SAINT MARY'S UNVERSITY

SCHOOL OF GRADUATE STUDIES

DETERMINANTS OF FRUITS & VEGETABLES HANDLING AND DISTRIBUTION: THE CASE OF ETHIOPIAN FRUITS & VEGETABLES MARKETING S.C, ADDIS ABABA, ETHIOPIA

MBA THESIS

By

MULUALEM AMARE

ID NUMBER SGS1/0057/2004

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A THESIS SUBMITTED TO ST.MARY'S UNIVERSITY, SCHOOL OF GRADUATE STUDIES IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF BUSINESS ADMINISTRATION.

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APPROVED BY BOARD OF EXAMINERS

Dean, Graduate Studies	**Signature& Date**
Advisor	**Signature & Date**
External Examiner	**Signature & Date**
Internal Examiner	**Signature & Date**

DEDICATION

I dedicate this piece of work to the kindest and devoted person in my life; to my dearest mother, Gebriela Gidey, for her enduring sacrifice to rescue my life from a very tough situation.

ACKNOWLEDGMENTS

To be honest it is God himself Who gave me such a great chance to pursue my graduate study and without Him I wouldn't succeed and even breath up to this very moment; So I wholeheartedly thank God Almighty for His support, provision and guidance in all aspects for my successful accomplishment of this study from the bottom of my heart.

Then I would like to thank my advisor, Dr. Negussie Simie (PhD), who helped me starting from title modification up to finalizing the research. Without his encouragement, guidance, and professional expertise, the completion of this work may not have been possible.

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My heartfelt thanks and sincere appreciation also goes to sample respondents for their willingness to scarify their time and provide genuine responses to questions in schedule.

I also like to extend my thanks to my generous friend, Abdurahman Alewi, who supported me a lot and was aside of me when I need his help.

ACRONYMS AND ABBREVIATIONS

APO	Asian Productivity Organization
COLEACP	Committee for Liaison between Europe, Africa, Caribbean and Pacific
CSA	Central Statistical Agency
ETFRUIT	Ethiopian Fruits & Vegetables Marketing S.C
EUREPGAP	Europe Retailers Produce Working Group Good Agricultural Practice
GLOBALGAP	Global Good Agricultural Practice
HDI	Human Development Index
PPS	Proportionate to population size
SPSS	Statistical Package for social sciences
USDA	United States Food and Drug Administration

TABLE OF CONTENTS

CONTENTS **PAGE**

TABLE OF CONTENTS (Continued…)

TABLE OF CONTENTS (Continued…)

LIST OF TABLES

Table **Page**

LIST OF FIGURES

Figure **Page**

ABSTRACT

The core objective of this study was to measure and analyze the main determinants of fruits and vegetables handling and distribution in the Etfruit, Addis Ababa. To attain the main and specific objectives, of the total retail shops (60) that were found under Etfruit in Addis Ababa city, at three sub - branches (Kera, Afincho Ber and Piassa) data was obtained from a sample of 30 retail shops. Interview schedule was administered to both sales heads and walking customers. Key informant interview was also made to obtain important information from knowledgeable and experienced supervisors. The data collected from these sources was processed and exposed to descriptive and econometric analyses. Logit model was specified to measure the determinants and predict for future relevant actions. The descriptive analysis result revealed that 80% of retail shops found to be poor and the rest qualified as a good in fruits and vegetables handling and distribution status and this would be attained by improving transportation facility, refrigerated storage and conducive retail shops in accessible site. Without such proactive measure, the loss and damages of produce will not be mitigated despite of the huge effort made to produce them. On the other hand, the econometric analysis results show that among variables fitted in to the model age of retail shop heads, sex and years of experiences of retail shop heads found to be significant. Therefore, although experience may correlate with age the positive relation of age need to be limited and by implication retention of younger retail shop heads encouraged, retaining experienced retail shop heads should be given much focus and males outperform for this research problem and hence male headed retail shops should be encouraged.

1. INTRODUCTION

1.1 Background of the study

According to Mohammed and Greenhalgh (2007), the domestic production and consumption of fruit and vegetables is growing in Ethiopia. Unlike the developed countries; the per capita consumption of vegetables and fruits in the developing world has been reported as only 100g (Messian, 1992 as cited by Idah, Ajisegiri and Yisa, 2007). It is inevitable that fruits and vegetables have a great nutritional value. They are rich in and are important sources of vitamins and minerals. Thus it is wise to increase intake of fresh produces along with the normal food stuffs.

The health professionals' recommendation for daily intake of fruit and vegetables is more than 400 grams per person per day or about 150 kg per person per year FAO/WHO (2003). As disclosed in FAO statistical database, the total supply of fruit and vegetables available is 173 kg per person per year, which consists of 111.6 kg of vegetables and 61.4 kg of fruits.

Most of us are not aware exactly how much food is lost between harvest and consumption. Recent findings depict that postharvest losses of fruits and vegetables are estimated at 5 - 20% in developed countries and 20-50% in developing countries (Mashav, 2010). Hence, it is argued for the proposition that increased returns to growers and other stakeholders in the supply chain might come from proper management after harvest rather than a further boost to crop production in the field. As stated by (Kamrul, 2010), the principal reasons for postharvest losses include; physiological and biochemical processes which exactly is an increase in the rates of respiration, ethylene production and transpiration loss of water, microbial decay, high perishability nature of the produce, and sub-standard postharvest handling infrastructures.

So it is the right time, perhaps too late, to take measure to save those losses. In other words, it must be the amount of the produce available to the consumer should be taken care of more importantly than the level of production.

This is to mean that designing a proper mechanism to manage pre-harvest, postharvest, storage, handling, and transportation is mandatory in order to maintain healthy fruits to the ultimate priceless consumers. Several other factors are also responsible for the damages and losses in the fresh produce. One of these factors is resulting from the transport vehicles as they pass through undulation and irregularities on the roads (Jones, Holt & Schoorl, 1991). This is very true with regards to Ethiopia's off- road condition in most of the rural areas where the fresh produces originate from and also rough roads in urban due to the huge road reconstruction undergoing during this research is undertaken.

Another factor is attributed to the use of sub-standard storage mechanism. Storage of produces serves as a means to extend the season, to maintain prices rises, to provide a reserve for more uniform retail distribution or to reduce a frequency of purchase by consumer or food service provider. So in appropriate handling of fruits and vegetables with improved cold chain and the degree and severity of handling by store personnel affects the quality and acceptability of these valuable produce.

The last factor which will be covered in this study is the retail distribution outlet. The ultimate destination of most fruits and vegetables is the retail market where a consumer makes the final decision to accept or reject the product. Conditions within the outlet such as temperature, relative humidity, close display of incompatible commodities, and length of exposure to external environment has impact on the quality of perishable produce. The most effective way to prevent quality loss at retail, however, is a rapid turnover of stock on the shelves. The retail distribution points provide the excellent opportunity to communicate with the consumer so always due attention needs to be committed to maintain its target.

To curtail or minimize fruits and vegetables damage; it requires a detailed study to search for the specific parameters involved. Until the locations of handling and distribution losses

in the system are clearly identified, opportunities to reduce them would be limited. This research, therefore, is to study the concealed problems in Ethiopian Fruits and Vegetables Marketing Enterprise S.C with regards to handling and distribution of fruits and vegetables in Addis Ababa.

1.2 Statement of the Problem

As mentioned by (Kamrul, 2010), the contribution of fruits and vegetables for ensuring food and nutritional security remains very important. But, as reported by (APO, 2006) in many countries on average there is a high proportion of edible food wastes which is between 10 and 40% before it reaches to consumers. However, despite the food shortage reported in many developing countries, heavy losses of fruits and vegetables are reported due to inappropriate handling and distribution practices which lie 5-20% in developed countries and 20-50% in developing countries (Mashav, 2010).

This research is, therefore, concerned to identify the inherent postharvest problems of perishable produces especially in handling and distribution of fruits and vegetables in Ethiopian Fruits and Vegetables Marketing S.C the case of Addis Ababa.

1.3 Objective of the Study

1.3.1 General Objective

The general objective of this research is to analyze determinants of fruits and vegetables handling and distribution of produces in Ethiopian fruits and vegetables marketing S.C in Addis Ababa city. To address this issue the following specific objectives are taken into consideration.

1.3.2 Specific Objectives

The specific objectives of the study include:

- Identify transport related causes of produce damages.
- Investigating the existing storage system in view of handling fruits and vegetables.
- Assess how fruits and vegetables are being handled in the retail outlets of the enterprise.
- To identify factors affecting handling and distribution of fruits & vegetables.

1.4 Research Questions

1.4.1 Specific Research Questions

- What are transport related causes of damages in produces of Etfruits in Addis Ababa?
- What type of storage system is used to maintain a quality produce handling in Etfruit at Addis Ababa?
- How are retail shops handling the fruits and vegetables in Etfruit shops at Addis Ababa?
- What are the factors affecting handling and distribution of fruits & vegetables in Etfruit at Addis Ababa?

1.5. Significance of the study

It is very important to conduct a study which analyzes the determinants of fruits and vegetables handling and distribution as it aids in providing information that could enhance fruits and vegetables management. Besides, the study outcome may also help to provoke further study related to this research topic. It may also help to policy makers and other stakeholders who made their livelihood in produce distribution and marketing to contribute some information which may help to minimize produce wastes. Moreover, the study result will also be documented in Etfruit for further reference as well.

1.6 Scope and Limitation of the Study

Since most of respondents were in tight working condition it was not easy to obtain the intended data on time, to mitigate this limitation, it was desired to reschedule data collection dates and compromise respondents' punctuality as well. In addition to this, there was a limitation in terms of small sample size availability. Moreover, the prescheduled focus group discussion was not possible to conduct due to the very busy time of proposed respondents. So it was changed to key informants' interview so as to obtain important information from respective respondents.

Even though, the enterprise has branches in different areas of Ethiopia, the study will be limited to Addis Ababa due to time and finance constraints. The scope of this study is to cover fruits & vegetables handling and distribution in Etfruit Addis Ababa city only.

This research is also limited to study determinants of fruits & vegetables handling and distribution especially on off-farm activities including transportation, packaging and distribution in Addis Ababa city only. And its main focus would be on improving physical and mechanical damages of produce that are caused during postharvest period and hence any prior concerns will not be discussed in the research.

1.7 Structure of the Thesis

This thesis is structured in seven sections or chapters. In the first chapter the background of the study, statement of the problem, objective of the study, and significance of the study were discussed. The second chapter converse the literature review part, in which concepts and definitions, the main theoretical considerations that support this research and relevant empirical reviews are presented and discussed. The third chapter explains about the research methodology section which is consisted of description of the study area, sampling technique, design, data sources and types will be discussed. In the fourth chapter major result and findings explanations will be presented. The fifth chapter mainly comprised of summary of major findings, conclusion and recommendations obtained from the research

outcomes. In the sixth chapter the reference part will be presented. Finally, in the last chapter, appendix part is found in attachment form for further reference.

2. LITERATURE REVIEW

2.1 Concepts and Definitions

Postharvest is the period from harvest of the produce until consumption. Whereas, postharvest handling, is about maintaining quality of produce right after harvest. It involves harvesting, cleaning, trimming, washing, sorting, grading, packaging, transportation and distribution (Ohiokpehai, 2003). Maintaining fruits and vegetables quality requires suitable systems and communication throughout the supply chain as each step is influenced by the previous; it is a chain of interdependent steps subsequent from the preceding part. The postharvest quality of produces is often measured in terms of freshness. Peneau, Linke, Escher & Nuessli (2009; 2007; 2006) properly demonstrated that consumers' definition of freshness of fruits and vegetables is associated with sensory determined appearance, texture and physiological age of the product at consumption. Consumers usually buy products the first time based on appearance, but repeated purchases are driven by expected quality factors determined by flavor compounds and texture experienced from last purchase (Barrett, Beaulieu & Shewfelt, 2010).

However, as a result of their nature these produces are easily exposed to postharvest losses. Postharvest losses mean that production resources such as land, water, energy, fertilizers, labor and effort wasted but no gain as a reward is secured. Lisa & Adel (2002) indicate the fact that rough handling and inadequate cooling and temperature maintenance is the most common causes of postharvest losses in developing countries. Besides, handling practice should attempt to avoid mechanical injuries, increase produce shelf life and avoid spread of microorganisms as well.

An important point outlined by Michael (2002) that fruits can be classified as climacteric and non-climacteric based on their ripening behavior. Climacteric fruits are defined as fruits that reach 'climacteric phase' after harvest i.e. they continue to ripen such as Apples, Bananas, Melons, Apricots, and Tomatoes are some among others. During the ripening process these fruits emit ethylene along with increased rate of respiration. Ripe

fruits are soft and delicate and generally cannot withstand rough transport and repeated handling. These fruits are harvested hard and green, but fully mature and are ripened near consumption areas. Non-climacteric fruits once harvested do not ripen further like Citrus, Grapes, and Strawberries are some of non-climacteric (ripen without ethylene and respiration bursts). Non climacteric fruits produce very small amount of ethylene and do not respond to ethylene treatment (Michael, 2002).

2.2 Theoretical Review

According to Reilly (2003), fruits and vegetables which contain most nutritive values lost due to miss-handling and inappropriate storage at different temperature requirement. Perishable food composed of high moisture thus make them prone to deteriorate almost immediately unless properly handled. Among several factors which have an effect on produce quality; temperature, controlled humidity, air circulation and appropriate storage space are the most important conditions to be fulfilled, failure to this, can lead to deterioration or eventual loss.

The appropriate knowledge of determinants and subsequent treatment in accordance to each produce may assist to maintain quality produce to the potential consumer. A recent study (Minten B., U. Deb, A. Kabir, D. Laborde, M. Hasanullah and K. Murshed. 2010) found that most of the perishable commodities like fruits and vegetables fail to reach in relatively full quantity to the urban market due to weak and fragmented value-chain, as a result, only a small percentage of the produce arrives at the virtue of consumers.

While reviewing theories it is found that fruit and vegetable sector has vital role in farm income enhancement, poverty alleviation, food security, and sustainable agriculture in developing countries (Kamrul, 2010).

Khandaker, S., Z. Bakht & G.B. Koowal (2009) argued that for the delivery of quality produce and to enhance benefit from the sector; adequate infrastructure and effective marketing are crucial factors. And to do so appropriate transportation system along with

improved product handling are also another important factors that shouldn't to be neglected for the trade of agricultural products in assuring good prices and poverty alleviation. However, the above improvements only will not allow in generating positive outcomes in the absence of better strategic policies which is formulated for the achievement of better results in consideration of perishable products. As it has been recommended by concerned institutions, in addition to infrastructure development; modification of policies for timely sales of produces has significant benefit (World Bank, 2005).

Chris & Jacqueline (2012) in their recent studies claim that development of postharvest technologies for fruits and vegetables has not kept equal pace with pre - harvest developments. In most cases that due care is given what, when and how much to produce rather than handling and distribution aspect of the supply chain which doesn't get the same attention often times as it is compared to the pre-harvest activities.

2.3 Empirical reviews

Sissay, Thierry & Lise (2006) discovered in their research that the production and export of fruit to international market is very minimal. This happened due to significant impact of pre - harvest and post harvest practice attributes to quality deterioration of Citrus fruit. It was also revealed that among several factors poor harvest practice, improper fruit handling, and lack of subsequent training to workers resulted in lowering the countries' export potential.

(Bezabih & Hadera, 2007 as cited in Adugna, 2009) stated that due to their nature perishable produces are exposed to about 25% loss which is resulted from poor storage facilities. According to the study carried out in Nigeria by Idah, Ajisegiri & Yisa (2007), some factors such as the transportation system in place for fruits and vegetables was found to be inadequate. Moreover, problems related to lack of suitable containers, non-availability of vehicles and lack of pre-shipment and pretreatment facilities at the collection centers have significant impact on the quality of fruits and vegetables.

Abubakari and Rees (2009) found that of several factors rough handling of fruits & vegetables and inappropriate storage temperature of tomatoes resulted to emit ethylene production and affect quality of tomatoes. As a result, it was noted that rough handling of tomatoes resulted in the destruction of the fruit cell wall leading to softening and reduced marketability of the produce. Moreover, high storage temperature resulted in increasing respiration and ethylene production as well as accelerates ripening and weight loss. It was happened because of the conditions (rough handling and high temperature) accelerate the metabolic rate of tomatoes. Thus they therefore reduce the shelf life of the produce. So it was recommended by the researchers that tomato fruits need to be transported in shock absorbing vessels and on smooth roads. The fruits should also be kept within the temperature tolerance zone of the produce.

We can infer from this experiment result that each produces have their own characteristics and way of handling them as to the type of their respective requirement. Had the same experiment been taken to different produces there would have been several findings. Therefore, further research and continued effort needs to be taken to enhance Etfruits product handling and distribution system further due to its higher support in improvement of produce quality as well as the increasing economic benefits gained from it.

2.4 Determinants of fruits and vegetables handling and distribution.

Both produce growers and handlers must be aware of issues concerning the shelf life and shipping requirements of produce to ensure quality and minimize loss (George, William, Kelley, Gerard & Kathryn 2009). Temperature, humidity and ethylene production affect internal quality, the tendency of fruit to rot, and dehydration. Some products will generate ethylene, potentially damaging other products in the same load. So load compatibility is an important consideration when shipping produce.

The poor infrastructure of storage, processing and marketing in many countries of Asia and the Pacific region contributes to a high proportion of waste, which is averaged between 10 and 40%. Most importantly, major infrastructural limitations also continued to impose

severe constraints to domestic distribution as well as to the export of horticultural produce (APO, 2006). It was also mentioned that a considerable waste occurs due to the fact that small farmers lack resources and are unable to market their produce and implement suitable postharvest handling practices. Spoilage of produce is also accelerated by the hot and humid climate of the region. Thus, postharvest management and processing of horticultural produce assumes a substantial significance in light of increasing demand for fruits and vegetables in the region. Despite the fact that India is a major producer of horticultural crops, many citizens of this nation are not able to obtain their daily requirement of fruits and vegetables which needs to human, as a result, the Human Development Index (HDI) of most citizens found to be very low (APO, 2006). Considerable quantities of fruits and vegetables produced in India go to waste due to improper postharvest operations and effective management. This results in a considerable gap between gross food production and net availability. Like India, Ethiopia is also located in the same geographic locations, thus, it can be argued that both nations share common facts with regard to natural environmental condition for horticultural crops production as well as shortfall of providing fruits and vegetables to their respective citizens.

2.5 Working Framework

Producing a quality product begins well before planting the seed, soil selection and preparation, its fertility and irrigation aptitude, weed control and crop rotations, variety selection and other decisions have an influence on the quality of the product. In the same way, quality is also affected by the climatic conditions during the growing period, as well as irrigation, fertilizations, control of pest and diseases and other cultural practices. Harvest is the end of cultivation and the beginning of post-harvest actions during which preparation for the market and distribution commence. This thesis also deals with determinants of fruits and vegetables handling and distribution concentrating on main focus subject matters including conditioning, transport, storage, packaging, retail shops, training and related management as it is depicted in Figure 1.

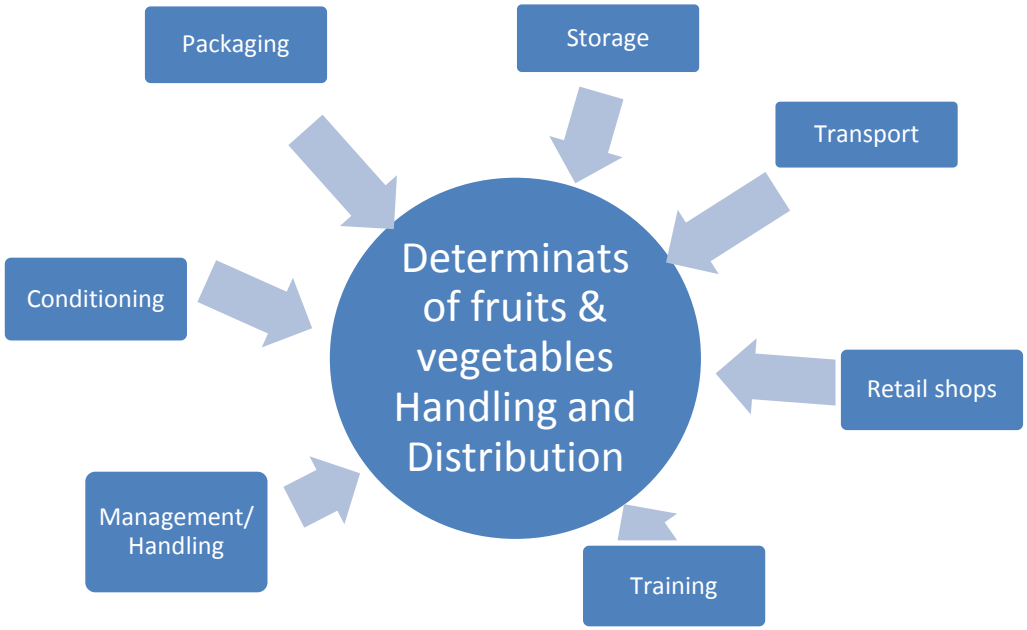

Fig.1. Working Framework

Source: Own, 2013

2.5.1 Conditioning

Produces should not be accepted coming from the field containing parasites, undesirable microorganisms, agricultural chemicals or other toxic substances that can significantly affect the shelf life of fruits and vegetables along the supply chain before actual consumption. Therefore, it is must to verify the quality and general condition of the product in the outset.

2.5.2 Packaging

Pursuant to harvest due care must be given also to use new and clean materials that are used to carry and transport fresh produces from one place to the other. While using re-usable containers it should be cleaned and disinfected by experts to ensure proper handling of those valuable edible produces up to final destination. Ensuring the availability of clean packaging materials or containers is important because remaining odors from previous

loads, residues of toxic substances, presence of insects or their nests may affect the quality of the load. In the same way, dirt or product remains could affect the air circulation.

2.5.3 Transportation

Products should also be transported protected from environmental conditions, from hazardous weather condition, from possible contamination and, when necessary, refrigerated to avoid their contamination or deterioration. Moreover, transportation vehicles should be completely clean, disinfected, and dry before loading.

For the refrigerated transport portion; it is suggested that the loading area must be refrigerated and also pre-cooling the vehicle compartment to the desired temperature before loading it. Frequently checking of the operating conditions of the refrigeration equipment in accordance to the requirements of the respective product should have to be also in place.

Well organized distribution chain of perishable products decrease the possibility of failure or decrease of the value of the products while maintaining efficient dispatching and profitable sale. Xiaoqiang *et al*. (2010) states, that supply chain of the perishable products is as strong as its weakest link. Therefore, primary importance should be given to the distribution system so as to ensure healthy supply of fresh produces along with profitable business management.

2.5.4 Storage

The storage facility must guarantee to be a better environment to produce with appropriate conditions such as temperature, humidity, and atmosphere as to their respective nature. Storage facilities should be designed and built in a manner that will allow adequate maintenance and cleaning, avoid the access and nesting of pests, allow an efficient food protection against contamination and reduce fruit deterioration to minimum (i.e. by controlling temperature and humidity).

It is also very important to be cautious while storing fruits and vegetables who are ethylene sensitive and not sensitive. Ethylene, is a natural hormone produced by some fruits as they ripen, promotes additional ripening of produce exposed around it. According to Aylesworth J. (1992) damaged or diseased apples produce high levels of ethylene and stimulate the other apples to ripen too quickly. As the fruits ripen, they become more susceptible to diseases. Ethylene producers include apples, apricots, avocados, ripening bananas, cantaloupes, honeydew melons, ripe kiwifruit, nectarines, papayas, passionfruit, peaches, pears, persimmons, plantains, plums, prunes, quinces, and tomatoes. Therefore, ethylene "producers" should not be stored with fruits, vegetables, or flowers that are sensitive to it. The result could be loss of quality, reduced shelf life, and specific symptoms of injury which will bring nutritious food loss and considerable economic loss to producers and marketers.

2.5.5 Training

What matters most in the fresh produce supply is to have experienced and knowledgeable personnel. It can be able to arrange all the above conditioning with advanced pre-harvest and post harvest technological equipment; however, the intended change cannot be achieved without the involvement of skilled and experienced staff. Therefore, ensuring capable personnel at each step in the supply chain right from production up to retail shop is mandatory. And also they need to have in depth knowledge of good agricultural practices and postharvest handling. Training is of fundamental importance in any system of food hygiene. Insufficient training and/or instruction and supervision of the hygiene of any person that participates in food handling, represents a possible threat to the safety food products and to their fitness for consumption. Personnel should have deep knowledge of their tasks at any of the production and post harvest handling steps (production/ conditioning /packing/storage/transportation) to obtain quality fruits and vegetable products, and also to be responsible for its protection against contamination and deterioration.

2.5.6 Retail Shop

Fruit and vegetable retail outlets should be located in good visibility, accessibility and proximity to buyers. Most importantly the conditions of the retail shops should also be better environment to handling and distribution of fresh produces in good quality.

2.5.7 Managing the handling and distribution process

After knowing all the above working frameworks as a fresh produce marketing institution, horticulturist, government or any stakeholders; a very coordinated effort towards the internalization and implementation is mandatory. Moreover, introducing best practiced improvement innovations in the industry with continuous total quality management has to be a strategically aligned approach of a given institution. It is known that globally quality standards developed and applied, new ideas conceived by the industry but how it matters positively is, if and only if, it is incorporated to the system.

Especially in the fresh produce production and marketing realm, firstly, it is evident that a systematic and preventive approach is much more effective and economic to improve quality than the elimination of the faulty units at the end of the line, when the production and packaging costs had already happened. Secondly, it is also clear that the quality concept extends beyond the product itself, since it is affected by the systems and procedures involved in the production and preparation for the market. Finally, the consumer's opinion begins to be more and more important. It is no longer sufficient for a product to be technically perfect and produced in an economically profitable way, it is also necessary to satisfy the consumers' expectations of quality both intrinsic and extrinsic parts. This is achieved by the potential, knowledge, experience and ability of the management in place. Therefore, to ensure economic benefit of the producers, marketing channels, healthy delivery of fresh produces enquires the understanding and linkage of all the above factors to enhance good produce handling and distribution of quality fruits and vegetables.

A little effort can make a huge difference when applied at the right time, for example reducing mechanical damage during harvesting, grading and packaging greatly decreases the likelihood of post harvest losses due to pathogens, because pathogens enter through wounds. This simple step would improve overall quality and food safety, translating to higher profits to growers, marketers and even processors.

2.6 Fruits and vegetables quality control and assurance

The process of maintaining an acceptable quality level to the consumer is called quality control. Subsequent to fruits and vegetables production quality assurance has to be maintained and its purpose is to assure that the overall quality control job is being done effectively (Hubbard, 1999). A successful quality control system cannot be flexible, but it must be subject to constant review and improvement as conditions change (Hubbard, 1999).

As clearly stated by the author (Kader, 2001), produce exposure to temperatures, relative humidity, and/or concentrations of oxygen, carbon dioxide, and ethylene outside its optimum ranges will accelerate loss of all quality attributes. The loss of flavor and nutritional quality of fresh intact or cut fruits and vegetables occurs at a faster rate than the loss of textural and appearance quality. Thus, quality assurance programs should be based on all quality attributes and not only on appearance factors as often is the case. Such standards, if enforced properly, are essential tools of quality assurance during marketing and provide a common language for trade among growers, handlers, processors, and receivers at terminal markets. Some of such measurement is done by United States Food and Drug Administration (USDA) post harvest operations measurement criteria. USDA is responsible for developing, amending, and implementing grade standards in the United States (Kader, 2001).

In the United States before distributions produces go through proper inspection using USDA post harvest operation checklist; either on a continuous basis, or on a sample basis (where representative samples of a prescribed number of boxes out of a given lot are

randomly selected and inspected to determine whether the product meets the grade specification for which it is packed). When inspection is completed, certificates are issued by the inspector on the basis of applicable official standards.

As mentioned by authors (Stems & Busch, 2002), EurepGAP was founded in the late 1990s by several European supermarket chains and their major suppliers. It is good agricultural practice certification standard for farm management and practice. It is also the most widely implemented farm certification scheme. Most European customers, which are found in the agricultural products marketing, enquire proof of EurepGAP certification as a prerequisite to begin a business. It is noted that EurepGAP has changed its name into GLOBALGAP in 2007. This decision was taken to reflect its expanding international role in establishing Good Agricultural Practices between multiple retailers and their suppliers.

COLEACP is the Committee for Liaison between Europe, Africa, the Caribbean and the Pacific, a non-profit-making, private, inter-professional association, set up in 1973 and composed mainly of exporters and importers in the ACP-EU horticultural industry. COLEACP is supporting the adoption of the COLEACP Harmonized Frame-work for horticultural exporters. The harmonized framework is the product of the harmonization of the national codes of practice of twelve exporters' associations in nine countries-Kenya, Tanzania, Uganda, Zimbabwe, Zambia, Burundi, Ghana, Jamaica, and Mauritius (Sterns & Busch 2002).

3. RESEARCH METHODOLOGY

This chapter briefly describes the study area, data sources, sampling technique, method of data collection and data analysis.

3.1 Description of the Study Area

Addis Ababa, founded in 1887 G.C, is the largest and the capital city of Ethiopia. It is the seat of the Federal Government of Ethiopia and lies on the central plateau at an altitude of 2,400 meters above sea level (CSA, 2007). Its relative location is found at 9° 1' N latitude & 38° 44' E longitude demarcation. Ethiopia is located in the Eastern Africa bordered on the west by the Sudan, the south west by the South Sudan, east by Somalia and Djibouti, the south by Kenya, and the northeast by Eritrea.

Based on the 2007 Census conducted by the Central Statistical Agency of Ethiopia, Addis Ababa has a total population of 2,739,551, of whom 1,305,387 are men and 1,434,164 women; all of the populations are urban inhabitants. The economic activities in Addis Ababa are diverse. According to official statistics from the federal government, some 119,197 people in the city are engaged in trade and commerce; 113,977 in manufacturing and industry; 80,391 homemakers of different variety; 71,186 in civil administration; 50,538 in transport and communication; 42,514 in education, health and social services; 32,685 in hotel and catering services; and 16,602 in agriculture. In addition to the residents of rural parts of Addis Ababa, the city dwellers also participate in animal husbandry and cultivation of gardens. 677 hectares (1,670 acres) of land is irrigated annually, on which 129,880 quintals of vegetables are cultivated (CSA, 2007).

3.2 Sampling Design and Sample Size

An important decision has to be taken while selecting a sampling technique especially with regard to sample size. Appropriate sample size depends on various factors related to the

study subject, relevance to the study topic, time, cost and degree of accuracy required (Gupta & Gupta, 2002).

The total population for this study is Ethiopian Fruits & Vegetable Marketing S.C Addis Ababa in which there are about three major storage and distribution named as *Kera*, *Piassa* and *Afinchober* branches.

Each branch is used to store fruits and vegetables harvested from outside Addis Ababa fields and distribute to whole sellers and retail purchasers to their respective areas in the city. Etfruit supplies its 70% of produces to wholesalers which are consisted of supermarkets, hospitals, universities and churches. On the other hand 30% of its produces distributed to retail consumers through its 60 sales outlets under the above mentioned three distribution centers. Therefore, samples taken from both sections which is from the distribution & storage centers and from the retail shops located in the city.

As it is difficult to reach all produce distribution branches and retail shops of the enterprise found in different locations of the country due to limitations in human power, time and other resources it is wise to take relevant representative samples which represent the total population for the collection of useful data. In line with this, a multi stage sampling procedure was used to select sample distribution & storage branches, retail shops and respondents.

In the first stage based on the opportunity of obtaining relatively larger size of target populations/retail shops and consumers concentration than other cities and towns, Addis Ababa, was selected purposively (based on time, budget and related constraints). Secondly, from three branches one branch which has relatively large retail shops was selected purposively for the focused group discussion. In third place, thirty retail shops were selected randomly from the total of three branches found under the study area using probability proportional to sample size (PPS) sampling techniques. It is illustrated in the following figure followed by subsequent processes of proportions from each branches as well;

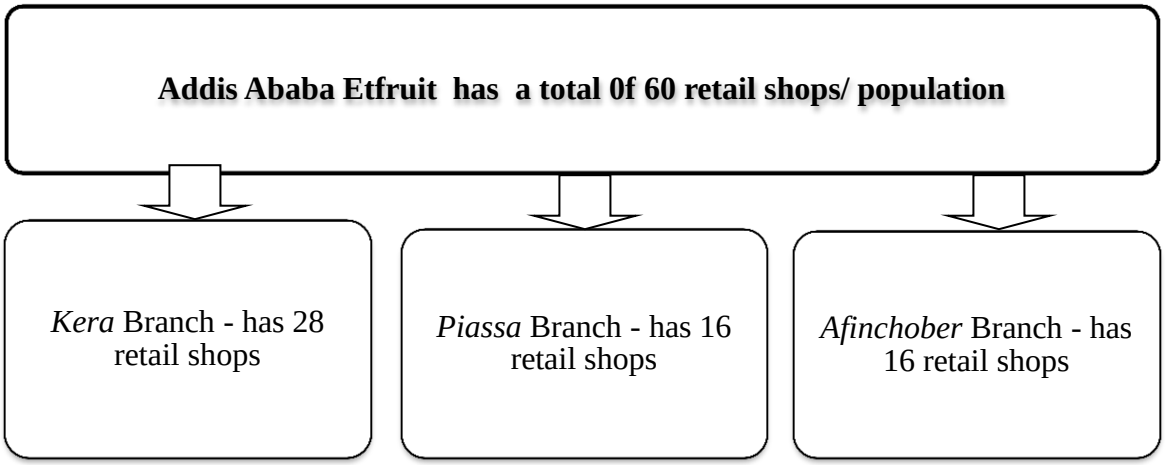

Fig 2. The three main branches along with the number of retail shops.

Kera Branch	Piassa Branch	Afincho Ber Branch
60 =100%	60 =100%	60 =100%
14 =?	8=?	8=?
$\frac{14*100\%}{60} = 23.33\ \%$	$\frac{8*100\%}{60} = 13.34\%$	$\frac{8*100\%}{60} = 13.34\%$

50% of the total population (Retail Shops) was taken as a sample

30 =100%	30 =100%	30=100%
?=46%	? = 27%	?=27%
$\frac{30*46\%}{100} = 14$	$\frac{30*27\%}{100} = 8$	$\frac{30*27\%}{100} = 8$

An interview schedules was collected from each of the above shown thirty retail shops which represent their particular branches. Finally 30 walking customers (1 from each retail shop) were also selected from the above said retail shops using accidental sampling technique. The sampling procedure which shows the detailed steps and sampling method is depicted in the below diagram.

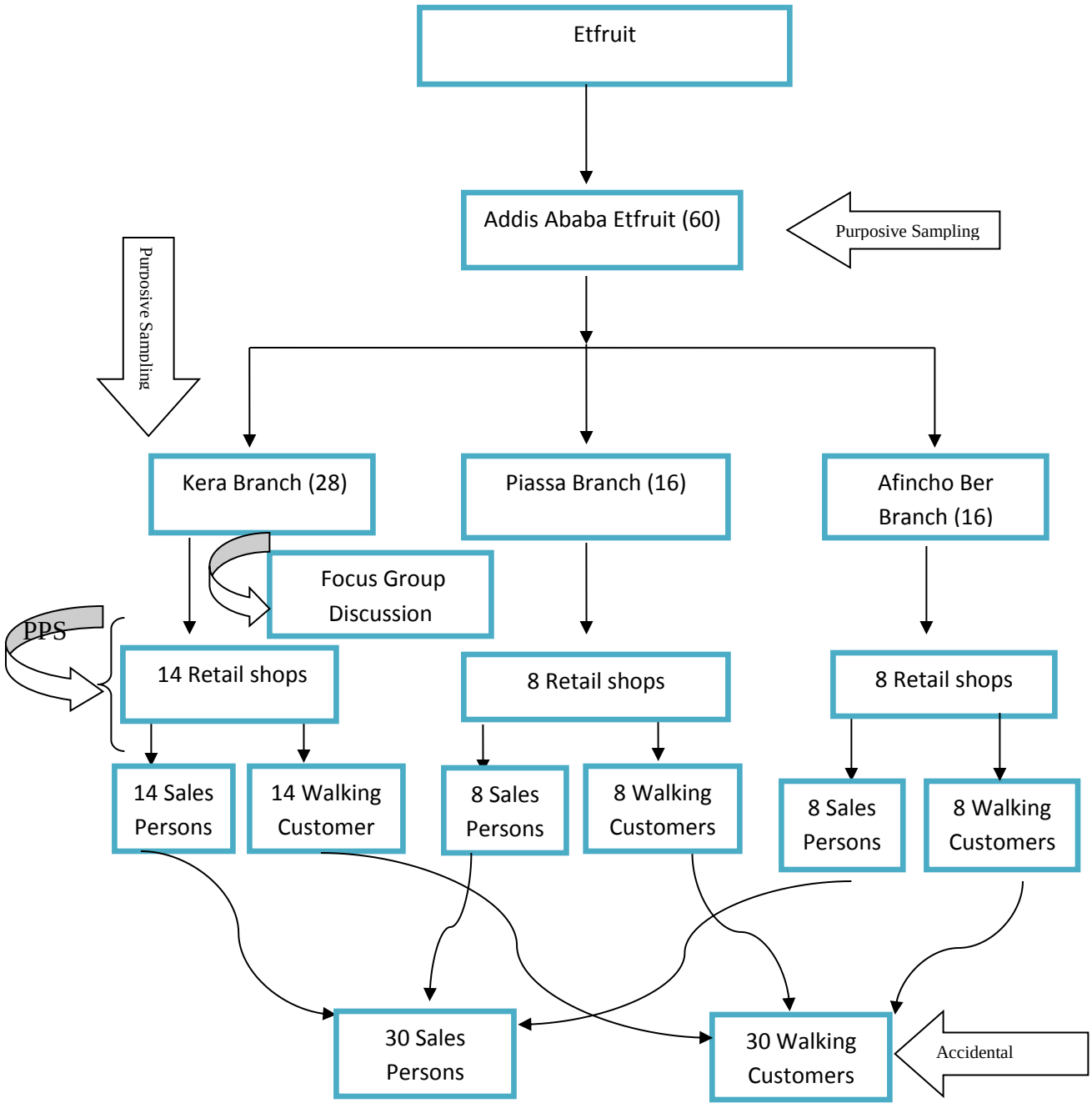

Fig.3 Sampling procedure

3.3. Types of data and method of data collection

Both qualitative and quantitative data were collected from primary and secondary sources to process and identify important independent variables that affect fruits & vegetables

handling and distribution. Thus, quantitative primary data were obtained from sales persons and walking customers through interview schedule. Whereas, quantitatively, key informant interview were used based on pre structured detailed checklist (APPENDIX A).

The key informant interview was made in *Kera* distribution & storage center and relevant staff who spent most of their times in the distribution and storing of produces within this branch have been involved to the interview. Managers, supervisors and technical specialists were active members of the group discussion. Besides, secondary data which have very relevant information to the study area were obtained from published and unpublished (APPENDIX C) sources of information. The main factors and variables of fruits and vegetables handling and distribution were also adopted from (Andrés, 2002). Accordingly, the detailed checklist consisted of major variables to the study subject such as storage set up, packaging quality, distribution, retail shops and other. The data collection from retail sales shops and walking customers was made by visiting each one of the sample retail shops to their physical address.

3.4 Data Analysis

3.4.1 Descriptive Analysis

In the data analysis major variables which affect fruits and vegetables handling and distribution were addressed to look into their relative importance in determining the conditions of produce management in efficient and quality manner. To get concrete information about the current situation, primary data were obtained using interview schedule from sales and walking customers of Etfruit sales outlets. In addition to this, a key informant interview was also used to collect relevant information from prudent officials whose routine activity is purely devoted in handling and distribution of fruits and vegetables. Data obtained from interview schedule from retail shops and walking customers was analyzed using Statistical Package for Social Sciences (SPSS) version 16.

3.4.2 Econometric Analysis

3.4.2.1 Model specification

The important aspect of this study is to assess the determinants of fruits & vegetables handling and distribution in Etfruit, Addis Ababa. The dependent variable in this case is a dichotomous variable, which takes a value of 0 if the handling and distribution of produce is found to be poor and 1 if it is good.

Transportation, storage and retail shop conditions which are assumed to be correlated for the quality of fruits were entered considered. Important factors, which significantly affect the level of handling and distribution, were identified using the model. The dependent variable in this case is a dummy variable, which takes a value of one or zero depending on whether or not good or poor handling and distribution is in place regarding the retail shops current condition. Therefore, the most important reason of a qualitative choice model is to determine the probability that an individual retail shop with a given set of attributes will make one choice rather than an alternative.

3.4.2.2 Analytical technique

The retail shops condition, retail sales experience and training exposure, handling and distribution management variables were assessed to look into their relative importance in determining the state of poor or good fruits handling and distribution condition. Appropriate models that accommodate all these aspects were tested to find suitable one.

Models, which are appropriate to either ‘’yes’’ or ‘’no’’ type of dependent variable, are called dichotomous or dummy variable regression models. Such models approximate the mathematical relationships between explanatory variables and the dependent variable that is always assigned qualitative response variables (Gujarati, 1988; Feder et al., 1985; Pindyck & Runbinfeld, 1981). The four most commonly used approaches to estimate dummy dependent variable regression models are (a) the linear probability model (LPM),

(b) the logit, (c) the probit and (d) the tobit model. They are applicable in a wide variety of fields (Gujarati, 1995).

The major point that distinguishes these functions from the linear regression model is that the outcome variable in these functions is binary or dichotomous (Hosmer & Lemeshow, 1989). Besides, the difference between logistic and linear regression is reflected both in the choice of a parametric model and in the assumptions. Once this difference is accounted for, the methods employed in analysis using logistic regression follow the same general principles used in linear regression (Hosmer & Lemeshow, 1989). The probability model, which expresses the dichotomous dependent variable (Yi) as a linear function of the explanatory variables (Xi), is called linear probability model (LPM). Due to econometric shortcomings like non-normality of the disturbances (Ui), heteroscedastic variances of the disturbances, non-fulfillment of $0 < E(Yi/Xi) < 1$ and lower value of R^2, as a measure of goodness of fit , linear probability model (LPM) failed to test the statistical significance of estimated coefficients (Liao, 1994; Gujarati, 1995).

In the case of logit and probit, the estimated probabilities lie between logical limit 0 and 1 (Pindyck & Runbinfeld, 1981). These are the most widely and frequently used models when the dependent variable happens to be dichotomous (Liao, 1994; Maddala, 1989; Gujarati, 1988; and Pindyck & Runbinfeld, 1981). Though they are comparable, the logit and probit models mainly vary in such a way that the logistic function has slightly flatter tails, that is, the normal curve approaches the axes more quickly than in the case of logistic function. Dichotomous dependent variable is a situation where the close similarity of logit and probit models lie/confined. In other words, the logistic and cumulative normal functions are very close in the midrange, but the logistic function has slightly heavier tails than the cumulative normal function (Maddala, 1983 & Kementa, 1986). Liao (1994), Gujarati (1988), Pindyck & Runbinfeld (1981), confirmed that the probit and logit models are quite similar. They usually generate predicted probabilities that are almost identical. As it was reported by (Liao 1994), the logit model has the advantage that these predicted probabilities could easily be arrived. He also indicated that when there are many

observations at the extremes of the distribution, then the logit model is preferred over the probit model.

The choice between these two models revolves around practical concerns such as the availability and flexibility of computer program, personal preference, experience and other facilities. In fact, it represents a close approximation to the cumulative normal distribution. Hosmer & Lemshew (1989), pointed out that a logistic distribution has got advantage over others in the analysis of dichotomous outcome variable. There are two primary reasons for choosing the logistic distribution. These are: (a) from a mathematical point of view, it is an extremely flexible and easily used function, and (b) it lends itself to a logically meaningful interpretation. Aldrich & Nelson (1984), also state that, the logit model is simpler in estimation than the probit model.

After reviewing the strength, drawbacks and assumptions of different models, the binary logistic regression model is employed to address the core objective of the study i.e. analyzing determinants of fruits and vegetables handling and distribution at retail shops.

Following Gujarati (1995), Aldrich and Nelson (1984), Hosmer & Lemeshow (1989) the functional form of logistic model is specified as follows:

$\pi(x) = E(Y=f/x) = 1$

$$\Pi(x) = E(y = 1/x) = \frac{1}{1 + e^{-(Bo + BiXi)}} \quad \text{---------- (1)}$$

For ease of exposition, we write (1) as:-

$$\Pi(x) = \frac{1}{1+e^{-z_i}} \quad \text{---------- (2)}$$

Where $\Pi(x)$ = is a probability of being fruits and vegetables handling and distribution ranges from 0 to 1

Zi = is a function of n-explanatory variables (x) which is also expressed as:

$Zi = Bo+B_1X_1 + B_2X_2 + \ldots\ldots\ldots\ldots + B_nX_n$

Where

X_1=Age of the respondent

X_2=Sex of the respondent

X_3=Marital status of the respondent

X_4= Experience of the respondent

X_5=Training of the respondent

X_6=The storage condition in the branch

X_7=The transport condition from storage to retail shops

X_8=Retail shop condition

B_o = intercept

B_1, B_2..... B_n = are coefficients to be estimated

The probability that a given retail sales shop is good handling and distribution is expressed by (2) while, the Probability for poor is:-

$$1-\Pi(x) = \frac{1}{1+e^{zi}} \quad \text{---------- (3)}$$

Therefore we can write:-

$$\frac{\Pi(x)}{1-\Pi(x)} = \frac{1+e^{zi}}{1+e^{-zi}} = e^{zi} \quad \text{---------- (4)}$$

Now Π(x) / (1-Π(x)) is simply the odds ratio in favor of good fruits and vegetables handling and distribution. It is the ratio of the probability that a given retail shop will qualify as good to the probability that it will be in a poor status.

Finally, taking the natural log of equation (4) we obtain-

$$Li = \ln \frac{\Pi(x)}{1-\Pi(x)} = Zi \quad \text{---------- (5)}$$

$Zi = Bo + B_1X_1 + B_2X_2 + \text{---------- } + BnXn$

If the disturbance term, (Ui) is introduced the logit model becomes

$Zi = Bo + B_1 X_1 + B_2 X_2 + ...+ BnXn + Ui$ ---------- (6)

Li = log of the odds ratio, which is not only linear in X_i but also linear in the parameters.

Xi = Vector of relevant explanatory variables

The iterative maximum likelihood estimation procedure was used to estimate the parameters of the model. This procedure yields unbiased and asymptotically efficient and consistent parameter estimates (Maddala, 1992; Gujarati, 1988 and Hosemer & Lemeshow, 1989). Changing an independent variable in this case, is expected to alter the probability that a given retail shop becomes in a good status, and this will be helpful to predict the probability of achieving good fruits and vegetables handling and distribution.

3.4.3 Estimation procedure

Given that the model selected for the analysis is the binary logit model, the dependent variable is assigned a value of 0 or 1, representing poor or good fruits handling and distribution status, respectively. To estimate the values of B_0 and B_i's, a set of data is fitted into equation 6. Since the method of ordinary least square (OLS) does not make any assumption about the probabilistic nature of the disturbance term (Ui), the parameters of the model are estimated using the maximum likelihood (ML) method (Maddala, 1992; Gujarati, 1988). Due to the non-linearity of the logistic regression model, an iterative algorithm is necessary for parameter estimation. In a very general sense, the method of maximum likelihood yields values for the unknown parameters, which maximize the probability of obtaining the observed set of data (Liao, 1994; Hosmer & Lemeshew, 1989). According to the same authors, the resulting estimators maximize the likelihood function, being constructed expressing the probability of the observed data as a function of the unknown parameters and those which agree most closely with the observed data. Before, estimating the logit model, since its existence seriously affects the parameter estimates, multicollinearity between continuous variables was detected.

3.4.4 Variables definition and hypotheses

3.4.4.1 Dependent variable

The dependent variable for this study was Fruits and Vegetables Handling and distribution. It has been stated that fruits and vegetables handlers and distributers should be very much concerned for the shelf life of produces as well as ensure quality during storing, transporting and distribution process before it reaches to the ultimate consumer for it has significance influence in minimizing loss (George *et al*, 2009). The status of handling and distribution, which is dependent variable for the logit analysis, is a dichotomous variable representing 1 for good status if the average score is greater than or equal to 7 and 0 is designated for poor handling and distribution status if the average score is below seven (Appendix D).

3.4.4.2 Independent variables

After the analytical procedure clearly defined, it was necessary to identify the potential explanatory variables that can influence fruits & vegetables handling and distribution status. Consequently, a thorough review of literature, and past research findings were used to identify the potential determinants of fruits & vegetables handling and distribution in the study area. Authors (Minten *et al*. 2010) argued that most of the perishable commodities like fruits and vegetables fail to reach relatively in full quantity to the consumer due to weak and fragmented value-chain. Thus, assuming part of the chain and importance to the status of fruits & vegetables handling and distribution; the following independent variables were identified to affect as well as influence produce handling and distribution were examined.

Age (AGE): age is a continuous variable measured in number of years assigned to the retail shops. As age of the sales person increases, it is assumed that the sales man becomes more committed and responsible to its job than youngsters. Aged person believed to handle

the fruits & vegetables at their respective custody as best as they can. So these actions increase towards the improvement of good handling and timely distribution. Thus, it is hypothesized that age of the sales person are positively correlated.

Sex of the respondent (SEX): Respondent sex is categorical variable which represents to the sex of the sales person and in the model it is represented by dummy variable (i.e. 1 if the sales shop head is male and 0 otherwise). It is assumed that females are good in managing sales activities in patience than male do. In this case sex of sales person becomes an important determinant for handling and distribution of fruits & vegetables. Thus, it is hypothesized that male sales person contribute less likely than female sales person, thus, it is correlated negatively to the dependent variable.

Marital status of the respondent (MARSTATS): Refers to the marital status of sale persons assigned to each retail shops and it is a categorical variable specified in a model 1 for Married 2 for Single 3 for Divorced 4 for widow/ widower and 5 for Separated respondents. It is believed that married person commitment and dedication to their job is most likely higher than single persons. Therefore, this effort will contribute positively to the handling and distribution of produces.

Experience of the respondent: It refers to the respondent / sales persons' number of years of experience in Etfriut. It is a continuous variable. Conventionally, it is assumed that experience increases knowledge, skill and ability of respective persons handling and distribution of fruits and vegetables handling. Thus, year of experience of respondents was positively correlated to the dependent variable.

Training of the respondent (TRAINIMPQUALPRO): It is a categorical variable and refers to the training exposure of respondents. It is assumed that trained persons are better motivated and employee commitment increases as compared to untrained ones. Employee training for each level of produce handling and distribution practitioners regarding safety of produce was found to be important for the delivery quality produce and to minimize losses as well (Lisa & Adel 2002). Therefore, training will have a positive correlation to produce handling and distribution.

The storage condition in the branch (SIGNFACTPHYDAMG): It refers to the overall condition of branch storage and distribution centers. It is believed that the better the storage environment to keep produces in the distribution center the longer the shelf life of the produce will became. A study (Reilly, 2003) depicts the fact that perishables which contain most nutritive values lost due to miss-handling and inappropriate storage management.

The transport condition from storage to retail shops (PROEXPOTEMPTRAN): This refers to the transportation condition which is assigned from the storage & distribution branches to each retail shops. It refers to the produce exposure to temperature during transport. So it is positively correlated to fruits & vegetables handling and distribution. Adequate and proper transportation along with better produce handling is an important factor to ensure good quality (Khandaker *et al.* 2009).

Retail shop condition (RETASHOPCONDN): It refers to each retail shop condition under the study. The conduciveness of retail shops affects to produce handling and distribution, thus, it is positively correlated to the dependent variable. Authors (Lisa & Adel, 2002), mentioned that good handling, temperature controlled display table and refrigerator are some of the preconditions that ultimate sellers and supermarkets should be equipped in order to maintain longer shelf life of produce and to ensure quality delivery.

For ease of understanding and quick reference the summary is prepared as follows;

Table 1. Hypothesized determinants of fruits & vegetables handling & distribution in Etfruit Addis Ababa city.

S/N	Determinants	Continuous	Categorical	Effect on fruits & veg. handling & distribution
1	Age of the respondent	✓		+
2	Sex of the respondent		✓	_
3	Marital status of the respondent		✓	+
4	Experience of the respondent	✓		+
5	Training of the respondent		✓	+
6	The storage condition in the branch		✓	+
7	The transport condition from storage to retail shops		✓	+
8	Retail shop condition		✓	+

3.5 Operational definition

For the purpose of this research, fruits & vegetables handling and distribution said to be good if the retail shops score is greater than or equal to 7 points out of 10 and poor if the scored point is below 7 points. The criterion is developed based on Etfruit document, respondents' response (resulted from scheduled interview) and personal observation while visiting the current condition of sub-storage & distribution branches, transportation, retail shop conditions and others.

As the retail shops commonly share the same sub storage & distribution branch, the same transportation facility, the same produces, similar management system and more or less similar retail shops condition. Subsequently, the most common conditions of sub-storage, transportation, retail shops and other reasons were bases at different degree of significance

that might influence the quality of produces taken into consideration. It was formulated from the obtained interview schedule response. Accordingly, retail shops who score less than 7 points out of 10 termed as poor where as retail shops who scored greater than 7 points was qualified as good. And the points were given based on personal observation of the respective retail shops and sub-storages (Appendix D).

Thus, in the SPSS system these scores are used to code the good and poor conditions of respective retail shops present condition to be used as dependent variables to analyze against independent variables.

4. RESULTS AND DISCUSSION

4.1Descriptive analysis of retail shops

Out of the total branches, 46.7 % respondents were from *Kera* branch and 26.7 % from each *Piassa* and *Afinchober*. The physical location of every single retail shop and the respective respondent frequency under the three branches found to be 3.3% without any repetition.

While looking at the age of respondents the minimum was 21 years old and the maximum age of respondents was 46 years. However, more than half of the respondent which accounts to 53.3 % age range falls between 29 years old to 46 years old.

In response to sex of respondents 43.3 % came to be male and the remaining 56.7 % of respondents were female.

The marital status of the respondents shows that 36.7 % were married, 60 % were unmarried and the rest 3.3 % were found to be divorced. So the majority of the respondents were single.

Concerning year of experience out of the total respondents 13.3% were below a year. The majority of the respondents which amount to 56.7 % having experience that range from one year to five years, while 3.3 % of respondents were from five to ten years, 6.7% from ten to fifteen years of experience, and 20 % were more than fifteen years.

From the total respondents about 16.7% replied that produces sent from their respective distribution and storage centers are clean and free of damages, on the other hand, 83.3 % of the respondents responded that they receive unclean produces. Consequently, 43.3% of the respondents replied that the major factor for physical damage is due to improper handling at the storage (distribution & storage) place, 6.7% responded that in city transport is responsible for physical damages, 36.7% replied that the packaging (specially broken

plastic boxes which are used to handle 20kg/box) are responsible factors for the damage of produces, and the remaining 13.3% replied that it is due to higher temperature at retail shops stay.

For the question raised regarding suitability and conduciveness of the retail shops current situation in terms of handling produces in view of appropriate humidity and temperature to the respective fruits and vegetables; 16.7% of respondents replied that the current containers are suitable for produce sales point, however, the majority of the respondents which are about 83.3% replied that it is not suitable for the proper handling as well as to be a good sales point due to the nature of perishablity of fresh produces.

About 53.3 % respondents replied that produces are exposed to excess heat during transportation from the branch to their respective retail sales shops whereas 46.7 % respondents responded that produces are not exposed during transportation in the city. 83.3 % of respondents replied that produces are exposed to excessive temperature while kept in the retail shops/ containers until sold to ultimate customers, on the other hand, 16.7 % of respondents responded that produces are not exposed to higher temperature while kept in the retail sales point.

When 46.7 % of respondents replied that storage at the branch has very significant impact to the overall damage of produce and 40% of the respondents responded that it is the retail shops condition responsible for highest damage of produces. Whereas 6.7 % of respondents replied that both transport and other reasons equally are responsible for the significant damage of produces.

About 60% of respondents replied that they have taken trainings whereas the remaining 40% of the respondents responded that they didn't receive any training with regard to produce handling and distribution. By the same token when respondents were asked with regards to the frequency of relevant trainings receiving time; 40 % of the respondents replied that they didn't take any relevant training whereas 10% of them responded that they

took often times, 26.7% some times, and 23.3 % replied that they took relevant trainings rarely.

The level of customers satisfaction was asked to the respondents and 10% of them replied that customers are satisfied often times, 30% of respondents responded that their customers are satisfied sometimes, 33.3% of respondents responded that customers are satisfied rarely, whereas 26.7 % of respondents replied that none of the visiting customers are satisfied by the quality of retail shops at all.

With regards to the presence of written procedures that should be followed in cleaning, handling and sales of produces 16.6 % responded that they are aware of its existence in Etfruit whereas 83.3% replied that they have taken orientation and training from their senior experienced staffs, therefore, there is no any written procedure that must be followed by all.

All of the respondents commonly replied that when produces damaged they are not sold out to customers, the retail shop heads rather return it to the respective distribution & storage branches.

Respondents' response to the comparison of Etfruit retail shops condition to keep quality of produces with that of supermarkets 23.3 % of them replied that it is medium, 13.3 % of respondents responded it is poor and 63.3 % of respondents regarded the fitness of retail shops for produce handling and sales to be very poor.

4.2 Descriptive analysis of walking customers

While processing the obtained data of walking customers; 46.7% of respondents emerged to be from *Kera* branch whereas the remaining proportion which is 26.7% found to be from *Piassa* and *Afinchober*. The sex of respondents became 53.3 % to male proportion and the remaining 46.7 % has become to female. In regard to the age of respondents the minimum was found to be 16 year whereas the maximum age of respondent was 43 years old. The

marital status of respondents also shows that 53.3% were married, 30% were single, 10% divorced and the remaining 6.7% goes to widow or widower portion.

From the data 80% of respondents' preference for fruits & vegetables consumption was found to be from Etfruits' retail shop, however, the remaining 20 % of respondents does not prefer they would rather chose private owned and supermarket produces. 56.7 % of respondents prefer Etfruit retail shops due to its attractive cheaper price, while 36.7 % of respondents prefer for the ease of vicinity to their respective houses but 6.7 % prefer due to produce quality supplied by the above sales shops.

Of the respondents 20% replied that Etfruit supplies clean and free of damage produces often times where as 26.7 % answered unlike the above respondents. However, majority of the respondents which account to 53.3 % replied that Etfruit retail shops supply both good and poor quality produces often times.

With regards to Etfruits selling price 83.3 % replied that its price is cheaper as compared to private owned and supermarkets sales price. Whereas the rest responded that both it is reasonable and fair in comparison to other private owned as well as supermarkets sales price.

From the respondents about 43.3% visit Etfruit very often times when they need to buy fruits & vegetables, 3.3% came often times, 33.3% replied that they used to come to Etfruit retail shops sometimes and the rest 20% visit rarely. When comparing quality of produces sold in Etfruit with that of supermarket supplies 43.3% respondents responded that it is medium and 40% replied that it is poor and the remaining 16.7 % answered that it is very poor.

In response to the appropriateness of current retail shops to keep produces only 6.7% replied it is good condition whereas 23.3 responded that it is poor condition to keep produces in the current retail shops and the majority of respondents which account to 70%

of the respondents replied that it is a very poor situation to produce handling and selling point.

4.3 Determinants of fruits & vegetable handling and distribution

Handling and distribution of produces is measured by different techniques. There are different pre and post harvest measurement criteria designed and employed by developed and developing countries such as Post-harvest Operations - USDA Checklist, GLOBAL GAP/Eurepgap and COLEACP. Due attention is given for the fact that postharvest management determines fruits and vegetables quality and safety, competitiveness in the market, and the profits earned by producers. Countries like South Africa, most exporters recently have certification of EurepGAP/GlobalGAP starting 2003-4 (Barirentos & Visser 2012). Unlike, Ethiopia, other African nations have COLEACP certification to meet quality assurance expectation for export standards.

It is not ideal to employ one of the above said postharvest management tools to measure the fruits & vegetables handling and distribution in Etfruit, because, it is inevitable that the infrastructure, systems set up, facilities and management styles has a different context, unlike other regions, as compared to our country. In the study, therefore, it was necessary to set measuring criteria to qualify whether the handling and distribution of fruits and vegetables is in a good or poor condition by setting important criterion based on personal observation and documents obtained from Etfruit. Accordingly, retail shops who score less than 7 points out of 10 termed as poor whereas retail shops that scored greater than 7 points were qualified as good status (Appendix D).

As a result the status of handling and distribution was measured using the scheduled interview obtained from the respondents. Accordingly, out of the total respondents 80% retail shops found to be in poor condition whereas 20% of them qualified in good condition. The mean value of score for the good handling and distribution as well as for the poor was 7.25 and 4.92, respectively. The minimum and maximum values available for good handling and distribution and poor handling and distribution was found to be 7 & 8

and 3 & 6, respectively. The mean value of all sample/retail shops was 5.23, whereas the minimum and maximum found to be 3 and 8, respectively (Table 2).

Table 2. Fruits Handling and Distribution status of retail shops.

Handling & Distn. Score Value	Poor Status	Good Status	Total (N=30)
Minimum	**3**	**7**	**3**
Maximum	**6**	**8**	**8**
Mean	**4.92**	**7.25**	**5.23**
Mean Difference	**2.33**		
S.D	**7.843**	**8.813**	**1.135**

Source: calculated from own survey: 2013

4.4 Descriptive Statistics of Continuous Variable

This sub section presents descriptive statistics of continuous variables. These variables were age of the retail shop heads and their year of experience as well. They are very helpful to observe differences among good handling and distribution and the reverse.

Table 4. Descriptive statistics of continuous variables

	Total (30)		Poor Status	Good status	t – value
Variables	Min/Max	Mean(SD)	Mean(SD)	Mean(SD)	
Age	21/46	30	29.88/8.16	30.50/6.89	-.172
Year of Exp.	1/20	7.03/6.60	6.42/6.69	9.50/6.15	-1.024

Source: calculated from own survey, 2013

Both Age and Year of experiences are continuous explanatory variables peculiar to the retail shops head. In this study, it was used to measure the respondents' age and the number of years/ of the respondent worked at Etfruit in terms of years. The retail shop head mostly devote his/her time taking care of produce safety, ventilating and separating the damaged from the pure lot for the instinct knowledge acquired due to experience and sense of responsibility. As shown in the Table 4, the average age and year of experience of sample respondents were 30 and 7 years, respectively. Likewise, while the minimum and maximum age of respondents found to be 21 and 46 whereas for the year of experience it has become 1 and 20, respectively. The average age and standard deviation of the good retail shops and the poor retail shops were 30.50 (6.89) and 29.88 (8.16), respectively. And also the average experience and standard deviation of the good retail shops and the poor retail shops were 6.42 (6.69) and 9.50 (6.15), respectively. The t- value - 0.172 for age and -1.024 for years of experience calculated confirms that there is no significant relationship among the age and experience of respondent and good handling & distribution status of retail shops condition (Table 4).

4.5 Descriptive Statistics of Categorical Variables

Table 4. Descriptive Statistics of Categorical Variables

Description of variables	Categories	Fruits & vegetables Handling and Distribution Status		Chi - square
		Poor (%)	Good (%)	
SEX	Male	30	13	
	Female	57	-	6.036 **
MARITAL STATUS	Married	37		
	Single	50	10	8.365**
	Divorced	-	3	
EXPOSUR	Yes	53		5.275 **
INTRANT	No	33	13	
	Yes	76	7	
EXPOSURINSTOR	No	10	7	3.692***
	Often Times	10		
TRAINING	Some times	23	3	.587 (NS)
	Rarely	20	3	
	Not at all	33	7	
ETFRUIT COND	Medium	23		
	Poor	13	13	2.672(NS)
	Very Poor	50		

** and *** significant at $p < 0.05$ and $p < 0.01$ respectively, NS= Non-Significant

Source: calculated from own survey, 2013

The structured interview was made to a total of 13 (43%) male headed retail shops and 17 (57 %) female headed retail shops. And it is found that about 87 % of retail shops handling and distribution of produce were in poor and 13 % of retail shops were managed in good condition. Consequently, 30% poor and 13% good handled retail shops are male headed sales shops whereas 57% of poor are found to be female headed retail shops. Moreover, the Chi-square value (6.036) for this specific variable indicates

that there is significant relationship between sex of retail shop head and handling and distribution of fruits & vegetables (Table 4).

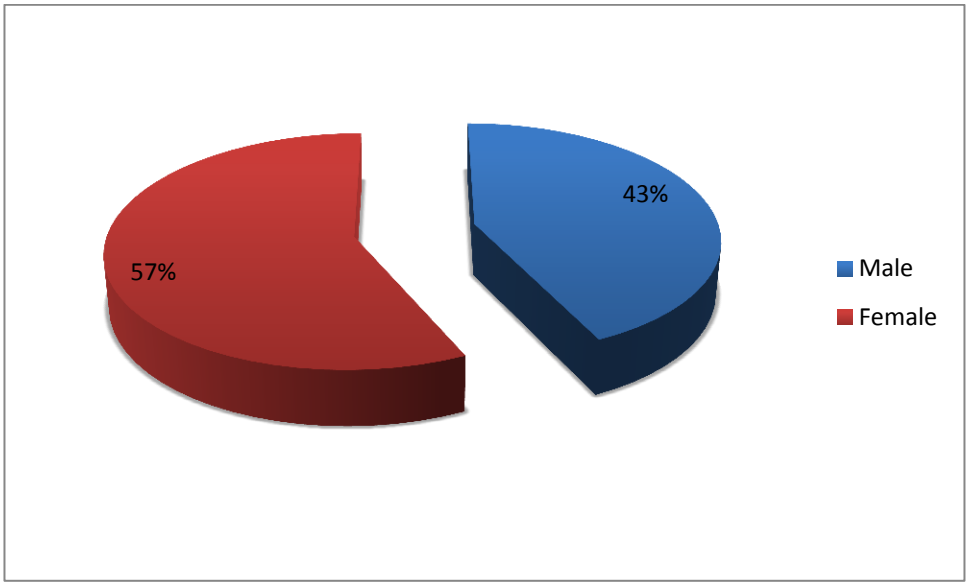

Fig. 4. Sex of retail shop heads

In this section marital status of retail shop heads in relation to poor and good handling and distribution of fruits & vegetables was analyzed. Accordingly, 37 %, 60% and 3% of the total sample respondents were married, single and divorced respectively. Among them 87% of which found to be in a poor handling and distribution status whereas 13 % constitute for the good status. The chi -square value (8.365) for the marital status variable designates that there is significant relationship between marital status of retail shop heads and fruits & vegetables handling and distribution status of the retail shops (Table 4).

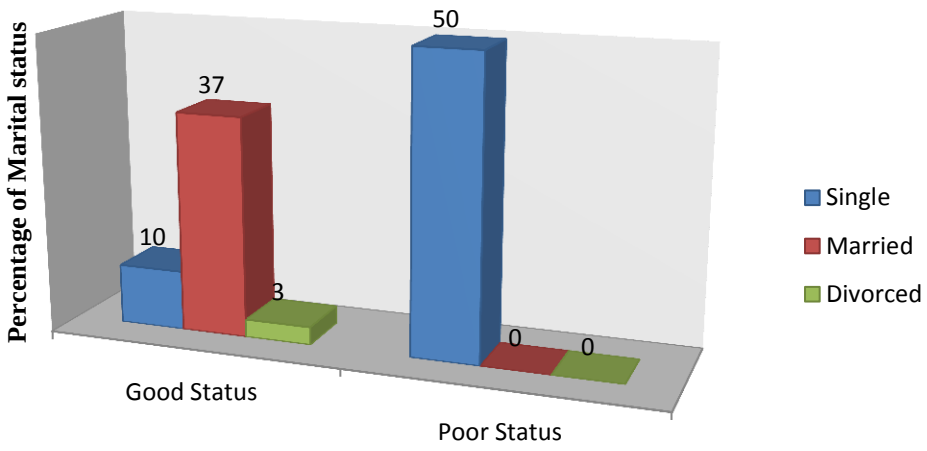

Fig.5. Fruits & vegetables handling and distribution by marital status

From the scheduled interview result it was also observed that 53% of respondents confirmed that produces are exposed to high temperature while transported from their respective sub storage & distribution branches up to the sales retail shops while 46% of the retail shops replied that produces are not exposed to higher temperature during in city transport. And also about 86 % of the retail shops handling and distribution was found to be poor due to temperature exposure effect of produces while in transportation, however, 13% of retail shops handling and distribution was found to be good without the effect of temperature exposure during produces transportation to retail shops. The Chi- Square value (5.275) of this variable shows that there is significant relationship between produce exposure to temperature during transport with fruits & vegetables handling and distribution condition.

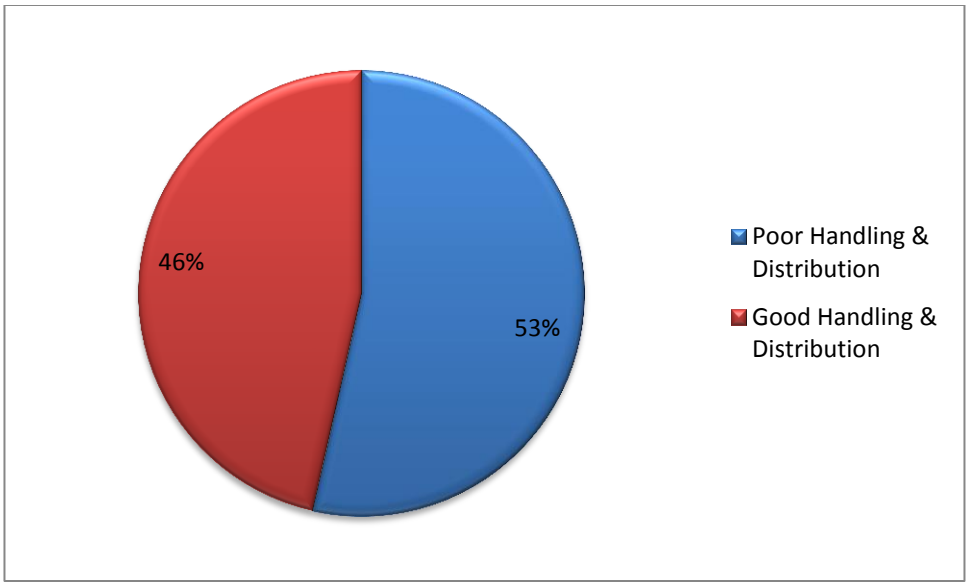

Fig. 6 Produce exposed to higher temperature during transport.

About 83 % of retail shops reply found to be that produces which are kept under their custody at retail shops are exposed to higher temperature in the retail shop storage before produces sold away to the ultimate customers and the remaining 17 % found to be not affected by the retail sales storage condition at all. Subsequent to this effect, 86% of retail shops fruit handling and distribution status becomes to be poor and the remaining 14% was found to be not affected by the temperature of retail shops storage condition. Moreover, the Chi-Square value (3.692) of this variable demonstrates that there is very significant relationship between the status of poor or good handling and distribution of produces as well as retail shops storage exposure to high temperature.

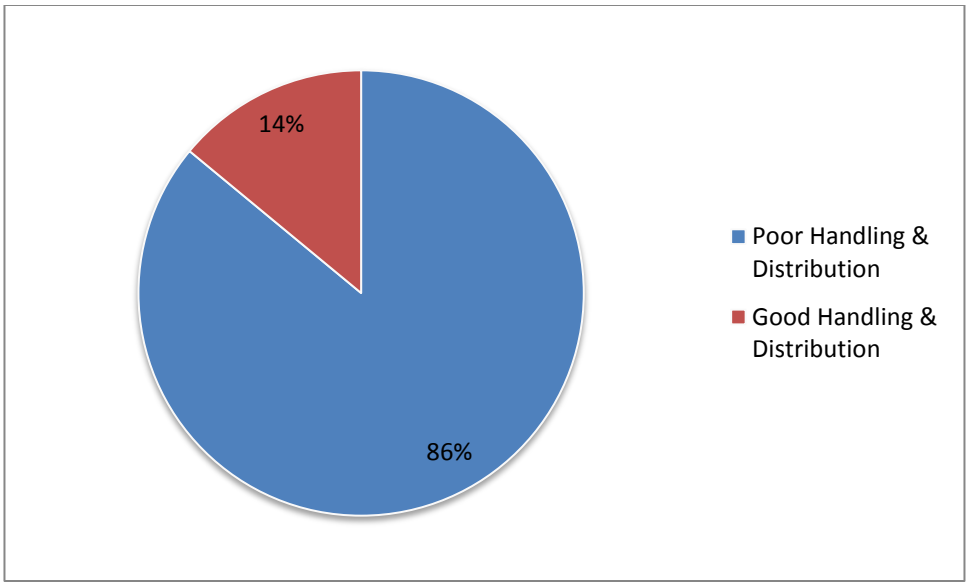

Fig.7. Produce Exposure to high temperature in retail shops.

4.6 Key informant interview

Key informant interviews are used to obtain useful qualitative information that supplements or clarifies what have been learned from scheduled interview, personal observation and existing secondary data sources. Thus, based on detailed checklist experienced, knowledgeable and responsible persons to their respective sector were interviewed.

As a result it was found that Ethiopian Fruits & Vegetables Marketing S.C has three different sub-storage and distribution branches in Addis Ababa which are found around ; *Piassa, Afinchober* and *Kera* areas. These branches are distribution centers of 30% fruits and vegetables harvested outside Addis Ababa for 60 retail shops which are found in different parts of the city under the above mentioned branches. However, the major sales portion which amounts to 70% used to sold to wholesalers such as supermarkets, universities, schools and hospitals.

From the interview it was known that the company has regional branches in Adama, Harar, BahirDar, Dire Dawa, Metehara, Hawassa, Mekele, Assela, Debreziet and Shashemene towns. In addition to this, it was learned that while different varieties of

Orange, Mandarin, Banana, Mango, Avocado, Cactus fruit and Apple are major fruits whereas the major vegetables constitute of different types of Onion, Garlic, Tomato, Cabage, Potato, and Carrot. Generally, Etfruit plays an important role in provision of fruits and vegetables to the larger portion of public sector at different areas of the nation as compared to other private sectors Mohammed & Greenhalgh (2007).

The interview resulted to discover the packaging materials used while transporting of fruits and vegetables from sub storage & distribution branches to respective retail shops are not disinfected and hence they are not clean. Some the packing materials are kept in open relatively clean and closed store areas.

It was also revealed that the sub-distribution & storage branch standard does not ensure appropriate environmental conditions as per to the respective produces nature in appropriate manner. The storage layout doesn't allow for efficient food protection against contamination. It also exposes fruit and vegetables deterioration due to short fall of important facilities such as temperature, humidity, and atmosphere.

The storage facilities are not always kept in clean and disinfected manner. There are storage usage standards/ procedures but are seldom followed to maintain fruits & vegetables health condition. In the storage practice ethylene sensitive produces are not separated such as apples, from non sensitive like grapefruits while keeping in the storage area.

It was observed that the company has around 25 vehicles which provide transportation service from harvest areas to Addis Ababa, to different regional areas and in city distribution. When it is needed, other private owned commercial vehicles are also used to transport produces. The transportation vehicles are not maintained as such in clean and disinfected conditioned for produce transportation. Usually refrigerated transport was used to exportable produces directly to transport from harvest to airport cargo.

With regards to training; it was mentioned that Etfruit attempts to provide relevant trainings which is formulated to capacitate its employees' efficiency as needed to improve handling and distribution practices of fruits and vegetables by allocating possible financial resources every year. Moreover, the company strives to ensure relevant training to address every employee as much as possible.

4.7 Condition of retail shops

As it was noted from the walking customers' response which was administered through scheduled interview; 21 (70%) respondents responded that the condition of retail shops to keep produce is very poor and 7 (23%) poor and 2(07%) good respectively. This clearly shows that the retail shop conditions are not suitable and conducive place for keeping and selling produce. The following bar shows the summery of this finding.

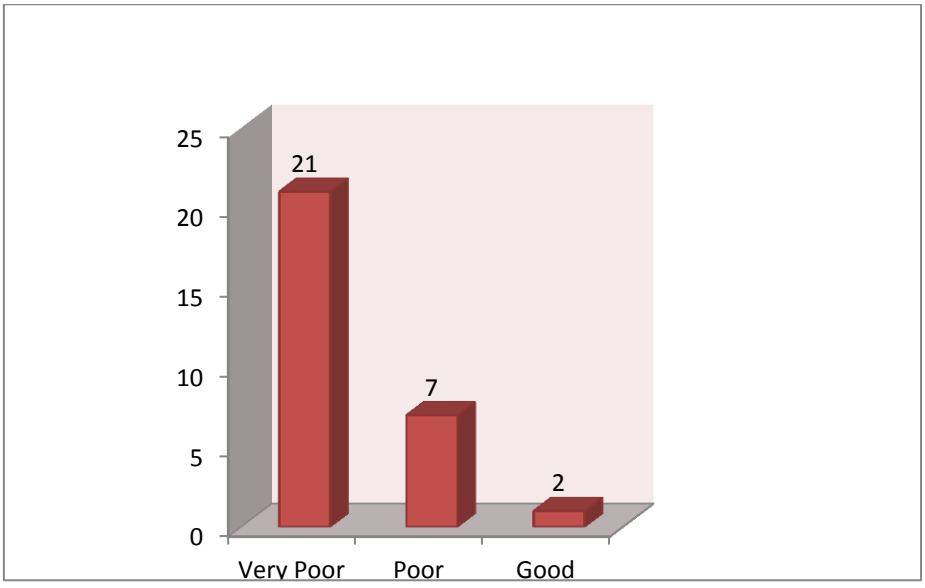

Fig.8. Retail shops condition

4.8 The Result of the Logit Model

Logistic regression model was used to identify determinants of fruits and vegetables handling and distribution in Addis Ababa retail shops of Etfruit. Accordingly, variables assumed to have influence in the retail shops good or poor handling and distribution

condition in different contexts were tested in the model and out of eight variables three of them were found to be significant. Among variables fitted in to the model age of retail shop heads, their sex and years of experiences of retail shop heads found to be significant.

Age and experience are continuous explanatory variables peculiar to the retail shop heads and that was measure in terms of years. The result of this survey revealed that age of sales shop head has negative and year of experience has a positive and negative significant relationship at 10 % respectively, to a status of good fruits and vegetables handling and distribution probability (Table 5). It was hypothesized that sex of retail shop head has negative impact on status of retail shops good handling and distribution of produces. However, the model output in Table 5 revealed that it has positive association with 5% probability. It was also revealed that this econometric model measurement prediction success found to be 93.3%.

Table 5. The result of logit models

Variables	Coefficients	Wald Statistics	Sign.	Odds Ratio
AGE	**-.790***	**3.680**	**.055**	**454**
SEX	8.281**	4.280	.039	3.9503
YEXPCE	.391*	3.014	.083	1.479
MARSTATS	-27.806	1.083	.582	.000
PROEXPOTEMPTRAN	-2.741	.539	.463	.064
PROEXPOTEMPSTOR	-2.265	.367	.545	.104
TRAINIMPQUALPRO	6.358	2.084	.149	577.304
ETFRETSHOCOND	-5.610	1.054	.590	.004
Constant	39.665	.000	.999	1.68317
-2Log likelihood		8.213		
Chi-squared		21.811**		
Prediction success		93.3		

*and ** are significant at p less than 10% and 5% probability levels, respectively.
Source: Model out put

Lastly, existence of multicollinearity between continuous variables was checked, subsequently, it was discovered that there is no association that link the discrete variables (Table 7).

Table 7. Multicolinearity test between continuous variables

Variables	**Significance**	**Collinearity Statistics**	
		Tolerance	VIF
Age of Respondents	.549	.597	1.674
Respondents year of experience	.253	.597	1.674

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

To measure good and poor conditions of handling and distribution of fruits & vegetables some relevant determinant factors were utilized to Etfruit case. Thus, scheduled interview for walking customers and retail shop sales heads was used to collect the data from respondents. The data were analyzed employing descriptive statistics and logistic regression model. And also potential variables presumed to determine the handling and distribution status of retail shops were analyzed with logistic regression model (binary logit).

According to the result of the study 24 (80%) of sample retail shops were found to be poor in produce handling & distribution status, whereas the remaining 6 (20%), were in good condition. Good qualified retail shops were characterized by the fact that they unload produces before exposed to temperature while distribution, had taken training, acquired experience and most importantly are accessible to consumers. Since their daily sales turnover was remarkable, produces exposure to excessive temperature and subsequent loss at retail shops was very minimal.

Student t-test of continuous variables, for the age of respondent and year of experiences of sales shop heads was employed to look into its influence on the status of fruits & vegetables handling and distribution. As a result, it was found that both variables do not have any significant relationship with good handling and distribution of produce. On the other hand among discrete variables, sex of respondent, marital status, produce exposure to temperature during transportation and exposure to higher temperature within the retail shop were found to have significant association with handling and distribution status of retail shops.

From key informants interview and personal observation it was found that lack of well-designed storage facility, poor packaging, old container / retail shops, ad hock training delivery, inappropriate storage management were the major areas that need due attention to improve produce handling and distribution condition.

From the waking customers response it was found that 70 %, 23 % and 7% responded that the retail shop condition is very poor, poor and good respectively. However, the main reason why these customers visit Etfruit retail shops is due to relatively reasonable price of the company and to take advantage of it as compared to private produce marketers.

5.2 Recommendations

Fruits & vegetables handling and distribution is not an easy task. A lot of dimensions affect at various times and in different places to avail an appropriate storage, transportation, and retail sales condition to the respective nature of produces frequently sold under Etfruits custody .

The production of fruits and vegetables would be very useful if only the produces reach the consumer in good condition, on time and at a reasonable price. This study revealed that procurement of fruits and vegetables for resale without improving the storage areas, the sales shop condition and location. This practice is scarifying Etfruit significantly to a huge loss due to weight loss and damage of produces (Appendix C). As it was attested by (Abubakari & Rees, 2009) that rough handling of fruits & vegetables results in the destruction of fruit cell wall leading to softening and reduced marketability of the produce. Subsequently, high storage temperature increases respiration and ethylene production as well as accelerates ripening and weight loss since the conditions (rough handling and high temperature) accelerate the metabolic rate of fruits and vegetables and this again reduce the shelf life of the produce.

Consistent with research result of Sissay B. *et al*. (2006), this study identified that among other factors, improving fruits handling and usage of cold storage can ensure the quality of

Citrus fruit in Ethiopia. Thus, it is important to enhance the existing storage and distribution branches and sales shops condition starting from the design stage for improving the quality of produce handling before consumption.

It was also observed from this study that produces were exposed to higher temperature during transportation and within the retail shop. This has significant role to develop weight loss and damage due to exposure to excess temperature. To mitigate losses from these types of cause; it is recommended to deploy ventilated vans or refrigerated trucks to all retail shops for the distribution of fruits and vegetables.

Moreover, unlike the existing practice, produce shipments/delivery to retail shops must be up on requested time in accordance to the respective retail shops demand rather than dumping without sellers' consent. Understanding the fact that the retail shops condition is not suitable to keep fruits and vegetables to lengthy time, the quantity loaded to each retail shops must take into consideration; the prior stock balance/unsold, sales forecast/ customers demand and accessibility to customers exposure.

The result of the study prove that most of the retail shops condition needs to be improved so as to maintain quality of produces in healthy and attractive to customers manner. Therefore, old containers must have to be fixed as earlier as possible, and the sales shops physical location has to be situated in public exposure sites with innovative display table so as to catch consumers eye and register higher sales turnover.

Years of experience of retail shop head is statistically significant and positive. Therefore, retaining experienced retail shop heads should be given much focus. Age is significant but has negative effect. Thus, although experience may correlate with age the positive relation of age need to be limited and by implication retention of younger retail shop heads should be encouraged. In general female sales personnel are appreciated for handling customers better. However, surprisingly this study revealed males outperform for this research problem and hence male headed retail shops should be encouraged.

It is known that food loss reduction is normally less costly than equivalent increases in food production (APO, 2006). Reduction of postharvest losses is essential in increasing food availability from the existing production. The success of production lies in the proper distribution of produce and its subsequent utilization by the consumer without or very minimal waste. Thus, improving the above suggested recommendations to mitigate the inherent problems of fruits and vegetables handling and distribution will enhance customers' health, to regulate food stuff prices and to improve the economic benefit of Etfruit through minimizing the loss and damages that are reported every single day.

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APPENDIX A

Checklist for Key informants interview

Introduction:

- ✓ What products are currently produced, stored & Distributed in general through Etfruit, and particularly in Addis Ababa? List ----------
- ✓ Where are Etfruits branch found out of Addis Ababa? List ----------
- ✓ How and in what ways is produce distributed to customers and wholesalers?

Packing:

- ✓ Do you use only clean packaging materials while transporting to Addis Ababa and to each retail shops?
- ✓ While re-usable containers are used; do you ensure that weather they are clean and disinfected?
- ✓ Are packing materials stored in a clean area, closed and adequately protected against the entrance of pests and rodents?
- ✓ Do you assign people who are responsible to check, remove and avoid bad condition or dirty containers before shipment?
- ✓ To avoid cross-contamination, do you ensure that packaged produce either ready to be delivered to the market or to be stored should not go across the dirty area or areas corresponding to previous preparation steps?

Storage

- ✓ Do you ensure that the storage environmental conditions (temperature, humidity, and atmosphere) required for each product in appropriate manner?
- ✓ Does the storage allow adequate maintenance and cleaning space?
- ✓ Is the storage built in a manner which can avoid the access and nesting of pests?
- ✓ Does it allow an efficient food protection against contamination?
- ✓ Is it helpful to reduce fruit and vegetables deterioration to minimum (i.e. by controlling temperature and humidity)?
- ✓ Are storage facilities always kept clean and correctly disinfected?
- ✓ Does equipments re-used to handle fresh produces after moving garbage, waste, etc. without properly cleaning and disinfecting?
- ✓ Are there any storage usage standards/ procedures that should be followed in order to maintain fruits & vegetables in a healthy condition?

- ✓ Do you separate ethylene sensitive produces such as apples, from non sensitive like grapefruits while keeping in the storage?
- ✓ What type of storage facility you use to keep fresh produces in good quality with longer shelf life before it reach to consumers? (Natural ventilation, temperature room, other)
- ✓ What possible reasons contribute to the damage of fresh produce in regard to storage?
- ✓ Do you have a record of losses and damages of sub storage and retail shops?
- ✓ What measures are taken for the damaged produces in the main storage & retail shops?

Transportation

- ✓ Does transportation ensure produce protection from environmental conditions and, when necessary, refrigerated to avoid their contamination or deterioration?
- ✓ Are always the transportation vehicles maintained completely clean, disinfected, and dry before loading?
- ✓ Is there a guide to load and unload pallets or individual containers gently to avoid wounds and bruises due to impacts or vibration?
- ✓ Is load secured to the compartment to avoid movement during travel that could harm the quality of the product and to avoid possible accidents?
- ✓ Is ideal holding conditions for each product in mixed loads (temperature, ethylene production and sensitivity to it, humidity, etc.) maintained?
- ✓ For the refrigerated transport; does pre-cooling of the vehicle compartment to the desired temperature before loading is ensured?
- ✓ Do you accommodate the pallets or individual containers inside the vehicle to ensure cold air circulation through and around them?
- ✓ Do you check the good operating conditions of the refrigeration equipment so as to adapt the requirements of each produce in particular?
- ✓ Do the integrity of walls, floor, roof, and doors of the load compartment, maintained? (since through any opening or crack heat, dirt, and insects can enter or cold and humidity can be lost)
- ✓ Do proper ventilation and openings in place?
- ✓ Do you verify the cleaning of the equipment? (because remaining odors from previous loads, residues of toxic substances, presence of insects or their nests may affect the quality of the load)
- ✓ Does the enterprise use refrigerated vehicles to distribute fresh produces in Addis Ababa?
- ✓ How do you see the transport facility and road conditions contribution to the distribution of quality fresh produces to each retail shops in Addis Ababa?

- ✓ To what extent is time delay (due to various reasons) has an effect to the damage of fresh produces while distributing them to retail shops?
- ✓ What distribution/transport related factors affect the quality of produces in A.A?

Training

- ✓ Do staffs trained and supervised continuously to detect and correct mistakes?
- ✓ Does the training designed to allow a better understanding of the importance of handling practices, sanitation or personal hygiene?
- ✓ How often do you give trainings to your employees?
- ✓ Does each staff across all units get relevant trainings with regard to handling and distribution in consistent manner?

Others

- ✓ Do you think equipment facilities in the store, packaging/ containers and transporting vehicles are up to date and safe for any physical or mechanical damages of fruits? If so how?
- ✓ Do you think that exporting fruits and vegetables to abroad have significant economic contribution?
- ✓ Have you put in practice any global or regional level standards to improve more Etfruits existing practice and export to abroad competitively? (such as to ad her COLEACP or GLOBAL G.A.P certification?
- ✓ What are the major bottlenecks for the failure to get these certification standards?
- ✓ What do you recommend to solve the above raised problems?
- ✓ What sort of improvements do you propose to improve Etfruits overall practice so as to maximize its profit?

Schedule Interview for Employees/Sales of Etfruit

THE PURPOSE OF THE PAPER, IS TO ENABLE THE RESEARCHER, TO COMPLETE HIS THESIS ON THE TOPIC OF "DETERMINANTS OF FRUITS AND VEGETABLES HANDLING AND DISTRIBUTION IN ETFRUIT THE CASE OF ADDIS ABABA"

NB. All information given would be treated with utmost confidentiality. Thank you.

Sub Branch Storage _____

Retail Shop Location: _____

Name of the Respondent: _____

Age: _____

Sex: _____ a. Male b. Female

1. Marital Status:

    1. Married 2. Single 3. Divorced 4. widow/ widower 5. Separated

2. Year of experience in Etfruit _____

3. Are the fresh produces sent from main store to your retail shop clean and free of any visible damage?

    1. Yes 2. No

4. If they reach to you with physical damage; where do you think this problem came from;

    1. Storage 2. Transportation 3. Packaging 4. any other reason

5. Are the produce kept on proper humidity and temperature appropriate to each produce at your respective retail shop.

    1. Yes 2. No

6. Are the produce exposed to high temperature during transportation of fresh produces?

    1. Yes 2. No

7. Are the produce exposed to high temperature during storage at the retail shops?

    1. Yes 2. No

8. How do you qualify the overall condition of the retail shops?

    1. Very Good 2. Good 3. Medium 4. Poor 5. Very Poor

9. Which of the following factors affect significantly for physical damages of fruits and vegetables?

1. Transport 2. Storage 3. Retail shops 4. another

10. Have you taken any training with regard to improving quality of produce handling?

1. Yes 2. No

11. How often do you receive trainings?

1. Very Often Times 2. Often times 3. Some times 4.Rarely 5. If other, please specify

12. How often are your customers satisfied by the quality of fresh produces supply

1. Very Often Times 2. Often times 3. Some times 4.Rarely 5. If other, please specify

13. Is there any written procedure that should to be followed how to clean, handle, and sale fresh produces?

1. Yes 2. No

14. What do you do when produces damaged at your retail shop due to various reason?

1. Sell to customers' 2. Return to the sub store 3. If any other; please specify _____

15. What do you feel about the Etfruits' retail shops over all condition to keep fresh produce quality as compared to supermarkets and other private shops?

1. Very Good 2. Good 3. Medium 4. Poor 5. Very Poor

16. What do you recommend to enhance the handling and distribution of your fresh fruits and vegetables?

_____

Schedule interview for Etfruit walking customers

THE PURPOSE OF THE PAPER, IS TO ENABLE THE RESEARCHER, TO COMPLETE HIS THESIS ON THE TOPIC OF "DETERMINANTS OF FRUITS AND VEGETABLES HANDLING AND DISTRIBUTION IN ETFRUIT THE CASE OF ADDIS ABABA"

NB. All information given would be treated with utmost confidentiality. Thank you.

Name of Respondent: _____
Sub Branch Storage _____
Retail Shop Location: _____
Age: _____
Sex: 1. Male 2. Female
1. Marital Status:
   a. Married b. Single c. Divorced d. widow/ widower e. Separated
2. Is Etfruit your preference than other private fresh produce sales shops

   1. Yes 2. No

3. Why do you prefer etfruits retail shop than others due to;

   1.Cheaper price 2. Vicinity 3. Quality of produce 4. If Other; please specify --------
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4. Dose Etfruits supply clean and free of any visible physical damage often times?

   1. Yes they supply clean produce 2. No I observe damages 3. They supply sometimes good quality and another times poor quality 4. If Other, please specify ----------

5. What is your opinion with regard to Etfruits selling price as compared to other private shops and supermarkets?
   1.Cheap 2. Fair 3. Reasonable 4. Expensive 5. I don't know
6. How often do you come to Etfruit retail shops to buy fruits & vegetables?
   1. Very Often Times 2. Often Times 3. Sometimes 4.Rarely 5. When I don't have access to other shops.
7. How do you observe the quality of the fresh produce sold in Etfruit shops as compared to supermarket supply
   1. Very Good 2. Good 3. Medium 4. Poor 5. Very Poor
8. How do you see the retail shops condition of Etfruit for fresh produce from your observation
   1. Very Good 2. Good 3. Medium 4. Poor 5. Very Poor
9. What improvements do you recommend as a valued client to Etfruit ----------
   ---

APPENDIX B

Appropriate Storage Temprature of fruits and vegetables

32-36°F, 0-2°C			45-50°F, 7-10°C	55-65°F, 13-18°C
Vegetables and Melons				
anise	collard*	parsnip	basil	casaba melon
artichoke	cut vegetables	raddichio	beans; snap, etc.	cassava
arugula*	daikon*	radish	cactus leaves	crenshaw melon
asparagus*	endive*	rutabaga	cucumber*	dry onions
bean sprouts	escarole*	rhubarb	eggplant*	ginger
beet	garlic	salsify	Juan Canary	honeydew melon
Belgian	green onion*	shallot	melon	jicama
endive*	herbs(not basil)	spinach*	kiwano	potato
bok choy	horseradish	snow pea*	okra*	Persian melon
broccoli*	Jerusalem	sweet corn	pepper; bell,	pumpkin
broccoflower*	artichoke	sweet pea*	chili	squash; winter, hard rind
brussel	kale	Swiss chard	squash; summer, soft rind*	sweet potato*
sprouts*	kohlrabi	turnip	tomatillo	taro
cabbage*	leek*	turnip greens*	watermelon*	tomato; ripe
cantaloupe	lettuce*	waterchestnut		mature green
carrot*	mint	watercress		yam*
cauliflower*	mushroom			
celeriac	mustard			
celery*	greens*			
chard*	parsley*			
chicory*				

32-36°F, 0-2°C		45-50°F, 7-10°C		60-65°F, 16-18°C	
Fruits					
Apple	fig	avocado,	mandarin	atemoya	mango
quince	gooseberry	unripe	olive	banana	mangosteen
apricot	grape	cactus pear,	orange	breadfruit	papaya
raspberry	kiwifruit*	tuna	passion fruit	cherimoya	plantain
avocado, ripe	nectarine	carambola	pepino	coconut	pummelo
strawberry	peach	chayote	pineapple	grapefruit*	rambutan
blackberry	pear; Asian	cranberry	pomegranate	lemon*	sapote
blueberry	pear; European	feijoa	tamarillo	lime*	soursop
cherry	persimmon*	guava	Tangelo		
currant	plum	kumquat	tangerine		
cut fruits	prune	longan			
date		lychee			

* Products marked with an asterisk are sensitive to ethylene damage.

Source: Thompson, J.F., Kader, A.A. and Sylva, K. 1995. Compatibility Chart for Fruits and Vegetables in Short-term transport or Storage. University of California DANR Publication 21560 (poster).

APPENDIX C

2005 EC Total Produce Damage & Weight Loss Report													
			Damage in Quintal					weight Loss in Quintal					
S/N	Distributors	Annual Quintal received	Weight Loss While Delivery	Damages due to delay in the store	Damages collected from Retail shops	Total Damage	Value in birr 800/quintal	Weight Loss While Delivery	Damages due to delay in the store	Damages collected from Retail shops	Total Damage	Value in birr 800/quintal
1	Kera Branc	32,969.73	83.44	717.74	2802.8	3,603.98	2,883,184.00	92.7	554.11	548.07	1195	956000
2	Piassa Bran	43739.31	182.5	1074.95	875.76	2,133.21	17,065.68	265.75	378.27	140.64	785	628000
3	Afinchober	14442.82	22.33	265.96	1196.2	1,484.49	11,875.92	63.86	96.04	124	284	227200
4	Adama	19633.49	70.48	142.7		213.18	1,705.44	34.31	58.88		93.2	74560
5	Harar	4340.6	21.09	171.41		192.5	1,540.00	26.73	50.65		77.4	61920
6	BahirDar	1179.26	11.21	125.29		136.5	1,092.00	18.03	26.33		44.4	35520
7	Diredawa	3594	36.54	171.44		207.98	1,663.84	16.23	36.11		52.3	41840
8	Metehara	7458.96	44.66	240.34		285	2,280.00	20.32	51.74		72.1	57680
9	Hawassa	2467.94	19.39	120.32		139.71	1,117.68	0	40.09		40.1	32080
10	Mekele	2317.04	10.24	214		224.24	1,793.92	39.85	52.22		92.1	73680
11	Assela	1231.9	9.75	56.54		66.29	530.32	1.8	44.03		45.8	36640
12	Debrezeit	4050.83	27.89	192.29		220.18	1,761.44	16.3	37.08		53.4	42720
13	Shashemer	3393.74	446.8	202.91		649.71	5,197.68	29.83	73.36		103	82400
	Total	140,819.62	986.32	3695.89	4874.76	9,556.97	2,930,807.92	625.71	1498.91	812.71	2937.8	2,350,240.00
	Value of Retail Loss				3,899,808.00					650,168.00		

Source : From Ethiopian Fruits & Vegetables Marketing S.C internal document

APPENDIX D

RETAIL SHOPS HANDLING & DISTRIBUTION STATUS CRITERION						
ID No.	**LOCATION**	**SUB - STORAGE (4)**	**TRANSPORT (2)**	**RETAIL SHOP CONDITION (3)**	**OTHERS (1)**	**TOTAL OUT OF 10 POINTS**
1	Gofa	2	2	1	0	5
2	Hana Mariam	1	1	1	1	4
3	Lebu	1	2	1	1	5
4	Akaki 1	1	1	1	1	4
5	Alembank	1	2	1	1	5
6	Besrate Gebriel	2	2	1	0	5
7	Kera	0	2	1	0	3
8	Betel	2	2	2	1	7
9	Sebeta	0	2	2	1	5
10	Akaki 2	1	2	1	1	5
11	Sarbet	0	2	1	1	4
12	Mekanissa Cond.	0	2	2	1	5
13	Adey Abeba	0	2	1	1	4
14	Saris Abo	1	2	1	1	5
15	Merkato	1	1	1	1	4
16	Asco	2	1	2	1	6
17	Giorgis	1	2	3	1	7
18	Wingate	2	2	1	0	5
19	Balcha	2	2	3	1	8
20	Piassa Tele	1	2	3	1	7
21	Medhanialem	1	2	1	1	5
22	Mexico	2	2	2	1	7
23	Megenagna	1	1	0	1	3
24	Meri	1	2	0	1	4
25	Amiche	1	2	1	1	5
26	Sidist Kilo	0	2	2	0	4
27	Gurdshola	0	1	1	1	3
28	Gerji	2	1	2	1	6
29	Sivil Service	2	2	2	1	7
30	CMC	2	2	1	0	5

Appendix E

Table1. Empirical studies on postharvest handling of produce

S/N	Name of authors	Year	Titles
1	P.A. Idah, E.S.A. Ajisegiri and M.G. Yisa	2007	Fruits and Vegetables Handling and Transportation in Nigeria
2	Orno Ohiokpehai	2003	Adding value to horticultural crops in Botswana
3	Andrés F. López Camelo	2002	Manual for the preparation and sale of fruits and vegetables
4	Lisa Kitinoja and Adel A. Kader	2003	Small-Scale Postharvest Handling Practices: A Manual for Horticultural Crops (4th Edition)
5	Kenneth Lynch	1994	Urban fruit and vegetable supply in Dar Es Salaam
6	Bezabih Emana and Hadera Gebremedhin	2007	Constraints and Opportunities of Horticulture Production and Marketing in Eastern Ethiopia
7	Adugna Gessesse	2009	Analysis of Fruits & Vegetables Marketing Chains in Alamata, Southern Zone of Tigray: The Case of Onion, Tomato and Papaya.
8	Hadiza Lawan	2012	Handling Perishable Food Stuff for Quality Assurance and its Effect on Quality and Price a Study of Yanlemo Market, Kumbotso L.G.A of Kano State
9	Abubakari Mutari and Rees Debbie	2011	The effects of postharvest handling and storage temperature on the quality and shelf of tomato.

Source: Own, 2013

DECLARATION

I, the undersigned, declare that this thesis is my original work, prepared under the guidance of Dr. Nigussie Simei (PhD). All sources of materials used for the thesis have been duly acknowledged. I further confirm that the thesis has not been submitted either in part or in full to any other higher learning institution for the purpose of earning any degree.

_____ _____

Name Signature& Date

ENDORSEMENT

This thesis has been submitted to St. Mary's University College, School of Graduate Studies for examination with my approval as a university advisor.

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Advisor Signature& Date