Dissertation

By

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MUSHROOM VALUE CHAIN ANALYSIS IN ADDIS ABABA, ETHIOPIA

Mushroom Value Chain Analysis in Addis Ababa, Ethiopia

June 2015

MUSHROOM VALUE CHAIN ANALYSIS IN ADDIS ABABA, ETHIOPIA

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DEDICATION

I dedicate this thesis to my late wife Serkalem Nigusse. I pray to God to rest her soul in peace.

STATEMENT OF AUTHOR

First, I declare that this thesis is my own work and that all sources of materials used for this thesis have been accordingly acknowledged. This thesis has been submitted in partial fulfillment of the requirements for M. Sc. degree at the Haramaya University and is deposited at the University Library to be made available to borrowers under rules of the Library. I seriously declare that this thesis is not submitted to any other institution anywhere for the award of any academic degree, diploma, or certificate.

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BIOGRAPHICAL SKETCH

The author was born in Addis Ababa, Ethiopia in 1974. He attended elementary and secondary education at Kebena Elementary and Junior Secondary School and Kokebe Tsibah Comprehensive and Secondary School, respectively. He employed in Ethiopian Institute of Agricultural Research (EIAR), Were Agricultural Research Center in 1994 as personnel record and statistics worker. In 1997 he got transfer to Ambo Plant Protection Research Center. Then after he got the chance to join the former Ambo College of Agriculture in the evening program and earned Diploma in General Agriculture. Then, he promoted as a laboratory technician in Biological Control Research Department of the center. In 2003, He was transferred to Holeta Agricultural Research Center (HARC) as laboratory technician and worked in Soil Microbiology and Plant Biotechnology Research Departments. The author joined summer in service program of Haramaya University in 2004 and earned Bachelor of Science Degree in Agricultural Economics in 2008. He was then employed in the Ministry of Agriculture, Alage ATVET College as junior instructor and served as Farm Management instructor for three semesters. In February 2011 he rejoined EIAR, HARC, as a Junior Researcher in Agricultural Economics, Research Extension and Farmer Linkage Coordination. He also served in coordinating the planning, monitoring and evaluation of the center. In October 2012, he joined Haramaya University, Department of Agricultural Economics, for his M.Sc. study in Agricultural Economics.

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ACRONYMS AND ABBREVIATIONS

AA	Addis Ababa
AAAOSZ	Around Addis Ababa Oromia Special Zone
AD	Anno Domini
AMGA	The Gest alt-rounder
APEC	Asia-Pacific Economic cooperation
APCAEM	Asian and Pacific Center for Agricultural Engineering and Machinery
CPUC	California Public Utilities Commission
CR	Concentration Ratio
CSA	Central Statistical Agency
EU	European Union
ETB	Ethiopian Birr
GMM	Gross Market Margin
HHI	Herfindhal- Hirchman Index
HIV	Human Immunodeficiency Virus
M4P	Making Market Work better for the Poor
MOFED	Ministry of Finance and Economic Development
Mt	Metric ton
PASDEP	Plan for Accelerated and Sustained Development to End Poverty
ROA	Return on Asset
ROE	Return on Equity
ROS	Return on Sales
S-C-P	Structural Conduct Performance
SMS	Spent Mushroom Substrate
TVET	Technical Vocational and Educational Training

UNIDO	United Nations Industrial Development Organization
USA	United States of America
USAID	United States Agency for International development
USD	United States Dollar
USITC	United States International Trade Commission

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ABSTRACT

MUSHROOM VALUE CHAIN ANALYSIS IN ADDIS ABABA, ETHIOPIA

In this study mushroom value chain analysis was conducted in Addis Ababa, Ethiopia. The general objective of the study was to understand the mushroom value chain which helps to identify what interventions will be needed in order to make the sector more competitive in the domestic and export markets and thereby improve the livelihood of the urban people. Primary and secondary data were collected from 120 producers, 5 traders, 8 spawn suppliers, 6 supermarkets, 7 hotels and restaurants and 40 end users. For analysis descriptive and inferential statistics, alternative specific conditional logit and Cobb-Douglas production function were applied. On average about 13,477.5 kg mushroom was produced per month by sampled producers with the productivity of 4.4 kilogram per bed. The average price of mushroom was range from 30.7 to 64 ETB per kilogram. Mushroom value chain actors are input suppliers, producers, traders, processors and consumers. There are eight mushroom market channels in the study area. The highest and the lowest amount of the total value added were 171.87 and 20.77 ETB per kilogram, respectively. Spawn suppliers play the greatest role in the distribution of input and output along the value chain. The structural conduct performance of mushroom producers revealed the characteristics of both monopolistic and perfect competitions. Whereas the structural conduct performance for spawn suppliers had show the characteristics of oligopolistic market structure. Alternative specific conditional logit model estimates showed that alternative specific variables, volume of mushroom purchased and mode of payment are significantly determining the choice of alternative market. Case specific variables such as sole proprietor business type, marketing experience, primary and tertiary education level, continuous production, being licensed and the amount of credit are significantly affecting the choice of alternative markets relative to the base alternative market. Cobb-Douglas production function result also shows that chemical pasteurization and the quantity of spawn were significant at 1% level. Cost of spawn was also significant at 5%, while being partner business type; extension access and experience were significant at 10% level. Based on the results it can be concluded that, demographic, cultural, socio- economic and institutional factors influence mushroom value chain. Higher educational and research institutes release of suitable mushroom production technologies and scale up may contribute for the commodity development. Relevant governmental bodies need to create awareness about the nutritional and medicinal values of mushroom, generate market information, to facilitate licensing, to establish standard and quality control mechanisms and link producers to potential market.

***Key words**: mushroom, alternative specific conditional logit, Cobb-Douglas production function, market structure, conduct and performance.*

1. INTRODUCTION

1.1. Background

Mushroom is a delicious food consumed throughout the world. It is also called the future vegetable which guarantee for food insecurity, mal-nutrition problem and has medicinal value. World production of mushroom is growing and now exceeds three million tons that worth a market value of 10 billion USD. Major mushroom producers are China, USA and Netherlands share of 47%, 11%, and 7% of world supply, respectively. The remaining about 35% of the total production was from Italy, France, Poland, Ireland, United Kingdom, Canada and India (Harsh and Joshi, 2008).

Birhanu and Zerihun (2012) reported that mushroom consumption habit in many parts of African countries is well developed. In rural area of Ethiopia eating mushroom is a common practice in traditional way, though very little was written and few edible mushroom are identified like *Agaricus campestries, Agaricus bingensis, Agaricus augustus, Chlorophyllum molybdites and Termitomyces* species. The role played by women in rural mushroom production can be very significant. Certain parts of the mushroom cultivation process, such as filling substrates in containers and harvesting ideally suited for women's participation. Several programs have enhanced women's empowerment through mushroom production by giving them the opportunity to gain farming skills, financial independence and self-respect.

The prevailing mild temperature in Ethiopia, particularly in the highlands, is conducive to mushroom growing. In addition it can be produced indoor with small area of land and with little investment throughout the year using agricultural and industrial by-products as substrate (Dawit, 1998). In its PASDEP document the country proposed to supply mushroom production technology for food and medicine from agricultural and forest by products (MoFED, 2006).

Even though mushroom production seems to be professional job, study on analysis of mushroom production for diversification of income in developing countries shows that 61.6% of managers of mushroom business were attended up to high schools. So, mushroom

production can be managed by people who have lower educational level with supplement of short time training (Celik and Peker, 2009).

Cultivated mushroom is fat- and cholesterol-free, low-sodium foods, rich in important nutrients (including some nutrients not usually found in great amounts in fresh produce) and containing antioxidants. Mushrooms satisfy the needs of health-conscious consumers and are a desirable alternative food, especially for vegetarians (USITC, 2010).

Hence, if mushroom production expanded and the product availed to the market the society benefited socially and economically. This study concludes that in Ethiopia there are opportunities to build competitive mushroom subsector and high potential for mushroom production but constrained by production and marketing which needs a value chain approach to address the constraints.

1.2. Statement of the Problem

Central Statistical Agency (CSA) (2012a) reported about 332,558 economically active unemployed persons available in Addis Ababa, which is 23% of the total Ethiopian unemployment rate in 2012; still rate of female is higher than male. On one hand, since mushroom production was labor intensive business especially suitable for females and disabled persons that provides employment opportunity. On the other hand, if there are sustainable supply in terms of quantity and quality it will be one of the cash crops that fetch foreign currency for the country. Thus, unless efficient value chain system, the above mentioned opportunities will not be easily achieved. Therefore, this research tried to assess major opportunities and constraints along mushroom value chain and what interventions needed to be taken on mushrooms value chain actors'.

Information obtained from Addis Ababa city urban agriculture office and literature review shows that no research has been done regarding mushroom economics in Ethiopia. There was no information about where and how much hectare (area) of land allocated under mushroom cultivation, how many producers engaged in mushroom sector, the methods of production, the amount of mushroom demanded, produced and supplied. Moreover, the socio economic importance of mushroom, the value chain actors, activities and their interrelationships among

themselves and with other institutions were not clearly known in Ethiopian context. In addition, the type of value addition and the amount of value added by the value chain actors were not identified. Therefore, in order to make interventions this study is expected to generate useful information.

A preliminary survey was conducted in Addis Ababa among spawn suppliers, mushroom producers, consumers and super markets shows on–off production systems, high input price and low output price for small scale producers, high price of locally produced and imported mushroom at supermarkets and low knowledge about mushroom dish by the society . Moreover, producers complain on the marketing system. So, these are some of the issues that were addressed in this study.

1.3. Objectives of the Study

To understand mushroom value chains which help to identify what interventions will be needed in order to make the sector more competitive in the domestic and export markets, and thereby improve the livelihood of the urban people.

Specific objectives of the study are to:

1. measure the amount of value added along the Mushroom value chain
2. identify determinants of producers choice to alternative markets
3. identify determinants for quantity of mushroom produced
4. analyze mushroom market structure, conduct and performance (S-C-P)
5. identify major opportunities and constraints along mushroom value chain in Addis Ababa

1.4. Significance of the Study

The identified interventions towards the constraints and opportunities faced by producers, marketing agents and consumers, helps to develop knowledge to improve the existing practices. In addition, the information about mushroom value chain actors helps to expand the industry. Moreover it will be bases for those willing to enter to mushroom industry and provide reference for those willing to conduct further research. Lastly, but not least, it builds

the awareness of policy makers for intervention to the benefit of the society in general and for the country in particular.

1.5. Scope and Limitation of the Study

The research was conducted in Addis Ababa, Ethiopia. This study intended to address all sub cities and most of the mushroom value chain actors. One of the major difficulties encountered during the course of this study was the lack of address of residence and growing shade of mushroom producers. In order to take face to face interview the first step was communicating them through mobile phone. Considering the net work and transportation problems it was time taking to negotiate for interview. It makes the study more complicated and difficult. In addition, some of the respondents in the value chain actors reject to be interviewed at the time of meeting. Moreover, since some of the communicated producers left the business which affect the sampling and sample size of producers stated in the methodology.

1.6. Organization of the Thesis

This study is composed of seven parts and subsections. The second part is the literature review which discusses about mushroom and sustainable livelihood; production process and marketing; concepts of market structure, conduct and performance, and concepts of value chain and empirical findings of the mushroom sector. The methodology part has three subsections. The first subsection describes the study area, demography and infrastructure. Sampling techniques and methods of data analysis are discussed in the second and third subsections, respectively. The result and discussion part discusses mushroom production and marketing systems, mushroom value chain functions actors and activities, mushroom market structure, conduct and performance, econometric estimation results and opportunities and constraints. Part five includes summary of the findings, conclusions and recommendations. The last two parts of the thesis are references and appendices.

2. LITERATURE REVIEW

2.1. Concept of Market Structure, Conduct and Performance (S-C-P)

The SCP approach links the structure of a market to the conduct of firms in that market and thereby to performance. In particular, the SCP paradigm posits that there is an increasing relationship between the level of market concentration and market power, exercised either individually or collectively through collusion. In either way, market efficiency would be presumed to suffer.

2.1.1. Market structure

Market structure divided in to four types based on the degree of concentration of buyer and seller, degree of product differentiation and barriers to entry in the market. Thus, there are different ways of classifying market structure in terms of their concentration and competition, like the number of firms, how easy it is to enter the industry, cost and difficulty of start-ups, the nature of the product and the extent of price controls/regulation. These points are characteristics of the four main market structures such as perfect competition, monopoly, monopolistic competition and oligopoly. It influences the conduct of a firm regarding the price, supply, barriers to entry, efficiency and competition (Krister A., 2008).

Market structure can be empirically measured by the absolute concentration measures and the relative concentration measures. The absolute concentration indicator includes concentration ratio and the Herfindhal-Hirschman index (HHI). Meanwhile, the Gini Coefficient and Lorenz curve are utilized as indicators of relative concentrations. Concentration ratio is the cumulative share of the K largest firm in the market, where typical value of K is 4,8,12, 16 and 20. Thus, the four firm concentration ratios is the sum of market shares of the four largest firms in the industry to the total market share. The most common measures of market size are sales, value added, employment or assets. Concentration ratio has the advantage of easy to understand. It ranges from the value of zero percent for a perfectly competitive industry to a

value of hundred percent of market share for a monopoly (APEC, 2008). The concentration ratio calculated as follows: $CR_k = \sum_{i=1}^{k} S_i$, Where CR= concentration ratio, S_i=Market share of firm I, K= Largest firms, it can be 4, 8, 16…20

Table 1 Summary of the values of concentration ratios

Concentration ratio	Concentration	Market structure
75-100%,	Very high	Tight oligopoly (Monopoly, if =100%)
50-74%,	High	Oligopoly
25-49%	Moderate	Monopolistic competition
0-24%	Low	Perfect competition (Atomistic)

The HHI is calculated by taking the square of each firm's market share, and then adding all of these squared shares together. Where n is an individual company's total customers and t is the total number of customers in the market: Market share = n / t, $HHI = \Sigma ((n/t)^2$ = the sum of squares of the individual market shares for every company participating in the market = $(n_1 / t)^2 + (n_2 / t)^2 + (n_3 / t)^2 + \ldots$ Often the HHI is expressed as that sum multiplied by 10,000 for a score of 1-10000 points. For a perfectly competitive market with n firms and t total customers, each firm would have an equal share of the market (n/t). If $n = 10$ and $t = 100$ (10 firms competing for 100 customers), HHI would be then be $(10 * (10/100))^2 = 1$. The HHI for a three-firm market where one firm has 80% of the market while the other two have 10% each would be $(4/5)^2 + 2*(1/10)^2 = .66$ or 6,660. The HHI for a three-firm market where one firm has 50% of the market while the other two have 25% each would be $(1/2)^2 + 2*(1/4)^2 = 0.375$ or 3,750. As the number of competitive firms increases infinite, the HHI approaches zero. This means that a higher HHI indicates a more concentrated, or oligopolistic, market. Markets in which the HHI is between 1,000 and 1,800 points (0.1000 to 0.1800) are considered moderately concentrated and those in which the HHI is greater than 1,800 points (0.1800) are considered to be concentrated (CPUC, 2011).

2.1.2. Market conduct

Market conduct refers to the patterns of behavior that traders and other market participants adopt to affect or adjust to the markets in which they sell or buy. These include price setting

behavior, buying and selling practices. The variables used to capture firm behavior include pricing strategies, collusion, advertising, research and development and capacity investment (USAID, 2008).

2.1.3. Market performance

Market performance refers to the extent to which markets result in outcomes that are deemed good or preferred by society. Market performance refers to how well the market fulfills certain social and private objectives. These include price levels and price stability in the long and short term, profit levels, costs, efficiency and quantities and quality of food commodities sold (USAID, 2008b).

Marketing margins are one of the most common tools to analyze market performance. Marketing margin is calculated by taking the difference between producers and retail prices. The producers' share is the commonly employed ratio calculated mathematically as, the ratio of producers' price to consumers' price. Mathematically, producers' share can be expressed as:

$$Ps = {}^{Pp}/_{Cp} = 1 - {}^{MM}/_{Cp}$$

Where: PS= Producer's share

Pp= Producer's price

Cp = Consumer price

MM = marketing margin

Calculating the total marketing margin was done by using the following formula. Computing the Total Gross Marketing Margin (TGMM) is always related to the final price paid by the end buyer and is expressed as a percentage (Mendoza, 1995)

$$TGMM = Cp - {}^{Pp}/_{Cp}$$

Where, TGMM=Total gross marketing margin.

Performance is directly impacted by the structure and conduct of the industry. It can be used as a measure of the success of the firm. The general indicators in measuring performance are rate of return on asset after tax, rate of return on share holders' equity after tax and return on sales after tax. Rate of return on asset (ROA) after tax measures the overall ability of the firm to utilize the asset in which it has invested to earn a profit. It is measured by: - $ROA = \frac{P-T+I}{A}$. Where P= net profit, T= tax on profit, I= interest payment to debt holder. Rate of return on share holders' equity after tax (ROE) is used to measure profitability. It can be written as: - $ROE = \frac{P-T}{E}$. Where P= net profit, T= tax on profit, E= equity. Return on sales after tax (ROS) is basic indicator of the overall profitability of the business. It can be expressed as: - $ROS = \frac{P-T}{S}$. Where P= net profit, T= tax on profit, S= total sales (APEC, 2008).

2.2. Concept of Value Chain Analysis

2.2.1. Value chain

Value chain analysis is a tool that assesses the dynamics and potential for competitiveness of an industry by examining actors, factors and the relationship aspects of the transactions involved in moving a product from beginning to end use or final consumption (USAID, 2006). Actors are the players involved in value chain transactions. Factors are the external influences affecting the nature and terms of transactions along the value chain. Relationships are to indicate the flows of power, knowledge and benefits throughout the chain. So, value chain analysis produces a roadmap to the value chain that illustrates the flow of products and value addition into key market channels, or end markets for final consumption. This value chain map provides a tool for visualizing value chain dynamics and for locating the transactions involved in the highest value or highest potential markets. These aspects of the value chain serve as a framework for identifying key constraints, opportunities, and suggested points of intervention for industry development (USAID, 2006).

Value chain analysis is the process of breaking a chain into its constituent parts in order to better understand its structure and functioning (UNIDO, 2009). It is a useful analytical tool that helps understand overall trends of industrial reorganization and identify change agents and control points for policy and technical interventions. The analysis consists of identifying chain actors at each stage and discriminating their functions and relationships; determining the chain governance to facilitate chain formation and strengthening; and identifying value adding activities in the chain and assigning costs and added value to each of those activities (UNIDO, 2009).

Kaplinsky and Morris (2012) defined Value chain as the full range of activities which are required to bring a product or service from conception, through the different phases of production, delivery to final customers and final disposal after use. According to UNIDO (2009) value chain is a concept which can be simply described as the entire range of activities required to bring a product from the initial input-supply stage, through various phases of production, to its final market destination. The production stages entail a combination of physical transformation and the participation of various producers and services, and the chain includes the product's disposal after use. As opposed to the traditional exclusive focus on production, the concept stresses the importance of value addition at each stage, thereby treating production as just one of several value-adding components of the chain.

Making Markets Work Better for the Poor (M4P) (2008) define the value chain in two approaches. In the first approach, value chain includes the range of activities performed with in the firm to produce output involved in the process of acquisition of inputs, production, marketing and distribution. The second approach define value chain as a complex range of activities implemented by actors such as primary producers, processors, traders and service providers to bring a raw materials to the sale of the final product.

2.2.2. Value addition

Value chain analysis is a useful tool to create the greatest possible value to the customer. Value added is created at different stages and by different actors throughout the value chain. According to Trienekens (2011) value added may be related among others to quality, costs,

delivery times, delivery flexibility and innovativeness. The size of value added is decided by the end-customer's willingness to pay. Opportunities for a company to add value depend on a number of factors, such as market characteristics (size and diversity of markets) and technological capabilities of the actors. Value added is produced in value chains aiming at certain markets and constituting a number of actors.

Adding value to products means to create value along the chain. According to Agriculture and Food Council (2004) value should be added to the product at each link of the chain. Value does not necessarily include dollar value rather it can be also form value, location value, time value, ownership/possession value and information value. Form value added to the product by converting raw materials into finished or semi-finished products and maintaining the product quality by cleaning, grading, sorting and cooling. Finished products, passed through processing and packaging, increases usability of the product. Location value expressed in terms of providing the product at a desired place like door-to-door delivery, mail order and convenience stores. Time value is added to the product through storage, scheduling, transportation and processing. It enables the product accessible at a desired time. Ownership or possession value can be physical possession or legal ownership of the product. It can be expressed by transferring cost and risk through insurance and credit agreements. Information value is obtained by delivering information and education. It is often done through marketing functions such as advertising, promotion, packaging, and labeling.

It seems very complicated to calculate the value added for staple food like mushroom in a menu item at hotels and restaurants. Since the amount of value added is the difference between the price of ingredient and its cost, it is mandatory to find out the price of ingredients in the menu item. According to Kendall Hunt (2009) when setting the preliminary selling price for a food item the desired food cost percent is used. The process of calculating the standard portion cost of a menu item is used by food service operations to determine how much the prepared menu item actually cost the business to purchase and to present on a plate. A standard plate cost is the total cost of the product needed to produce a menu listing. Because most recipes include several ingredients, it is often a time consuming process to calculate how much a recipe costs to prepare. But the process is necessary, especially to

determine the value added to a particular ingredient like mushroom. By knowing the entire cost of the recipe, it can be able to determine the standard portion cost and mushroom selling price. Ingredient selling price calculated by the formula, $P_i = \frac{Ci}{Cd}$, Where Pi = selling price of ingredient per dish, C_i = cost of the ingredient per dish, C_d = desired food cost portion Desired food cost portion can be computed by: - $C_d = (\sum_{ci=1}^{n} \div pf) * 100$, Where Ci = cost of all ingredients in a dish (i= 1, 2....n), Pf = Selling price of a dish. The individual ingredient cost informs the cost of each ingredient within the standard recipe. The individual ingredient cost is easily calculated by the formula, INDIVIDUAL INGREDIENT COST =INGREDIENT QUANTITY X PRICE.

2.2.3. Mapping the value chain

Mapping is a vital step in the analysis of the value chain. A value chain map is a way of making what is seen and encountered more easily understood. Many potential dimensions of the value chains could be included in the mapping. Some of it is the product and volume flow, actors involved along the chain and value added at different levels. M4P (2008) puts mapping the value chain in eleven steps.

1. Map the core processes in the value chain: - try to distinguish a maximum of six or seven major processes that the raw material goes through before it reaches the final consumption stage, including the provision of inputs to produce raw materials.
2. Identify and mapping the main actors involved in the process: - how to distinguish between actors depends on the level of sophistication the mapping exercise is trying to reach. The most straightforward distinction would be to categorize actors according to their main occupation. In many value chains, especially in small or weak markets, there is often no pure specialization. One actor will take on several different roles. For example, a spawn supplier will also collect mushroom and act as mushroom collector. Try to find out what the main occupation of this actor is and categorize accordingly.
3. Map flows of products: - this involves identifying the products at each stage of the process as they transformed from inputs to raw materials, to intermediate material and

to final products. Mapping these flows creates a clear picture of what form of products are handled, transformed and transported at each process stage of the value chain.

4. Mapping knowledge and flow of information: - intangible qualities of the value chain, such as knowledge and information, are generally difficult to capture in a visual map. These flows are often going in both directions.
5. Map volume of product, number of actors and jobs: - mapping the volume of products flow is closely related with mapping the product flow. The dimension of the volume is added to following the product through the value chain. Finding out the volume of product makes it possible to have an overview of the size of the different channels with in the value chain.
6. Mapping the geographical flow of the product or service: - based on the mapping of processes, actors and product flow, it is relatively straight forward to develop geographical map, following the trail of the product or service that is to be mapped. Identify where each process of the value chain are physically located. Start at the place of origin and see if it is possible to map how the product travels from intermediary trader to wholesaler, retailer and final consumer. If possible, a map of the region can be used to indicate the physical flow on it.
7. Mapping the value at different level of the value chain: - depiction of monetary flow at the value that is added at every step throughout the chain, providing an over view of earning at different stage.
8. Mapping relationships and linkages between value chain actors: - relationships or linkages between similar actors can be mapped according to three broad categories, such as spot market relations, persistent market relations and horizontal integration. In order to map these types of relationships, different lines and arrows are used. Spot market relations created on the spot. This is typical for transactions made at a fresh vegetable market place. Persistent market relations exist when actors have a preference for transacting with each other time and time again. This comes with higher level of trust and some level of interdependence. Horizontal integration happens since both actors share the same ownership. One and the same organization deals with different processes throughout the value chain.

9. Mapping services that feed in to the value chain: -rules and regulations that are governing the value chain or in services that are feeding in to the value chain. Mapping these services will give an overview of the potential for interventions outside the value chain itself.
10. Mapping constraints and potential solutions: -constraints exist at all process levels of the value chain. Initial identification of these constraints should be made at all process levels and in addition, identification of potential solution can be made.
11. Making a value chain map matrix: - a value chain map matrix can be constructed which summarizes the key information from the map in one table. It serves as an easy to interpret sector summary from a value chain perspectives.

2.3. Mushroom and Sustainable Livelihood

Mushroom maintains sustainable livelihood through securing malnutrition problem, improving health, generate income and well-being of human. Its health importance is not only for human but also for plants through helping in breaking down and absorb nutrient by attaching themselves to the root of the plant and act like secondary root system reaching deep in to the soil otherwise the plant could not get (Halpern, 2007).

Mushroom is good source of vitamins B, C and D, including niacin, riboflavin, thiamine, folic acid, ascorbic acid and various minerals including potassium, phosphorus, calcium, magnesium, iron and copper. They provide carbohydrates, but are low in fat and fiber, and contain no starch. On a dry weight basis, mushroom is high in protein. Mushroom proteins contain essential amino acids (Halpern, 2007). Mushroom adds both flavor to bland staple foods and are a valuable food in their own right. They are often considered to provide a fair substitute for meat, with at least a comparable nutritional value to many vegetables. The consumption of mushroom can make a valuable addition to the often unbalanced diets of people in developing countries (Birhanu and Zerihun, 2012).

Besides their nutritional values, different mushroom species have various healing ability. The fruiting body of Ganoderma mushroom has traditionally been used to improve body function, maintaining healthy and long life. It has been used clinically since ancient time in china for

treatment for fatigue, coughing, asthma, indigestion, neurosis and variety of other diseases. *Ganoderma* basidiocarp has several components responsible for the inhibition of HIV multiplication. *Pleurotus Spp.* stimulate the immune system of the body help to fight abnormal cells as well as boost the system against the damaging effect of chemo and radiation therapies used to kill tumor cells. *Pleurotus* also contains compound which inhibit reductase, an enzyme used in cholesterol biosynthesis. The consumption of oyster mushrooms can lower the cholesterol level in the body and also prevent high blood pressure, hangovers and constipations (Quimio, 2004).

2.4. Mushroom Production, Processing and Marketing

People have harvested mushroom from the wild and domestically produced for thousands of years for food and medicines. Many wild edible mushrooms can be cultivated domestically. The most common types of mushroom in the world markets were oyster, shiitake and button, while mycorrizal mushrooms were the most difficult to cultivate (Jones and Buttolph, 2012).

2.4.1. Wild mushroom

Of the estimated 1.5 million species of fungi, about 10,000 produce the fruiting bodies we call mushroom. Not all wild mushrooms are edibles; some of them are poisonous and results in death if ingested. Among wild mushrooms, the most economically important were porcini *(Boletus)* and chanterelles or fox mushroom *(Cantharellus cibarius)*, followed by juniper mushroom (*Morchella* or morels) and black trumpets *(Craterellus)* due to the high prices they command on local and international markets, as well as their nutritional/health characteristics (USAID, 2008a).

Hengduan Mountain, one of the world's 34 biodiversity hotspot, in southwestern china, over 4000 species of fungi has been identified. Out of it about 600 species were edible. *Englermyces goetzii,* well known medicinal fungus found in eastern Africa and Asia (Wang and Yang, 2006).

Wild mushroom consumption in Ethiopian, especially in rural areas, is a very common practice. For *Majangir*, an Ethiopian tribe, mushroom seems to be considered as a kind of meat rather than vegetable. They collected most of the edible mushroom during rainy seasons except Lentinus species that occurred during dry season. They consider mushroom as it have the good test of meat and fish. The tribe distinguishes edible and non-edible wild mushrooms (Tuno, 2001).

Wacha Kebele residents, southwestern Ethiopia, have awareness about mushroom consumption by collecting from the forest, termite nest and uncultivated farm lands. Women mostly hunt mushrooms around village while men usually collect from forest and distant areas. The dominant groups of mushroom types collected in the area were *Termitomyces* spp. and *Laetiporus sulphureus* (polypores). They prepare mushroom dishes like 'wot', fried/roasted and as salad (Teferi *et al.*, 2013).

2.4.2. Domestically cultivated mushroom

The Chinese first domestically cultivated shiitake mushroom (*Lentinula edodes*) around 1100 AD. White button mushrooms (*Agaricus* spp.), most familiar to Americans and Europeans, were first domesticated in France in 1650. Commercial production began in the United States in the 1880s. *Agaricus* spp. was the leading mushroom crop worldwide and accounted for 99 percent of the United States' mushroom production in1997. Oyster mushroom (*Pleurotus* spp.) was more recently domesticated, and now ranks second in world production. Shiitake mushroom, which was very popular in Asian cultures, ranks third. Other edible mushrooms, such as straw and wood ear mushrooms, were gaining in popularity (Danny, 1998).

Even though, there were over 300 genera of mushroom only few of them were cultivated commercially. Commonly cultivated mushrooms throughout the world were Button mushroom, (*Agaricus bisporus),* Shiitake mushroom (*Lentinus edodes),* Oyster mushroom (*Pleurotus Ostreatus),* Velvet stem mushroom (*Flammulina velutipes),* Paddy straw mushroom (*Volvariella volvacea),* Ear fungus (*uricularia auricular),* Reishi mushroom (*Ganoderma lucidum),* Nameko mushroom (*Pholiota nameko),* White jelly fungi (*Tremella*

Fuciformis) and Truffle (*Tuber aestivum)* Among these the most commonly known mushrooms in the world market were; Button mushroom (*Agaricus bisporus),* Shiitake mushroom (*Lentinus edodes)* and *Oyster* mushroom (*Pleurotus Ostreatus)* (Chakravarty, 2011).

Biology Department of Addis Ababa University was the initiator of a three year project on mushroom cultivation in 1993 with the objective of identifying appropriate types of mushroom for cultivation in Ethiopia; evaluate the usefulness of different readily available substrates; develop methods for spawn production; and construct suitable, simple growing houses for small scale mushroom cultivation (Dawit, 1998).

2.4.2.1. Mushroom production system

Three systems used in mushroom growing were try, bag and shelf. Tray growing is used mainly by medium and large growers. This is the major method used for the growing of mushrooms in Australia. Trays are made of wood, usually lm x 2m x 0.3 m in size fastened using stainless steel fittings. Bag growing is becoming increasingly popular with small to medium growers and new entrants into the mushroom industry. This system requires a smaller capital outlay than the tray system. Bag growing offers advantages in pest and disease control by allowing fast and easy removal of infected bags. However, these advantages are offset because bag growing requires a larger labor input per kilo than either of the other two systems. Shelf growing is the growing system used by only a few growers. It offers large savings in labor costs but this is offset by very large capital setup costs. Each of these growing systems is economically viable in some circumstances and all are represented in the mushroom industry in Australia. Of paramount importance is the level of expertise is required in both management and growing methods in mushroom growing. If skill in either area are lacking, production can vary greatly between crops regardless of the growing system used (AMGA, 2010).

Substrate is a mushroom growing medium which can be compost, agricultural by product or industrial wastes. Depend on the type of mushrooms some of the most known substrates are banana leaves, bracts of pineapple, coconut coir, coffee bran, coffee pulp, corn cob, corn

stover, orange peel, rice bran, rice straw, sisal bagasse, sugarcane bagasse, and wheat straw (Amin *et al.*, 2010). The substrate must be rich in essential nutrients in forms which are readily available to the mushroom, and be free of toxic substances which inhibit growth of the spawn. Moisture content, pH and good gaseous exchange between the substrate and the surrounding environment are important physical factors to consider. Before spawning (mixing the spawn with substrate) the substrate should be free from all competitive micro organisms through sterilization. Systems involving such strict hygiene were generally too costly and impractical to operate on a large scale. For cultivating edible mushroom substrate require different degree of pre-treatment in order to promote the growth of mycelium by inhibiting other competitive micro-organisms (APCAEM, 2010).

The word "spawn" was derived from an old French verb, espandre, meaning to spread out or expand, which was derived from the Latin, expandere, meaning to spread. Spawn is also defined as "the mycelium of fungi, especially of mushrooms grown to be eaten, used for propagation". In the mushroom industry, spawn is a substrate into which a mushroom mycelium has impregnated and developed, and which will be used as a seed in propagation for mushroom production. In addition the verb, to spawn, is used to mean inoculation of a substrate with mushroom spawn. The simple definition of spawning is the planting of mushroom spawn in the prepared compost/substrate. Along with advances in spawn making, the methods of spawning have also been continuously developed and improved, making it possible for the mushroom mycelium to grow through the compost more quickly (APCAEM, 2010).

According to Dawit (1998) the major constraint in mushroom production in Africa is the lack of spawn supplier. Though obtaining quality spawn from abroad is expensive and technically difficult, so the first activity of a three year project on mushroom cultivation was to develop the capacity to produce spawn for various cultivated mushrooms.

Spawn production is the process of creating "seed" for the growth of mushroom. It is sometimes referred to as spawn making. It is highly complicated process in which pure strain of selected fungus is chosen to generate a specific variety of mushroom. Spawn making

requires a great deal of understanding of environments and technique and thus represents science as well as art (Tirbrichu and Buykusenge, 2009).

Growing process of mushroom involves thorough mixing of spawn into the compost using a manual spawning system. Once the spawn had been mixed throughout the compost, the compost temperature, the relative humidity and the light in the growing room were managed by the farmer to optimize mycelia growth. In this function the spawn grows out in all directions from a spawn grain. The time needed for spawn to fully colonize the compost depends on the amount of spawn added and its distribution, the compost moisture and temperature, and the nature or quality of the compost. A complete spawn run usually requires at least 10 to 21 days (Tirbrichu and Buykusenge, 2009).

The cultivation of mushrooms can be both a relatively primitive farming activity, and a high technology industry. In each case, however, continuous production of successful crops requires both practical experience and scientific knowledge. Mushroom growth dynamics involve some technological elements, which are in similar with those exhibited by our common agricultural crop plants. After the vegetative (mycelia) phase had reached maturity, what the mushroom farmer needs next was the induction of fruiting. This was the time the mycelia growth tips should be retarded by regulating the environmental factors. These factors generally called "triggers" or "environmental shocks", such as, switching on the light, providing fresh air, and lowering temperatures, can trigger fruiting (APCAEM, 2010).

2.4.2.2. Recycling of wasted substrate

The substrate left after mushrooms had been harvested was known as spent compost. This was present in large amounts, and raises the question of what can be done with it. It is certainly not desirable to leave it as a possible source of pollution. It was known that there still remains in the spent compost a considerable amount of lingo cellulosic material in addition to the mushroom mycelia and also other products formed by the metabolic activities of the mycelium. Thus, the spent compost should be capable of supporting further biological

activities, e.g., the growth of another species of edible mushroom; use as fodder for livestock; as a soil conditioner and fertilizer; and also in bioremediation (APCAEM, 2010).

2.4.3. Mushroom processing

According to APCAEM (2010), mushroom processing includes drying, freezing and pickling. **Drying mushroom:-**Following delivery of mushroom to the primary local buyer; the supply was weighed; then, trained workers sit at a table and brush off carefully the ground and other dirt. At the same time, they cut off damaged parts with a sharp knife and cut the stems even. The prepared mushrooms were sliced and placed carefully over wattles, making sure that the slices did not come on top of one another and that they were spread equally all over the wattles. There were a variety of drying chambers, used for both cultivated and wild mushrooms, include chambers, tunnel dryer, belt conveyor dryer and solar dryer (at 45°C for 3hours and 70°C for 1hour). Then it was packed, labeled and placed in a special storehouse to keep the quality (below -10°C) until it was delivered to the buyer.

Freezing mushroom:-Only the best mushrooms with medium-sized caps were frozen and other mushrooms were dried or pickled. The mushrooms selected for drying were placed carefully into a perforated plastic packaging, and then carefully placed onto the wooden pallets. They were frozen in a tunnel, at -35 to -40 °C. After 8-10 hours, frozen mushrooms were taken out of the tunnel and packed in cardboard three-layer boxes with polythene bags which were tied into a knot. Then the cardboard box was sealed with an adhesive tape. The closed boxes were properly labeled and stored in a temporary freezer warehouse at -20 °C until they are delivered to the buyer.

Pickling (Preserve) mushroom:-The pickling process was relevant only for chanterelles which were placed in a perforated plastic packaging and delivered to the pickling chamber the same day. The pot filled with chanterelles was sunk into the kettle with hot 90 - 95 °C water for 4-5 minutes. Then, the pot was taken out and slowly cooled under a cold shower. Chanterelles were then carefully poured into plastic barrels. Prior to these steps, the barrels were filled with 20% saline solution, 5-6 cm below the rim, so that chanterelles account for about 70% of the overall weight after the water was drained off.

2.4.4. Mushroom marketing

Canada was the principal foreign supplier of fresh mushrooms to the U.S.A. with market share of 77% for the year 2003/4 to 2008/9. China and Mexico were the second and third suppliers with market share of 12% and 6% respectively. Imports of fresh mushrooms amounted to 30,299 Mt in the year 2007/08, up by 12 percent from 27,145 Mt in year 2003/04 and imports were up by 3 percent in quantity from 2007/08 to 2008/09. China, India and Indonesia principal suppliers of canned mushrooms to the U.S.A. with respective market share of 49%, 20% and 16% from 2003/04 to 2008/9. Imports of canned mushroom amounted to 64,867 Mt in 2007/08, down by 2 percent from 66,212 Mt in 2003/04; imports were down by 23 percent in volume from 2007/08 to 2008/09. Also, China increased its exports to newer markets such as Russia in 2005/06 (USITC, 2010).

Mushroom was the only sector of Irish horticultural food industry focused primarily on serving a major export market. Approximately three quarters of mushroom production was exported to Britain, with the balance serving domestic market consumption. In 2001total mushroom produced were 67723 tones and 53223 tones fresh and processed mushroom exported. The top three vegetable markets ranked by value were tomatoes, carrots and mushrooms, respectively. Of all fresh vegetables sold across the year tomatoes had 18% value share, carrots 15% and mushroom 8.5% (Bord Glas, 2002).

U.S.A. also exports fresh mushrooms to other countries for the period 2003/4 to 2008/9. The major importing country was Canada 86% of the total fresh mushrooms. Imports of fresh mushrooms amounted to 1587 Mt for the year 2003/4 to 2008/9. Fresh mushroom exports to Canada were mostly common mushrooms, with low average annual unit values of $2,400 to $3,400 per Mt. Mushroom exports to Japan and France, by comparison, were principally specialty mushrooms, with unit values consistently over $9,000 and $13,000 per Mt, respectively. Canada, Singapore, Hong Kong, Philippines, and India were the principal U.S.A export markets for canned mushrooms throughout the report period. As noted earlier, exports of canned mushrooms trended downward from 2003/04 to 2007/08, amounting to 709 Mt, valued at $2.2 million, in 2007/08. The United States had never exported appreciable amounts

of canned mushrooms to any market because of intense competition in those markets from EU and Asian countries (USITC, 2010).

Shirra (2003) reported that mushrooms trade in Uganda was approximately 1000 Kg per week and the supply was less than the demand. Oyster mushrooms were not produced in sufficient quantities, especially during the hot dry seasons and Button mushrooms require a particularly cool climate. Uganda imports all Button mushrooms from Kenya and canned mushroom from China producers in Kenya who dominate the East African supply-market. Uganda had not yet produced Button mushrooms or taken the advantage of cool region production and market opportunities. From East African, button mushroom produced only in Kenya, and as a result it was a high priced mushroom.

2.5. Empirical Findings

Research result on economics of mushroom conducted in Bangladesh shows that mushroom was found to be profitable and promising agricultural enterprise which generates high income per household (Barmon *et al.*, 2012). Since mushroom production requires small piece of land relative to other crops and vegetables, little amount of initial capital and labor is required.

Research on economic viability of mushroom to poverty reduction in Bangladesh was also conducted by comparing net income earning of mushroom with rice and wheat production. Each rice and wheat cultivated on 4.046 km^2 (1 acre) and mushroom were grown on 50.14m^2 (30 * 18 feet) area of land. The expected yield per four months equals 2.4ton, 1.6ton and 1ton while the net income in USD was 183.59, 365.38, and 439.48 of rice, wheat and mushroom, respectively. The income generated from mushroom was 1.2 times income of wheat and 2.3 times income of rice. It was concluded that mushroom cultivation was potential job for Bangladesh and for those countries where unemployment rate was high and thus providing employment for all family member (Imtiaj and Rahman, 2008).

Mabuza *et al.* (2013) identified that about six to ten percent of the total mushroom produced consumed at household level and the remainder sold through the following four channels.

• Channel I (Farm gate): Producers → Consumers;

• Channel II (Retail market): Producers → Supermarkets → Consumers;

• Channel III (Middlemen): Producers → Middlemen → Supermarkets → Consumers;

• Channel IV (Food services industry): Producers → Restaurants/hotels → Consumers.

About 528 kg of fresh oyster mushrooms were traded by the sampled producers within three months. Further analysis indicated that 42% was sold through the farm gate and 52% through the retail market, whereas 2 and 4% were sold through middlemen and the food services industry, respectively. Upon receiving the already-packed mushrooms, supermarkets screen them for quality using their own procedures which are based on visual inspection for browning, weight loss and microbial spoilage. The mushrooms are then displayed in refrigerators and generally sold out within a day. Restaurants and hotels add value by cooking the mushrooms as part of different recipes. However, given that mushrooms are rarely cooked alone, but in combination with various food products and ingredients, costing the value added by the food services industry proved to be an impossible. Hence, Market intermediaries' share of oyster mushroom consumer price was not included channel IV. Share of consumer price indicates the magnitude of returns earned by different market intermediaries in each channel. In channel I, 100% was the share of producers. In channel II, the share of producers and retailers were 80.3% and 19.7%, respectively. In channel III, the share of producers, middlemen and retailers were 63.5%, 16.7% and 19.7%, respectively. This study was also identified the underlying factors constraining mushroom production and producers' access to markets in Swaziland. Using a value chain approach, the results indicated that producers' plans to expand production capacities and improve consistency in market supply are hampered by the difficulty in accessing key inputs such as spawn, substrate preparation technology and incubation services. Other constraints relate to the lack of diversification as farmers currently produce the oyster mushroom, yet major buyers are interested in the button, which has a relatively high consumer demand. Although, producers realized a relatively larger share of the consumer price, more benefits could be realized if certain services currently offered by the government could be privatized. In view of the possible increase in market supply, it was important that an integrated value chain governance system is established in an attempt to enhance market access and facilitate the movement of mushrooms from producers to consumers.

Study on marketing of fresh mushroom in Haryana, India, showed that cost of production and return per Kg of mushroom was 62 percent and 38 percent of the selling price, respectively. The variable cost constituted 82.20 per cent and fixed cost 17.80 percent of the total cost. For fresh mushroom producer's share in consumer price was 60 percent. The wholesalers and retailers were taking away the share of 3 per cent and 31.67 percent of consumer's price without investing in any of the marketing process. All the expenses in the marketing process are incurred by the producer. The producer's share in consumer's price was reduced to about 28 percent in case of value added (processed) sale of mushroom. The processor's and retailer's margin constituted about 14 per cent and 31 per cent to consumer's respectively. It was concluded that Mushroom cultivation was economically viable enterprise. It provided gainful employment to the under employed farmers in additional income generation. The major share of consumer's price was pocketed by the middlemen. Thus cooperative marketing and processing should be encouraged to increase the producer's share in consumers' price. Government intervention was also necessary to safeguard the interest of farmers (Khatkar *et al.,* 2005).

Research on mushroom value chain analysis in Kenya, descriptive statistics was used to describe players and activities along the value chain and logit model was applied to determine the probability of entry to mushroom cultivation. The key determinants of entry into mushroom industry were access to extension services, number of female adults in the household, household head being a fulltime farmer and male headed households (Odendo *et al.*, 2009).

3. RESEARCH METHODOLOGY

3.1. Description of the Study Area

The study is conducted in Addis Ababa, Ethiopia. Addis Ababa, the federal capital city of Ethiopia, was founded in 1886. The city is located at an altitude between 2300 in the south of the city and 3000 meters in the north. Addis Ababa is called "political capital of Africa" since headquarters of the African Union, numerous international organizations and embassies are located in the city (City Government of Addis Ababa, 2013).

Geographically, Addis Ababa is located at 9°1′48″N and 38°44′24″E having area coverage of 526.99km^2. It has a subtropical highland climate as well as complex mix of highland climate zones, with temperature differences of up to 10 °C (18 °F), depending on elevation and prevailing wind patterns. The high elevation moderates temperatures year-round, and the city's position near the equator means that temperatures are very constant from month to month. Mid-November to January is a season for occasional rain. The highland climate regions are characterized by dry winters, and this is the dry season in Addis Ababa. During this season the daily maximum temperatures are usually not more that 23 °C (73 °F), and the night-time minimum temperatures can drop to freezing. The short rainy season is from February to May. During this period, the difference between the daytime maximum temperatures and the night-time minimum temperatures is not as great as during other times of the year, with minimum temperatures in the range of 10–15 °C (50–59 °F). At this time of the year the city experiences warm temperatures and a pleasant rainfall. The long wet season is from June to mid-September; it is the major winter season of the country. This period coincides with summer, but the temperatures are much lower than at other times of year due to the frequent rain and hail and the abundance of cloud cover and fewer hours of sunshine. This time of the year is characterized by dark, chilly and wet days and nights (Addis Ababa city profile).

According to CSA (2007) the total population of Addis Ababa was 2,738,248. Among the total population, 47.7% was male and 52.3% female, with the annual fertility rate of 2.1.

Average household size in Addis Ababa was 4.1, which is lower than the average of the country (4.7) next to *Harari* region (3.9). Addis Ababa is the resident place for most ethnic groups found in Ethiopia. The major ethnic groups found in the city are Amhara (47.05%), Oromo (19.51%), Gurage (16.34%) and Tigray (6.18%). Different religions also found in the city; Orthodox (74.7%), Muslim/ Islam (16.2%), Protestant (7.8%), Catholic (0.5%), traditional and others (0.9%). The city have organized by ten sub cities such as *Addis ketema, Akaky Kaliti, Arada, Bole, Gullele, Kirkos, Kolfe keranio, Lideta, Nifas silk-Lafto* and *Yeka* (CSA, 2007).

Though, most of the households have access to drinking water and electricity, poor maintenance and lack of new facilities combined with rapid population growth has been causing water shortages in Addis Ababa. This shortage particularly affects the low income section of the city dwellers. About 97.7 percent of the households' drinking water source in the city is pipe water. About 2.3 percent of the households have no access to pipe water. Their sources of water are from protected well or spring, unprotected well or spring and river/lake/ pond. About 97.5 percent of the household in the city have access to electricity, the rest use lighting like generator, biogas, lamps, candle/wax and fire wood (CSA, 2010).

The socio economic status showed health service provisions in Addis Ababa have been improving. Throughout 99 *kebeles* there are about 36 health centers, 359 clinics, 42 hospitals and 44 pharmacies. The education sector has also improved in recent years. There are about 917 kindergartners, 736 primary schools, 172 junior and secondary schools and 145 preparatory schools. Number of other social services like fuel station, hotels, police station, number of telecommunication and post offices were 107,282, 51, 36 and 42, respectively. In Addis Ababa City there are 67 market places, 15 banks and 262 bank branches. Among these private banks were 12 (197 branches) and government banks were 3 (65 branches) (Addis Ababa City Administration, 2010).

The economic activities in Addis Ababa are diverse. According to CSA (2012) female and male people in the city engaged in professional jobs (technical or managerial) were 10.1 percent and 11.9 percent; in clerical 13.6 percent and 4.9 percent; sales and service 53.6 percent and 31.8 percent; skilled and unskilled manual 18.1 percent and 42.9 percent and in agriculture 1.8 percent and 3.4 percent, respectively.

3.2. Data and Sampling Techniques

Both primary and secondary data were collected for this study. To collect primary data; household survey, focused group discussion, key informants and personal observation were carried out. Secondary data were collected from, spawn suppliers, training providers and from Addis Ababa Administration Urban Agriculture Office. As shown in figure 2, the study were addressed 8 input suppliers, 120 producers, 5 collectors and traders,7 hotels, restaurants and cafeterias, 6 supermarkets and 40 consumers and non consumers.

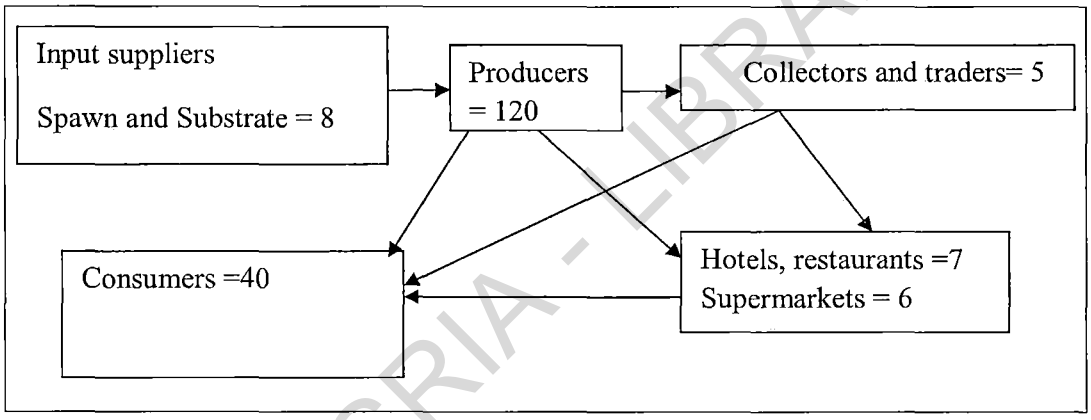

Figure 1 Mushroom value chain sample frame work

Sample size was determined using a simplified formula provided by Yamane, (1967). $n = \frac{N}{1 + N(e)^2}$; Where, n =Sample size, N = Total Mushroom producers in the study area estimated to be 1000, e = precision at $\pm 5\%$. A two stage random sampling was adopted for selecting mushroom growers. At the first stage, of the total 17 spawn suppliers 5 were randomly selected. Then a list of all mushroom producers was prepared based on the information provided by selected spawn suppliers and urban agricultural offices. Samples proportionally drew by simple random sampling technique. Accordingly, sampled households included from all sub cities, as shown in Table 2, and interviewed by well trained enumerators using a structured questionnaire.

Table 2 Sampled mushroom producers

Spawn suppliers	Total	Samples
Spicy Mushroom	92	11
Shitaki International Mushroom	92	11
Sheger Mushroom	67	8
Ethio Mushroom	100	12
Z mind Enguday	50	6
From all sub cities	599	72
Total	1000	120

Focus group discussion with producers and consumers were conducted at the study area. Checklist developed and used to facilitate the discussion. Key informants such as input suppliers, mushroom assemblers, hotels, restaurants, super markets and end users were also randomly identified and interviewed. For this purpose, different semi-structured guiding questionnaires were prepared and used.

3.3. Methods of Data Analysis

The data were analysed by using descriptive and econometric methods in order to attain the objectives set.

3.3.1. Descriptive statistics

Descriptive statistics such as percentage, mean, standard deviation, costs and revenue used to analyze the amount of value added along the chain. Moreover, concentration ratio, market share, ROS and marketing margin were conducted to assess mushroom market structure, conduct and performance. The major opportunities and constraints along the mushroom value chain were also addressed.

The concentration ratio calculated as follows: $CR_k = \sum_{i=1}^{k} Si$, Where CR= concentration ratio, S_i=Market share of firm i, K= Largest firms, it can be 4, 8, 16…20.

The market share of the i firm calculated as $Si = \frac{Ri}{TR}$, where R_i= revenue of the i firm, TR=total revenue of the whole firms.

To analyse the performance of mushroom markets, return on sale and margin analysis was employed. The cost and price information will used to construct marketing cost and margin. Return on sale can be expressed as: - $ROS = \frac{P-T}{S}$. Where, P= net profit, T= tax on profit, S= total sales. Many studies used market margin than net returns for the analysis to compute profit. Kindie (2007) also applied marketing margin analysis for sesame market chain analysis. It is calculated as the difference between producers and retail prices. The producers share is the commonly employed ratio calculated mathematically as, the ratio of producer's price to consumer's prices. Mathematically, producers share can be expressed as:
$Ps = P_x/P_y = 1-(TMM / P_y)$ Where, Ps =Producers share; P_x= Producers' price; P_y= Retail price, TMM= Total marketing Margin

3.3.2. Econometric methods

The choice of economic models depends on the nature of research objectives and the hypothesis to be tested. Conditional logit model was used to determine factors affecting producers' participation to alternative markets while, factors affecting mushroom production was analyzed by Linear Regression model.

3.3.2.1. Conditional logit model

The rational economic agents choose what maximizes their profit or satisfaction given alternative situations from which different choices exist. The value chain actors including the producer made choices among alternative outlets like selling to processers, traders, supermarkets, hotels, restaurants or final consumers. In the process, they made a decision to sell or not to sell to different market outlets. According to Hoffman and Duncan (1988) both multinomial logit and conditional logit are used to analyze the choice of an individual among a set of 'J' alternatives. The central distinction between the two can be put very simply; multinomial logit focuses on the individual as the unit of analysis and uses the individual's characteristics as explanatory variables. In contrast, conditional logit focuses on the set of alternatives for each individual and the explanatory variables are characteristics of those alternatives as the unit of analysis. Hence, conditional logit is appropriate for different classes

of model in which a choice among alternative is treated as a function of the characteristics of the alternative rather than or in addition to characteristics of individual making the choice. In this case the general class of discrete choice model is the commonly used. Market outlet choice (Y_i) depends on $\mathbf{x}_{ij}$, which includes aspects specific to the individual as well as to the choices. It is useful to distinguish them. Let $\mathbf{z}_{ij} = [\mathbf{x}_{ij}, w_i]$. Then $\mathbf{x}_{ij}$ varies across the choices and possibly across the individuals as well. The components of $\mathbf{x}_{ij}$ are typically called the attributes (condition) of the choices. But $\mathbf{w}_i$ contains the characteristics of the individual and is, therefore, the same for all choices (Green, 2003).

$$prob \quad (Yi = j) = \frac{e^{\beta X_{ij}} e^{\alpha_i' w_i}}{\sum_{j=1}^{J} e^{\beta X_{ij}} e^{\alpha_i' w_i}}$$

Definition of variables

Based on economic theories and empirical findings of studies conducted so far, several continuous and discrete variables that explain producer's alternative market participation are identified. Accordingly, the following variables are constructed for Conditional Logit Model:

Dependent variable

Market choice: it is a categorical dummy variable which represents the producer's choice among alternative market and takes a value of 1 for that chooses any one of the alternatives and 0 otherwise.

Alternative specific independent variables

Distance to alternative market: is distance (in km) to the nearest alternative market. The closer the market, the lesser would be the transportation charges, loss due to spoilage and better access to market information and facilities (Xaba and Masuku, 2012). Therefore, in this study, distance from nearest alternative market is hypothesized to be negatively related to market participation decision and alternative market outlet choice.

Quantity of mushroom purchased: The amount of mushroom purchased by alternative markets are continuous variables measured in Kg. Gani and Adeoti (2011) stated that the size of sales volume positively affect household market choice. So that it is hypothesized to influence the entry to market and alternative market choice positively.

Mode of sale: it is a dummy variable that takes the value one if mode of payment is on cash or on advance basis and zero if it is on credit. According to Tadele (2012) mode of sale for dairy product did not affect the market choice. In this study it is hypothesized that mode of payment to affect market participation decision and alternative market choice positively.

Price offered in alternative market outlets: is a continuous variable measured in ETB per kilogram. The price for mushroom fluctuates depending on the supply of fresh mushroom in the local market (Tirbrichu and Buykusenge, 2009). It is hypothesized to have a positive influence on an alternative market choice.

Case specific independent variables

Type of the business: it is a categorical dummy variable which represents the producer's business types such as sole proprietor, partnership and cooperatives. It takes a value of 1 for that chose any one of the business types and 0 for others business types. If the producer business type is sole proprietor, it will take a value of 1 and the value 0 for both partnership and cooperatives. Tadele (2012) found that cooperatives have positive effect on milk marketing. Thus the type of business is expected to affect alternative market choice either positively or negatively.

Mode of the business: it is a dummy variable in which producers engaged as a full time or part time work. If fulltime business =1, 0 = if it is a part time business. According to Stallmann and Alwang (1992) full time and part time mushroom producers differ in their linkage to output market because they produced mushroom as primary source of income or not. Thus it affects the market choice either positively or negatively.

Education category of producers: is a categorical dummy variable. Education category of producer can be elementary, secondary or tertiary. 1 if one of the education categories is chosen, otherwise 0 for the others. Education is believed to improve the knowledge of the

alternate market choice. According to Xaba and Masuku (2012) as producers become literate the odds of selling to specific alternative market decreases. Thus, it affects alternative market outlet choice either positively or negatively.

Mushroom marketing experience: is a continuous variable measured in number of months. As producers marketing experience in mushroom increases they know which alternative market to be chosen. Woldemichael (2008) found that experience has negative impact on milk market participation. Hence, it is hypothesized that marketing experience has a positive relationship with choosing alternative market.

Continuous mushroom production: is a dummy variable taking a value of 1 if continuously produce mushroom and 0 if not produce mushroom continuously. Some alternative market requires sustainable supply of mushroom so that those who continuously produce mushroom meet the need of such markets. The finding of Tadele and Tewodros (2013) also shows high milk production determines the market choice. It is hypothesized that continuous production determines the market choice positively.

Access to credit: is a continuous variable measured in ETB. If producers have credit access they can access mushroom production inputs and able to supply mushroom to alternative market. According to Adugna (2009) capital in terms of credit is important to all market players. It is expected to influence the market choice positively.

License: is a dummy variable taking the value of 1 if licensed and 0 if not having license. According to Adugna (2009) having license has no influence in horticultural marketing. But for this study having license hypothesized to have a positive influence on mushroom market choice.

Access to extension service: is measured as a dummy variable taking a value of 1 if accessed to extension service and 0 if not accessed. It is expected that extension service widens the knowledge with regard to the production technique and pre and post harvest handling of mushroom and have positive impact on market participation decision and alternative market outlet choice (Gani and Adeoti, 2011). The variables are summarized in Table 3.

Table 3 Summary of variables included in conditional logit model

Variables	Description	Type of variable	Exp sign
Dependent variable			
AMC	Alternative market choice	1= choose consumers; 0= otherwise	
		1= choose supermarkets; 0=otherwise	
		1= choose traders; 0=otherwise	
		1= choose spawn suppliers; 0=otherwise	
		1= choose hotel /restaurants; 0=otherwise	
Alternative specific independent variables			
distance	Distance to alternative market	Continuous (in kilometer)	- ve
volume	Quantity purchased	Continuous (in kilogram)	+ ve
modeofsale	Mode of sale	Dummy(1 = cash, 0 = credit)	+ ve
price	Price of alternative market	Continuous (in ETB)	+ ve
Case specific independent variables			
tb	Type of business	Categorical Dummy variable	+ve/-ve
		1= if sole proprietor,0=for other	
		1= if partnership,0=for others	
		1= if cooperative, 0 = for others	
busmod	mode of business	Categorical dummy variable	-ve
		(1= if fulltime, 0 = not)	
		(1= if part time, 0 = not	
edul	Education level	Categorical dummy variable	+ve
		(1= if elementary, 0 = not)	
		(1= if secondary, 0 = not)	
		(1= if tertiary, 0 = not)	
experience	Marketing experience	Continuous (in months)	+ve
contpron	Continuous production	Dummy (1= yes, 0 = no)	

Variables	Description	Type of variable	Exp sign
credit	Amount of credit	Continuous (in ETB)	+ve
license	License	Dummy (1= yes, 0 = no)	+ve
extcont	Access to extension service	Dummy (1= access, 0 = no)	+ve

3.3.2.2. Cobb-Douglas production function

Realizing that output is a function of inputs, production function can be expressed as $\mathbf{Y=F(X_{it})}$ where, **Y** is output level, $\mathbf{X_{it}}$ is a vector of variable inputs that affect output. In order to estimate this relationship, a mathematical function needs to be specified. For this purpose the Cobb–Douglas production function was chosen. Cobb-Douglas Production Function or trans- log production functions was chosen to estimate the effects of key variables on production process of mushroom. The Cobb–Douglas production function is expressed in general form as follows (Hatirli *et al.*, 2005).

$$L_n Y_n = \beta_0 + \sum \beta_i L_n (X_{in}) + \varepsilon_n$$

Where $\mathbf{Y_n}$ denotes the quantity of mushroom produced for the $\mathbf{n^{th}}$ farmer, $\mathbf{b_o}$ is a constant, $\mathbf{b_i}$ denotes coefficients, $\mathbf{X_{in}}$ is variable inputs used in the production of mushroom and ε_i is the error term, assumed normally distributed with mean 0 and constant variance. Following this explanation, it can be alternatively written as:

$$L_n Y_n = \beta_0 + \beta_1 L_n X_1 + \beta_2 L_n X_2 + \beta_3 L_n X_3 + \beta_4 L_n X_4 + \ldots \beta_n L_n X_n + \varepsilon_n$$

Dependent Variable

The quantity of mushroom produced: it is a continuous variable which represents the total amount of mushroom produced in kilogram per season.

Independent variables

Cost of spawn: high price of spawn per kilogram affects the production of mushroom negatively. It is a continuous variable measured in ETB. When production costs are high

relative to price, firms produce little, switch to the production of other products, or may simply go out of business (Arnold, 2008).

Pasteurization methods: is a categorical dummy variable and is measured as 1 if hot water, steam or chemical, 0 otherwise. Kidane (2006) showed pasteurization method is hypothesized to affect mushroom production positively or negatively.

Type of business: it is a categorical dummy variable with three alternatives. The business types were sole proprietor, partnership or cooperatives. Jari (2009) also shows that production in group encourages market penetration among smallholder farmers than individual producers. It is 1 if one of the alternatives chosen, otherwise 0. It is expected to determine production positively or negatively.

Education category of producers: it is a categorical dummy variable with three alternatives such as elementary, secondary or tertiary level. It is 1 if one of the alternatives chosen, otherwise 0. Abebayehu (2011) showed that literate producers are technically more efficient since they have relatively adequate knowledge to apply new production technology. Therefore, education is hypothesized to affect mushroom production positively.

Experience in mushroom production: is a continuous variable measured in months. Woldemichael (2008) found that experience has negative impact on milk market participation. It is hypothesized to have a positive relationship with quantity of mushroom produced.

Credit service: is a continuous variable measured in ETB. If producers have credit access they can access mushroom production inputs and able to produce more. According to Adugna (2009) capital in terms of credit is important to all market players. It is expected to influence the quantity of mushroom produced positively.

Quantity of spawn (in gram): Sara (2007) identified significant variations in production among different rate of spawn inoculation. The highest production was recorded for mushrooms spawned at 3% inoculation rate (749 g/ kg dry substrate) which was significantly higher from all other inoculation rates and the lowest was recorded at 1% inoculation rate (456 g/ kg dry substrate). Moreover, increased spawn rate would provide faster substrate colonization and, thus, more rapid completion of the production cycle. Hence, the amount of

spawn (seed) applied to the substrate, measured in gram, is a continuous variable and expected to affects production positively.

Mode of the business: it is a categorical dummy variable in which producers engaged as a full time or part time work. If full time or part time =1, 0 otherwise. According to Stallmann and Alwang (1992) full time and part time mushroom producers differ in their linkage to output market because they produced mushroom as primary source of income or not. Thus it affects the quantity of mushroom produced either positively for those spend their fulltime to mushroom production or negatively for those part time producers.

Size of house for mushroom production: is a continuous variable measured in M^3. Size of housing encourages producers and other value chain actors to produce and process mushroom. Tadele (2012) found that owning large size of land is conducive for agricultural production and marketing. In this study, size of house is hypothesized to influence mushroom production positively.

Access to extension service: is a dummy variable; 1 if has access, 0 otherwise. According to Abebayehu (2011), access to extension service is expected to increase the quantity of mushroom produced. Since it widen the producers' knowledge with regard to the production technique of mushroom and has positive impact.

Access to substrate: the availability of enough amount of substrate at the required time affects production positively (Amin *et al.*, 2010). It is a dummy variable, if producers have access to enough substrate at the time needed 1 and if not 0.

Spawn availability: availability of spawn at the required time determines mushroom production positively (Dawit, 1998). It is a dummy variable, if available at the time needed 1 and if not 0.

Table 4 Summary of variables included in Cobb-Douglas production function

Variable	Description	Type of variable	Exp sign
Dependent variable			
tqmps	Total quantity of mushroom produced per season	Continuous (in kilogram)	
Independent variables			
modebus	mode of business	Dummy variable (1= full time, 0 = part time)	-ve
edul	The education category of the producers or manager	Categorical dummy variable (1= if elementary, 0 = not) (1= if secondary, 0 = not) (1= if tertiary, 0 = not)	+ve
volshed	Size of house	Continuous (in M3)	+ve
license	Mushroom production license	Dummy (1= yes, 0 = no)	+ve
extension	Access to extension service	Dummy (1= access, 0 = no)	+ve
experience	Experience in production	Continuous (in months)	+ve
quaspawn	Quantity of spawn used	Continuous, (in gram)	+ve
costspawn	Cost of spawn	Continuous (in birr per kilogram)	-ve
tb	Type of business	Categorical Dummy (1= if sole proprietor, 0 = not) (1= if partnership, 0 = not) (1= if cooperative, 0 = not)	+ve/-ve
Pastmeth	Pasteurization method	Categorical Dummy (1= if chemical, 0 = not) (1= if hot water, 0 = not) (1= if steam, 0 = not)	+ve/-ve
subsavi	Substrate availability	Dummy (1= available, 0 = not)	+ve
costsub	Cost of substrate	Continuous (in birr per kilogram)	-ve/+ve
spawnavi	Spawn availability	Dummy variables(1=available, 0 = not)	+ve/-ve

4. RESULTS AND DISCUSSIONS

The result and discussion part has six sub sections. The first sub section discusses about mushroom producers, production system, production and productivity and the marketing system. Mushroom value chain functions, actors, activities and market flow are discussed in the second section. The next two subsections show the map of mushroom value chain and the market SCP, respectively. The last two sub sections are econometric estimation results and opportunities and constraints of mushroom production, respectively.

4.1. Mushroom Production and Marketing System

4.1.1. Description of mushroom producers

Mushroom producers in Addis Ababa, Ethiopia were categorized in to three; individual producers (sole proprietors), producer groups (partnership) and cooperatives. Variation in the distribution of female and male mushroom producers or members was seen among sole proprietors', partners and cooperatives (Table 5).

Table 5 Gender distribution among business types

	Type of the business			
Category	Sole prop.	Partners	Cooperative	$\chi 2 - test$
Sex n (%)				
Female	30(17)	55(31.3)	91(51.7)	62.794***
Male	55(39.3)	29(20.7)	56(40)	

*** Significant at 1% significance level
Source: Own survey

The educational background of respondents in mushroom production showed that all mushroom producers type have members from all education levels. About 32.9 percent of respondents in sole proprietorship had secondary educational level, whereas 47.4 percent in partnerships and 43.8 percent in cooperatives had Diploma/TVET educational level. Generally, there was no significant difference in the highest education level reached by members of mushroom producers (Table 6).

Table 6 Educational background of mushroom

Education level	Type of the business N (%)			F-test
	Sole proprietor	Partners	Cooperative	
Primary	7 (5.8%)	1 (0.8%)	4 (3.3%)	0.065
Secondary	28 (23.3%)	6 (5.0%)	1 (0.8%)	
Diploma/TVET	27 (22.5%)	9 (7.5%)	7 (5.8%)	
BA/ B. Sc and above	23 (19.2%)	3 (2.5%)	4 (3.3%)	
Total	85 (70.8%)	19 (15.8%)	16 (13.3%)	

Source: Own survey

4.1.2. Description of mushroom production system

4.1.2.1. Growing shade

All sampled mushroom producers cultivated mushroom in door at growing shade (house). Iron roofed and plastic roofed shades were the most commonly used types of houses for the production of mushroom in Addis Ababa. These constituted 92.5 percent of the total growing shades. The rest 7.5 percent of the shades were concrete, both iron and plastic and both iron and concrete roofed. The ground of both iron and plastic roofed houses were classified into beaten ground, cemented, well dressed plastic and other types like stone and sand layer. Cemented ground was the most common for both iron and plastic roofed shades which accounts 60.6 percent and 31.6 percent, respectively (Table 7).

Table 7 Type of growing house based on type of roof and ground

Types of houses	Ground	n	Type of the business			F-test
			Sole prop.	Partners	Cooperative	
Iron roofed		109	(68) 56.7%	(17)14.2%	(14)11.7%	
	Beaten ground		20.2%	2.8%	.0%	
	Cemented		35.8%	11.0%	13.8%	
	Well dressed plastic		10.1%	1.8%	.0%	
	Others (stone layer, sand etc.)		4.6%	.0%	.0%	
Plastic roofed		19	(9) 7.5%	(2) 1.7%	(1).8%	0.949
	Beaten ground		26.3%	.0%	.0%	
	Cemented		15.8%	10.5%	5.3%	
	Well dressed plastic		15.8%	.0%	.0%	
	Others		21%	0%	5.3%	
	Others		(8) 6.7%	(0) .0%	(1) .8%	

Source: Own survey

The average volume of the growing shade hold by sole proprietorship, partnership and cooperatives were 83.2, 182 and 142.8 meter cube, respectively. Table 8 also shows the presence of significant difference in the volume of growing shade within and among business types. This limits the choice of bedding materials used for mushroom production. There was significant difference in the type of bedding materials at 5 percent significance level within and among business types. The widely used types of bedding materials in the study area were wooden box, plastic bag and shelf which cover 65 percent, 28.3 percent and 5.8 percent, respectively. There were no significant difference in both age and experience among the business types (Table 8).

Table 8 Volume of shade, experience, age and bedding materials

Category	Type of the business			
	Sole prop.	Partners	Cooperative	F-test
Volume of shade (M^3)				
Mean	83.2	182	142.8	
Std. Dev.	117.3	252.9	85.4	3.977**
Experience (in months)				
Mean	10.58	10.26	15.62	1.198
Std. Dev.	1.19	1.78	4.46	
Age (in year)				
Mean	35.9	34.4	36.8	0.254
Std. Dev.	11.06	7.99	13.14	
Bedding materials n (%)				
Box	57(47.5%)	16 (13.3%)	5 (4.2%)	
Plastic bag	22 (18.3%)	2 (1.7%)	10 (8.3%)	
Shelf	5 (4.2%)	1 (.8%)	1 (.8%)	3.227**
Box and plastic bag	1 (.8%)	0.00%	0.00%	

** Significant at 5% significance level.

Source: Own survey

4.1.2.2. Type of mushroom produced

Even though, mushroom production in Ethiopia passed more than one decade, only oyster mushroom was well known by most of mushroom producers in Addis Ababa. About 87.4 percent of the total producers' cultivated only oyster mushroom. Among the three types of businesses, all cooperatives produce only oyster with the knowledge of the type of mushroom. But, 6.7 percent of sole proprietorship and 2.5 percent of the partners did not know the type of cultivated mushroom. This may be due to low number of members in both types of business limits the information flow and the diversity of knowledge than cooperatives, which have more members, high information exchange and high diversity (Table 9).

Table 9 Knowledge about the type of mushroom produced

Type of mushroom	Type of the business			F-test
	Sole prop.	Partners	Cooperative	
Oyster	73 (61.3%)	16 (13.4%)	15 (12.6%)	
Shitake	2 (1.7%)	0 (0%)	0 (.0%)	
Unknown	8 (6.7%)	3 (2.5%)	0 (.0%)	
Oyster and button	1 (0.8%)	0 (.0%)	0 (.0%)	1.533
Oyster, Shitake and Button	1 (0.8%)	0 (.0%)	0 (.0%)	
Total	85 (71.4%)	19 (16.0%)	15 (12.6%)	

Source: Own survey

Oyster mushroom strains/varieties found in the study area were *p. oestratus*, *p. saju caju* and *p. florida*. Most mushroom producers (78.3%) did not know the name of the strains/varieties under cultivation. Even those who know the name of the strains/varieties they could not differentiate them (Annex 1).

4.1.2.3. Substrates and additive/ supplements

The unique character of mushroom is its ability to be produced in a wide range of agricultural by products and industry wastes. Unfortunately, mushroom producers in the study area were limited on cotton seed husk and straw. Accordingly, mushroom producers in Addis Ababa used wheat bran and Gypsum (*Jesso*, $CaSO_4$) to supplement the substrate. Generally there was no significant difference in the use of substrates and supplements among and within producers in Addis Ababa (Table 10).

Table 10 Types of substrate and additives used for mushroom production

Substrate n (%)	Type of the business			F-test
	Sole prop.	Partners	Cooperative	
Cotton seed husk	70(58.3%)	18(15%)	16(13.3%)	
Straw	6(5%)	0(0%)	0(0%)	1.607
Cotton seed husk and straw	8(6.7%)	1(0.8%)	0(0%)	
Cotton seed husk and Saw dust	1(0.8%)	0(0%)	0(0%)	
Additive to substrate n (%)				
Wheat bran	4(3.3%)	1(0.8%)	0(0%)	
Gypsum ($CaSO_4$)	14(11.7%)	2(1.7%)	2(1.7%)	0.009
Wheat bran and *Gypsum*	26(21.7%)	7(5.8%)	8(6.7%)	
None	41(34.1%)	9(7.5%)	6(5%)	

Source: Own survey

4.1.2.4. Amount of substrate, spawn and additive

Producers in the study area used different amount of substrate and additives for the cultivation of mushroom. Accordingly, the amount of dry substrate and rate of spawn per bedding material used by three types of businesses were varying. Thus, the amount of dry substrate significantly varies among and within the type of businesses. While, there was no variation on applications of spawn and additives (Table 11).

Table 11 Amount of dry substrate, spawn and proportion of additives

Variable	Type of the business						F-test
	Sole prop.		Partners		Cooperative		
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	
Substrate (kg/bed)	4.26	1.93	4.58	0.77	3.14	1.49	3.380**
Spawn (gm /bed)	214.5	82.6	233.7	59.0	179.7	64.0	2.192
Wheat bran (%)	4.3	6.36	2.66	4.38	4.69	5.0	0.689
Gypsum (%)	1.4	3.11	1.61	2.85	2.59	3.55	0.973

** Significant at 5% significance level

Source: Own survey

4.1.2.5. Access to spawn and substrate

Spawn and Substrate are the basic inputs for the production of mushroom in the study area. So that access and availability of these inputs affects the production of mushroom. On one hand, 55.6 percent of the total producers had access to whatever the amount of spawn required while 44.4 percent not accessed. On the other hand, 68.4 percent of producers did not get spawn whereas the rest 31.6 percent had whenever they need. Even though it was somehow accessible, the spawn was readily available only for 25.2 percent of the producers. Of the total producers 58.3 and 38.3 percent had got substrate whatever the amount and whenever required, respectively (Annex 2).

Availability, accessibility and stability in supply with respect to spawn were not the only factors for the producer but also the quality that determines the production and productivity of mushroom. Thus, there was no significant variation in the availability, quality and stability of spawn (Table12).

Table 12 Access of spawn in terms of availability, quality and stability

Variables	Type of the business			F-test
	Sole prop.	Partners	Cooperative	
Availability				
Readily available	21(17.6%)	6(5.0%)	3(2.5%)	
Average	46(38.7%)	9(7.6%)	10(8.4%)	0.117
Hard to obtain	17(14.3%)	4(3.4%)	2(1.7%)	
Unknown	1(.8%)	0(.0%)	0(.0%)	
Quality				
Good	36(30.3%)	7(5.9%)	7(5.9%)	
Average	31(26.1%)	7(5.9%)	5(4.2%)	0.333
Poor	10(8.4%)	3(2.5%)	3(2.5%)	
Unknown	8(6.7%)	2(1.7%)	0(.0%)	
Stability				
Stable supply	29(24.4%)	6(5.0%)	6(5.0%)	
Average	36(30.3%)	10(8.4%)	3(2.5%)	0.170
Unstable supply	19(16.0%)	3(2.5%)	6(5.0%)	
Unknown	1(.8%)	0(.0%)	0(.0%)	

Source: Own survey

4.1.2.6. Pasteurization method and type of spawn

Pasteurizing or sterilizing substrate before cropping the spawn is a primary duty for mushroom growers to protect mushroom mycelia from the competition of other molds and bacteria's. Having this, mushroom producers in the study area used hot water, steam boiling, cold water, water guard, formalin and autoclave to disinfect the substrate. Hence, pasteurization method varies among and with in business types significantly. Unless effective pasteurization of the substrate, whatever the type and quality of spawn used it is impossible to obtain good yield. Even though, there are many ways to produce different types of spawn from different agricultural and forest products, only sorghum and wheat spawn were available for mushroom producers in the study area. Thus, 95 percent of the total producers used sorghum spawn and the rest 3.4 percent and 1.7 percent used wheat spawn and both wheat and sorghum, respectively (Table 13).

Table 13 Pasteurization method and type of spawn

	Type of the business			F-test
Pasteurization	Sole prop.	Partners	Cooperative	
Hot water	18 (15.0%)	2 (1.7%)	1(.8%)	
Steam boiling	53 (44.2%)	12 (10.0%)	9 (7.5%)	
Cold water treatment	1 (.8%)	1 (.8%)	1(.8%)	
Autoclaving	1 (.8%)	0 (.0%)	0 (.0%)	2.831*
Using Formalin	6 (5.0%)	0 (.0%)	0 (.0%)	
Water guard (*Weha* agar)	6 (5.0%)	4 (3.3%)	5 (4.2%)	
Spawn type				
Wheat spawn	3 (2.5%)	1 (.8%)	0 (.0%)	
Sorghum spawn	79 (66.4%)	18 (15.1%)	16 (13.4%)	0.314
Wheat and Sorghum spawn	2 (1.7%)	0 (.0%)	0 (.0%)	

*Significant at 10% significance level
Source: Own survey

4.1.2.7. West disposal

The bulky substrate left after the production of mushroom, spent spawn, were disposed in different ways. Most of mushroom producers (54.2%) were throw it while 31.4 and 12.7 percents used spent spawn for compost and for fuel, respectively. The remaining 1.7 percent used spent spawn for livestock feed (Annex 8).

4.1.3. Mushroom production and productivity

Mushroom production passed through incubation period, in the dark room for full development of mycelia growth, and fruiting period in the light room, to provide enough light and air flow for better fruit production. Conducive environment like temperature, humidity and CO_2 concentration together with the management influence the production and productivity of mushroom. The amount of mushroom produced and the yield differed among producers due to variation of the environment in the growing shade and the management. The minimum and maximum amounts of mushroom produced were 0 and 1200 kilogram, respectively with an average of 121.4 kilogram per season. In the study area there was significant difference in yield of first harvest. There was no significant variation on yield of

the rest harvesting, harvesting frequency, quantity produced and number of days per season among and within business types (Table 14).

Table 14 Amount of mushroom produced, frequency of harvest and production season

Variables	Type of the business						
	Sole prop.		Partners		Cooperative		
	Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev	F-test
First harvest (kg/bed)	2.8	1.8	3	1.9	2.2	0.7	4.338**
Rest harvests (kg/bed)	1.8	1.6	2	1.5	0.7	0.3	0.932
Quantity/ season(Kg)	118.6	144	169.2	271.4	79.5	68	1.345
Harvesting frequency	3.8	1	3.4	1.5	4.1	0.9	1.667
No. of days/ season	64.9	24.4	77.4	25.6	65.6	19	2.117

**Significant at 5% significance level

Source: Own survey

4.1.4. Description of mushroom marketing system

4.1.4.1. Distance of alternative markets from growing shades

Mushroom producers in the study area sold mushroom to consumers, hotels, restaurants, supermarkets, spawn suppliers and retailer market. On average hotels and restaurants were 12.3 km and 10.3 km far from the production site, respectively. The nearby market for sole proprietors was supermarkets whereas for partners and cooperatives were consumer market and restaurants, respectively. The study shows there was no significant variation in distance of alternative markets within and among business types (Table 15).

Table 15 Distance of alternate markets from mushroom growing shed in Km

Alternative markets	Type of the business						
	Sole prop.		Partners		Cooperative		
	Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev	F-test
Consumers	10.5	15.5	3.8	1.8	9	0	0.175
Traders	9.3	8.4	7.5	3.6	7.7	2	0.113
Hotels	14.4	15.7	15	14.1	7.3	2.1	0.437
Restaurants	13.3	14	6	0	4	2.6	1.126
Supermarkets	8.1	8.6	7.4	10.3	8.9	2.6	0.071
Spawn suppliers	10.1	10.1	3.8	7.7	6.8	1.9	0.341

Source: Own survey

4.1.4.2. Means of transport and pricing methods

Whether the alternate market is far or near, either the buyer collected the product at farm get or the producers used means of transport like on foot, public transport and own vehicle to deliver the product. Most of mushroom producers (79 %) in the study area used public transport or taxi to deliver their product to the alternate markets. About 4.2 percent and 3.4 percent of the producers used own vehicle and on foot, respectively while the remaining 13.4 percent sold at farm gate, so that the buyer was responsible to transport product. Actually, the way of transporting mushroom together with other costs affect the selling price. But the study showed that 63 percent of the total producers were price takers. Generally, in the method of transporting mushroom and setting the price there were no significant difference within and among business types (Table 16).

Table 16 Means of transporting mushroom and pricing methods

	Type of the business			
Methods of shipment	Sole proprietors	Partners	Cooperatives	F-test
On foot	4(3.4%)	0(.0%)	0(.0%)	
public transport/ Taxi	65(54.6%)	17(14.3%)	12(10.1%)	
Buyer/ broker for shipment	11(9.2%)	1(.8%)	4(3.4%)	0.634
Own Vehicle	5(4.2%)	0(.0%)	0(.0%)	
Price Settings				
Producer only	4(3.4%)	4(3.4%)	2(1.7%)	
Buyer only	63(52.9%)	8(6.7%)	4(3.4%)	
Negotiation	11(9.2%)	4(3.4%)	7(5.9%)	
Producer only for consumers	0(.0%)	0(.0%)	2(1.7%)	
Seller and buyer for different market	6(5.0%)	2(1.7%)	0(.0%)	1.477
The market	1(.8%)	0(.0%)	1(.8%)	

Source: Own survey

4.1.4.3. Market agreement and mode of payment

As variation in quantity and quality of mushroom produced within and among producer types, the requirement by alternative market was also vary. Hence, market agreement on the product quantity, quality, delivery time, price and mode of payment facilitates the transaction between buyer and seller. Accordingly, there was high significant difference within and among business types regarding the market agreement (Table 17).

Table 17 Market agreement and mode of payment

Market agreement	Type of the business n (%)			$\chi 2-test$
	Sole prop.	Partners	Cooperative	
No agreement	60 (50.0)	14 (11.7)	12 (10.0)	22.533***
Have agreement	25 (20.8)	5 (4.2)	4 (3.3)	

***Significant at 1%
Source: Own survey

Mushroom producers sold mushroom to different alternative market. The mode of payment was both in cash and credit. It varies significantly for consumers and hotels at 10 percent significance level. This shows that most of mushroom producers from sole proprietors and all producers from partners and cooperatives business types sold mushroom in cash for consumers and traders while both in cash and credit for others alternative markets (Table 18).

Table 18 mode of payment

Mode of payment	Type of the business n (%)						
	Sole prop.		Partners		Cooperative		$\chi 2-test$
	Credit	Cash	Credit	Cash	Credit	Cash	
Consumers	5 (8.2)	27(44.3)	0 (0)	14 (23)	0 (0)	15 (24.6)	4.936*
Traders		6 (60)	-	2 (20)	-	2 (20)	
Hotels	4 (28.6)	2 (14.3)	4 (28.6)	0 (0%)	1 (7.1)	3 (24.4)	4.926*
Restaurants	5 (26.3)	6 (31.6)	3 (15.8)	0 (0)	2(10.52)	3 (15.8)	3.247
Supermarket	12 (41.4)	4 (13.8)	3 (10.3)	3 (10.3)	6 (20.7)	1 (3.4)	2.182
Spawn suppliers	31 (36.5)	34 (40)	10(11.8)	4 (4.7)	2 (2.4)	4 (4.7)	3.365

* Significant at 10% significance level
Source: Own survey

4.1.4.4. Average mushroom supplied and price of the alternative market

The primary objective of all mushroom producers in the study area is to supply the product to the market and earning income. Except, the extent of the product all of them supply mushroom to different alternative markets. Hence, the quantity of mushroom supplied to spawn supplier was significantly vary within and among the business types in Addis Ababa (Table 19).

Table 19 Average fresh mushroom supplied to alternative market (in Kg/month)

Market	Type of the business						F-test
	Sole prop.		Partners		Cooperative		
	Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev	
Consumers	22.6	39.5	22.7	26.5	25.5	24.9	0.042
Traders	35.9	42.83	43.33	0	36	7.1	1.219
Hotels	211	338	762.5	1043	25.3	13	1.994
Restaurants	101.7	109.1	30	0	43.2	21.5	0.838
Supermarkets	55.4	79.4	131	232.1	41.3	45.6	1.083
Spawn suppliers	45	5.6	128.5	160.1	31.3	17	6.199***

***Significant at 1% significance level
Source: Own survey

Average price of fresh mushroom for alternative markets not significantly vary except restaurants. The average price of fresh mushroom supplied to restaurants significantly varied within and among business types. The average price offered by restaurant for mushroom producers vary significantly at one percent significant level may be related to their bargaining power and consistency in supplying the product (Table 19).

Table 20 Average price of fresh mushroom in ETB/kg

Alternative market	Type of the business						
	Sole prop.		Partners		Cooperative		
	Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev	F-tests
Consumers	53.4	6.3	50.8	7.8	55.1	6.3	1.527
Retailers	41.2	5.7	30.7	0.0	50.0	0.0	1.053
Hotels	54.2	9.2	50.0	0.0	60.0	8.2	1.102
Restaurants	56.8	6.0	40.0	0.0	64.0	5.5	7.516***
Supermarkets	49.1	10.0	50.8	9.2	55.7	11.3	1.038
Spawn suppliers	47.7	6.7	47.1	5.4	49.5	1.2	0.27

*** Significant at 1% significance level
Source: Own survey

4.2. Mushroom Value Chain Functions, Actors, Activities and Market flow

Mushroom value chain actors in Addis Ababa were generally classified to input suppliers, producers, traders, processors and consumers. All actors along the chain add value in the

process of changing product title. The main functions and activities performed along the value chain are shown in Figure 2.

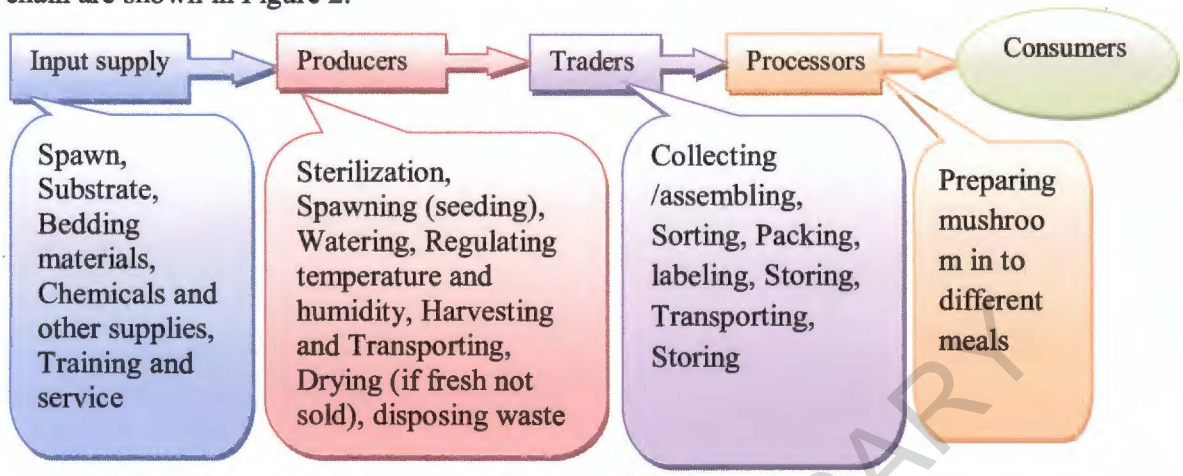

Figure 2 Processes and functions of mushroom value chain
Source: Own survey

4.2.1. Input suppliers

4.2.1.1. Spawn

During the study period there were about sixteen spawn suppliers and five own spawn producers found in Addis Ababa. Fifteen of the spawn suppliers were private sectors and only one spawn supplier under the government. Producers have got the spawn from two channels. The first channels originate from primary spawn suppliers to the producer where as the second channel passed through primary and secondary spawn suppliers to reach mushroom producers (Figure 3).

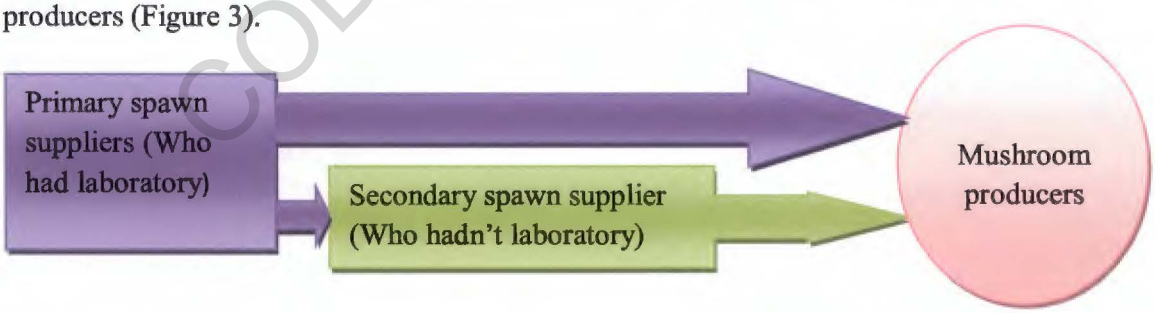

Figure 3 Spawn market flow
Source: Own survey

4.2.1.2. Substrate

As shown below in Figure 4 the dominant substrates used for mushroom production were cotton seed husk and straw. About 95.8 percent of the total producers used cotton seed husk, waste product, from *Mojo* oil refinery. The rest 4.2 percent used straw, agricultural byproduct, directly from the farmer. Regarding four channels of substrate, 53.3 and 4.2 percent of producers were purchased substrate directly from the oil refinery and farmer, respectively. The remaining two channels provided substrate to the producer through spawn suppliers (39.2%) and local markets (3.3%).

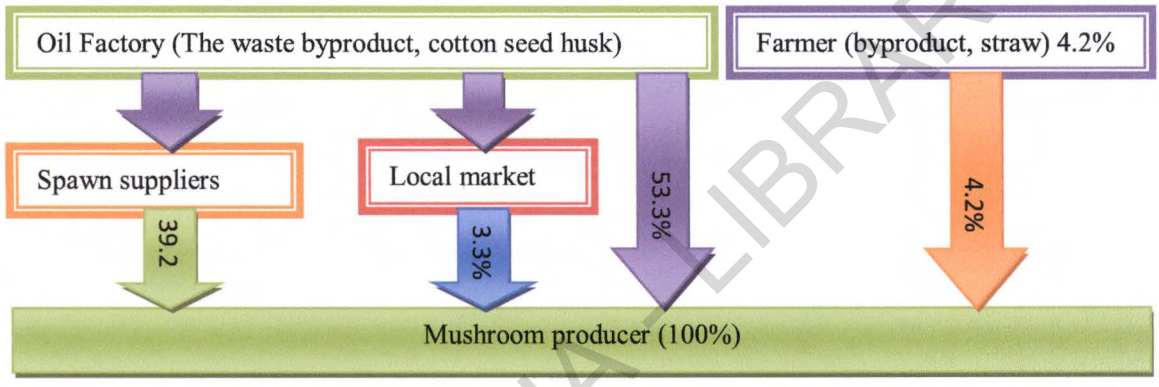

Figure 4 Flow of substrate for mushroom production
Source: Own survey

4.2.1.3. Training

About 78.9 percent of mushroom producers have got training from spawn providers for about 6.4 hours on average, and about 21.1 percent from governmental TVET colleges, on average for 22.5 days with 3.4 hours per day basis. TVET colleges provide training for jobless individuals organized by sub cities under small and micro institutions (Annex 3). Regarding to other inputs such as bedding materials, chemicals and other supplies, producers obtained from the local markets, pharmacies, and/ or *merkato* (the main market in Addis Ababa).

4.2.1.4. Credit Service

Credit service helps for the development of any business sector. Since mushroom sector is a new business area to Ethiopia producers highly need credit facilities to run the business. Out of the total sampled producers 86.7 percent had no access to credit in 2013 cropping year. For mushroom production even if 16.4 percent need credit, they did not have access due to restrictive procedure and other reasons while 83.6 percent of them did not face any financial problem (Annex 4).

4.2.1.5. Extension and demonstration

Addis Ababa urban agricultural office organized to assist those engaged in urban agriculture through district urban agricultural offices. Even though professionals were recruited under different case teams for the agricultural sector including horticulture in all sub cities and districts, the extension service was not uniform among business types. The study result indicated significant difference in extension contact at 5 percent significance level within and among business types (Table 20).

Table 21 Access to extension, demonstration and written materials

	Type of the business			$\chi 2-test$
	Sole. Prop.	Partners	Cooperative	
Extension contact				
No extension contact	77(65.3%)	13(11.0%)	12(10.2%)	7.752**
Have contact	7(5.9%)	6(5.1%)	3(2.5%)	
Expert visit				
No expert visit	54(45.0%)	9(7.5%)	8(6.7%)	
Have expert visit	31(25.8%)	10(8.3%)	8(6.7%)	3.321
Demonstration				
No access to demonstration	72(61.5%)	16 (13.7%)	13(11.1%)	
Have access to demonstration	12(10.3%)	2(1.7%)	2(1.7%)	0.128
Written materials				
No access to written material	44(36.7%)	13(10.8%)	6(5.0%)	
Have access to written material	41(34.2%)	6(5.0%)	10(8.3%)	3.393

** Significant at 5% significance level

Source: Own survey

4.2.2. Producers

Mushroom producers are the next major actors who perform most of the value chain functions start from mobilizing inputs to post harvest handling and marketing. The major value chain activities that mushroom producers perform include purchasing inputs, sterilizing substrates, spawning, managing the temperature and relative humidity, disease and pest controlling, harvesting, post harvest handling and marketing. According to mushroom producers hot water or steam sterilization was the most difficult activity, since it is labor intensive and time consuming. The major actors in the production function of the value chain include sole proprietors (individual mushroom producers), partners (producer groups) and cooperatives. These producers harvested their product early in the morning and immediately transported to six market outlets. About 34.5 percent of the total product in the study area supplied to spawn suppliers followed by 31.6 and 14.6 percent to hotels and restaurants and supermarkets, respectively. The remaining 10.4 percent to consumers and 9 percent were supplied to traders such as assemblers and retailers. The flow of input for the production of mushrooms towards the producers and the supply of output to different alternative market is depicted in Figure 5.

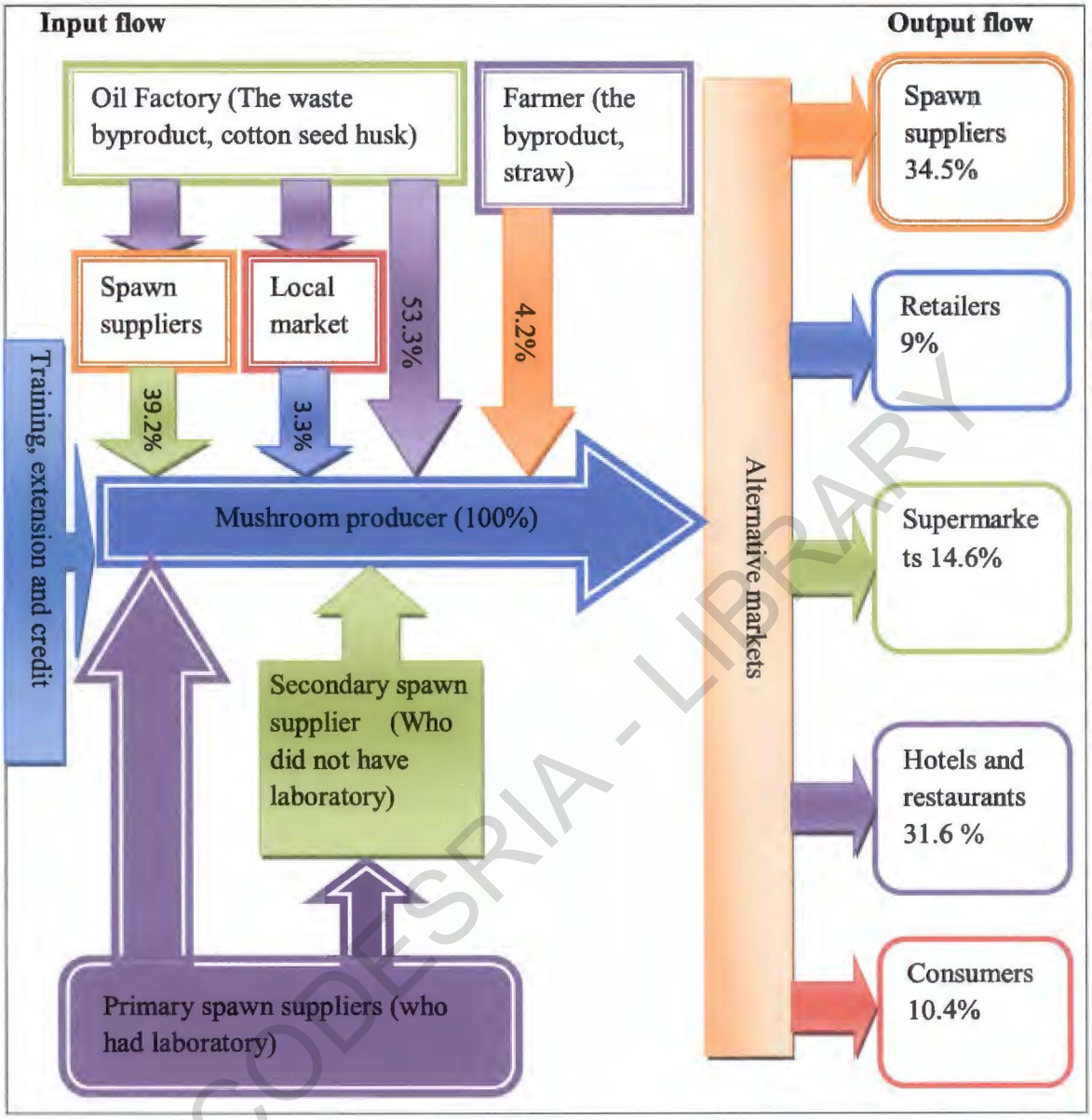

Figure 5 Input and output market flow for producers
Source: Own survey

4.2.3. Traders

The major actors in mushroom trade categorized in to spawn suppliers, retailers and supermarkets. The activities of spawn suppliers and retailers were collecting, sorting, packing and transporting to the next destination market. As shown in Figure 6 spawn suppliers played the leading role in collecting and distributing fresh and dry mushroom from producers to

alternative markets. Their destination markets were consumers, supermarkets, hotels and restaurants, and retailers. The main alternate markets for spawn suppliers were supermarkets, consumers and hotels and restaurants with the market share of 50.9, 24.9 and 20.1 percent of the total supplied mushroom, respectively (Annex 5). Retailer market, found at Bole Ruanda *gulit gebeya,* collected fresh mushroom from producers and spawn suppliers. Hence, this market was well known by foreigners who live in Addis Ababa, almost the entire mushroom product sold for them.

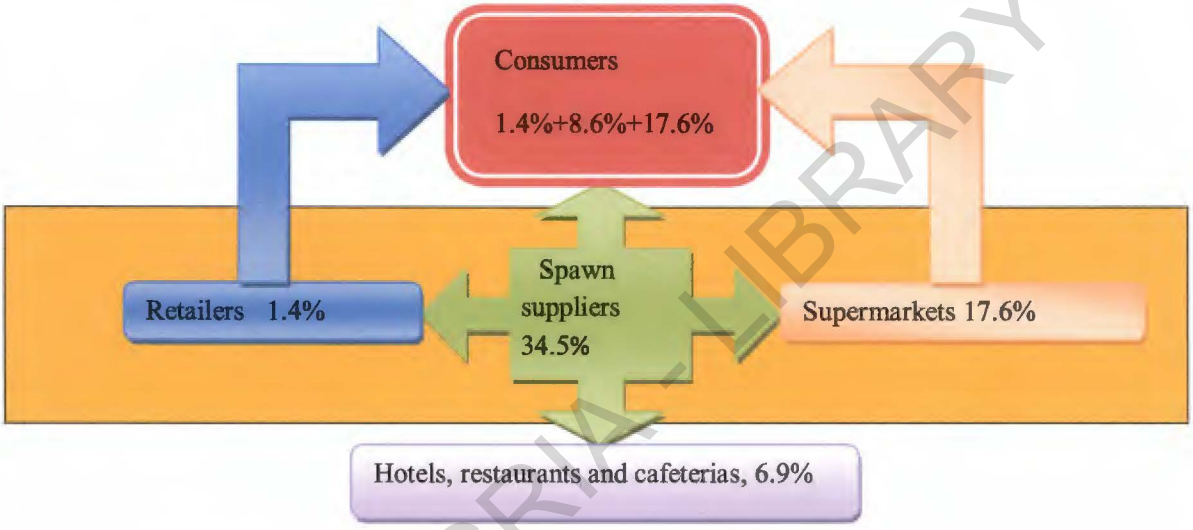

Figure 6 Mushroom market flows from spawn suppliers
Source: Own survey

Supermarkets sale both imported and locally produced mushroom. Their major activities are packaging, labeling and storing until they are selling the product. The primary client of supermarkets for locally produced fresh mushroom were foreigners (66.7%) followed by diasporas (16.7%) and local peoples (16.7%) (Annex 6). On average supermarkets sold 640 kg fresh mushrooms per month to end users. The shelf life of mushroom at supermarket, on average 4.33 days, which is longer life than any other types of market actors for whom the life period is not more than a day (Annex 7).

4.2.4. Processors

Processing is one of the mushroom value chain functions. The actors are hotels, restaurants and cafeterias. Hotels, restaurants and cafeterias further process locally produced and imported mushroom in to different dishes. As depicted in figure 6 and 7, in the previous pages, they obtain locally produced fresh mushroom from producers (31.6%) and Spawn suppliers (20.1%) where as imported mushroom mostly from supermarkets. Sampled hotels, restaurants and cafeterias prepared 48 types of 154 fasting and non fasting mushroom dishes per day. The main customers for mushroom dishes were foreigners (71.4%) and local peoples (28.1%) (Annex 8).

4.2.5. Consumers

Consumers are end users of mushroom in the value chain. As discussed previously consumers purchase and used mushroom from producers, traders and processors. As shown in annex 13, about 67.5 percent of sampled respondents did not know about mushroom whereas 32.5 percent knew either wild, locally cultivated, imported or all types. Wild edible mushroom was well known (46.2%) than both locally cultivated (23.1%) and imported ones in the study area. Accordingly, 53.8 percent of those who knew mushroom have consumed it in the last twelve months. Whose monthly income of birr 3 551and above were 66.6%, while the remaining 33.4 percent had below birr 1 400. Some of the reasons for those who knew but did not consume mushroom were due to non availability and expensiveness (50%), Lack of awareness (33.3%) and prefer to consume meat (16.7%).

4.2.6. Institutional support

Like any agricultural sector, enablers' plays vital role for sustainability of the mushroom production. For instance, agricultural offices involved in facilitating mushroom training, licensing, organizing producers in small and micro- institutions, provide shade, extension service and spawn. Addis Ababa University contributes to the sector through training, research and development. Food and Health Research Institute give certificate for those producers who qualify the edibility criteria of their produced mushroom. Forestry research

center of the Ethiopian Institute of Agricultural Research is the other facilitator who conducts research on substrates under the non timber forest product case team. TVET colleges provided training service for those willing to join mushroom production.

4.3. Mapping Mushroom Value Chain

4.3.1. Mushroom value added along the market channels

Mushroom value chain actors added value when the product passes from one actor to another. The actors either change the form of the product through processing or improving the grade through sorting, cleaning, packing or creating place and time utility. As listed below there were eight marketing channels in the study area. Identified mushroom market Channels were:-

1. Producers→spawn suppliers→hotels, restaurants and cafeterias→consumers
2. Producers→spawn suppliers→Retailers→consumers
3. Producers→spawn suppliers→supermarkets→consumers
4. Producers→spawn suppliers→consumers
5. Producers→ retailers→ consumers
6. Producers→supermarkets→consumers
7. Producers→consumers
8. Producers→hotels, restaurants and cafeterias→Consumers

Among the marketing channels the total values added to mushroom were highest in the first and the eighth channels, each account 171.87 ETB per kilogram. In both channels, hotels, restaurants and cafeterias, processed mushroom in to different meals, added the highest gross values to mushroom. In contrast, the seventh marketing channel, direct flow of mushroom from producers to consumers, shows the lowest total value added to mushroom product (20.77 ETB/ kg). Spawn suppliers played the greatest role in the distribution of mushroom along four marketing channels (channel 1, 2, 3 and 4). Their percent of value added in these channels were 5.82, 24.78, 18.74 and 38.77, respectively (Table 22).

Table 22 Mushroom value added along the market channels in ETB per kilogram

Channels		Producers	Spawn supplies	Retailers	Super markets	Hotels and rest.	Consumers	Total Value Added
	Selling price, birr/kg		50			60	204.1	
1	Cost of raw materials	32.23	50.00			60.00		
	Gross value added	17.77	10.00			144.10		171.87
	Total value added (%)	10.34	5.82	0.00	0.00	83.84	0.00	100.00
2	Selling price, birr/kg		50	57.5			62.5	
	Cost of raw materials	32.23	50.00	57.50				
	Gross value added	17.77	7.50	5.00				30.27
	Total value added (%)	58.70	24.78	16.52	0.00	0.00	0.00	100.00
3	Selling price, birr/kg		50		58.75		83.67	
	Cost of raw materials	32.23	50.00		63.51			
	Gross value added	17.77	8.75		20.16			46.68
	Total value added (%)	38.07	18.74	0.00	43.19	0.00	0.00	100.00
4	Selling price, birr/kg		50				61.25	
	Cost of raw materials	32.23	50.00					
	Gross value added	17.77	11.25					29.02
	Total value added (%)	61.23	38.77	0.00	0.00	0.00	0.00	100.00
5	Selling price, birr/kg			43.6			57.5	
	Cost of raw materials	32.23		43.60				
	Gross value added	11.37		13.90				25.27
	Total value added (%)	44.99	0.00	55.01	0.00	0.00	0.00	100.00
6	Selling price, birr/kg				51		83.67	
	Cost of raw materials	32.23			55.76		0.00	
	Gross value added	18.77			29.91			48.68
	Total value added (%)	38.56	0.00	0.00	61.44	0.00	0.00	100.00
7	Selling price, birr/kg						53	
	Cost of raw materials	32.23					0.00	
	Gross value added	20.77						20.77
	Total value added (%)	100.0						100.00
8	Selling price, birr/kg					56.65	204.1	
	Cost of raw materials	32.23				56.65	0.00	
	Gross value added	24.42				147.45		171.87
	Total value added (%)	14.21	0.00	0.00	0.00	85.79	0.00	100.00

Source: Own survey

4.3.2. Mapping the volume of mushroom along the chain

The volume of mushroom supplied varies along the alternative market channels. On average, the total amount of 13,477.5 kg of mushroom is supplied by sampled producers per month to different markets. Out of which individual producers supplied 59.4 percent followed by partners (32.3%) and cooperatives (8.3%). In the shortest channel 10.4 percent of the total mushroom was supplied directly from producers to consumers. The largest volume of mushroom, 34.5%, flow from producers through spawn suppliers to retailers (1.4%), supermarkets (17.6%), hotel, restaurants and cafeterias (6.9%) and consumers (8.6%). Hotels, restaurant and cafeterias processed 37.5 percent of the total mushroom in to different meals before delivered to consumers (Figure 7).

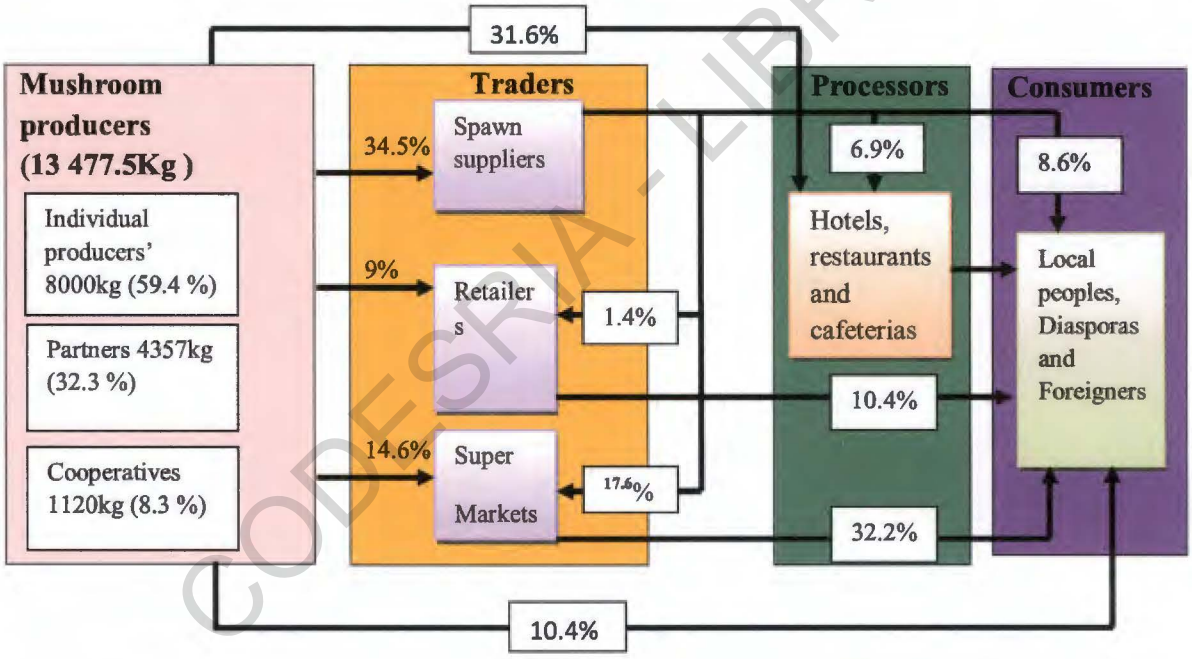

Figure 7 Volume of mushroom flow per month through the value chain function
Source: Own survey

4.3.3. Mushroom value chain map in Addis Ababa, Ethiopia

Mushroom value chain map in the study area, depicted in Figure 8, summarizes the whole input and output flow along with the support institutions. As shown in the map spawn

suppliers were the leading actors almost in all input and output flows along the mushroom value chains. It seems the mushroom business centrally controlled by these actors.

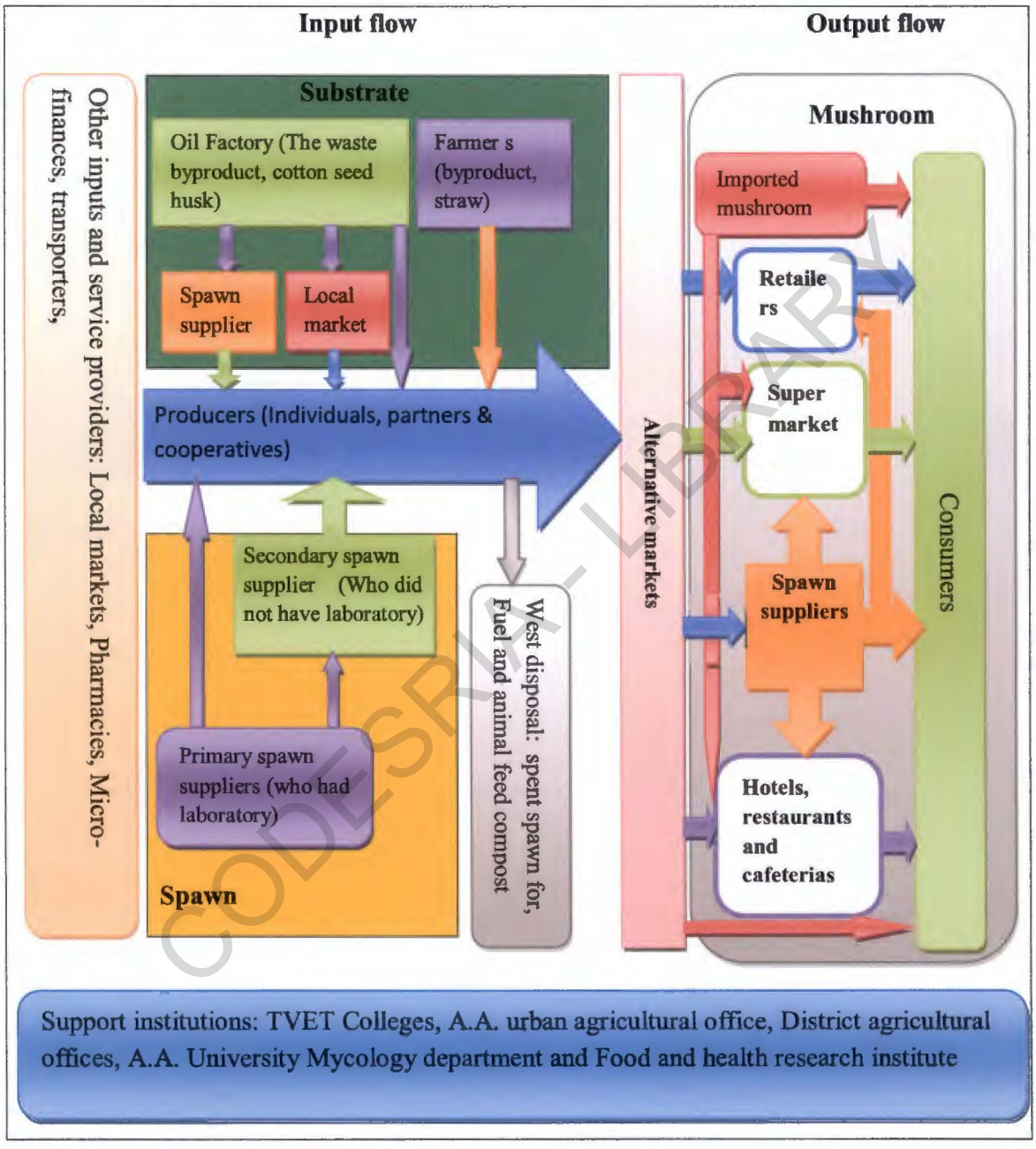

Figure 8 Mushroom value chain maps in Addis Ababa, Ethiopia
Source: Own survey

4.4. Mushroom Market Structure, Conduct and Performance

The mushroom S-C-P describes the key structural characteristics such as concentration, extent of product differentiation and condition of entry. Firms' conduct was dealt with the price, output and promotion strategy. Market performance, the result of the structure and conduct, analyzed through ROS of the firms. Thus, market S-C-P for mushroom producers and spawn suppliers were conducted.

4.4.1. Market structure

The concentration ratio analyzed for the largest four, eight, sixteen and twenty mushroom producers. The result showed that the concentration ratio for the largest four and eight mushroom producers were 32.9 and 44.5 percent, respectively (Table 23). It means of the total mushroom market share the largest proportion was goes to few mushroom producers. This indicates mushroom market was controlled by few numbers of mushroom producers.

Table 23 Concentration ratios for mushroom producers

Top producers	Sales in ETB/month (S)	Market share (*Si*) = (Sales ÷ Total sales) x 100	Concentration ratio
1	105500	14.91	$CR_4 = \sum_{1}^{4} si = 32.88$
2	59800	8.45	
3	38325	5.42	
4	29000	4.10	
5	24843	3.51	$CR_8 = \sum_{1}^{8} si = 44.54$
6	20150	2.85	
7	19050	2.69	
8	18500	2.61	
9	18000	2.54	$CR_{16} = \sum_{1}^{16} si = 60.66$
10	16830	2.38	
11	14300	2.02	
12	14025	1.98	
13	13750	1.94	
14	13750	1.94	
15	12250	1.73	
16	11118	1.57	
17	11118	1.57	$CR_{20} = \sum_{1}^{20} si = 66.45$
18	10850	1.53	
19	10250	1.45	
20	8750	1.24	
Total (n=120)	707578.2	100	

Source: Own survey

On average the number of mushroom producers in the study area is estimated to be more than 3,797 (Annex 10). They produced and supplied homogeneous mushroom product to the alternative market. Among mushroom producers, who sold their product to hotels (75%) and restaurants and cafeterias (64.7%), have the license (Annex 9). Some of the barriers to sell mushroom for different alternate market were license, ability to supply sustainable quantity and quality and to be clientele.

The concentration ratios of spawn market for the largest four and eight firms were 62 and 85.7 percent, respectively; highly and very highly concentrated (Table 24). About 62.04and 85.7 percent of the total market share of spawn market was goes to four and eight spawn suppliers. Some of the barriers to enter to spawn market were capital for investment, qualified personnel and license. Information obtained from focus group discussion revealed that spawn suppliers were delivered somehow differentiated product in terms of quality and packaging.

Table 24 Concentration ratios for spawn suppliers

Top spawn producers	Sales in ETB/month (S)	Market share (*Si*) = (Sales ÷ Total sales) x 100	Concentration ratio
1	37 800	30.89	
2	13 731	11.22	
3	12 228	9.99	$CR_4 = \sum_{1}^{4} si = 62.04$
4	12 150	9.93	
5	10 232	8.36	
6	7 134	5.83	
7	6 182	5.05	$CR_8 = \sum_{1}^{8} si = 85.74$
8	5 436	4.44	
9	3 660	2.99	
10	2 850	2.32	
11	2 400	1.96	
12	2 287	1.86	
13	2 118	1.73	$CR_{16} = \sum_{1}^{16} si = 99.71$
14	1 370	1.12	
15	1 206	0.98	
16	1 200	0.98	
17	360	0.29	
Total (n=17)	122 346	100	

Source: Own survey

4.4.2. Market conduct

Though there were alternative markets for mushroom, buyers mostly control price and amount of mushroom supplied. As shown in Table 25, about 63 percent of mushroom producers are price takers while 26.9 percent set price by negotiation. The remaining 10.1 percent set the price themselves. In addition, 42.5 percent of them promote mushroom product while the remaining 57.5 percent did not have any mushroom promotion strategy.

Table 25 Mushroom price setting and product promotion

Category	Frequency	Percent
Price setting		
Producers only	12	10.1
Buyer only	75	63.0
Negotiation	32	26.9
Total	119	100.0
Promotion		
No promotion	69	57.5
They promote	51	42.5

Source: Own survey

Even though there were sixteen spawn suppliers in the study area, most of the mushroom producers did not get spawn whenever they need. They should have to pay in advance in order to get whatever the amount of spawn required. Moreover, 75 percent of the spawn producers were price makers whereas for 25 percents price is set by negotiation (Annex 11).

4.4.3. Market performance

Return on sales: Market performance for mushroom producers were analyzed through return on sales (ROS). There is no significant difference within and among the type of business. As showed in Table 26 the average ROS for individual producers are negative. This means the market performance for individual producers and the whole business are poor, they produce mushroom under loss. For partners and cooperatives ROS are 40 and 21 percents, respectively. Their market performances are better than that of individual producers. It seems reasonable because they have better access to potential alternative market due to having resource, license and sustainable supply. In general, the negative mean ROS for mushroom

producers indicates the market performances for mushroom producers were inefficient since most of them were not benefited from the business.

ROS for all spawn suppliers were positive with the minimum and maximum of 34 and 68 percent, respectively. The ROS for spawn was significantly vary among supplies at 1 percent significance level. Since the average ROS is 57 percent so that spawn suppliers were benefited and enjoyed from the business. Thus, the spawn market performance was concluded as profitable (Table 26).

Table 26 Mushroom producers and spawn suppliers' market performance

Type of the business		Return on sales = $\frac{Profit-Tax}{Total\ sales}$		
	n	Mean	Sta. Dev.	F-test
Sole proprietor	85	-0.14	1.354	
Partners	18	0.40	0.351	1.911
Cooperatives	16	0.21	0.487	
Total	119	-0.01	1.181	
Spawn suppliers	8	0.57	0.113	14.178***

***Significant at 1% significance level

Source: Own survey

Market margin: Is the difference between prices at two market levels. Thus, mushroom market margin along the marketing channel computed considering the price difference along the market levels. Accordingly, the highest producers share is 100 % for the 7th channel because of no involvement of mushroom market actors. They sell mushroom directly to consumers. While the lowest producers share is 24.5% and 27.8% for the 1st and the 8th market channels, respectively due to the involvement of hotels and restaurants that process mushroom in to different dishes to add form value to mushroom. In other words, hotels and restaurants have got the highest total gross margin in the 1st and 8th channels (Table 27).

Table 27 Mushroom market margin along the marketing channels

Channels		Mushroom marketing actors					
		Producers	Spawn supplies	Retailers	Super markets	Hotels and rest.	Total MM
1	Unit price, birr/kg	50	60			204.1	
	GMM= P_2-P_1	50	10			144.1	154.1
	Total Gross Margin (%)	24.5	4.9			70.6	100
2	Unit price, birr/kg	50	57.5	62.5			
	GMM= P_2-P_1	50	7.5	5			12.5
	Total Gross Margin (%)	80	12	8			100
3	Unit price, birr/kg	50	58.75		83.67		
	GMM= P_2-P_1	50	8.75		24.92		33.67
	Total Gross Margin (%)	59.76	10.46		29.78		100
4	Unit price, birr/kg	50	61.25				
	GMM= P_2-P_1	50	11.25				11.25
	Total Gross Margin (%)	81.63	18.37				100
5	Unit price, birr/kg	43.6		57.5			
	GMM= P_2-P_1	43.6		13.9			13.9
	Total Gross Margin (%)	75.83		24.17			100
6	Unit price, birr/kg	51			83.67		
	GMM= P_2-P_1	51			32.67		32.67
	Total Gross Margin (%)	60.95			39.05		100
7	Unit price, birr/kg	53					
	GMM= P_2-P_1	53					0
	Total Gross Margin (%)	100					100
8	Unit price, birr/kg	56.65				204.1	
	GMM= P_2-P_1	56.65				147.45	147.45
	Total Gross Margin (%)	27.8				72.24	100

Source: Own survey

In general, the market performance regards to mushroom producers in terms of market margin show's producers have more market share than other actors in the market chain while, return on sales reveals that the market performance for mushroom producers is inefficient. In addition, the market structure, conduct and performance regards to mushroom producers (sellers) showed the characteristics of both perfect and monopolistic competitions but with regard to buyer (Alternative markets) oligopoly market structure. Moreover, market structure, conduct and performance of the spawn suppliers (spawn sellers) categorized them under oligopolistic market structure.

4.5. Econometric Estimation Results

4.5.1. Determinants of producers' participation to alternative markets

Choice of alternative market by mushroom producers determined not only by them but also on the alternative markets. Thus Alternative specific conditional logit (Asclogit) model requires alternative specific and case specific variables. Alternative specific variables such as distance, volume, mode of payment and price vary among alternative markets while case specific variables as shown in Table 28 vary among cases or observations but the same for all alternative markets. The regressors are highly jointly statistically significant with LR chi^2 (48) =170.97.

From alternative specific variables both volume of mushroom purchased and mode of payment are significant at 1 percent significance level. Thus, the positive coefficient of alternative specific regressors (volume of mushroom and mode of payment) means, for example, if the volume of mushroom purchased by hotels and restaurants increased, producers will chose hotels and restaurants more than other alternative markets. In addition, if mode of payment, for example for supermarkets, is in cash, producers will choose supermarkets more than other alternative markets and vice versa for negative coefficients.

Positive coefficients for significant case specific regressors are interpreted against the base category, traders. The type of business in which producers engaged affects the market choice. Sole proprietor is significant at 5 percent and 10 percent for consumers, spawn suppliers and supermarkets with the coefficients of -1.1209, 2.2107 and -1.3729, respectively. That mean if

the producers business type is sole proprietor, the probability of choosing spawn suppliers for individual producers will increase and the probability of choosing consumers and supermarkets will decreases relative to the base alternative market (traders). Contrary to sole proprietors, marketing experience is significant at 10 percent with the coefficients of -0.0628 and 0.03616 for spawn suppliers and supermarkets, respectively. Relative to the base alternative market, if marketing experience increases, the probability of choosing supermarkets will also increases where as the probability of choosing spawn suppliers' will decrease.

The coefficient of primary education is significant at 5 percent and negative for hotels and restaurants indicate that if producers being primary education level, probability of choosing hotels and restaurants will decrease. Continuous production also influences the market choice. It is significant at 10 percent with the coefficient of 0.9363 to spawn suppliers' means if they produce mushroom continuously, they will chose spawn suppliers' relative to base alternative market. The amount of credit is also significant at 10 percent for spawn suppliers. If the amount of credit increases relative to the base alternative market the probability of choosing spawn suppliers will increase.

Table 28 Alternative specific conditional logit model estimates

Number of obs. = 1039
Log likelihood = -362.54604 LR chi^2 (44) = 170.97
Prob. > chi^2 = 0.0000 Pseudo R^2 = 0.1908

Alternative specific variables	Coef.	Std. Err.	P>|z|
distance	-0.01261	0.011231	0.262
volume	0.007344	0.001828	0.000***
modeofsale	0.923794	0.30435	0.002***
price	0.002116	0.01624	0.896

Base alternative market	Traders						
Case spec. var.	Consumers		Hotels and Res.		Spawn suppliers		Supermarkets	
	Coef. (Std.Err.)	P>|z|	Coef. (Std.Err.)	P>|z|	Coef. (Std. Err.)	P>|z|	Coef. (Std. Err.)	P>|z|
soleprop	-1.1209 (0.5855)	0.056*	-0.5137 (0.8204)	0.531	2.2107 (1.0831)	0.041**	-1.3729 (0.7631)	0.072*
partners	-0.3090 (0.6344)	0.626	-1.6957 (1.5106)	0.262	1.4098 (1.1374)	0.215	-0.7813 (0.8380)	0.351
busmod	-0.5496 (0.4777)	0.25	-0.0755 (0.7924)	0.924	-0.3329 (0.5193)	0.522	0.2953 (0.5758)	0.608
edprimary	0.2046 (0.6355)	0.748	-5.6345 (2.4465)	0.021**	-0.7433 (0.9232)	0.421	-0.6246 (0.9159)	0.495
Edtertiary	0.0303 (0.4293)	0.944	0.2949 (0.7352)	0.688	0.6518 (0.4637)	0.16	-0.9277 (0.5510)	0.092*
experience	-0.0047 (0.0175)	0.788	0.0140 (0.0234)	0.551	-0.0629 (0.0328)	0.055*	0.0362 (0.0195)	0.064*
contpron	-0.2243 (0.4321)	0.604	-0.2828 (0.6942)	0.684	0.9363 (0.5178)	0.071*	-0.2208 (0.5551)	0.691
credit	-2.9E-05 (2.66E-5)	0.278	6.00E-06 (2.38E-5)	0.801	4.98E-05 (2.92E-05)	0.088*	3.02E-05 (2.37E-05)	0.203
license	0.5057 (0.5512)	0.359	0.1627 (1.1472)	0.887	-0.7560 (0.6926)	0.275	-1.3918 (0.8384)	0.097*
extcon	-0.2293 (0.5443)	0.674	0.1633 (0.7479)	0.827	-1.1525 (0.9364)	0.218	-0.4766 (0.7085)	0.501
cons	1.8457 (0.7836)	0.018**	0.3000 (1.0736)	0.78	-0.0673 (1.2329)	0.956	2.2193 (0.9707)	0.022**

*** Significant at 1%, **significant at 5%, *significant at 10%

Source: Own survey

4.5.2. Determinants for the quantity of mushroom produced

Cobb-Douglas production function is applied to identify determinants for quantity of mushroom produced. The Cobb-Douglas model fitted the data quite well as indicated by F-values and R-Square. The co-efficient of multiple determinations R^2 was 0.54 for mushroom producers. The value of R^2 means that the explanatory variables explained 54% of the variation in mushroom production. The contribution of specified factors in determining the quantity of mushroom produced can be observed from the estimates of regression equation. The result shows that the co-efficient of chemical pasteurization and the quantity of spawn were significant at 1% level. Cost of spawn was also significant at 5%, while partner business types of mushroom producers, extension access and experience were significant at 10% level. This implies that the variation in mushroom production mostly depends upon the above explanatory variables included in the model.

The value for the production co-efficient of chemical pasteurization was 1.0207. Mushroom producers who used chemical pasteurization have got more amount of mushroom by 1.0207 units than those used other pasteurization methods. So, producers need to use chemical than other pasteurization methods for more production. The coefficient for quantity of spawn used was 0.2713 revealed that 1% increase in the quantity of spawn used, with other factors remaining constant, the quantity of mushroom produced would increase by 0.2713% up to certain level. Similarly, the coefficient of expenditure for spawn was 0.3684, revealed that 1% increase in the expenditure to spawn, with other factors remaining constant; the quantity of mushroom produced would increase by 0.3684% up to certain level. The positive sign indicates the production of mushroom can be increased by using more spawn per season.

The value for the production co-efficient of partner business type was 0.6294. It means being a partner business type; producers have got 0.6294 units more amount of mushroom than other businesses types. The value for the production co-efficient of extension access was 0.5572 and negative. It means those mushroom producers who have access to extension service the probability of getting mushroom product declined by 0.5572 units than those who have not access to extension service; that is against the expected. The first reason may be even if there is extension service less emphasis given to mushroom sector than other urban

agricultural sectors which retard the quantity of mushroom produced. The other reason may be since it is a new agricultural sector for the country, lack of skill and knowledge in the field of mushroom results in poor and biased extension service lead to affect mushroom production. The value of production co-efficient for experience was 0.2821. The positive sign indicates that experience directly determine the quantity of mushroom produced. It means as experience increased by 1% the quantity of mushroom produced would increased by 0.2821% up to certain level (Table 29).

Table 29 determinants for the quantity of mushroom produced

Number of obs.	= 119	F(23, 95)	= 4.89
Prob. > F	= 0.0000 ,	R-squared	= 0.5419
Adj. R-squared	= 0.4310	Root MSE	=0.84984

Translogamps	Coef.	Std. Err	t	P>t	VIF
Gottrain	0.4438	0.2853	1.56	0.123	2.35
Tbsole	0.3648	0.3252	1.12	0.265	3.49
Tbpart	0.6294	0.3556	1.77	0.080*	2.67
Eduelement	-0.2771	0.3179	-0.87	0.386	1.51
Edusecondary	0.0484	0.2067	0.23	0.815	1.46
Modeofbusiness	-0.2121	0.2308	-0.92	0.360	2.15
Credit	0.3461	0.2927	1.18	0.240	1.64
Ext	-0.5572	0.2975	-1.87	0.064*	1.70
License	-0.2022	0.3127	-0.65	0.519	3.23
Pmhotwater	0.1622	0.2513	0.65	0.520	1.51
pmchemical	1.0207	0.3237	3.15	0.002***	2.41
Markagre	-0.1954	0.2180	-0.90	0.372	1.57
Translogcostspawn	0.3684	0.1472	2.50	0.014**	3.47
Translogvolumeshed	0.0235	0.1163	0.20	0.841	2.21
Translog age	0.4891	0.3446	1.42	0.159	1.54
Translogexp	0.2821	0.1424	1.98	0.051*	2.41
Translogareabed	0.0817	0.0777	1.05	0.295	1.86
translogquantiyspawn	0.2713	0.0720	3.77	0.000***	1.38
Translogservicecost	0.0827	0.0808	1.02	0.309	1.66
cons/Average	-4.6707	1.7731	-2.63	0.010**	2.12
ovtest Ho: model has no omitted variables		hettest Ho: constant variance			
F(3, 92) = 2.14, Prob > F = 0.1009		$chi^2(1) = 2.42$, Prob > $chi^2 = 0.1200$			

***significant at 1%, ** significant at 5%, * significant at 1%

Source: Own survey

4.3. Opportunities and Constraints of Mushroom Value Chain

Most of mushroom producers in the study area have not enough knowledge towards mushroom production technique and marketing. The most common opportunities include availability of spawn, substrate and increased consumers awareness about nutritional value of mushroom. In addition, special attention given by the government for urban agriculture in general and for mushroom in particular provides opportunity for mushroom producers to expand their business. Some of the constraints beyond the capacity of mushroom producers are high cost of spawn and substrate, lack of quality spawn; extension service and market access are mentioned (Table 30).

Table 30 Summary of opportunities, constraints and weakness

Opportunities	Constraints	Weakness
Availability of substrate and spawn	High cost of substrate, spawn and lack of quality spawn. High cost of processing equipments	Producers do not exploit their most relevant assets/resources (eg. Growing shade)
Free training by TVET, attention given to urban agriculture	Lack of door to door extension services, weakness of mushroom association, lack of national quality standards and quality management system and lack of access to affordable credit facility	Lack of effective linkage among mushroom producers and between research institutes. Cooperation and coordination among different mushroom producers, input supplier etc.
Increasing consumers awareness	Lack of awareness on the emerging demography, economy, technological changes, producers hardly get market during the oversupply of mushrooms	Producers did not have linkage to potential buyers of mushrooms, lack of promotion, most producers unable to supply the required amount of mushroom product sustainably, low quality of mushroom product

Summary of opportunities, constraints and weakness (continued…)

Opportunities	Constraints	Weakness
The emerging world demand for mushroom	Lack of mushroom market organization & techniques, absence of mushroom value chain governance system. Unable to exploit the emerging markets (Internet, web site set up and development, E-commerce, etc.). Lack of awareness to mushroom processing technology.	Lack of enough skills, knowledge or experience in mushroom production technology. Unable to exploit the changed production technology (new productive variety, new productive substrate, new production method etc.)
Credit facilities	Lack of collateral, production knowledge about mushroom other than oyster, unaffordable expansion cost for modern mushroom farming	lack of shade for mushroom production, poor post harvest management and handling practices, poor financial management system
West recycling technologies	Bulky substrate cause environmental pollution,	Serious production loss due to contamination, Absence of license, unable to recycle substrate left after mushroom production, Lacks to cooperate and network with other enterprises

Source: Own survey

5. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.3. Summary and Conclusions

In this study mushroom value chain analysis in Addis Ababa was conducted. It is still not well developed like other urban agricultural sectors. This study conducted to understand mushroom value chains which help to identify what interventions will be needed in order to make the sector more competitive in the domestic and export markets, and thereby improve the livelihood of the urban people in Addis Ababa.

Primary and secondary data were collected from producers, traders, spawn suppliers, supermarkets, hotels and restaurants. The data were analyzed using descriptive, inferential statistics, alternative specific conditional logit and multiple linear regression models.

Mushroom is produced in the study area by individuals, partners and cooperatives. They had iron roof, plastic roof and concrete roof types of growing shades. The most common bedding materials were box, plastic bags and shelf types. Cotton seed husk was the dominant substrate used for mushroom production. Producers in the study area frequently cultivate oyster mushroom which is harvested 3.8 times per season. On average about 13 477.5 kg mushroom produced per month with the productivity of 4.4 kilogram per bed. The primary objective of producers was to supply the output to alternative markets. They used public transport, taxi, own vehicle and on foot to deliver the product to different markets. Most mushroom producers did not have market agreement and sold their products both in cash and in credit. The average price of mushroom was range from 30.7 to 64 ETB per kilogram.

Mushroom value chain actors in Addis Ababa were input suppliers, producers, traders, processors and consumers. Support institutions and service providers, facilitate the sector; includes higher educational and research institutes, urban agricultural offices, micro finances and transporters. There were eight mushroom marketing channels in which mushroom flows from producers to consumers. The highest and the lowest amount of the total value added were 171.87 and 20.77 ETB per kilogram, respectively. Spawn suppliers play the greatest role

in the distribution of mushroom along the marketing channels. The market structure, conduct and performance of mushroom producers reveal the characteristics of both monopolistic and perfect competitions. Whereas the SCP for spawn suppliers had show the characteristics of oligopolistic market structure.

Alternative conditional logit model estimates showed that alternative specific variables, volume of mushroom purchased and mode of payment, are significant at 1 percent significance level. The choice of one alternative market depends on some conditions of the other alternative market. Case specific variables such as sole proprietor business type, marketing experience, primary education level, continuous production and the amount of credit significantly affect the choice of alternative markets relative to the base market.

Determinants of the quantity of mushroom produced are cost of spawn, chemical pasteurization method, quantity of spawn, being partner business type, access to extension service and experience. All listed determinants, except access to extension, have positive coefficients and significantly affects the amount of mushroom produced per season.

Based on the results summarized above it can be concluded that, demographic, cultural, socio-economic and institutional factors influence mushroom production and alternative market choice of mushroom producers. This indicates a need to improve this sector in Addis Ababa in particular, and in Ethiopia in general considering the importance of the commodity from different aspects.

5.4. Recommendations

Based on the findings of the study, the following recommendations are forwarded for policy makers.

1. Most mushroom producers were limited to spawn and substrate options. As a result, they are constrained to produce mushroom using only cottonseed husk. Therefore, having substitute substrate ensure sustainable mushroom production. In addition, spawn should be available in terms of quantity, quality and sustainability. Thus, there

is a need to link higher educational and research institutes to urban agricultural offices to address the problem, scale up suitable spawn and substrate technologies.

2. Mushroom is perishable vegetable cash crop and producers have limited market options. As a result either they consumed or dispose it during over supply. Therefore, there is a need for governmental and non governmental bodies to play their role to contribute in this respect. In addition, continuous promotion may contribute to improve the awareness of the society about the nutritional and medicinal values of mushroom. Moreover, providing mushroom processing technologies at fair price needs focus of relevant body.
3. Mushroom and spawn market are concentrated in the hands of few groups which makes mushroom market imperfect. As a result, most of mushroom producers are exploited and discouraged. Therefore, government intervention required in terms of generating mushroom market information like other agricultural commodities, establish standard and quality control mechanism and link producers with potential markets. In addition, producers should communicate with each other and establish cooperatives and unions to overcome the problem.
4. The negative co-efficient of extension access implies gap in extension service so that urban agricultural offices need to strengthen the capacity of extension workers through training and give emphasis to mushroom like other urban agricultural sectors by allocating adequate budget for close supervision.
5. Having license by producers significantly determines the quantity of mushroom supplied to alternative market. Thus most of the mushroom producers did not have it due to lack of awareness and restrictive procedures. Therefore, since both producers and government are benefited from having the license, awareness creation by relevant bodies need to be done.

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7. APPENDICES

Appendix Table 1. Knowledge of oyster mushroom strains

Oyster Variety	Type of the business N (%)			F-test
	Sole Proprietor	Partners	Cooperative	
P. Saju caju	2(1.7)	2(1.7)	0(.0)	
P. Florida	5(4.2)	1(.8)	0(.0)	
Oesteratus	6(5.0)	2(1.7)	3(2.5)	
No knowledge	68(56.7)	14(11.7)	12(10.0)	1.533
P. Saju Caju, P. Florida and Oesteratus	1(.8)	0(.0)	1(.8)	
P. Saju Caju and P. Florida	1(.8)	0(.0)	0(.0)	
P. saju caju and Oestratus	2(1.7)	0(.0)	0(.0)	

Own survey

Appendix Table 2. Access to spawn and substrate

Access to spawn	Type of the business N (%)			$\chi 2-test$
	Sole proprietor	Partners	Cooperative	
Any quantity				
No	35(29.9)	10(8.5)	7(6.0)	0.720
Yes	48(41.0)	9(7.7)	8(6.8)	
At needed time				
No	58(49.6)	13(11.1)	9(7.7)	0.573
Yes	25(21.4)	6(5.1)	6(5.1)	
Access to substrate				
Any quantity				
No	34(28.3)	9(7.5)	7(5.8)	
Yes	51(42.5)	10(8.3)	9(7.5)	0.380
At needed time				
No	53(44.2)	11(9.2)	10(8.3)	0.136
Yes	32(26.7)	8(6.7)	6(5.0)	

Own survey

Appendix Table 3. Mushroom production training providers

Training provider		Number of days	Total hour	Payment, ETB
Tegbareed TVET	N	4	4	
	Mean	18.00	49.0000	0
	Min.	10	20.00	
	Max.	26	78.00	
The spawn supplier	N	72	72	71
	Mean	1.76	6.3938	356.00
	Min.	1	.25	150
	Max.	12	36.00	600
Spawn supplier, mojo	N	1	1	1
oil factory and sub-city	Mean	4.00	20.0000	250.00
	Min.	4	20.00	250
	Max.	4	20.00	250
Sub-City and Ethio	N	2	2	1
mushroom	Mean	1.75	13.0000	400.00
	Min.	1	6.00	400
	Max.	3	20.00	400
Entoto TVET	N	5	5	
	Mean	13.60	26.6000	0
	Min.	12	24.00	
	Max.	15	30.00	
A.A. University and	N	1	1	
ECOPIA	Mean	22.00	64.0000	0
	Min.	22	64.00	
	Max.	22	64.00	
Misraq TVET	N	7	7	
	Mean	23.00	39.8571	0
	Min.	15	2.00	
	Max.	30	84.00	
Private	N	1	1	1
	Mean	10.00	80.0000	2000.00
	Min.	10	80.00	2000
	Max.	10	80.00	2000
Kefitegna 7 TVET	Mean	1	1	
	Min.	35.00	140.0000	
	Max.	35	140.00	0
	N	35	140.00	
Ewqet amba TVET	Mean	1	1	
	Min.	25.00	125.0000	
	Max.	25	125.00	0
	N	25	125.00	

Own survey

Appendix Table 4. Training and credit access

	Type of the business			$\chi 2-test$
	Sole proprietor	Partners	Cooperative	
Access to credit				
No	76(63.3%)	18(15.0%)	10(8.3%)	9.712***
Yes	9(7.5%)	1(.8%)	6(5.0%)	
Problems in credit				
No	75(64.7%)	10(8.6%)	12(10.3%)	8.998**
Yes	10(8.6%)	7(6.0%)	2(1.7%)	
Training access				
No	22(18.3%)	3(2.5%)	2(1.7%)	1.966
Yes	63(52.5%)	16(13.3%)	14(11.7%)	

*** Significant at 1%, **Significant at 5% significance level

Own survey

Appendix Table 5. Average mushroom sold by spawn suppliers to different markets

	Average mushroom supplied (in Kg) to									
	Consumers per		Super markets per		Hotels per		Restaurants per		Traders per	
	day	month	day	month	day	month	day	month	day	month
Mean	5.7	172.5	11.7	352.5	3.13	93.75	1.5	45.0	0.9	28.1
Sum	23	690.0	47	1410	13	375	6	180.0	3.75	112.5
Min.	1	30.00	2	60.0	0	0	0	0	0	0
Max.	14	420.0	35	1050	6	180	3	90.0	3.75	112.5
%	24.9		50.9			13.6		6.5		4.1

Own survey

Appendix Table 6. Customers at supermarkets for locally produced mushrooms

Customers		Locally produced fresh mushroom purchased and sold
Diasporas	n	1
	%	16.7
Foreigners	n	4
	%	66.7
local peoples	n	1

%	16.7

Own survey

Appendix Table 7. Average fresh mushroom sold and shelf life at supermarkets

	Average fresh sold per week	Average fresh sold per month	shelf life for fresh mushroom in days
N	6	6	6
Mean	26.67	106.7	4.33
Sum	160	640.0	-
Minimum	4	16.0	3
Maximum	50	200.0	7

Own survey

Appendix Table 8 Number of mushroom meal, total dish prepared per day and type of customers

Meals	Minimum	Maximum	Sum	Mean	Total dish prepared
Fasting	0	10	19	2.7	154.00
non fasting	2	10	29	4.1	
Total	2	20	48	3.4	
Customers		Frequency		Percent	
Foreigners		5		71.4	
Local peoples		2		28.6	
Total		7		100.0	

Source: Own survey

Appendix Table 9. Ways of disposing substrate left after mushroom production

	Type of business			
Category	sole proprietors	Partners	Cooperative	Total
Throwing	47 (39.8%)	11 (9.3%)	6 (5.1%)	64 (54.2%)
Used as compost	27 (22.9%)	4 (3.4%)	6 (5.1%)	37 (31.4%)
Used as livestock feed	2 (1.7%)	0 (0%)	0 (0%)	2 (1.7%)
Used for fuel	9 (7.6%)	4 (3.4%)	2 (1.7%)	15 (12.7%)
Total	85 (72%)	19 (16.1%)	14 (11.9%)	118 (100%)

Source: Own survey

Appendix Table 10 License and alternative market for mushroom producers

Alternative markets	License		
	No	Yes	Total (N)
Consumers	36(60%)	24(40%)	60(100%)
Local Markets	3(75%)	1(25%)	4(100%)
Retailer	3(30%)	7(70%)	10(100%)
Assemblers	12(85.7%)	2(14.3%)	14(100%)
Hotels	3(25%)	9(75%)	12(100%)
Restaurant and cafeterias	6(35.3%)	11(64.7%)	17(100%)
Supermarkets	17(58.6%)	12(41.4%)	29(100%)
Spawn suppliers	68(81.9%)	15(18.1%)	83(100%)
Total producers	86(71.7%)	34(28.3%)	120(100%)

Criteria to sell mushroom for alternate markets

	License	Have to be clientele	license and sustainable supply	Total
N	23	5	15	43
percent	53.49	11.63	34.88	100.00

Own survey, 2013

Appendix Table 11 Number of clients for spawn

Name of spawn suppliers	Number of clients
Afro enguday seed laboratory PLC.	300
Ethio mushroom	540
Liyou mushroom	41
Senaole Mushroom	20
Sheger mushroom	11
Shitaki international	370
Sweet mushroom	2500
Z.T.H	15
Total N	8
Sum	3797
Mean	474.63
Minimum	11
Maximum	2500
Std. Deviation	842.511

Own survey

Appendix Table 12 Spawn market characteristics

Variables	Category	Frequency	Percent
Payment	Advance	6	75.0

	Cash	1	12.5
	Both advance and in cash	1	12.5
	Total	8	100.0
Price setter	Seller (Spawn producer)	6	75.0
	The market	2	25.0
	Total	8	100.0
License	No	2	25.0
	Yes	6	75.0
	Total	8	100.0

Own survey

Appendix Table 13 Mushroom consumers' characteristics

Variables	Category	Frequency	Percent
Mushroom knowledge (n=40)	Do not know	27	67.5
	Have knowledge	13	32.5
Type of mushroom (n=13)	Wild	6	46.2
	Locally cultivated	3	23.1
	Both wild edible, locally cultivated and imported	1	7.7
	Both wild edible and locally produced	3	23.1
Consumed (n=13)	Not consumed	6	46.2
	Consumed	7	53.8
Reasons for not consumed (n=6)	Due to non available	2	33.3
	Due to expensiveness	1	16.7
	Lack of awareness	2	33.3
	Prefer to consume meat	1	16.7
Income group of consumers/ month, in ETB (n=6)	From 151 to650	1	16.7
	From 651 to 1400	1	16.7
	From 3551 to 5000	2	33.3
	Over 5000	2	33.3

Source: Own survey

Appendix Table 14 Formal questionnaires

FORMAL QUESTIONNAIRE FOR MUSHROOM PRODUCERS

Enumerator Name ---------- Date----------

A. General Questions

1. Name of the business---------- Sub city----------District-------Tel--
2. Type of the business 1)sole proprietorship 2)Partnership 3) cooperative 4) other
3. Name of the respondent----------
4. Sex 0) Female 1) Male
5. If not sole proprietorship responsibility of the respondent-------Number of members------ Male-------Female
6. How is the decision maker----------
7. Age of the respondent/s---------- (year), 8. Education level ----------Area ----------
9. Marital status if sole proprietorship 1) married 2) single 3) widowed/er 4) divorced
10. This business for you: 1) Full time occupation 2) Part time occupation 3) Hobby 4) Others,
11. If not full time occupation what is your primary occupation----------
12. Experience in this business in months ----------
13. In which activities are you involved? (Please check all that apply):
14. Mushroom production
15. Provide training on mushroom production
16. Collect fresh mushrooms from producers
17. Collect dry mushrooms from producers
18. Sell fresh mushrooms, in bulk
19. Sell fresh mushrooms, packaged
20. Selling value-added products:
    1) Frozen mushrooms 2) Dried mushrooms 3) mushroom sandwich 4) Other value-added products (please specify): ----------
21. Family/member size total----------Male---------, Female----------

Age	Sex		education											
	M	F	14.4. Not reached		14.5. Informal/ Religious		14.6 Primary (1-8)		14.7. Secondary/ Prep. (9-12)		14.8 TVET / Diploma		14.9 BA. / B.Sc. and above	
			M	F	M	F	M	F	M	F	M	F	M	F
14.1.<15														
14.2.15-65														
14.3. >65														
Total														

B. **Ownership of Fixed production resources, Housing structure**

1.types of growing house (circle)	**2.1** NO. of house	**2.2** Ground (A)1) Beaten ground 2) Cemented ground 3) Well dressed plastic ground 4)Others	**2.3** Wall(B) 1) Mud with stick 2) Painted mud with stick 3) Made with bricks/stone 4) Plastic 5) corrugated iron 6) others	**2.4** No. of rooms	**2.5** Volume m^3
1= Iron roofed					
2= Grass roofed					
3= Plastic roofed					

3. Equipments

	3.1 Growing box	3.2 hanging rope	3.3 Bedding shelf (total area =------	3.4 Boiling (soaking)container	Others----------
Quantity					
price	3.5	3.6	3.7	3.8	

C. Mushroom production and cultural practices

1. Where do you grow the mushrooms? (Please check all that apply) 1) Outdoors 2) Indoors 3) both 5) others, specify------
2. When did you start Mushroom production ----------(month and year)
3. What attracted you to start a mushroom production business? ----------
4. From the start year to now did you continuously produce mushroom 0) No 1) yes
5. If yes, during which months of the year do you produce mushrooms? (Circle all that apply) Jan. Feb. Mar. Apr. May June July Aug. Sep. Oct. Nov. Dec. 1) Year round
6. If no, for how many years do you cease --------
7. During which months of the year you become out of production? (Circle all that apply) Jan. Feb. Mar. Apr. May June July Aug. Sep. Oct. Nov. Dec. 1) Year round
8. What are the reasons for the cease, rank the major three reasons 1)---------2)-------3)--------
9. Have you separate room for incubation and growing of mushroom 0) No 1) Yes

Please put the answer under the appropriate bedding material used for the production	Choice
10. Type of bedding material used 1)Box 2) plastic bag 3)shelf 4)others	
11. If plastic bag 1) hanged by rope 2) put on shelf 3) other specify	
12. Which type of mushroom did you produced 1) Oyster 2) Shitake 3) Button 4)other, -- ----	
13. What type of Oyster did you produce?1) P. Saju caju 2) P. Florida 3) Oestrus 4)Others----	
14. Average number of bedding material used/ season/	
15. Volume/Area/ of the bedding material (Area m^2, Volume $m^{3)}$	
16. Type of substrate 1) cotton seed husk 2)straw 3) saw dust 4) coffee pulp 5)other--	
17. Types of additives to substrate 1)Wheat bran 2)Jesso($CaSO_4$) 3) Others	
18. What type of Pasteurization method did you use for the aseptic treatment of substrate 1)Hot water 2)steam boiling 3)Cold water treatment 4)Autoclaving 5) Using Formalin 6) other, --	
19. Amount of dry substrate per bedding material (kg)	
20. Spawn (seed) rate (gm /bed , No. of jar/bed)	
21.1 Proportion of additives 1 (Wheat bran)	

21.2 Proportion of additives 2 (Jesso ($CaSO_4$),)	
21. What kind of spawn do you use? 1) Wheat spawn 2) sorghum spawn 3) Sawdust spawn 4) Other-----	
22. On average total amount of spawn used per season in gm or number of jars (1 Jaj=---gm)	
23. Frequency of harvesting per cycle (season) (in number)	
24. On average the amount of first harvest/bed (kg)	
25. On average the total amount of the rest (2^{nd}, 3^{rd}, 4^{th}, 5^{th}) harvests/bed (kg)	
26. Throughout the month how many times did you saw spawn (in 2013)	
27. On average the total amount of mushroom produce per cycle (season) **(kg/ season)**	
28. On average the total amount of mushroom produce per month (in 2013.)	
29. Number of days per one production cycle (season)	
30. Did you see contamination on the substrate after incubation period 0)no , 1) yes	
31. If yes what measure did you take?	
32. What did you do the substrate left after mushroom production? 1)throwing 2)used as compost 3) Used as livestock feed 4) use for fuel 5) other specify	
33. Did you consume the mushroom that you produce 0) No 1) Yes	
34. If yes, on average how much kg of mushroom consume per month	

35. Is your mushroom production 1) Conventional 2) Pesticide free 3) Organic certified 4)Organic non-certified 5) Free of chemical for sterilizing substrate 6) others
36. What problem did you face to start mushroom production business? ----------
37. How many mushroom producers do you know within the *kebele*---district --- the Sub city---Addis Ababa--- --
38. Compared to other local operations, is your production operation 1) Smaller than average 2) Average3) Larger than average 4)I don't know
39. Over the past five years, has the number of mushroom farms in your area (within *kebele*): 1) Increased 2) Remained stable 3) Decreased 4) I don't know
40. In your opinion, how competitive is the mushroom industry? 1) Highly competitive 2)Moderately competitive 3) Non competitive 4) I don't know
41. What are your top 3 competitive advantages? Please select the top three competitive advantages by checking the appropriate boxes. Rank checked boxes in order of importance

Competitive advantage	Rank 1) the most important 2) medium 3) the least important 4)I don't have
1.Skills/Knowledge of mushroom production	
2.Resources (financial ,human & material) available	
3.Quality of mushroom produced	
4.Quantity of mushroom produced	
5.Customer service	
6.Market knowledge	
7. Better selling Price of mushroom	
8.Consistent supply of mushroom	
9.Low cost of production of mushroom	

D. Access to inputs for the production of mushroom

1. Who is / are your primary supplier(s) for your mushroom production? Please specify.

	Item	Name of primary	Phone
1.1	Spawn supplier		
1.2	Growing medium (Substrate)		
1.3	Tools and supplies		
1.4	Packaging		

2. Do you have alternative suppliers?

2.1. Spawn supplier 0) No 1) Yes 2.1.1 if yes, name of alternative spawn supplier-----

2.2. Growing medium (Substrate) 0) No 1) Yes

2.3. Tools and supplies 0) No 1) Yes 2.4. Packaging 0) No 1) Yes

3. Do you have contractual agreements with your Spawn supplier 0) No 1) Yes

4. 4. If yes, what type of agreement do you have with spawn suppliers ----------

5. Did you get whatever the amount of spawn you required? 0) No 1) Yes

6. Did you get spawn whenever you required? 0) No 1) Yes

7. Did you get whatever the amount of substrate you required? 0) No 1) Yes

8. Did you get substrate whenever you required? 0) No 1) Yes

9. How would you describe the spawn available in terms of the following characteristics?

9.1 Quality	1) Good	2) Average	3) Poor
9.2 Availability	1) Readily available	2) Average	3) Hard to obtain
9.3 Stability	1) Stable supply	2) Average	3) Unstable supply

E. Cost of mushroom production

1. Input costs used in the production of mushroom

Item	unit	Average unit cost	Average Quantity used /season	How many times produce per month	Quantity used /month
1.Spawn					
2.Cotton seed huck					
3.Plastic bag					
4.Fire wood					
5.Formalin					
6.Chemical(powder)					
7.Wheat bran					
8.Jesso ($CaSO_4$)					
9.Others, specify					

2. Service costs incurred on the production of mushroom (in ETB per Unit or Per season)

Service costs	unit	Av. unit cost	
1.Water	Per month		
2.Electricity	Per month		
3.Telephone	Per month		
4.Other (specify)	Per month		
Total costs	Per month		

3. Did you hire people to help you with production of mushrooms? 0) No 1) Yes
4. If Yes, total number of male----------females----------
5. Labor cost in ETB.

job type	Full time/month				Part time/month				Seasonal			
	Male		Female		Male		Female		Male		Female	
	No	Salary	No	Salary	No	Wage	No	Wage	No	Wage	No	Wage

F. **Mushroom Market Participation**

1. What form of mushroom did you sold? 1) Fresh 2) Dried 3) Both dry& fresh 4) Other,
2. Where, and for how much, do you sell your fresh/dry mushrooms? **(Please check all that apply)**

Sales to Different Alternative market	0) No 1) yes	Distance from the mushroom farm (in Km) to market	Average mushroom supplied per cycle (season) (in Kg)	Average mushroom supplied per month (in Kg)	Average mushroom supplied per year (in Kg)	Average Price (birr/kg)		Mode of payment	Number of customers
						Fresh	Dry	0. Credit 1. Cash	
1.Consum									
2.Local									
3.Retailers									
4.Assembl									
5.Wholesa									
6.Hotels									
7.Restaura									
8.Superma									
9.Spawn									
10.Own consumpti									

3. If the mode of payment in selling your mushroom product is in credit, how long it takes to receive ----(days/Months)
4. Did you have market agreement with the buyers? 0) No 1)Yes
5. If yes, from which buyer category ----------
6. What type of agreement do you have ----------
7. Who is going to set market price? 1) Producer only 2)Buyer only 3)Negotiation b/n producer and buyer 4) Other, Specify----------

8. Are there any criteria /requirement to sell mushroom for different alternate market not addressed by you? 0) No 1) Yes 3) I don't know
9. If yes, what Criteria/requirement needed to sell ----------
10. Given the choice, where or how do you prefer to sell? Please select the top three buyers by checking the appropriate boxes. Rank checked boxes in order of preference.

Buyer category	Rank:1) highly preferred 2) moderately preferred 3) least preferred)
1.Direct to consumers	
2.local market	
3.Retailers	
4.Distributors / Assemblers	
5.Wholesalers	
6.Hotels	
7.Restaurants	
8.supermarkets	
9.Others (please specify)	

11. What methods of shipment do you use to transport your mushrooms to the market? 1) On foot direct to market 2) Use public transport/ Taxi 3) Buyer/ broker responsible for pick up and shipment 4) Others, Specify----------
12. If use public transport / Taxi, on average how much did you pay per round trip---per month--- in ETB
13. How would you describe demand for fresh mushrooms at the present time?
    1) Strong demand 2) Steady 3) Weak demand 4) I don't know
14. How would you describe demand for dry mushrooms at the present time?
    1) Strong demand 2) Steady 3) Weak demand 4) I don't know
15. Is current demand for fresh mushrooms?
    1) In excess of supply 2) Equal to supply 3) Below supply 4) I don't know
16. Is current demand for dry mushrooms?
    1) In excess of supply 2) Equal to supply 3) Below supply 4) I don't know
17. In order to meet demand, are you able to maintain a steady supply of fresh mushrooms? 1)No 1)Yes 3) I don't know

18. If yes, how do you meet demand? 1) from own production 2) from other growers 3)Others, ---
19. Have you lost demand during harvesting time of fresh mushroom 0) No 1)Yes
20. If yes, what did you do the product? 1) Consumed 2) Disposing 3)Drying 4) others-----
21. Is there a particular period for loss of demand is happened 1) Yes 0) No
22. If yes, when did it happen ----------(days and / or months)
23. If yes, how frequently happen loss of demand 1) always 2) sometimes 3) rarely)Not happen at all

G. Access to Credit and Extension Service

Access to Credit

1. Initial capital to start mushroom production, Own----------ETB Borrowed---------- ETB
2. Have you got credit for mushroom farm in 2013? 0) No 1) Yes ,
3. If yes, Source of credit

1) Formal 1) Banks ---------- 2) Micro-finances----------3) Saving and credit associations---------- 4) Others, Specify----------

2) Informal 1) relatives 2) Neighbors 3) Money lenders 4) Others, specify

4. Amount of loan----------ETB , interest rate----------total loan repaid-------ETB
5. Repayment period---------year
6. For what purpose do you borrow? 1) For farm construction 2) For the purchase of inputs 3) To farm expansion 4) Others, specify----------
7. Do you have any problems in getting credit? 1)Yes 0)No
8. If yes, what is the nature of your credit problem(s)? 1) few supply; 2)inadequacy of credit 3) absence of informal sources; 4)unfavorable repayment time; 5) high interest rates; 6) restrictive procedures; 7) collateral 8)others (specify) ----------

Access to extension service

9. Have you got training related to mushroom in 2013? 0) No 1) Yes

10. If yes,

training provider Organization /Individual	Area of the training 1) Mushroom production process 2) use of different substrates 3) Contamination control methods 4) Aseptic production of mushroom 5) Others, specify---------	Number of days	Total hour	Comment on the training 1) Satisfactory 2) medium 3) good 4) poor

11. Are you paid for the training 0) No, it is free 1) Yes
12. If yes, how much, ETB 1)-------, 2)--------, 3)------- (if more than one training provider)
13. Is any mushroom expert have visited your farm 0)No 1) yes
14. If yes, What lesson did you got----------
15. Do you have an extension contact in the last five years? 1) Yes; 0) No;
16. If yes, number of contact per year. --------
17. Types of extension messages given by the agents? 1) use of different substrates 2) Aseptic production of mushroom 3) post harvest handling and processing 4) value addition 5) market information; 6)Use of credit 7) others (specify)----------
18. Have you ever attended mushroom technology demonstration trial or field day? 1)Yes 0)No
19. What do you think is the role of extension agents in your district urban agriculture office? -------
20. Do you listen/watch to any mushroom related program? 1) Yes 0) No
21. If yes, how often? _____ (days/weeks/months/year)
22. Do you have access to any written materials discussing about agriculture in general and mushroom in particular? 1=Yes; 0=No
23. If yes, how often? _____ (days/weeks/months/year)
24. Are you a member of any formal organization/association? 1)Yes 0)No
25. If yes, which one? 1) Cooperatives 2) youth/Women group 3) Mushroom association 4) others specify ----
26. What services do you get from formal organization you belong to? 1) loans/credit 2) Spawn 3) substrate 4) education, training and information 5) others (specify) -----

27. Do you know price to be offered by each buyer before you sale your product? 1)Yes 0) no

28. If Yes, How do you get information on supply, demand and price of Mushroom?

information on	1) traders 2) cooperatives 3) NGOs 4) restaurants and hotels 5) radio and TV 6) telephone and newspaper 7) other producers 8)Others----------
Supply	
Demand	
Price	

29. How do you evaluate source of information? 1) It is reliable 2) it is adequate 3) it is timely 4) others (specify) ----------

H. Farm and non farm income

1. What are your major sources of income? 1) Sale of mushroom 2) off-farm income; 3)others --------
2. Would you estimate average monthly cash income from mushroom-------ETB?
3. Estimate average monthly agricultural cash income other than mushroom _____Birr/year
4. from other off farm income sources __Birr /year

I. Governance

1. Are there any policies policies/regulations (local, state or national) that make it difficult to enter the mushroom production? 1=Yes 0=no
2. If yes, what are they----------
3. Are there any policies policies/regulations (local, state or national) that make it difficult to enter the mushroom market? 1=Yes 0=no
4. If yes, what are they----------
5. Are there any policies policies/regulations (local, state or national) that are helpful to entry into the mushroom production? 1=Yes 0=no
6. If yes, what are they----------

7. Are there any policies/regulations (local, state or national) that are helpful to entry into the mushroom market? 1=Yes 0=no

8. If yes, what are they----------

K. Producers perception on Strengths, Weakness, Opportunities and Threats

Opportunity and threat	0)No 1) yes
1. Availability of substrate for production of mushroom.	
2. Availability of spawn for production of mushroom.	
3.Access to affordable credit facility to purchase large amount of substrate, bedding materials, packaging materials, etc.	
4. Affordable cost of Spawn for small scale growers.	
5. Affordable cost of Substrate for small scale growers.	
6. Affordable cost of mushroom processing equipments. Electric drier, vacuum packing machinery	
7.Access to quality spawn (seed) ready for planting	
8.Access to extension (expert support) services to mushroom growers	
9. Affordable expansion cost for modern mushroom farming requirement includes: Storage space, incubator room, training, packaging materials, shelves, plastic materials and substrate sterilizing material.	
10. Access to affordable technology for processing mushroom (electric drier, modern vacuum packing machinery, and refrigerated van.)	
11.Availability of market during the oversupply of mushrooms	
Availability of market organization & techniques to improve access of smaller farmers to the viable mushroom markets	
12.Strength/availability of cooperatives/mushroom association	
13. Availability of value chain governance system. (Technical value chain working group to coordinate the activities in the different functions).	
14.Ability of farmers to provide adequate collateral required by commercial banks to access commercial loans	
15.Lack of effective linkage between the mushroom farmers and research (like a research component dedicated to strain improvement and development, preservation and quality control, alternative substrate development, ways of improving the shelf life and packaging of mushrooms)	
16. Availability of national quality standards and quality management system to facilitate good hygiene and food safety practices by the producers and other players in the value chain.	
17. Awareness/exploitation of emerging trends (in demography, economy,	

technology...)	
18.Increased consumers awareness about mushroom products	
19. Exploiting the emerging markets (Internet, web site set up and development, E-commerce, etc.)	
20.Existence of other mushroom production areas that competitors have not yet covered (other than oyster)	
21. Exploitation/awareness of changed production technology (new productive variety, new productive substrate, new production method etc.)	
22.Bulky substrate left after mushroom production cause environmental pollution	
Strength and weakness	
23. Adequate skills/ knowledge/ experience in mushroom production technology.	
24.Adequate space for mushroom production	
25.Having post harvest handling practices –grading system, primary processing skills, storage facility like refrigerator	
26. Efforts to cooperate and network with other enterprises such as poultry, horticulture and Livestock which could yield new partnerships and uses for agricultural waste products.	
27.Linkage to potential buyers of mushrooms e.g. hotels, restaurants and supermarkets etc.	
28.Financial management system and capacity of the members to increase share capital – resulting into overdependence on grants (If Cooperative farm)	
29.Serious production loss due to contamination	
30.Ability to supply the required amount of mushroom product sustainably	
31.Have you Proprietary (ownership) know-how	
Have you Proprietary (ownership) patents	
Have you Proprietary (ownership) license	
32.did you exploit your most relevant assets/resources	
33.Are alternate market /customers complain on the quality of your mushroom product	
34.Have you promote your mushroom product	
35.Cooperation and coordination among different mushroom producers, input supplier etc.	
36.Recycling substrate left after mushroom production	

If anything that you like to say----------

FORMAL QUESTIONNAIRE FOR SPAWN SUPPLIERS

Enumerator Name ---------- Date----------

A. General Questions

1. Name of the business---------- Sub city----------District-------Tel--
2. Type of the business 1)sole proprietorship 2)Partnership 3) cooperative 4) other
3. Name of the respondent---------- 4. Sex 0) Female 1) Male
4. If not sole proprietorship responsibility of the respondent----------Number of members--------Male---------Female
5. How is the decision maker----------
6. Age of the respondent---------- (year)
7. Education level ----------Area ----------
8. Marital status if sole proprietorship 1) married 2) single 3) widowed/er 4) divorced
9. This business for you: 1) Full time occupation 2) Part time occupation 3) Hobby 4) Others,
10. If not full time occupation what is your primary occupation----------
11. Experience in this business----------Years
12. In which activities are you involved? (Please check all that apply):

13.1 Sell growing supplies for mushrooms

1) Spawn 2) Bedding materials 3) Substrate 4) other, specify----------

13.2 Mushroom production

13.3 Provide training on mushroom production

13.4 Collect fresh/dry mushrooms from producers

13.5 Sell fresh/dry mushrooms, in bulk

13.6 Sell fresh/dry mushrooms, packaged

13.7 Selling value-added products:

1) Frozen mushrooms 2) Dried mushrooms 3) mushroom sandwich 4) Other value-added products (please specify): ----------

B. Ownership of production resources

Houses

Types of house (circle)	0)No 1) yes	Qn.	Ownership (A)	If rented cost/month	
1) Laboratory					
2) Office, collection and distribution shop					
4) Others					

(A) 1) Own 2) Rented in 3) Gift 4) Others

Other fixed assets

Item	Quantity	price	Item	Quantity	price
Autoclave			Water distiller		
Transfer hood (Modified)			Spatula		
Incubator (Growing Chamber)			Scalpel		
Refrigerator			Jar(bottle)		
Sensitive Balance (Elec./Battery)			Test tubes		
Dry oven			Petri dish		
Vacuum cleaner			Beaker		
Sealer			Measuring cylinder		
Inoculation loop			Volumetric flask		
Bunsen Burner (Homemade)			Glove		
Hot plate/Stove			thermometer		
Hygrometer			Others, Specify		

C. Training and extension service

1. Have you provided training related to mushroom in the last five years? 0) No 1) Yes
2. If yes,

Year	Average number of trainee per month		title of the training (A)	Total no. of training	Average number of hour per day	Location of trainee came from
	Male	Female				
2013						
2012						
2011						
2010						
2009						

(A) 1) Mushroom production process 2) use of different substrates 3) Contamination control methods 4) Aseptic production of mushroom 5) Others, specify---------

3. Are there payment for the training 0) No, it is free 1) Yes
4. If yes, on average how much, ------- ETB per person per training
5. After providing the training have you visited their farm 0)No 1) yes
6. If yes, how many trainee farm in 2013----------
7. How many times per month----------per year----------
8. In general what feedback did you give----------

D. Spawn production and cultural practices

9. When did you start spawn production ----------(month and year)
10. What attracted you to start a spawn business? ----------
11. Where is the source of mushroom mother culture----------
12. From the start year to now did you continuously produce spawn 0) No 1) yes
13. If yes, during which months of the year do you produce spawn? (Circle all that apply) Jan. Feb. Mar. Apr. May June July Aug. Sep. Oct. Nov. Dec. 1) Year round
14. If not, for how many years do you cease --------
15. During which months out of production? (Circle all that apply) Jan. Feb. Mar. Apr. May June July Aug. Sep. Oct. Nov. Dec. 1) Year round
16. What are the reasons for the cease, rank the major three reasons
17. ---------- 2)----------3)----------
18. Which type of mushroom spawn did you produced 1) Oyster 2) Shitake 3) Button 4)other,
19. What type of Oyster mushroom spawn did you produce? 1) P. Saju caju 2) P. Florida 3) Oesteratus 4)Others----------
20. What kind of spawn do you produce? 1) Wheat spawn 2) sorghum spawn 3) Sawdust spawn 4) Other---------
21. For how may jars did 1Kg grain used ---------
22. How long it take to produce spawn----------days
23. On average how many bottles of spawn produced per month----------
24. What capacity bottle do you use 1) 200gm 2) 400gm 3) 600gm 4) 800gm 5) other specify
25. Did you face contamination during spawn production? 1) Yes 2) No

26. If yes, what did you do the contaminated spawn? ----------
27. On average the number of bottle contaminated per season ----------
28. What problem did you face to start spawn production business? ----------
29. How many spawn producers do you know within the 1. Kebele ----- 2. District ----- 3. The Sub city----- 4. Addis Ababa ----?
30. Compared to other local operations, is your spawn production operation 1) Smaller than the average 2) Average 3) Larger than the average 4)I don't know
31. Over the past five years, has the number of spawn producers in kebele -----, District -----, Sub city-----, Addis Ababa ----? 1) Increased 2) Remained stable 3) Decreased 4) I don't know
32. In your opinion, how competitive is the spawn industry? 1) Highly competitive 2)Moderately competitive 3) Non competitive 4) I don't know
33. What are your top 3 competitive advantages? Please select the top three competitive advantages by checking the appropriate boxes. Rank checked boxes in order of importance

Competitive advantage	Rank 1) the most important 2) medium 3) the least important
Skills/Knowledge of spawn production	
Resources (financial ,human & material) available	
Quality of spawn produced	
Quantity of pawn produced	
Customer service	
Market knowledge	
Better selling Price of spawn	
Consistent supply of spawn	
Low cost of production of spawn	

E. Access to inputs for the production of spawn

1. Who is / are your primary supplier(s) for your spawn production? Please specify.

	Item	Name of primary supplier	Address
1.1	Mother culture supplier		
1.2	Sorghum		
1.3	Glass wares		
1.4	Chemicals		
1.5	Packaging materials (plastic sealer etc.)		

F. Cost of spawn production

6. Input costs used in the production of spawn

Item	unit	Quantity/ month	Average unit cost	TC/ spawn period	TC/ month	TC/ year
Grain	kg					
PDA	500gm					
Alcohols	lit					
Gypsum (powder,$CaSO_4$)	pack					
$CaCO_3$	pack					
Formalin	lit					
Cotton	roll					
sugar	kg					
potato	kg					
Agar	500gm					
Wheat bran	Kg					
Bleach (*Berekina*)	Lit					
Surgical blade	Pack					
Others						

7. Service costs incurred on the production of mushroom (in ETB per unit or per season)

Service costs	unit	Average cost in ETB	TC / year
Water	Per month		
Electricity	Per month		
Media advertizing	Per air time		
House rent	Per month		
License fee			
Tax			
Other (specify)			
Total costs			

8. Do you hire people to help you with production of spawn? 0) No 1) Yes
9. If yes, total number of male----------females----------
10. Labor cost in ETB.

job type	Full time/month				Part time/month				Seasonal			
	Male		Female		Male		Female		Male		Female	
	No	Salary	No	Salary	No	Wage	No	Wage	No	Wage	No	Wage

11. Estimate cost of spawn production in ETB per jar/bottle.
a) per 200gm bottle -----b. per 250 gm bottle -----c) per 400gm bottle ---d) per 800gm bottle
12. Estimate cost of mushroom production in ETB, per month----------per year----------
13. Initial capital, Own----------ETB, Borrowed----------

G. **Spawn marketing**

24. For whom did you supply spawn? 1) Ind. Producers 2) Producer groups 3) Other spawn producers /distributers 4)specify------

25. Number of clientele, individuals----------Producer group----------Other distributers------

26. How much is the price of spawn for mushroom producers per bottle (200gm) in ETB------

27. How much is the price of spawn for other spawn producers (distributers)per bottle (200gm) in ETB----------
28. Mode of payment. 0) Advance 1) Cash 3) Credit 4) Other
29. If the mode of payment in selling your spawn is in advance, how long it takes to deliver the product------ (days/Months)
30. If the mode of payment in selling your spawn is in credit, how long it takes to receive-----
31. Average spawn supplied in jar per day ---------per month----------
32. Did you have agreement with the spawn buyers? 0) No 1)Yes
33. What type of agreement do you have ----------
34. Who is going to set spawn price? 1) Producer only 2)Buyer only 3)Negotiation b/n producer and buyer 4) Other, Specify----------
35. Did you label the spawn you were selling? 0) No 2)Yes
36. If yes, what was the label incorporated? ----------
37. Estimate income from mushroom production in ETB, monthly----------Yearly----------

H. Governance

1. Is there any policies/regulation (local, state or national) that makes it difficult to enter the spawn production? 1=Yes 0=no
2. If yes, what are they----------
3. Are there any policies/regulations (local, state or national) that makes it difficult to enter the spawn market? 1=Yes 0=no
4. If yes, what are they----------
5. Are there any policies/regulations (local, state or national) that are helpful to entry into the spawn production? 1=Yes 0=no
6. If yes, what are they----------
7. Are there any policies/regulations (local, state or national) that are helpful to entry into the spawn market? 1=Yes 0=no
8. If yes, what are they----------

I. **Spawn suppliers strengths, weakness, opportunities and threats**

Opportunity and threat	0)No 1) yes
Availability of chemicals for production of spawn.	
Availability of spawn demand for production of mushroom.	
Access to affordable credit facility to purchase laboratory equipments and materials for spawn production	
Affordable cost of chemicals	
Access to mother culture for different mushroom types	
Availability of market during the oversupply of spawn	
Strength/availability of cooperatives/mushroom association	
Availability of value chain governance system. (Technical value chain working group to coordinate the activities in the different functions).	
Linkage among the spawn suppliers mushroom producers and research	
Availability of national quality standards and quality management system to produced spawn	
Awareness/exploitation of emerging trends in mushroom production, economy, technology...)	
Increased demand for mushroom due to consumers awareness about mushroom products	
Exploiting the emerging markets (Internet, web site set up, E-commerce, etc.)	
Others, specify	
Strength and weakness	
Adequate skills/ knowledge/ experience in spawn production technology.	
Inadequate space and equipment for spawn production	
Linkage to potential buyers of spawn.	
Financial management system	
Serious spawn loss due to contamination	
Ability to supply the required amount of spawn sustainably	
Have you Proprietary (ownership) know-how, patents (exclusive right to market invention), marks, license, etc. for your spawn product	
did you exploit your most relevant assets/resources	
Are customers complain on the quality of your spawn product	
Have you promote your spawn product	
Cooperation and coordination among different spawn suppliers mushroom producers, input supplier etc.	
Others, specify	

If anything that you like to say----------

FORMAL QUESTIONNAIRE FOR TRADERS AND ASSEMBLERS

Enumerator Name ---------- Date----------

A. General Questions

1. Name of the business---------- Sub city----------District-------Tel---
2. Type of the business 1)sole proprietorship 2)Partnership 3) cooperative 4) other
3. Name of the respondent---------- 4. Sex 0) Female 1) Male
4. If not sole proprietorship responsibility of the respondent----------Number of members--------Male---------Female
5. How is the decision maker----------
6. Age of the respondent-------- ------ (year)
7. Education level ----------Area ----------
8. Marital status if sole proprietorship 1) married 2) single 3) widowed/er 4) divorced
9. This business for you: 1) Full time occupation 2) Part time occupation 3) Hobby 4) Others,
10. If not full time occupation what is your primary occupation----------
11. Experience in this business----------Years
12. In which activities are you involved? (Please check all that apply):

13.1 Sell growing supplies for mushrooms 1)Spawn 2) Bedding materials 3) Substrate 4) others

13.2 Mushroom production

13.3 Provide training on mushroom production

13.4 Collect fresh mushrooms from producers

13.5 Collect dry mushrooms from producers

13.6 Sell fresh mushrooms, in bulk

13.7 Sell fresh mushrooms, packaged

13.8 Selling value-added products:

13.9 Frozen mushrooms 2) Dried mushrooms 4) Other value-added products specify --------

B. Ownership of resources useful for mushroom business

Housing

Resources	Ownership (A)	No. of rooms	Monthly payment, if rent
Office			
Processing room			
Storage room			
Others			

(A) 1) Own 2) rented in 3) Gift 4) Others ----------

Other resources used for mushroom marketing and processing business

Item	Quantity	Value	Item	Quantity	value
Table			Drying oven		
Chair			Vacuum cleaner		
Land line phone			Sealer		
Mobile phone			Scalpel		
Fax					
Computer					
Printer					
Refrigerator (deep freezer)					
Balance			Others, Specify		

C. **Mushroom processing and Marketing (Purchasing)**

1. What form of mushroom did you purchase?1) Fresh2) Dried 3) Both dry& fresh 4) Other,
2. Which type of mushroom did you purchase 1) Oyster 2) Shitake 3) Button 4)other, -- --
3. Did you process fresh mushroom? 0) No 2)Yes
4. If yes, what type of process did you do? 1) drying 2) Packaging 3) Freezing 4) Pickling (Preserving) 5)Standardizing 6)grading 7) other specify
5. What is the purpose of processing 1)----------2) ----------3) ----------4)---
6. Did you have grade to standardize your purchased mushroom? 1) Yes 2) No
7. If yes, describe the standard requirement in your grading system? 1) Grade1 ---------- --- 2) Grade 2----------3) Grade 3 ----------4) Grade 4 ----------
8. Who set the standards? ----------
9. What is the purchasing price per kg for different grades of fresh mushroom (ETB)?1)----- --2)----------3)----------4)----------

10. What is the purchasing price per kg for different grades of dry mushroom (ETB)?1)-------
2)----------3)----------4)----------

11. Where, and for how much, do you purchase your fresh/dry mushrooms? (Please check all that apply)

Purchase from suppliers	0) No 1) yes	How did you collect (A)	Average mushroom purchased in Kg per Day		Average cost (purchasing price) birr/kg in 2005EC.		Mode of payment 0) Credit 1) cash	No. of supplier s Address
			Fresh	Dry	Fresh	Dry		
producers								
Local								
Retailers								
Others								

(A) 1) Producers deliver to office 2) Myself from suppliers 3) through broker 4)family members 5) commission agent 6) friends 7) others (specify)

12. If the mode of payment in buying mushroom product is in credit, how long it takes to pay--------(days/Months)
13. Did you have market agreement with the supplier? 0) No 1)Yes
14. If yes, from which supplier category ----------
15. What type of agreement do you have ----------
16. Who is going to set purchase price? 1) supplier only 2)I am(buyer) 3)Negotiation b/n supplier and buyer 4) Other, Specify----------
17. Did you purchase mushroom from all producers and suppliers? 0)No 1) Yes
18. If not, are there any criteria /requirement to purchase mushroom from different alternate market not addressed by you? 0) No 1) Yes
19. If yes, What Criteria/requirement needed to buy from the above supplier category ----------
20. Please list your primary supplier:----------
21. How do you work with your suppliers to insure high quality mushroom? ----------
22. How would you describe supply for fresh mushrooms at the present time?
    2) Strong 2) Steady 3) Weak 4) I don't know
23. How would you describe supply for dry mushrooms at the present time?
    2) Strong 2) Steady 3) Weak 4) I don't know

24. Is current supply for fresh mushrooms?

1) In excess of demand 2) Equal to demand 3) Below demand 4) I don't know

25. Is current supply for dry mushrooms?

1) In excess of demand 2) Equal to demand 3) Below demand 4) I don't know

D. Mushroom processing and Market (Selling)

1. Which type of mushroom did you Sell 1) Oyster 2) Shitake 3) Button 4)other, -- ----
2. What form of mushroom did you sell? 1) the purchased fresh mushroom as it is 2) dry 3) Both the purchased fresh mushroom as it is & dry 4) Other, -----
3. What is the selling price per kg for different forms of fresh mushroom (ETB)? 1) Packed----2) Low moisture----------3) high moisture ----------4) others ----------
4. Did you label the product you were selling? 1) Yes 2) No
5. If yes, what is your labeling incorporate? ----------
6. Where, and for how much, do you sell your fresh/processed mushrooms? (Please check all that apply)

Customers	0) No 1) yes	How did you sold (A)	Average mushroom sold in Kg per Day in2013.				Average Price (birr/kg)				Mode of payment 0) Credit 1)Cash	No., Name and address Separate sheet attached
			Fresh as it is	Fresh packed	Dry not packed	Dry packed	Fresh as it is	Fresh packed	Dry not packed	Dry packed		
Consumers												
Supermarke												
Hotels												
Restaurants												
Assemblers												
Local												
Retailers												
Exporter												
Embassies												

(A) 1) I deliver to customers 2) through distribution shop 3) through broker 4) commission agent 6) friends 7) others (specify)----

7. If the mode of payment in buying mushroom product is in credit, how long it takes to pay--------(days/Months)
8. Did you have market agreement with the customers? 0) No 1)Yes
9. If yes, from which customer category ----------
10. What type of agreement do you have ----------
11. Who is going to set selling price? 1) seller only (I am) 2)Buyer only 3)Negotiation b/n seller and buyer 4) Other, Specify----------
12. Did you sell mushroom for all customer category listed above? 0)No 1) Yes
13. If not, are there any criteria /requirement to sell mushroom for different customers not addressed by you? 0) No 1) Yes
14. If yes, What Criteria/requirement needed to sell for Other customers ----------
15. please list your primary customer (buyer)----------
16. How would you describe demand for fresh mushrooms at the present time?
    1) Strong demand 2) Steady 3) Weak demand 4) I don't know
17. How would you describe demand for dry mushrooms at the present time?
    1) Strong demand 2) Steady 3) Weak demand 4) I don't know
18. Is current demand for fresh mushrooms?
    1) In excess of supply 2) Equal to supply 3) Below supply 4) I don't know
19. Is current demand for dry mushrooms?
    1) In excess of supply 2) Equal to supply 3) Below supply 4) I don't know
20. In order to meet demand, are you able to maintain a steady supply of fresh mushrooms?
    0) No 1)Yes
21. If yes, how do you meet demand? 1) from own production 2) from other Collectors/traders 3)Others,----
22. Have you lost demand for fresh mushroom 0) No 1)Yes
23. If yes, what did you do the product? 1) Consumed 2) throwing 3)Drying 4) others-------
24. How frequent loss of demand is happened 1) always 2) sometimes 3) rarely
25. Is mushroom trading in your locality needs a trading license?1) yes 2) No 3) not mandatory 4) others
26. If yes, how do you see the procedure to get the license? 1) complicated; 2)easy 3) others --

27. Do you store mushroom before you sale? 1) Yes; 0) No

28. If yes, for how long do you store (maximum)?---------Days

29. If locally produced mushrooms exported, specify the country and the amount in kg/qt. in 2013.

Country	Type of mushroom(A)	Price per kg /qt. (in ETB/Dollar)	per month		per year	
			volume	Value	volume	Value

A) 1) Oyster 2) Shitake 3) Button 4) other, -- ---

E. Cost of mushroom processing and marketing

1. Service and material costs incurred on the processing and marketing of mushroom (in ETB per Unit or Per season)

Service	Average cost / month	Total cost/ year	Service	Average cost / month	Total cost / year
House rent			Water		
Marketing fee			Storage loss		
License fee			Electricity		
License renewal fee			Telephone		
Loading			Internet		
Unloading			Fax		
Transport cost			Packing's		
Storage cost			Other (specify)		

2. Did you hire people to help you with mushroom marketing business? 0) No 1) Yes
3. If Yes, total number of male----------female----------
4. Labor cost in ETB.

Job type	Full time/month				Part time/month				seasonal			
	Male		Female		Male		Female		Male		Female	
	No	Salary	No	Salary	No	Wage	No	Wage	No	Wage	No	Wage

5. On average estimate cost of packing mushroom per Kg---------ETB, Per month--------ETB

6. On average estimate cost of drying mushroom per Kg---------ETB, Per month--------ETB
7. On average estimate the purchasing cost of mushroom per Kg---ETB, Per month------ETB
8. On average estimate selling cost of mushroom per Kg-----ETB, Per month--------ETB

F. Membership and information service

34. Are you a member of any formal organization/association? 1=Yes 0=No
35. If yes, which ?1) Cooperatives 2)youth/Women group 3)Mushroom association 4) others
36. If yes, what services do you get from formal organization you belong to? 1) loans/credit service 2) market information 3) capacity building 4) product promotion 5) others
37. Do you know price to be offered by each suppliers and buyer before you purchase or sale your product? 1=Yes 0=no
38. How do you get information on supply, demand and price of Mushroom?

information on	1) traders 2) cooperatives 3) NGOs 4) restaurants and hotels 5) radio and TV 6) telephone and newspaper 7) other producers 8) others(specify)----------
Supply	
Demand	
Price	

39. How do you evaluate source of information? 1) It is reliable 2) it is adequate 3) it is timely 4) others (specify) ----------

G. Governance

1. Are there any policies/regulations (local, state or national) that make it difficult to enter mushroom marketing business? 1=Yes 0=no
2. If yes, what are they----------
3. Are there any policies/regulations (local, state or national) that makes it difficult to enter the processing business? 1=Yes 0=no
4. If yes, what are they----------
5. Are there any policies/regulations (local, state or national) that are helpful to entry into the marketing business? 1=Yes 0=no
6. If yes, what are they----------
7. Are there any policies/regulations (local, state or national) that are helpful to entry into the mushroom processing business? 1=Yes 0=no

8. If yes, what are they----------

H. **Mushroom processing and marketing Strengths, Weakness, Opportunities and Threats**

Opportunity and threat	0)No 1) yes
Access to mushroom processing equipments and materials	
Access to affordable credit facility to purchase processing equipments and materials	
Availability of market during the oversupply of mushroom	
Strength/availability of cooperatives/mushroom association	
Availability of value chain governance system. (Technical value chain working group to coordinate the activities in the different functions).	
Are there lacks of effective linkage among the value chain actors?	
Availability of national quality standards and quality management system along the value chain	
Do you have awareness/exploitation of emerging trends in the global mushroom production, consumption, processing, marketing and economic contribution, *etc*)	
Is demand for mushroom increased due to consumers awareness about nutritional and medicinal value	
Do you exploiting the emerging national and international market through internet, web site set up, E-commerce, *etc.*)	
Is lack of market information system	
Strength and weakness	
Have you adequate skills/ knowledge/ experience in mushroom processing and marketing technology.	
Have you adequate space and equipment for mushroom processing and storage	
Have you Linkage to potential buyers and importers (local and foreign).	
Have you financial management system	
Have you encounter Serious product loss due to storage or loss of demand	
Have you ability to supply the required amount of mushroom sustainably	
Have you proprietary (ownership) know-how, patents (exclusive right to market invention), marks, license, *etc.* for your mushroom product	
Have you exploiting most relevant assets/resources	
Have your customers complain on the quality of your mushroom product	
Have you promoting mushroom product	
Have you cooperation and coordination among different mushroom assemblers, processors, traders, retailers and exporters (local)	
Have you standardizing and grading system	
Others, specify	

If anything that you like to say----------

FORMAL QUESTIONNAIRE FOR CONSUMERS

Enumerator Name ---------- Date----------

A. General Questions

1. Name of the respondent----------
2. Sex 0) Female 1) Male
3. Age of the respondent/s-------- ------ (year), 8. Education level ----------Telephone ---
4. Size of your household, i.e. the number of people, including yourself, who live in your house/dwelling at least for a year----------

B. This section of the questionnaire explores your habits and preferences, if any, with regard to the mushroom consumption

5. Have you consumed mushroom in your life time? 0)No 1) Yes
6. If yes, which one 1) Wild 2) Locally produced 3) Imported 4)Others specify----------
7. If wild, what are the local names----------
8. Have you consumed mushroom at least in the past 12 months? No 1) Yes
9. If not consumed , Allocate a rank 1 to 6 the most important reasons for not consuming mushroom in the last 12 months

Reasons	Rank
Culturally not known (mushroom as food)	
Not available	
Culturally it considered as poor man food	
I do not like the taste of mushroom	
I do not like the smell of mushroom	
It was too is expensive	
I do not consume for health reasons	
I am not comfortable when consuming mushroom	
I prefer to consume meat than mushroom	

C. The following questions only pertain to people who have consumed commercial mushroom in the last 12 months.

10. When did you consume mushroom? 1) During fasting days 2) When available 3) All time 4) other specify----------

11. At what time of the day did you consume? 1) At breakfast 2) At lunch 3) At dinner 4) When I got 5) other specify----------
12. Where did you consume mushroom? 1) At home 2) At hotel and restaurants 3) When visiting friends or family 4) other specify----------
13. Which type of mushroom dishes you prefer 1st ----------2nd ----------3rd----------
14. Did you know the type of mushroom you consumed? 0)No 1) Yes
15. If Yes, Please indicate which one of the following types of mushroom you use and prefer most. (Mark one option only in each of the columns.)

Types of mushroom	Used most	Preferred
Oyster	1	1
Shitake	2	2
Button	3	3
Wild	4	4
Other (specify)	5	5
Other (specify)	6	6

16. What is the reason for consuming mushroom? 1) Nutritional value 2) Medicinal value 3) It is the most affordable 4) Since I am a vegetarian 5) Other (specify)
17. If prepare mushroom dish at home, how many kilogram of mushroom did you purchased per month? ----------
18. From where did you purchase mushroom? 1) producers 2) supermarkets 3) Retailers 4) spawn suppliers 5) other specify----------
19. What cost you per kg of mushroom? ----------
20. Total monthly income of the household

Income group	Circle one
0 to 150	1
151 to 650	2
651 to 1400	3
1401 to 2350	4
2351 to 3550	5
3551 to 5000	6
Over 5000	7

21. Did you get whenever you need mushroom? 0) No 1) Yes
22. Did you get whatever amount of mushroom you need? 0) No 1) Yes

23. How is the price of mushroom 1) Cheap 2) Expensive 3) Moderate 4) Other----------

24. If anything that you like to say? ----------

FORMAL QUESTIONNAIRE FOR SUPERMARKETS

A. General Questions

Enumerator Name---------- Date----------

1. Name of the supermarket ----------Sub city----------District----------
   Telephone----------
2. Name of the contact person (respondent) ---------- 3. Sex 0) Female 1) Male

4. Age of the respondent ------ (year) 5.Name of the owner, ----------

6. Sex 0) Female 1) Male

7. Year of establishment----------EC.
8. In which activities are you involved related to mushroom? (Please check all that apply):
   a. Sell imported mushroom
   b. Collect fresh/dry mushrooms from producers
      Sell fresh/dry mushrooms

B. Mushroom processing and Marketing (Purchasing)

9. What form of locally produced mushroom did you purchase and sold? 1) Fresh 2) Dried 3) Both dry& fresh 4) I don't know
10. What form of imported mushroom had you purchase and sold? 1) fresh 2) dried 3) canned 4) Frozen 5) I don't know
11. Which type of locally produced mushroom did you purchase and sold 1) Oyster 2) Shitake 3) Button 4)I don't know
12. What type of imported mushroom did you purchase and sold? 1) Oyster 2) Shitake 3) Button 4) I don't know
13. Did you process locally produced fresh mushroom? 0) No 2)Yes
14. If yes, what type of process did you do? 1) drying 2) Packaging 3) Freezing 4) Pickling (Preserving) 5) standardizing 6) other specify----------
15. What is the purpose of processing 1)----------2) ----------3) ----------4)-----

16. On average the cost of processing mushroom per kg in ETB----------
17. How many mushroom suppliers you have (in number)----------
18. Who are your suppliers 1) Individual Producers 2) Cooperatives 3)Spawn suppliers (Assemblers) 4)Partners 5) Others----------
19. What is the purchasing price (cost) per kg of fresh mushroom (ETB)? -------
20. What is the purchasing price (cost) per kg of dry mushroom (ETB)? -------
21. How did you purchase 1) Suppliers deliver to office (shop) 2) Myself from suppliers 3) through broker 4) commission agent 5) others (specify)
22. Average fresh mushroom purchased in Kg per day-------week---------month----------
23. Average dry mushroom purchased in Kg per day-------per week---------per month----------
24. Average imported mushroom purchased in Kg per day-------week---------month----------
25. Mode of payment 0)Credit 1) Cash
26. If the mode of payment in buying mushroom product is in credit, how long it takes to pay--------(days/Months)
27. Did you have market agreement with the supplier? 0) No 1)Yes
28. What type of agreement do you have ----------
29. Who is going to set purchase price? 1) supplier only 2)I am(buyer) 3)Negotiation b/n supplier and buyer 4) Other, Specify---------
30. Did you purchase mushroom from all producers and suppliers? 0)No 1) Yes
31. If not, Why? ---------- ----------
32. If you buy from more than one supplier, please list your primary supplier:----------
33. How would you describe the supply for locally produced fresh mushrooms at the present time? 1)Strong 2) Steady 3) Weak 4) I don't know
34. How would you describe the supply for locally produced dry mushrooms at the present time? 1)Strong 2) Steady 3) Weak 4) I don't know
35. In the last five years the supply for locally produced fresh mushrooms?
    1) Increasing 2) decreasing 3) steady 4) I don't know
36. In the last five years the supply for locally produced dry mushrooms?
    1) Increasing 2) decreasing 3) steady 4) I don't know

C. Mushroom processing and Marketing (Selling)

37. What is the selling price per kg of fresh mushroom (ETB)? ----------

38. What is the selling price per kg of dry mushroom (ETB)? ----------

39. Did you label the product you were selling? 1) Yes 2) No

40. If yes, describe the labeling incorporate? ----------

41. Average fresh mushroom sold in Kg per day-------per week---------per month----------

42. Average dry mushroom sold in Kg per day-------per week---------per month----------

43. Average imported mushroom sold in Kg per day-------week---------month----------

44. Who were the most clients for locally produced fresh mushroom? 1) foreigners 2) local peoples 3)Hotels 4) Restaurants 5)Others, specify----------

45. Who are the most clients for locally produced dry mushroom? 1) foreigners 2) local peoples 3)Hotels 4) Restaurants 5)Others, specify----------

46. Who is going to set selling price? 1) seller only (I am) 2)Buyer only 3)Negotiation b/n seller and buyer 4) Other, Specify----------

47. How would you describe demand for locally produced fresh mushrooms at the present time?

3) Strong demand 2) Steady 3) Weak demand 4) I don't know

48. How would you describe demand for locally produced dry mushrooms at the present time? 1) Strong demand 2) Steady 3) Weak demand 4) I don't know

49. How would you describe demand for imported mushrooms at the present time?

4) Strong demand 2) Steady 3) Weak demand 4) I don't know

50. Is current demand for locally produced fresh mushrooms?

1) In excess of supply 2) Equal to supply 3) Below supply 4) I don't know

51. Is current demand for locally produced dry mushrooms?

1) In excess of supply 2) Equal to supply 3) Below supply 4) I don't know

52. Is current demand for imported mushrooms?

1) In excess of supply 2) Equal to supply 3) Below supply 4) I don't know

53. Have you lost demand for locally produced fresh mushroom 0) No 1)Yes

54. If yes, what did you do the product? 1) disposing 2) return to supplier 3)Drying 4) others

55. How frequent loss of demand was happened for locally produced fresh mushroom 1) always 2) sometimes 3) rarely

56. Can you estimate the shelf life of locally produced fresh mushroom in days----------

D. Trend of imported mushroom in the last five years

Year	Type of mushroom	unit	Amount per pack	Total volume	Cost per unit	Total value	Exporting country
2009	Oyster						
	Shitake						
	Button						
2010	Oyster						
	Shitake						
	Button						
2011	Oyster						
	Shitake						
	Button						
2012	Oyster						
	Shitake						
	Button						
2013	Oyster						
	Shitake						
	Button						

E. Opportunities and constraints related to mushroom

1. What are the market opportunities of locally produced mushrooms?
   A) ---------- B) ---------- C)----------D)----------
2. What are the market opportunities of imported mushrooms? A) ----------
   B) ---------- C)----------D)----------
3. What are the market constraints of locally produced mushrooms?
   A) ---------- B) ---------- C)----------D)----------
4. What are the market constraints of imported mushrooms?
   A) ---------- B) ---------- C)----------D)----------

FORMAL QUESTIONNAIRE FOR HOTELS AND RESTAURANTS

A. General questions

Interviewer Name---------- Date----------

3. Name of the Hotel/Restaurant----------Sub city------District----- Telephone-------
4. Name of the contact person (respondent) ---------- 3. Sex 0) Female 1) Male
4. Age of the respondent ------ (year) 5. Responsibility----------Education level----
6. Name of the Owner ---------- 7. Sex 0) Female 1) Male 8.Year of establishment---EC.
9. Which service is the Hotel/Restaurant provide? (Please check all that apply): 1) Restaurant 2) Cafeteria 3) Bed service 4) Conference hall service 5) Bar 6) Night club 7) others, --
10. Grade of the hotel (star) 1) One 2)Two 3) Three 4) Four 5) Five 6) Six
11. Do you prepare mushroom dishes? 0) No 1)Yes
12. If yes, when did you start to prepare mushroom dish----------Year

B. Mushroom Marketing (Purchasing)

13. Which type of mushroom did you used 1) Oyster 2) Shitake 3) Button 4) Other,--------
14. What form of mushroom did you purchase? 1) Fresh local 2) Dried local 3) Both dry& fresh 4)Packed imported 5) Other, -----
15. If not purchased locally produced fresh mushroom, why? ----------
16. If not purchased locally produced dry mushroom, why? ----------
17. What is the purchasing price per kg for the above type of mushrooms used respectively(ETB)?1)-------2)----------3)----------4)---------- 5)----------
18. In what frequency did you purchase mushroom? 1) daily 2) weekly 3)monthly 4) other --
19. Did you purchase mushroom from all producers and suppliers? 0)No 1) Yes
20. If not, are there any criteria /requirement to purchase mushroom from different alternate market? 0) No 1) Yes
21. If yes, What Criteria/requirement needed to buy ----------
22. Please list your primary supplier:----------
23. How did you describe the supply of imported mushrooms in the last five years?

1) Increasing 2) decreasing 3) remains the same 4) I don't know

C. **Mushroom dish preparation and Marketing (selling)**

24. On average total number of different dishes/Recipe / prepared **per day/week** in your hotel/restaurant in 2013. ------ **fasting** -------- **non fasting**
25. Who are your customers for mushroom dishes? 1) Tourists 2) office workers 3)Business persons 4) Special diet customers 5) Others------
26. How did you describe the trend of using locally produced mushroom compared with the imported in the last five years? 1) Increasing 2) decreasing 3) remains the same 4) I don't know
27. List the most common types of mushroom dishes, their price and cost of ingredients.

S. No.	List of mushroom dishes	Total dish prepared per day (portion) (A)	Time of meal 1)Breakfast 2) Lunch 3) dinner	Selling price in ETB per dish	ingredients of the dish (in Kg/liter)	Unit	Amount of ingredients used /Total portion of dish/or per dish (B)	Cost of ingredients per unit (C)
					Mushroom	Kg		
					Edible oil	Lit		
					Spices	gm		
					Mushroom	Kg		
					Edible oil	Lit		
					Spices	gm		