Mekelle University

The School of Graduate Studies

Faculty of Dry Land Agriculture and Natural Resources

OPPORTUNITIES AND CHALLENGES OF VEGETABLE MARKETING IN KILTE-AWLAELO WOREDA

By

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A Thesis

Submitted in Partial Fulfilment of the Requirements for The

Master of Science Degree

In

Cooperative Marketing

Advisor

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March, 2008

Mekelle

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Declaration

This is to certify that this thesis entitled "**Opportunities and Challenges of Vegetable Marketing**" in Kilte-Awlaelo Woreda submitted in partial fulfillment of the requirements for the award of the degree of M.Sc., in Cooperative Marketing to the School of Graduate Studies, Mekelle University, through the Department of Cooperatives, done by Mr. Alem Kiros, Id.No. FDA/GR 011/98 is an authentic work carried out by him under my guidance. The matter embodied in this project work has not been submitted earlier for award of any Degree or Diploma to the best of my knowledge and belief.

Name of the student: Alem Kiros Signature & date

Name of the supervisor: Dr. G.B. Pillai, Professor   Signature & date

Abstract

The study was conducted in selected major vegetable producing Tabias of Klite-Awlaelo woreda namely Genfel, Mesanu, A/ksanded, and Aynalem. The study aims at assessing the major constraints and opportunities to improve vegetable production and marketing.

The data collection was conducted in October 2007. A survey was conducted using structured interview schedule to collect primary data from 162 vegetables producers and 30 officials of the woreda and cooperatives.

Different types of vegetables are grown in the study area under irrigated conditions. The most commonly grown vegetables in terms of the number of growers are potato, cabbage, onion, carrot and tomato. Onion, potato and tomato which are the major vegetables cultivated in the woreda were considered for the study.

House holds uses family labour for land preparation, planting, cultivation, weeding, irrigation, fertilizer application, pesticides application, harvesting and transporting of the products to the market. Farmers in the study area used organic manure to improve the production of vegetables.

Vegetables are produced in some specific locations in the eastern part of Tigray and supplied to the local markets. The major markets identified for collection and distribution of large quantities of vegetables are at Wukro and Mekelle. The market actors namely producers, collectors, brokers, transporters, traders, and consumers play different roles along the market chain.

Most producers in the study area are intending to expand vegetable production. The most commonly mentioned opportunities are related to market demand, proximity to the market, better price, irrigation facility and government support.

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The constraints of vegetable production viewed from the farmers' perspective are: institutional factors, natural factors and transportation related factors. Inadequate farmer skills and knowledge of production, product management and attack of pests and diseases are the most common constraints of vegetable production.

In cash crop production, households decide which cash crop(s) to grow and at which market(s) to sell their crop harvests. Different market outlets that households may consider are selling at the farm-gate, selling at a local market or selling at a central market. Chi-square model was used to examine the interaction between crop and market outlet choices in the study area.

 The result shows the existence of statistical evidence that market outlet choice and quantity produced with respect to Potato, Onion and Tomato are associated.

Vegetable production is increasing from time to time in the woreda. The output and productivity of vegetables, is affected by the different factors. Therefore multiple regression analysis was used to identify the factors which influence the productivity of vegetable products in the study area.

The results show that availability of extension services, oxen, labour and fertilizer utilization positively influenced vegetable production. But it is influenced negatively by the cultivated size of land.

 The production cost of onion, potato and tomato was 73.8 birr, 58.4 birr, and 57.7birr per quintal respectively. This cost excludes the marketing cost such as transportation cost, loading and unloading, and other costs. During the survey time, the profit of onion per ha was far better when compared to the others.

The price of vegetables in the study area is unstable. When compared to onion and potato, the price of tomatoes was found more unstable (the variation in prices around mean was 32 %).

Farmers in the study area use donkey, car and local carts to transport their produces to the market. They used ordinary rooms for storage of their produces with ground/soil floor and with no shelves.

Farmers are not aware about the price of their agricultural commodities before they arrive at market. As the result of this, farmers get lower price for the agricultural commodities.

Multipurpose cooperatives do not significantly support the vegetable growers in the study area. The study points out to the need of effective interventions of multipurpose cooperatives to support and train the vegetable growers.

Sound policies favouring vegetable cultivators and related rural agro-based industries are necessary conditions for rural poverty reduction, and for coping with domestic competition in the home market. Therefore government with the support of official donors and the multilateral institutions should help technically and financially the vegetable growers to increase productivity, to diversify production, to add value through processing, to provide the farmers a greater share of the final value of products through improved marketing, and to achieve environmental sustainability.

Providing access to credit for the vegetable cultivators, improving marketing infrastructure especially improved storage and transportation facilities, providing technical guidance and training opportunities in processing and post-harvest technologies, supply of improved and quality seed material for increased production , extension efforts for plant protection, ensuring the availability of market information and adopting a group and participatory approach for vegetable production and marketing are the areas which need immediate attention.

ACKNOWLEDGEMENT

This thesis marks the end of a long journey I was determined to take, for as long as I could remember. It marks a milestone in my life; the fulfilment of a dream, the end of an era, and the beginning of another period of my existence.

There are many individuals and institutions who contributed towards finalizing my MSc study and writing this thesis. Without their support, it would not be in this format this time. If I forgot to mention someone, it is not intentional and I am of course grateful to them.

First of all, I would like to express my sincerest gratitude to my supervisor Dr. G.B. Pillai, for the valuable contributions and many fruitful discussions we had in the duration of my MSc studies. His thoughtful guidance and critical reviews of my output helped me find a path towards which I could direct my work and steered me back when I tended to get lost.

Difficult to choose where to start but my deepest gratitude goes to my Dutch contact friends with their family members (The committee of passion connects in Holland, Co & Marja).

My deepest appreciation also goes to my friend Mr. Michel. I am profoundly grateful for all his constructive comments to make my thesis better, for his unwearied reviews of numerous drafts and for the academic, professional, personal and financial support.

I am also thankful to my parents and friends for sending me to higher studies and keeping me there with great encouragement. I see this academic achievement as a great success to them as well.

Above all, I would like to thank God for absolutely *EVERY THING.*

January, 2008

Acronyms

AISE	Agricultural Input Supply Enterprise
AMA	American Marketing Association
APMC	Agricultural Produce Market Committee of Ahmedabad
DAP	Di-Ammonium Phosphate
Ha	Hectare
Kg	Kilogram
Qt	Quintal
MPCs	Multipurpose Cooperatives
NGO	Non Governmental Organization
SCP	Structure Conducted performance

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CHAPTER I

INTRODUCTION

1.1 BACKGROUND

More than 85% of the Ethiopian population, residing in the rural area, is engaged in agricultural production as a major means of livelihood. However, the agricultural productivity is low due to land degradation, use of low level of improved agricultural technologies, risks associated with weather conditions, diseases and pests, etc. Moreover, due to the ever increasing population pressure, the land holding per household is declining leading to low level of production to meet the consumption requirement of the households. As a result, intensive production is becoming a means of promoting agro-enterprise development. Vegetable production gives an opportunity for production of high value added products and increases smallholder farmers' participation in the market.

The production of Vegetable crops is a major element of the farming system of some of the *woredas* in the Eastern part of Tigray such as Kilte-Awlaelo, Saesie-Tsaeda Enba and others.

In the areas where water for irrigation is available and farmers have access to the market, vegetable production is a major source of cash income for the households. Vegetable products are supplied to the local markets. Vegetable production and marketing are of the major sources of livelihood for a large number of farmers, transporters, middlemen and traders in the area.

The Ethiopian Rural Development Strategy document has given emphasis to market-led agricultural development that will be achieved by establishing and implementing grades and standards, improving the provision of market information, expanding and strengthening cooperatives, and improving and strengthening private sector participation in the agricultural system. The growing government support for market integration and agro-enterprise development provides an opportunity for the vegetable growers and market actors. This

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indicates that the government is using policy support as one of the mechanisms for creating investment opportunities in the vegetable promotion sector for production, transportation, grading, exporting and financing the venture. It has been, however, witnessed that farmers are getting low price for the agricultural commodities and the middlemen and exporters are major gainers from the business. Farmers are often losers or receive a marginally low share of the price paid by the consumers for the vegetable products.

Few studies are available on few commodities such as, potatoes and point out that there is a greater need to diversify export earning options by improving the quality of produces supplied to the export market and enhancing the efficiency of the marketing system to contribute to the economic growth of the country. Nevertheless, study is needed on how to do this and particularly on how to improve the life of poor producers by increasing their share of the market price and enhance farm productivity.

In order to address these issues and generate further knowledge on the production and marketing of vegetables in the study area and inform policy makers as well as to use the knowledge gained as basis for designing local level development programs, this study was conducted by the researcher. The study was conducted in the major vegetable producing *woreda* and major horticulture market centres in Kilte-Awlaelo woreda which is in the Eastern Zone of Tigray region of Ethiopia.

1.2 Problem statement

Ethiopia has a variety of vegetable crops grown in different agro-ecological zones by small farmers, mainly as a source of income as well as for food. Commercial producers are also involved in the production, processing and marketing of vegetables. The crops are produced under rain fed and irrigated conditions. It is produced both in cereal based cropping system and in monoculture. The warm season vegetables such as tomato, onion and *potato are* grown

in the lowland areas under irrigation, whereas the high land areas offer favourable conditions to grow cool season vegetables like cabbage, garlic, shallot, carrot etc (Lemma *et al*, 1994).

The production of vegetables varies from the cultivation of few plants in the backyard for home consumption to large-scale production for the domestic and export markets. The crops can generally be a very important source of vitamins, minerals and proteins to a country like Ethiopia where the people experience malnutrition due to heavy dependence on cereal. Its primary contribution in solving the health problem is through providing vitamins, minerals and hence improving the nutritional quality of the family diet. As the population increase, the need for intensive agriculture becomes of paramount importance to maximize output to which vegetables are favourable.

With a long-run objective of promoting the participation of small-scale farmers in the production of non-traditional agricultural commodities for market like Vegetable commodities, agricultural development policies need to focus on re-orienting the household resource use from the usual subsistence or semi-subsistence production towards more market oriented production and consumption decisions. In rural Tigray, the actual share of resources allocated to the semi-subsistence food production is still higher than the share of resources allocated to cash crops. It is interesting to investigate what economic factors explain household resource allocation decisions between cash and food crops.

This knowledge will be useful in formulating targeted policies that could help in shifting resources from food towards cash crop production.

It is well known that different attributes put households under different production and marketing potentials. The market outlets that households would like to participate might influence the type of vegetable crops they would like to grow and the size of farmland they would like to allocate to a specific crop. This could be due to the fact that production and marketing decisions of households are two sides of a coin. The two decisions go hand in hand

as farmers produce what they could sell at an available market. Knowing the interaction patterns between the two decisions helps to understand what crop is sold at which market and whether the intention of selling at a particular outlet increases or decreases the allocation of farmland to the specific crop.

In moving from subsistence towards cash crop production, the role of markets and market price, information and infrastructure are substantial. In this regard, marketing vegetable crops at farm-gate is an interesting process that has not been investigated much in Kilte-Awlaelo woreda. Both buyers and sellers usually do not have equal market information on the vegetable prices at the local market. Under such circumstances, farm households selling vegetable commodities at farm-gate deal with the trade-off between selling their crop at higher possible prices and avoiding the risk of loosing product quality if the transaction fails by holding on to higher prices. An interesting issue in this regard is what factors could enhance sellers' bargaining position at the farm-gate transaction and how information flows facilitate farm-gate transactions to take place in a short period.

1.3 Purpose of the Study

Marketing research in the country has been primarily focused on food grains and to some extent on crop inputs, e.g. seeds and fertilizers. Pre-liberalization market studies primarily looked at the performance of the public sector marketing operations in the grain sector as this was the dominant mode of marketing. Post–liberalization (post 1991) market studies covered more diverse issues but still focusing on the grain sector. The purpose of this paper is to identify opportunity and constraints of the vegetable marketing in the woreda for it provide information that will enable policy makers to improve the marketing performance of vegetable growers.

1.4 Objective of the study

1.4.1 General objective

The general objective of this research work is to identify the opportunities and challenges of vegetable marketing in Kilte-Awlaelo woreda

1.4.2 Specific objectives

➢ To study the existing nature of vegetable marketing in Kilte-Awlaelo woreda

➢ To identify Constraints in vegetable marketing

➢ To examine the pattern of household decisions in crop and market outlet choices.

➢ To examine the production and marketing efficiency and infrastructure.

➢ To examine the role of multipurpose cooperatives in vegetable marketing, and

➢ To suggest an effective strategy for vegetable marketing

1.5 Hypothesis

1. The existing infrastructure for vegetable marketing in the Woreda is inadequate.

2. There is a shifting of cultivated cereal crops to vegetables.

3. The multipurpose cooperatives do not significantly support vegetable growers in the woreda.

CHAPTER II

Literature Review

The review of literature relevant to the study is presented blow:

2.1. Concepts

2.1.1 Importance of marketing

It is important to study marketing because it permeates society. Marketing activities are performed in both business and non-business organizations. Moreover, marketing activities help business organizations generate profits and income, the live-blood of an economy. The study of marketing enhances consumer awareness. Marketing costs absorb about half of what the consumer spends. Marketing practiced well improves business performance.

The marketing concept is a management philosophy that prompts a business organization to try to satisfy customers' needs through a coordinated set of activities that also allows the organization to achieve its goals. Customer satisfaction is the major objective of the marketing concept. The philosophy of the marketing concept emerged during the 1950s, as the marketing era succeeded the production and the sales eras. As the 1990s progressed into the relationship marketing era, transaction based marketing was replaced by relationship marketing. To make the marketing concept work, top management must accept it as an overall management philosophy. Implementing the marketing concept requires an efficient information system and sometimes the restructuring of the organization.

2.1.2 Marketing strategy

Marketing strategy involves selecting and analyzing a target market (the group of people whom the organization wants to reach) and creating and maintaining an appropriate marketing mix (product, place/distribution, promotion, price and people) to satisfy this market.

Marketing strategy requires that managers focus on four tasks to achieve set objectives:

1. marketing opportunity analysis

2. target market selection

3. marketing mix development and

4. marketing management

Marketers should be able to recognize and analyze marketing opportunities, which are circumstances that allow an organization to take action towards reaching a particular group of customers. Marketing opportunity analysis involves reviewing both internal factors (organizational objectives, financial resources, managerial skills, organizational strengths, organizational weaknesses and cost structures) and external ones in the marketing environment (the political, legal, regulatory, societal/green, technological, and economic and competitive forces).

A target market is a group of people for whom a company creates and maintains a marketing mix that specifically fits the needs and preferences of that group. It is important for an organization's management to designate which customer groups that company is trying to serve and to have some information about these customers. The identification and analysis of a target market provide a foundation on which a marketing mix can be developed.

The five principal variables that make up the marketing mix are product, place/distribution, promotion, price and people. The product variable is the aspect of the marketing mix that deals with consumers' wants and designing a product with the desired characteristics. A marketing manager tries to make products available in the quantities desired to as many customers as possible and to keep the total inventory, transport and storage costs as low as possible. The promotion variable relates to activities used to inform one or more groups of people about an organization and its products. The price variable refers to establishing pricing policies and determining product prices. The people variable controls the marketing

mix; facilitates the product's distribution, sale and service; and as consumers or buyers give marketing its rationale. Marketing exists to encourage consumer satisfaction.

2.1.3The Marketing Process

Under the marketing concept, the firm must find a way to discover unfulfilled customer needs and bring to market products that satisfy those needs. The process of doing so can be modeled in a sequence of steps: the situation is analyzed to identify opportunities, the strategy is formulated for a value proposition, tactical decisions are made, the plan is implemented and the results are monitored.

Figure 1: The Marketing Process

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│     Situation Analysis      │
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│     Marketing Strategy      │
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│   Marketing Mix Decisions   │
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│  Implementation & Control   │
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2.2. Definitions

2.2.1 Market

In marketing, the term *market* refers to the group of consumers or organizations that is interested in the product, has the resources to purchase the product, and is permitted by law and other regulations to acquire the product.

Various terms are used to describe the market:

- **Total population**

- **Potential market** - those in the total population who have interest in acquiring the product.

- **Available market** - those in the potential market who have enough money to buy the product.

- **Qualified available market** - those in the available market who legally are permitted to buy the product.

- **Target market** - the segment of the qualified available market that the firm has decided to serve (the *served market*).

- **Penetrated market** - those in the target market who have purchased the product.

In the above listing, "product" refers to both physical products and services.

The size of the market is not necessarily fixed. For example, the size of the available market for a product can be increased by decreasing the product's price, and the size of the qualified available market can be increased through changes in legislation that result in fewer restrictions on who can buy the product.

Defining the market is the first step in analyzing it. Since the market is likely to be composed of consumers whose needs differ, market segmentation is useful in order to better understand those needs and to select the groups within the market that the firm will serve.

2.2.2 Marketing

Marketing: There is no universally accepted definition of marking, indicating the variety of options, which exists concerning the subject Barker, (1989). Barker (1989) offers a very broad definition of marketing as "the collection of activities undertaken by the firm to relate profitability to market".

Marketing is a societal process, by which individuals and groups obtain what they need and want through creating, offering, and freely exchanging products and services and value with others (Kotler, 2003). (Barker 1981) offers a definition of marketing which is applicable to most agricultural systems: "Marketing is the primary management function, which organizes and directs the aggregate business activities involved in converting consumer purchasing into effective demand for a specific product or service and in moving the specific product or service to the final customer or user so as to achieve company-set profit or other objectives", The American Marketing Association(AMA) offers the following definition: Marketing is the process of planning production, pricing, promotion, and distribution of ideas, goods, and services to create exchanges that satisfy individual and organizational goals. (AMA, cited in Kotler, 2003:9).

2.2.3 Agricultural marketing

Agricultural marketing is the performance of all business activates related in the flow of goods and services from the point of initial agricultural production until they are in the hands of the ultimate consumers (Kohls and Uhl, 1985).

2.2.4 Agribusiness

Agribusiness means the very large or conglomerate businesses within the agricultural industry. But this is a very narrow definition. According to Davis and Goldberg *(1957)* agribusiness includes the sum total of all operations involved in the manufacture and distribution of farm supplies; production operations on the farm; and the storage, processing, and distribution of farm commodities and items made from them.'

2.2.5 Marketing management

Marketing management is the art and science of choosing target markets, keeping, and increasing customers through creating, delivering, and communicating superior customer value (Kotler, 2003)

2.2.6 Market performance

Market performance is defined as the way in which markets and marketing contribute to various aspects of economic performance (Scarborough and Kydd, 1992). Performance criteria could be divided into two categories, namely these related to economic efficiency and other performance objectives (Scarborough and Kydd, 1992). The former group includes technical efficiency, operational efficiency and whiles the latter group includes innovation, inter-sectoral resource transfer, equity, employment, and co-ordination efficiency.

2.2.7 Efficiency of marketing

Efficiency of marketing (economic efficiency) is mainly concerned with the cost of performing several marketing functions, such as purchasing, transportation, storage, processing, exchange, etc. Marketing efficiency is usually measured in the following dimensions: (a) technical efficiency (b) operational efficiency (c) allocate (exchange) efficiency (Solomon, 2002)

2.2.8 Technical efficiency

Technical efficiency refers to the efficiency, with which resources are used in marketing, in terms of physical input and output ratios. A technically efficient firm, or market, produces the maximum possible output from the inputs used, given location and environmental constraints, and it minimizes resource inputs for any given level of output (Scarborough and Kydd, 1992).

2.2.9 Exchange efficiency

Exchange efficiency refers to market level locative; pricing or economic efficiency and it depends on, and influential in, the above two efficiency criteria (Scarborough and Kydd, 1992).

2.2.10 Economic efficiency

Economic efficiency implies that a firm and an industry are operational on the lowest cost basis feasible with the techniques, skills and knowledge available, and that the benefits of all possible economies are reflected in the prices and margins prevailing in the market. Thus, all enterprises concerned with the marketing sequence must be continually on the lookout for new and better ways of performing their functions and providing services, and must adopt them as soon as they promise savings in cost (Abbott, 1958).

2.2.11 Marketing channels

Marketing channels are sets of interdependent organizations involved in the process of making a product or services available for use or consumption. Marketing channel decisions are among the most critical decisions facing management (Kotler, 2003).

2.2.12 Farmers choice of marketing channels

 All farmers must utilize marketing channels; regardless of whether they are production - oriented or market- oriented, it they produce goods, which are in excess of their domestic consumption. For some, this is simply a matter of routine, selling through the same outlets year in and out. However, farmers are required to choose between various marketing channels

in order to dispose of their produce. Possibilities certainly exist for the market-oriented farmer to improve his profit potential, if he is prepared to spend time deliberating over which marketing channel to use, and then makes his decision on the basis of sound economic motives (Barker, 1989)

2.2.13 Farmers' choice of marketing channels acting individually

When a farmer operates as an individual in the market, his ability to influence that market is negligible. Despite this disadvantage, the bulk of agricultural produce is marketed by farmers acting independently through various outlets (Barker, 1989).

2.2.14 Marketing margin

Marketing margin: Each market participant generally should obtain some profit margin. The services of various agencies constituting a marketing channel are remunerated out of the marketing "margin". This term is used to denote the difference between the price paid to the first seller (Producer) and that paid by the final buyer. It is made up of individual margins obtained by intermediaries who actually assume ownership of product and then resell it, together with specific charges for marketing services rendered (Abbott, 1958). In general terms, marketing margin refers to price difference between two stages in the marketing system.

2.3 Empirical studies

2.3.1 Local Experience

Bezabih Emana and Hadera Gebremedhin (2007) conducted a research on Constraints and Opportunities of Horticulture Production and Marketing in Eastern Ethiopia and the results are presented blow:

The study was conducted in selected major horticulture producing woredas, namely Kombolcha, Haramaya, Kersa (for vegetables) and Dire-Dawa (for fruits). The study aims at assessing the marketing channels, organizations, linkages and lines of movements of

horticultural products and production inputs to understand the major constraints of marketing functions and opportunities to improve horticulture production and marketing.

2.3.1.1 Production:

Different types of vegetables are grown in the study area with different intensities in terms of land and other input allocation, purpose of production, and marketability. The most commonly grown vegetables in terms of the number of growers are Irish potato, cabbage, onion, carrot and beet roots. Only 23% of the respondents produce fruits. The production is concentrated in the lowland areas. Most of the households have few plants often grown for consumption although a limited amount is also sold. Vegetables provide the most intensive production system where some farmers produce them in three cycles within the same year. But two cycles are very common.

2.3.1.2 Irrigation:

Irrigation water is crucial for horticulture production. Hence, most of the vegetable producers rely on irrigation mainly to harvest their products during the dry season when the price is also high. High fertilizer and animal manure intensity is used. Since the land size is small, the fertilizer use intensity is high. About 31% of the vegetable producers used local varieties.

Improved varieties needed to produce the desired product are said to be unavailable. Pesticides are used by some 33% of the sample respondents. About 74% of them acquired it from known sources while some 11% purchased it from unknown sources. There are observations of adulteration of inputs affecting germination qualities of seeds and efficacy of pesticides.

2.3.1.3 Input supply system:

Improved seeds, fertilizers and pesticides are supplied through different channels. Seeds and pesticides are either collected from local producers or imported for further distribution. Fertilizers are imported. The role of unions in importing and distributing inputs is growing.

Currently there are some 11 unions importing fertilizer. The regional governments deal and facilitate input supply through the unions to member cooperatives and then to farmers. The Ethiopian Agricultural Inputs Supply Enterprise (AISE) is a major public institution involved in inputs importing, collecting and distributing through its branch offices at woreda level. Traders also play a crucial role in supplying inputs.

2.3.1.4 Production constraints and opportunities:

The major horticulture production constraints include pests, drought, shortage of fertilizer, and high price of fuel for pumping water for irrigation. Lack of desired seed variety was also stated. The opportunities for increasing horticulture production include the increase in market integration, the need for intensive production in response to increasing population pressure, farmers' awareness of the benefits, the current outreach program in relation to supportive government policy, attempts made in water harvesting, etc.

2.3.1.5 Horticulture marketing:

Vegetables and fruits are produced in some specific locations in the eastern part of Ethiopia and supplied to the local markets and to the neighbouring countries. The major markets identified for collection and distribution of large volumes of vegetables are Haromaya, Finkile, Harar, Kombolcha and Dire-Dawa. The market actors namely producers, collectors, brokers, transporters, traders, consumers, and exporters play different roles along the market chain.

Irish potatoes and onion/shallot are the most commonly marketed vegetables accounting for about 60 and 20% of the marketed products. The other products such as cabbage, beetroots and carrot, garlic, green pepper, *Baharo*, lettuce and tomato are marketed at relatively smaller quantities by few farmers.

The leafy vegetables are often supplied from the *woredas* within the eastern region to markets in the eastern towns including Djibouti while relatively less perishable and highly demanded vegetables such as Irish potatoes and onion, are also supplied from markets in Addis Ababa and eastern Shewa zone of Oromia to these markets depending on the seasonal supply deficit in the region.

The production is seasonal and price is inversely related to supply. During the peak supply period, the prices decline. The situation is worsened by the perish ability of the products. Storage facilities are poor. Along the market channel 25% of the product is spoiled.

Farmers' bargaining power is low due to the lack of alternative market outlet. The most common marketing channel immediately available to the farmer is through brokers. There are up to three brokers between the producer and the trader. Each of the brokers makes a known margin of Birr 5-10 per quintal. The traders/wholesaler and the producer do not have any contact in which case the broker is decisive in setting the price, often making his own margin (unknown to both trader and producer). There is no norm or regulation governing the acts of the brokers and their behaviour negatively affects the farmers.

2.3.1.6 Marketing problems:

The major constraints of marketing include lack of markets to absorb the production, low price for the products, large number of middlemen in the marketing system, lack of marketing institutions safeguarding farmers' interest and rights over their marketable produces (e.g. cooperatives), lack of coordination among producers to increase their bargaining power, poor product handling and packaging, imperfect pricing system, lack of transparency in market information system mainly in the export market.

Informal transaction prevails in the export system. Producers and local traders receive value for their products only after the exported products sold. There is a lack of standard for quality

control and hence lack of discriminatory pricing system that accounts for quality and grades of the products.

Recommendations:

Different recommendations have been given in the study of Emana and Gebremedhin (2007). The most crucial ones are organizing the traders and the producers to work as partners. Building their business capacity and overcoming their constraints and capacitating them to use market information are important. Putting the market right through institutionalizing the marketing system, the commission agents' functioning, grades and standards, improving the export system by improving the transparency in the price setting and credit system are crucial interventions. Finally, the government should review the export price, which is determined through negotiations.

Moti (2006) conducted a research on Econometric analyses of horticultural production and marketing in Central and Eastern Ethiopia and the results are presented blow:

The central item of this research is to examine the development of less-favoured areas through commercializing small-scale agriculture that produces crops with export potential, particularly in horticulture.

First, the role of horticulture, along with other non-traditional agricultural commodities, in stabilizing the export income of Ethiopia is analyzed using a portfolio approach. Next, farm household land and labour allocation decisions to cash and food crop production are investigated using household survey data collected from Central and Eastern Ethiopia. Using the same survey data, crop and market outlet choice interactions at household level are analyzed to examine the impact of institutional arrangements on agricultural commercialization. Finally, farmers' bargaining power on tomatoes transacted at farm-gate under asymmetric price information is examined.

2.3.2.1 Summary of main finding:

The first specific objective of the study of Moti (2006) was to evaluate the potential contribution of horticultural crops in stabilizing export earnings of Ethiopia. Results show that Ethiopia should diversify its export portfolio in the non-traditional agricultural commodities like hides and skins, chat, pulses, cereals, cotton, and horticultural products (fruits, vegetables and flowers). These commodities contributed positively to the overall stability in the total export earnings in recent years. Furthermore, the analysis indicates that fluctuations in supply have more effect on earnings instability than export prices. In general, it can be concluded that there are various export products (traditional and non-traditional) that lead to a more balanced export portfolio, either because of negative volume or price correlation. The main lesson to be learned is that a more balanced export portfolio is possible leading to stable export earnings and horticultural products can contribute to that. One should note, however, that price and volume fluctuations are subject to change in the future and further updated analysis is required to make up-to-date recommendations.

2.3.2.2 Land and labour allocation decisions in the shift from subsistence to commercial agriculture

Farm household behaviour in land and labour allocation decisions to cash and food crop production was examined. Reduced form equations derived from a non separable farm household model were used in estimating the effect of different economic variables on land and labour allocation decisions for households in different market participation regime. Empirical results show that farm households that own much farm capital and have exogenous income sources allocate more land and labour to cash crop production. More farm capital employed on a given farm increases the productivity of land and labour and as a result encourages households to rent in (hire) more land (labour) as the marginal benefits from renting (hiring) factors from local markets are higher than the marginal costs of these

resources. Since cash crops are mostly produced using irrigation, motor pumps play a central role to get adequate quantities of water for irrigation and use a farmland multiple times a year including the dry off-season. Thus, access to motor pump service for irrigation increases both land and labour allocation to cash crop production. The purchase of a motor pump might be expensive for small-scale farmers unless there are institutional arrangements providing motor pumps on a short-term credit basis or renting the motor pump services out. Promotion of savings from the vegetable sale could also contribute in enhancing farm household investment on farm capital.

In addition, higher cash crop prices promote more labour use in cash crop production and reduce the respective labour demand in food crop production, as expected. Unlike in food crop production, there is no strong evidence that transaction costs affect household market participation and the level of resource use for cash crop production. This finding could be due to the fact that distance to local market is the only variable used as a proxy to measure the effect of transaction costs in the estimations whereas most cash crops are marketed at farm-gates. There are also regional differences both in land and labour market participation for cash crop production. Households from the two research sites (Haro-Maya and Ziway) significantly differ in their land and labour market participation decisions. This implies that policies that work at one region may not necessarily work at the other. Therefore, market development policies should consider region specific differences.

2.3.2.3 Crop and market outlet choice interactions at household level:

The interaction between crop and market outlet choices at a household level was examined. A simultaneous equation model was developed for crop and market outlet choice interactions and used to test for simultaneity between the two decisions for seven vegetable crops. From the test results it can be learned that for onion and kale crops produced around Ziway there is simultaneity in size of farmland allocated to these two crops and the share of these crops

marketed at the farm-gate. This shows that household preference to trade at a particular market outlet influences farm household land allocation decisions to a particular crop. In other words, institutional arrangements and their accessibility to farm households play a role in commercializing small-scale agriculture.

2.3.2.4 Farm-gate tomato price negotiations under asymmetric information:

The bargaining power of vegetable producing farm households at farm-gate price negotiations under asymmetric price information was examined in the study. Estimation equations for factors influencing the bargaining position of sellers at farm-gate and the spread between the initial ask and offer prices in negotiation are developed. The general conclusion to be drawn from the estimation results is that transmitting the daily vegetable wholesale price information to the potential vegetable producing areas via radio, internet or mobile phones could help tomato producers in reducing their valuation uncertainties and claim reasonable farm-gate prices.

Recommendation

In this regard, establishing and supporting farmers' vegetable marketing co-operatives could help to bridge the price information gap, facilitate the price information transmission process, and when there is a shortage of buyers at farm gate, assist farmers in assembling and transporting their vegetable products to the central market. Basic infrastructural developments like improving local road networks connecting vegetable farms with the main roads contribute towards increasing farmer's bargaining power over farm-gate prices.

2.3.2 International Experience

2.3.2.1 Philippines

A research was conducted on the Institutional economic analysis of vegetable production and marketing in northern Philippines: It is summarized as follows:

This made use of the integrated *Economics of Institutions* framework of Williamson (2007) and the *Structure-Conduct-Performance (*SCP) approach to analyze the Benguet vegetable sector from an institutional economics point of view. The integrated framework fused the institutional environment, governance structure and resource allocation levels of Williamson's schema with the *Structure-Conduct- Performance* (SCP) approach, respectively.

With regard to farm size structure, the total area of arable lands in the province showed a pattern of increasing hectare from 1980 to 2002. However, farm size showed a tendency towards fragmentation and parcelization based on the tripling in total number of farms of less than one hectare in the same time period. A total of 60% of the total arable area is comprised of farms which were predominantly less than three hectares in size; leading to an observation of a dualistic structure in the distribution of land in the province. There was a high level of land ownership among farmers.

Geographic cropping strategies in Benguet exhibit the Von Thünen characteristics.

Farmers nearer to the centres take advantage of the higher land rent by planting high value crops which are more perishable, more expensive to transport but sell at higher prices relative to other crops. Farmers living in the remote municipalities were observed to mostly cultivate lower value crops that are storable for longer periods of time, cheaper to transport but sell at lower prices relative to the high value crops.

Observed deviations from the von Thünen theory were assumed to be attributed to the risk aversity of farmers and the physical limitations of land cultivation.

Lack of proper market infrastructure is an issue in Benguet. There are only two major vegetable markets servicing the whole province. These are the La Trinidad and Baguio City vegetable trading posts. A total of 19 warehouses for vegetable storage that are all located in La Trinidad area are all privately owned by Manila-based traders. As of 2005, there still are vegetable-producing municipalities that remain inaccessible through farm to market roads.

Vegetable marketing in the region follow traditional methods, where wet markets are the primary sources of fresh vegetables for consumers and institutional buyers

The *suki* system is an institution in the vegetable sector. In this trading scheme, farmers and traders create a system of patronage where a farmer and trader regularly trade with each other in order to receive financial credits, discounts or high buying prices, means of production and allowance for delayed payment. The farmer-trader relationship that builds trust and networks in a *suki* system works to reduce opportunistic behaviour and increase cooperation on both sides as well as improve credit availability for growers. When credit is involved in the suki relationship, farmers who availed of production loans from traders are usually compelled to sell their harvests to the lender-trader, referring to *locked-in* situations. The formal rules in vegetable marketing in the province do not officially acknowledge the existence of the *suki* although there are also no regulations that sanction it. Overall, the formal institutional environment was seen to lack rules that pertain to critical transaction related elements that are the common sources of disagreement between farmers and traders.

In terms of conduct, vegetable production per unit area is intensive. This results in the hastening of the natural erosion process and a reduction in soil fertility. Farmers in the province are therefore heavily dependent on fertilizers and chemicals to address soil fertility and pest problems. To finance production, farmers rely on agricultural cooperatives and trader-financiers. Informal sources, in particular, wholesaler financiers, offer easily obtainable loans, but enclose unfavourable repayment schemes. Repayment schemes trap farmers into *locked-in* situations where they find it difficult to get out of debt or *suki* trading agreements. Agricultural cooperatives have been inefficient with regards to the agricultural loan issue. Their own lack of coordination and lack of monetary sources within the cooperative imply that they are unable to provide countervailing power and financial credit even to farmer-members.

Almost three quarters of the farmers surveyed obtain price information from other farmers although only one third of the farmers admitted knowing the correct market prices. Government-led agencies tasked to collect and disseminate price information were cited by only a minor number of respondents. Not knowing market prices results in lower bargaining power for farmers, and survey results showed evidence that traders set the price in almost 90% of farmer transactions.

There are three governance structures that farmers commonly use to market their crops. There are the commissioner-led market-based, wholesaler-led partly-market partly- credit based, and contractor-led partly-market part-relation-based modes of governance.

In terms of performance, farmers' sales values show evidence of the presence of many small farmers in the province conducting small scale production. There were also a few farmers conducting large-scale production. The duality of sales distribution among farmers is linked to the initial observation of the duality of the farm size structure in the region. Trader sales values similarly point to a dual structure, where many small traders divide a small share of total market sales among themselves while fewer traders account for a higher share of market sales. Due to the suspected flawed quality of the gathered cost data, cost and income estimates were assumed to be suspect. This is particular to the observation that 43% of the farmers and 4% of the traders earned negative incomes during the survey period. It is probable that 2003 is a special year where many farmers and traders incurred losses. However, it is more plausible that the cost measurements failed to capture the real financial situation traders are in. Initial margin analysis showed that farm prices for the most commonly traded crops comprise 66% of the provincial retail price. This does not include however, the additional 20% complimentary vegetables that farmers provide for traders for every 50-kg basket of vegetables bought.

2.3.2.2 Onion Production and Marketing

In New Mexico

A Marketing Order: How it Works

A federal crop marketing order is an organizational marketing alternative that agricultural producers of specialty crops may want to consider. This order is not permitted for livestock or the basic field crops. A marketing order is a way for an agricultural crop industry to seek orderly marketing of its production. A federal marketing order sets up a mechanism for all producers of a crop in a given area to exercise control over selected aspects of marketing their crop and yet be exempt from antitrust prosecution. The federal law permitting marketing orders is the Agricultural Marketing Agreement Act of 1937. Each crop marketing order is developed by and for the particular needs of the commodity group seeking the marketing order. One or all of the following provisions may be included in a crop marketing order:

- specifying grades, size, quality or maturity;

- advertising, promotion, market development and research;

- allotting the amount each processor may handle or purchase;

- establishing how much may be marketed during a set period;

- establishing methods of determining surpluses and their control and disposition;

- establishing a reserve product pool;

- inspecting the product;

- fixing the size, capacity, weight, dimensions or pack of the containers used in marketing;

- prohibiting unfair competition and unfair trade practices; and

- Requiring processors to file their selling prices and to not sell below prices filed.

Only those marketing tools included in a marketing order may be used by that commodity group. Any one tool, or a combination of the above, may be written into the order.

To start a marketing order, an order proposal must be submitted with a request for hearings on the order to the U.S. Secretary of Agriculture. If sufficient grower support is shown, the secretary holds public hearings on the proposal. Opportunities for written comments follow the hearings. Then the secretary makes a decision about whether or not to submit a proposed marketing order to a vote of all growers. The marketing order is started if two-thirds of the voting growers vote in favour of the order or if those representing two-thirds of the production vote for the order. Marketing orders are ended when more than half of the growers with more than half the production vote against the order. An order may be amended through a procedure similar to that for initiating the order.

A marketing order is administered by an elected board of growers and processors and a public member who is elected by the other board members. Board members, other than the public member, are elected by those they represent on a one-person-one-vote basis.

The U.S. Secretary of Agriculture oversees board actions to make sure the board does not act beyond its authority as given in the marketing order.

Under the order, it is the processors who are regulated. Assessments for operating the order are collected from processors or first handlers. However, they can pass that cost forwarded to buyers or deduct it in making their purchases from growers. Imports are not regulated under a marketing order. Advantages of a marketing order include industry self-control through use of selected marketing tools. It provides a means for all growers and processors to join together for various marketing activities. A disadvantage is that it is compulsory for all in the defined area.

2.3.2.3 A Study of Wholesale Markets in Ahmedabad Area, India:

The study was conducted by Vasant P. Gandhi and N.V. Namboodiri (2002), in the marketing of fruits and vegetables in the regulated wholesale markets of Ahmedabad, a large city of 4.5 million in western India, in light of widespread concerns about poor marketing efficiency and

low share of farmers in the consumer rupee in India. The study finds that the Agricultural Produce Market Committee of Ahmedabad (APMC) has put up significant infrastructure including three regulated wholesale markets with many facilities and services. The objective of this is to improve the marketing and its efficiency for fruits and vegetables. The volume of business transacted through the markets has increased substantially to 700 thousand tons by 1998-99 and the financial viability of the APMC was very good.

Vegetables and fruits are known for their seasonality in sales and this is exhibited substantially by vegetables such as cauliflower and green peas, and fruits such as mango and apple. However, some such as potato, tomato and onion show less seasonality. The study finds that the extent of contact between farmers and commission agents is low and needs considerable improvement. It also shows that the adoption of open auctions in the markets is very low and so much potential for gain in market efficiency has not been realized.

The study finds that the share of the farmer in the consumer rupee works out to only 48 percent for vegetables and 37 percent for fruits. Further, the explicit marketing costs work out to only a very small percentage of the price difference between the farmer and the consumer, and the profit margin works out frequently to 80 to 90 percent of the price difference. These figures are indicative of relatively poor efficiency of the marketing system despite the presence of the APMC and the regulated markets.

The measures required to improve this efficiency should include wide and necessary adoption of open auction, measures to increase the number of buyers and sellers in the market, improvements in market infrastructure such as storage facilities, cold storages, loading and weighing facilities, and improving transparency through supervision, and making available up to- date market information through various means including internet at the market.

Conceptual frame work

The following figure shows the structural relationship between the dependent and independent variable. The dependent variable is Production of the vegetables where, as, age, labor, oxen, credit, cart owned, farm size, selected seeds, fertilizer, pesticides, are the independent variables

Figure 2: Conceptual frame work
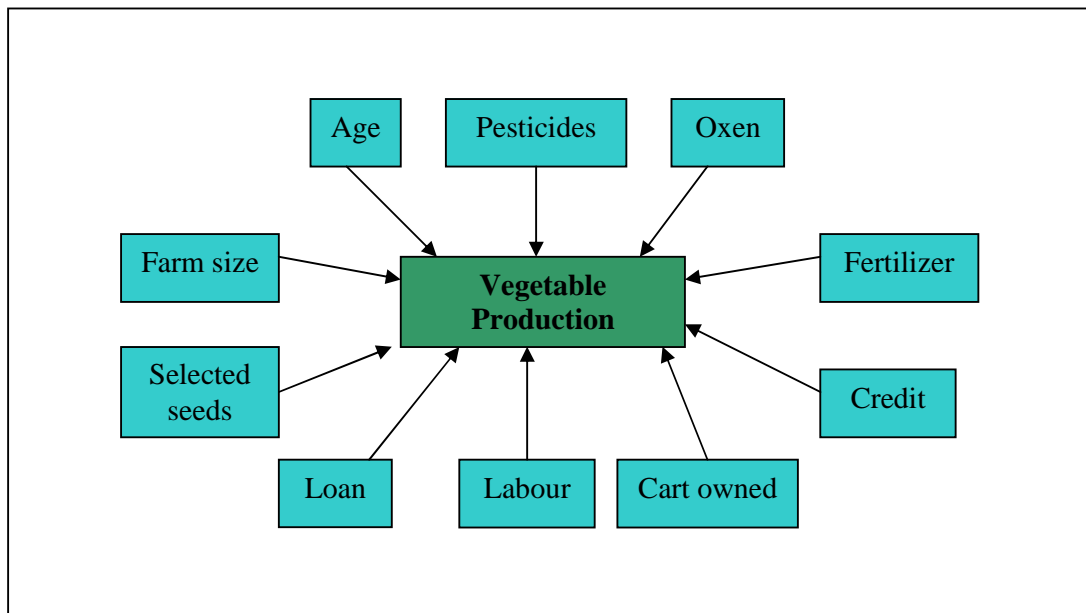
CHAPTER III

Materials and Methods

3.1 Site Selection and Description of the Study Area.

Kilte-Awlaelo Woreda has been selected for the study purposively because it is one of the top abundant vegetable growing areas in Tigray region.

Kilte Awlaelo woreda is found in eastern zone of Tigray region of Ethiopia. It is located at a distance of about 44 km from the regional capital city, Mekelle and 73 km from the zonal main city Adigrat. Administratively the woreda covers 16 'Tabias' and 59 Kushets. It is bordered to the East by Atsbi-Womberta, to the West Hawzen wereda and central zone, to the north Sasie sa'da emba and to the south Enderta.

Figure 3: MAP OF KILTE-AWLAELO WOREDA
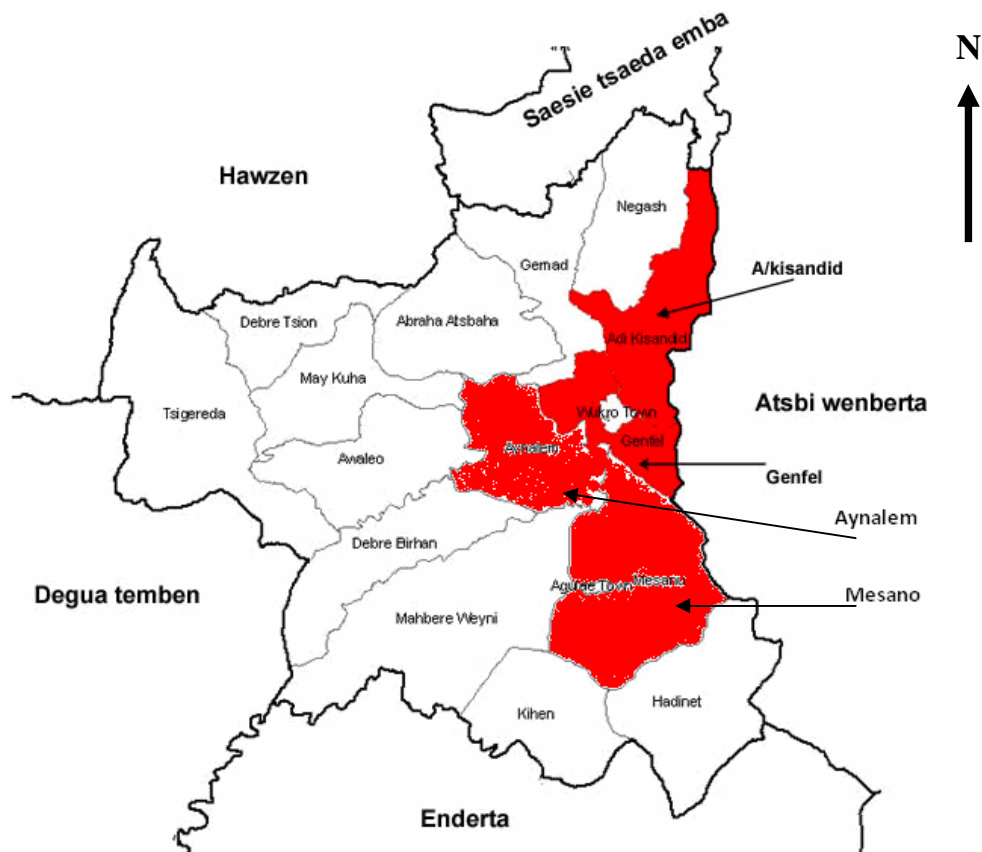
The total area of the woreda is estimated to be 1010.28 square km. The average land holding per household is about 1 ha. The cultivable land is about 210.895 square km.

The Woreda lies at a an altitude of 1900-2460 meter above sea level with annual mean temperature of 17-23°c and rainfall 350-450 mm.

The total population size of the Woreda is estimated to be 119,493 for the year 1999E.C .The male category is about 58, 552 (49 % of the total). The total household size is about 23,200 out of which the male headed is about 79 percent and the remain 21percent is female headed (Kilte Awlaelo Woreda Rural and Agricultural development office)

3.2 Agriculture

3.2.1. Crop production /rain fed agriculture

During the harvesting season 1996/97 and 1997/98 E.C. the total cultivated area was estimated to be 17,197 ha and 19,183 ha and the agricultural production was about 41,854.7 quintal and 132,709.7 quintal respectively. Of the total cultivable land, cereals take the highest share which is about 91.5 percent. (Kilte Awlaelo Woreda Rural and Agricultural development office)

3.2.2. Irrigated agriculture

The total area under irrigation was estimated to be 329.786 ha, 1104.8 ha and 1227.15 ha respectively in the year 1996, 1997 and 1998. In the year 1997 the total area covered under irrigation for vegetables was 20 % followed by cereals (10 %) and spices (2 %) and in 1998 irrigated area under vegetable was 52.5%, spices 6% and cereals 6 %. The data on the area coverage of the traditional crops vis-à-vis the market oriented crops indicates that in 1993 of the total irrigated area (219.22 ha), 12.7 % was covered by the market oriented crops. The remaining 87.3 % was covered by cereals such as maize and barely. Where as, in 1999 of the total irrigated area of 1263.6 ha, 86.5 % was covered by marketed crops and the rest 13.5 % by traditional crops. (Woreda Kilte Awlaelo Rural and Agricultural development office). This

indicates that in the Woreda, expansion of irrigable area and also crop diversification toward high valued crops and vegetables was noted.

3.3. Data collection Procedure and Sampling Techniques

3.3.1. Sampling

The Kilte Awlaelo woreda comprises of sixteen villages (Tabias). However, vegetable cultivation is predominant only in eight villages (tabias). The area under vegetable cultivation in each village is given in table 1

Table 1: Villages under vegetable cultivation in kilte Awlaelo worda

No	Tabia	Beneficiaries		Total	Land size	
		M	F			
1	Genfel*	894	230	1124	200	
2	Msanu*	728	158	886	144	
3	Adksand-d*	894	250	1144	240	
4	Abreha-watsbha	243	168	411	68	
5	Aynalem*	791	123	914	255	
6	Gmad	483	100	583	57.62	
7	Ngash	493	83	576	36	
8	Tsgeireda	181	9	190	20.25	
	Total	4707	1121	5828	1000.62	

Source: Woreda Agriculture and Rural development Office report (1998),

From the eight villages under vegetable cultivation, four villages (Genfel, Msanu, Adeke-Sandid and Aynalem) were selected at random for the study. From the vegetable growers of each village, two percent were selected at random from the vegetable cultivators'. The number of vegetable growers in each village and the sample size based on probability proportionate to size are given in table 2. The total sample size of producers of vegetable was 162.

Table 2: Number of vegetable growers and sample size

No	Tabia	Beneficiaries		Total	Land size	sampling 2%
		M	F			
1	Genfel*	894	230	1124	200	44.96
2	Msanu*	728	158	886	144	35.44
3	Adksand-d*	894	250	1144	240	45.76
4	Aynalem*	791	123	914	255	36.56
	Total	3307	761	4068	839	162.72

3.3.2. Data Collection

Primary data were collected from the selected farmer respondents of the four villages. The interview schedule was developed in English and later translated in to Tigrigna before administration.

Data collection from farmer respondents was done by two enumerators selected for this purpose. Another interview schedule was developed for collecting responses from the Woreda officials and officials of the multipurpose cooperatives societies. This is mainly with the objective of assessing their perception of the constraints in vegetable marketing through the cooperatives, the opportunities and their suggestions to make improvements.

A total sample size of 30 officials was interviewed by the researcher.

Appropriate training, including field practice, was given to the enumerators to develop their understanding regarding the objectives of the study, the content of the interview schedule, how to approach the respondents and conduct the interview. Pre-testing of the interview schedule was carried out and depending on the results some modification were made on the final version of the interview schedule. Moreover, personal observations and informal discussions with staff of Agriculture and Rural development offices were made. Secondary data were collected from government offices and Cooperatives. Secondary data was collected

from different sources included improved input uses, total cultivated land, and annual yield/ha, total production, loan disbursed and collected, etc.

3.3.3 DATA ANALYSIS

For analysis of data, the pre-coded data of the research questions was entered together into computer and analyzed using the statistical package for social science (SPSS). The data analysis for each objective was selected according to the nature of the objectives as follows

1. For the first, second and the fifth objective simple descriptive statistical analysis such as frequency distribution average, standard deviation, percentage and cross tabulations was used with different supporting graphs, bar charts and pie charts.

2. For   third objective both simple descriptive statistical analysis and model were used to analyze the data.

3.3.3.1 Specification of the model: Chi-square

Chi-square test for Independence

The *chi-square* (chi, the Greek letter pronounced "kye") statistic (x^2) is a nonparametric statistical technique used to determine whether a distribution of observed frequencies differs from the theoretical expected frequencies. Chi-square statistics use nominal (categorical) or ordinal level data, thus instead of using means and variances, this test uses frequencies. The value of the chi-square statistic is given by:

$$\chi^2 = \sum \left[\frac{(F_o - F_e)^2}{F_e} \right]$$

Where $\sum$ = summation, Fo = observed frequency, F_e = expected frequency.

Degrees of freedom (*df)* for the test are calculated as *df* = (R-1) (C-1); where R = number of rows and C = number of columns.

Observed frequency refers to the number of respondents actually found to lie at the intersection point of any two categories of the variables of interest. Expected frequency refers to the number of respondents that would lie at the intersection point of any two categories of

the variables of interest were the null hypothesis true. Degrees of freedom refer to the number of observations that are free to vary for a given statistic.

Chi Square is used when both variables are measured on a nominal scale. It can be applied to interval or ratio data that have been categorized into a small number of groups. It assumes that the observations are randomly sampled from the population. All observations are independent (an individual can appear only once in a table and there are no overlapping categories). It does not make any assumptions about the shape of the distribution nor about the homogeneity of variances.

Generally the *chi-squared statistic* summarizes the discrepancies between the expected number of times each outcome occurs and the observed number of times each outcome occurs, by summing the squares of the discrepancies over all the categories (Dorak, 2006). Data used in a chi-square analysis has to satisfy the following conditions

1. Randomly drawn from the population,
2. Reported in raw counts of frequency,
3. Measured variables must be independent,
4. Observed frequencies cannot be too small, and
5. Values of independent and dependent variables must be mutually exclusive.

3. For the fourth objective, descriptive statistical analysis such as frequency distribution average, standard deviation, percentage and cross tabulations were used with different supporting figures,

3.3.3.2 Specification of the Model: Multiple Regressions

This study is intended to analyze which and how much the hypothesized regressors are influenced in the production of the vegetable in the study area. As already noted, the

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dependent variable is a dummy variable, which took a value zero or one. However, the independent variables are of both types, that is, continuous or categorical.

Therefore, the multiple regression models are specified as follows:

$$Y = b_o + b_1x_1 + b_2x_2 + \ldots\ldots\ldots\ldots\ldots\ldots b_kx_k + \epsilon \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(1)$$

Where: Y = represents the dependent variable

b_o = denotes the intercept of the regression plane which is constant.

b_j, j = 0,1,……k, are called the regression coefficients

x_1, x_2…..x_k = refers to the repressor variables

ϵ = is the error or deviation between y value and the expected value of y given by

$b_o + b_1x_1 + b_2x_2 + \ldots\ldots\ldots\ldots\ldots\ldots b_kx_k$

It is a multiple linear regression model with k repressors. The parameters b_j , j= 0,1,….k, are called the regression coefficients. This model describes a hyper plane in the k-dimensional space of the repressor variables x_j. The parameter b_j represents the expected change in the response y per unit change in x_j when all the remaining regressor variables x_i (i ≠ j) are held constant. For this reason the parameters b_j, j =1, 2,....k, are often called *partial* regression coefficients.

Multiple linear regression models are often used as approximating function. That is, the true functional relationship between y and x_1, x_2,…..x_k is unknown, but over certain ranges of the regressor variables, the linear regression model is an adequate approximation.

Test for Significance of Regression

In multiple regression problems certain tests of hypothesis about the model parameter are useful in measuring model adequacy. The test for significance of regression is a test to determine if there is a linear relationship between the response y and any of the regressor variables x_1, x_2, …..x_k. Separate tests of the null hypothesis that individual coefficients are zero can be computed using t-test of the multiple linear regression models (Gujarati, 1988).

This test can be used to see the statistical significance of each coefficient. An overall test of the null hypothesis that all the parameters associated with the explanatory variables in these models are equal to zero is an F-test based on the OLS estimation procedure. The Chi-square tests the null hypothesis that the coefficients for all terms in the current model except the constant are zero.

The appropriate hypotheses are:

$$H_{o:} \; b_1 = b_2 = \ldots \ldots b_k = 0$$

$$H_{1:} \; b_j \neq 0 \text{ for at least one } j \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (2)$$

Rejection of Ho in the above hypothesis implies that at least one of the regressors x_1, $x_2 \ldots \ldots x_k$ contributes significantly to the model

3.3.3.3 Coefficient of Multiple Determinations

The coefficient of multiple determinations R^2 is defined as

$$R2 = SS_R/S_{yy} \; \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (3)$$

The multiple coefficient of determination represents the percentage of variability in y that is explained by the estimated regression equation. We have $0 < R^2 < 1$ as in the case of simple regression case. However, a large value of R^2 does not necessarily imply that the regression model is a good one. Adding a regressor to the model will always increase R2 regardless of whether or not the additional regressor contributes to the model. Thus it is possible for models that have large values of R^2 to perform poorly in prediction or estimation. (Montgomery)

The positive square root of R^2 is the multiple correlation coefficient between y and the set of regressor variables $x_1, x_2, \ldots x_k$. That is, R is a measure of the linear association between y and $x_1, x_2, \ldots x_k$.

The functional relationship between the probability of improvement productivity and explanatory variables is specified as follows:

$$Y = b_o + b_1 x_1 + b_2 x_2 + \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots b_k x_k + \epsilon \ldots \ldots \ldots (4)$$

Where: Y is average yearly vegetable production of respondents

b_o is Constant or intercept

$b_1, b_2, \text{......................} b_k$ refers Regression coefficients

$x_1, x_2 \text{.................} x_k$ refers vector of explanatory variables that include: age family size, input utilization, loan, extension service availability, oxen availability, cart owned, and others.

3.3.3.4 Definitions and Working Hypothesis

The output and productivity of vegetables, is affected by the difference in an on-farm application of improved seed, Fertilizer input, agro-ecology, soil fertility, loan, price of the product, and other socioeconomic factors can cause the differences in the performance of the production. The researcher used multiple regressions to identify the factors which influence the productivity of vegetable products in the study area

Dependent variable is yearly average production of the vegetable obtained by the farmers.

Age of the producer is defined as the number of years one has completed. Aged farmers may be reluctant to accept new agricultural technology in addition to that agricultural activity needs more labour. Therefore young farmers can produce effectively

Ox: Vegetable production in Tigray is based on tradition, which is poorly supported by scientific recommendations. Farmers used oxen to plough their land. Therefore the more oxen farmers owned, the less time and cost incurred.

Fertilizer: fertilizer can improve the soil fertility and increase production. Therefore, if farmers apply fertilizer they can increase production.

Farm size: The quantity of Agricultural production is limited to the availability of size of land. So the more the cultivated land, the more production can be obtained.

Credit: Farmers use credit to purchase agricultural inputs. Therefore, if farmers got credit, they can buy the necessary agricultural input; as a result it can increase the production.

Pesticide: Pests can considerably affect the yield of all crops production. Therefore the application of pesticide can maintain the quality of the product, at the same time it can increase production.

Selected seeds: The applications of adequate and quality vegetable seeds are crucial for increasing production.

Cart: Most of post harvest loss for vegetable commodities is related to transport and storage. Therefore if farmers owned their own cart the loss can be minimized.

Labour: Labour is an important factor of vegetable production. Therefore the more the family size they can participate in much agricultural activity which can increase the productivity of the soil.

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CHAPTER IV

RESULTS AND DISCUSSION

The results and discussion are presented in this chapter.

4. 1 Some Characteristics of the Respondent

4.1.1 Age and Sex

Table 3: Average age and sex of the respondents

Kebele of the respondent		Age of respondent	Sex of the respondent		Total
		Mean age	Male	Female	Count
			Count	Count	
	Genfel	47.00	38	4	42
	A/sended	42.29	40	5	45
	Msanu	46.73	29	3	32
	Aynalem	44.70	31	5	36
	Total	45.26	138	17	155

Source: Primary data - October 2007.

Age and sex composition are the major demographic features used to characterize the producers. Although efforts were made to account for gender representation, the actual random sampling resulted in only 17 female headed households from the 162 sample producers.

The respondents 'average age ranges from 42 to 47. About 138 of the producers are male and the 17 are females.

4.1.2 Education

Table 4: Level of education of the household heads by *woreda*

Education level	Count	Percent
No formal education	88	56.1
Grade 6 or less	53	33.8
7th - 12th grade	12	7.6
Certificate	3	1.9
Diploma	1	.6
Total	157	100.0

Source: Primary data - October 2007

Education is a crucial factor for skill development and enhancing effective production and marketing decisions. The survey shows that 56 percent of the producers do not have formal education while about 33 percent attended elementary school (less than 6th grade), eight percent attended high school, about two percent attended 12+1 and got certificate and about one percent attended the college level education.

It could be seen from the table and diagram that the largest proportions of the respondents do not have a formal education.

Figure 4: Level of education of the household heads
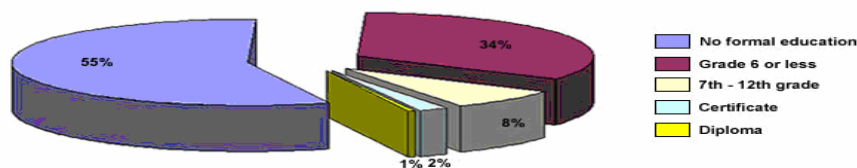
Table 5 Average No, of children in school per sample household

Tabia	No of children in school		
	Male	**Female**	**Total**
Genfel	2	2.2	4.2
A/ksanded	1.7	2	3.7
Mesanu	1.5	1.3	2.8
Aynalem	1.8	2.3	4.1

Source: Primary data - October 2007

Though children can learn informally from their parents as well as from their surrounding, the knowledge that the children gain in school is of a formal type which is useful in determining their life. The importance of education in the study area as indicated above is getting momentum. Table 5 shows that, the respondent sample of farmers who are living in Genfel Tabia send 4.2 children to school. Where, farmers from A/ksanded, Mesanu and Aynalem send 3.7, 2.8, and 4.1 children to school respectively. From this, it is possible to infer that the parents in the study area are positive to send females to school.

4.1.3: Marital status

Table 6: Marital status of the respondents

Marital status	Count	Percent
Married	121	81.2
Unmarried	11	7.4
Divorced	6	4.0
Widowed	11	7.4
Total	149	100

Source: Primary data - October 2007

As it is displayed in table 6, 81.2% of all the sample respondents were married while about 7.4 % were unmarried, 4% are divorced and the remaining 11% were widows. Therefore the majorities of the respondents are married.

Table 7: Average household size and dependency ration

Tabia	Household size			Working force in the family			Dependency ratio
	Male	Female	Total	Male	Female	Total	
Genfel	3.91	3.04	6.95	1.81	1.15	2.69	0.58
A/ksanded	4.02	3.53	7.47	1.9	1.05	3.04	0.6
Mesanu	3.33	3.34	6.67	2.00	1.6	3.6	0.5
Aynalem	3.5	3.6	7.1	2.1	1.7	3.8	0.46
Total	3.69	3.4	7.1	1.9	1.4	3.22	0.54

Source: Primary data - October 2007

The vegetable production system is often intensive and requires more labour for cultivation than in the case cereal production. The household provides a major source of labour for agricultural activities. The labour available for work per household is directly proportional to the family size. The family size of the respondents ranges from 1 to 11 with an average of 7.1. As it can be observed from table 7, 46 present of the total household members are able to work while 54 present of the household members are dependent. From the given data the

dependency ratio was also calculated and it is 54 present. This indicates that in the study area 54 present of the family members are dependent on 46 present which are the active force.

4.1.4: Means of income

Table 8: Major means of income generation of the vegetable producers

Source of income	< 1000 birr		1000 - 3000 birr		3000 - 6000 birr		6000 - 9000 birr		> 9000 birr		Total	
	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%
Income generated from vegetable production	22	15.0	84	57.1	20	13.6	18	12.2	3	2.0	147	100.0
Income generated from grain & pulses production	32	21.6	85	57.4	26	17.6	5	3.4	0	.0	148	100.0
Income generated from grain trading	13	25.5	24	47.1	12	23.5	2	3.9	0	.0	51	100.0
Income generated from other income types	80	25.8	167	53.9	50	16.1	13	4.2	0	.0	310	100.0

Source: Primary data - October 2007

The respondents depend on different means of income generation strategies.

A. Vegetable

Table 8 reveals that 15% of the respondents are getting less than 1000 birr per year from producing vegetable, while 57.1% are getting income between 1000 birr to 3000 birr per year, 13.8% are getting income ranging from 3000 birr to 6000birr, 12.2% are got from 6000 birr to 9000 birr and two percent are getting more than 9000 birr income per year from vegetables.

b. Grains and Pulses

Production of grains and pulses are the major source of income for the majority of the producers. 21.6% of the respondents are getting average income of less than 1000 birr per

year from grains and pulses. On the other hand 85% of the respondents are getting an average income ranging from 1000 birr to 3000 birr per year, 26% of the respondents are getting an income of 3000 birr to 6000 birr per year, and only 3.4% of the respondents are getting an income of 6000 birr to 9000 birr per year.

c. Grain trading

Farmers also participate in off-farm activities to generate supplementary income during slack production seasons. Grain trade is a major off-farm activity. The participants of such trading activity could make an income in every market day. Among the sample respondents, 51 farmers are participating in grain marketing. Among the farmers who participate in the grain marketing, 25.5% have an income of less than 1000 birr per year from it, while 47.1% do have income of 1000birr to 6000 birr, 23.5% of them earn income of 3000 birr to 6000 birr and about 3.9 % are getting an income of 6000 birr to 9000 birr.

4.1.5 Experiences in Vegetable Cultivation

The sample respondents were asked as to how many years they practiced vegetable cultivation. The respondents have an average of 7.69 years of experience in vegetable production. Most of the farmers did not have an access to irrigation earlier.

4.1.6 Irrigation

 Farmers in the study area use irrigation to grow and supplement vegetable production during the dry seasons. The information gathered during the focus group discussions made with the officials and development agents of the Woreda shows that almost all the sample farmers in the study area produce vegetables and fruits under the irrigation system.

Table 9: Average land allocated for crop and irrigation (ha)

Land type	Genfel		Aynalem		A/nded		Mesanu		Total	
	Fre	Area	Fre	Area	Fre	area	fre	Area	fre	area
Crop area	20	0.75	19	0.45	28	0.60	18	0.43	85	0.56
Irrigable	24	0.28	17	0.27	17	0.31	17	0.25	75	0.28
Total	44	1.00	36	0.72	45	0.91	35	0.71	160	0.84

Source: Primary data - October 2007

The assessment of the study indicates that the household average cultivated land is 0.84 ha. It can be noticed from table 9 that, the average land proportion for irrigation is 33 percent. It is true that the proportion of the irrigated land is little when weighed against the total cultivated land. But the irrigated land is determined by the availability of the water for irrigation. It can be possible to conclude that the area which is allotted to the vegetable production is small.

Table 10: Type of crops produced by using irrigation

Crop	Frequency	Percent
Vegetable	139	89
Fruits	10	6
Chat	1	0.6
Teff	7	4.4
Total	157	100

Source: Primary data - October 2007

Several factors could affect household decisions in area of farmland allocation across different crops and where to sell their products. Available family labour could play an important role in area allocation when there is a shortage of hired labour. Labour availability could also influence the market outlet choices as some crops may require more labour to transport to local markets. As it can be inferred from table 10 the survey indicates that, 89 present of the sample respondents use irrigation for growing of vegetables while 6 present are using irrigation for cultivation of fruits and the other 0.6 and 4.4 present are use irrigation for

Chat and Teff respectively. Therefore it is possible to conclude that the most of the irrigation water is allotted for growing the vegetables.

Table 11; Source of water for irrigation

Source of Irrigation water	Frequency	Percent
River/spring	78	52
Borehole	10	7
Lake	32	21
Pond	30	20
Total	150	100

Source: Primary data - October 2007

Irrigation water comes from different sources including boreholes, river/spring, ponds, and lakes. 52 percent of the sample farmers are relaying on the river/spring water, where 21 percent are depend on lake and the remaining 7 present and 20 of the sample respondents depend on borehole and pond respectively. It can be summarized that in the study area, only few farmers are using the borehole as a source of water for irrigation.

Table 12 Mean area and production in 1999.

Type of crop	Area prods. in 19999(ha)	Production in 1999(qt)	Price/qt	Income generated from sales in 1999
Onion	0.15	31	250.00	7750
Potato	0.15	30	175.00	5250
Tomato	0.257	64.26	100.00	6425

Source: Primary data - October 2007

As it is depicted in table 12, the farmers according to their interest, allocate land to the different crops. An average of 0.15ha of land was allocated for onion during 1999 and obtained an average of 31 qt and 7750 was the income. On the other hand, an average of 0.15ha was allocated for potato and obtained a production of 30qt. This was sold for birr

5250. Tomato was cultivated in 0.257ha and the production was 64.26 qt and it was sold for

birr 6425.

In addition to the above, farmers were also asked to identify the period where the production

increased or decreased, all expect 5 of the sample respondent stated that April – June and

July – Sept is the time when vegetable production decrease and increases respectively.

4.1.7 Labour

Labour is an important factor of agricultural production in the developing countries like

Ethiopia. The sample farmers in the study area rely on family labour for land preparation,

planting, cultivation, weeding, irrigation, fertilizer application, pesticides application,

harvesting and transporting of the product to the market. The assessment indicates that 82

percent of the respondents depend on family labour while 12 percent of the respondents hired

manpower for their vegetable production and the remaining 3 percent and 3 percent are using

labour exchange and help from relatives and neighbours respectively. The majority of the

sample farmers in the survey area do have enough own labour force for agricultural activities.

4.1.8 Fertilizer and Pesticides

Farmers apply animal manure and chemical fertilizers such as DAP and Urea to improve the

productivity of the land. The use of farm yard manure is widespread in the study area while

the use of compost is not much. Animal manure is transported from farmhouse to the field

mostly during the dry season and spread in the field. From the farmers interviewed, 71percent

used manure to increase the fertility of the irrigated land while 29 present applied the

fertilizers like DAP and Urea. To conclude farmers in the study are preferred to use the

manure to increase their productivity than that of applying the chemical fertilizer.

Disease and insects can affect vegetable and reduce the productivity and quality of the

product specially vegetables like onion, tomato and potato. The provision or availability of

suitable pesticides, especially for vegetable production, is an important input. Pests can

considerably affect the yield of all crops under irrigated conditions,

Table: 13 Place/ Institution where fertilizers and pesticides are found.

Inputs	Institutions	Count	Percent
Fertilizer	Development agents/ Agriculture office	84	70
	Local Market	1	5
	Cooperative	9	25
	Group Total	156	100.0
Pesticide	Development agents/ Agriculture office	130	80
	Cooperatives	15	5
	local market	17	15
	Group Total	162,00	100.0

Source: Primary data - October 2007

Farmers do have an opportunity to select market for purchasing their fertilizer and pesticides

from a different source. As it is displayed in table 13, 70 percent of the sample farmers

purchased fertilizer from Agricultural development agent, while 5 and 25 percent are porches

the fertilizer from the open market and cooperatives respectively.   In addition to the above 80

percent of the total respondent recognized that, they got their pesticide from Agricultural

development office while 5 percent and 15percent of the total respondent got their pesticide

from cooperatives and open market respectively. To conclude, majority of the farmers got

their fertilizer and pesticide from the agriculture and development agency nearby.

Table14: Problems faced in using pesticides

Problems	Frequency	Percent
High price	90	56
Unavailability	40	25
Lack of instrument for applying it	20	12.5
Low quality	10	6.5
Total	160	100

Source: Primary data - October 2007

As it is shown in table14, 56 percent of the respondent says the high price of the pesticide is the most common constraint of using pesticides. The unavailability of pesticides is encountered by 25 percent of the respondents which is also a basic problem. The supplier is not also providing the necessary instrument for utilizing the pesticide as reported by12.5 percent of the respondents and 6.5 percent of the respondent complains about the quality of the supply.

4.2 Vegetable production and marketing in the Kilte Awlaelo woreda

4.2.1Nature of Vegetable production and marketing in Kilte Awlaelo woreda

Farm households in developing countries mostly operate under imperfect factor and/or product markets resulting from high transaction costs, shallow or thin markets for factors and/or products, price risks and risk aversion, or limited access to market information (Sadoulet and de Janvry, 1995)

Under such circumstances, production and consumption decisions taken at farm household level are far from separable (Singh et al., 1986; Taylor and Adelman, 2002).

Specially when there are high transaction costs to participate in a factor or product market, farm households prefer to be self-sufficient in production and/or consumption of that particular factor or product. (de Janvry et al., 1991; Skoufias, 1994).

In addition to market failures resulting in endogenous prices for non-tradable factors or products at a household level, markets may exist for other factors or products in which the buying and selling decision prices of households are discontinuous due to high transaction costs prevailing in these markets (Omamo, 1998; Woldehanna, 2000; Key et al., 2000). This discontinuity in decision prices occurs due to the fact that transaction costs put a wedge between market prices at which households are willing to buy and sell the same factor or product considering all the searching, negotiation, monitoring and enforcement costs. Note that for risk averse farmers this price wedge may be widened by price risks. Due to price risks farmers will mark-up purchase prices positively whereas they mark-up selling prices negatively (Sadoulet and de Janvry, 1995).

Given all these market features, farm households in developing countries earn far less than the potential income they could have attained under perfect markets. For instance, areas around Kilte Awlaelo woreda have relatively good potential for cash crop production. However, households in these areas are still engaged in producing both cash and food crops using their limited land and labour resources. Though it is believed that cash crops can help these households to earn more profit per unit of resource used, a complete shift of land and labour towards cash crop production is hardly seen and the share of land allocated to cash crop is still minimal. Of the total farmland cultivated by the sample households from Kilte Awlaelo woreda areas covered under this study, of the total irrigated area (219.22 ha) 12.7 % was covered by cash crops during the 1993 E.C production period. The lack of a complete or partial shift towards specialized high value cash crop production is linked to households' resource use behaviour under market imperfections (de Janvry et al., 1991; Omamo, 1998).

4.2.1.1 Markets for Vegetable Products

Production of vegetables including other high value crops need well structured infrastructure and integrated market for their quick post harvest handling and sales transactions to avoid

losses and reduce marketing costs. In the woreda the produce is being sold in different markets. Moreover in the present system, the value addition is minimal at the woreda. This results in lower profit to the farmers. Lack of grading, cleaning, packing and transport of the produce, especially perishables, lead to loss of value and wastage. Various studies have indicated that the post harvest losses accounts for 30 percent of perishable produce .Hence it is necessary to develop collection centres nearer to the farmer's field with proper infrastructure for grading, sorting, packing and transport.

In the woreda a weekly market is the first link in the marketing channel and the price they receive at this market constitute their cash income. It is estimated that 90 percent of the total marketable surplus in the remote areas is sold through these markets. (Such as Abraha-We-Atsebha and Agula).The Small cultivators of the woreda with limited surplus find it uneconomical to go to wholesale.

Rural Primary Markets play a very vital role in marketing of produce, particularly of small farmers. But rich farmers with higher surpluses (very few in numbers) generally take their produce to wholesale a market at Mekelle.

The study reveals that, farm gate; Wukro and Mekelle serve as major vegetable collection centres, whereas the insignificant amount can also be sold in others market outlets.

Figure 5:   Major vegetable markets and flow in the woreda
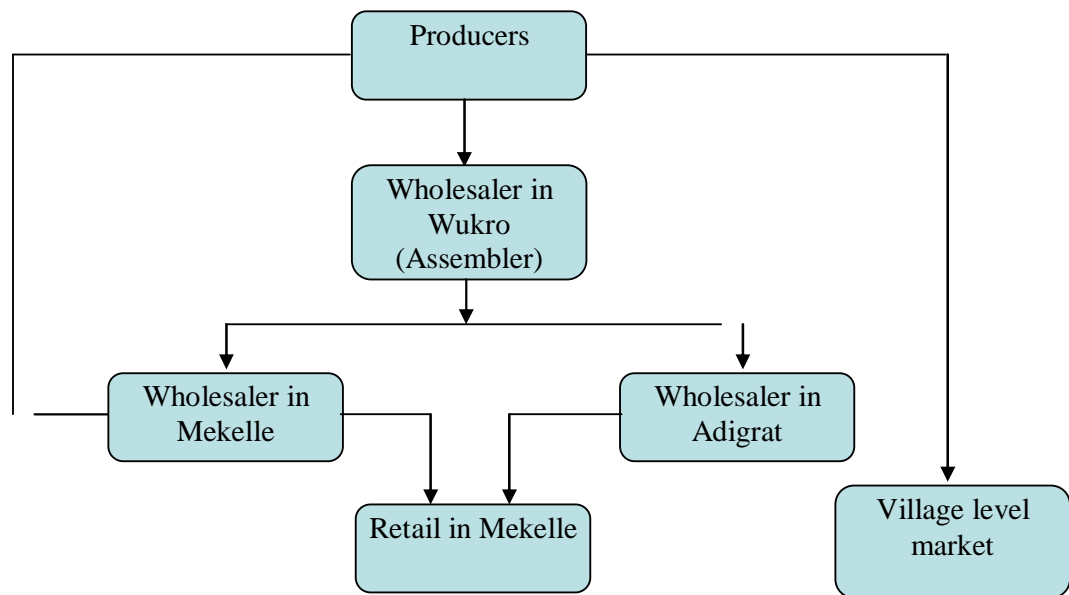
4.2.1.2 Agricultural marketing system and Major Actors of the woreda

Agricultural commodities move in the marketing chain through different channels. The marketing channels are distinguished from each other on the basis of market functionaries involved in carrying the produce from the farmers to the ultimate consumers. The lengths of the marketing channel depend on the size of market, nature of the commodity and the pattern of demand at the consumer level. The marketing channels for agricultural commodities in general can be divided into four broad groups as in the study area as follows

Figure 6: Major Vegetable markets channels and flow in the woreda
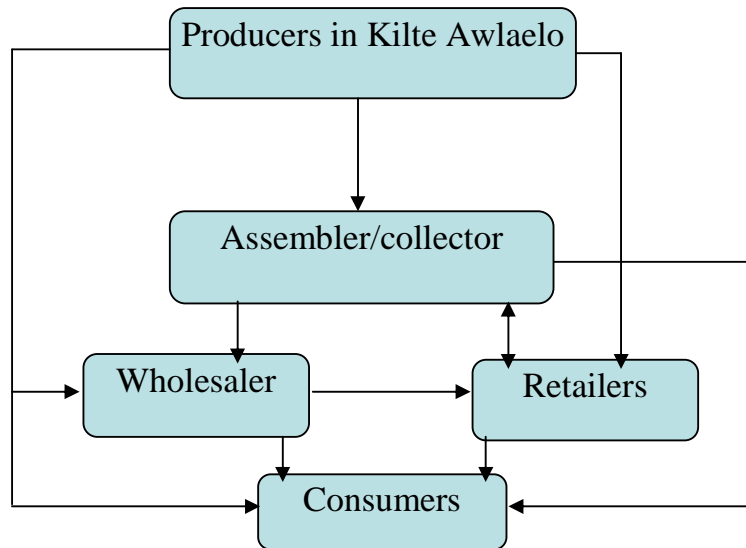
a. producer

Vegetable crops are produced in 16 Tabias of the Woreda. Vegetable production by smallholders in the eastern part of the region is more popular compared to fruit production.

Production of fruits such as banana, mango, and papaya, and orange is limited at household level except at a few places such as the Abreha-we-Atsbeha, Genfel and other small producers. Farmers who produce small quantities of fruits sell them in the local markets to consumers or retailers. A large number of producers of vegetables sell their products through brokers. When there is a lager quantity produces there is no direct transaction or linkage between the producers and large buyers. The wholesalers have contact persons/brokers who identify vegetables to be purchased, negotiate the price, and purchase and deliver the products. These brokers play a decisive role in the marketing system and determine the benefits reaching the producers. Onion, potato, and tomato (in Mekelle) are often purchased in the field through this process. There are numerous actors handling the product along the channel between producers and consumers.

b. Collectors

Collectors are found in small towns like Agula, and Abrah-We-Atsbha market to collect vegetables and deliver them to traders in big market centres such as Wukro and Mekelle. The collectors have small capital. The collectors are closely associated with brokers who work at grassroots level as well as with those coming from bigger marketing centres. In the markets where the producers sell their products, mainly during the peak supply period, the collectors fix the prices, which is often very low.

c. Retailers

There are different types of traders, namely retailers, wholesalers, and exporters. Retailers include supermarkets, grocers, vendors, hotels, restaurants, cafeteria, etc. which are available in all the markets studied. The retailers purchase vegetables and fruits from producers, assemblers/collectors, and wholesalers. The retailers except street vendors do have licences and fixed working place.

Some vegetables such as onion, potato, tomato, pepper, etc. are needed in the hotels and restaurants. The purchasing capacity of the hotels depends on the demand they have, most of the time it ranges from 20 to 30 qt per market day.

d. Wholesalers

Wholesalers purchase from other traders, collectors, or producers. Large buyers some times enter in to a contract farming with the farmer producer.

4.2.2 Opportunities for expansion of the vegetable production

Table 15: Opportunities for expansion of the vegetable production

S/n	Opportunities	Percent
1	Better market demand	33.3
2	Proximity to market	15.6
3	Better price	13.3
4	Better support from experts	8.9
5	Enough water/ different alternatives	15.6
6	It doesn't require more man-power	4.4
7	Production within short time interval	4.4
8	Others (Use of fertilizers, available of different varieties	4.4
Group Total		100.0

Source: Primary data - October 2007.

The survey result shows that 100% of the producers intend to expand Vegetable production. The opportunities they anticipate to realize in the intended plan are given in table 15. Though the entire farmer respondents say that there is an opportunity to expand the vegetable production, the opportunities they obtain differ out from one to other. 33percent of the sample respondents say that the most common opportunity to expand the vegetable production is related to market demand. On the other hand, 15 percent stated that proximity to the market, 15 percent says water accessibility and facility, 13percent said better market, and 4.4 percent stated that they could get production in a shorter time and accessibility of the different fertilizers. It can be inferred that the most common opportunity to expand the vegetable production is related to marketability of the product, proximity to the market and water availability.

4.2.3. Opportunity for expansion of vegetable marketing

Table16: opportunity for expansion of vegetable marketing

Opportunities	Type of vegetables				Group Total
	Tomato	Potato	Onions	Others (pepper, ...)	Percent
	Percent	Percent	Percent	Percent	
Enough water/different alternatives	26.1	29.2	29.6	20.0	27.4
Better production in terms of qty.	21.7	12.5	7.4	6.7	14.0
Better price	8.7	12.5	11.1	20.0	11.3
Better market demand	20.3	22.9	20.4	13.3	20.4
Enough area of land	10.1	6.3	11.1	6.7	9.1
Better variety	7.2	0.0	0.0	0.0	2.7
It doesn't require more man-power	4.3	0.0	9.3	6.7	4.8
Not easily perishable.	0.0	16.7	11.1	26.7	9.7
Proximity to market	1.4	0.0	0.0	0.0	0.5
Group Total	100.0	100.0	100.0	100.0	100.0

Source: Primary data - October 2007

Vegetable marketing has increasing opportunities for expansion. The opportunities may vary according to the nature of the vegetables the farmers are producing.

a. Tomato

As it is displayed in table 16, 26 percent of the sample farmer respondents in the study area have opined that the most common opportunity for tomato market expansion is the availability of water, while 21.7persent, 20.3persent and 32 percent respectively reported improved yield, better market demand, and others like availability of enough land, price of the product, and better verity.

b. Potato

Potato is also one of the most common crops which is mainly grown by the farmers in the study area by use of traditional and modern irrigation system. The respondents were of opinion that they are willing to expand the potato marketing. As it is illustrated in table 16, 29.2 present of the sample farmer respondents in the study area replied that the most common

opportunity for potato market expansion is the availability of water, while 22.9persent, 16.7persent and 31.2 present replied that better market demand, of the product and others like availability of enough land, price of the product, and better variety are the opportunities.

c. Onion

It can be inferred from table 16 that, respondents reported that keeping quality of onion, availability of water, market price and demand of the commodities are the most common opportunities of expansion of onion marketing. It can therefore be concluded that availability of water and demand of the product are the most important opportunities for expansion of the vegetable marketing in the study area.

4.3 Constraints of vegetable production and marketing in Kilte Awlaelo woreda

4.3.1 Production constraints

The land is mostly undulating and vulnerable to soil erosion. Despite the erosive soil, intensive cropping typifies vegetable production in the region. Except for the rare crop deviations, the same vegetables have been planted on the same soil for decades, allowing less time for the soil to regenerate. Intensive cultivation of the land eventually led to depleted soil fertility. Coupled with plant pathological problems, farmers in the province spend huge amounts for manure and chemicals. These bring expenses higher and oftentimes cause losses when vegetable prices are too low to recover production costs. Land degradation and declining land fertility are the biggest concerns of farmers. Erosion caused by the sloppy nature of the land is further induced by the heavy rains on sloping farms and over-cultivation. Soil nutrients get depleted quickly and the top layer does not have time to regenerate before the next cropping season begins anew. Preventive and rehabilitative measures have been taken by concerned local agencies, sometimes in cooperation with foreign donors. The "Soil and Water Conservation Project" of the Department of Agriculture continues to introduce "soil

conservation methods of land utilization" to the woreda farming communities through promotion of organic fertilizer use and trainings.

Traditional farming techniques and slow technology transfers could be behind non-optimum production in the Woreda. Many growers observe only two, instead of three cropping seasons per year because of shortage of water. The demand for more extension activities, like the Department of Agriculture's on-farm demonstration trials and technology dissemination programs is great. The fragmentation of arable land areas into smaller parts indirectly signifies farmers' financial difficulties to operate vegetable production on a larger scale. The availability of production capital is critical in vegetable production particularly in areas with low income growers. In the ideal situation, banks and credit institutions provide financial support for production purposes. In Ethiopia as in Tigray region, the formal agricultural credit market is underdeveloped because many small farmers do not have collateral or the necessary legal documents for their assets. Cooperatives and traders are the most common sources of money because of the quick release of funds, few supporting papers or collateral required, and the flexible terms of payment. Unfortunately, most cooperatives do not accumulate enough money to accommodate farmer-borrowers (cooperative promotion office on the topic of challenges and opportunities of irrigation cooperatives 1997).

4.3.1 Vegetable Production constraints

Table 17: vegetable production constraints

S/n	Constraints	Frequency	Percent
1	Lack of skill & facility to processing	70	45
2	Diseases	41	26
3	Insects	33	21
4	Seed shortage	5	3
5	Weeds	3	2
6	Lack of pesticide	4	2.5
7	Fertilizer shortage	1	1
	Total	156	100

Source: Primary data - October 2007

The constraints of vegetable production could be viewed from the farmers' context, institutional factors, natural factors and transportation related factors.

Vegetable production in the eastern part of Tigray is based on tradition, which is poorly supported by scientific recommendations. Although one can associate this constraint to institutional factors, it is apparent that inadequate farmer skills and knowledge of production and product management affects the supply. Farmers attempt to select varieties and practice traditional crop management practices. Farmers' know-how of product sorting, grading, packing and transporting is traditional, which severely affects the quality of horticultural products supplied to the market.

Institutional factors are related to the provision of improved vegetable production technologies including supply of relevant varieties, agronomic practices and improved product management techniques. The study reveals that the farmers are not receiving the varieties they wish to cultivate. The capacity to distinguish between varieties is also low in the area.

Natural factors such as rainfall, water supply, flood and pests are often beyond the control of farmers and institutions. There is a shortage of irrigation water mainly in the lowland areas.

As indicated in table 17, 45 percent of the sample farmer respondents stated that, the most important constraint in the study area is lack of knowledge in processing, where as 26 percent and 21 percent reacted that diseases and insects are the constraints respectively. Therefore, the most important constraint in the study area is lack of knowledge in processing.

4.3.2 Vegetable marketing constraints

High production costs due to high cost of seeds, equipment, fertilizers and chemicals plague the vegetable sector of the woreda. For instance, locally produced hybrid seeds are more expensive than imported types. This is because of the controlled pollination procedure and breeding work required for their production. In the long run, it may be cheaper for the country to import. Seeds of vegetables like tomato, potato and onion are among the higher priced seeds that are locally available. Many growers borrow water pumps irrigation system because they are too costly to purchase. Unlike in developed countries, cooperatives that jointly purchase machines for the use of its members are not common in the Kilte Awlaelo woreda. Farmers' limited access to production capital is another key issue. Farmers who know they can not pay in cash tend to create selling agreements with the trader-financier for the future harvests. In the region, costs in terms of spoilage and quality loss due to transit are high. The transport issue brings into focus the inadequacy of farm-to-market roads and poor condition of existing ones. (Report of the woreda 1999).

Table 18: Vegetable marketing constraints

S/n	Constraints	Frequency	Percent
1	Lack of market	50	31
2	Low price of products	25	16
3	Lack of storage	35	21.8
4	Lack of transport	25	16
5	Lack of market information	20	12.5
7	Perish ability	5	3
	Total	160	100

Source: Primary data - October 2007

Marketing constraints have been identified from the producers' perspectives and presented in table 18. 31 percent of the respondents pointed out that, market problems are the most important constraints in the study area. 16 percent of the respondents respond that low price of the produces, 21.5 replied lack of storage facility, 16 percent, 12.5 percent and 3 percent replied lack of transport facility, and lack of market information and perishable nature of the products were the constraints respectively. Therefore the major problems the farmer faced in the study area were lack of market followed by lack of storage facility and low price of the produces.

4.4 Examination of the pattern of household decisions in crop and market outlet choices.

4.4.1 Introduction

Farm households make a number of decisions in their daily activities. In cash crop production, households decide which (combination of) cash crop(s) to grow and at which market(s) to sell their crop harvests. Different market outlets that households may consider are selling at the farm-gate, selling at a local market or selling at a central market. Both crop and market outlet choices are household specific and depend on several attributes like household characteristics, farm resource endowments and access to different market outlets. Effective market prices expected at different market outlets and household's ability to transport their produce to these

different market outlets can also affect household crop and market outlet choices (Fafchamps and Hill, 2005).

A farm-gate transaction usually happens when crops are scarce in their supply and highly demanded by merchants or when the harvest is bulk in quantity and inconvenient for farmers to handle and transport to local markets without losing product quality. A large volume of farm-gate transaction also attracts buyers as it helps to get fresh products with more homogeneous quality. For crops like tomato, farm-gate transactions are important as grading and packing are done on the farm under the supervision of the buyer. Therefore, households are expected to base their crop choice on their production capacity, their ability to transport the harvest themselves and their preferred market outlet.

At first glance, crop specific market outlet choice seems a post harvest decision in its nature. However, it could also be decided when farmland is allocated to a specific crop during or before a planting period. The larger the area a household allocates to a given crop, the higher the quantity of harvest expected and the higher the cost of transportation to a local market. Thus, households might consider growing a specific crop relatively on a larger area if they expect that they can sell the crop harvest at the farm-gate. Such considerations are important especially in fresh vegetable production in the absence of storage facilities that could help to spread the selling over time with a minimum loss in quality.

From these premises we can formulate the hypothesis that crop and market outlet choices at a farm household level are interdependent. Examining the interaction between crop and market outlet choice is the core of this chapter. Understanding farm household behaviour in crop and market outlet choice interaction helps to develop market outlets that could bring maximum benefit to households through orienting household resource use towards specific crop types with relatively higher income per unit of resource used.

Moreover, different market outlets require different types of production and marketing chain arrangements. For instance, compared to the shallow local market that does not allow larger volume of supply of a given crop at a time, farm-gate and central market transactions require a larger volume of vegetable supply. The underlying difference in the nature of market outlets and household's preference for different production and marketing chain arrangements explain the level of households' commercialisation. Thus, examining the relationship between crop and market outlet choices at household level helps to understand the process of agricultural commercialisation.

For this sub section two types of analyses were done. These are descriptive and chi square

4.4.1.1 Analytical models

When there are alternatives to choose from, economic theory tells that agents choose what maximizes their expected utility given the existing situations. However, how these choices are made in time is usually not considered. Some choices are made jointly whereas others are made in successive steps considering all information on the previous decisions. With particular attention to crop and market outlet choices, farm households may successively decide on the crops to be grown, size of farmland allocated to each crop chosen and where to sell the expected crop harvest. Alternatively, households may decide on which vegetables to grow, farmland allocation and market outlet jointly and simultaneously.

Chi-square analysis of relationship between crop type and market outlet choice is considered in this analysis. In addition, the model in which households first decide on the allocation of farmland across vegetable crops they would like to grow and then, when the crops are ready for marketing, choose a market outlet. In choosing a market outlet, different factors are considered including the size of farmland allocated to a specific vegetable crop. This model that assumes household decisions on the size of farmland allocation to a particular crop and

market outlet choice to sell the specific crop are jointly made before or during a planting period. Detailed specifications for the models are presented below

4.4.1.2 Data and empirical specification

Household survey data collected from the study area in the woreda is used for this analysis. The survey includes a sample of 162 farm households: Vegetable products from the area are mainly sold at the farm gate if the quantity is too small, if not, it is transported to the Wukro and Mekelle market according to the quantity of the product.

4.4.2 Crop choice and land allocation across vegetable crops

Table 19: Number of growers and farm size

Vegetable type	Number of growers		Area allocated (ha)
	Count	Percent	
Tomato	54	27	0.257
Potato	40	20	0.15
Onion	25	12	0.15
Cabbage	27	13.5	0.10
Pepper	55	27.5	0.25
Total	201	100	

Source: Primary data - October 2007

Of the total sample households in the study area, 27% of them grow tomatoes on an average plot size of 0.257 per household. While potato growers are 20 percent with average land size of 0.17 ha, onion growers are 12 percent with the area coverage of 0.17 ha; cabbage and pepper growers are 17.5 percent and 27.5 percent with the area coverage of 0.10 and 0.25 respectively. In the study area tomato and pepper are widely grown in terms of area coverage and number of growers. Tomato and pepper are grown by 27% and 27.5 of the sample households and, on average, 0.257 ha and 0.25 ha respectively. Table 19 gives the number of growers and area allocated to each type of vegetable crop per household.

Households either produce a single vegetable crop or a combination of them at the same time. The sample households are drawn from a population of households growing vegetables for cash income purpose and all the sample households produce at least one vegetable crop

4.4.3 Market outlet choice

Table: 20 Share of each crop marketed at different market outlets

Vegetable type	No. producers	Farm level market (%)	Wukro market (%)	Mekelle market (%)
Tomato	54	10.76	74.23	15
Potato	40	7.54	80.23	12
Onion	25	11.5	84	4.5
Cabbage	27	30.53	60.48	8.91
Pepper	55	13.23	76.78	10.1

Source: Primary data - October 2007

Households use a combination of both local market and farm-gate transactions in order to sell their vegetable products, though the share of products marketed at farm-gate and the other differs with crops. Tomato, potato and onion at the study area are mostly traded 74.23% 80.23% and 84% at Wukro market respectively, in addition cabbage and pepper are also traded 60.48%, and 76.7% at Wukro market respectively. Almost all vegetables grown are mostly traded at the Wukro market, i.e. farmers have to transport their vegetable harvested to the local market or to vegetable assemblers located at Wukro town. As seen in table 20.

4.4.3.1 Choice of explanatory variables

Several factors could affect household decisions in area of farmland allocation across different crops and where to sell their products. But the most important thing which can influence the decision of household is the availability of land and the quantity they produce. Market outlet choice could be affected by the availability of markets at farm-gate and household's capability to transport vegetable harvests to local market. Moreover, outlet choice

could also be mainly affected by quantity of the harvest available for marketing, which is a function of area allocated for a given crop.

4.4.3.2 Estimation results

The overall estimation of results show that there is simultaneity between quantity of crop production and market outlet choice decisions (table 21, 22, 23). The effect of outlet choice on the size of crop production is significant in the case of potato, onion and tomato.

Table 21Results of Chi-square Analysis: Market outlet selected vs. quantity sold (Potato)

Market Outlet	Quantity sold			
	below 1 Qtl	1-50 Qtl	50 or more Qtl	Total
Farm gate	14 (4.60)	0 (4.50)	0 (4.91)	14
Mekelle	0 (16.42)	2 (16.06)	48 (17.52)	50
Wukro	31 (23.98)	42 (23.45)	0 (25.58)	73
Total	45	44	48	137

Chi-Square = 152.709, DF = 4, P-Value = 0.000

Table 22 Results of Chi-square Analysis: Market outlet selected vs. quantity sold (Onion)

Market Outlet	Quantity sold			Total
	below 1 Qtl	1-50 Qtl	50 or more Qtl	
Farm gate	25	0	0	25
	(8.97)	(11.21)	(4.83)	
Mekelle	0	12	28	40
	(14.34)	(17.93)	(7.72)	
Wukro	27	53	0	80
	(28.69)	(35.86)	(15.45)	
Total	52	65	28	145

Chi-Square (x_2= 137.980, DF = 4, P-Value = 0.000

Table 23 Results of Chi-square Analysis: Market outlet selected vs. quantity sold (Tomato)

Market Outlet	Quantity sold			
	below 1 Qtl	1-50 Qtl	50 or more Qtl	Total
Farm gate	40 (18.16)	1 (12.97)	0 (9.86)	41
Mekelle	0 (16.39)	9 (11.71)	28 (8.90)	37
Wukro	30 (35.44)	40 (25.32)	10 (19.24)	80
Total	70	50	38	158

Chi-Square = 118.971, DF = 4, P-Value = 0.000

The p-value shown in the table 21, 22, 23 (p = 0.000) shows the existence of statistical evidence that market outlet choice and quantity produced (Potato, Onion and Tomato) are associated (are dependent on each other). The direction of the relationship is that when a person produces less than 1 quintal, he/she would like to sell the produce at farm gate market. If the production is 1-50 quintals, the farmers would like to sell their produces at Wukro market. It is also clear that when the quantity of produce goes beyond 50 quintals, the producers choose to go to Mekelle market.

Farm households make a number of decisions in their farm management and marketing practices. What size of farmland to allocate to a given crop and where to sell the crop harvest are few of the production and marketing decisions made at household level. These two

decisions are the central decisions when crops are particularly produced for marketing purpose. Based on different situations, households might decide on two of them consecutively or at the same time.

This shows whether there is an interaction between the quantity of crop production and decisions of market outlet choices at the farm-household level. From the results it is revealed that size of crop production is related to decisions of market outlet choices for potato, onion and tomato crops.

As noticed in the table 21, 22, and 23, the quantity of the production has a great role in the selection of the market outlet. If farmers do have a production of less than 1qt and in between of 1qt and 50qt they prefer to sale their product at farm gate market and at wukro market respectively, if it is beyond 50qt, they are transporting to Mekelle market.

4.5 production and marketing performance of the Woreda

4.5.1 Production performance

4.5.1.1 Farmers' production performance

Agricultural products are usually measured by weight or volume. An immediate question arises as to how best to combine different agricultural products since summing over weights or volumes is not very meaningful. One approach when dealing with crops is to convert them to a common physical unit, such as wheat units (Hayami and Ruttan, 1985; Block 1994). More commonly, aggregate output in agriculture is measured in monetary units as the sum of the value of all production in the agricultural sector minus the value of intermediate inputs originating within the agricultural sector. Both cash and non-cash (barter, trade and self-consumption) transactions of final products should be included. This is referred to as "final output" and differs from agricultural GDP by not subtracting out the value of non-agricultural inputs (Rao, 1993). In other words, final output is the amount of agricultural output available

for the rest of the economy, while agricultural GDP measures the net contribution of agriculture to the GDP of a country.

Table24: Area cultivated & total production (20003 – 20007)

Year	total Production generated(qt)					
	Onion	% growth	Tomato	% growth	Potato	% growth
2002/03	729		17000		2349,6	
2003/04	2475	240%	59450	250%	3445	47%
2004/05	5643	128%	112250	89%	5740	67%
2005/06	5320	-6%	84210	-25%	4350	-24%
2006/07	15225	186%	151200	80%	16625,2	282%

Source: Woreda Agriculture and Rural development Office report (20003 – 20007)

Vegetable production is increasing from time to time in the woreda. As it is presented in the above table, there is a growth in the three vegetable crops during the last years even though the change in growth varies. The highest change noted for the three productions was by 2003/4. The woreda officials were asked why there was a greater change during this year and they replied that, aggressive promotion was made on this time to change the attitude of farmers and in addition there was a better market for vegetable than that of cereals.

Figure 7: Trends in Production of Vegetables
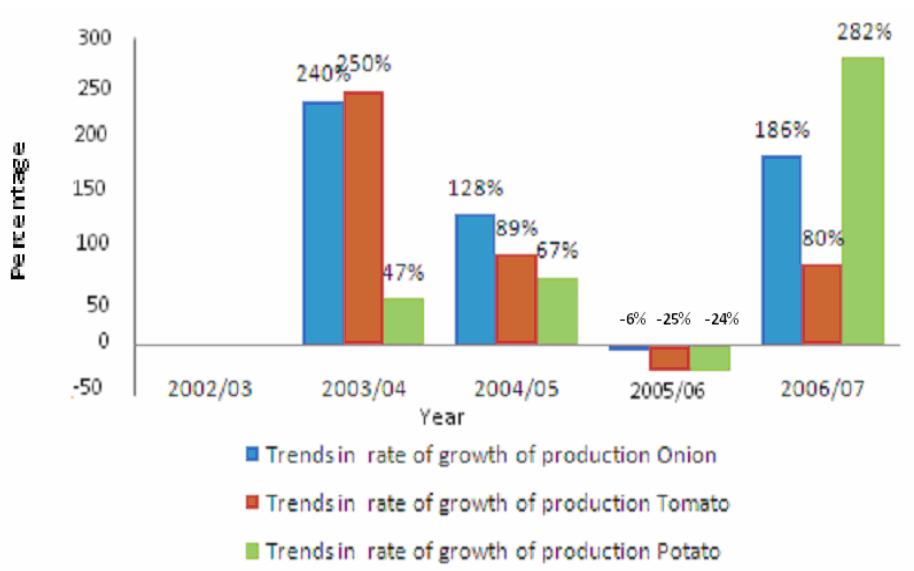
The figure shows clearly how much vegetable production increases from year to year. The very important thing is not to show the percentage change from time to time, if not supported how it grows. It is very important to identify the factors which can influence the vegetable production. The output and productivity of vegetables, is affected by the difference in an on-farm adoption of improved seed, Fertilizer input, agro-ecology, soil fertility, loan, price of the product, and other socioeconomic factors which can cause the differences in the performance of the production. Therefore multiple regression analysis was used to identify the factors which influence the productivity of vegetable products in the study area

This study is intended to analyze which and how much the hypothesized regressors are influenced in the production of the vegetable in the study area. As already noted, the dependent variable is a dummy variable, which took a value zero or one. However, the independent variables are of both types, that is, continuous or categorical.

Therefore, the multiple regression models are specified as follows:

$$Y = b_o + b_1 x_1 + b_2 x_2 + \ldots\ldots\ldots\ldots\ldots\ldots b_k x_k + \epsilon \ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where: Y = represents the dependent variable

b_o = denotes the intercept of the regression plane which is constant.

b_j, j = 0,1,……k, are called the regression coefficients

x_1, x_2…..x_k = refers to the repressor variables

ϵ = is the error or deviation between y value and the expected value of y given by

$b_o + b_1x_1 + b_2x_2 +………………..b_kx_k$

It is a multiple linear regression model with k repressors. The parameters b_j , j= 0,1,….k, are called the regression coefficients. This model describes a hyper plane in the k-dimensional space of the repressor variables x_j. The parameter b_j represents the expected change in the response y per unit change in x_j when all the remaining regressor variables x_i (i ≠ j) are held constant. For this reason the parameters b_j , $j = 1,2,....k$, are often called *partial* regression coefficients.

Multiple linear regression models are often used as approximating function. That is, the true functional relationship between y and x_1, x_2,..…x_k is unknown, but over certain ranges of the regressor variables the linear regression model is an adequate approximation.

Test for Significance of Regression.

In multiple regression problems, certain tests of hypothesis about the model parameter are useful in measuring model adequacy. The test for significance of regression is a test to determine if there is a linear relationship between the response y and any of the regressor variables x_1, x_2, …..x_k. Separate tests of the null hypothesis that individual coefficients are zero can be computed using t-test of the multiple linear regression models (Gujarati, 1988). This test can be used to see the statistical significance of each coefficient. An overall test of the null hypothesis that all the parameters associated with the explanatory variables in these models are equal to zero is an F-test based on the OLS estimation procedure. The Chi-square

tests the null hypothesis that the coefficients for all terms in the current model except the constant are zero.

The appropriate hypotheses are:

$$H_{o:} b_1 = b_2 = ...b_k = 0$$

$$H_{1:} b_j \neq 0 \text{ for at least one } j.................................(2)$$

Rejection of Ho in the above hypothesis implies that at least one of the regressors x_1, x_2........x_k contributes significantly to the model

Coefficient of Multiple Determinations

The coefficient of multiple determinations R^2 is defined as

$$R2 = SS_R/S_{yy} ....(3)$$

The multiple coefficient of determination represents the percentage of variability in y that is explained by the estimated regression equation. We have $0 < R^2 < 1$ as in the case of simple regression case. However, a large value of R^2 does not necessarily imply that the regression model is a good one. Adding a regressor to the model will always increase R2 regardless of whether or not the additional regressor contributes to the model. Thus it is possible for models that have large values of R^2 to perform poorly in prediction or estimation.

The positive square root of R^2 is the multiple correlation coefficient between y and the set of regressor variables $x_1, x_2,.....x_k.$ That is, R is a measure of the linear association between y and $x_1, x_2, ...x_k.$

The functional relationship between the probability of improvement productivity and explanatory variables is specified as follows:

$$Y = b_o + b_1x_1 + b_2x_2 +.............................b_kx_k + \epsilon............ (4)$$

Where: Y is average yearly vegetable production of respondents

b_o is Constant or intercept

$b_1, b_2,....................b_k$ refers Regression coefficients

$x_1, x_2\ldots\ldots\ldots\ldots x_k$ refers vector of explanatory variables that include: age family size, input utilization, loan, extension service availability, oxen availability, cart owned, and others.

4.5.1.2 Empirical result

Based on equations presented, estimated results for factors which are highly influenced to the production of the vegetable are presented in this section.

The model estimation result in table 25 show that, for household production in the study area, is positively influenced by extension service, number of oxen owned, amount of fertilizer used, and family size and is negatively influenced by farm size.

Table 25   Pearson Correlation coefficient – of the production and the other variables

Model	Un standardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	194.4	742		0.262	0.799
Age	-13.8	11	-0.06	-1.26	0.237
No of extension services	1042.4	412	0.5	2.53	**0.032**
No of oxen owned	962	355	0.3	2.71	**0.024**
Amount of fertilizer used 1999	41	11	0.45	3.76	**0.004**
Farm size	-2098	608	-3.6	-3.45	**0.007**
Amount of credit during 1999	-0.903	0.6	-0.31	-1.46	0.178
Amount of pesticide used in 1999	-109.5	112	-0.19	-0.97	0.355
Amount of selected seed in 1999	67.6	96	0.30	0.7	0.502
No cart owned	-253	310	-0.046	-0.815	0.436
Family size	2163	667	3.61	3.241	**0.010**

a. Dependent Variable: vegetable production

1. The p-value of the independent variable *extension services availability* is less than the chosen 5% level of significance (0.032<0.05). This indicates the fact that availability of extension service has a significant effect on vegetable production. Specifically,

when number of extension service increases by 1 unit, vegetable production per hectare increases by 1042.36 kilograms.

2. The p-value of the independent variable number of oxen owned by the farmers is less than the chosen 5% level of significance (0.024 < 0.05). This shows that the independent variable (number of oxen) has an influence on the dependent variable (vegetable production). More specifically when the farmer increased one ox, vegetable production can be increased by 961.9qtls per hectare.

3. The p-value of the independent variable amount of fertilizer used by farmers is less than chosen 5% level of significance (0,004 < 0.05). This indicates the fact that utilization of fertilizer does have a significant effect on vegetable production. Specifically, when number of fertilizer utilization is increased by 1 quintal, vegetable production per hectare can increases by 40.794 kilograms.

4. The p-value of the independent variable land size owned by the farmers is less than the chosen 10% level of significance (0,007 < 0.10). This shows that the independent variable (farm size) has an influence on the dependent variable (vegetable production). More specifically when the farmer increased to utilize one hectare of land for vegetable production, the yield of vegetable production can decrease by 2098.230 quintal per hectare.

It is possible to conclude that, farm households that get more extension service, own more oxen, utilized appropriate fertilizer and do having more productive labour force can increase production and productivity of the vegetables. But as it can be observed from the above table, when the house hold farmer is rising to cultivate an additional hectare of land, it can increase the total production but its efficiency will reduce. From every additional one hectare of land there will be a reduction of almost 21qt. This could be due to negligible managerial effort, lack of adequate water and lack of enough labour in the additional area cultivated.

4.5.2 Marketing efficiency

Prices play an important role in markets. In neo-classical economic theory, prices, together with other economic factors, coordinate the actions of buyers and sellers in the market by influencing production and consumption decisions (Tomek and Robinson, 1990). Costs, sales and income are measured of market performance used in the SCP approach. The objective of the succeeding sections is to assess the performance of farmers in the physical markets.

A case study was conducted to measure the efficiency of the production in the study area. The information about cost and yield were obtained from the survey area and were derived without holding for type of marketing arrangement used. The costs incurred by farmers for the crops they produced in the season were studied. Although the vegetable types and their production specifics vary, the values give an idea of the way farmers allocate production costs at the farm level. The calculation was made by taking a representative of average farmers who produce three different products in the same season at the same site. The products selected were Tomato, potato and onion in the same area which is in Genfel Tabia.

4.5.2.1Cost of production

Table 26 Cost of Production of the selected vegetables in 0.25ha

Description	Onion production		potato production		Tomato production	
	Physical Q	Value in birr	Physical Q	Value in birr	Physical Q	Value in birr
Area	0.25 ha		0.25 ha		0.25 ha	
Irrigation cost		300,00		250,00		250,00
Fertilizer						
DAP	0.5q	200,00	0.5q	200,00	0.5q	200,00
urea	0.5q	175,00	0.5q	175,00	0.5q	175,00
Cost for fertilizer		375,00		375,00		375,00
Labour cost		850,00		494,00		600,00
pesticide		70,00		80,00		85,00
Deprecation		180,00		220,00		220,00
Seed		250,00		250,00		260,00
Total variable cost		2400,00		2044,00		2165,00
Unit cost per ha		9600,00		8176,00		8660,00
Unit cost per qt		73,80		58,40		57,70
Yield(qt/ha)	130		140		150	

Source: Primary data - October 2007

Shown in the above table are the costs incurred by farmers for the crops they produced in the season that was covered by the survey. Although the vegetable types and their production specifics vary, the values give an idea of the way farmers allocate production costs at the farm level. Farmers in the study area who cultivated 0.25 ha of onion, potato and tomato in the survey time at the same site which is in Genfel incurred a cost of 73.8 birr, 58.4 birr, and 57.7birr per quintal respectively. This covers expenses for planting materials, maintenance, irrigation, hired labour, fertilizer and chemicals, tools and machinery. This cost excludes the marketing cost (transportation cost, lading unloading, and other costs).

4.5.2.2 Farmer sale sand income (different products at a different market centre)

Farmers are selling their products at different times and places to get more benefit out of it.

The data in the following table shows that, the different commodities sold at the different

market centres and their values.

Table 27: Production and marketing efficiency at different market

Identification	Parameters	Onion		Potato		Tomato	
		Value at Wukro	Value at Mekelle	Value at Wukro	Value at Mekelle	Value at Wukro	Value at Mekelle
a	Production by qt	32.5	32.5	35	35	37.5	37.5
b	Price (birr/qt)	250	200	175	190	100	140
c (a X b)	Income	8125	6500	6125	6650	3750	5250
d	Total cost	2400	2400	2044	2044	2044	2044
e =(c - d)	Gross margin	5725	4100	4081	4606	1706	3206
f (e/area)	Gross margin/ha	22900	16400	16324	18424	6824	12824
g	Transport cost to Wukro and Mekelle	162.5	325	175	350	187.5	375
h	Loading un loading	65	65	70	70	75	75
i (g + h)	Total market cost	227.5	490	245	420	262	450
j (e – I)	Gross profit	5497,5	3610	3836	4186	1444	2756
k (j/area)	Profit per ha	21990	14440	15344	16744	5776	11024
l (j/a)	Profit per qt	169,15	111	109,6	119,6	38,5	73,5

Source: Primary data - October 2007

Marketing margins are defined as the difference between prices paid at different stages of the

marketing process. It is the starting point in evaluating market margin. Marketing margins

include among others, costs for packing, transportation, and storage. Normally, margins

should behave constantly over homogeneous products over time even as the quantity

exchanged is varying (Tomek and Robinson, 1990). Within the woreda, we can distinguish a margin between the Wukro centre and Mekelle market. The total margin is measured between the prices growers received at the market and the prices consumers paid to the retailer. Table 27 shows the evaluation of the margins for different products (onion, potato, tomato) at different market places (Wukro and Mekelle) per qt basis.

Market prices were recorded during the data gathering stage. It was observed that mean farm gate prices for the top three traded vegetables (onion, potato, and tomato) are generally lower than retail prices. The average farm price is normally at 75% of the retail price of onion, potato, and tomato. During the survey it was observed that, buying offers varied within the same crop in the two market centres (Wukro and Mekelle). For example, in the case of onion, potatoes and tomato, Wukro market price was 250 birr, 175birr, 100 birr per qt respectively.

4.5.2.2 Margin of the three products at the different market

a. Onion

The profit per ha of onion if sold at Wukro market is Birr 21990 and if the product is sold at Mekelle the profit will be Birr 14440. Selling the product at Mekelle, however, reduced the farmers' profit by 34 percent.

b. Potato

The profit per ha of potato if sold at Wukro market is Birr 15344 and if the product is sold at Mekelle the profit will be Birr 16744. Selling the product at Mekelle, however, increased the farmers' profit by 9.1 percent

c. Tomato

The profit per ha of potato if sold at Wukro market is Birr 5776 and if the product is sold at Mekelle the profit will be Birr 11024. Selling the product at Mekelle, however, increased the farmers' profit by 90 percent

Conclusion

During the survey time the profit of onion per ha was far better in comparing to the others. But the profit of onion was also very attractive if it was sold at the local market which is Wukro market. When we consider potato and tomato, they were less profitable than that of onion but if they are sold at Mekelle market they could have increased the profit of farmers by 9.1percent.

4.5.3 Price Analysis

Prices of horticultural products show significant variations depending on the supply situation. During harvesting time, the price falls quite significantly.

Table.28. Average price in Birr of vegetable products (2006)

Crop	Sep	Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug
Tomato	4.8	3.88	2.9	1.8	2	2.5	2.5	2.6	2.51	2.57	288	4.45
Onion	3.38	2.94	3	3	4.6	4.88	3.95	2.9	3.12	2.93	2.9	3
Potato	2.2	2.34	1.95	2	2.3	2.57	2.88	2.7	2.36	2.38	2.38	2.3

Source: Woreda Agriculture and Rural development Office report (2006),

Farmers are denied their legitimate share in the consumers birr due to imperfection in the marketing system, aggravated by uncertainty in prices. Stable price situation helps in improving the marketing system to the benefit of producers. Hence the coefficient of variation (measure of price instability or the coefficient of variation is the standard deviation of a data set, divided by the mean of the same data set) is calculated for the vegetables that grow in the area in order to evaluate how the prices of tomatoes are instable. As indicted in the table .28, the price of tomatoes are found more unstable (the variation in prices around mean was 32 %) as compared to other vegetables sold in the market.

Figure 8: Variations in Price of Vegetables
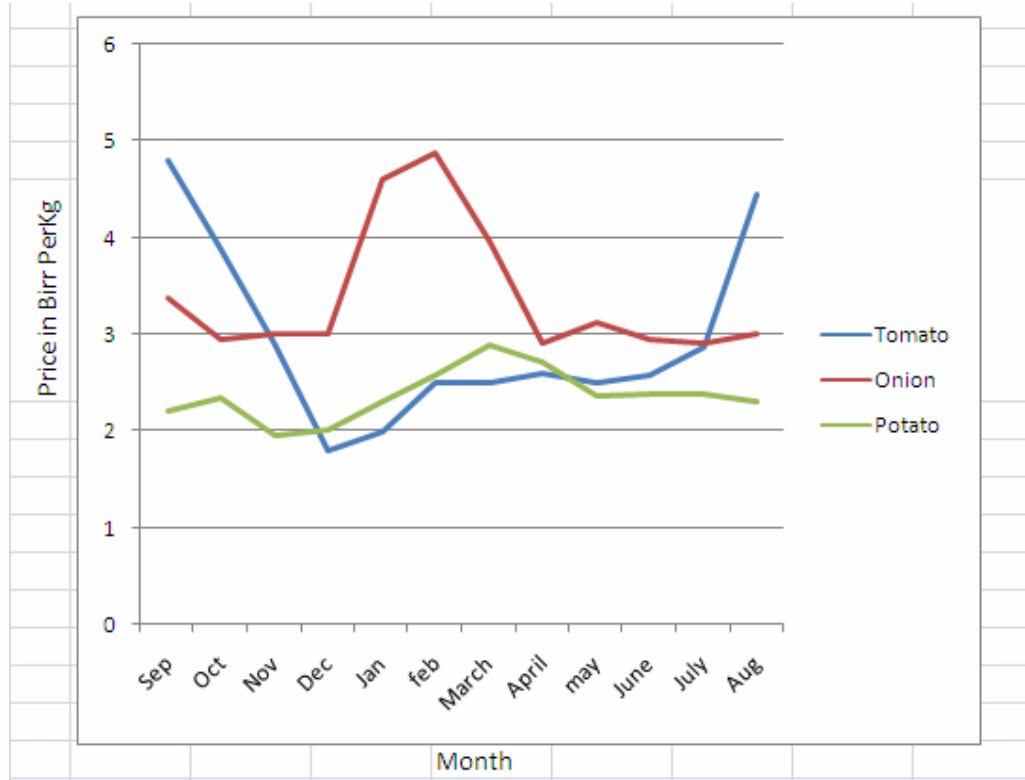
4.5.3.1 MARKETING MARGINS

The marketing margin may fluctuate due to perishable quality of the product, the number and levels of participants in the marketing channel, the marketing service provided, and the risk and uncertainty born by each of the market participants (Scott, 1995). In this analysis, the overall tomato, potato and onion marketing margins are computed for four market actors in one market centre (Wukro): Producers, wholesalers, retailer and consumers.

Table 29 Marketing gross profit (Birr/qt)

Stakeholder		Price at different market channel		
		Onion	Potato	Tomato
		Value at Wukro	Value at Wukro	Value at Mekelle
Producer	Price given to farmer at farm get	200	140	75
	Transport cost to Wukro	+5	+5	+5
	Loading un loading	+2	+2	+2
Total cost for wholesalers		207	147	82
Wholesaler	Wholesalers price	235	155	90
	Wholesaler Gross profit	28	8	8
	Purchase price for retiles	235	163	90
	Lording unloosing cost	+2	+2	+2
	Total cost for retailers	237	165	92
	Selling price of the retailers (consumer purchasing price)	268	185	125
	retailers Gross profit	31	20	33

Source: Primary data - October 2007

The gross profit reflects the benefits the marketing agent/actor generates by participating in the product flow or the marketing system. The buyer (Wholesaler and retailers) encounters additional costs of transporting the commodities from the points of production to the next buyer. In this case, the wholesaler makes a margin of Birr 28.8 and 8 Birr from marketing a

quintal of onion, potato and tomato respectively. These prices are actual prices estimated by the wholesalers in the respective areas. Retailers also get a gross profit of Birr 31, 20 and 33 from the respective products. The gross profit appeared inflated because the cost structure did not consider weight and damaged cost encored as the result of extended shelf life.

4.5.4 MARKET FACILITIES/INFRASTRUCTURE

4.5.4.1 Transportation

Table: 30 Means of transportation for vegetable products.

Means of transport for vegetable products	Percent
On donkey	55
Vehicle	25
local cart	20
Group Total	100.0%

Source: Primary data - October 2007

Most of the *woredas* in the study area are served by a rough/rock and all-weather secondary road that connects the *woreda* towns to Wukro asphalt road.

Most of the production sites in the rural areas are not accessible by car during the rainy season. 55 percent of the farmers use donkeys to transport their products to the market centre, while 25percent and 20 percent use vehicles and local cart to transport vegetables to the nearby collection centres. Transporting irrigated vegetables is much easier since the harvest occurs during the dry season and the traders use Isuzu, which are capable of travelling and transporting the vegetables to the market centres. To conclude, most of the farmers use donkey to transport their products to the different market centres.

4.5.4.2Storage

Almost all the farmers used ordinary rooms for storage with ground/soil floor and with no shelves. The storage facilities are in poor conditions. Cooling and preservation systems are unavailable, and perhaps unaffordable. After harvest, the commodities are directly spread on

the floor and this created the quality problem to the product. Some of the mechanisms include keeping product on soiled floor, with no exposure to air and sunlight.

Vegetables are harvested by many farmers at a similar period. Therefore, the supply increases and the price declines. On the other hand, the post harvest handling is very poor. The farmers' complained that their major problem or constraint is low price followed by less demand of the product. Therefore it is true that if farmers can produce at the same time and if they don't have an adequate storage facility for it, there might not be enough market to sell. As the result, 91percent of the sample farmers complained about the lack of appropriate technology and know-how for post harvest vegetable management to allow them a gain from price changes.

To conclude, inadequate improved storage facilities leads farmers to keep their product only for short period of time.

4.5.4.3 Grading, standardization and packaging

Table 31: ways of grading vegetable products

Ways of grading	Count	Percent
Color	4	2.5
Weight	2	1.3
Size	14	8.8
All	140	87.5
Group Total	160	100.0

Source: Primary data - October 2007

Farmers were asked whether they have a mechanism to grade their product or not, 98 percent of the total farmers' responded that they have the mechanism to grade their products while 2 percent don't have. As noticed in table 31, the mechanisms they use to grade their products are colour, size and weight.

4.5.4.4 Financing

Table 32 Rural credit

Is it difficult to get credit from rural financial institutions	Yes	23.0%
	No	77.0%
Have you ever got any rural credit	Yes	93.2%
	No	6.8%
Avg. amount of money that you have got	Mean	4141.51
Avg. amount of interest rate	Mean	.09
View on the amount of interest rate	Fare	63.6%
	Moderate	13.3%
	Expensive	21.7%
	Highly expensive	1.4%
View on the payback period	Medium	63.6%
	Long	4.9%
	Too short	9.1%
	Fair	22.4%

Source: Primary data - October 2007

The farmers who grow vegetables are financed through different mechanisms. Farmers were asked whether there is difficulty to get loan or not, 77 percent of the sample respondents reported that they don't have any problem in getting loan from the different sources while the 23 percent do have a problem. In addition, 93.2 percent of the sample respondents get loan on an average of 4141.53 birr where the 6.8 percent are not. 63.6 percent of the farmers viewed that the interest rate was fare whereas 0.09 percent, 13.3 percent, 21.7 percent opined that it was minimum, moderate, and expensive respectively.

4.5.4.5 Market information

Table 33: Mechanism of getting market information

Mechanism of getting market information	Count	Percent
Media (radio & TV)	21	14.1
Friends	42	28
Government agencies	2	1.5
Self observation	64	43
Retailers	20	13.4
Group Total	149	100.0%

Source: Primary data - October 2007

As it is indicated in the table33, 43 percent of the respondents got information by their own observation in the market, while 14.1 percent of the total sample population got information from media, 28 percent, 1.3 percent , and 13.4 percent are getting information from friends, government , and retailers. It is possible to farmers to get information by their own effort. The majority of farmers become aware of the price upon their arrival at the market place

Farmers were asked whether they have equal information with the traders or not, 95 percent of the farmers respond as they don't have equal information with the traders in the central market. Farmers are facing problems by the absence of the market information among others about selling their produces at cheaper price and some times also they bring products which do not have a demand at that time and they can not sell it at all.

Table 34: Determining factors of the price of vegetable products in the market

Stack holders	Count	Percent
Producer	28	17.4
Wholesaler	70	43
Retailer	40	25
Demand & supply	23	14
Group Total	161	100.0

Source: Primary data - October 2007

When, producers were asked who is the decision maker with respect to price in the market, 17.4 percent responded that the farmer producer is the decision maker on the prices, where as 43 percent reported that the decision maker of the price in the market is the wholesaler, 25 percent and 14 percent of the sample respondents stated that retailers and demand and supply decided the price in the market respectively. Therefore, most of the time farmer producers are the price takers.

4.5.5 PRODUCTION PARTICIPATION

Production of vegetable crops is the responsibility of the household in general. In the study area, land preparation, planting, fertilizer application and irrigation are often done by men. Women play a great role in providing the labour force and assist in weeding, harvesting and transporting.

The survey result also shows that both men and women share the responsibility of producing and selling of vegetable crops often equally.

4.5.6 MARKETING DECISION

The decision to sell valuable agricultural products and control the income generated from the sales of the products is a question of right. In the study area, men and women appear to make decisions regarding the sale of horticultural products. The entire sample indicates that men decide on who should sell horticultural crops while more than 90% of the respondents indicated that women also participate in decision making regarding who should sell the products. But only 35% of the respondents indicated that children are involved in decision making regarding who should sell the product.

The result confirms the fact that women sell smaller quantities of vegetables to purchase items needed for the household while men sell these products in larger quantities

4.6 The role of multipurpose cooperatives in vegetable marketing

4.6.1 Introduction

In this section the writer examines the role of cooperatives in the vegetable marketing in the study area. This section focuses on the performance of multipurpose cooperatives in production and marketing of vegetables. The cooperatives were studied to know whether they provide services like storage, loan, training, transportation, collection and selling of produces and inputs to the farmers or not? The levels that are analysed here are connected to, and serve as the jump-off point for the more specialised analysis that is done later. The purpose is to give the reader not only a general impression of the overall agricultural cooperative situation in the study area, but provides the farmers' perception about the cooperatives.

4.6.2 Membership of cooperatives

Table: 35 Membership of cooperatives.

		Count	Percent
Are you a member of any cooperatives	Yes	116	78.9
	No	31	21.1
Group Total		147	100.0
	Multipurpose and irrigation	94	81

What type of cooperatives (for members)	Saving and credit	22	19
Group Total		116	100.0

As it revealed in the table35, 78.9 percent of the sample respondents are members of cooperatives, where as 21.1 are not. It is true that there are different types of cooperatives and farmers are free to choose which cooperative to join according to theirs needs and preferences as far as they fulfil the rules and regulation of the cooperative bylaw. Accordingly out of the total 94 house holds they are members of the multipurpose cooperatives at the same time they are also members in the irrigation cooperatives. To infer, most of the farmers are members of multipurpose or irrigation cooperatives.

4.6.3 Role of multipurpose cooperatives

Table 36: Role of multi-purpose cooperatives in vegetable marketing

Role of the cooperatives	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Group Total
	Percent	Percent	Percent	Percent	Percent	Percent
Are playing an important role in provision of credit	95	4.1	0	0.98	0	100.0
Are playing an important role in supply of inputs	5	25	0	60	10	100.0
Are playing an important role in transportation facility	91	9	0	0	0	100.0
Are playing an important role in storage facility	99	0.9	0	0	0	100.0
Are playing an important role in provision of information	98.3	1.6	0	0	0	100.0
Are playing an important role in processing facility	991	1	0	0	0	100.0

The most successful type of cooperative, measured by market share, is the agricultural cooperative. Ever since the industrial revolution turned them into producers of food for distant markets rather than just for local consumption, farmers have needed to take control over three processes: farm inputs (such as fertilizer, seeds and livestock); marketing of the produce; and food processing to add value to the product. They have also needed a supply of credit, to smooth out the seasonal variability in farm incomes. Without a strong membership organization to meet their needs, farmers are reliant on intermediaries, merchants who often find it easy to exploit them (particularly when they supply credit in exchange for produce or have control over transport systems).

Credit

Credit is very important to the vegetable growers for they can not directly buy the agricultural input from the market. In addition to this they don't have a financial capacity to buy the agricultural inputs. As inferred in table 36, most of farmer respondents in the study area do not get loan from multipurpose cooperatives.

Agricultural input

As it is noticed in table 36, 70 percent of respondents pointed out that, they got agricultural inputs from multipurpose cooperatives, while 30 did not.

Transportation, storage and information and processing

As it is inferred in table 36, almost all sample respondents viewed that they don't get transportation facility , storage facility, information and processing facility from the multipurpose cooperatives in the study area.

It is possible to conclude that the multipurpose cooperatives are not significantly supporting the vegetable growers in the study area.

4.6.4 Suggestions for improvement of the cooperatives

There were a lot of suggestion which was given by the farmers and woreda officials in how the cooperatives can improve their serves, but for simplicity the writer has organized as follows

Table 37: suggestion for improvement of cooperatives

S/n	Suggestions	Frequency	Percent
1	New technology has to be introduced to the cooperatives.	60	37.5
2	Technical assistance and business counselling	40	25
3	Collecting the vegetable product directly from the farmers and providing also input to the farmers	25	16.5
4	Provision of facilities like credit, market information and others	5	3
5	Training, enhancing the management capacity of elected leaders and awareness of members	30	19
	Total	160	100

Source: Own survey - October 2007

There was a lot of suggestion which was given by the respondents (both the farmer and the officials of the woreda) but the above mentioned in table are the most common ones. As noticed in the above table, 37.5 percent of the respondents say new technology has to be introduced to the cooperatives, 25 percent responds that advisory service on technical assistance and business plan development has be given to the cooperatives for improving their economic performance, 16.5 percent said the cooperatives should be capacitated to collect the farmers' product and to supply farmers the necessary agricultural inputs, and 3 percent and 19

percent respectively say that cooperatives should be helped in order to provide different facilities like credit, transportation, and market information, and training should be given to the elected leaders and members.

CHAPTER V

5.1 CONCLUSIONS AND RECOMMENDATIONS

5.1.1 Limitation of the Study

Marketing of vegetable products in the eastern part of the Tigray (Kilte-Awlaelo) extends to markets in the neighbouring market centres Mekelle, Edaga-Hamus and Adigrat. The time and logistics budgeted for the study was not, however, favourable for detailed assessment of the markets in Mekelle and Adigrat, which are the potential markets for vegetables. Thus, only a few respondents and secondary data were used as source of information. There was also a big problem of getting the necessary secondary data from the woreda Agriculture and Rural development Office. ,

5.1.2 CONCLUSIONS

Farm households in developing countries mostly operate under imperfect factor and/or product markets resulting from high transaction costs, shallow or thin markets for factors and/or products, price risks and risk aversion, or limited access to market information (Sadoulet and de Janvry, 1995:149-150).

The farming system in both highland and lowland areas is mixed farming. Farmers produce different crop enterprises in order to secure their family food supply and also cover various household expenses. Keeping animals in their farmhouse to provide feed by the cut and carry system is commonly practiced in the highland areas where the farmland is small. The production system in the study area can be described in two ways, i.e., rain-fed and irrigated

systems. The rain-fed production system is most dominant and is practiced by the majority of the farmers in the study area. The vegetable crops are often produced using irrigation.

With the help of irrigation, different types of vegetables are grown in the study area with different intensities in terms of land and other input allocation, purpose of production, and marketability. The most commonly grown vegetables in terms of the number of growers are potato, cabbage, onion, carrot and tomato.

Water for irrigation is from different sources including boreholes, river/springs, ponds and lakes. Most of the farmers rely on river/springs and lake for irrigation.

The majority of the farmers in the study area rely on family labour for land preparation, planting, cultivation, weeding, irrigation, fertilizer application, pesticides application, harvesting and transporting of the product to the market. . Majority of the farmers in the study area used organic manure to increase the fertility of the irrigated land.

Vegetables are produced in some specific locations in the eastern part of Tigray and supplied to the local markets. The major markets identified for collection and distribution of large quantities of vegetables are at Wukro and Mekelle. The market actors namely producers, collectors, brokers, transporters, traders, and consumers play different roles along the market chain. Vegetables, notably, potatoes, onion, tomato cabbage, pepper and carrot are major vegetable products offered in the market.

The survey result shows that, most producers intend to expand vegetable production. The most commonly mentioned opportunities are related to market demand, proximity to the market, better price, irrigation facility and government support.

The constraints of vegetable production could be viewed from the farmers' context, institutional factors, natural factors and transportation related factors.

Vegetable production in the eastern part of Tigray is based on tradition, which is poorly supported by scientific recommendations. Although one can relate this constraint to

institutional factors, it is apparent that inadequate farmer skills and knowledge of production and product management affects the supply. Farmers attempt to select varieties and practice traditional crop management practices. Farmers' know-how of product sorting, grading, packing and transporting is traditional, which severely affects the quality of vegetable products supplied to the market.

In general, lack of knowledge and skill in processing, poor product management and attack of diseases and insects are the most important constraints in the study area.

Vegetable marketing has increasing opportunities for expansion. The opportunities may vary according to the nature of the vegetables the farmers are producing. Most common opportunity for expansion of vegetable marketing in the study area are related to availability of water for irrigation, market demand, improved yield, and better price.

Farm households make a number of decisions in their daily activities. In cash crop production, households decide which (combination of) cash crop(s) to grow and at which market(s) to sell their crop harvests. Different market outlets that households may consider are selling at the farm-gate, selling at a local market or selling at a central market. Both crop and market outlet choices are household specific and depend on several attributes like household characteristics, farm resource endowments and access to different market outlets.

The interaction between crop and market outlet choices at a household level was examined. Chi-square model was used to examine the interaction between crop and market outlet choices in the study area.

 The result shows the existence of statistical evidence that market outlet choice and quantity produced (Potato, Onion and Tomato) are associated (are dependent on each other). The direction of the relationship is that when a person produces less than 1 quintal, he/she would like to sell the produce at farm gate market. If the production is 1-50 quintals, the farmers

would like to sell their produces at Wukro market. It is also clear that when the quantity of produce goes beyond 50 quintals, the producers choose to go to Mekelle market.

Vegetable production is increasing from time to time in the woreda. There is a growth in the three vegetable crops during the last years even though the change in growth varies. The highest change noted for the production was by 2003/4. The very important thing is not to show the percentage change from time to time, if not supported how it grows. It is very important to identify the factors which can influence the vegetable production. The output and productivity of vegetables, is affected by the difference in an on-farm adoption of improved seed, Fertilizer input, agro-ecology, soil fertility, loan, price of the product, and other socioeconomic factors which can cause the differences in the performance of the production. Therefore multiple regression analysis was used to identify the factors which influence the productivity of vegetable products in the study area

It is possible to conclude that, farm households that get more extension service, own more oxen, utilized appropriate fertilizer and having more productive labour force can increase production and productivity of the vegetables. But when the house hold farmer is rising to cultivate an additional hectare of land, it can increase the total production but its efficiency will reduce. From every additional one hectare of land there will be a reduction of almost 21qt. This could be due to negligible managerial effort, lack of adequate water and lack of enough labour in the additional area cultivated.

Prices play an important role in markets. In neo-classical economic theory, prices, together with other economic factors, coordinate the actions of buyers and sellers in the market by influencing production and consumption decisions (Tomek and Robinson, 1990). Costs, sales and income are measured of market performance used in the SCP approach.

A case study was conducted to measure the efficiency of the production in the study area. The calculation was made by taking a representative of average farmers who produced three

different products in the same season at the same site. The products selected were Tomato, potato and onion in the same area which is in Genfel tabia. Farmers in the study area who cultivated 0.25 ha of onion, potato and tomato in the survey time at the same site which is in Genfel incurred a cost of 73.8 birr, 58.4 birr, and 57.7birr per quintal respectively. This covers expenses for planting materials, maintenance, irrigation, hired labour, fertilizer and chemicals, tools and machinery. This cost excludes the marketing cost (transportation cost, lading unloading, and other costs).

Marketing margins are the differences between prices paid at different stages of the marketing process. Marketing margins include among others, costs for packing, transportation, and storage. Normally, margins should behave constantly over homogeneous products over time even as the quantity exchanged is varying (Tomek and Robinson, 1990).

The profit per ha of onion if sold at Wukro market is Birr 21990 and if the product is sold at Mekelle the profit will be and Birr 14440. Selling the product at Mekelle, however, reduced the farmers' profit by 34 percent.

The profit per ha of potato if sold at Wukro market is Birr 15344 and if the product is sold at Mekelle the profit will be Birr 16744. Selling the product at Mekelle, however, increased the farmers' profit by 9.1 percent.

The profit per ha of tomato if sold at Wukro market is Birr 5776 and if the product is sold at Mekelle the profit will be Birr 11024. Selling the product at Mekelle, however, increased the farmers' profit by 90 percent.

At the survey time, the profit of onion per ha was far better in comparing to the others. In addition to that, the profit of onion is also very attractive if it is sold at the local market which is Wukro market. When we consider potato and tomato they were less profitable than that of onion but if they are sold at Mekelle market they can increase the profit of farmers by 9.1perccent.

Prices of vegetable products show significant variations depending on the supply situation. During harvesting time the price falls quite significantly. When compared to onion and potato, the price of tomatoes is found more unstable (the variation in prices around mean was 32 %). Most of the production sites in the rural areas are not accessible by car during the rainy season. Most of farmers use donkeys, vehicles and local carts to transport their products to the market centre.

Almost all the farmers used ordinary rooms for storage with ground/soil floor and with no shelves. The storage facilities are in poor conditions. Cooling and preservation systems are unavailable, and perhaps unaffordable. After harvest, the commodities are directly spread on the floor and this created the quality problem to the product. Some of the mechanisms include keeping product on soiled floor, with no exposure to air and sunlight.

Most of the farmers are getting marketing information by their effort. The farmers become mostly aware of the price upon their arrival at the market place. Farmers don't have equal marketing information with the traders in the central market. Farmers are the price takers in the market, where as wholesalers are the price makers.

The most successful type of cooperative, measured by market share, is the agricultural cooperative. Ever since the industrial revolution turned them into producers of food for distant markets rather than just for local consumption, farmers have needed to take control over three processes: farm inputs (such as fertilizer, seeds and livestock); marketing of the produce; and food processing to add value to the product

It can be concluded that the multipurpose cooperatives do not provide significant support to the vegetable growers in the study area. Specifically, they are not providing services like credit facilities, transportation facilities, storage facilities and alike.

Many suggestions were pointed out by the respondents (both the farmer and the officials of the woreda) but the following are most common ones.

- New technology has to be introduced to the cooperatives,

- Technical assistance on business plan development should be given to the leaders of cooperatives, and

- The cooperatives should be financially strengthened in order to collect and sell the produces of the farmers.

5.1.3 RECOMMENDATIONS

Sound policies favouring small farms and related rural industries are a necessary condition for rural poverty reduction, for coping with domestic and international competition in the home market, and for taking advantage of market opportunities. The main challenges to small-scale agriculture are to increase productivity of both land and labour, to diversify production, to add value through processing, to retain a greater share of the final value of products through improved marketing, and to achieve environmental sustainability. To this end, government action, with the support of official donors and the multilateral institutions, and with the active participation of farmers themselves, needs to ensure the following:

1. **Greater access to land and water**: Demarcation and protection of land rights of traditional population are important. Women's rights and entitlements often need strengthening. Secure access to land, water, and natural resources helps to ensure that small producers are not displaced by expanding export agriculture, and encourages sustainable forms of production.

2. **Greater access to micro-finance:** Agricultural credit is essential for growth and competitiveness. Other financial services such as saving schemes and crop insurance are also helpful. There are equity and economic arguments for subsidies, so service provision cannot be left to the private sector alone.

3. **Improved infrastructure:** Small-scale agriculture, and related rural industries such as food processing, cannot grow and compete unless there is public investment in

economic infrastructure in rural areas (roads, electricity, water supply, irrigation, telephones, etc.).

4. **Greater access to technical guidance and training:** Small producers and their associations need appropriate technical assistance and training, based on research relevant to their needs. This should cover the development of processing activities and the challenging task of producing quality goods. The development of human capital in rural areas, especially women's potential, also requires the provision of good education and vocational training.

5. **Diversification of production**: Diversification of vegetable crops, animal and forest production is a key strategy in all forms of sustainable agriculture production and should be encouraged by government policy. It reduces vulnerabilities to the vagaries of the market, has positive impacts on soil fertility and pest resistance, and translates into diverse diets (since poor farmers eat a significant proportion of their own production). Today's dominant agricultural models, however, stimulate cash crop monoculture and thus tend to increase the vulnerabilities of smallholders.

6. **Achieving scale and valued-added:** Small producers can only survive in more open markets if they acquire 'critical economic mass', and this means developing associative forms of economic activity, covering joint purchasing of inputs, warehousing, refrigeration, processing and marketing. Although marketing and agro-industrial co-operatives and their variants have a chequered history, they remain a key condition for development of the sector. The state's role is to actively stimulate these associations through education and advice, and by providing a favourable legislative and fiscal framework

7. **Fair and stable prices:** Governments often intervene in domestic agricultural markets by setting official prices, by engaging directly in commercial activities, by holding

stocks, or simply through tax policy. These interventions, while sometimes legitimately aimed at securing stable, low prices for urban consumers, must give due weight to the interests of small-scale rural producers. If they are aimed at supporting agriculture, they should favour the poorer producers. Price fluctuations in vegetable products are major problems for smaller farmers. A combination of risk management and insurance schemes, as well as use of buffer stocks, could help stabilise farm gate prices, thereby extending to smaller producers the security routinely enjoyed by big companies and traders. These initiatives would, however, require a substantial injection of ideas and finance from international institutions.

8. The MPCS may periodically conduct training programmes for vegetable cultivators on the area of post harvest handling.

Providing access to credit for the vegetable cultivators, improving marketing infrastructure especially improved storage and transportation facilities, providing technical guidance and training opportunities in processing and post-harvest technologies, supply of improved and quality seed material for increased production , extension efforts for plant protections, ensuring the availability of market information and adopting as group and participatory approach for vegetable production and marketing are the areas which need immediate attention.

5.1.4 Implication for future studies

1. Similar research studies on vegetable marketing can be undertaken on the other Woredas of Tigray Region.

2. A study on the training needs of vegetable cultivators of Tigray region is worth conducting.

3. A study on the adoption of post harvest management practises and technological gap can be conducted

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APPENDIX

Opportunities and Challenges of Vegetable Marketing in the Kilte-Awlaelo Woreda

S/n_____

Code No_____

Interview schedule A

I Personal information:

1.1 Name of the **Enumerator**: _____

1.2. Education Level (fill grades completed, or certificate earned) _____

1.3. Affiliation of the Enumerator: _____

1.4. Date of the Interview: _____

1.5. Name of the **respondent** (he/she must be head of the household: _____

1.6. Age of the respondent: [_____] years (in completed year)

1.7. Sex of the respondent

    1. [ ] Male

    2. [ ] Female

1.8. Education level of the respondent:

    1. [ ] No formal education

    2. [ ] 6th grade or less.

    3. [ ] 7th to 12th grade

    4. [ ] Certificate

    5. [ ] Diploma

    6. [ ] Degree

1.9. Marital status   1. [ ] Married   2. [ ] Unmarried

                             3. [ ] Divorce   4. [ ] Widowed

1.10. Woreda: _____

1.11 Kebele: _____

1.12. Distance to nearest town: [_____] km OR [_____] hrs walk

1.13. What is your major means of income generation and amount of income?

    1. [ ] Vegetable production

amount of income per year				
< 1000	1000-3000	3000-6000	6000-9000	>9000

2. [ ] Grain and pulses production

amount of income per year				
< 1000	1000-3000	3000-6000	6000-9000	>9000

3. [ ] Grain trading

amount of income per year				
< 1000	1000-3000	3000-6000	6000-9000	>9000

4. [ ] Horticulture trading

amount of income per year				
< 1000	1000-3000	3000-6000	6000-9000	>9000

5. [ ] chat trading

amount of income per year				
< 1000	1000-3000	3000-6000	6000-9000	>9000

7. [ ] Livestock production

amount of income per year				
< 1000	1000-3000	3000-6000	6000-9000	>9000

8. [ ] Livestock trading

amount of income per year				
< 1000	1000-3000	3000-6000	6000-9000	>9000

1.14 How long have you practiced production of Vegetables products? _____ Years

2. Household and Resource Data

2.1. Family size: [___] Male [___] Female [___] Total

2.2. Number of working persons: [___] Male [___] Female [___] Total

2.3. No. of children in school: [___] Male [___] Female [___] Total

2.4. Total cropland: _____

2.5. Total irrigable area: ____

2.6. What is the size of land **used twice** in a year? _____

3. Crop production

3.1. Crop production during the last cropping season

Crop type	Rain fed Area	Irrigated
1. Vegetables		

2. Cereals		
3. Pulses		
Others		

3.2. Area and production during last Years?

Crop type	Area captivated 2005(ha)	Area Captivated 2006(ha)	Production (2005) (qt)	Production (2006) (qt)	Income generated In Birr	
					2005	2006
Cabbage						
Carrot						
Onion						
potato						
Tomato						

4. Labour and other activities

4.1 In your opinion, do you think that you have enough/extra/ family labour to conduct your agricultural activity?

1 yes [ ]

2 No [ ]

4.2 If no what could be the reason?

1 large farm size [ ]

2 small family labour [ ]

3 old age [ ]

4 women headed [ ]

5 children at school [ ]

4.3 If you have extra labour what do you do with your extra family labour.

1 work on others land for cash [ ]

2 work on non farm activities [ ]

3 involve in petty trade [ ]

4 others (explain)_____

4.4 Have you ever used any hired labour out of your family labour?

1 Yes [ ]

2 No [ ]

4.5 Have you used traditional labour pooling systems (wefera) during 1998/99 production period?

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1 yes [ ]

2 No [ ]

4.6 If yes at what time of the agricultural activities do you share labour more?

1 land preparation [ ]   2 planting [ ]

3 weeding [ ]   4 harvesting [ ]

4.7 In your opinion, if only one person was assigned to cultivate a 0.25 ha / one timed/ to cultivate an onion plant, how many days will it take him to:

1 ploughing [   ]

2 planting [   ]

3 Weeding/hoeing [   ]

4 harvesting [   ]

4.8 In your view which of the following   vegetable crops do need more labour to cultivate

1 pepper [ ]   2 onion [ ]   3 tomato [ ]

5. Input

5.1 Do you use fertilizer to you farm

1 yes [ ]

2 No [ ]

5.2   If you use fertilizer, where do you get it?

1. [ ] Development agents/Agriculture office

2. [ ] Market

3. [ ] NGOs

5. [ ] Cooperatives

6. [ ] Others (Specify) _____

5.3What type of seeds of Vegetable do you use?

1. [ ] Local

2. [ ] Improved

3. [ ] Both

5.4 If you use pesticides, where do you get them?

1. [ ] Development agents/Agriculture office

2. [ ] Known source in market

3. [ ] Unknown source in market

4. [ ] Cooperatives

5. [ ] Fellow traders

6. [ ] NGOs

7. [ ] Others (Specify) _____

5.5 If you have ever encountered problems with the use of improved seeds, what type?

1. [ ] There is germination problem

2. [ ] Low quality (taste)

3. [ ] High price

4. [ ] Unknown origin

5. [ ] Others (Specify) _____

5.6 have you ever encountered problems with the use of pesticides, what type?

1. [ ] Poisoning when applying

2. [ ] Low quality (taste)

3. [ ] High price

4. [ ] Unknown origin

5. [ ] Lack of safety device

6. [ ] Others (Specify) _____

5.7 What type of farm implements do you use for Vegetable production? Give year of purchase and the price?

Type of farm implement/equipment	Number	Year of purchase	Cost of purchase (Birr)
Plough			
Hoe			
Rake			
Harrow			
Pump			
Others (specify)			

6. Irrigation activities

6.1 Do you use irrigation?

[ ] 1 yes

[ ] 2 No

6.2 If you use irrigation, what is source, method, frequency of use, and costs of irrigation?

Crop type	Source: 1= pond 2=borehole 3= river/spring 4=lake	Method: 1= Furrow 2=sprinkler 3=basin	How many Times applied?	Cost of using irrigation (Birr)	
				Own pump*	Rented pump
Onion					
Potato					
Tomato					
Others					

* Annual use cost includes fuel cost, wage (if employed labour is used),

6.3 What type of Vegetable production system do you adopt?

[ ] 1. Sole cropping

[ ] 2. Mixing different horticultural crops

[ ] 3. Mixing with other crops

[ ] 4. Others _____

6.4 Whose responsibility is the following production?

Crop type	Men	Women	Children
Vegetable			
Other crops			

6.5 How is the trend of volume of Vegetable crops production during the past 5 years?

Crop type	Increasing	Decreasing	Same
Vegetable			
Other crops			

6.6 If the production increases, what are the reasons?

1._____

2._____

3._____

6.7 If the production decreases, what are the reasons?

1._____

2._____

3._____

7. Opportunity

7.1 Would you like to expand Vegetable production?

[ ] 1. Yes

[ ] 2. No

7.2 What opportunities exist to expand horticulture production?

1._____

2._____

3._____

7.3 What are the opportunities of vegetable marketing?

S/N	Vegetable crops	opportunities
1	Tomato	1) 2)
2	Potato	1) 2)
3	Onion	1) 2)
4	Others specify	1) 2)

8. Constraints (Challenges)

8.1 What are the Vegetable production constraints on your farm? Rank horizontally*

Crop type	Insects	Diseases	Drought	Weeds	Flood	Frost	Seed shortage	Fertilizer shortage	Fertilizer shortage	Lack of pesticide	Lack of skill and facility to processing	Other
Vegetable												
potato												
Tomato												
Cabbage												
Carrot												
Onion												

8.2 What are the Vegetable marketing constraints? Rank horizontally*

Crop type	Lack of market	Low price of product	Lack of storage	Lack of transport	Lack of market information	Brokers (hinder) fair sales	Perish ability	Others (specify)
Vegetables								

9. Marketing

9.1 Where do you sell your Vegetable l products? Please respond to the following questions.

Crop type	Market Place (Name)	Distance to Market (km)	Means of transport*	Transport fee per trip (Birr)	How many times do you sell this product per week	How much do you sell this product Per week?	How much do you sell Per week? (kg)	By how much do you sell it (Birr)	No. of months you may Sell so?	To whom do you Sell?**
Onion										
potato										
Tomato										
Others										

* 1= on donkey 2= Vehicle 3= on foot (Being carried)

** 1=Whole sellers; 2=Retailers; 3= Household consumers; 4=Institutions/organization such as university, factory, hotels; 5= Exporters; 6 = Processors; 7= Brokers; 8=others (Specify)

9.2 How do you select your market outlet choice with respect to your vegetable product?

Crop	Market outlay						
	Farm gate sales	Whole sales market	Retailers	Cooperatives	Consumers	Hotel & Restaurant	Other
Onion							
Tomato							
Potato							
Others							

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9.3 Whose responsibility is the selling of the following production?

Crop type	Men	Women	Children
Vegetable			
Other crops			

9.4 Who decides on the expenditure from income generated from the following

products?

Crop type	Men	Women	Children
Vegetable			
Other crops			

9.5 Do your Vegetable products have preferred qualities by buyers?

> 1. Yes [ ]   2. No [ ]

9.6 If No, what interventions are needed to improve quantity and quality of vegetable

crops production to attract better prices?

> 1 _____
>
> 2._____
>
> 3._____

9.7 Do you find buyers for all Vegetable products you take to markets?

> 1. Yes [ ]
>
> 2. No [ ]

9.8. If you do not find buyers for your product, what do you do?

> 1._____
>
> 2._____
>
> 3._____

9.9 Do you have any way of grading your vegetable product before bringing to the

market?

> 1. Yes [ ]
>
> 2. No [ ]

9.10 If yes, in what basis do you grade your product?

> 1. Colour [ ]   4. 1 and 2 [ ]
>
> 2. Weight [ ]   5. 1 and 3 [ ]
>
> 3. Size   [ ]   6. all [ ]

9.11 Have you ever had any training about marketing?

    1. Yes [ ]

    2. No [ ]

10. Price

10.1 Who is the decision maker on the price of vegetable product in the market?

    1. Producer [ ]

    2. Wholesaler [ ]

    3. Retailer [ ]

    4. Consumer [ ]

    5. Government [ ]

    6. Demand and Supply [ ]

10.2 How is the trend of price per unit of sales of Vegetable product during the last 5 years?

Crop type	Increasing	Decreasing	Same
Vegetable			
Other crops			

10.3 If the price increases, what are the reasons?

    1._____

    2._____

    3._____

10.4 If the price decreases, what are the reasons?

    1._____

    2._____

10.5 In your opinion at what period of the year most vegetable product prices decrease

    1. Jan-March

    2. April-June

    3. July-Sep

    4. Oct-Dec

    5. No constant price change

10.6 In your opinion at what period of the year most vegetable product prices increase

    1. Jan-March   4. Oct-Dec

    2. April-June   5. No constant price change

    3. July-Sep

11. Credit

11.1 In your view do you think that it is difficult to get credit form rural financial institutions?

    1. Yes [ ]

    2. No [ ]

11.2 Have you got any rural credit?

    1. Yes [ ]

    2. No [ ]

11.3 If yes, what was the amount of money that you get from micro finance institutions in monetary form? Put the amount_____ birr

11.4 What was the interest rate? Explain_____

11.5 How do you view the level of interest rate?

    1. Cheap [ ]

    2. Faire [ ]

    3. Moderate [ ]

    4. Expensive [ ]

    5. Highly expansive [ ]

11.6 How about its payback period?

    1. Medium [ ]

    2. Long [ ]

    3. Too short [ ]

    4. Fair [ ]

11.7 Did you start paying back your debt?

    1. Yes [ ]

    2. No [ ]

11.8 If no, what is the reason?

    1. It is not time [ ]

    2. Unable to pay back [ ]

    3. Not interested to payback [ ]

    4. Other (explain) [ ]

11.9 Do you think that the credit you get from microfinance institutions is enough for conducting your business?

    1. Yes [ ]

    2. No [ ]

11.10 If no what amount of money would be enough for conducting your business well?

Explain_____ birr

12. Market infrastructure

12.1 Through what mechanisms do you get about market information?

    1. Media (radio and TV) [ ]

    2. Friends [ ]

    3. Government agencies [ ]

    4. Self observation [ ]

    5. Retailers [ ]

    6. Middle man [ ]

    7. Others [ ]

12.2 How do you know whether there will be excess or small amount of vegetable production in the market similar to your type of product either locally or regionally?

    1. No mechanism [ ]

    2. Through government officials [ ]

    3. Through traders   [ ]

    4. From other farmers [ ]

12.3 Do you have any guideline how much to produce and how much to sell of your products?

    1. Yes [ ]

    2. No [ ]

12.4 Do you think you have equal information with the merchant about the existing market situation?

    1. Yes [ ]

    2. No [ ]

12.5 If not, what problem do you face by the absence of that information

    1._____

    2._____

    3._____

12.6 What are the reasons when you chose to produce a given product?

    1. Market demand   2. weather condition

    3. Simple interest   4. consumption interest

    5. other (explain)_____

1. Lack of information [ ]

2. High supply of vegetable products [ ]

3. Lack of demand [ ]

4. Other [ ]

12.7 How do you transport your produces to the market place?

1. By Car [ ]

2. Donkey [ ]

3. Local cart [ ]

4. Other [ ]

12.8 Do you have storage facility?

1. Yes [ ]

2. No [ ]

12.9 If your answers for the above question specify it

13. Cooperatives

13.1 Are you a member of any cooperative?

1. Yes [ ]

2. No [ ]

13.2 If yes, what type of cooperative?

1. Multipurpose [ ]

2. Service [ ]

3. Saving and credit [ ]

4. 2 and three [ ]

5. All [ ]

13.3 Do you perceive that, the multipurpose cooperatives are playing an important role

in vegetable marketing in the woreda for the following?

Role	Strongly agree (4)	Agree (3)	Nether agree or disagree (2)	Disagree (1)	Strongly disagree (0)
Provision of credit					
Input supply					
Transportation Facility					
Storage facility					
Information					

13.4 If you have an opinion that, the multipurpose cooperative does not play an important role in vegetable marketing, what are your suggestions for improving their role?

1._____

2._____

3._____

Interview schedule B

Name of the official _____

Position _____

Experience_____

1. What are the opportunities of vegetable marketing?

S/N	Vegetable crops	opportunities
1	Tomato	1) 2)
2	Potato	1) 2)
3	Onion	1) 2)
4	Others specify	1) 2)

2. Please identify the major problems in vegetable marketing in Kilte Awlaelo woreda

S/n	Problem	Rank	Suggestions
1			
2			
3			

3. What are the technical problems?

1._____

2._____

3._____

4. What are the managerial problems?

1._____

2._____

3._____

5. What are the infrastructural problems?

1._____

2._____

3._____

6. Any other problems

    1._____

    2._____

    3._____

7. What is your suggestion to overcome the above problems?

S/N	Problems	Suggestions
1	Technical	1) 2)
2	Managerial	1) 2)
3	Infrastructural	1) 2)
4	Others specify	1) 2)