



St. MARY'S UNIVERSITY
SCHOOL OF GRADUATE STUDIES
Institute of Agriculture and Development Studies

**ASSESSMENT OF MUSHROOM PRODUCTION
AND MARKETING IN ETHIOPIA: THE CASE OF
ADDIS ABABA**

By
MIKIYAS SILESHI
ID No: MARD/0192/2005

JUNE, 2014
ADDIS ABABA, ETHIOPIA

**ASSESSMENT OF MUSHROOM PRODUCTION
AND MARKETING IN ETHIOPIA: THE CASE OF
ADDIS ABABA**

By

MIKIYAS SILESHI

ID No: MARD/0192/2005

**A THESIS SUBMITTED TO St. MARY'S UNIVERSITY, SCHOOL OF
GRADUATE STUDIES IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE OF MASTER IN RURAL
DEVELOPMENT**

JUNE, 2014

ADDIS ABABA, ETHIOPIA

St. MARY'S UNIVERSITY
SCHOOL OF GRADUATE STUDIES
INSTITUTE OF AGRICULTURE AND DEVELOPMENT STUDIES
RURAL DEVELOPMENT DEPARTMENT

**ASSESSMENT OF MUSHROOM PRODUCTION AND
MARKETING IN ETHIOPIA: THE CASE OF ADDIS ABABA**

By

MIKIYAS SILESHI

APPROVED BY BOARD OF EXAMINERS

Dean of Graduate Studies

Signature and Date

Advisor

Signature and Date

External Examiner

Signature and Date

Internal Examiner

Signature and Date

DECLARATION

I, the undersigned, declare that this thesis is my original work, prepared under the guidance of Dr. Milkessa Wakjira. 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.

Mikiyas Sileshi

Name

Signature and Date

ENDORSEMENT

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

Dr. Milkessa Wakjira

Advisor

Signature and Date

ACKNOWLEDGMENTS

First and for most, my heartily thanks go to Almighty God for his grace and for all his help in successful completion of my study.

I would like to thank St. Mary's University for giving me the chance to attend this postgraduate program.

I would like to express my sincere thanks to my advisors Dr. Milkessa Wakjira who provided me his professional support to complete this paper.

I am grateful to express my gratitude to Ato Mulugeta Tadesse (Head of work unit, Addis Ababa Agricultural office) for his patience and support throughout the duration of my study.

My gratitude is extended to Ato Denisew Liramu for his technical and professional support, all Testing Center Staff members of St. Mary's University, and my friends who provided me valuable assistance for the accomplishment of my study.

I am also grateful to express my sincere thanks to Ethio-Mushroom, Sweet Mushroom, Mushroom 2000, Z.T.H Mushroom Spawn Production, and Sheger Mushroom, Akaki, Gulele, and Ledeta sub city staff members who provided me the necessary data to materialize this paper.

Finally I would like to acknowledge the encouragement and assistance given to me by Ato Fikadu Begna (Director of Testing Center, St. Mary's University) and Dr. Wubishet Shiferaw (Vice- Director of Testing Center, St. Mary's University).

ABSTRACT

The study has focused on assessing Mushroom Production and Marketing activities in Ethiopia with special reference to Addis Ababa. The main objective of this study is to assess the existing mushroom production and marketing in Addis Ababa and its adoption in rural Ethiopia. Hence, in order to achieve this objective, an assessment was conducted from February, 2014 to June, 2014 to collect the primary data. The data were collected from eight organizations namely Ethio-Mushroom, Sweet Mushroom, Mushroom 2000, Zenebech, Teshome and Haymanot Mushroom Spawn Production, Sheger Mushroom, Akaki, Gulele, and Ledeta mushroom farms. Samples of 91 respondents from the eight organizations were addressed through structured close and open ended questionnaire as well as interviews. Respondents were selected using systematic sampling method. The data collected were analyzed by descriptive statistics using simple statistical analysis i.e. frequencies, percentages, figures and tables with the help of SPSS. The results of the study revealed that, the existing market demand and supply were at rudimentary stage and the specific factors contributed to this condition were termed to be inefficient production and poor quality of the products. As well as in terms of amount of production, most of the production is practiced at small scale level. On the other hand the major factors that hinder the cultivation of mushroom was found to be lack of awareness, lack of knowledge, low product price, lack of space and lack of facilities. Though there are potentials and opportunities for cultivation of mushroom in the country such as favorable climate, availability of agricultural wastes, cheap labor, good water resources, and high demand for mushroom products in the market. Among the factors that was found from this study which hinder the marketing and production of mushroom were the access to direct sale to consumers, lack of awareness of the potential consumers about the product, lack of promotion, lack of market and poor quality of the product. Thus based on this study it is recommended that all stakeholders should incur efforts to promote the production and marketing of mushroom around the study area in particular and in the country in general.

Key words: *Mushroom, Production, Marketing, Adaptation and Rural Ethiopia.*

TABLE OF CONTENTS

	PAGE
ACKNOWLEDGMENT.....	III
ABSTRACT	IV
TABLE OF CONTENTS	V
LIST OF TABLES.....	VIII
LIST OF FIGURES.....	IX
ACRONYMS	X
CHAPTER ONE: INTRODUCTION.....	1
1.1 Background.....	1
1.2 Statement of the Problem.....	3
1.3 Research Question	5
1.4 Objective of the Study	5
1.4.1 General Objective	5
1.4.2 Specific Objectives	5
1.5 Significance of the Study.....	5
1.6 Delimitation/ Scope of the Study.....	5
1.7 Definition of Terms.....	6
1.8 Limitation of the Study.....	6
1.9 Organization of the Thesis.....	6
CHAPTER TWO: REVIEW OF LITERATURE	7
2.1 Definitions of Mushroom.....	7
2.2 History of Mushroom Growing.....	8
2.3 Opportunities and Risks of Mushroom Growing.....	9
2.3.1 Opportunities.....	9
2.3.2 Challenges	10

2.4 Production of Mushroom.....	12
2.5 Marketing of Mushroom.....	13
2.5.1 Market and Market Channels.....	14
2.6 Benefits of Mushrooms	15
2.6.1 Economic Value Mushrooms.....	15
2.6.2. Nutritional Value of Mushrooms.....	15
2.6.3 Medicinal Effect of Mushrooms.....	17
2.7 Potentials, Opportunities, and Challenges of Mushroom Production in Ethiopia.....	18
2.7.1 Potentials and Opportunities of Mushroom Production in Ethiopia.....	18
2.7.2 Challenges of Mushroom Production in Ethiopia.....	20
2.8 Adopting Mushroom Technology in Rural Ethiopia.....	21
2.9 Production and Marketing of Mushrooms.....	22
2.9.1 Global Scenario.....	22
2.9.2 National Scenario	22
2.10 Empirical Evidences	23
CHAPTER THREE: METHODOLOGY	26
3.1 Overview of the Study Area.....	26
3.2. Research Design.....	27
3.3. Sampling and Population.....	27
3.4. Sampling Technique and Sample Size.....	27
3.5 Data Collection Procedure.....	29
3.6. Sources of Data	29
3.6.1 Primary Data.....	29
3.6.2 Secondary Data.....	30
3.7 Methods of Data Analysis.....	30

CHAPTER FOUR: RESULTS AND DISCUSSION	31
4.1 Respondents' Profile	31
4.2 Initiation in Mushroom Production.....	34
3 Summary of Responses for Open-ended question.....	44
Summary of Interview Responses.....	45
CHAPTER FIVE: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS.....	48
5.1. Summary of Findings.....	48
5.2 Conclusions	49
5.3. Recommendations.....	50
REFERENCES	
APPENDIX	A-B

LIST OF TABLES

	Page
Table 3.1 Total Number of Population and Proportion of Samples taken from each Enterprise..	28
Table 4.1 Summary of the Total Number and Percentage of Respondents by Age and Sex....	31
Table 4.2 Marital Status of Respondents by Sex.....	32
Table 4.3 Household Size.....	32
Table 4.4 Respondents' Educational Qualification and Occupation.....	33
Table 4.5 Frequency of Respondents on how they Start Mushroom Production.....	34
Table 4.6 Source of Mushroom Spawn.....	36
Table 4.7 Facilities or Assistance of Mushroom Enterprises.....	36
Table 4.8 Satisfaction in Being a Producer of Mushroom.....	37
Table 4.9 Producers Involvement in the Production Process.....	38
Table 4.10 Mushroom Production Seasons.....	38
Table 4.11 Awareness of Residents about Mushroom.....	39
Table 4.12 Factors Hinder the Cultivation of Mushroom.....	39
Table 4.13 People Eating Habit of Mushroom.....	40
Table 4.14 Supplying Mushroom Products.....	40
Table 4.15 Mushroom Species Types.....	41
Table 4.16 Potentials and Opportunities for Mushroom Production.....	41
Table 4.17 Marketing Problems Faced by the Producers of Mushroom.....	42
Table 4.18 Technical Problems Faced by the Producers.....	42
Table 4.19 Purpose of Mushroom Products.....	43
Table 4.20 Demand and Supply of Mushroom	43
Table 4.21 Producers Living Condition.....	44

LIST OF FIGURES

Page

Figure: 3.1 Location Map of the Study Area.....	26
Figure 4.1 Farm Size in Square Meters	35
Figure 4.2 Length of time in Mushroom Production Activities.....	35

ACRONYMS

DoFED = Department of Finance and Economic Development

FAO = Food and Agricultural Office

ESP = Environmental Support Project

MoA = Ministry of Agriculture

OSH = Occupational Safety and Health

SMU = Saint Mary's University

SPSS = Software Package for Social Sciences

SWOT = Strengths, Weaknesses, Opportunities and Threats

USD = United State Dollar

UN = United Nations

WFP = World Food Program

REFERENCES

- Ahlawat O.P., and R.P. Tewari, (2007). Cultivation Technology of Paddy Straw Mushroom (*Volvariella volvacea*) Technical Bulletin. pp. 3-7
- Alice, B. and Michael, K.,(2004). Mushroom Cultivation and Marketing: pp.1-15 (www.attra.ncat.org, 2006)
- Azeb, W., (2008). Oyster Mushroom Cultivation by Urban Youth in Addis Ababa as an Income Generating Activity. Youth Program Officer Institute for Sustainable Development (ISD) Addis Ababa, Ethiopia. pp. 23-31
- Bram van, N., (2007). Small-Scale Mushroom Cultivation – 2, Agro dok (41) 6-12
- Celik, Y. and K. Peker, (2009). Benefit/Cost Analysis of Mushroom Production for Diversification of Income In Developing Countries. Bulgarian Journal of Agricultural Science, Agricultural Academy. **15 (No 3)** 228-237
- Addis Ababa City Administration, (2012). Addis Ababa City Profile.
- Danny, L., (1997). Growing Mushroom Commercially - Risks and Opportunities. pp. 1-8
- Dawit, Abate, (1998). Mushroom Cultivation –Ethiopia: Experiences in Developing Capacity for Sustainable Development, **Volume (17) 109 – 116.**
- , (2008). Mushroom Cultivation in Ethiopia: Status and Opportunities Department of Biology, Addis Ababa University, Addis Ababa, Ethiopia. pp. 28-34
- Diriba, M., Delelegn W., and Teferi, Y., (2013). Mushroom Consumption Habits of Wacha Kebele Residents, Southwestern Ethiopia. Global Research Journal of Agricultural and Biological Sciences **Vol.4(1): 6 –16,** May 2013. (<http://www.globalresearchjournals.org/journal/grjabs>, 2013)
- Elaine, K., Marshall, G. and N. G. (Tan) Nair, (2009). FAO, Diversification Booklet No. 7. Make Money by Growing Mushrooms. pp. 1-44
- Georges, M., (2007). Healing Mushrooms: Ancient Wisdom for Better Health/ Compliments of Aloha Medicinals Inc. of the USA, and Pure and Clean of Switzerland, SA. pp. 13-17

- Jean-Michel, S., Marie, F., Michèle, L. and Gérard, B. (2011). Proceedings of the 7th International Conference on Mushroom Biology and Mushroom Products (ICMBMP7) 2011 – Arcachon – France – 4-7 October 2011. pp. 28-33
- Kavitha (2005). Guide for mushroom cultivation Posted on June 1, 2006.
- , (2005). Agriculture and Industry Survey - a monthly magazine published from Bangalore since 1989.
- Manikandan K., (2011). Mushrooms Cultivation, Marketing and Consumption Nutritional and Medicinal Values of Mushrooms. pp. 11-14
- Kivaisi, A., Assefa B., Hashim S. and A. Mshandete, (2010). Sustainable Utilization of Agro Industrial Wastes through Integration of Bio-Energy and Mushroom Production. Nairobi, Kenya, ILRI. pp. 1-4
- Kiflemariam, Y., (2008). Potentials and Constraints of Mushroom Production in Ethiopia. pp. 3-15
- , (2010). Contribution of Small Scale Mushroom Production for Food Security in Amhara Region, Ethiopia. pp. 11-18
- Manjit, S., (2011). Mushrooms Cultivation, Marketing and Consumption. Directorate of Mushroom Research (*Indian Council of Agricultural Research*) Chambaghat, Solan 173213 (HP): 1-10
- Narayanasamy P., Suganthavel P., Sabari P., Divya D., Vanchinathan J., and M. Kumar, (2008). Cultivation of Mushroom (*Pleurotus Florida*) By Using Two Different Agricultural Wastes In Laboratory Condition. The Internet Journal of Microbiology. **Volume 7(2)**.
- Nobuko, T., (2001). Mushroom Utilization by the Majangir, an Ethiopian Tribe. Volume 15, Part 2: 78-79
- Oseni, J. Olumide, (2007). Economic Analysis of Mushroom Marketing as a Copping Strategy for Poverty Reduction in Ondo State, Nigeria. Vol. 8. pp. 1255-1260
- Occupation Safety and Health (OSH) (2002). Risks to Health from Moulds and Other Fungi. Workplace Health Bulletin. <http://www.epa.gov/iaq/pubs/moldresources.html>

Oxford (2010). Advanced Learner's Dictionary. P. 484

Pant L. M., (2008). Mushroom Research, Production, and Technology Transfer at Haramaya University, Ethiopia. pp. 17-24

Peter, O., (2005). Small-Scale Mushroom Cultivation, Agrodok (40) 37-55

Sarah, S., (2006). Mushrooms the News Super Food. (www.mushroom-uk.com,2006).

Shu-Ting Chang, (2006). Biotechnology – **Vol. III** – Mushroom Production. pp. 3-7

, (2008). Training Manual on Mushroom Cultivation Technology. United Nations - Nations Unies (Unescap). Economic and Social Commission for Asia and the Pacific. pp. 6-12 (www.unapcaem.org, 2010)

, (2008). Overview of Mushroom Cultivation and Utilization as Functional Foods. pp. 3-11

Sulman M., Sana M., Umair and H. Jawad, (2011). Oyster Mushroom Farming, University of Central Punjab. pp. 6-12

United Nations, (2009). World mushroom and truffles: Production, 1961-2007. 3 (No 2) 228-237

Wakchaure G.C., (2011). Mushrooms Cultivation, Marketing and Consumption. pp. 15-22

World Food Program, (2009). Food security and vulnerability in Addis Ababa, Ethiopia. Vulnerability Assessment and Mapping (VAM), Addis Ababa, Ethiopia. pp. 163-171

Yamane T., (1967). Statistics: An Introductory Analysis, 2nd Ed., New York: Harper and Row. pp. 1- 5.

http://www.ethiopiainvestor.com/index.php?option=com_docman, 2008.

www.ibm.com/legal/copytrade.shtml, 2011

Appendix A
St. Mary's University
School of Graduate Studies
Institute of Agriculture and Development Studies
Rural Development Department

Dear respondents, I am a student in St. Mary's University and conducting a research on 'Assessment of Mushroom Production and Marketing in Ethiopia; The Case of Addis Ababa' for the partial fulfillment of Masters Degree in Rural Development.

The purpose of the questionnaire is to gather adequate information about mushroom production and marketing in Addis Ababa. In order to make the study more fruitful, your response to the given questions would be necessary. All of your response to the questions would be used only for the research work and will be kept strictly confidential.

Therefore, I would like to forward my deepest gratitude for your unreserved cooperation to complete the questionnaire.

Part One – General Information

Directions: Please put a tick mark from the alternatives that are most applicable to you in respect of each of the following items.

1. Sex Male Female
 2. Age Below 20 years 21-30 31-40 years
 41 – 50 years Above
 3. Marital status Single Married 50 years Widowed (er)
 4. Household size Large Divorced Small
 5. Educational background
 Elementary Degree
 Secondary Masters
 Diploma Above Masters Degree
- Others, please specify _____

Medium

6. Occupation: Civil Servant Private Organization
 Self Employed Student
 Others, please specify _____

Part Two – Basic Research Questions

Directions: Please put a tick mark from the alternatives that are most applicable answer to you in respect of each of the following items.

1. How did you start your mushroom farm?

Own interest Seeing the service of the enterprises
 Awareness by Influenced by neighbors
 promoters Forced
 by families Others,
 please specify _____

2. For how many years have you been engaged in mushroom production activities?

Less than 1 year 2-3 years Above 3 years and

3. How much is your farm size in square meters?

Below 3sq.m. 3- 4sq.m. Above 4sq.m.

4. Where do you get mushroom spawn? Private Enterprises/
 traders Non Governmental Government
 Organizations (NGOs) Others, please
 Low
 Others, please specify _____

specify

5. How is the facilitation or assistance of mushroom enterprises?

High Medium



Others, please specify _____

6. Your satisfaction in being a producer of mushroom is _____ .

Very satisfied Dissatisfied
Satisfied Very dissatisfied

7. What is your source of satisfaction in being a producer of mushroom?

Better income
Others, please specify _____

8. How is your involvement in the production process?

Full time basis Part time basis
Others, please specify _____

9. Which season is best for mushroom production?

Dry season Rainy season Autumn Spring
Others, please specify _____

10. Awareness of residents about mushroom.

High Medium Low
Others, please specify _____

11. Which factors hinder the cultivation of mushroom? (You can indicate more than one response).

Lack of awareness Lack of Non-availability of mushroom seed/spawn
Knowledge Low amount seed Lack of space
Low product price Diseases and Lack of facilities
Insects Lack of capital
Hot temperature

Others, please specify _____

They eat always
They eat when encountered by chance
Do not eat at all

Others, please specify _____

12. Indicate the frequency or condition under which people eat mushroom.

Others, please specify _____

13. Where do you supply your product? Private Mushroom Supermarket Restaurants Hotels Enterprises Others, please specify

14. Which mushroom species or types are currently being produced?
Oyster mushroom Shiitake mushroom Button mushroom
Others, please specify _____

15. Indicate potentials and opportunities for mushroom production. (You can indicate more than one response).
Good water resources Availability of agricultural wastes
Encouraging government investment code Favorable climate
Cheap labor It is an untouched business sector Abundant land
Others, please specify _____

High demand of fresh mushroom

16. Which marketing problems are faced by the producers of mushroom? (You can indicate more than one response). Lack of promotion Lack of markets The product not well known by consumers Low quality of the product Influence of broker Less amount of the product Too much competition Others, please specify

17. What technical problems are faced by the producers? (You can indicate more than one response).

Unavailability of air conditioner (A.C.) _____

Lack of Training Lack of experienced
labor

Others _____

18. For what purpose are you used your mushroom product? (You can indicate more than one response).

Medicinal purpose

Nutritional purposes

Economic purpose

Others please specify

19. How is the market demand for mushroom?

Medium

18. How is your supply of mushroom product to the market?

Medium

20. How is your overall current living standard situation compared to the previous or before you engage in mushroom production?

Highly Improved
improved

Slightly

Same

Deteriorated

21. What do you suggest for good mushroom production?

Thank you for your cooperation

Sincerely

Mikiyas Sileshi

Cell phone 0912056884

Appendix B

Interview Questions

1. How is government assistance (policies) for mushroom enterprises?
2. What are the potentials and opportunities of mushroom production and marketing in Ethiopia?
3. How is people awareness and consumption about mushroom?
4. How is the structure/facility of your organization?
5. Are you satisfied with the amount and quality of product supplied by producers?
6. How is the relationship between the amount of production and the demand of market?
7. What are the Constraints of mushroom production and marketing in Ethiopia?
8. How this technology adopted in rural Ethiopia?
9. What do suggest for good mushroom production and marketing?

Thank you once again for your genuine cooperation!

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

In different parts of the world, mushrooms are considered as the fifth largest vegetation. Mushrooms are type of fleshy plants that belong to the fungi group. Fungi are organisms that are free of chlorophyll and cannot, therefore process photosynthesis. They got their energy through biochemical decomposition processes. They usually grow in cool and moist places. They are mostly found in pastures, meadows, and woodlands. At commercial level, they are cultivated in cave, indoors on shelves filled with plant materials, and in greenhouses where the average temperature is cool (Sulman *et al.*, 2011).

Over hundreds of identified species of fungi have made a significant global contribution to human food and medicine. The most acceptable species cultivated for food and medicinal purposes are 12 which includes the Common mushroom (*Agaricus*), Shiitake (*Lentinus*), Oyster (*Pleurotus*), Straw (*Volvariella*), Lion's Head or Pom Pom (*Hericium*), Ear (*Auricularis*), Ganoderma (*Reishi*), Maitake (*Grifola frondosa*), Winter (*Flammulina*), White jelly (*Tremella*), Nameko (*Pholiota*), and Shaggy Mane mushrooms (*Coprinus*). (Elaine *et. al.*, 2009). The most commonly cultivated mushrooms in Ethiopia are:-*Agaricus bisporus* (button mushroom), *Pleurotus ostreatus* (oyster mushroom) and *Lentinula edodes* (shiitake mushroom) (Dawit, 1998).

Mushrooms have different colors such as white, orange, red, and brown and also have different sizes and shapes. The most common mushrooms have short, thick stems and umbrella like fleshy caps. (Elaine *et al.*, 2009). Mushrooms are richer in proteins and contain minerals like iron, phosphorus, potassium, and calcium and rich with vitamins. It is also filled with fibers that help in digestion in humans. Thus, mushrooms are considered as perfect food, and are also very popular around the world (Sulman *et al.*, 2011).

Presently, mushroom farming is being practiced in more than 100 countries and its production is increasing at the rate of 6 - 7 per cent per annum. Production of mushrooms has already crossed

6 million metric tons annually in the world and is expected to reach around 7 million metric tons in the next ten years (Manjit, 2011).

Within the Eastern African region, production of edible mushrooms is at a small scale which is hardly satisfying the fast growing demand for fresh mushrooms locally and by the booming tourist industry. In Kenya, the current production is estimated at 500 tons per annum and the imports stand at 150 tons per annum. In Ethiopia, the current demand for fresh mushrooms by hotels and airlines is estimated at about 460 tons and being catered mostly through imports because the production is much lower. In Tanzania, production stands at 30 tons while the imports stand at about 150 tons. The local market for fresh mushrooms in Eastern Africa is guaranteed and needs to be satisfied. On the other hand, the global mushroom demand is more than 50 billion USD annually and is increasing every year by about 20%, hence there is also room for export markets. Additionally, there is also a growing demand for mushroom-based food supplements as health enhancing additions by the local and external markets. Therefore the demand for large scale production in East Africa is apparent with a huge impact potential (Kivaisi *et al.*, 2010).

However, in the case of Ethiopia it was started in 1997 by cultivating Oyster (*Pleurotus ostreatus*), followed by Button (*Agaricus bisporus*) and the Shiitake (*Lentinula edodes*) mushrooms which have been introduced to the local market at small scale farm, respectively (Dawit, 1998).

Ethiopia has a favorable climate, abundant land and labor as well as reasonably good water resources that created ample opportunities for horticulture production. The range of altitude, temperature, and soil variability of the country has created an enormous ecological diversity and a huge wealth of biological resources. However, due to different factors, the production and utilization of mushrooms in Ethiopia are neglected. As a result, the country is not benefited from mushrooms as the rest of the world (Kiflemariam, 2008).

On the other hand, there is high demand for fresh mushrooms in the market that exceed the current supply and augmented by imported products with high prices of that have made the cost of mushrooms beyond the reach of average consumers (ibid).

The problem of mushroom production locally is not agronomic. Lack of awareness, interest among the community to produce mushroom and lack of knowledge about its production and marketing could be mentioned as problems that hinders potential producers not involve in the production of the crop. As the objective of production is marketing, this study had assessing the

production and market aspect of the crop is vital for better production and marketing of mushroom products.

Therefore, since mushroom production is being done in different cities of Ethiopia, particularly in Addis Ababa by various interested institutions and groups. This paper assessing the production and marketing situation of mushroom around Addis Ababa is crucial for enhancement of mushroom production in the country.

1.2 Statement of the Problem

In future, the ever-increasing population, depleting agricultural land, changes in environment, water shortage and need for quality food products at competitive rates are going to be important issues. To meet these challenges and to provide food and nutritional security to our people, it is important to diversify the agricultural activities in areas like horticulture.

Diversification in any farming system imparts sustainability. Mushrooms are one such component that not only impart diversification but also help in addressing the problems of quality food, health and environment related issues. One of the major areas that can contribute towards goal of conservation of natural resources as well as increased productivity is recycling of agro-wastes including agro-industrial waste. Utilizing these wastes for growing mushrooms can enhance income and impart higher level of sustainability (Manjit, 2011).

Ethiopia has a favorable climate, comparatively abundant land and agricultural wastes, labor as well as reasonably good water resources that created ample potentials for horticulture production. It has also a wide range of altitude, temperature, and soil variability. All these potentials can be used to the advantage of intensification of new crops including mushrooms in the country (Dawit, 1998).

In Ethiopia there is no commercial mushroom farm that can reach the demand of large cities and towns. According to the market survey conducted in 2006/07 in Addis Ababa, supply of fresh mushrooms is close to zero (demand of fresh mushroom exceeds the supply). As a result the existing few fresh mushroom producers in Addis Ababa could not meet the demand of the market. Because of this, certain supermarkets in Addis Ababa import chemically preserved mushrooms at higher costs and sell at higher prices that would be complemented on the ultimate consumers. As Addis Ababa is the center of large number of international, continental, national

and regional institutions and organizations, and the seat of Diplomatic missionaries, high demand of mushrooms is incontrovertible. This all creates good opportunity for market of the agricultural product including mushrooms.

However, the production and marketing of mushrooms in Ethiopia as well as in Addis Ababa is still at an awareness creation stage. As a result the country is not benefited from mushrooms as the rest of the world. This is due to different factors like; lack of concept and skill on production technology, lack of research, extension, and adaptation works, lack of appreciation about the food and dietary importance of mushrooms, low infra structural development, low level of information supply both on production and marketing aspects, and the monotonous traditional diets and the conservative eating habit of the people that may be a few of the impairments that constrained the introduction of this industry into the country (Kiflemariam, 2008).

Furthermore, there are many pioneer fresh mushroom growers and training centers around Addis Ababa, who can be model for the newly emerging producers and trainer in urban and peri-urban and in the rural areas in particular.

Hence, identifying and analyzing the root causes of mushroom production and market, which takes deep investigation of the problem, is very crucial to come up with viable way of developing it. Taking this in to cognizance, the research questions of this research focuses on the analyses of the problem of mushroom production and marketing in Addis Ababa in terms of its extent, major causes and coping strategies of the producer and assess also possible opportunities for technology transfer to the rural areas.

1.3. Research Question

The study was designed to answer the following questions.

- ¾ What are the opportunities of mushroom production in Addis Ababa?
- ¾ What kind of challenges mushroom producers faces?
- ¾ Is there relationship between the amount of mushroom production and the market situation?
- ¾ How this valuable agricultural output can be introduced to rural Ethiopia?

1.4 Objectives of the Study

1.4.1 General Objective

The main objective of this study is to assess the existing mushroom production and marketing in Addis Ababa and its adoption in rural Ethiopia.

1.4.2 Specific Objectives

The specific objectives of this study include:

- ¾ To assess the potentials of mushroom production situation in Addis Ababa,
- ¾ To identify the major constraints of mushroom producers faces,
- ¾ To analyze the marketing problem of the products, and
- ¾ To study how this technology could adopted in rural Ethiopia.

1.5. Significance of the Study

A study of assessing mushroom production and marketing in Addis Ababa is vital, since it provides information that would enable to take effective measures to improve the production and market situation of mushroom.

1.6 Delimitation/Scope of the Study

The fact shows that mushroom production activity in Ethiopia is highly practiced in Addis Ababa and the city is the pioneer of mushroom production sector in Ethiopia. In addition to these facts time and financial constraint forced the researcher to restrict the study area at Addis Ababa.

1.7 Definition of Terms

Edible is fit or suitable to eaten; not poisonous (oxford, 2010).

Fungi are simple, microscopic organisms, present virtually everywhere, indoors and outdoors (OSH, 2002).

Spawn is the mycelium of the mushroom with its substrate, which is the propagating material, used for initiating mushroom production (Ahlawat [et. al.](#), 2007).

1.8 Limitations of the Study

While trying to achieve the goal of the study, the researcher had encountered certain problems, which might influence the findings of the study.

For instance, studies conducted recently, on the entire production and marketing of mushroom are found to be limited which was the major constraint during the study. The researcher also faced with difficulties in getting most of the respondents on time. This created a problem of delay in the distribution of questionnaires and collection of responses as quickly as needed. However, efforts have been made to solve the problem through consulting the concerned authorities and individuals to meet objective of the study.

1.9 Organization of the Study

The study was organized under five chapters. The first chapter deals with the introduction of the research, which includes its background, statement of the problem, research questions, objectives, significance, and delimitation/scope of the study. The second chapter contains review literature. In the third chapter, the study design and methodology. The fourth chapter reveals the results/findings of the study. The last chapter, the fifth chapter involves the conclusions and recommendations of the study.

CHAPTER TWO

REVIEW OF LITERATURE

2.1 Definitions of Mushroom

Before looking into the entire situation of mushroom production and marketing, it is important to start by defining what mushroom is. According to Sulman *et al.* (2011) mushrooms are type of fleshy plants that belong to the fungi group. Fungi are organisms that are free of chlorophyll and cannot, therefore process photosynthesis. They usually grow in cool and moist places. They are mostly found in pastures, meadows, and woodlands. At commercial level, they are cultivated in cave, indoors on shelves filled with plant materials, and in greenhouses where the average temperature is cool. Similarly, Shu-Ting Chang, (2008) define mushrooms are the fruiting bodies of macrofungi. They include both edible/medicinal and poisonous species.

In addition to the above, Kavitha, (2005) also define mushrooms do not contain chlorophyll and therefore depend on other plant material (the “substrate”) for their food. The part of the organism that we see and call a mushroom is really just the fruiting body. Unseen is the mycelium—tiny threads that grow throughout the substrate and collect nutrients by breaking down the organic material. This is the main body of the mushroom. Generally, each mushroom species prefers a particular growing medium, although some species can grow on a wide range of materials.

Narayanasamy *et. al.*, (2008) stated that mushroom is a horticultural crop having high quality of proteins, high fiber value, vitamins and minerals. According to Chang and Miles, (1992) as cited in Chang, (2006), a mushroom is a macrofungus with a distinctive fruiting body which can be either epigeous or hypogeous and large enough to be seen with the naked eye and to be picked by hand.

According to Georges, (2007) mushroom is the fruit-body of a fungus, the reproductive part of the fungus that grows above ground and releases spores, the seed like elements from which new fungi are made. Typically, spores sprout from the gills, the thin brown tissue found on the underside of the mushroom cap. Borne by the wind, some kinds of spores are capable of traveling great distances from the fruit-body to start their own fungus colonies.

2.2 History of Mushroom Growing

The edibility of mushrooms has been known to humans many years ago, but the intentional cultivation of mushrooms had its beginning in China, around A.D. 600, when *Auricularia auricular* was first cultivated on logs. The use of mushrooms as food is probably as old as civilization itself and mushrooms have been treated as a special kind of food. Greeks believed mushroom provides strength in battle. The Chinese treasured mushrooms as a health food the elixir of life. The Egyptians regarded them as food for Pharaohs. Romans regarded it as food of the gods. Moreover, the Romans were very fond of mushrooms; often it was the lord of the house himself who prepared mushrooms. Story goes that picking the Emperor's Amanite (*Amanita caesarea*) was punished by cutting off the hands of the offender (Chaube, 1995; Tripathi, 2005, and Oei, 2003 as cited in Kiflemariam, 2010).

As pointed out by Jean-Michel *et. al.*, (2011) people have harvested mushrooms from the wild for thousands of years for food and medicines. Of the estimated 1.5 million species of fungi, about 10,000 produce the fruiting bodies we call mushrooms. While commercial harvesting of wild mushrooms continues today, most of the world's supply comes from commercial mushroom growers.

Roughly 300 mushroom species are edible, but only 30 have been domesticated and 10 are grown commercially. Button, oyster, and shiitake mushrooms make up about 70 percent of the world's production. During the past 30 years, mushroom production worldwide increased twenty-fold, with much of that increase occurring in the 1980s and 1990s. Increased demand for specialty mushrooms (everything besides *Agaricus*) has been particularly strong. Asian countries continue to dominate world production and consumption; however, consumption in the United States has increased sharply in recent years, providing potential opportunities for mushroom growers (Danny, 1997).

Peter, (2007) pointed out that, there are hundreds of identified species of fungi which, have made a significant global contribution to human food and medicine. Some estimate that the total numbers of useful fungi – defined as having edible and medicinal value – are over 2300 species. Although this contribution has historically been made through the collection of wild edible fungi, there is a growing interest in cultivation to supplement, or replace, wild harvest. This is a result of the increased recognition of the nutritional value of many species, coupled with the realization of the income generating potential of fungi through trade. In addition, where knowledge about

wild fungi is not passed on within families or throughout communities, people have become more reluctant to wild harvest and prefer to cultivate mushrooms instead.

In their comprehensive explanation, Elaine *et al.*, (2009) cultivated mushrooms have now become popular all over the world. There are over 200 genera of macrofungi which contain species of use to people. Twelve species are commonly grown for food and/or medicinal purposes, across tropical and temperate zones, including the common mushroom (*Agaricus*), Shiitake (*Lentinus*), Oyster (*Pleurotus*), Straw (*Volvariella*), Lion's Head or Pom Pom (*Hericium*), Ear (*Auricularis*), Ganoderma (*Reishi*), Maitake (*Grifola frondosa*), Winter (*Flammulina*), White jelly (*Tremella*), Nameko (*Pholiota*), and Shaggy Mane mushrooms (*Coprinus*). Commercial markets are dominated by *Agaricus bisporus*, *Lentinula edodes* and *Pleurotus* spp, which represent three quarters of mushrooms cultivated globally.

2.3 Opportunities and Risks of Mushroom Growing

2.3.1 Opportunities

Mushroom production represents an opportunity for farmers interested as an additional work, and is specially an option for farmers with no adequate farm lands (Alice *et al.*, 2004) especially in the current alarmingly increasing Ethiopian population. The consumption of mushroom can make a valuable addition to the often unbalanced diets of people in developing countries and they are considered to provide a fair substitute for meat with at least a comparable nutritional value to many vegetables (Elaine *et al.*, 2009). It also lessen the farmers dependant on rain feed agriculture and they get good production from small plot of land. And the farmers are not worried about the current climate change or seasonal variation.

Mushrooms can play an important role on the livelihoods of rural and peri-urban dwellers, food security and income generation. It can also make a valuable dietary addition through protein and various micronutrients and, coupled with their medicinal properties, mushroom cultivation can represent a valuable small-scale enterprise option.

Mushroom cultivation is highly combinable with a variety of other traditional agricultural and domestic activities, and can make a particularly important contribution to the livelihoods of the disabled, of women and the landless poor who, with appropriate training and access to inputs, can increase their independence and self-esteem through income generation (Elaine *et al.*, 2009).

According to Dawit (1998) mushrooms offer small-scale growers several advantages. Growing facilities range from logs stacked outdoors under a shade cloth to sophisticated production chambers with precisely controlled temperatures, humidity, and light. Depending on the production system, you can grow large quantities in a small space. Mushrooms can be delicious and are rich in proteins, vitamins, and minerals while containing little fat.

Kiflemariam, (2008) pointed out that, mushrooms are a nutritious food source, being rich in protein, vitamins and minerals. They are also known to contain substances that enhance the immune system, fight infectious diseases, and lower blood pressure and cholesterol levels. The advantage of mushrooms cultivation is it can be cultivated on a variety of substrates, including agricultural and agro-industrial waste materials such as cereal straw, grass straw, cotton waste, corn cobs, bagasse (the biomass remaining after crushing of sugarcane or sorghum stalks for juice extraction), coffee waste, sawdust, animal dung, chicken manure and brewers' spent, which are abundant in sub-Saharan Africa, a predominantly agricultural region. Thus, mushroom growing is a means of converting such non-edible biomass into food. The waste products of mushroom cultivation (spent compost) can also be used as organic fertilizer for growing vegetables and developing tree nurseries.

The prevailing mild temperatures in Ethiopia, particularly in the highlands, are conducive to mushroom growing. Although the low level of relative humidity during most of the year is not optimal for cultivation, this is a problem that can be dealt with by using appropriate environmentally sustainable methods of moistening the air. The area of land required for cultivation is small, as mushrooms do not need light for growth and they are commonly produced on shelves indoors. Thus mushrooms can be produced and harvested throughout the year with relatively little investment (Kiflemariam, 2010).

2.3.2 Challenges

Establishing larger scale mushroom cultivation systems can be more labor and management intensive. All production systems, to some extent, are vulnerable to sporadic yields, invasions of 'weed' fungi, insect pests, and unreliable market prices for traded goods. Moving from cultivating mushrooms for subsistence use to commercial production and marketing can be quite challenging to local growers. One of the most important aspects of growing mushrooms for commercial purposes is the ability to maintain a continuous supply for chosen market outlets,

and if the mushroom enterprise is one of many livelihood activities, producers need to become multi-skilled to manage several enterprises successfully (Kiflemariam, 2010).

Mushrooms have not often been actively promoted in the past by agricultural ministries of developing countries. Various reasons have been cited for this neglect, including: lack of technical capacities in production techniques with poorly equipped government supported advisory services resulting in interested farmers having to seek technology on their own; comparatively few studies on tropical mushrooms; and a lack of technical skills to produce spawn with suitable strains often hard to find. The market can present an additional constraint in some regions as the prices of mushrooms are out of the range of most local consumers and unable to compete with other protein sources like beef, beans or eggs for a place in the average family diet (Elaine *et al.*, 2009).

As Danny, (1997) indicated, growing mushrooms outdoors, weather is an important consideration. Since, mushrooms are strongly affected by temperature, humidity, and light. A cold snap, heat wave, or drought can reduce yields or favor the development of undesirable “weed molds.” Outdoor production also generally provides lower yields and longer production times than are available with indoor facilities. Outdoor grown mushrooms also fruit seasonally, producing crops when supplies are greatest and prices are lowest. People are not the only ones who enjoy fresh mushrooms. Insects and animal pests can become serious pests for mushroom farmers, especially with outdoor operations.

Indoor growers also face challenges. Precision- controlled indoor facilities are expensive to build, operate, and maintain. Operating and maintaining environmental controls require a certain degree of technical expertise. Cleanliness is critical in controlled environment production systems to ensure high-quality products free of potentially toxic contaminants. Pest control is also critical because some insect pests, such as fungus gnats, flourish under the same conditions that favor mushrooms. With high yields and short production cycles, harvest windows are short.

Whether you grow mushrooms indoors or out, labor should be a serious concern. Mushroom production is labor intensive (*ibid*).

2.4 Production of Mushroom

Presently, three continents, East Asia, America and Europe contribute to about 96% of world mushroom production. With the rise in the income level, the demand for mushrooms is bound to increase in other parts of the world as well. China has been producing mushrooms at very low costs with the help of seasonal growing, state subsidies and capturing the potential markets in the world with processed mushrooms at costs not remunerative to the growers in other mushroom producing countries (Manjit, 2011).

Mushroom production is completely different from growing green plants. Mushrooms do not contain chlorophyll and therefore depend on other plant material (the “substrate”) for their food. The part of the organism that we see and call a mushroom is really just the fruiting body. Unseen is the mycelium-tiny threads that grow throughout the substrate and collect nutrients by breaking down the organic material. This is the main body of the mushroom. Generally, each mushroom species prefers a particular growing medium, although some species can grow on a wide range of materials (Alice *et al.*, 2004).

Mushrooms can be cultivated through a variety of methods. Some methods are extremely simple and demand little or no technical expertise. On the other hand, cultivations which require aspects of sterile handling technology are much more technically demanding. Mushroom cultivation is both a science and an art. The science is developed through research; the art is perfected through curiosity and practical experience. Mushroom growth dynamics involve some technological elements that are in consonance with those exhibited by our common agricultural crop plants (Chang, 2008).

It involves a number of different operations including the selection of an acceptable fruiting culture of the mushroom, preparation of spawn and compost/ substrate, inoculation of the compost/ substrate, crop care, harvesting, preservation of the mushrooms and marketing. Each of these operations consists of many sequential steps which are equally important if success is to be achieved in the mushroom business. Cultivation techniques vary for different mushroom species in different countries. (Chang, 2006)

According to Chang and Miles, (2004) as cited in Kiflemariam, (2010), the practices of mushroom cultivation, or mushroom technology, consist of six major phases. These phases generally occur in the sequence that follows:

- A. Selection of a mushroom species,

- B. Selection of a fruiting culture,
- C. Development of spawn,
- D. Preparation of compost (or substrate media),
- E. Spawn running, and
- F. Mushroom development.

2.5 Marketing of Mushroom

Marketing is getting the right product, to the right people, at the right price, at the right time and in the right way. Marketing of fresh mushrooms all over the world is not very organized except the auction system in Netherlands. Producers make direct efforts to bring the produce to the super markets and ‘wholesale distributor’ element is mostly missing. However, trade in the processed (canned and dried) is sizeable and organized (Wakchaure, 2011).

Marketing is the most important consideration of all. If you can’t sell your mushrooms at a price that ensures a reasonable profit margin, you don’t want to invest in this enterprise. Spend some time, even some money and educating yourself about marketing your potential product (Kavitha 2005).

As Sulman *et al.* (2011) indicated, the valuation of overall world market for mushroom industry in 2005 was over \$45 billion. The mushroom industry can be divided into three main categories:-

1. Edible mushrooms
2. Medicinal mushrooms products
3. Wild mushrooms

Holland and China are the world largest exporter of canned mushrooms with a market share of about 68.5 percent. Moreover, France is another important exporter with contribution of about 13.5 percent of the world exports.

Elaine *et al.*, (2009) explained that, mushroom cultivation is a reliable and effective way for resource poor cultivators to grow nutritious food in a short space of time. It also provides an opportunity to generate a highly tradable commodity, thereby contributing to income generation. How small-scale producers might successfully identify buyers and then supply them with consistent and quality produce?

There are typically three principal marketing routes for mushroom growers:

- ¾ The grower can sell directly to the consumers either at the farm gate or at local markets; however, the ability to reach distant markets is limited.
- ¾ The grower can sell to an agent, who then sells the mushrooms either to local or distant markets, including exports.
- ¾ The grower can belong to a cooperative or another farm organization, which offers easy market linkages to both local and distant markets, including export markets

Bram, (2007) stated that, marketing is a vital aspect of developing a healthy business. Marketing includes products, prices, physical distribution and promotion. Although small-scale farmers have limited possibilities to deal with large market.

One should know to whom and in which places one will sell one's product as soon as, or even before, building a mushroom farm, be it a simple barn or a more sophisticated construction. That means that one will have to explore in advance who the customers are and where to find them.

For instance:

- ¾ Marketplaces
- ¾ Delivery to door
- ¾ Tourist centers and hotels
- ¾ Shops and/or supermarkets

2.5.1 Market and Market Channel

Most small-scale growers focus on the local markets rather than outside the country. Export markets are far too complicated, even when they join forces and cooperate with each other. It is important to know what is happening on local markets. Three points are to be observed:

- ¾ what is the demand,
- ¾ who are the suppliers and
- ¾ what are the prices paid for the various products.

With this knowledge choices can be made about the type of mushrooms to be grown, location, and transport to the markets, packaging and presentation of the products. Who are the customers and what are they interested in (Bram, 2007).

2.6 Benefits of Mushrooms

Mushroom cultivation can directly improve livelihoods through economic, nutritional and medicinal contributions. However, it is essential to note that some mushrooms are poisonous and may even cause death, thus the need for extra caution in identifying those species that can be consumed as food.

2.6.1 Economic Value Mushrooms

Presently, mushroom farming is being practiced in more than 100 countries and its production is increasing at the rate of 6 - 7 per cent per annum. Production of mushrooms has already crossed 6 million metric tons annually in the world and is expected to reach around 7 million metric tons in the next ten years (Manjit, 2011).

As Chang, (2006) as cited in Kiflemariam, (2010) the world market for the mushroom industry in 2005 was valued at over \$45 billion. The global increase in mushroom production is mainly due to contributions from developing countries such as China, India, and Vietnam. China produces about 60% of world production and about 80% its mushrooms come from small scale production.

Mushroom cultivation activities can play an important role in supporting the local economy by contributing to subsistence food security, nutrition, and medicine; generating additional employment and income through local, regional and national trade; and offering opportunities for processing enterprises (such as pickling and drying).

Income from mushrooms can supplement cash flow, providing either:

- **a safety net** during critical times, preventing people falling into greater poverty;
- **a gap-filling** activity which can help spread income and generally make poverty more bearable through improved nutrition and higher income; or
- **a stepping stone** activity to help make people less poor, or even permanently lift them out of poverty (Elaine *et al.*, 2009).

2.6.2. Nutritional Value of Mushrooms

Meeting the food demand for the increasing population from the limited land resource is a big challenge for our world in this vulnerable climate change era. In addition to this, wide spread malnutrition and associated diseases are more common among the economically poor population.

According to Manikandan, (2011) the greatest difficulty in feeding man is to supply a sufficient quantity of the body-building material -- protein. The other three nutritional categories are: the source of energy food— carbohydrates and fats; accessory food factors-- vitamins; and inorganic compounds which are indispensable to good health. This compels us to search for cheap alternative quality nutritional sources for our huge population. Non green revolution otherwise referred as mushroom farming is one among the appropriate ways to meet this challenge because mushrooms grow in different area without requiring additional land besides its exceptional nutritional and medicinal properties.

Mushrooms are a nutritious food source, being rich in protein, vitamins and minerals. They are also known to contain substances that enhance the immune system, fight infectious diseases, and lower blood pressure and cholesterol levels (Dawit, 1998).

According to Sarah (2006), mushroom is considered to be a complete, health food and suitable for all age groups, child to aged people. The nutritional value of mushroom is affected by numerous factors such as species, stage of development and environmental conditions. Mushrooms are rich in protein, dietary fiber, vitamins and minerals. The digestible carbohydrate profile of mushroom includes starches, pentoses, hexoses, disaccharides, amino sugars, sugar alcohols and sugar acids.

The moisture content of fresh mushrooms varies within the range of 70 - 95% depending upon the harvest time and environmental conditions, whereas it is about 10 - 13% in dried mushrooms. The protein content of the cultivated species ranges from 1.75 to 5.9 % of their fresh weight. It has been estimated that an average value of 3.5 to 4.0 % would be more representative. This means that the protein content of edible mushrooms in general, is about twice that of onion (1.4 %) and cabbage (1.4%), and four times and 12 times those of oranges (1.0 %) and apples (0.3 %), respectively. In comparison, the protein content of common meats is as follows: pork, 9-16%; beef, 12-20 %; chicken, 18-20 %; fish, 18 -20 %; and milk, 2.9- 3.3 %. On a dry weight basis, mushrooms normally contain 19 -35 % protein, as compared to 7.3 % in rice, 12.7 % in wheat, 38.1 % in soybean, and 9.4 % in corn. Therefore, in terms of the amount of crude protein, mushrooms rank below animal meats, but well above most other foods, including milk, which is an animal product. Furthermore, mushroom protein contains all the nine essential amino acids required by man (Chang and Miles, 1989 as cited in Shu, 2008).

2.6.3 Medicinal Effect of Mushrooms

Since thousands of years, edible fungi have been valued for their immense health benefits and extensively used in folk medicine. Specific biochemical compounds in mushrooms are responsible for improving human health in many ways. These bioactive compounds include polysaccharides, tri-terpenoids, low molecular weight proteins, glycoproteins and immunomodulating compounds. Hence mushrooms have been shown to promote immune function; boost health; lower the risk of cancer; inhibit tumor growth; help balancing blood sugar; ward off viruses, bacteria, and fungi; reduce inflammation; and support the body's detoxification mechanisms. Increasing recognition of mushrooms in complementing conventional medicines is also well known for fighting many diseases (Manikandan, 2011).

As Shu, (2008) indicated, their medicinal properties of mushrooms, has long been recognized in China, Korea, and Japan. There has been a great upsurge in activities related to the use of mushroom products for medicinal purposes in recent years. In 2001, the figure of USD9-10 billion was cited as representing the value of medicinal mushroom products, including tonics and medicines. The application of modern analytical techniques can be used to establish a scientific basis for the empirical observations that have been made centuries before.

Recently, there has been a spectacular growth in, and commercial activity associated with, dietary supplements, functional foods and other products that are 'more than just food'. Medicinal fungi have routinely been used in traditional Chinese medicine. Today, an estimated six percent of edible mushrooms are known to have medicinal properties and can be found in health tonics, tinctures, teas, soups and herbal formulas. *Lentinula edodes* (shiitake) and *Volvariella volvacea* (Chinese or straw mushroom) are edible fungi with medicinal properties widely diffused and cultivated.

The medicinal properties of mushrooms depend on several bioactive compounds and their bioactivity depends on how mushrooms are prepared and eaten. Shiitake are said to have antitumour and antiviral properties and remove serum cholesterol from the blood stream. Other species, such as *Pleurotus* (oyster), *Auricularia* (mu-er), *Flammulina* (enokitake), *Termella* (yiner) and *Grifola* (maitake), all have varying degrees of immune system boosting, lipidlowering, anti-tumour, microbial and viral properties, blood pressure regulating, and other therapeutic effects. Mushrooms represent a vast source of yet undiscovered potent pharmaceutical products and their biochemistry would merit further investigation (Elaine *et al.*, 2009).

2.7 Potentials, Opportunities, and Challenges of Mushroom Production in Ethiopia

2.7.1 Potentials and Opportunities of Mushroom Production in Ethiopia

According to Kivaisi, (2010) mushroom cultivation is a labor intensive activity and therefore has a potential to employment opportunities, particularly for villagers within the vicinity of agro-processing factories in order to improve their livelihood. Mushroom cultivation on a large scale will thus improve on their availability at affordable cost, and hence provide the people with an additional nutrient rich vegetable which can be of direct benefit to the human health. Mushroom cultivation is a profitable agri-business and mushrooms can be sold in local markets or exported to earn foreign revenue that will definitely contribute to sustainable economic development.

Mushrooms can be cultivated on a variety of substrates, including agricultural and agroindustrial waste materials such as cereal straw, grass straw, cotton waste, corn cobs, biogases (the biomass remaining after crushing of sugarcane or sorghum stalks for juice extraction), coffee waste, sawdust, animal dung, chicken manure and brewers' spent, which are abundant in sub-Saharan Africa, a predominantly agricultural region. Mushroom growing is a means of converting such non-edible biomass into food. The waste products of mushroom cultivation (spent compost) can also be used as organic fertilizer for growing vegetables and developing tree nurseries.

Kiflemariam, (2010) conducted another survey and stated that, Ethiopia has a favorable climate, comparatively abundant land and agricultural wastes, labor as well as reasonably good water resources that created ample opportunities for horticulture production. The country has a wide range of altitude, temperature, and soil variability. All these potentials can be used to the advantage of intensification of new crops including mushrooms in the country.

Mushroom growing is an activity that can create jobs and help to generate cash income. It is environmentally friendly and the by-products can be recycled or used for other agricultural purposes. Training and technical support to growers can significantly help the transfer and adoption of the technology of mushroom production. With the support of research and training, mushroom production could have a significant impact on poverty alleviation and food security in Africa.

The production of mushroom enables the producers to have a healthy nutritious diet, enhance household food security, generate cash income and once the mushroom harvest is finished the

substrate can be added to a compost pile and be reused as a natural fertilizer. Moreover, the acquired knowledge can be effectively transferred to their back yard to ensure food security and income, fresh and healthy food for the family, good image in the society, excellent opportunities for direct selling and consumers are in the position to see how their food is produced and the experience can be scaled up in other urban and rural areas of the country (Azeb, 2008).

Mushroom growing represents an employment opportunity for jobless people and cash generation for growers. Moreover, the development of a value chain comprising spawn producers, suppliers of substrates (raw materials), mushroom growers and supermarkets is gradually taking shape. Some of the trainees of the Ethiopian Society for Appropriate Technology were employed by the emerging mushroom enterprises. Others are looking for financial support to establish themselves as mushroom growers (Dawit, 1998).

Kiflemariam, (2008) pointed out the potential and opportunities of mushroom production in Ethiopia as follow:

- ¾ Mushroom cultivation is based on recycling of agricultural residues, which are available in huge amount in every corner of the country;
- ¾ The availability of alternative production options for marginal and small scale producers;
- ¾ Cheap labor even cheaper than most African countries for labor intensive tasks such as compo sting, pasteurization, and spawn production;
- ¾ Currently there is a considerable level of awareness and interest among certain group of the society as to the importance of mushroom production in our country;
- ¾ Today, one may encounter the rarely occurring mushrooms even in smaller cafes and restaurants as a pizza flavoring;
- ¾ Few mushroom growers are growing especially oyster mushroom in Addis Ababa, which is an indication of the products good future;
- ¾ Cultivation of fresh mushrooms is an untouched and wholly vacant business sector in Ethiopia and it is a highly lucrative type of business for those who dare it;
- ¾ Amendment of Investment code by the government with the aim of encouraging the involvement of foreign and local investment; the government supports entrepreneurs who wish to engage in exportable agricultural produces in supplying loans and other

incentives; and

¾ Suitable climatic factors that favors cultivation of mushrooms with little modification of the growing environment.

In order to support the above points, the temperature requirement of the *Agaricus bisporus*, *A. bitorquis*, *A. avensis*, *Pleurotus ostreatus*, and *P. cornucopiae* is 16-25 °C, 24-30 °C, 25-30 °C, 8-25 °C, and 18-22 °C, respectively for vegetative and generative phase of the fungi. In most parts of Ethiopia such temperatures can be presented naturally at least 6-8 months in a year.

2.7.2 Challenges of Mushroom Production in Ethiopia

In most cultures of the people in Ethiopia mushrooms have different names tagged with them. The Amharic names of wild mushrooms reflecting negative intuition include: “Ye-abohay fes” meaning the “Pert of Monk”, “Ye-Jib Tilla” meaning “Hyena’s Umbrella”, “Dem Astefy” meaning “that causes vomiting of blood” etc. Due to this bad impression about mushrooms in Ethiopia, the food and medicinal values of mushrooms have been undermined. However, in some cultures on the other hand mushroom is named as “Enguday” meaning “Mushroom”. In this group of society there is a culture of wild mushroom harvesting and consumption whenever they encounter it in the wild by a stroke of luck (Diriba *et al.*, 2013).

On top of these, lack of concept and skill on production technology, lack of research, extension, and adaptation works, lack of appreciation about the food and dietary importance of mushrooms, and the monotonous traditional diets and the conservative eating habit of the people may be the reasons that constrained the introduction of this delicious vegetable into the menu of most Ethiopians (Kiflemariam, 2010).

In many countries mushrooms are highly consumed. However, in Ethiopia production and consumption of mushrooms is limited. As a result hotels and restaurants which cater to tourists and other foreigners are forced to import the product. The country imports mushrooms in fresh, chilled and preserved forms (<http://www.ethiopiainvestor.com>, 2008).

2.8 Adopting Mushroom Technology in Rural Ethiopia

As Elaine [et. al.](#), (2009) stated that, mushroom cultivation can help reduce vulnerability to poverty and strengthens livelihoods through the generation of a fast yielding and nutritious source of food and a reliable source of income. Since it does not require access to land, mushroom cultivation is a viable and attractive activity for both rural farmers and peri-urban dwellers. Small-scale growing does not include any significant capital investment: mushroom substrate can be prepared from any clean agricultural waste material, and mushrooms can be produced in temporary clean shelters. They can be cultivated on a part-time basis, and require little maintenance. Indirectly, mushroom cultivation also provides opportunities for improving the sustainability of small farming systems through the recycling of organic matter, which can be used as a growing substrate, and then returned to the land as fertilizer. Through the provision of income and improved nutrition, successful cultivation and trade in mushrooms can strengthen livelihood assets, which can not only reduce vulnerability to shocks, but enhance an individual's and a community's capacity to act upon other economic opportunities.

Mushroom technology can go to rural poor in a short period of time and bring about significant impact. It can be full time occupation to a sizeable section of poor and marginalized farmers including women and unemployed youth once they are trained. At the same time, it need not to be a main business for many other farms e.g. farmers of cereal and horticultural plantations can also run mushroom cultivation as a sideline business. In this way, they can get from their farm wastes high quality protein food for themselves, or they might sell them in local markets and get some money for other foods (UN, 2009).

Presently there should not be overemphasis on its large-scale development for export over domestic consumption, but there is need to recognize the significance and over all benefits of this small scale business to the local people. Because of the fact that the people of the developing countries like Ethiopia eat too little protein, the significant role of mushroom cultivation in these areas becomes very obvious (Pant, 2008).

2.9 Production and Marketing of Mushrooms

2.9.1 Global Scenario

The global commercial production of mushrooms in 2002 was 12 million tons per year worth about 45 Billion USD. Production has increased 10 fold during the last 25 years and the market is still on the increase (Wakchaure 2011).

The global mushroom production as per FAO Statistics was estimated at about 2.18 to 3.41 million tons over period of last ten years (1997-2007). Mushrooms in FAO database have been classified as FAOStat code 0449 and have been defined as those inter alia: *Boletus edulis*; *Agaricus campestris*, *Morchella spp.* and *Tuber magatum*. Since there was an increase of about 56% world mushroom production in last decades and guess estimates can be put on current production to be around 3.5 million tons. China, USA, Netherlands, Poland, Spain, France, Italy, Ireland, Canada and UK are the leading producers (UN, 2009).

2.9.2 National Scenario

In many countries mushrooms are highly consumed. However, in Ethiopia production and consumption of mushrooms is limited. As a result hotels and restaurants which cater to tourists and other foreigners are forced to import the product. The country imports mushrooms in fresh, chilled and preserved forms.

As pointed out by Ethiopian investor, (2008) during the period 1998 – 2006 the highest quantity of mushrooms (66,011 kg) was imported in year 2001 while the lowest 5,735 kg was imported in year 1999. However, during the period of analyses an average of 30,054 kg's of mushroom were annually imported. Annual import data of the product does not show a clear trend. For example the 1999 imported quantity shows a 79% decrease compared to 1998. During 2000 and 2001 import has increased by 83% and 52.8% respectively. However, in 2002 import has decreased by 85% compared to 2001. Regarding the remaining years even though import has exhibited a consistent increase the level was not similar i.e. an increase of 156% in 2003, 45% in 2004, 21% in 2005 and 8% in 2006.

Accordingly, due to the fluctuating nature of import the average import of the last three years (2004 – 2006) is assumed to reasonably indicate present (2008) level of demand. Accordingly, the present demand for mushrooms supplied through import is estimated at 42,143 kg. (<http://www.ethiopiainvestor.com>, 2008)

Demand of fresh mushroom in Addis exceeds the supply. In Ethiopia there is no commercial mushroom farm that can reach the demand of large cities and towns. According to the market survey conducted in 2006/07 in Addis Ababa, supply of fresh mushrooms is close to zero. As a result the existing few fresh mushroom producers in Addis could not meet the demand of the market. Because of this, certain supermarkets in Addis Ababa import chemically preserved mushrooms at higher costs and sell at higher prices that would be complemented on the ultimate consumers. As Addis Ababa is the center of large number of international, continental, national and regional institutions and organizations, and the seat of Diplomatic missionaries, high demand of mushrooms is incontrovertible. This is an opportunity in promoting mushroom production technology in Ethiopia (Kiflemariam, 2008).

2.10 Empirical Evidences

Investigations concerning production and marketing of mushroom have been limited in Ethiopia. This in turn caused limited understanding of the interplay of factors determining mushroom situation in Ethiopia do not deviate much from other developing countries. However, certain attempts have been made by Ethiopian scholars about the status, opportunities, potentials, and constraints of mushroom production in the country in recent times.

As Nobuko, (2001) describes traditional ways of mushroom utilization by the Majangir, an Ethiopian ethnic group, who live in the southwestern escarpment of the Ethiopian plateau. The area is still covered with a dense forest, while most of other natural forests in Ethiopia have already disappeared due to human activities. The Majangir provide us with a unique opportunity shifting cultivators and honey collectors, leading a life of self-sufficiency. In a sense, the forest sustains their life, as shifting cultivation and honey collection is only sustainable by virtue of a rich and wide forest environment. They consume various crops daily, such as yam, taro, cassava, sweet potato, sorghum, maize and banana, all of which with the exception of banana are products of shifting cultivation. Although they eat different crops at different times of the year, they only eat one or two crops at a time since each crop has a specific harvesting season. As a result, their daily meal is quite monotonous, consisting of only a few crops. This explains why the Majangir prizes subsidiary food items gathered or hunted in the forest, such as mushrooms, insects, or hunted in the forest, such as mushrooms, insects, honey, berries, nuts and game. He also described the relationship between the Majangir and mushrooms, as products of forests. This

relationship seems to depend on the lifestyle of the tribe as shifting cultivators who have kept a low population density in the forests. Most of the mushrooms grow in the forest, as products of shifting cultivation, where fields are created and fertilized by burning down a part of the forest.

In this regard Diriba *et al.*, (2013) have conducted research on mushroom consumption habit of Wacha Kebele residents, Southwestern Ethiopia. In this study 164 adult individuals (96 males & 68 females) were selected and used as information source in the study area. Data were collected from October 2009 to July 2010 by using structured open and close ended questionnaire, interview as well as personal observation. The result of the study indicated that most (93.29%) of the Kebele residents have awareness about mushroom consumption and its various benefits. Mushroom collection was mainly from forest followed by uncultivated land and termite nests and almost all family members (children, women and men) were involved in collection. However, none of the inhabitants was found to cultivate mushrooms due to various reasons, of which lack of awareness on possibility of cultivation was indicated by the majority (66.45%). All the inhabitants have also stated that the status of wild mushroom distribution has been sharply decreasing from time to time since the past two decades. From the current study, it can be concluded that though the majority of inhabitants in the study area like eating mushrooms and well aware about the current decrease in wild edible mushrooms, they have neither cultivated nor are aware about the possibility of cultivating mushroom, implying that there is an urgent need to initiate and create awareness among the inhabitants to adopt cultivation and conservation of such very important non-timber forest product in order to protect the decreasing status of the mushroom. Furthermore, such awareness and cultivation process could also be important to use the mushrooms for serving to diversify agricultural activity and supplement diet as well as income generation in the long run for the local farming community.

Celik *et al.*, (2009), carried out the benefit/cost and strengths, weaknesses, opportunities and threats (SWOT) analyses of mushroom production in developing countries as diversification of rural income; a case study in Konya, Turkey. Data were obtained through a survey method by application of 33 questioners. Benefit / Cost Analysis and SWOT analysis were used as methods. In research area, the average production area was determined as 1135.1 m². A majority (76.9 %) of the business in the province have four production periods annually. The average yearly output of the business was 45.4 kg m², that periodic output was 11.6 kg m² and that compost output was 256.6kg ton¹. The cost of 1kg mushroom as an average of business was USD 1.36 that its

average sales price was USD 1.54. Strengthening mushroom production sector could be essential in order to enable the rural economy to keep its vibrancy and development, increasing and diversifying business and employment opportunities in the rural areas, and providing income opportunities for disadvantageous groups, small family farms.

Oseni, (2007) has undertaken a study focused on the economics of mushroom marketing as a coping strategy for reducing poverty in Ondo State of Nigeria, primary data were collected from one hundred randomly selected mushroom marketers. Descriptive statistics, gross margin and regression analysis were used for data analysis. The study revealed that majority of the mushroom marketers (72%) are the feminine gender. Mushroom marketing in the area is mostly done on retail basis with marketing activities undertaken mostly on daily basis as corroborated by 94%, of the respondents. There is a considerably high level of formal education as majority of marketers attained at least senior school education but with considerably low marketing experience. The gross margin analysis revealed that mushroom marketing is profitable in the study area as average gross margin of 73,459.00 was realized per marketer per season. Regression analysis showed that there is a significant relationship between net monthly profit of marketers and degree of involvement, transportation costs, price and quantity of mushroom sold.

CHAPTER THREE

METHODOLOGY

3.1 Overview of the Study Area

This study was conducted in Addis Ababa the capital city of Ethiopia. The city lies at an altitude of 2,300 meters and is a grassland biome, located at 9°1 ~48~N 38°44~24~E Coordinates: 9°1 ~48~N 38°44~24~E. The city lies at the foot of Mount Entoto. From its lowest point, around Bole International Airport, at 2,326 meters above sea level in the southern periphery, the city rises to over 3,000 meters in the Entoto Mountains to the north (City Administration, 2012). Based on the 2009 report of WFP, Addis Ababa has more than 3.4 million residents. The political map of the city is shown in Figure 3.1 below.

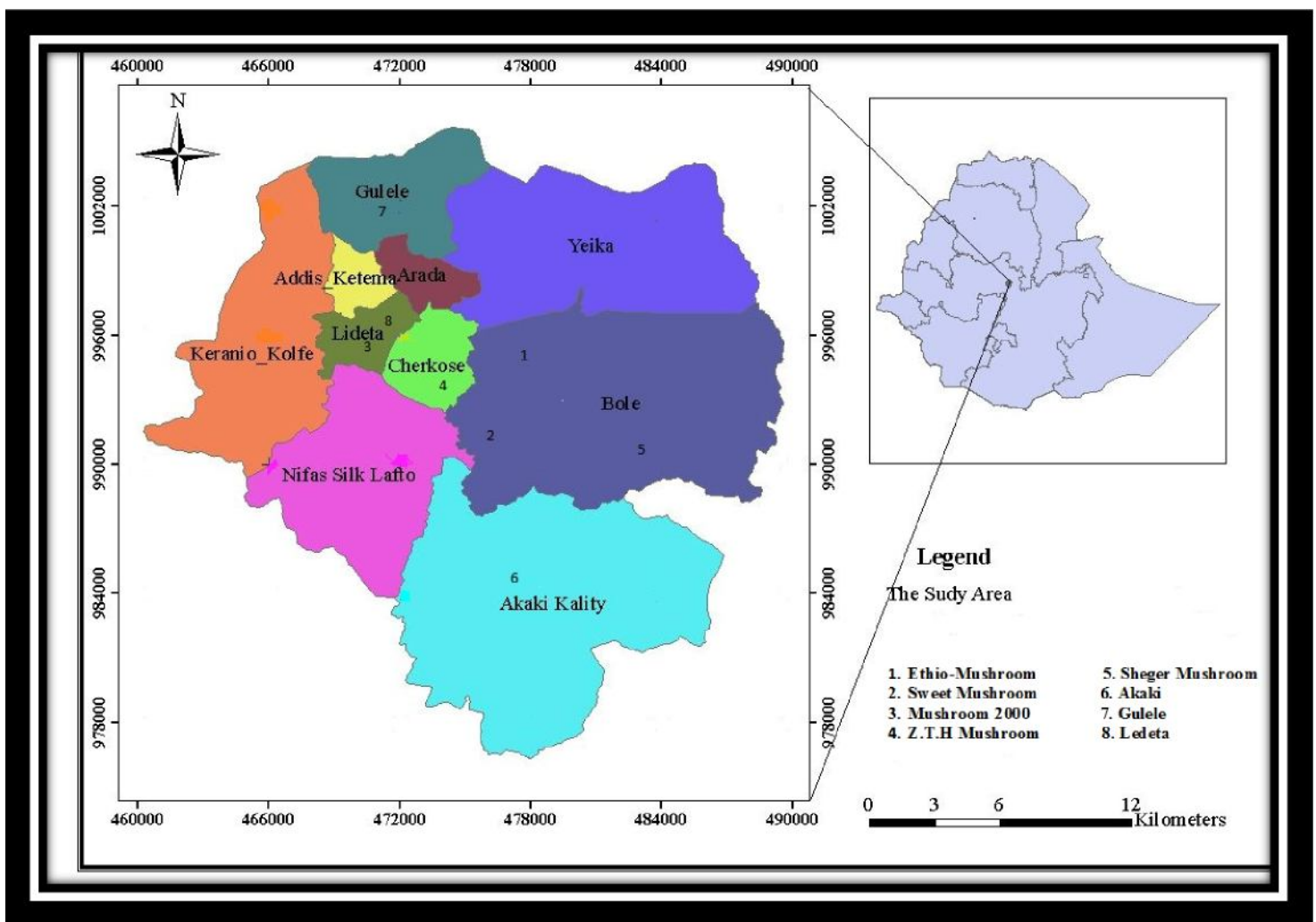


Figure: 3.1 Location Map of the Study Area (MoA, ESP, Addis Ababa DoFED, 2006) 26

3.2. Research Design

The study was conducted from February 2014 to June 2014. The researcher used both questionnaire and interview to gather qualitative and quantitative data on production, marketing situation, strategic issues and related issues about mushroom. Descriptive research design was used to summarize the gathered data from different sources.

3.3. Sampling and Population

For the purpose of this study, samples of respondents were taken from eight enterprises out of 30 enterprises that were found in Addis Ababa. These eight enterprises were selected based on the number of producers they had. The study used purposive sampling technique. Because, according to Addis Ababa Agricultural office they are the potential area of mushroom producer enterprises. Ethio-Mushroom, Sweet Mushroom, Mushroom 2000, Z.T.H Mushroom Spawn Production, and Sheger Mushroom which have 256, 153, 128, 178 and 160 producers, respectively for the large producer base were selected and Akaki, Gulele, Ledeta sub city centers that had 30, 64 and 51 producers, respectively sample was also taken small size producers.

3.4. Sampling Technique and Sample Size

Systematic sampling technique was employed to select the respondents from the eight enterprises of mushroom producers. Every (2nd, 4th, 6th, 8th, 10th) producers coming to the mushroom enterprise on even number basis are addressed through the questionnaires.

The following sample size determination formula was used to determine the sample size which is developed by Yamane, (1967). The total population was 1020 so that:

$$n = \frac{N}{1 + N(e)^2}$$

Where, n = is the sample size,

N = is the total population size, and

e = is the level of precision or sampling error = (0.10)

$$n = 91$$

Hence, the total sample size was 91 respondents. Since the number of people in each enterprise is not the same, the number of samples for each enterprise would be calculated by the following formula:

$$n_1 = \frac{1}{N} \times n$$

Where n= total number of samples

N= total number of population

N1= total number of population in each enterprise

n1= number of samples in each enterprise

The number of population and sample of respondents taken from each branch is indicated in the following Table 3.1 below:

Table 3.1 Total number of population and proportion of samples taken from each Enterprise

S. No	Enterprises	Total number of producers	Total number of sample
1	Ethio-Mushroom	256	23
2	Sweet Mushroom	153	14
3	Mushroom 2000	128	11
4	Z.T.H Mushroom Spawn Production	178	16
5	Sheger Mushroom	160	14
6	Akaki	30	3
7	Gulele	64	6
8	Ledeta	51	4
	Total	1020	91

Source: Organizations' Record Office, 2014

3.5 Data Collection Procedure

After getting an official permission from the concerned authority of the organizations, producers of mushroom were requested and most of them did not willing to fill the questionnaire and return, however, finally managed through some efforts.

3.6. Sources of Data

3.6.1 Primary Data

Close-ended questionnaire: This part of the questionnaire contains 28 items to be filled in the form of multiple responses in order to gather **quantitative** information (Appendix 'A'). At the last part the questionnaire, there was **an open-ended** question in which the respondents were given a chance to express their opinion and feelings openly in a written form with the intention of collecting a **qualitative**. The questionnaires were prepared in Amharic and distributed among a total sample of 91 individuals working in different parts of the city. The focus of the entire theme of the questionnaire was based on collecting information about the production and marketing situation of mushroom.

Interview: In this method of data collection, one type of semi--structured interviews have been carried out. The interview was conducted with a total of 8 individuals composed of 8 organizations heads of work units. This approach was also preferred in order to obtain information regarding the strategic issues in the area of production and marketing of mushroom (Appendix 'B').

The focus areas of the interviews were:

- x government policies on mushroom industry,
- x about people awareness towards mushroom consumption ,
- x volume of production and the market demand for the product, and
- x about issues that requires an immediate attention.

Accordingly, the interviews were undertaken from May 1st-5, 2014 in a friendly environment and were dominated by open-ended questions. It took from 15-20 minutes to deal with each

interviewee. The semi-structured process allowed the researcher to probe answers and build on responses.

3.6.2 Secondary Data

In addition to the primary data, secondary data have been used to analyze supportive evidences putting the situation in the context of the production and marketing of mushroom in Ethiopia. The researcher tried to use different types of books, journals, articles, annual reports, authorized and related publications available in the documentation centers and libraries.

3.7 Methods of Data Analysis

The collected data was edited, organized and tabulated. The quantitative data were encoded, processed and analyzed using analytical tools such as cross- tabulation; percentage and Software Package for Social Sciences (SPSS) version 20 (www.ibm.com/legal/copytrade.shtml, 2011); so as to verify the facts associated with mushroom production and marketing in Addis Ababa. In addition, the qualitative data (responses of open-ended question and interview) were categorized under each process of mushroom production and marketing, and analyzed manually.

CHAPTER FOUR

RESULTS AND DISCUSSION

This part of the study deals with displaying and interpreting the data obtained from various sources in tabular and textual forms. Tables were designed for the production and marketing of mushroom, on which the study was based. Tables involve detailed information about each item including frequency of responses and percent.

4.1 Respondents' Profile

In this sub-chapter information related to demographic and professional characteristics of the respondents such as sex, age, marital status, educational background, and occupation were present in subsequent tables. The respondents age and sex is presented in table 4.1.

Table 4.1 Summary of the Total Number and Percentage of Respondents by Age and Sex

Age	Sex					
	Male		Female		Total	
	No	%	No	%	No	%
< 20 years	11	12.1	3	3.3	14	15.4
21-30	23	25.3	16	17.6	39	42.9
31-40	14	15.4	11	12.1	25	27.5
41-50	5	5.5	4	4.4	9	9.9
>50	4	4.4	—	—	4	4.4
Total	58	63.7	33	36.3	91	100

Source: Field survey

As shown in the above, 63.7% of the respondents were male and the rest 36.3% were females. In terms of age, the first and second largest groups (42.9%, 27.5%) fall under 21-30 and 31-40 years, respectively, which cover the majority of the population 64(70.4%). The lowest number of population (4.4%) is within the age group of above 50 years.

Table 4.2 Marital Status of Respondents by Sex

Marital Status	Sex		Total
	Male	Female	
Married	19	15	34(37.4%)
Single	37	15	52(57.1%)
Divorced	2	–	2(2.2%)
Widowed (er)	2	1	3(3.3%)
Total	60(65.9%)	31(34.1%)	91(100%)

Source: Field survey

As presented in the table above, the majority of producers 52(57.1%) were single which helps to get some sort of information that most of the producers were in the area of carrying lower responsibility of the family and the work compared with married one.

The household size of the respondents is given in Table 4.3

4.3 Household Size

House Hold Size	No	Percent
Large >8	9	9.9%
Medium 5-8	45	49.5%
Small 2-4	37	40.7%
Total	91	100.0%

Source: Field survey

As indicated in **Table 4.3**, 49.5% of mushroom producers had medium family size. Others (40.7% and 9.9%) were in the range of small and large family size, respectively. This shows that the majority of mushroom producers had more than five family members that enable them to get support during production and marketing process.

The education level and occupation type of the respondents is given in Table 4.4

Table 4.4 Respondents’ Educational Qualification and Occupation

Educational Qualification		
Primary	3	(3.3%)
Secondary	14	(15.4%)
Diploma	30	(33.0%)
Degree	38	(41.8%)
Masters	6	(6.6%)
Total	91	(100%)
Occupation		
Civil Servant	22	(24.2%)
Self Employed	32	(35.2%)
Private	20	(22.0%)
Student	17	(18.7%)
Total	91	(100%)

Source: Field survey

As shown in the table above, 41.8% of mushroom producers were degree holders. Others (33% and 15.4%) were in the range of diploma and secondary school certificate, respectively. Regarding the occupation, 35.2% of the total numbers of producers had their own work and the remaining 24.2%, and 22% engaged in government and private organization, respectively. This shows that the majority of producers had enough time that enables them to fully engage them in the production and marketing situation. Producers with the lowest number (18.7%) were students.

4.2 Initiation in Mushroom Production

This part of the study deals with how producers initiate or involve in the production and marketing of mushroom sector.

How they first started this business is given in Table 4.5

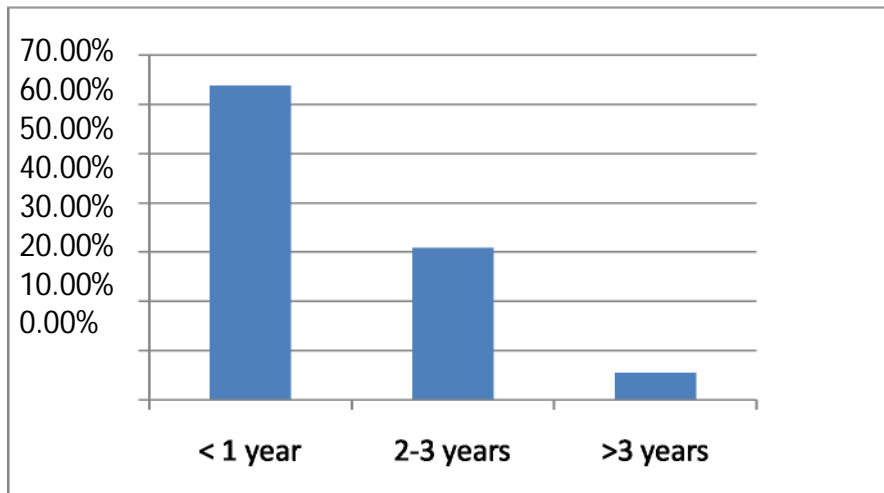
Table 4.5 Frequency of Respondents on how they Started Mushroom Production

How did you start your mushroom farm?	No.	Percent
Own interest	48	52.7%
Awareness by promoters	20	22.0%
Forced by family	8	8.8%
Forced by neighbors	15	16.5%
Total	91	100.0%

Source: Field survey

As shown in the table 4.5, more than half of respondents 48 (52.7%) were started mushroom production by themselves. The rest 22%, 16.5% and 8.8% were started production through awareness by promoters, persuaded by neighbors and by their families, respectively. This indicates that the majority of producers were initiated by themselves in deciding to involve in mushroom production. The length of time they involved in production and marketing of mushroom is shown in figure 4.1.

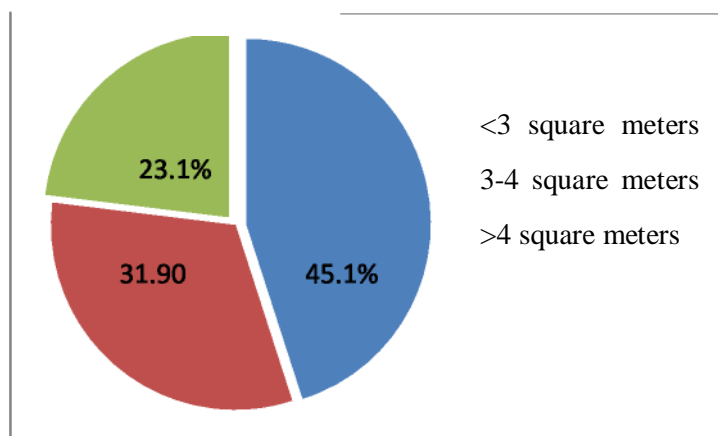
Figure 4.1 Mushroom Production Engagement Years



Source: Field survey

As shown in the above figure, majority of respondents 58 (63.7%) were engaged in the production activity less than one year in mushroom production activities. The combined number of respondents, 28 and 5 (36.3%) were engaged in more than 3 years and 2-3 years, respectively. This shows that the majority of the producers were new and they had little experience in mushroom production. In addition to the length of time they involved in the production activities, their respective farm size is shown in figure 4.2.

Figure 4.2 Farm Size in Square Meters



Source: Field survey

As indicated in different literature China is the leading producer and exporter of mushroom in the world and most of Chinas' producers (80%) are found at small scale level. Figure 4.2 also

indicated that most of respondents 41 (45.1%) had produced mushroom in less than three square meters area or at small scale level. The remaining 3 1.9% and 23.1% were producing on 3-4 square meters and more than four square meters, respectively.

The other important factor for the success of mushroom farm is dependable source of spawn. The details of this is shown in Table 4.6

Table 4.6 Source of Mushroom Spawn

Source of Spawn	No.	Percent
Private enterprises	82	90.1%
Government	9	9.9%
Non Governmental Organizations	-	0%
Total	91	100.0%

Source: Field survey

Almost all growers in the sample 82(90.1%) were getting their mushroom spawn/ seed from private enterprises. The rest (9.9%) respondents get their spawn/ seed from government. This indicates that private organizations have good laboratory facilities to provide spawn to the producers and the government responsible body was not well organized. Similarly, it is also supported by responses of interview. In line with this, the assistance they receive in the production and marketing of their product from the concerned body is indicated in Table 4.7.

Table 4.7 Facilities or Assistance of Mushroom Enterprises

	No.	Percent
High	30	33.0%
Medium	43	47.3%
Low	18	19.7%
Total	91	100.0%

Source: Field survey

As Elaine *et al.*, (2009) explained that, various types of supporting services have the potential to improve conditions for small scale mushroom growers and other producers, processors, farmers and traders. Table 4.7, indicated that a majority of respondents (80.3%) rated in the range of

‘medium’ and ‘high’. The rest 18(19.7%) said that the assistance they received low. This shows that experts in mushroom office partially provide facilities and assistance to the producers. In this case, nearly similar problems were rated with regard to experts in mushroom production trend, producers’ responsibility on the production, and how to solve problems.

The satisfaction obtained by the respective producers because they were involved in mushroom production is depicted in Table 4.8.

Table 4.8 Satisfaction in Being a Producer of Mushroom

Level of Satisfaction/Dissatisfaction	No.	Percent
Very satisfied	32	35.2%
Satisfied	53	58.2%
Dissatisfied	6	6.6%
Very Dissatisfied	-	0%
Total	91	100.0%
Source of Satisfaction	No.	Percent
Better income	48	52.7%
Less work load	31	34.1%
Marketing availability	6	6.6%
Total	85	93.4%

Source: Field survey

As Kiflemariam, (2010) pointed out, favorable climate, comparatively abundant land and agricultural wastes, labor as well as reasonably good water resources that created ample opportunities for horticulture production is a source of satisfaction. Table 4.8, indicated that majority of respondents 85(93.4%) rated in the range of ‘Satisfied’ and ‘Very satisfied’. The rest 6(6.6%) were dissatisfied. Regarding the source of satisfaction in mushroom production, more than half of the respondents 48(52.7%) indicated that the source of their satisfaction was better income. On the other hand, the rest 37(40.7%) pointed out that the source of their satisfaction was less work load and marketing availability. Moreover, mushroom production demands less time and resource as shown in table 4.9.

Table 4.9 Producers Involvement in the Production Process

Involvement in the Production	No.	Percent
Full time basis	34	37.4%
Part time basis	57	62.6%
Total	91	100.0%

Source: Field survey

As shown in Table 4.9, more than half (62.6%) of respondents were engaged themselves in the production on part time basis and the remaining (37.4%) on full time basis. This shows that producers diversify their livelihood through part time involvement in the production of mushroom.

As shown in Table 4.10, majority of the respondents 61(67%) replied ‘rainy season’ is best for mushroom production and the remaining respondents 30(33%) believing that mushroom production is good out of Ethiopian summer (rainy season). This revealed that small scale mushroom producers were dependent on climate condition of an area and they lack of air conditioner to be more productive.

Table 4.10 Mushroom Production Season

Season	No.	Percent
Dry season	8	8.8%
Rainy season	61	67%
Autumn	13	14.3%
Spring	9	9.9%
Total	91	100.0%

Source: Field survey

Table 4.11, also shows that majority of the respondents (67%) replied that high number of the societies had low awareness about mushroom consumption. On the other hand some respondents (33%) indicated that few society members have medium awareness about mushroom consumption.

Table 4.11 Awareness of Residents about Mushroom

Awareness level	No.	Percent
High	-	0%
Medium	30	33%
Low	61	67%
Total	91	100%

Source: Field survey

As Kiflemariam, (2008) pointed out, the monotonous traditional diets and the conservative eating habit of our people which is resulted from the social and cultural pressures, the low level of per capita income, the higher price of fruits and vegetables, particularly fruits, low knowledge about production and utilization of fruits and vegetables; and supply shortage of some preferred produces.

As it can be seen in the table 4.12, the respondents replied in their multiple response, that the factors that hinder the cultivation of mushroom were lack of awareness 77(84.6%), lack of knowledge (57.1), low product price (54.9%), lack of space and lack of facilities.

Table 4.12 Factors Hinder the Cultivation of Mushroom

Factors	No.	Percent
Lack of awareness	77	84.6%
Lack of Knowledge	52	57.1%
Low amount of seed	16	17.6%
Low product price	50	54.9%
Diseases and Insects	16	17.6%
Non-availability of mushroom seed/spawn	4	4.4%
Lack of space	39	42.9%
Lack of facilities	23	25.3%
Lack of capital	5	5.5%
Hot temperature	19	20.9%

Source: Field survey

Table 4.13, also shows that majority of the respondents (62.6%) replied that high number of the society member did not eat mushroom at all. On the other hand, some respondents (37.4%) indicated that few society members eat mushroom when they encountered by chance. This shows that there is low awareness and knowledge gap among the societies we live in.

Table 4.13 People Eating Habit of Mushroom

Eating Habit of People	No.	Percent
They eat always	-	0%
They eat when encountered by chance	34	37.4%
Do not eat at all	57	62.6%
Total	91	100.0%

Source: Field survey

As Kiflemariam, (2008) indicated that, the monotonous traditional diets and the conservative eating habit of our people which is resulted from the social and cultural pressures.

As shown in Table 4.14, majority of the respondents 55(60.4%) provide their product to the private mushroom enterprises and the remaining 18.7%, 14.3% and 6.6% supply to supermarket, restaurant and hotels respectively. This revealed that, most producers supply their product to private enterprise rather than selling by their own way. Access to the market is on the hand of private enterprises. In addition to this, the private mushroom enterprises are intermediaries (the market channel) between producers and markets.

Table 4.14 Supplying Mushroom Product

Organization	No.	Percent
Private Mushroom Enterprises	55	60.4%
Supermarket	17	18.7%
Restaurants	13	14.3%
Hotels	6	6.6%
Total	91	100.0%

Source: Field survey

In market both fresh and dried mushrooms are acceptable. Table 4.15, shows that all producers were engaged in Oyster mushroom production.

Table 4.15 Mushroom Species Types

Species	No.	Percent
Oyster mushroom	91	100.0%
Shiitake mushroom	-	0%
Button mushroom	-	0%
Total	-	0%

Source: Field survey

As Elaine *et al.*, (2009) explained that, Oyster mushrooms can utilize a wide variety of raw materials and can be grown in a wider range of temperature. Their production method is convenient for small scale production (low cost). Thus, it is a good choice for beginner mushroom growers. Dawit, (2007) as cited in Kiflemariam, (2010) Oyster mushroom is the first mushroom to be introduced to the market in Ethiopia. Currently, a few growers were engaged in the cultivation of the mushroom.

As it can be seen in the table 4.16, the respondents replied in their multiple responses, that the potentials and opportunities for cultivation of mushroom was favorable climate 62(68.1%), it is untouched business sector (56%), availability of agricultural wastes (50.5%), cheap labor force (42.9%), good water resources, and high demand of fresh mushroom in the market.

Table 4.16 Potentials and Opportunities for Mushroom Production

Potentials and Opportunities	No.	Percent
Favorable climate	62	68.1%
Good water resources	28	30.8%
Encouraging government investment code	16	17.6%
Cheap labor	39	42.9%
Availability of agricultural wastes	46	50.5%
It is untouched business sector	51	56%
Abundant land	19	20.9%
High demand of fresh mushroom	23	25.3%

Source: Field survey

Dawit (2007) as cited in Kiflemariam, (2010) mushrooms can be grown in a wider range of temperature and utilize a wide variety of raw materials.

Table 4.17, show that, the respondents replied in their multiple response, that the factors that hinder the marketing of mushroom producers were the influence of broker (80.2%) , the product not well known by consumers (low level of societies awareness) (68.1%), lack of promotion (56%), lack of market and low quality of the product.

Table 4.17 Marketing Problems Faced by the Producers of Mushroom

Factors	No.	Percent
Lack of promotion	51	56%
Lack of market	20	21.9%
Low awareness of the society	62	68.1%
Low quality of the product	10	10.9%
Influence of broker	73	80.2%
Less amount of the product	8	8.7%
Too much competition	0	0%

Source: Field survey

This indicates that the access to the market is on the hand of private mushroom enterprises. On the other hand, the producers sell directly their products to the enterprises and their access to reach the consumers was limited.

As shown in Table 4.18, majority of the respondents replied in their multiple responses that they faced technical problems like lack of training (71.4%), unavailability of air conditioner (AC) (48.4%) and lack of experienced labor (3 8.5%). This revealed that, most producers faced lack of training because they got training only once time at the beginning of production period.

Table 4.18 Technical Problems Faced by the Producers

Technical Problems	No.	Percent
Unavailability of air conditioner (AC)	44	48.4%
Lack of experienced labor	35	38.5%
Lack of training	65	71.4%

Source: Field survey

As it can be seen in the table 4.19, all the respondents replied in their multiple responses, that the purpose of their involvement in mushroom production is for income generation (economic purpose) (100.0%) and the remaining indicates that their involvement is not only for income generation, but also for source of food.

Table 4.19 Purpose of Mushroom Product

Purpose	No.	Percent
Medicinal purpose	-	0%
Nutritional purposes(self-consumption)	31	34.1%
Economic purpose	91	100.0%

Source: Field survey

From the above table one can understand that producers' involvement in mushroom production was to diversify their livelihood.

Table 4.20, indicates that a majority of respondents (65.9%) rated the market demand in the range of 'Medium' and 'High'. The rest (34.1%) responded in contrary.

Table 4.20 Demand and Supply of Mushroom

S. No.		High		Medium		Low		Total	
		No	%	No	%	No	%		
1	Market demand	11	12.1%	49	53.8%	31	34.1%	91	100%
2	Product supply	8	8.8%	27	29.7%	56	61.5%	91	100%

Source: Field survey

As Kiflemariam, (2008) indicated that, demand of fresh mushroom in Addis exceeds the supply. In Ethiopia there is no commercial mushroom farm that can reach the demand of large cities and towns. According to the market survey conducted in 2006/07 in Addis Ababa, supply of fresh mushrooms is close to zero. As a result the existing few fresh mushroom producers in Addis could not meet the demand of the market.

Regarding the product supply of mushroom, more than half of the respondents (61.5%) indicated that there was low product supply. On the other hand, the rest (38.5%) pointed out that there is medium and high supply in the market.

Table 4.21, indicated that a majority of respondents (56.1%) rated in the range of ‘Slightly’ and ‘Highly improved’. The rest (44%) responded in contrary.

Table 4.21 Producers Living Condition

Living Condition	No.	Percent
Highly improved	7	7.7%
Slightly improved	44	48.4%
Same	37	40.7%
Deteriorate	3	3.3%
Total	91	100.0%

Source: Field survey

This shows that the availability of favorable climate, an untouched business sector and high demand of mushroom in the market was the reason of producers’ improvement in their living condition.

4.3 Summary of Responses for Open-ended Question

At the end of close-ended questionnaire, the respondents were requested to express their idea if they have any additional suggestion or opinion. Among the total of 91 respondents, 47 individuals (51.6%) had expressed their opinion through writing. In this case, the total number of respondents seems to be more than 91, which was happened due to multiple responses. An attempt is made to summarize the main ideas as follows by indicating the frequency of respondents in front of each case.

- ~ Need more extension and training for producers35 (74.5%) ~
- Increase market price of mushroom 30 (63.3%) ~
- ~ Obtain easy loan program 21 (44.7%) ~
- Own good mushroom spawn28 (59.6%) ~
- Reduce market price of inputs25 (53.2%) ~
- Need more promotion for awareness40 (85.1%) ~

4.4 Summary of Interview Responses

As it is explained in chapter 3, semi-structured interview were developed; the interview was conducted with a total of 8 individuals composed of 8 organizations heads of work units. This approach was also preferred in order to obtain information regarding different issues in the area of production and marketing of mushroom (Appendix 'B').

To conduct interview, a face-to-face interaction was made according to the schedule of an appointment which took 15-20 minutes with each interviewee. Accordingly, the responses given to each question were summarized hereunder.

This part of the interview contains nine questions which were attached in Appendix 'B'. The purpose of this interview was in need of getting additional qualitative information. The main responses of all interviewee were summarized as below:

Regarding government policies for mushroom production all respondents replied that governments' investment code encourage the involvement of local as well as foreign investors; the government supports entrepreneurs who wish to engage in exportable agricultural produces in supplying loans and other incentives. In addition, the government allows and helps to organize societies, especially unemployed youth.

According to the respondent, there were many potentials and opportunities of mushroom production and marketing in Ethiopia. Such as:

- x Available of agricultural residues in huge amount in every corner of the country;
- x Mushroom cultivation does not require a large area of land or it can be grown in non arable land;
- x Mushrooms are high yielder per unit area of land;
- x Mushrooms are short season crops and their cultivation is environmentally friendly;
- x The availability of alternative production options for marginal and small scale producers is a good opportunity for those interested to engage in small scale level; and
- x As a result, today one may encounter mushrooms in cafes and restaurants served as condiments and pizza flavoring items. Particularly in Addis Ababa there is high demand of fresh mushrooms in the market surpassing the current supply by growers in and around Addis.

In terms of society's awareness and consumption about mushroom, the respondent replied that, there is a low traditional eating habit of the population which is resulted from the social and cultural pressures.

Respondents expressed about the structure and facilities of their organization in that, the private enterprises have relatively good structure and facilities to support the producers than the government one.

Regarding the amount and quality of product supplied by the producers, most respondents were not satisfied. Because the amount and quality of the product did not meet the demand of the market. And they replied that, the demand of mushroom in the market exceed the supply of the product.

According to the responses of interviewees, the following problems were encountered in mushroom production and marketing in Ethiopia:

- x lack of concept and skill on production technology,
- x lack of research, extension, and adaptation works,
- x lack of appreciation about the food and dietary, importance of mushrooms, and x the monotonous and conservative eating habit of the people.

Most respondents replied that, this technology could be adopted in rural Ethiopia, through:

- x Selection of appropriate mushroom production technology which is appropriate to Ethiopia and improving through research, extension, and adaptation trial by linking universities, mushroom producing farms, and governmental research and training institutes. And introducing the food and dietary importance of mushrooms among the majority of the population, through national nutrition extension packages are advisable.

Suggestions forwarded to improve the challenges of mushroom production and marketing were:

1. Support to investors who would like to invest their knowledge and money is expected from the central and local government functionaries so as to promote large scale production of mushrooms both for domestic and export market.
2. Facilitate mushroom research programs and location trials as part of the national agricultural research endeavors is another point. The research may include compost

formulation, composting and casing, pasteurization, growing environment management, nutrient contents, processing, packaging and marketing of mushrooms.

3. Organizing consulting institutes in such a way that they could provide consultancy services to the emerging and already established mushroom industries.
4. Provision of integrated financial credit services and other supports may help to build the confidence of new comers of the industry.
5. Establishing mushroom growers association and promoting the industry through building Websites, organizing workshops, and sharing of practical experiences helps to promote the industry at large-scale.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1. Summary of Findings

This study was intended to assess the existing mushroom production and marketing in Ethiopia: The case of Addis Ababa city. From the demographic profile of the respondents, we could see that 42.9% of the respondents from the total sample population were from 21-30 years, followed by ages 31-40 which were 27.5% and 63.7% were male, 57.1% were single, 49.5 are medium family size and 41.8% are degree holders.

The information generated from both quantitative and qualitative data analysis indicated that the existing demand and supply of the market was not satisfactory for the consumers. The specific factor contributed for to this condition was ineffective production and low quality of the product.

In terms of societies awareness, as it is revealed in the study, majority of the respondents (62.6%) replied that high number of the societies did not eat mushroom at all. This shows that there was high awareness and knowledge gap among the society members.

In its overall assessment, the factors that hinder the cultivation of mushroom was lack of awareness (84.6%), lack of knowledge (57.1), low product price (54.9%), lack of space and lack of facilities.

According to the analysis made, the potentials and opportunities for cultivation of mushroom were favorable climate (68.1%), it is untouched business sector (56%), availability of agricultural substrates (50.5%), cheap labor force (42.9%), good water resources, and high demand of fresh mushroom in the market.

Regarding the factors that hinder the marketing of mushroom producers were lack of access to direct sale to consumers (80.2%) , the product not well known by consumers (low level of societies awareness (68.1%), lack of promotion (56%), lack of market and low quality of the product. This indicates that the access to the market is on the hand of private mushroom enterprises (intermediaries). On the other hand, the producers directly sell their products to the enterprises and their access to reach the consumers was limited.

5.2 Conclusions

Based on the analysis and discussions made the researcher concluded the following points.

As revealed by this study, the existing market demand and supply was not satisfactory for the consumers. The specific factor contributed to this condition was ineffective production and quality of the product.

In terms of societies awareness, as it is revealed in the study, most society members showed that there was low awareness and knowledge of mushroom consumption. In addition to this, there are major factors that hinder the cultivation of mushroom such as lack of awareness, lack of knowledge, low product price, lack of space and lack of facilities.

There were potentials and opportunities for cultivation of mushroom in the country such as favorable climate; it is new business sector, availability of agricultural wastes, cheap labor force, good water resources, and high demand of mushroom in the market.

Regarding the factors that hinder the marketing and production of mushroom producers are direct sale to consumers was not possible, the product not well known by consumers (low level of society's awareness), lack of promotion, lack of market and low quality of the product. This indicates that the access to the market is on the hand of private mushroom enterprises (intermediaries). On the other hand, the producers sell directly their products to the enterprises and their access to reach the consumers was limited.

5.3. Recommendations

Based on the findings and conclusions of the study, the following recommendations are forwarded:

1. **Creating conducive work atmosphere:** As pointed out in the literature part, there are many potential and opportunities that enable producers to fulfill their production problems. The private as well as the government bodies should give conducive-working condition to the producers for high production.
2. **Create/Provide knowledge about mushroom:** The problem of mushroom awareness was highly reflected in the study from both producers and organizations heads of work units. In order to avoid such basic problem, firstly, the private and government should be given awareness training about the mushroom through different media and secondly, producers themselves initiate the societies or their neighbors to consume the product.
3. **Increase Amount and quality of product:** regarding the amount and quality of product supplied by the producers, most respondents were not satisfied. Because the amount and quality of the product did not meet the demand of the market. And they replied that, the demand of mushroom in the market exceed the supply of the product. To solve this there should be more extension and training for producers, provide easy loan program, own good mushroom spawn, reduce market price of inputs for production, and need more promotion for awareness.
4. **Adopting this technology in rural Ethiopia:** through selection of appropriate mushroom production technology which is appropriate to the rural Ethiopia and improving through research, extension, and adaptation trial by linking universities, mushroom producing farms, and governmental research and training institutes. And introducing the food and dietary importance of mushrooms among the majority of the population, through national nutrition extension packages are advisable.