °c with an average of 25 °c.

Rainfall

The mean annual rainfall of the area ranges from about 300 mm to around 500 mm. The woreda is one of the lowest rainfall areas in the region. The highest rainfall occurs in the summer season, which starts in June and ends in September (IPMS, 2005).

Population

There were 41,398 household heads in the woreda (IPMS, 2005). According to (ARDO, 2008), the total population of the woreda was 112,639 of which 55,359 (49.15%) were males and 57,280 (50.85%) are females. Urban and rural population was 9,609 and 103,030 respectively.

Soils

The soils in the area are predominantly Lithic Leptosol covering nearly 100% in the woreda except some parts where Vertic Cambisols are also observed (IPMS, 2005).

Crop production

Faba bean, field peas, lentils, chickpea and barley cover the woreda's cultivated area. These crops are currently important marketable crops in the woreda there are other crops growing in the area even though their quantity is small as compared to Faba bean, Field peas, lentils and chickpea.

Livestock production

Cattle, goat, sheep, donkey, poultry and bee production are practiced in the woreda. The animal population of Atsibi-wonberta woreda is Cattle 58264, Sheep 58264, Goats 22264, Donkeys 16635, Mules 2446, Camels 1529, poultry 100457 and Beehives are 6154 (CSA, 2003)

3.2. Data Requirement, Type, Sources and Methods of Data Collection

3.2.1. Data requirement, type and sources

The study used information on different variables. Data on poultry marketed, prices of poultry supplied, distance to woreda market, distance to all weather road, age of the household head, extension service, educational status of the household head, family size, access to market information, credit facility and type of sellers and buyers were collected.

3.2.2. Methods of data collection

Both primary and secondary data sources were collected. To collect primary data formal survey was employed and informal survey was used for the collection of secondary data. Rapid Market Appraisal (RMA) technique was also employed to collect general data on poultry production in the area. RMA technique considered a number of stakeholders, who are believed to provide general information about the area. Formal survey was done by interviewing the sample farm households and traders using the structured questionnaire developed for sample households and traders, respectively. The developed questionnaire was pre-tested before starting the real or actual data collection system then the questionnaire was modified accordingly. This method was used to reduce the unwanted questions from the questionnaire and include some variables, which were not included in the questionnaire, to fit with the existing situation of the study area. Enumerators were trained based on the nature of the questionnaire to create clear awareness on the subject matter of the questionnaire. Secondary data was collected from BoARD (Bureau of Agriculture and Rural Development) and IPMS reports.

The primary data collected from the sampled households focused on factors affecting poultry supply, market information, credit access, access to market, distance to nearest market, extension service and demographic characteristics of the households. The questionnaire developed for traders include variables such as type of trader's business category and their demographic characteristics.

3.3. Sample Size and Procedure

The question of sample is not answered in terms of target population size rather it is as a function of the variability of the population characteristics. The study was conducted in Alamata and Atsbi-wonberta woredas of Tigray. For this study, based on degree of homogeneity of the population, time and resource availability 100 households from each woreda and 200 households were randomly selected and interviewed. A two-stage sampling procedure was employed to select sample households. First, from Alamata and Atsbi woredas 8 and 14 Tabias were selected out of 10 and 16 Tabias respectively, based on their accessibility to undertake the research. Using the household list of sample Tabias, the sampled households were selected proportional to the population size of the selected Tabias¹. Traders' survey was conducted in market towns, which connect the study areas with Tigray Regional State capital. The market towns selected for the traders' survey were Alamata, Atsbi, Wukro and Mekelle. The sampled traders were 20 egg traders and 10 chicken traders totally 30 traders were sampled for the study from the above listed market towns.

3.4. Methods of Data Analysis

Descriptive statistics and econometric analysis were used to analyze the data collected from poultry producers and traders.

3.4.1. Descriptive statistics

This method of data analysis refers to the use of ratios, percentages, means, and standard deviations in the process of examining and describing marketing functions, facilities, services, household characteristics and trader characteristics.

¹ Tabia-is the smallest administration unit

3.4.1.1. Market structure, conduct and performance analysis (S-C-P)

Market Structure: structural characteristics like market concentration, product differentiation, barriers to entry, and diversification were some of the basis considered in the study.

Barriers to entry: A barrier to entry is simply any advantage held by existing firms over those firms that might potentially produce in a given market.

Market concentration: this refers to the number and size, distribution of sellers and buyers in the market. The greater the degree of concentration the greater will be the possibility of non-competitive behavior, such as collusion existing in the market.

The concentration ratio is given as:

$$C = \sum_{i=1}^r S_i \quad i= 1,2,3, 4 \dots r \quad (1)$$

Where, C= concentration ratio

S_i = the percentage market share of the i^{th} firm

r= the number of relatively larger firms for which the ratio is going to be calculated

Kohls and Uhl (1985) bring into play as a rule of thumb, four largest enterprises' concentration ratio of 50% or more (an indication of a strongly oligopolistic industry), 33-50 % (a weak oligopoly) and less than that (competitive industry). The problem associated with this index is the arbitrary selection of r (the number of firms that are taken to compare the ratio).

Market conduct: it is a systematic way to detect indication of unfair price setting practices and the conditions under which practices are likely to prevail. Meijer (1994) said that, "conduct is pattern of behavior which enterprises follow in adopting or adjusting to the market in which they sell or buy", in other words the strategies of the actors operating in the market.

3.4.1.2. Market performance (Marketing margin)

Estimates of the marketing margin and their cost components are the best tools to analyze performance of market. Marketing margin is calculated taking the difference between producers and retail prices. The producers' share is the commonly employed ratio calculated mathematically as, the ratio of producers' price (ex-vessel) to consumers' price (retail).

Mathematically, producers' share can be expressed as:

$$PS = \frac{P_x}{P_r} = 1 - \frac{MM}{P_r} \quad (2)$$

Where: PS = Producers' share

P_x = Producers' price of poultry

P_r = Retail price of poultry products which is consumer price of poultry

MM = marketing margin

The above equation tells us that a higher marketing margin diminishes producers' share and vice versa. It also provides an indication of welfare distribution among production and marketing agents.

Calculating the total marketing margin will be done by the following formula:

$$TGMM = \frac{\text{Consumer price} - \text{Farmer's price}}{\text{Consumer price}} \times 100 \quad (3)$$

Where TGMM=Total gross marketing margin

Net Marketing Margin (NMM) is the percentage over the final price earned by the intermediary as his net income once his marketing costs are deducted. The equation tells us that a higher marketing margin diminishes the producer's share and vice-versa. It also provides an indication of welfare distribution among production and marketing agents.

$$NMM = \frac{\text{Gross Margin} - \text{Marketing Cost}}{\text{Consumer price}} \quad (4)$$

From this measure, it is possible to see the allocative efficiency of markets. Higher NMM or profit of the marketing intermediaries reflects reduced downward and unfair income distribution, which depresses market participation of smallholders. An efficient marketing system is where the net margin is near to normal or reasonable profit.

3.4.2. Factors affecting market supply (Econometric analysis)

Heckman has developed a two-step estimation procedures model that corrects for sample selectivity bias. If two decisions are involved, such as participation and value of poultry sales, Heckman (1979) two-step estimation procedure is appropriate. The first stage of the Heckman model a ‘participation equation’, attempts to capture factors affecting market participation decision. This equation is used to construct a selectivity term known as the ‘inverse Mills ratio’ (which is added to the second stage ‘outcome’ equation’ that explains factors affecting value of poultry sales. The inverse Mill’s ratio is a variable for controlling bias due to sample selection (Heckman, 1979). The second stage involves including the Mills ratio to the value of poultry sales equation and estimating the equation using Ordinary Least Square (OLS). If the coefficient of the ‘selectivity’ term is significant then the hypothesis that an unobserved selection process governs the participation equation is confirmed. Moreover, with the inclusion of extra term, the coefficient in the second stage ‘selectivity corrected’ equation is unbiased (Zaman, 2001).

Specification of the Heckman two-step procedure, which is written in terms of the probability of Poultry Market Participation (PMP), and Value Poultry Sales (VPS), is:

The participation Equation/the binary probit equation

$$Y = X_1 B_1 + U_1 \quad U \sim N(0,1) \quad (5)$$

$$PMP = 1 \text{ if } Y > 0 \quad (5a)$$

$$PMP = 0 \text{ if } Y \leq 0$$

Where: Y_{li} is the latent dependent variable, which is not observed

X_1 is vectors that are assumed to affect the probability of sampled household poultry market participation

B_1 is a vector of unknown parameter in participation equation

U_1 are residuals that are independently and normally distributed with zero mean and constant variance

The observation equation/the supply equation

$$VPS = Y_1 = XB_2 + U_2 \quad U_2 \sim N(0, \delta^2) \quad (6)$$

Y_1 is observed if and only if $PMP = 1$. The variance of U_1 is normalized to one because only PMP , not Y is observed. The error terms, U_1 and U_2 , are assumed to be bivariate and normally distributed. B_1 and B_2 are the parameter vectors.

Y_1 , is regressed on the explanatory variables, X_{2i} , and the vector of inverse Mills ratios (λ_i) from the selection equation by ordinary least squares.

Where: Y_1 is the observed dependent variable

X_2 is factors assumed to affect value of poultry sales

B_2 is vector of unknown parameter in the value of poultry sales equation

U_2 is residuals in the supply equation that are independently and normally distributed with zero mean and constant variance.

$$\lambda_i = \frac{f(X\beta)}{1 - F(X\beta)} \quad (7)$$

$f(X\beta)$ is density function and $1 - F(X\beta)$ is distribution function

3.5. Hypothesis, Variable Construction and Definition

The data covered information necessary to make farm level indices of social, economic, demographic and efficiency indicators comparable across different categories of poultry producers and poultry market. .

3.5.1. Dependent variables

Market Participation Decision (MPD): is the dummy variable that represents the market participation of the household in the market that is regressed in the first stage of two stages estimation procedure. For the respondents who participate in market take the value of one where as it takes the value of zero for the respondent who did not participate in market.

Value of Poultry Sales (VPS): It is continuous dependent variable in the second step of the Heckman selection equation. It is measured in value and represents the actual sales of poultry by producer households, which is selected for regression analysis, which takes positive value.

3.5.2. Independent variables (Xi)

Age of household head (AGH): It is a continuous variable and measured in years. Age is a proxy measure of farming experience of household head. Aged households are believed to be wise in resource use, on the other hand young household heads have long investment horizon and it is expected to have either positive or negative sign effect on market participation, value of poultry sales and access to poultry service.

Distance to woreda poultry market (DWPM): It is the distance of the poultry producer households from the woreda poultry market and it is measured in kilometers. The closer the market, the lesser would be the transportation charges, reduced walking time, and reduced other marketing costs, better access to market information and facilities. A study conducted by Holloway *et al.* (2002) on expanding market participation among smallholder livestock producers in the Ethiopia high lands revealed that distance to market was negatively related to market participation decision by dairy household. Therefore, in this study distance to woreda poultry market is hypothesized to affect market participation decision, value of poultry sales and access to poultry service negatively.

Education status of the Household Head (EDH): This is a dummy variable with a value of one if a household head is literate and zero otherwise. Education plays an important role in the

adoption of innovations/new technologies. Literate poultry producers are expected to be early adopters. Therefore, in this specific study, education is hypothesized to affect market participation decision, value of poultry sales and access to poultry service positively.

Sex of the household head (SH): This is dummy variable (takes a value of 0 if the household head is male and 1 otherwise). Study conducted by Gizachew (2005) indicated negative relation between sale volume of milk and male-headed household. Therefore, in this specific study, male-headed household is expected to affect market participation decision, value of poultry sales and access to poultry service negatively.

Family size (FZ): This variable is a continuous explanatory variable and refers to the total number of family in the household. It is assumed that household with larger family size consume more of what is produced in the house and little will remain to be marketed. However, in this study, family size is expected to affect market participation decision, value of poultry sales and access to poultry service positively.

Woreda dummy (WD): this variable is dummy which consists of a number of characteristics of the woredas. This variable influences market participation, value of poultry sales and access to poultry service either positively or negatively.

Land owned (LOW): this variable is continuous measured in hectare. Land is a major asset in rural Ethiopia. It can be taken as a proxy for wealth level. Household with large land holding has little attention to poultry production. Therefore, this variable is expected to influence market participation, value of poultry sales and access to poultry service negatively.

Poultry owned (POW): It is continuous variable measured in value terms. This variable is expected to influence market participation, value of poultry sales and access to poultry service positively. The number of poultry kept is expected to have positive relation to market participation and marketable surplus. As the poultry owned increases, the probability to participate in market and sales will increase. Hence, this variable is expected to influence market participation, value of poultry sales and access to poultry service positively.

Oxen owned (OXOW): is a continuous independent variable indicating total oxen holding of the household. This variable is expected to influence market participation, value of poultry sales and access to poultry service negatively. This measures the traction power one owned by household. Households with high traction power can get high income to participate in activities, which demand high capital. Therefore, this variable is expected to influence market participation, value of poultry sales and access to poultry service negatively.

Other Tropical livestock Unit owned (OTLU): Is a continuous independent variable indicating total livestock holding of the household in (TLU), which excludes poultry and oxen. This variable is expected to influence market participation, value of poultry sales and access to poultry service negatively.

Distance to development agent (DDV): is the distance of poultry producer from development agent, measured in kilometers. The nearer is the development center, the easier is for farmers to request development assistance from the extension agent and vice versa. Hence, this variable is expected to affect market participation, value of poultry sales and access to poultry service negatively.

Distance to all weather road (DAWR): is the distance of poultry producer from all weather road, measured in kilometers. This is expected to influence market participation, value of poultry sales and access to poultry service negatively. The higher the distance to all weather road the higher will be the transport and other related costs. Hence, this variable is expected to influence market participation, value of poultry sales and access to poultry service negatively.

Market information (MI): It is a dummy variable. Farmers marketing decisions are based on market price information. Therefore, it is hypothesized that market information is positively related to poultry market participation and value of poultry sales. In his study of household food marketing behavior, Goetz (1992) found that better information, significantly raised the probability of market participation for potential selling households.

Table 1. Description of the dependent and independent variables used in the model

Variables used in the model	Explanation	Category	Value
MPD	Market participation decision	Dummy	0=No 1=Yes
VPS	Poultry sale	Continuous	Birr
Independent explanatory variables			
AGH	Age of the household head	Continuous	Years
SH	Sex of the household head	Dummy	0= male 1= female
EDH	Education status of the hh	Dummy	0=Illiterate 1= literate
FZ	Family size	Continuous	Number
DWPM	Distance to woreda market	Continuous	Kilometers
OXOW	Oxen owned	Continuous	Number
POW	Poultry owned	Continuous	Birr
LOW	Land owned	Continuous	hectare
OTLU	Other Tropical livestock unit	Continuous	Number
DDV	Distance to development agent	Continuous	Kilometers
DAWR	Distance to all weather road	Continuous	Kilometers
MI	Market information	Dummy	0=No 1=Yes
WD	Woreda dummy	Dummy	1=Alamata 0=Atsbi

It is important to check multicollinearity problem for continuous and dummy variables before running the model. As Gujarati, (2003) indicates, multicollinearity refers to a situation where it becomes difficult to identify the separate effect of independent variables on the dependent variable because there exists strong relationship among them. In other words, multicollinearity is a situation where explanatory variables are highly correlated. There are two measures, which are often suggested to test the existence of multicollinearity. These are Variance Inflation Factor (VIF) for association among the continuous explanatory variables and Contingency Coefficients (CC) for dummy variables.

Variance inflation factor (VIF) is used to check multicollinearity of continuous variables. As R_j^2 increase towards unity, that is, as the collinearity of X_j with the other regressors increase, VIF also increases and in the limit it can be infinite. The larger the value of VIF, the more troublesome or collinear is the variable X_j . As a rule of thumb, if the VIF greater than 10, which will happen if R_j^2 is greater than 0.90, that variable is said to be highly collinear (Gujarati, 2003). Multicollinearity of continuous variables can also be checked using Tolerance. Tolerance is unity if X_j is not correlated with the other explanatory variable, whereas it is zero if it is perfectly correlated with other explanatory variables. The popular measure of multicollinearity is defined as

$$VIF(X_j) = (1 - R_j^2)^{-1} \quad (8)$$

Where, R_j^2 is the coefficient of determination in the Auxiliary regression

Contingency coefficient is used to check multicollinearity of discrete variables. It measures the relationship between the row and column variables of a cross tabulation. The value ranges between 0 - 1 , with 0 indicating no association between the row and column variables and value close to 1 indicating a high degree of association between variables. The decision criterion ($CC < 0.75$) is that variables with the contingency coefficient is computed as follows

$$CC = \sqrt{\frac{\chi^2}{N + \chi^2}} \quad (9)$$

Where, CC is contingency coefficient, χ^2 is chi-square test and N is total sample size. Statistical package for Social Science (SPSS) 12 was used to compute both VIF and CC.

4. RESULTS AND DISCUSSION

The result and discussion part of this thesis consists of descriptive statistics and econometric analysis. Descriptive statistics such as means, averages, percentages, t-test and chi-square test were used. Heckman two-stage econometric model was also used to analyze market participation decision by using probit model and value of poultry sales by using selection model.

4.1. Characteristics of Sample Households

As can be seen from Table 2 the average age of farmers was about 42 years. Mean age of farmers in Alamata was 43.25 years while that of Atsbi was 40 years. In the case of sex of the household head in the two woredas male-headed households were 70 and 58 in Alamata and Atsbi woredas respectively whereas female-headed households were 30 and 42 in Alamata and Atsbi woredas, respectively. With regard to education status of the two areas, 53% and 54% were illiterate while 47% and 46% were literate in Alamata and Atsbi respectively. As indicated in Table 2, in Alamata 75% of the sample households were Orthodox and 25% were Muslim while in Atsbi 99% were Orthodox and 1% were Muslim. The Average family size of Alamata and Atsbi were 5.58 and 5.63 respectively, which is about 6 persons per household.

Table 2. Demographic characteristics of sample households

Variable		Alamata	Atsbi
Age of HH		43.25(12.3)	39.97(10.03)
Sex	Male	70	58
	Female	30	42
Education	Illiterate	53	54
	Literate	47	46
Religion	Orthodox	75	99
	Muslim	25	1
Family size		5.88(2.06)	5.63(2.07)

Source: survey result, 2009

4.2. Market Structure, Conduct and Performance of Poultry

Market structure describes the poultry market actors, their roles and linkages in the channels of chicken and egg marketing. In addition to this, market conduct and performance of poultry market are also presented in order.

4.2.1. Poultry market actors and their role in the channels

As can be seen from the marketing channels there are actors between the producers and consumers, which are the end users of the commodity. The actors involved in these channels were rural assemblers, retailers and wholesalers.

Table 3. Percentage of farmers' market outlet for chicken in Alamata woreda

Market actors		% of farmers' out let
Rural assembler		12
Retailer		13
Consumer		75
Percentage of farmers' market outlet for chicken in Atsbi woreda		
Rural assembler		13
Retailer		16
Consumer		71

Source: Survey result, 2009

Table 4. Percentage of farmers' market outlet for eggs in Alamata woreda

Market actors		% of farmers' out let
Retailer		8.33
Wholesaler		25
Consumer		66.67
Percentage of farmers' market outlet for eggs in Atsbi woreda		
Rural assembler		2
Retailer		6
Wholesaler		17
Consumer		75

Source: Survey result, 2009

4.2.2. Chicken marketing channels

Chicken marketing channels for both woredas are of similar nature as shown below.

Chicken Marketing Channels

Channel I Farmer → Consumer

Channel II Farmer → Retailer → Consumer

Channel III Farmer → Rural assembler → Retailer → Consumer

Channel IV Farmer → Rural assembler → Consumer

Egg Marketing Channels for Atsbi woreda

Channel I Farmers → Consumers

Channel II Farmer → Rural assembler → Consumer

Channel III Farmer → Retailer → Consumer

Channel IV Farmer → Retailer → wholesaler → Consumer

Egg Marketing Channels for Alamata woreda

Channel I Farmers → Consumers

Channel II Farmer → Retailer → Consumer

Channel IV Farmer → Retailer → wholesaler → Consumer

4.2.3. Measure of market concentration ratio

Four traders with the largest volume of chicken handled were used for the calculation of market concentration ratio of chicken traders. As indicated in Table 5, the chicken four firms' market concentration ratio for Mekelle chicken market was 82 percent and this figure suggested that the market type is strong oligopoly market type. Due to limited number of traders in wukro and Atsbi market concentration ratio was calculated only for Mekelle and Alamta markets.

Table 5. Chicken traders' concentration ratio for Mekelle market

Number of traders (1)	Cumulative frequency of traders(2)	% of traders (3)	Cumulative % of traders (4)	Quantity purchased in number (5)	Total quantity purchased in number (6)= 1*5	% share of purchase (7)	% cumulative purchase (8)
1	1	20	20	40	40	23	23
1	2	20	40	36	36	21	44
1	3	20	60	35	35	20	64
1	4	20	80	32	32	18	82
1	5	20	100	30	30	18	100
		100			173	100	

Source: Own computation, 2009

Table 6. Chicken traders' concentration ratio for Alamata market

Number of traders (1)	Cumulative frequency of traders(2)	% of traders (3)	Cumulative % of traders (4)	Quantity purchased in number (5)	Total quantity purchased in number (6)= 1*5	% share of purchase (7)	% cumulative purchase (8)
1	1	20	20	42	42	25	25
1	2	20	40	32	32	20	45
1	3	20	60	32	32	19	64
1	4	20	80	30	30	18	82
1	5	20	100	30	30	18	100
		100			166	100	

In the same way to the above calculation, four firms' market concentration ratio for Alamata chicken was also calculated and it was 82 (Table 6). As a result, this market type will be classified as a Strong oligopoly.

Table 7. Egg traders' concentration ratio in Mekelle market

Number of traders (1)	Cumulative frequency of traders(2)	% of traders (3)	Cumulative % of traders (4)	Quantity purchased in number (5)	Total quantity purchased in number (6)= 1*5	% share of purchase (7)	% cumulative purchase (8)
1	1	10	10	12,000	12,000	26	26
1	2	10	20	7,000	7,000	14	40
1	3	10	30	6,000	6,000	13	53
1	4	10	40	5,000	5,000	11	64
1	5	10	50	4,000	4,000	8	72
2	7	20	70	2,000	4,000	9	81
3	10	30	100	3,000	9,000	19	100
		100			47,000	100	

Source: Own computation, 2009

As can be seen from Table 7, the four firms' market concentration ratio for Mekelle egg market was calculated and it was found to be 64%, which implies that the market type is tight oligopoly.

Table 8. Egg traders' concentration ratio in Alamata market

Number of traders (1)	Cumulative frequency of traders(2)	% of traders (3)	Cumulative % of traders (4)	Quantity purchased in number (5)	Total quantity purchased in number (6)= 1*5	% share of purchase (7)	% cumulative purchase (8)
1	1	10	10	3500	3500	0.16	0.16
1	2	10	20	1200	1200	0.06	0.22
1	3	10	30	400	400	0.02	0.24
1	4	10	40	200	200	0.01	0.25
1	5	10	50	30	300	0.01	0.26
2	7	20	70	2000	4000	0.18	0.44
3	10	30	100	4000	12000	0.56	1.00
		100			21600	1	

As can be seen from Table 8, the four firms' market concentration ratio for Alamata egg market was calculated and it was found to be 25%, which implies that the market type is loose oligopoly.

4.2.4. Conduct of poultry market

Producers' market conduct

In this study, all selected sample households were engaged in poultry keeping but the purpose of production differs based on the interest of producer households. The purpose could be for egg, chicken meat or both chicken meat and egg depending on the interest of the producers. Out of the total sampled respondents who were asked about the type they produce, 2% produce chicken only, 3% produce egg only and 95% of the respondents produce both egg and chicken. When interviewed about the purpose of producing egg, out of the total sampled farmers, 7% produce for consumption only, 8.5% produce for sale only and 84.5% produce egg for both sale and consumption. The demand of chicken and eggs increase in the holydays and in the winter, the period on which diseases prevalence is lower than other times such as the summer period. Eggs could not be stored for longer time because they can be easily damaged. As a result, farmers sell their eggs within short period. The mode of transaction was in a cash basis.

Traders' market conduct

Based on the survey result, brokers were not among the market actors on egg and chicken marketing channels in selected markets. The egg and chicken traders purchase egg and chicken either directly from producers at the PA market (Tabia market) or from rural assemblers. Price setting mechanism is also worth considering in egg and chicken marketing. According to the survey results, about 50% of the sample chicken traders reported that purchase price was set by negotiation with the suppliers, about 20% of the traders reported that purchase price was set by their own. While 20% traders reported that purchase price was set by the suppliers and 10% of traders reported that purchase price was set by the market. Coming to the egg trading, about 20% of the sample traders reported that purchase price was set by their own, 15% of them reported that purchase price was set by the suppliers and the other 20% traders responded that purchase price was set by the market. About 40% of them also reported that purchase price was set by negotiation between traders and suppliers and the 5% of them reported that purchase price was set by observing market price of Mekelle market. Unlike the other commodity marketing, license was not considered as one element of market entry barrier in poultry marketing in the selected markets.

4.2.5. Performance of poultry market

The performance of poultry market was evaluated by considering associated costs, returns and marketing margins.

Table 9 shows marketing costs and profit margins of chicken in the four channels for each group of market player. Channel I represents direct selling from producers to consumers. Channel II represents selling of chicken from producer to consumer through retailers. Channel III represents selling of chicken from producer to consumer through rural assemblers and retailers. The last channel, channel IV represents selling of chicken from producers to consumers through rural assemblers.

Table 9. Marketing costs and profit margins of chicken traders (Birr/chicken)

Group of market players	Cost/profit item	Channel I	Channel II	Channel III	Channel IV
Rural assembler	Buying price/head			24.5	22.85
	Transport			.20	.20
	Feed			.75	.75
	Store				
	Loan interest (Br)				
	Others				
	Profit margin/head			2.4	3.85
Retailer	Selling price/head			27.85	27.65
	Buying price/head		27.3	27.85	
	Transport		.25	.25	
	Feed		.90	.70	
	Store		.65	.65	
	Loan interest (Br)				
	Others				
	Profit margin		2.8	2.95	
Consumer price		26.75	31.9	32.40	27.65
Total marketing margin		-	4.6	7.9	4.8

Own computation, 2009

Remark: Channel I Producer selling directly to consumer
 Channel II Producer selling to consumers through retailers
 Channel III Producer selling to consumer through rural assemblers and retailers
 Channel IV Producer selling to Consumer through rural assemblers

From Table 9 it can be seen that, the largest contribution of market costs was for feed representing 50 in channel II, 43 in channel III and 78 in channel IV. From Table 10 the farmer's share of the total consumer price was 100 in channel I, 85.6 in channel II, and 75.6 and 82.6 in channels III and IV respectively. This implies that 14.4 of the total consumer price in channel II results from marketing activities by traders. About 18% of the total consumer price in channel IV also results from marketing activities by traders while 24.4% of the total consumer price in channel III constitutes trader margins and marketing costs. As indicated in Table 10 marketing margins of chicken traders as a proportion to final consumer price and total channel marketing margin were calculated.

Table 10. Player group's marketing margin as a proportion of final consumer price and total channel marketing margin in chicken marketing (Birr/chicken)

Group of market players	Cost/profit item	Channel I	Channel II	Channel III	Channel IV
Producer	Selling price/head	26.75	27.3	24.5	22.85
	Farmer's share%	100	85.6	75.6	82.6
	TGMM%		14.4	24.4	17.4
Rural assembler	Selling price/head			27.85	27.65
	Margin/chicken			3.35	4.8
	Marketing margin %			10.3	17.4
	TCMMa %			42.4	100
Retailer	Selling price/head		31.9	32.40	
	Margin/chicken		4.6	4.55	
	Marketing margin %		14.4	14	
	TCMMr %		100	57.6	
Final Consumer price (FCP)		26.75	31.9	32.40	27.65
TCMM			4.6	7.9	4.8

Own computation, 2009

TGMM: Total Gross Marketing Margin (%) Marketing Margin as a percentage of FCP (Final Consumer Price)

TCMMa: Assemblers' Portion of the Total Channel Marketing Margin (%)

TCMMr: Retailers' Portion of the Total Channel Marketing Margin (%)

TCMMw: wholesalers' Portion of the Total Channel Marketing Margin (%)

TCMM: Total Channel Marketing Margin

Table 11 represents marketing costs and profit margins of egg in the four channels for each group of market players. Channel I represents direct selling from producers to consumers. Channel II represents selling of eggs from producer to consumer through rural assemblers. Channel III represents selling of eggs from producers to consumers through retailers. The final channel, channel IV represents selling of eggs from producers to consumers through retailers and wholesalers.

Table 11. Marketing costs and profit margins of egg (Birr/egg)

Group of market players	Cost/profit Item (Birr)	Channel I	Channel II	Channel III	Channel IV
Rural assembler	Buying price/head		0.60		
	Transport		0.006		
	Tax		0.02		
	Others		0.03		
	Profit margin/head		0.14		
Retailer	Selling price/head		0.80		
	Buying price/head			0.65	0.65
	Transport			0.006	0.013
	Tax			0.02	0.02
	Others			0.015	0.01
Wholesaler	Profit margin/head			0.139	0.157
	Selling price/head			0.83	0.85
	Buying price/head			0.83	0.85
	Transport				0.004
	Tax				0.02
Consumer price	Others				0.01
	Profit margin/head				0.016
		0.75	0.80	0.83	0.90
Total marketing margin		-	0.2	0.18	0.25

Own computation, 2009

Remark: Channel I Producer selling directly to consumers
Channel II Producer selling to consumer through rural assemblers
Channel III Producer selling to consumer through retailers
Channel IV Producers selling to consumers through retailers and wholesalers

From Table 11, it can be observed that tax was the largest marketing costs representing 35.7% in channel II, 48.8% in channel III and 51.9% in channel IV. From Table 12, the farmer's share of the total consumer price was 100% in channel I, 77.5% in channel II, 78.3% in channel III and 72% in channel IV. This suggests that 22.5% of the total consumer price in channel II, 21.7% of the total consumer in channel III and 27.8% of the total consumer price results from marketing activities by traders. Table 12 shows the marketing margins of egg traders as a proportion of final consumer price and total channel marketing margin. In channel II, the assembler's market margin constituted 25% of the final consumer price and 100% of the total marketing margin. In channel III, the retailer's market margin constituted 21.7% of the final consumer price and 100% of the total marketing margin. In channel IV, the retailer's market margin constituted 22% of the final consumer price while the wholesaler's market margin represent 6% of the final consumer price. This shows that a large proportion of the total marketing margin (.25 Birr) generated in channel IV goes to the retailer (80% verses 20%).

Table 12. Player group's marketing margin as a proportion of final consumer price and total channel marketing margin in egg marketing (Birr/egg)

Group of market player	Revenue item (Birr)	Channel I	Channel II	Channel III	Channel IV
Producer	Selling price/head	0.75	0.60	0.65	0.65
	Farmer's share %	100	75	78.3	72.2
	TGMM %	-	25	21.7	27.8
Rural assembler	Selling price/head		0.80		
	Margin/egg		0.2		
	Marketing margin %		25		
	TCMMa %		100		
Retailer	Selling price/head			0.83	0.85
	Margin/egg			0.18	0.2
	Market margin %			21.7	22
	TCMMr %			100	80
Wholesaler	Selling price/head				0.90
	Margin/egg				0.05
	Market margin %				6
	TCMMw%				20
Final consumer price (FCP)		0.75	0.80	0.83	0.90
TCMM		-	0.2	0.18	0.25

Own computation, 2009

TGMM: Total Gross Marketing Margin (%) Marketing Margin as a percentage of FCP (Final Consumer Price)

TCMMa: Assemblers' Portion of the Total Channel Marketing Margin (%)

TCMMr: Retailers' Portion of the Total Channel Marketing Margin (%)

TCMMw: wholesalers' Portion of the Total Channel Marketing Margin (%)

TCMM: Total Channel Marketing Margin

4.3. Cost and Profitability Analysis of Poultry Production

As can be seen from Table 13, cost and return components was considered to calculate poultry production profitability. Costs and profitability was calculated on channel bases. The average selling price per head was 26.75 for channel I, 27.3 for channel II, 24.5 for channel III and 22.85 for channel IV. From the cost components, feed cost covers the large portion, which is about 53% of the total cost.

Table 13. Cost and profitability analysis of chicken production for farmers (Birr/chicken)

Cost/profit item	Channel I	Channel II	Channel III	Channel IV
Transport				
Feed	4.17	4.17	4.17	4.17
Housing	2.10	2.10	2.10	2.10
Loan interest (Br)	1.59	1.59	1.59	1.59
Others	0.00	0.00	0.00	0.00
Profit margin/head	18.89	19.44	16.64	14.99
Selling price/head	26.75	27.30	24.5	22.85
Consumer price	26.75	31.9	32.40	27.65
Total marketing margin	-	4.6	7.9	4.8

Own computation, 2009

Remark: Channel I Producer selling directly to consumer

Channel II Producer selling to consumers through retailers

Channel III Producer selling to consumer through rural assemblers and retailers

Channel IV Producer selling to Consumer through rural assemblers

Table 14. Cost and profitability analysis of egg production for farmers (Birr/egg)

Cost/profit item	Channel I	Channel II	Channel III	Channel IV
Transport				
Others				
Profit margin/head	0.75	0.60	0.65	0.65
Selling price/head	0.75	0.60	0.65	0.65
Consumer price	0.75	0.80	0.83	0.90
Total marketing margin	-	0.2	0.18	0.25

Own computation, 2009

From Table 14 it can be indicated that selling price of egg in channels I, II, III and IV was 0.75, 0.60, 0.65 and 0.65 respectively. Total marketing margin is calculated by deducting farmers selling price from consumer price. In the first channel, the consumer price and farmers selling price are equal because this channel connects the producer directly with the consumers.

4.4. Constraints and Opportunities of Poultry Production and Marketing

There are a number of constraints as well as opportunities of poultry production and marketing. Some of the major constraints in poultry production identified by the producers in the study areas were diseases, low supply of exotic breed and limited credit for poultry production.

Production and marketing constraints of poultry

There were a number of production constraints in the study areas. Some of them were shortage of exotic chicken, lack of good management practices, which leads chicken diseases to spread widely as a result, it increases death rate of chicken in the area. The other thing, which leads chicken diseases to spread, was placing exotic and local chicken in one house. Some of the diseases in the study areas were New Castle (*Kinbil*)², Salmonella and Chicken mites. Accordingly, when the sampled poultry producers were asked to share the measures they took to prevent their chicken from diseases. They have listed some of the measures used to control these diseases. Among these, providing juice of lemon with water, separating from other chicken, painting with benzene, giving shallot every morning, providing them with Holly water and cultural medicines were some of the measures taken by the producers. Concerning the source of the diseases 51.5% and 79.7% of the Alamata and Atsbi sampled respondents respectively reported that it was from neighboring households while 45.5% and 3.4% of the Alamata and Atsbi respondents replied that the source of the diseases was from market. There were also other sources of diseases such as feed shortage, providing spoiled

² Kinbil is local name in the rural areas for New Castle disease

feed and wind as well. It is obvious that, diseases damages a number of chickens, as a result, the average number of chicken died in the survey year in Alamata and Atsbi were 6.2 and 5.4 per household respectively.

There were also poultry marketing constrains. The major market constraints as identified by traders were lack of market place, poultry diseases, absence of market information and lack of training on improved trading practice and marketing management. Lack of market place is a constraint mainly at Mekelle market. Most traders do not have access to permanent market place. Poultry transaction on weight base is non-existent. Prices are determined with visual observation and approximation weighing with hand. Farmers do not get timely market information upon which to base their marketing decisions. They depend on other farmers and traders price information for marketing decisions. Poultry traders have little skill on how to identify chicken diseases and its symptoms. Poor knowledge of poultry diseases may leads to risks, which could occur if diseased chicken are purchased and die.

Production and marketing opportunities of poultry

The newly established private poultry farm in Alamata is an opportunity for poultry producers. Some of the opportunities are supply of manufactured poultry feed in the present, due to the existence of the necessary ingredients, miller and mixer in the farm, and supply of exotic chicken in the near future. There are also other opportunities such as high turnover earning, small feed requirement, lower initial cost requirement, employment opportunities for poor women, landless farmers and disadvantaged groups and being land a non-limiting factor for its production. The establishment of Abergele International Livestock Fattening Private Limited Company in Alamata will create good price for ruminants and small ruminants as a result poultry produce will get good price in the domestic market when this company start to purchase ruminants and small ruminants for export. This happens because poultry meat could be a substitute ruminant and small ruminant's meat.

4.5. Access to Input Supply, Credit Services, Extension and Market

From Table 15, it is indicated that more percentage of the female headed households have evaluated local chicken availability, quality, timeliness, adequacy and price as good. This was because of the reason that female-headed households have no enough capital to run other business, which demands higher amount of capital. As a result, poultry production is becoming the major occupation of most female-headed households.

As can be seen from Table 15, most of the male-headed households evaluated the availability, quality, timeliness, adequacy and price of exotic chicken as good. This could be because of the reason that male-headed households have alternative jobs than female-headed household heads so; they can purchase many exotic chickens from the market even if the price is expensive. Unlike male-headed households, female-headed households are unable to purchase many exotic chickens with high price due to lack of capital.

Concerning Poultry feed evaluation criteria more percent of male-headed households have evaluated as good. This could be because of the reason that male-headed households can have an alternative source of income as a result they can purchase good feed for their chicken than the female-headed households, who face shortage of income to purchase enough feed for their chicken.

Coming to the poultry equipment availability more of the female-headed households evaluated as good. This could be because of the fact that poultry production is their major source of income and the equipments are local materials, which did not need higher amount of income.

Chicken house based evaluation criteria was perceived as good by more of the female-headed households. Chicken house in the area is made of local materials so it does not need high capital for its construction. As a result, most of the female-headed households are found to have chicken house.

Table 15. Evaluation of access to input supply based on sex of the household head in terms of number of responses

Evaluation criteria/perception	Availability of local chicken		Availability of exotic chicken		Availability of poultry feed		Availability of poultry equipment		Availability of chicken house	
		χ^2 value		χ^2 value		χ^2 value		χ^2 value		χ^2 value
Sex of the household head										
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Good	76	49	48	26	79	48	58	28	69	42
Medium	36	16	37	22	45	20	33	20	39	22
Poor	5	4	6	3	1	3	15	6	5	2
	1.33		.05		3.57		.68		.26	
	quality of local chicken		quality of exotic chicken		quality of poultry feed		quality of poultry equipment		quality of chicken house	
Good	74	43	61	36	96	50	59	31	63	36
Medium	39	25	26	15	27	20	33	18	46	27
Poor	3	1	2	0	2	1	10	4	4	3
	.35		1.16		1.07		.22		.11	
	Timeliness of local chicken		Timeliness of exotic chicken		Timeliness of poultry feed		Timeliness of poultry equipment		Timeliness of chicken house	
Good	70	47	44	20	73	42	54	27	71	41
Medium	43	21	41	28	50	27	37	20	38	22
Poor	3	1	4	3	1	2	12	6	4	3
	1.22		1.37		1.24		.05		.11	
	Adequacy of local chicken		Adequacy of exotic chicken		Adequacy of poultry feed		Adequacy of poultry equipment		Adequacy of chicken house	
Good	66	40	34	20	69	37	49	25	64	38
Medium	40	25	46	25	52	30	41	22	42	23
Poor	11	4	9	6	3	4	15	7	7	5
	.77		.137		1.40		.07		.18	
	Price of local chicken		Price of exotic chicken		Price of poultry feed		Price of poultry equipment		Price of chicken house	
Good	68	42	40	23	66	35	49	26	58	34
Medium	43	24	45	28	55	32	45	22	41	20
Poor	6	3	4	0	3	4	8	4	11	7
	.15		2.40		1.43		.05		.36	

Source: Survey result, 2009

As can be indicated from Table 16, more of the illiterate household heads evaluated availability, quality, timeliness, adequacy and price of local chicken as good than the literate household heads. This could be because of the fact that literate household heads can have alternative sources of income and they may give little attention to poultry production.

More of the literate household heads have evaluated the criteria for exotic chicken as good as compare to the illiterate household heads. This could be because of the fact that the literate households know that exotic chicken are more productive even if they demand high amount of capital for feed. As a result, literate households are ready to implement the introduced technologies.

For the poultry feed more percent of the literate households evaluated as good. This could be because of the fact that literate household heads have the knowledge that feed has direct relation with production. In addition literate household heads have can have alternative source of income as a result they can purchase poultry feed.

More percentage of the literate households has evaluated the criteria for poultry equipment as good. This could be because of the fact that literate households may have know how on the importance of poultry equipment for the well-being of its production.

The criteria used for poultry house was evaluated as good by more of the literate household heads. The most probable reason for this could be that literate households have knowledge on family health management. Because of this reason, most of the literate household heads can build house for their chicken separately.

Table 16. Evaluation of access to input supply based on education status of the household head

Evaluation criteria/perception	Availability of local chicken		Availability of exotic chicken		Availability of poultry feed		Availability of poultry equipment		Availability of chicken house	
	χ^2 value		χ^2 value		χ^2 value		χ^2 value		χ^2 value	
Education status of the household head										
	Illiterate	Literate	Illiterate	Literate	Illiterate	Literate	Illiterate	Literate	Illiterate	Literate
Good	77	48	31	41	69	58	42	44	58	53
Medium	20	32	33	26	34	31	29	24	35	26
Poor	6	3	4	5	2	2	7	14	2	5
	8.4**		1.8		.34		1.6		2.17	
	quality of local chicken		quality of exotic chicken		quality of poultry feed		quality of poultry equipment		quality of chicken house	
Good	65	52	48	49	79	67	43	47	49	50
Medium	34	30	20	21	24	23	28	23	44	29
Poor	3	1	0	2	2	1	5	9	2	5
	.75		2.07		.70		.94		3.71	
	Timeliness of local chicken		Timeliness of exotic chicken		Timeliness of poultry feed		Timeliness of poultry equipment		Timeliness of chicken house	
Good	67	50	26	38	61	53	38	43	58	54
Medium	32	32	39	30	41	37	33	24	35	25
Poor	3	1	3	4	2	1	5	13	2	5
	1.04		4.11		.28		3.7		2.42	
	Adequacy of local chicken		Adequacy of exotic chicken		Adequacy of poultry feed		Adequacy of poultry equipment		Adequacy of chicken house	
Good	59	47	22	32	55	51	34	40	49	53
Medium	35	30	38	33	44	38	36	27	40	25
Poor	9	6	8	7	5	2	8	14	6	6
	.19		1.57		.95		2.4		2.95	
	Price of local chicken		Price of exotic chicken		Price of poultry feed		Price of poultry equipment		Price of chicken house	
Good	60	50	28	35	52	49	35	40	44	48
Medium	37	30	40	33	47	40	36	31	32	29
Poor	6	3	0	4	5	2	4	8	11	7
	.49		5.04*		.95		1.01		1.15	

**and * indicates statistical significant at less than 5 and 10% respectively

Source: Survey result, 2009

As can be seen from Table 17 most of the female household heads evaluated poultry extension service as good. This is because of the fact that female household heads are familiar with poultry production and training related to poultry production is given for female household heads.

More of the illiterate household heads evaluated poultry extension service as good. This could be because of the reason that the illiterate households may need technical support while the literate household heads can manage the technical support by themselves.

Households with small cultivated land evaluated poultry extension service as good. This could be because of the fact that, the income generated from crop cultivation may not be enough to satisfy their need. As a result, they can participate in poultry production activities to increase their income source and to satisfy their needs. On the other hand, households with large cultivated land did not give attention for poultry extension service. The reason could be that, they can generate enough money from crop and discourage to participate in intensive poultry production activities.

Households with few TLU evaluated poultry extension service as good. This is because of the reason that households with few TLU are interested in increasing their holding. Poultry production can be a starting point for households with small starting capital. As the household grows in his/her TLU holding he/she starts to deviate from poultry and invest in other animals and give less attention to poultry extension service as well.

Table 17. Evaluation of access to input supply based on different variables

Evaluation criteria/perception	Availability of extension		Availability of extension		Availability of extension			Availability of extension			
	χ^2 value		χ^2 value		χ^2 value			χ^2 value			
	Sex of the hh		Education status hh		Total cultivated land ha			Tropical livestock unit			
	Male	Female	Illiterate	Literate	0-1	1.01-2	2.01-2.75	0-5	5.01-10	10.01-15	15.01-22
Good	39	25	35	29	54	9	1	44	14	5	1
Medium	28	12	18	22	33	6	1	20	18	2	0
Poor	4	5	2	7	9	0	0	6	2	0	111.12*
	quality of extension		quality of extension		quality of extension			quality of extension			
Good	43	29	38	34	57	14	1	50	15	6	1
Medium	24	10	16	18	32	1	1	16	17	1	0
Poor	4	3	1	6	7	0	0	4	2	0	115.6**
	Timeliness of extension service		Timeliness of extension service		Timeliness of extension service			Timeliness of extension service			
Good	24	20	27	17	36	7	1	31	7	5	1
Medium	37	17	24	30	47	6	1	31	21	2	0
Poor	10	5	4	11	13	2	0	8	6	0	19.97
	Adequacy of extension service		Adequacy of extension service		Adequacy of c extension service			Adequacy of c extension service			
Good	26	25	30	21	42	8	1	37	8	5	1
Medium	37	11	22	26	42	5	1	25	21	2	0
Poor	8	6	3	11	12	2	0	8	5	0	111.90*

**and * indicates statistical significant at less than 5 and 10% respectively

Source: Survey result, 2009

Table 18. Responses of sampled households on credit need

		Credit need for poultry production		χ^2 value
		Need	No need	
Sex of the house hold head	Male	21	107	7.57***
	Female	24	48	
	Illiterate	26	81	
Education status of the household head	Literate	19	74	3.38
	Religion of the household head	Orthodox	45	129
	Muslim	0	26	
Tropical livestock unit owned	0-5	30	91	2.84
	5.01-10	13	52	
	10.01-15	1	11	
	15.01-22	1	1	
Total cultivated land ha	0-1	41	125	3.58
	1.01-2	3	28	
	2.01-2.75	1	2	
Age of the household head	20-40	29	80	2.68
	41-60	15	66	
	61-90	1	9	

*** indicates statistical significant at less than 1%

Source: Own computation

Credit need assessment was done in the study to know credit need of the households for poultry production. As a result, based on sex difference of the household head about 33 percent of the female-headed households were in need of credit while the male headed households who need credit were only 16 percent. As a result, there was statistical significant difference between male and female-headed households in their credit need at 1% significance level. The religion based credit need assessment shows that Muslim follower households did not need credit even if they had good credit access. On the other hand, about 35 percent of the Orthodox follower households need credit for poultry production unlike that of Muslim followers. The most probable reason why this is happening is the doctrine of the religion. As a result, there was statistical significant difference in credit need between Muslim and Orthodox follower households at less than 1% significance level (Table 18).

Table 19. Sampled households response on credit access

		Credit access for poultry production		χ^2 value
		Accessed	Not accessed	
Sex of the household head	Male	5	16	0.10
	Female	7	18	
Education status of the household	Illiterate	10	17	4.12
	Literate	2	17	
Religion of the household head	Orthodox	12	34	3
	Muslim	0	0	
Tropical livestock unit owned	0-5	8	23	3.24
	5.01-10	3	10	
	10.01-15	1	0	
	15.01-22	0	1	
Total cultivated land ha	0-1	10	32	3.02
	1.01-2	2	1	
	2.01-2.75	0	1	
Age of the household head	20-40	4	26	8.65**
	41-60	7	8	
	61-90	1	0	

** indicates statistical significant at less than 5%

Source: Own computation

Out of the variables listed in Table 19, only age of the household head has statistical significant difference on credit access. Aged household heads have no an alternative job to work on due to labor shortage, as a result they are forced to access credit for poultry production. On other words, the young household heads can have a number of alternative jobs rather than poultry production as a result only few households are willing to access credit for poultry production.

When the sampled household heads are asked whether they access extension service or not, 57 percent of them said yes while the rest 43% say no.

Demographic characteristics of traders

The demographic characteristics of traders consists of, age, sex, religion and education status (Table 20). From Table 20 we can also see that the average ages of the traders in the selected

³ No statistics are computed because religion of the household is a constant

market towns were 23, 33, 38 and 31, which are, Atsbi, Wukro, Mekelle and Alamata respectively. From the total 20 traders 18 are males while 2 are females. In case of religion, all of the traders were Orthodox Christian. Coming to the education status of traders 2 were illiterate and 18 were literate.

Table 20. Demographic characteristics of sampled traders

Variables	Category	Atsbi	Wukro	Mekelle	Alamata
Average age		23	33	38	31
Sex	Male	4	4	8	2
	Female	0	0	2	0
Religion	Orthodox	4	4	10	2
	Muslim	0	0	0	0
Education status	Illiterate	0	1	0	1
	Literate	4	3	10	1

Source: survey result, 2009

4.6. Determinants of Poultry Market Supply

All of the selected sample households in Alamata and Atsbi keep poultry. Several variables were hypothesized to determine market participation decision and value of poultry sales of the sample households.

It is important to check multicollinearity problem before running the model for both the continuous as well as the dummy variables. The usual measure of multicollinearity among continuous variables is Variance Inflation Factor (VIF) as a result the values of variance inflation factor of the continuous variables were in the ranges of 0.067 and 1.794. Contingent Coefficient (CC) is also a measure used to check the multicollinearity problem of dummy variables and the values of CC (Contingent Coefficient) for dummy variables were in the range of 0.010 and 0.325. To do the variance inflation factor and contingency coefficient SPSS 12 was employed. As a result, depending on the results of variance inflation factor and contingent coefficient multicollinearity was not a serious problem among the hypothesized continuous and dummy variables (Appendix Tables 1 and 2).

4.6.1. Econometric results of heckman two stage model

Twelve variables which are age of the household head, sex of the household head, education status of the household head, family size, distance to woreda market, distance to all weather road, distance to development agent, land owned, poultry owned, oxen owned, other TLU owned, and woreda dummy were the hypothesized variables for poultry market participation decision. Based on the heckman selection assumption one variable, which is market information, was included in the probit but not in the OLS (Ordinary Least Square). Among these variables, four of them influence market participation decision statistically significant (Table 21).

Sex of the household head influenced market participation decision of poultry negatively and statistically significant at less than 1 percent significance level. Contrary to the expectation sex of the household was found to influence market participation decision negatively and significant. The most probable reason for this result might be that even if female-headed households hold poultry, they may lack good management practices; this in turn would increase the death rate. As a result, they may not participate in the poultry market. The marginal effect indicated that, if the household head is female the probability to participate in poultry market decreases by 14.5 percent.

Education of the household head was negatively and statistically significant at less than 10 percent significance level. This result could be because of the fact that educated household heads have know how on family nutrition requirement. The reason for this result could be, that educated household heads may involve in satisfying the family nutrition requirement rather than participating in the market. The marginal effect also confirmed that, if the household head is educated the probability to participate in poultry market decreases by 2.7 percent.

Family size on the contrary was found to influence market participation decision negatively and statistically significant at less than 5 percent significance level. This can be because of the fact that if the family number increases some may involve in poultry production while others may be idle, their labor could be unproductive. Because of this reason, some of labor force for

sure will shift to other activities, which could be alternative sources of income. The marginal effect indicated that, if the family size increases by one the probability to participate in poultry market decreases by 7.4 percent.

Distance to woreda market as expected influences market participation decision negatively and statistically significant at less than 10 percent significance level. The most probable reason for this result could be that households, which are far apart from woreda market, incurred high transportation and other related costs. Incurring high amount of transportation and other related costs due to long distance to market will discourage them to participate in the market. The marginal effect also indicated that as the distance to woreda market increases by one kilometer the probability to participate in poultry market decreases by 0.6 percent.

Table 21. Estimates of poultry market participation and their Marginal Effect

Variable	Coefficient	P-Value	Marginal effect
CONSTANT	0.44	0.000	0.086
AGE	-0.002	0.209	-0.002
SEX	-0.145	0.003***	-0.145
EDUCLEV	-0.074	0.083*	-0.027
FAMSIZE	-0.027	0.032**	-0.074
DRTWORMK	-0.006	0.095*	-0.006
DRTALLWR	-0.010	0.188	-0.010
MARKINFO	0.047	0.420	0.047
DSDEVAG	0.001	0.914	0.001
LANDOWN	0.011	0.359	0.011
POLTOWN	0.000	0.379	0.000
OXENOWN	0.014	0.637	0.015
OTHERTLUOWN	0.001	0.947	0.001
WOREDA DUMMY	0.081	0.165	0.081
Chi-square	49.98		
P-value	0.0021		
Number of observation	197		

***, ** and * indicate statistically significant at 1, 5 and 10% respectively

Source: Own computation, 2009

Dependent variable: Market participation

In the second stage of Heckman model, twelve variables were hypothesized to influence value of poultry sales. These variables were age of the household head, sex of the household head, education status of the household head, family size, distance to woreda market, distance to all weather road, distance to development agent, land owned, poultry owned, oxen owned, other TLU owned, and woreda dummy. Out of these, two variables were found to influence value of poultry sales (Table 22).

Poultry owned influenced value of poultry sales positively and statistically significant at less than 1 percent significance level. This could be because of the fact that, the more the poultry owned by the household the more will be the value of poultry sales if they are kept with good management. A unit increase in the number of chicken owned will lead a 0.002 Birr increase in the value of poultry sales being other variables held constant.

As the woreda becomes Alamata, it influences value of poultry sales significantly and negatively at less than 5 percent significance level. As the woreda become Alamata the value of poultry sales decreases by about 1.10 Birr being other variables held constant.

Lambda: According to the model output, the Lambda (Inverse Mills Ratio) or selectivity bias correction factor has positive, but statistically insignificant impact on value of poultry sales. This result suggests that there appears to be no unobserved factors that might affect both market participation decision and value of poultry sales.

Table 22. OLS estimation of value of poultry sales

Variable	Coefficient	P-Value
CONSTANT	2.287	0.036
AGE	-0.013	0.438
SEX	-0.457	0.373
FAMSIZE	-0.065	0.491
EDUCLEV	-0.367	0.444
POLTOWN	0.002	0.002***
DRTWORMK	-0.014	0.714
DSDEVAG	0.079	0.409
DRTALLWR	-0.056	0.373
LANDOWN	0.046	0.700
OXENOWN	0.384	0.258
OTHERTLU	-0.025	0.811
WOREDA DUMMY	-1.109	0.020**
LAMBDA	0.040	0.854
Chi-square	49.98	
P-value	0.0021	
Number of observation	197	

*** and ** show the values statistically significant at 1% and 5% respectively

Source: Own computation, 2009

5. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1. Summary

This study was aimed at analyzing market chain of poultry the case of Alamata and Atsbi-Wonberta Woredas of Tigray. The specific objectives of the study include the following. Analyzing the structure, conduct and performance of the market, analyze the structure of production costs and determine profitability of poultry production, identifying major constraints and opportunities of poultry production and marketing, to analyze production and marketing support service of extension, input supply, credit and marketing, and analyzing the determinants of poultry supply in the study woredas. The data were collected from individual interview using pre-tested semi-structure questionnaire and checklist. The analysis was made using descriptive statistics and econometric model using SPSS and STATA software. All the sampled household heads were poultry keepers. Market participation decision and value of poultry sales are found to be important elements in the study of poultry market chain. Therefore, Heckman two stage model was used to identify factors influencing market participation decision of poultry and value of poultry sales of the sample household heads in the study areas. Poultry market participation is a dummy dependent variable, thus in the first stage of the Heckman two stage procedures probit model was used for the study and selection model was used in the second stage. The main findings of this research are summarized as follows.

Out of the total 200 sample households, 128 were male-headed households while 72 of them were female-headed households. Sample households, 100 from each woreda, were selected randomly from 8 out of 10 Tabias from Alamata woreda and 14 out of 16 Tabias from Atsbi woreda respectively. Twenty traders from Mekelle, Alamata, Atsbi and Wukro were also interviewed using the pre-tested questionnaire developed for traders. The major prevalent diseases identified by the sampled households were New Castle, Salmonella and chicken mites. Limited supply of exotic chicken was the other problem identified by the sample household heads.

The market channel of egg and chicken shows short route as compared to other agricultural commodities. The market actors in the marketing channels were producer, rural assembler, retailer, wholesalers and consumers. Significant amount of chicken and egg were channeled through the first channel, direct selling of the commodities from farmers to consumers.

Sex of the household head, distance to woreda market, family size and education status of the household head were the variables significantly influencing the market participation decision of poultry market negatively. Value of poultry sales was influenced negatively by Alamata as compare to Atsbi woreda, and positively by poultry owned.

5.2. Conclusions

Understanding the nature of the market type will help to make the right decision on resource use. As a result, both egg and chicken markets have loose oligopoly market nature. That is, there are many suppliers and considerable number of buyers in both of the markets. The dominant channel connects suppliers and consumers directly. Due to this, the channels are short as compared to other agricultural commodities. Market actors in egg marketing channel were farmers, rural assemblers, retailers, wholesalers and consumers. While the market actors in chicken market were producers, rural assemblers, retailers and consumers. There is no involvement of brokers in both egg and chicken marketing. There is no standard measure of weighing for these commodities in the markets. Some of the problems identified by the sampled households were poultry diseases prevalence and limited supply of exotic chicken. Lack of permanent market place for Egg and chicken traders, and not considered license as one entry barrier element in the sample markets were some of the identified problems. The sampled traders were not providing veterinary service for the purchased chicken.

From the variables hypothesized to influence market participation decision. Sex of the household head, distance to woreda market, family size and education status of the household head were significantly influencing the market participation decision of poultry. From the

variables that were expected to affect value of poultry sales, poultry owned, and woreda dummy were found to influence the value of poultry sales.

5.3. Recommendations

Based on the aforementioned conclusions, the following recommendations cloud be given depending on the nature of production and marketing of poultry in the study areas.

From the descriptive statistics result of the study, the most prevalent problem of poultry production was disease, which can clear the flock of chicken at a time. To solve this problem establishment of animal health center/animal production extension packages in the nearby area of the producers is the best alternative to save the producers from an unexpected lose due to chicken death because of diseases problem. The other production problem was limited supply of exotic chicken in that, most of the sampled households were in need of more number of exotic chicken but they were given in quota basis. Addressing these problems require various stakeholders, such as policy makers, input suppliers, research and extension groups, NGOs and other actors interested in poultry production development in particular and in agricultural development in general. Thus, these actors need to collaborate in search of appropriate solutions and implementing them.

The survey result indicated that standard weight measurement was not used while transacting their produce in the area. This kind of transaction benefits to one party and at the same time harms to the other. This kind of transaction is not benefiting the whole society at a time. To solve such kind of problem, standard way of measuring the commodity should be developed by the respective organizations. This type of transaction can get acceptance by the society if they get awareness creation on the importance of this modern method of measurement.

Market participation decision was influenced by sex of the household head negatively. Contrary to the expectation sex of the household head was found to influence market participation decision negatively and significant. The most probable reason for this result could be the poor management practices by female-headed households that cause chicken

death and then they will have less probability to participate in poultry market. Therefore, training on modern poultry management practices should be provided by giving due attention to female headed households.

Education of the household head influenced market participation negatively and significant. The reason for this result could be that, educated household heads have know how on family nutrition requirement. As a result, educated household heads may involve in satisfying family's nutritional requirement rather than participating in the market. Hence, educated households should be encouraged to produce more poultry so as to participate in poultry market after satisfying their nutrition requirement.

Distance to the woreda market also influence market participation decision negatively. The negative relationship of the variable on market participation decision can be explained as, as the distance is closer to the woreda market the lesser would be the transport and other related costs incurred in the process of marketing. Therefore, government and non-governmental organizations can play their role in providing recommended solutions for this problem. Among the recommended solutions of the problem, one could be developing a linkage between the producer and consumer and this can be done by establishing cooperatives in the area. The other alternative solution for this problem could be improving the infrastructure in the areas in order to reduce transportation and other related costs resulted from distance to poultry market.

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7. APPENDICES

Appendix Table 1. Contingency coefficient for dummy variables

	SEX	EDUC-LEV	WOREDA DUMMY	MARKINFO
SEX	1			
EDUCLEV	.325	1		
WOREDA DUMMY	.124	.010	1	
MARKINFO	.120	.064	.050	1

Source: own computation

Appendix Table 2. Variance inflation factor for continuous explanatory variables

Variables	VIF $(1 - R_i^2)^{-1}$
AGE	1.188
FAMSIZE	1.430
POLTOWN	1.067
DSTWORMAR	1.104
DSTDEVAG	1.319
DSTALLWR	1.221
LANDOWN	1.505
OXENOWN	1.794
OTHE TLUOWN	1.692

Source: own computation

Appendix Table 3. Conversion factors used to compute tropical livestock units

Animal category	Conversion factor
Heifer	0.75
Cow or Ox	1.00
Horse/Mule	1.10
Donkey adult	0.70
Donkey young	0.35
Camel	1.25
Sheep or Goat adult	0.13
Sheep or Goat young	0.06
Chicken	0.013
Bull	0.75

Source: Storck *et al.*, 1991

Appendix Figure 1: Map of Tigray region and the study areas (Alamata and Atsbi woredas)

