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ASSESSEMENT OF URBAN AGRICULTURE IN ADDIS ABABA; THE CASE OF MUSHROOM CULTIVATION

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Assessment of Urban Agriculture in Addis Ababa; the case of Mushroom Cultivation

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Declaration

I declare that the assessment of urban agriculture in Addis Ababa, particularly urban mushroom agriculture, is my own work and that all sources that I have used or quoted have been indicated and surely acknowledged by means of complete references and that this work has not been submitted before for any other degree at any other institution.

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DEDICATION

This research paper is dedicated

to the memory of my beloved sister,

Senait Tekie Gebresilassie

ABBREVIATIONS

AAUAB – Addis Ababa Urban Agriculture Bureau

AU – African Union

CSA – Central Statistics Authority

EMA – Ethiopian Mapping Authority

FAO – Food and Agriculture Organization

ILO – International Labour Organization

MDG – Millennium Development Goal

NGO – Non-Governmental Organization

SPSS – Computer program to interpret and analyze collected data

UN – United Nations Organization

UNDP – United Nations Development Program

UNHCR – United Nations Higher Commission on Refuges

UNICEF – United Nations International Children's Fund

DEFINITION OF TERMS

Mushroom – any of the fleshy fruiting bodies of fungi typically produced above ground on soil or on their food sources such as decaying materials

Productivity – the rate at which crops are grown on a standard area of land

Profitability – the capacity to make profit

Urban agriculture - is the practice of food production within a city boundary, it includes the cultivation of crops, mushroom farming, vegetables, fruit, flowers, orchards, parks, forestry, fuel wood, livestock, aquaculture, and bee- keeping.

Urbanization – the process of increasing peoples living in towns and cities as a result of rural to urban migration

ABSTRACT

This research paper was studied on urban agriculture with particular emphasis on assessment of urban mushroom farming in Addis Ababa. The general objective of the study is to identify some of the major problems and constraint faced the urban mushroom producers, investigates and explains the character and role of urban agriculture with emphasis on mushroom farming. It also tries to see the types of assistance needed and suggests possible solutions to the problems. The analysis of the study utilized both primary and secondary data. The primary data were collected through questionnaire survey, interviews and personal observations that covered 55 persons directly and indirectly involved in mushroom agriculture. The secondary data were collected from different libraries, document centres and offices.

The study investigate lack of capital investment to start up, flying pests, diseases, high temperatures, lack of physical materials such as the production place, lack of training and experience, lack of awareness of the people due to lack of modern advertisement, lack of support from governments and other bodies as well as less concern of the government about the practice of mushroom farming makes them less productive. Mushrooms used as a food directly or indirectly, it also have a great culinary capability since it can protect many diseases and source of employment to all groups of the people (women, child, youths, old ages and disabilities), mushrooms can be cultivated 7 to 8 times per year on the same bedroom, its more productive and profitable.

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND OF THE STUDY

By 2020 the developing countries of Africa, Asia, and Latin America will be home to some 75% of all urban dwellers, and to eight of the anticipated nine mega-cities with populations in excess of 20 million. Most cities in developing countries have great difficulties coping with this development and are unable to create sufficient formal employment opportunities for the poor. It is expected that by 2020, 85% of the poor in Latin America, and about 40-45% of the poor in Africa and Asia will be concentrated in towns and cities. This rapid urbanization goes together with a rapid increase in urban poverty and urban food insecurity (Daniel, 2008).

The world population is becoming highly urbanized rapidly, with urban poverty growing at a higher pace in the developing world. Food and fuel absorb a large share of urban poor household incomes, and household food insecurity has been worsening in recent years (Dubbeling, 2001). Hence, at a time of increasing urbanization, decreasing agricultural resources, increased food insecurity, increasing unemployment and an accelerating deterioration in the quality of life for those living in urban areas, it is absolutely vital to be considerate of the existing and future urban agricultural activities(Martin, 1999).

A growing number of urban dwellers are engaged in agricultural activities specially in the less developed countries and self-produced food can cover considerable share of the household's total food intake thereby releasing a large share of the household's income to cover non-food expenses (Whittinghill and Rowe, 2012). Urban agriculture boosts the asset base of the urban residents and reduces vulnerability to urban economic collapse (Chingarande, 2001). Hence, urban people are not passive food recipients as they are actively involved in food production. However, urban agriculture is synonymous with leisure, environmental education, healthy food production and processing, green space and genetic preservation in the developed countries (Rufa, 2001).

Ethiopia is a country where subsistence agriculture of low productivity predominates and there has been an acute deficit in food supply and hence food self-sufficiency is a primary issue in the national agricultural development policy. Rural agriculture is not in a position to supply sufficient food both for the rural and the urban population. Hence, urban agriculture activities have been carried out in cities supplementing rural agriculture. Although Urban Agriculture plays a significant role in producing food and generating employment and income for the urban dwellers, it has been given less emphasis. Tinker (1994) stated that; Despite its critical role in producing food for the city dwellers around the world, urban food production has largely been

ignored by scholars and agricultural planners; government officials and policy makers at best dismiss the activity as peripheral and at worst evict farmers, claiming that urban farms are not only unsightly but also promote pollution and illness.

In Ethiopia, urban agriculture has been shown to be a final stage by households in their sequence of survival strategies. Households in the urban areas respond to the extreme threat of poverty and food insecurity by carrying out urban farming on any vacant space available. Urban agriculture is also practised because of shortage of income and unemployment in the urban centres (G/Egziabher, 1992). However, it is carried out on land in transitional use where usufruct rights are at issue. This problem leads to low investment in urban agriculture and hence poor productivity.

Mushroom with their great variety of species, constitute a cost effective means of both supplementing the nutrition to human kinds and can generate additional employment and income through local, regional and national trade offering opportunities through processing enterprises. 4 - 5 species of mushroom are of industrial significance throughout the world (FAO, 2007, Chang and Miles, 1998).

1.2 STATEMENT OF THE PROBLEM

One of the world's biggest challenges is food insecurity. This problem is largely common in low and middle income countries which mainly have poor food production system and hence, suffer from serious malnutrition. Such countries must find ways of improving food production so as to feed vastly increasing human population. Mushroom cultivation could be a possible option to alleviate poverty and develop the life style of the vulnerable people (FAO, 1997).

Most of the urban development studies in the developing countries concentrate on housing, urban services and non-agricultural informal activities. However, they exclude or give little attention to mushroom agriculture. Despite its contribution to the urban economy and environment, mushroom has been underestimated and unrecognized, unassisted or discriminated and in some cases outlawed because of the supposed hazards associated with it. It is not also treated as a temporary phenomenon and research on this area has been scanty, especially in Ethiopia. It has been disregarded by researchers and little understood by urban planners, Ministry Of Agriculture, NGO's and decision makers. In short, studies conducted on this sector are limited and the existing studies focus on the limited aspects, to encourage researchers and people engaging on mushroom business. On the other hand, there are governments such as China and USA, who create agencies to manage mushroom agriculture and are actually encouraging the activity.

A well distributed and organized urban agriculture especially in developing countries can influence the quality of life of the people especially the poor urban population; nonetheless, urban agriculture in Addis Ababa is not well organized.

The social impact of agriculture is still predominant in Africa. In the absence of formal employment opportunities from other sectors of the economy, industries and services, agriculture remains a necessary contributor to livelihoods (Ellis, 1998), However, the economic impact of agriculture in Addis Ababa level is not always so significant.

Mushroom cultivation is an important part of urban agriculture. It is indicated that there are many opportunities to engage the people in mushroom cultivation. Therefore, mushroom cultivation is actually the true representative of social and economic activities and the one which large population may be engaged. However, mushroom production is affected by many challenges such as lack of local people awareness about collection and processing techniques, lack of proper market knowledge and access, lack of interest of government for its cultivation in the suitable areas, failure of government to include in the agriculture policy and quality of offspring which leads to lower prices in the market. Thus, it is vital to explore the challenges of urban mushroom producers through their experience and preferences.

The demand of mushroom has been increasing due to population growth, market expansion, changing of consumer behaviour, and developments in the manufacturing industries, storage, transportation, and retailing. Gradually, the world mushroom production has reached 33.4 million tons in 2007 while it was 26 million tons in 2000. China, United State of America and Netherlands rank as the first threes in mushroom production in the world. Nearly 42% of the world mushroom production takes place in China, 12 % in the USA, and 8% in the Netherlands (Anonymous, 1995) the remaining comes from other countries with no contribution from Ethiopia.

Since mushroom cultivation practice does not always require access to land (that is, space conserving) and large capital investment, it is a viable and attractive activity for rural, peri-urban and urban dwellers. Mushroom cultivation is suitable for all job seeking groups including women, elders, disabled and youngsters. Although mushroom cultivation is labour intensive, this may not be a problem of tropical regions (Chang, 2007 and FAO, 2012).

Currently in Addis Ababa fresh mushrooms are sold in supermarkets, cafeterias and hotels but it's not enough because of the cultural effects of the society. Its production and consumption system also low; even though large hotels and foreigners used from supermarkets which is imported from abroad, so production of mushroom in Addis Ababa cannot support the consumers in the city (AAUAB, 2015)

Finally this study assesses mushroom farms development conditions and its contribution to livelihood and households income in the city it also recommend the results and experiences obtained from small-scale mushroom cultivation to larger and more environmentally controlled production systems with facilities for the export market .

1.3 SIGNIFICANCE OF THIS STUDY

Mushroom agriculture is important as a source of fresh food by improving the supply of perishable but nutritious food to urban consumers. It is also a source of income and security for the producers and provides employment for all part of the population. Since mushroom agriculture is land saving, it also benefits the city at large in terms of more efficient use of land, in creating sustainable environment as mushroom can turn urban waste into resources.

Usually special skills and training are not required for people to be engaged in urban Mushroom agriculture. There is a job opportunity for unprivileged society who lacks formal schooling to participate. Both males and females are also active participants in urban agriculture. Hence, urban agriculture provides jobs for people with limited mobility, low skills and little capital.

Urban mushroom agriculture contributes much both for the urban environment, the urban population at large and the urban mushroom producers in particular. Hence, there is a need to recognize the activity to have an appropriate policies to improve the activity and the status of the urban farmers, since there were no any study conducted. Thus, it is hoped that the study will contribute a lot to indicate issues related to the nature and extent of the problems and attempts to investigate the challenges that the urban mushroom producers face at present and suggest some solutions and make significant contribution in formulating policies and strategies which could alleviate both the immediate and long-term problems of urban mushroom producers. It can also contribute to the effectiveness of governmental, non-governmental and community-based organizations in their effort in bringing about sustainable urban development

Despite of the high diversity in Ethiopia, very little of it is known. Cultivation and production of mushrooms has not been practiced on commercial scales in most developing countries which has consequently affected commercial mushroom marketing which is yet to be embraced by most farmers (AAUAB, 2015). In developing countries, governmental and non-governmental organizations have not given due attention to mushrooms as an important crop that can fetch farmers a substantial income to alleviate poverty. However, there is no mushroom cultivation practice in the country to fill the demands of people interested in the mushroom consumption (Gurja, 1993).

The study will also contribute to the literature of urban agriculture in general and urban mushroom in particular as the lessons to be drawn from this study are likely to fill the gaps in the literature about urban agriculture.

Generally the study will be important source of information for urban planners, policy makers, NGO practitioners and academic working on mushroom agriculture.

1.4 OBJECTIVES OF THE STUDY

1.4.1 General objective

The general objective of this study is to assess urban based mushroom farming in Addis Ababa; their contribution to employment, income and food security.

1.4.2 Specific objectives

1. To investigate the income, employment and consumption contribution of mushroom farms in supporting household food security in Addis Ababa.
2. To investigate the major factors affecting the practice, productivity and profitability of mushroom production.
3. To explore the main types of mushrooms and their social, economic and environmental impacts.
4. To review governmental policies that is related to urban agriculture especially mushroom agriculture and

1.5 RESEARCH QUESTIONS

On the basis of the problem stated and the objectives formulated, the following specific research questions are listed for further investigation.

1. Does mushrooms contribute towards the sustainability of the urban environment and benefiting the urban population and mushroom producers?
2. What are the major factors that influence the practice, productivity and profitability of mushroom farming?
3. What are the main types of mushrooms produced on mushroom farm that are influenced socially, economically and the environment?
4. What policy exists that support and improve the conditions of urban mushroom agriculture?

1.6 SCOPE AND DELIMITATION OF THE STUDY

Urban agricultural activities include varieties of activities such as the cultivation of crops, mushrooms, vegetables, fruits, floricultures, forestry and livestock rearing (cattle for beef and dairy products), sheep, poultry, bees etc. However, the scope of this research was limited to assess urban agriculture in Addis Ababa, with particular emphasis to urban mushroom agriculture.

1.7 LIMITATION OF THE RESEARCH

While conducting the study many challenging problems were faced the researcher. Some of them are; lack of collaboration and unwillingness of the producers to open their production place since light is unnecessary to mushroom growth and lack of cooperation in providing data (producers, managers and experts), high burden of job on managers and experts makes the data collection late, involuntariness of producers to give their response, time and financial constraints of the researcher and lack of compiled information about mushroom agriculture at country and city level were negatively affect the study.

1.8 ORGANIZATION OF THE STUDY

The report of the research is organized in five chapters as major parts. The first chapter is introducing the research. The second chapter concern with review of related literature. The third chapter includes methodology for conducting the research. The fourth chapter focus on the major findings of the results and analysis of the collected data and then present the major findings and the fifth chapter draws conclusions and proposes some recommendations.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1 URBAN AGRICULTURE

2.1.1 CONCEPT OF URBAN AGRICULTURE

According to the UN Development Programme, some 800 million people, or nearly 8% of the world's population, are now engaged in urban agriculture worldwide; Urban agriculture is defined as the practice of food production within a city boundary or on the immediate periphery of a city, it includes the cultivation of crops, mushroom farming, vegetables, herbs, fruit, flowers, orchards, parks, forestry, fuel wood, livestock, aquaculture, and bee-keeping or Urban gardeners around the world are very often rural migrants or immigrants who used to rely on the land for food, or who need supplements to their food supply or income. They tend to be a vulnerable population, and the gardens and farms act as a means of increasing security and health (Mara, 2009).

Urban agriculture means farming in the city. It refers to the system of cultivating, processing and distributing food crops in a town or city (FAO, 1999). It also denotes animal husbandry, aquaculture, agro-forestry and horticulture carried on in a city or town. The cultivation carried out in peri-urban areas is also called as urban agriculture. Urban agriculture is also called as urban farming.

UNDP (2006) has also defined urban agriculture; as an activity that produces, processes, and markets food and other products, by using intensive production methods, natural resources and urban wastes, on land and water in urban and peri-urban areas to yield diversity of crops and livestock.

Urban agriculture is an industry that produces, processes and markets food, largely in response to the daily demand of consumers within a town, city, or metropolis, on land and water dispersed throughout the urban and peri-urban area, applying intensive production methods, using and reusing natural resources and urban wastes, to yield a diversity of crops and livestock (Smit et al. 1996).

Urban agriculture comprises of the production, processing and distribution of a diversity of foods and non-food products including vegetables and animal products within or at the fringe of an urban area (FAO, 2012). Its main motivation is food production for personal consumption or to generate income.

2.1.2 URBANIZATION, POPULATION GROWTH AND FOOD SUPPLY

Addis Ababa is the capital and largest city in Ethiopia, its 99.4% of the population lives in slums. Slight increases in food prices and available land for cultivation can push many individuals and families into hunger. With this in mind, there is a growing movement to empower the efforts of farming within the city (CSA, 2007).

Urbanization is an inevitable consequence of socio-economic development but in many countries it is proceeding at such a fast rate that it is out-pacing the growth of services and employment (FAO, 2001). Major concerns of rapid urbanization include inaccessibility to clean drinking water, inadequate food supplies, lack of housing, air, soil and water pollution and increasing production of solid waste. Rapid urban population growth and unmanaged expansion are also degrading the environment of cities and their surrounding bio-regions.

High levels of urbanization, population growth and rapid expansion of urban areas represent a new dimension for development and food security policies in many developing countries (FAO, 1997). There is increasing concern about the impact of growing levels of urbanization; by the year 2020, 75% of the world population will be living in urban areas. Many will be living close to or below the poverty line. How to adequately feed this rapidly expanding urban population is a challenge. Population growth is an important element in the growth of demand for food in the city as a rapidly growing population requires a fast increase in agricultural production to maintain the current level of consumption.

Many African cities have urban growth rates which will double their population in less than twenty years. Urban poverty has been on the increase with increasing urbanization for reasons like rapid population growth, economic recession and structural adjustment policies. Hence, the challenge for countries is represented by the need to organize food production, processing and marketing facilities so as to satisfy an urban demand characterized by growing poverty levels (FAO, 2001). Urbanization influences the aspects of food production and consumption. Urban populations are growing fast because of natural growth and rapid migration to the cities as people escape rural poverty, land degradation, famine, war and landlessness thereby necessitating high demand of food for the rapidly growing population Urban growth has a number of direct and indirect consequences on food supply and distribution which are relevant in the assessment of urban food security. Urban growth increases marketed food demand but reduces the availability of productive land. It modifies food purchasing habits and makes existing market areas and infrastructure inadequate; it increases the price of available land, intensifies traffic, alters the location of consumers and modifies their food consumption habits, increases the distance of consumers from their work sites and the cost of food transport (FAO, 2001 and 2012), 800 million people engaged in urban agriculture, 15 – 20% of global food output is from cities 50-70% of income of the urban poor is spent on food Local production is a dominating factor in determining progress or failure in improving food security.

2.1.3 FEATURES OF URBAN AGRICULTURE

Ethiopia has a high rate of urbanization, averaging about 4.3% per annum. About 30% of this population is concentrated in the capital and primate city, Addis-Ababa. The City's population growth has been accompanied by growing unemployment, urban poverty and malnutrition. The Addis-Ababa City Government has recognized urban agriculture as one of the important tools to end poverty. However, its contribution towards income generation, employment creation, food security, poverty alleviation and environmental protection has remained negligible (Thomas, 2013).Urban agriculture can directly and indirectly contribute in pursuing several of the Millennium Development Goal (MDG). Urban agriculture has direct contribution in poverty and hunger reduction and the reduction.

There is now growing consensus that urban agriculture is not a problem, as previously thought, but an important contributor to sustainable urban growth, development and to people's livelihoods. The sector contributes significantly to food supply, employment creation, income generation and environmental management. It is estimated that about 800 million people worldwide engage in urban agriculture (Thomas, 2013). It is thought that globally, urban agriculture produces 15% of all food consumed in urban areas, and that this figure is likely to double within the next twenty years.

2.1.4 IMPACTS OF URBAN AGRICULTURE

The social impact of agriculture is still predominant in Africa. In the absence of formal employment opportunities from other sectors of the economy; industries and services, agriculture remains a necessary contributor to livelihoods. However, the economic impact of agriculture at the country level is not always so significant (FAO, 2012).

A major feature of Urban Agriculture is the diversity of the socio-economic profiles of the actors involved, and their varying income and livelihood strategies, a reflection of the diversity of the labour and capital basis in urban areas (Hubert et al, 2008).

Urban agriculture can cause long-term adverse impacts on environmental quality and human health. Nearly half of the households lacked access to good drinking water. Good quality and drinking water and a safe& healthy environment are essential prerequisites for food safety. Their absence will pose a serious health risk to the larger proportion of urban households. Even though urban agriculture has the potential to recycle waste water and organic materials and thereby contribute to solving waste disposal problems in urban areas, the uncontrolled use of untreated waste water in backyard gardens can become a breeding ground for diarrhoeal diseases and increases income spent on medical expenses. Excessive accumulation of heavy metals in agricultural soils may not only

result in environmental contamination, but lead to elevated heavy metal uptake by crops, which may affect food quality and safety (Susan, Emmanuel and Dmitri, 2010).

Thomas (2013) stated that urban farmers are men and women coming from all income groups. However, the majority of them are low to medium income earners, who grow food for self-consumption or supplementary income. Low-income farmers practice urban agriculture mainly to survive and achieve a combination of nutritional and socio-economic benefits. Middle-income home gardeners practice urban agriculture mainly to provide supplementary food and /or income. Agribusiness farmers practice urban agriculture to obtain income, although these are often in the minority. In the second and third categories are found people who have their gardens maintained by their servants and watchmen. Most of the cultivation is informal, with little, if any support.

2.1.5 CHALLENGES OF URBAN AGRICULTURE

The marketing of farm production, especially vegetables, is considered as a major challenge facing farmers. There are profound fluctuations in prices resulting from supply and demand inequalities. Usually, households residing near the urban farms purchase the biggest share of the production but in most cases at low prices which do not reflect the effort of the farmers (Kutiwa, Boon and Devuyst, 2010). Agricultural land in urban areas has the lowest value and is therefore, considered uneconomic. Thus, little land is allocated for this purpose in urban areas. Most farmers who cultivate in open spaces, urban fringes and along roadsides in the city, inherited land from family and friends, rental or had acquired the land by first claim, the first person who found a vacant piece of land and started using it became the de facto owner. However, these farmers have limited security of tenure.

2.1.6 OPPORTUNITIES AND RISKS ON URBAN AGRICULTURE

Urban agriculture is diverse activities, which have proximity to large settlements of people, thereby creating opportunities as well as risks. According to Daniel (2012), the opportunities include: Access to consumer markets, Less need for packaging, storage and transportation of food, Potential agricultural-related jobs and incomes, Non-market access to food for poor consumers, Availability of fresh, perishable food, Proximity to services, including waste treatment facilities and Waste and by-products recycling and re-use possibilities.

The risks include; Environmental, health risks from inappropriate agricultural and aquaculture practices and also increased competition for land, water, energy, and labour.

2.2 MUSHROOM AGRICULTURE; CONCEPTS, FEATURES, CHALLENGES, POLICIES, OPPORTUNITIES, PROSPECTS AND MARKETING CHANNELS

2.2.1 CONCEPTS

Mushroom is any of various fleshy fungi; characteristically having an umbrella-shaped cap borne on a stalk grows usually in the forest. Mushroom is not a taxonomic category. The term mushroom is a macro-fungus with a distinctive fruiting body, which can be hypogenous or epigeous, large enough to be seen with the naked eye and to be picked by hand (Chang and Miles, 1992).

A mushroom is the fleshy, spore-bearing fruiting body of a fungus, typically produced above ground on soil or on its food source. The standard for the name mushroom is the cultivated white button mushroom, Agarics bisporus; hence the word mushroom is most often applied to those fungi (Basidiomycota, Agaricomycetes) that have a stem (stipe), a cap (pileus), and gills (lamellae, sing. lamella) or pores on the underside of the cap. These pores or gills produce microscopic spores that help the fungus spread across the ground or its occupant surface (Chang, 2007).

Mushrooms lack true roots and they anchored into the substrates, this is affected by their tightly interwoven thread-like hyphae, which also colonise the substrates, degrade their biochemical components, and siphon away the hydrolysed organic compounds for their own nutrition (Chang, 2007). "It has been well known that the 20th century has been an explosive time for the accumulation of knowledge. Modern technology for human civilisation is expanding every day. However, human beings still face and will continue to face three basic problems: shortage of food; pollution of the environment; and diminishing quality of human health, due to the continued increase of the world population. The 20thC began with a world populated by 1.6 billion people and ended with 6 billion inhabitants-- with most of the growth occurring in the developing countries".

The growing world population is increasing by about 80 million people per year. At present, about 800 million people in the world are living in poverty. On the other hand, it has been observed that over 70 % of agricultural and of forest products has not been put to total productivity, and have been wasted in processing. Mushrooms can convert these huge lignocelluloses biomass wastes into human food, produce notable immune enhanced products, which have many health benefits. Another significant aspect of mushroom cultivation is in creating a pollution-free environment (Chang, 2007).

2.2.2 FEATURES OF MUSHROOM AGRICULTURE

The main activities of a mushroom farm are culture preservation and spawn-making, substrate preparation, spawn-running, casing-watering, hygiene (maintaining standards of cleanliness to minimize the incidence of pests or diseases), harvesting/ packing and supplying mushrooms to the market (Gurja, 1993).

Cultivation of mushrooms is labour intensive for the countries where jobs are rare. In fact, some technologies can use family labour thus providing employment for all of the family members (Chang and Miles, 1992).

The potential of mushroom cultivation to poverty reduction among the vulnerable groups like women are especially encouraged. In this context, an assistance of the local government is important for the development of mushroom industry which can create job opportunities both in semi-urban and rural areas (UNDP, 2006).

One of the attractive factors towards mushroom farming is the short time period between cultivation and harvesting where people not require much more initial investment and can be grown with locally available resources. Most of the farmers did not have strong economic background. They had to take loans and wanted to repay it as soon as possible. Mushroom farming gave them quick profit (Celik and Peker, 2009).

An important factor of mushroom cultivation spawn is profitable. The spawn of mushroom is like seed is to crop. Unlike spore, spawn is already at its mycelia stage growing on its own substrate such as sawdust. The life cycle of mushroom starts from spores, but growers inoculate mycelia origin spawn rather than spore origin spawn because of possible variations and mutations. The quality of spawn is one of the most critical factors for successful crop. Therefore, growers need to use qualified spawn for commercial production. Spawn maintains the strain characteristics and is propagated by subcultures (Erkal and Aksu, 2000).

Mushroom cultivation is one of the immense potential agricultural activities which could trigger youth generation towards the sector. High valued crop in terms of both food and medicine aspects with low cost production technology can not only attract youth but also smallholder farmers to get high return within short time interval (Madan, 2014).

Mushrooms are devoid of leaves, and of chlorophyll-containing tissues. This renders them incapable of photosynthetic food production. Yet, they grow, and they produce new biomass. For their survival, for their growth, and for their metabolism, they rely on organic matter synthesized by the green plants around us, including organic products contained in agricultural crop residues. The organic materials, on which mushrooms derive their nutrition, are referred to as substrates. Mushrooms are a unique biota which assembles their food by secreting degrading enzymes and decompose the complex food materials present in the biomass where they grow, to generate simpler compounds, which they then absorb, and transform into their own peculiar tissues. These substrate materials are usually by-products from industry, households and agriculture and are usually considered as wastes. And these wastes, if carelessly disposed of in the surrounding environment by dumping or burning, will lead to environmental pollution and consequently cause health hazards.

However, they are actually resources in the wrong place at a particular time and mushroom cultivation can harness this waste/resource for its own beneficial advantage (Chang and Miles, 1992).

Preconditions to be start up and profitable in mushroom cultivation; choose the species to grow by thinking about (Alice and Michael, 2004); "what waste materials are readily available to use as a growth medium, what kind of facility or environment is available, how much will the necessary equipment cost, what level of skill is required to manage the life cycle of the fungus and, what is market demand for this species"?

2.2.3 THE SCIENCE AND ART OF MUSHROOM CULTIVATION

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 cultivation is both a science and an art. The science is developed through research; the art is perfected through curiosity and practical experience. Mushroom growth dynamics involve some technological elements, which are in consonance with those exhibited by our common agricultural crop plants (Chang and Chiu, 1992).

2.2.4 BASIC REQUIREMENTS IN MUSHROOM AGRICULTURE

According to AAUAB (2015); to produce and continued the practice of mushrooms agriculture, the following conditions are necessary;

Temperature –mycelia are grow with a place its temperature is from 5 - 40^0C, the mycelia is changed to mushroom by 10 – 20^0C and the mushroom develops between 13 – 21^0C.

Substrates – substrates mushrooms are grown from 65 – 75% moisture content; if possible from 75 – 85% and from 6 – 8 PH value of acidity of the soil.

Bedrooms – the bedrooms (boxes) should construct with 120 – 150cm width and 15 – 20cm depth with not less than 24 m^2. This gives averagely from 5–7kg mushroom production per one bedroom and also may give up to 20,000kg per hectare.

Altitude – mushrooms are growing in all altitude places, it is determined based on its temperature and moisture content.

Light and **air** – to develop mushrooms high content of CO_2 and low amount O_2 is needed once a day; in addition to this it should be covered by a black plastic to protect light.

Chemicals – to control flies, pests, weeds and diseases; the production place should be sprayed using chemicals.

2.2.5 MAJOR PHASES OF MUSHROOM CULTIVATION

Mushroom farming requires precision (exactness). It calls for adherence to precise procedures. The major practical steps/segments of mushroom cultivation are: Selection of an acceptable mushroom species, secreting a good quality fruiting culture, development of robust spawn, preparation of selective substrate/compost, care of mycelia (spawn) running, management of fruiting/ mushroom development and harvesting mushrooms carefully (Chang and Chiu, 1992, Wang, Liu, Ooi and Chang ,1996). If you ignore one critical step/segment, you are inviting trouble, which could lead to a substantially reduced mushroom crop yield and mushroom marketing value.

Alice and Michael (2004) also stated that, mushroom production, as a cycle that takes about 15 weeks from start to finish; choosing a growing medium, pasteurizing or sterilizing the medium (The substrate on which the mushrooms will fruit must be sterilized or pasteurized in order to destroy any fungal and/or bacterial competitors), seeding the beds with spawn (material from mature mushrooms grown on sterile media), maintaining optimal temperature, moisture, and other conditions for mycelium growth and the conditions that favour fruiting, this is the most challenging step, harvesting, packaging, and selling the mushrooms and cleaning the facility and beginning again.

2.2.6 MAJOR TYPES OF MUSHROOMS

The number of mushroom species on the earth is estimated to be 140000 and only 10% are known. The proportion of useful mushrooms among the undiscovered and unexamined mushrooms may be 5%, which can be of possible benefit to mankind (Hawksworth, 2001).

Roughly 300 mushroom species are edible, but only 30 have been domesticated and 10 are grown commercially. Button, oyster, and shiitake mushrooms make up about 70% of the world's production. Agaricus is the leading mushroom crop worldwide and accounted for 99% of the 1997 United States' mushroom production. Oyster mushrooms were more recently domesticated, and now rank second in world production. Shiitake mushrooms, which are very popular in Asian cultures, rank third. Many other edible mushrooms, such as straw and wood ear mushrooms, are gaining in popularity (Danny and Chang, 1996).

Oyster mushrooms are a good choice for beginning mushroom cultivators because they are easier to grow than many of the other species, and they can be grown on a small scale with a moderate initial capital investment. Although commonly grown on sterile straw from wheat or rice, they will also grow on a wide variety of high-cellulose waste materials. Some of these materials do not require sterilization, only pasteurization, which is less expensive. Another advantage of growing oyster mushrooms (Alice and Michael, 2004) is that a high percentage of the substrate converts to fruiting bodies, increasing the potential profitability. Oyster mushrooms can

become an integral part of a sustainable agriculture system. Many types of organic wastes from crop production or the food processing industry can be used to support oyster mushroom production.

Edible mushrooms once called the “food of the gods” and still treated as a garnish or delicacy can be taken regularly as part of the human diet or be treated as healthy food or as functional food. The extractable products from medicinal mushrooms, designed to supplement the human diet not as regular food, but as the enhancement of health and fitness, can be classified into the category of dietary supplements/mushroom nutriceutical (Chang and Buswell, 1996). Dietary supplements are ingredients extracted from foods, herbs, mushrooms and other plants that are taken without further modification for their presumed health-enhancing benefits.

There are hundreds of identified species of fungi which have made a significant global contribution to human food and medicine. Some estimate that the total numbers of useful fungi defined as having edible and medicinal value are over 2300 species. Cultivated mushrooms have now become popular all over the world. There are over 200 types of macro fungi which contain species of use to people. Twelve species are commonly grown for food and/or medicinal purposes, across tropical and temperate zones, including the Common mushroom (Agaricus), Shiitake (Lentinus), Oyster (Pleurotus), Straw (Volvariella), Lion’s Head or Pom Pom (Hericium), Ear (Auricularis), Ganoderma (Reishi), Maitake (Grifola frondosa), Winter (Flammulina), White jelly (Tremella), Nameko (Pholiota), and Shaggy Mane mushrooms (Coprinus). Commercial markets are dominated by Agaricus bisporus, Lentinula and Pleurotusp, which represent three quarters of mushrooms cultivated globally (Elaine and Nair, 2008).

2.2.7 SEXUALITY IN THE EDIBLE MUSHROOMS

The process of sexuality is complicated by nutritional and physiological conditions; genetic constitution is the most critical factor determining both the occurrence and the morphology of the fruiting bodies in the edible mushrooms. Sexuality in fungi consists of three important stages. The first essential stage is plasma gamy which is the fusion of cytoplasm of the two mating individuals. By plasma gamy the nuclei from two strains are brought together in a common cytoplasm. The second essential stage in sexuality is known as karyogamy or nuclear fusion. The third essential stage is meiosis, the nuclear division in which the chromosome number is reduced from the diploid to the haploid number. The product of meiosis is the formation of a tetrad. Through the process of sexuality, genetic recombination and segregation subsequently occurs (Chang, 1999).

2.2.8 PROSPECTS, OPPORTUNITIES AND RISKS IN MUSHROOM AGRICULTURE

Rural and peri-urban populations in developing nations often suffer from poor nutrition, inadequate incomes, and job shortages. Many African nations have the additional problem of coping with the thousands of orphans, whose parents were lost to the AIDS epidemic.

There are now some innovative programs that are developing mushroom cultivation as a means of ameliorating (enhancing) these problems. There is an abundance of agricultural waste in these poor areas, which is normally discarded. Mushroom cultivation is able to transform this agricultural waste into a nutritious food and to create income-generating opportunities.

This is accomplished by training communities (especially women and youth) in the skills and technologies involved in the production of mushrooms. As a result, these communities develop economic self-reliance as well as individual self-esteem (Simsek, 1988).

Erkal and Aksu (2000) summarized the strengths of mushroom agriculture as "cost of production is low because Seasonal production is possible**,** raw materials are easily and cheaply available for compost and casing material, awareness about food and medicinal values is increasing in country thus creating better domestic market, transport facilities are available both by land and air, there is increasing market for postharvest products, they are mainly utilizing the agricultural waste mainly wheat and paddy straw and may reduce poverty and improved the life style of many poor people", On the other side mushroom has weakness such as high cost of energy for year round production, unorganized production and sale particularly by seasonal farmers and lack of facilities to produce quality compost, casing material, spawns and processed products**,** it grows on wide range of agricultural wastes, it can grow in wide range of temperatures, its conversion rate i.e., mushroom production from the substrate is high (be 100%), It is less prone to diseases and competitor moulds that other mushrooms, faster growth rate and easy cropping, low cost of production, can create self-employment and easy post-harvest processing particularly dehydration, its production by poor people can help to bring them above poverty line and improve their socioeconomic status, can grow in the small space of a farmer's own house for small scale production and generate income that aids in the family support, suitable for the women's life style, the product is highly nutritive and a good food for children and old parents, and because of its high economic value they can also earn some income from the production, can brought significant economic, social and environmental benefits to poor and women". Spore allergy to certain people and **c**hanging trend in agricultural support policies and lack of spore less commercial strain are also identified as a threat in mushroom agriculture".

As Erkal and Aksu, (2000) stated that in accelerating mushroom production in developing countries depending on local resources, the following issues have gained more importance to create the

investment support to mushroom enterprises;"Improving local knowledge and skill, Strengthening cooperation and partnership based on local mushroom production, Enhancing entrepreneurship culture and empowerment of the productivity of rural community, Establishing the value added chain of mushroom from farm to the final consumer, Developing production technology and increasing productivity, Ensuring low cost raw material needs of mushroom production, Utilizing the potential of mushroom industry by meeting the expectations of consumers at unique markets and Increasing the efficiency of storage, transportation, packaging, labelling, promotion and marketing activities of mushroom, Strengthening mushroom production sector could be essential in order to enable the rural economy to keep its vibrancy and development, increasing and diversifying business and employment opportunities in the rural areas, and providing income opportunities for disadvantageous groups, small family farms. Those mainly depending on local opportunities and circumstances, supporting microenterprises, strengthening structures for processing mushroom in parallel with developments in consumer preferences. On the other hand, the local knowledge and experience in mushroom production have the potential to provide significant opportunities to develop micro enterprises and entrepreneurship. Vocational training opportunities shall be provided in order to develop human resources in addition to the investment supports for mushroom production".

Taking necessary precautions can be advantageous in order to further improve the mushroom production. These measures can be listed as follows; "The lack of knowledge in cultivation as well as in fighting diseases and pests should be eliminated, the mushroom producers are not organized in any manner whatsoever, mushroom producers is formed on effectiveness to be obtained in both marketing and price determination and the most important input in the mushroom production is the compost".

Producers face various problems in obtaining the supply of quality and healthy compost as Erkal and Aksu, (2000) stated, these includes;

"Increasing tendency for demand of mushroom, migration of young from rural areas, loss of productive factors and ageing population, increasing interest in protection and improvement of environment, accessibility to European Union, and domestic funds, increasing pressure of rapid urbanization, and industrialization, enhanced opportunities to access foreign markets, progress in production, and processing technologies, rising input prices in the world, creating strong functional relations between urban population and mushroom producers, increasing concern for the empowerment of local support and improvement of public administration for mushroom production and growing intra and inter-regional development disparities".

As Beje, Diriba and Dawit, 2012; Chang, 2007; Madan, 2014 and FAO, 2009 stated that;

"Since mushroom cultivation practice does not always require access to land (that is, space conserving) and any significant capital investment, it is a viable and attractive activity for rural, peri-urban and urban dwellers. Mushroom cultivation is suitable for all job seeking groups including women, elders, disabled and youngsters. Although mushroom cultivation is labour intensive, this may not be a problem of tropical regions. In addition, mushroom cultivation drives towards full use of all materials in which nothing left as waste, without any adverse impacts on the environment through sustainable utilization of lignocelluloses wastes available in abundance everywhere, usually as by-products from agriculture, forestry and households. Currently, mushrooms are regarded as the most profitable and environment-friendly method for recycling of the vast lignocelluloses waste substrates which could otherwise dropped into the environment and cause pollution. Another attractive factor towards mushroom farming is that; the short time period between cultivation and harvesting where people not require much more initial investment and can be grown with locally available resources".

2.2.9 FACTORS AFFECTING MUSHROOM AGRICULTURAL PRACTICE, PRODUCTIVITY AND PROFITABILITY

1. CULTURE INFLUENCE

Mushroom is not a traditional crop in Ethiopia or in Africa in general and the low level of research and training in mushroom cultivation is the main problem hampering the development of mushroom production (Gurja, 1993).

"Mushroom farming can be good source to attract youth of today's generation and better way to upheaval the economic status of smallholder farmers. Technology transfer is also a challenging issue considering the literacy level of farmer and long history of dependency on traditional method. The rational idea to trigger the mushroom production is to attract young generation towards mushroom farming with improved technology, training and research (Madan, 2014)".

In developing countries small family farms are disadvantaged groups since they do not have enough land to produce crops and raise animal. Mushroom production can be; "meaningful to the extent that non-agricultural job and income opportunities. Intensive type of mushroom production could provide good alternative income opportunities for small family enterprises since they do not have adequate land to produce crops and raise animal. Also, mushroom production gives additional and / or alternative income to farmers looking for a value-added product and a way to supplement farm income while making use of by products or co-products from other crops. Since mushrooms can be grown on nearly any type of agricultural and forestall residue (Madan, 2014)".

2. PHYSICAL FACILITY

The most important problem of the producers who cultivate by renting a workplace was the lack of places such as organized industrial areas, where the producers are together and where necessary buildings are built for producing mushroom. As there is no such structuring, production rooms are formed by renting empty workplaces and making necessary alterations. In that case, due to bad smell released from waste compost the industrialists operating in other areas are disturbed and furthermore environmental problems also appear (Simsek, 1988).

Many of the physical assets required to undertake mushroom cultivation for local consumption and trade are not exclusive items, but rather assets which help to meet livelihood needs in general, including the transport and communication infrastructure, clean water, a source of energy, and buildings for shelter and storage (FAO, 2008).The more developed the infrastructure, the easier it is to establish and undertake mushroom cultivation.

In Ethiopia the area of land required for mushroom cultivation is small, as mushrooms do not need light for growth and they are commonly produced on shelves indoors. Thus mushrooms can be produced and harvested throughout the year with relatively little investment (Gurja, 1993).

3. INSECTS, DISEASES AND ANIMALS

As mushrooms are grown mostly in an enclosed environment, the risk of pests and diseases spreading rapidly within the crop is high, so it is important to monitor the crop on a daily basis for incidence of pests and diseases, to prevent losing at least some of the crop. It is also important to sterilize the growing room and the preparation areas on a regular basis from insects and animals (Noble, 2005).

Operating and maintaining environmental controls require a certain degree of technical expertise. Cleanliness is critical in controlled environment production systems to ensure high-quality products free of potentially toxic contaminants. Pest control is also critical because some insect pests, such as fungus gnats, flourish under the same conditions that favour mushrooms (Danny and Chang, 1996).

One of the most challenging activities of a small-scale mushroom farm is to control the diseases and pests of mushrooms, such as various species of mould, weeds, bacterial blotch and, most damaging of all, mushroom flies. Good management practices and strict hygiene can reduce these problems (Gurja, 1993).

4. LACK OF FINANCE AND SKILL

A level of technical guidance and support will be beneficial to most mushroom growers, particularly in the initial stages of cultivation, as many of the technical terms and procedures relating to mushroom cultivation may be unfamiliar to potential growers. Growers need to be familiar with fungi life cycles, and the importance of hygiene and sterilization in developing a

successful growing system. Support may be required to improve cultivation techniques, access to appropriate varieties of spores, and post-harvest care (Noble, 2005). Financial resources will become more important as the size of an enterprise scales up, or if cultivators want to explore adding value through processing and consider investment in drying equipment, or secure specialist containers to package and transport products further to more distant markets.

In mushroom cultivation staff is employed in substrate preparation and composting, cleaning of mushroom houses, harvesting and packing. A driver is responsible for transporting raw materials to the farm and mushrooms to market. A guard takes care of the farm property. A manager is responsible for production, marketing and profitability (Gurja, 1993). Mushroom cultivation requires expertise in the techniques of spawn-making, substrate preparation, composting, pest control, harvesting and packing

5. INPUTS AND SPAWN PROBLEM

As Gurja (1993) stated that the major constraint to mushroom production in Africa has been the lack of spawn, the vegetative seed of mushrooms. Spawn suppliers (enterprises) did not exist in Africa and obtaining quality spawn from abroad is expensive and technically difficult. Moreover, the yield of mushrooms depends on the type of substrate used, the method of preparation and the suitability of environmental conditions (temperature and humidity) for growth and fruiting-body formation.

6. MARKETING CHALLENGES

Concerning marketing, all producers complain about the decrease and instability in the sales prices despite the regular cost increases. On the other hand, it was stated that the mushrooms brought from the other district of Turkey and its vicinities and introduced to the market at lower prices have diminished the competition power of the producers and also brought along the issue of their no longer being effective in price determination. The other problems related to marketing were the negativities met in collecting payment in exchange for the product (deferred payment sale, delays etc.) and deficiencies in marketing organization (Simsek, 1988).

7. ENVIRONMENTAL CONDITIONS

The most important factor for mushroom growing is providing an appropriate environment both for vegetative and reproductive growth. Not being protected by a skin layer, fungi are easily affected by their growing conditions. So it can be said that the success or failure of mushroom cultivation depends on the control of growing conditions. Environmental factors affecting mushroom (Chang and Miles, 1992) cultivation include temperature, humidity, light and ventilation. Optimal levels of them at vegetative stage differ from those at reproductive stage. Mushrooms are strongly affected

by temperature, humidity, and light. A cold snap, heat wave, or drought can reduce yields or favour the development of undesirable weed moulds (Danny and Chang, 1996).

Rice straw, wheat straw, sugarcane waste, banana leaves, grass and sawdust are the major fibrous residues important for mushroom cultivation substrates (Hawksworth, 2001). Furthermore, Mushroom mycelia grow well with the temperature range between 5^0c and 40^oC. Substrate moisture content should be 60-75% and log moisture content 35-45%. During fruiting, different relative humidity levels ranging from 80-95% are needed at the early, mid and later stage.

"The use of bioconversion processes to transform the polluting substances into valuable foodstuffs, e.g., the proper treatment and reutilization of spent substrates/composts in order to eliminate pollution problems (Beyer and Noble, 2005). One of the most intriguing opportunities offered by mushroom mycelia in the area of bioconversion is the exploitation of their ability to degrade pollutants, many of which are highly carcinogenic, released into the environment as a consequence of human activity and the use of fungi/mushroom mycelia as tools for healing soil, what (Mitlin 2005) called "mycorestoration", which is the use of fungi/mushrooms to repair or restore the weakened or damaged bio systems of environment. The processes of mycorestoration include the selective use of mushrooms for microfiltration, to filter water; mycoforestry, to enact Eco forestry policy; mycoremediation, to denature toxic wastes; and mycopesticides, to control insect pests. Mycorestoration recognizes the primary role fungi/mushrooms can play in determining the balance of biological populations."

8. CLIMATE CONDITIONS

The prevailing mild temperatures in Ethiopia, particularly in the highlands, are conducive to mushroom growing. Although the low level of relative humidity during most of the year is not optimal for cultivation, this is a problem that can be dealt with by using appropriate environmentally sustainable methods of moistening the air (Gurja, 1993). Moreover, the yield of mushrooms depends on the type of substrate used, the method of preparation and the suitability of environmental conditions (temperature and humidity) for growth and fruiting-body formation. The environmental factor is very important for the production of oyster mushrooms. Various mushrooms are known to be sensitive to the climatic conditions. The major environmental factors like temperature, humidity, fresh air and compact materials affect in mushroom production.

2.2.10 MUSHROOM AGRICULTURAL PRACTICE IN SOME SELECTED COUNTRIES

MUSHROOM IN USA

Based on the reports of (Alice and Michael, 2004); about 260 USA growers produced more than 844 million pounds of mushrooms in 2002-03, with a farm gate value of $889 million. Certified organic mushrooms accounted for only 1% of all sales, although 12% of growers were certified

organic. The vast bulk of sales were of the Agaricus species. Large, well-established companies produce virtually all Agaricus mushrooms; most are located in Pennsylvania and California. Their production houses are full of mushrooms in every stage of development. Mushrooms raised in these systems can be sold profitably on the wholesale market. It is very difficult for a beginning grower to compete with these companies at wholesale prices.

The key to the mushroom business in the USA is to have established buyers and be capable of consistent production. New growers might encounter an uphill educational experience for two or three years. Launching a commercial mushroom operation can cost between $50,000 and $250,000, depending on whether a grower starts with an appropriate building. For that reason, it is prudent to start small (Drescher, 2000).

As (Chang and Danny, 1996) stated that; mushroom production in the United States has traditionally centred in Pennsylvania, California and Florida. These are the leading producers, with limited production in 27 other states. Large-scale growers with established, year-round markets dominate commercial mushroom production. In 1997, 7% of United States mushroom farms supplied 20 million pounds or more each, or 38% of total U.S. production. In contrast, 36%of mushroom farms produced less than one million pounds per year.

MUSHROOM IN BRAZIL

Thanks to a great marketing strategy in Japan say Colauto and Silveira (2010) the medicinal mushroom in Brazil has obtained relevant value. Japan has become the greatest importer of mushroom produced in Brazil. Since then, many Brazilian farmers, and many people without any prior experience with agricultural activity, have realized the promise of cultivating this mushroom and generating a strong expansion of its cultivation in several regions of Brazil. This expansion has increased the popularity of this mushroom species in the country and Brazilians' knowledge of the medicinal properties not only of this species but also of other edible mushroom species. Nevertheless, people without proper qualifications who also began cultivating this mushroom later suffered great losses, mainly due to false advertisements by specialists in the area, which led to the contamination of these cultivation activities by immoral economic interests.

This scenario began to change in 2006, when a great decline in Japanese importations occurred due to problems found in mushrooms imported from other countries, which made the mushrooms harmful to human health. Although the Brazilian product was considered of higher quality, this did not prevent a decrease in Japanese consumption. Consequently, importations fell drastically, causing most Brazilian producers to give up production Colauto and Silveira (2010).

As Colauto and Silveira (2010) further stated that the decline in Japanese importations occurred for three consecutive years (2006 to 2008), and the market suffered a loss of 76%. In 2009, the market

stabilized, with a slight increase in exportations. It is not possible to predict whether the market will return to the levels of 2004; however, producers who maintained their mushroom cultivation activities have now found economically favourable conditions for this mushroom's cultivation. This has occurred firstly because exportation to Japan continues, although with less intensity, and also because there has been an increase in demand in the Brazilian market, either for consumption in the form of tea or for sale as capsules.

A mushroom also has great potential for its culinary uses, which might increase its consumption. In light of the current situation regarding its potential for consumption and the importance this mushroom had in changing perceptions of Brazilian consumers with respect to edible and medicinal mushroom consumption (Colauto and Silveira, 2010).

2.2.11 POLICIES ON URBAN MUSHROOM AGRICULTURE

Policy decision and integration of Urban agriculture into development strategies are prerequisites to efficiency and long term sustainability of Urban agriculture programs, which need to address multi-sectoral and multi-disciplinary issues including crop and livestock production, aquaculture, agro-forestry in the overall context of proper natural resource management. Rising food prices, has an ever more negative impact on the potential access to adequate food for the poorer sectors of the urban population (Daniel, 2008).

The city of Addis Ababa has an Office of Urban Agriculture. Some of the responsibilities of the office include: design strategies for the production and supply of quality agricultural products and for the expansion of investment that enhances agricultural development in the city and implements same upon approval, facilitate the ways for the distribution of improved products of agricultural technology, selected seed and fertilizer, supervise the outcome thereof; give education and training as well as render professional support to farmers, design ways of reforestation, prepare for the conservation and protection of forest resource and issue and supervise professional licenses to individuals and enterprises that are engaged in agricultural activity (Mara, 2009).

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Mushroom is an important vegetable usually grows in the forest with its nutritive and medicinal value. It can also be cultivated domestically in a small scale by landless people. The cultivation of mushroom is one of the profitable agricultural jobs. The profitability of mushroom cultivation was

found comparatively higher than that of rice and wheat, the most popular cash earning crops in Bangladesh. As funding to promote the production and consumption of mushrooms is limited, local government and NGOs can play vital role to develop mushroom agriculture to arise at industrial level which can create ample employment opportunities both in semi-urban and rural areas (Aksu, Isik and Erkal, 1996).

Although mushrooms have been collected from the wild and cultivated artificially for human food and for medicine uses for hundreds and thousands of years, it is only recently that the three main segments of the mushroom industry could be identified. These three segments have received international recognition as important inter-related components, with each deserving its own special patronage and paths of development: cultivated edible mushrooms, medicinal mushrooms (mushroom derivatives-used as nutriceutical therapy/dietary supplements); and wild mushrooms including edible mycorrhizae, symbiotic and poisonous mushrooms (collected up to now only from the wild).

2.2.12 IMPORTANCE AND IMPACTS OF MUSHROOM PRODUCTION

2.2.12.1 IMPORTANCE OF MUSHROOM PRODUCTION

As source of income and employment benefits food

Oyster type of mushroom is grown commercially for food on a large scale in the USA; in Asia other species such as the shiitake mushrooms, cortinellus are cultivated. Wild mushrooms are regularly collected for sale and as popular activity in Europe and Asia (Book of World, 1980).

Mushroom cultivation is attractive for the resource poor for two reasons. Firstly, because mushroom cultivation can be done on any scale, the initial financial outlay to establish a basic cultivation system need not be very great, and substrate materials are often free. Secondly, compared to many agricultural and horticultural crops, mushroom production systems have a short turn around; a harvestable crop can be produced and sold within two to four months, which is very helpful for small-scale producers (FAO, 20008).

Mushroom cultivation activities can play an important role in supporting the local economy by contributing to subsistence food security, nutrition, and medicine; generating additional employment and income through local, regional and national trade; and offering opportunities for processing enterprises such as pickling and drying (Elaine, 2008). Income from mushrooms can supplement cash flow, providing either:

"A safety net during critical times, preventing people falling into greater poverty, a gap-filling activity which can help spread income and generally make poverty more bearable through improved nutrition and higher income or a stepping stone activity to help make people less poor, or even permanently shift them out of poverty".

Mushroom growing represents an employment opportunity for jobless people and cash generation for producers, suppliers of substrates (raw materials), restaurants and supermarkets(Gurja, 1993) .

Livelihood opportunities (Economic benefits)

Mushrooms can generate additional employment and income through local, regional and national trade offering opportunities through processing enterprises (FAO, 2009).Trade in cultivated mushrooms can provide a readily available and important source of cash income for men, women, young, the old, infirm and disabled (Sarah, 2012).

Trade in cultivated mushrooms can provide a readily available and important source of cash income for men, women and the old, infirm and disabled peoples. The role played by women in mushroom production can be very significant. Certain parts of the mushroom cultivation process, such as filling substrates in containers and harvesting, are ideally suited for women's participation. Several programmes have enhanced women's empowerment through mushroom production by giving them the opportunity to gain farming skills, financial independence and self-respect (Elaine, 2008).

Cultivation of mushrooms is labour intensive for the countries where jobs are rare. In fact, some technologies can use family labour thus providing employment for all of the family members. Unfortunately, funding to promote the production and consumption of mushrooms is limited in Ethiopia. But the potential of mushroom cultivation to poverty reduction among the vulnerable groups like poor women disables and unemployed young population are especially encouraged. In this context, an assistance of the local government is important for the development of mushroom industry which can create job opportunities both in urban and rural areas (Gurja, 1993).

Mushrooms have long been favoured by Asian people as food stuff in soup. Now a day mushrooms are found in markets throughout America, Europe, Asia as well as Africa. Popularity of mushrooms is ever increasing throughout every part of the world because of its exotic flavour and their culinary properties whether eaten alone or in combination with other foods. But until now, it is not well known that mushrooms are full of nutrients and can therefore make a very important contribution to human nutrition (Yip et al, 1987).

Fertilizers, machinery and pesticides are not much used, the market price is relatively high and profit margins for mushroom crops can be considerably higher than traditional crops. In general the project takes very little space and can produce returns within a short period of time (Erkal and Aksu, 2000).

Eating mushroom can prevent various vitamin B and D deficiencies including beri-beri2 (thiamine), nerve tissue damage (riboflavin); abnormal growth in infants and children (niacin); and rickets

(vitamin D). Vitamin D boosts calcium absorption and thus plays an important role in bone formation (UNDP, 2006).

Mushrooms are not only sources of nutrients but have also been reported as therapeutic foods, useful in preventing diseases such as hypertension, hypercholesterolemia and cancer (Bobek and Galbavy, 1999; Bobek and Kuniak, 1995). Some recently isolated and identified compounds, originating from mushrooms, show other quite significant medical properties, such as immune-modulator, cardiovascular, liver protective, anti-fibrotic, anti-inflammatory, anti-diabetic, anti-viral and anti-microbial activities (Wasser and Weis, 1999 and Cimerman, 1999). Some antifungal protein are also recognized which shows the inhibiting activity of HIV-1 reverse transcriptase (Ngai et al., 2003), possible being used for healing AIDS disorder. The scientific evidences of mushrooms as multi-purpose medicines on different human diseases have been accumulated. So mushrooms can be used to combat human diseases.

By taking into consideration of drought problem in some countries, mushroom production could help soil and water conservation too. At the same time mushroom demand increasing due to health consideration. Many drugs and dietary supplements contain at least some component produced from fungi because of their immune system enhancing qualities Fungus. Conjugated linoleum acid is found in mushrooms, and the study indicated it can stop cancer cell growth through blocking cancer cell reproduction (Madan, 2014).

Wastes such as cereal straws are largely burnt by the farmers, which causes air pollution. However, these raw materials can actually be used for the cultivation of mushrooms. This kind of bioconversion exercise can greatly reduce environmental pollution; mushroom cultivation can be a labour intensive activity. Therefore, it will serve as means of generating employment, particularly for women and youths in order to raise their social status. It will also provide additional work for the farmers during winter months when the farming schedule is light, it will provide the people with an additional vegetable of high quality, and enrich the diet with high quality proteins, minerals and vitamins which can be of direct benefit to the human health and fitness. The extractable bioactive compounds from medicinal mushrooms would enhance human's immune systems and improve their quality of life; mushroom cultivation is a cash crop. The harvested fruiting bodies can be sold in local markets for additional family income or exported for an important source of foreign exchange that will definitely improve the economic standards of the people and some warm mushrooms, e.g. Volvariella volvacea (Straw mushrooms) and Pleurotus sajor-caju (Oyster mushrooms) are relatively fast growing organisms and can be harvested in 3 to 4 weeks after spawning. It is a short return agricultural business and can be of immediate benefit to the community (Yip et al, 1987).

2.2.12.2 IMPACTS OF MUSHROOM AGRICULTURE

ECONOMIC IMPACT

The economic impact of agriculture is still predominant in Africa. In the absence of formal employment opportunities from other sectors of the economy, industries and services, agriculture remains a necessary contributor to livelihoods. However, the economic impact of mushroom agriculture at the country level is not always so significant. Mushroom cultivation activities can play an important role in supporting the local economy by contributing to subsistence food security and generating additional employment and income through local, regional and national trade and offering opportunities for processing enterprises (Sarah, 2012).

ENVIRONMENTAL IMPACT

The agriculture-based Ethiopian economy is highly dependent on Coffee Arabica and releases huge amount of coffee wastes to the environment from dry processing methods. Similarly, there are approximately 35 million cattle and 32.2 million chickens (FAO, 1999) in Ethiopia that can potentially discharge significant amount of organic wastes (manures) to the environment. Many literatures has reported the possibility of using these agro-wastes for a range of purposes i.e. mushroom cultivation in order to generate value added products and reduce environmental pollution by using the wastes as input through the process of bioconversion (Beje, Diriba and Dawit, 2012).

SOCIAL IMPACT

The cultural, social and organizational issues in drawing up the mushroom associations are important for determining the direct and indirect benefits of mushroom consumption and trade for different social groups. As a result of the high perishability of mushrooms, it can be of great benefit, for small-scale cultivators selling their crop, to be organized with other growers and to share transport costs, market contacts, etc. Moreover (Elaine and Nair, 2008); working in collaboration with other growers may enable cultivators to establish local production, processing, or packaging facilities to increase harvest output or product shelf life i.e. a drying facility. Mushroom cultivation represents a very suitable and empowering income generating option particularly for women, because it can be combined with traditional domestic duties and can be undertaken at home. This gives women the opportunity to gain financial independence, farming skills and higher self-esteem.

Mushroom growing involves all members of the community. Younger group members help the older people by preparing the substrates (chopping and pasteurisation) and mixing the spawn collectively (Sarah, 2012). People with disabilities can also do almost everything that is required for establishing a successful mushroom growing enterprise. People with disabilities gained self-satisfaction, self-esteem and several became physically stronger.

Since mushrooms are not labour intensive and can be undertaken as an additional livelihood activity which fits around other household or productive tasks. People with physical disabilities are also fully capable of accomplishing all necessary tasks in mushroom cultivation, even if some modifications in construction, equipment and tasks are required (Elaine and Nair, 2008). People with mental disabilities and chronically ill or weak people too can grow mushrooms because several of the key tasks are repetitive and can be easily learned.

Cultivation of mushrooms is a relatively new activity throughout much of the developing world. Qualities identified as being useful for mushroom cultivators include the ability to carry out operations on time, be attentive to detail, be vigilant about pest invasions, and for marketing, excellent skills in public relations (FAO, 2008).

During the year of 2011; from the total urban agricultural production in Ethiopia, 60-70% was milk, 40-60% eggs and 30% vegetables (FAO, 2012); which is practiced over 303 hectare, with a total of 129,880 quintals vegetable production per annum, where Cereals, pulses, oil & horticultural crops, mushrooms and honey are the major productions. Directly supports over 51,000 families both poor and rich.

2.2.13 ENHANCE HUMAN HEALTH THROUGH MUSHROOM DERIVATIVES

Many people are intrigued by mushrooms' nutritional and medicinal properties, in addition to their culinary appeal. Mushroom cultivation can directly improve livelihoods through economic, nutritional and medicinal contributions. However, it is essential to note that some mushrooms are poisonous and may even be lethal, thus the need for extra caution in identifying those species that can be consumed as food. The following points are some of the importance of mushroom;

Nutritional value of mushrooms

Eating mushroom can prevent various vitamin B and D deficiencies including beriberi (thiamine), glossitis, corneal vascularisation, Seborrhoea dermatitis, nerve tissue damage (riboflavin); abnormal growth in infants and children (niacin), rickets and plays an important role in bone formation (Kiribuchi, 1991).

The greatest difficulty in feeding man is to supply a sufficient quantity of the body building material protein. The other three nutritional categories are: the source of food energy carbohydrates and fats; accessory food factors, vitamins; and inorganic compounds which are indispensable to good health. Of course, water, too, is essential. In terms of the amount of crude protein, mushrooms rank below animal meats, but well above most other foods, including milk, which is an animal product (Chang and Miles, 1989). Furthermore, mushroom protein contains all the nine essential amino acids required by man. The moisture content of fresh mushrooms varies within the range 70 - 95% depending upon the harvest time and environmental conditions, whereas it is about 10 - 13% in

dried mushrooms. In addition to their good proteins, mushrooms are a relatively good source of the following individual nutrients: fat, phosphorus, iron, and vitamins including thiamine, riboflavin, ascorbic acid, ergosterine and niacin. They are low in calories, carbohydrates and calcium. Mushrooms also contain a high proportion of unsaturated fat. In addition to nutritional value, mushrooms have some unique colour, taste, aroma and texture characteristics, which attract their consumption by humans.

Mushrooms both add flavour 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 mushrooms can make a valuable addition to the often unbalanced diets of people in developing countries. Fresh mushrooms have high water content around 90%, so drying them is an effective way to both prolonged their shelf-life and preserve their flavour and nutrients (Elaine and Nair, 2008). Furthermore, Mushrooms are a good source of vitamin B, C and D, including niacin, riboflavin, thiamine, and various minerals including potassium, phosphorus, calcium, magnesium, iron and copper. They provide carbohydrates, but are low in fat and fibre, and contain no starch. Furthermore, edible mushrooms are an excellent source of high quality protein between 19 % and 35 %, and white button mushrooms contain more protein than kidney beans.

Medicinal value of mushrooms

The second major attribute of mushrooms, their medicinal properties, has also been drawn to our attention for study, e.g., hypertensive and rental effects (Tam et. al., 1986; Yip et al., 1987), immune modulator and antitumor activities of polysaccharide-protein complex (PSPC) from mycelia cultures (Liu, et al, 1995, 1996; Wang et al., 1995, 1996,), immune modulator and antitumor activities of lectins from edible mushrooms (Wang et al., 1995, 1996, 1997), isolation and characterization of a Type I Ribosome-Inactivation protein from V. volvacea (Yao et al., 1998), and medicinal effects of Ganoderma lucidum (Chang and Buswell, 1996, Chang and Miles, 1989).

Edible mushrooms provide high quality of protein that can be produced with greater biological efficiency than animal protein. They are rich in fibre, minerals and vitamins, and have low crude fat content, with a high proportion of poly unsaturated fatty acids (72- 85 %) relative to total content of fatty acids. These properties are major contributing factors to the traditional recognition of mushrooms as healthy foods. A large number of mushroom species are not only edible and nutritious but also possess tonic and medicinal qualities. However, some mushrooms are lethally poisonous, and one should eat mushrooms only if one knows their names and their properties with considerable precision. In the past, the mushroom industry concentrated mainly on the production of fresh, canned and dried mushrooms for food. Thus, the industry had only one leg. In the present

era, high-pressure work demands are causing greater stress to the human body, and resulting in the weakening of the human immune system. A variety of proprietary products based on mushroom nutriceutical and mushroom pharmaceuticals have already been produced and marketed. This trend is expected to increase with wider consumer satisfaction and acceptability. This is the second leg of the industry. These two legs/segments of the mushroom-based industry will not compete but will complement each other (Tam et al, 1986).

The medicinal properties of mushrooms depend on several bioactive compounds and their bioactivity depends on how mushrooms are prepared and eaten. Shiitake are said to have antitumor and antiviral properties and remove serum cholesterol from the blood stream. Other species, such as Pleurotus (oyster), Auricularia (muer), Flammulina (enokitake), Term Ella (yiner) and Grifola (Maitake), all have varying degrees of immune system boosting, lipid lowering, anti-tumour, microbial and viral properties, blood pressure regulating, and other therapeutic effects (Elaine, 2008).

NUTRICEUTICALS AND DIETARY SUPPLEMENTS

The recent upsurge of interest in traditional remedies for various physiological disorders and the recognition of numerous biological response modifiers in mushrooms have led to the coining of the term “mushroom nutriceutical” (Chang and Buswell, 1996). A mushroom nutriceutical is a refined/partially defined mushroom extractive which is consumed in the form of capsules or tablets as a dietary supplement (not a food) and which has potential therapeutic applications. A regular intake may enhance the immune responses of the human body, thereby increasing resistance to disease and, in some cases, cause regression of a disease state.

2.2.14 DEMAND, SUPPLY AND MARKETING CHANNEL OF MUSHROOMS

Marketing is the most important consideration of all. If you can’t sell your production at a price that ensures a reasonable profit margin, you don’t want to continue in this investment. Spend some time and even some money in educating yourself about marketing your product.

In the world mushroom production started in the 1800’s. The demand of mushroom has been increasing due to population grow, market expansions, changing of consumer behaviour, and developments in the manufacturing industries, storage, transportation, and retailing. Gradually, the world mushroom production has reached 33.4 million tons in 2007 while it was 26 million tons in 2000. China, United State of America and Netherlands rank as the first threes in mushroom production in the world. Nearly 42% of the world mushroom production takes place in China, 12 % in the USA, and 8% in the Netherlands (Erkel, 2004).

The structure that we call a mushroom is in reality only the fruiting body of the fungus. The vegetative part of the fungus, called the mycelium, comprises a system of branching threads and

cord-like strands that branch out through soil, compost, wood log or other lignocelluloses material on which the fungus may be growing. After a period of growth and under favourable conditions, the established (matured) mycelium could produce the fruit structure which we call the mushroom. Accordingly mushrooms can be grouped into four categories (chang, 2007):

"those which are fleshy and edible fall into the edible mushroom category, e.g., Agaricus bisporus, mushrooms which are considered to have medicinal applications are referred to as medicinal mushrooms, e.g., Ganoderma lucidum, those which are proven to be, or suspected of being poisonous are named as poisonous mushrooms, e.g., Amanita phalloides; and a miscellaneous category which includes a large number of mushrooms whose properties remain less well defined, which may tentatively be grouped together as 'other mushrooms'. Certainly, this approach of classifying of mushrooms is not absolute and not mutually exclusive. Many kinds of mushrooms are not only edible, but also possess tonic and medicinal qualities".

MARKETING CHANNELS

According to Nair (2008), there are typically three principal marketing routes for mushroom growers; the grower can sell directly to the consumers either at the farm gate or at local markets; however, the ability to reach distant markets is limited, the grower can sell to an agent who then sells the mushrooms either to local or distant markets, including exports and the grower can belong to a cooperative or another farm organization, which offers easy market linkages to both local and distant markets, including export markets.

MARKETING STRATEGIES

Marketing is the most important consideration of all. If you can't sell your mushrooms at a price that ensures a reasonable profit margin, you don't want to invest in this enterprise. Spend some time and even some money educating yourself about marketing your potential product (Erkel, 2004).

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 BACK GROUND OF THE STUDY AREA

Addis Ababa, being the capital city and the major centre for economic, political and social affairs of the country as well as the seat of international organizations and agencies, Like AU, UNDP, UNICEF, FAO, UNHCR, ILO. The major sectors which employed most of the labour force in the city are service (71%) and industry (25%) and while agriculture constitute only 1.5%. Addis Ababa is the commercial and industrial centre of the country, which is located in the central Ethiopian highlands; geographically known as the Shoan plateau. It is an autonomous administrative city that comprises 10 sub cities and 106 *'woreda'* (CSA, 2011)

3.1.1 PHYSICAL CHARACTERISTICS

LOCATION

Addis Ababa is the capital city of Ethiopia and the commercial and industrial centre of the country, it is located in the central Ethiopian highlands known as the Shoan plateau. It is an autonomous administrative city that comprises 10 sub cities and 106 *'woreda'*. The city is astronomically located between 8^0 55'N and 9^0 05'N latitude and 38^0 40' E and 38^0 50'E longitude. The area of the city covers more than 600km^2. The northern boundary of the city runs along the Entoto Chain Mountains and the western limits are found along the flanks of mount Wechecha. To the south the city extends over the plain towards the Akaki river, whereas on the eastern limit extends towards the plateau of Northern Shoa (CSA, 2011).

CLIMATE

Addis Ababa lies within the tropics, a zone of maximum insulation where the overhead sun is experienced twice a year. However, because of the high elevation, tropical temperature conditions are not experienced and the city enjoys temperate climatic conditions. Temperature is mild and relatively constant throughout the year. It averages approximately 15^0c, within normal daily highs and lows varying between 25^0c and 5^0c. Higher and lower temperatures are occasionally reported (EMA, 2012 and CSA, 2011).

Though it is possible to have precipitation during all the seasons of the year, with maximum from June to September the rain occurs during the seasons of summer, autumn and spring. Summer is the main rainy season which accounts for about 63% of the annual average rainfall of 1200 mm whereas winter is mostly dry (CSA, 2007).

3.1.2 DEMOGRAPHIC CHARACTERISTICS

The size of a population is a very important demographic data that should be obtained within the territory of a given governing body for a number of undertakings. Addis Ababa's population data was available for the first time in September 1961 when the first census was carried out which was followed by another census in September 1967. In 1978 a demographic sample survey was conducted which was followed by the 1984 population and housing census. Thus, the population of the city for the years 1961, 1967, 1978, 1984, 1994 and 2007 were 443,728; 683,530; 1,167,315; 1,423,111, 2,739,551 and 3,384,569 peoples. The population has been growing at an average annual growth rate of 3.8% between 1984 and 1994(CSA, 2007).

Addis Ababa, being the capital city and the major centre for economic, political and social affairs of the country as well as the seat of international organizations and agencies, has attracted a large number of people. According to the 1994 census result, nearly half (about 47%) of the total population of Addis Ababa was an immigrant and the main form of migration was rural-urban which constitutes 57.8% of the total in migration to Addis Ababa (CSA, 2007).

The age structure of the population of the city indicates that the proportion of the population under 15 years was about 32% while the age group 15-64 years comprised about two-thirds of the population. The population above 65 years was very low (about 3%). The literacy rate of the population indicated that 89% of the males and 76% of females' above10 years of age were literate. The total fertility rate, infant mortality rate and life expectation at birth were indicated to be 1.4, 78/1000 and 58 years respectively (CSA, 2007).

Distribution of the population in the city shows a significant variation. Population density decreases with distance from the centre of the city. In the city, almost all the ethnic groups of the country are represented, the predominant ones being Amhara, Oromo, Gurage and Tigre (CSA, 2007).

3.2 STUDY POPULATION

The study population for this research was all those businesses who are currently employed in mushroom agriculture and members of the Urban Agriculture Bureau of Addis Ababa city administration i.e. those mushroom producers, managers and experts in both governmental and private businesses.

3.3 RESEARCH PROCEDURE

The Study was design for investigating the contribution of mushroom agriculture in alleviating poverty in Addis Ababa city. The study was employed both qualitative and quantitative approaches to capture the in-depth and wider data and information for a systematic analysis and understanding of the role of mushroom production in alleviating poverty.

Qualitative approach was involved methods such as personal observations and Interviews with producers, managers and experts while quantitative approach included questionnaires. The target population was members of the Addis Ababa urban agriculture bureau expert's /Operators/ and experts and also those businesses engaged in mushroom cultivation in Addis Ababa city. The required data for the study was collected through primary and secondary sources by using different techniques.

3.4 DATA TYPES AND SOURCES

3.4.1 TYPES OF DATA

Both quantitative and qualitative data was collected from different sources through various methods. Primary as well as secondary types of data were gathered for the analysis of the study. The importance of collecting and considering primary and secondary as well as qualitative and quantitative data was used to interpret and supplement the diverse data generated from different sources which in return is used to make the data and the result of the research reliable.

3.4.2 DATA SOURCES

In order to gather reliable information, both primary and secondary sources was employed. The data was collected primarily from first hand sources through interviews, questionnaires and personal observations to achieve the objectives of the study. The secondary data sources was gathered from official statistical sources (like- CSA, publications and municipal documents), books, journals, internet sources, research findings of various scholars on the topic under investigation, and other publications.

3.5 DATA COLLECTION METHOD AND TOOLS

The primary and secondary data comprising both quantitative and qualitative data was collected through variety of methods and tools. The ways these data was gathered is described as follows.

3.5.1 PRIMARY DATA COLLECTION

Primary data are first hand data collected from primary sources. In this study, primary data was collected from urban agriculturalists who engaged in mushroom cultivation and their respective experts and managers both from government and private. The primary data can be either quantitative or qualitative. The researcher was collected the primary data at the time of field survey. Questionnaires and Interviews were the most important methods used to collect the primary data. The questionnaires contain both open ended and close ended types was design and administer.

3.5.2 SECONDARY DATA COLLECTION

The secondary sources of data was gathered from official statistical sources (like CSA, publications and municipal documents), books, journals, Internet sources, research findings of various scholars on the topic under investigation and other publications.

3.6 DATA ANALYSIS METHODS

For analysis of the data both quantitative and qualitative methods were employed. Quantitative and also qualitative data generated from the survey questionnaire were analysed using SPSS programme. Descriptive statistics like frequencies, percentage and tables were applied to facilitate meaningful analysis and interpretation of research findings. The results of the processed data were presented in tables, frequency and percentages. The qualitative data obtained through personal observations and interviews were analysing through descriptive method of analysis.

CHAPTER FOUR

DATA ANALYSIS AND INTERPRETATION

4.1 DEMOGRAPHIC AND SOCIO-ECONOMIC PROFILE OF RESPONDENTS

The urban mushroom producers, managers and experts were requested to answer questions pertaining to their demographic and socio- economic characteristics. The practice of urban mushroom agriculture is related to factors that include age, sex, cultural ethnicity, place of origin, head of family, household size, educational status and occupational characteristics of the respondents under consideration. The results are presented as follows.

4.1.1 AGE, SEX AND RELIGION OF THE RESPONDENTS

The majority of urban mushroom agriculture (30.9 and 27.3%) belongs to the age group of 35-39 and 30-34 years of age. In fact, above half (58.2%) are between the age of 30-39 years old. Whereas 25.5% between the age of 20 and 29 years old and 16.3% of the respondents are from 40-49 years of age. On the other hand the proportion of urban mushroom experts and managers between the ages 20-24 were 3% and 45-49 years comprises only 2%. The remaining larger 95% were between the ages of 25-44. Hence, it is possible to say that most of the participants in this activity belong to the age group 25-44 years of age.

As regarding the distribution of the respondents by sex, females comprise (54.5%) and the remaining 45.5% of the total respondents are males see table 4.1. The fact that there are more females than males; this shows mushroom agriculture is found to be actively practiced by females.
The overwhelming majority of the respondents (60%) belongs to the orthodox Christianity, about (23.6%) and (16.4%) were Muslim and protestants.

Table 4.1 Distribution of respondents by age, sex and religion

Age of respondents	Category	Frequency	percentage
	20-24 years	3	5.5
	25-29 years	11	20.0
	30-34 years	15	27.3
	35-39 years	17	30.9
	40-44 years	7	12.7
	45-49 years	2	3.6
	total	**55**	**100.0**
Sex of respondents	Male	25	45.5
	Female	30	54.5
	total	**55**	**100.0**
Religion of responden	Orthodox	33	60.0
	Protestant	9	16.4
	Muslim	13	23.6
	total	**55**	**100.0**

Source: own field survey

4.1.2 Educational status of the respondents

The educational level of the urban mushroom agriculture participants shows that, 3.6% did not attend school while the relatively majority (36.4% and 29.1%) were from grade 5-8 and university graduates, 23.6% had a collage diploma, with no one from grade nine to twelve and only the 7.3% are from grade 1-4. An interesting point one can obtain from a careful observation of (table 4.2) is that only the 3.6% of the respondents cannot read and write the remaining 96.4% can read and write. From this one can conclude mushroom agriculture benefits and practices by both peoples of low level of education and educated ranging from the illiterate ones to those who attended university. The involvement of educated people in this activity may also suggest that, the practice of mushroom agriculture may continue to expand with increasing urbanization and finally be legitimized in the urban policy since the educated ones can protect their investments by influencing policies and regulations in their favour.

Table 4.2 Educational status of the respondents

Educational level of respondents	Frequency	percentage
Illiterates	2	3.6
1-4 grade	4	7.3
5-8 grade	20	36.4
Collage	13	23.6
University	16	29.1
total	55	100

Source: own field survey

4.1.3 Marital status and family size of the respondents

Out of the total population covered by the study, the majority (65.5%) are married and the remaining (34.5%) were single. One can conclude from this, mushroom agriculture is a means of and / or livelihood and income of households. The proportion of family size also in table 4.3, are that majority of the respondents (41.8 and 38.2%) having family size of 3-4 and 0-2 respectively. From the total respondents only 3% has family size of above 6 and the 14.5% has 5-6 only 5.5% have above 6.

Table 4.3 marital status and family size of the respondents

		frequency	percentage
Marital status respondents	married	36	65.5
	single	19	34.5
	total	55	**100.0**
Family size of responde	0-2	21	38.2
	3-4	23	41.8
	5-6	8	14.5
	Above6	3	5.5
	total	55	**100.0**

Source: own field survey

4.1.4 Job title and job types of the respondents covered by the study

About 63.6% of the total numbers of the respondents 63.6% were directly involved in mushroom production, 27.3% were experts and the remaining 9.1% were managers both from privates and governments. Out of the total respondents, the majority (90.9%) were private workers and only the 9.1% were government employers. From the total respondents (27.7%) were private experts and managers and the remaining (9.1%) were governmental experts.

Table 4.4 job title and types of the respondents

	title	frequency	percentage
Job title of respondents	Producers	35	63.6
	Experts	15	27.3
	Managers	5	9.1
	total	55	**100.0**
Job type of experts and managers of respondents	Governmental	5	9.1
	Private	15	27.3
	total	20	**36.4**

Source: own field survey

4.1.5 Satisfaction level and duration of stay in years of the respondents

As the respondents were asked whether they are satisfied or not on the current production and services of mushroom farms as table 4.5, indicates that; the majority (81.8%) were satisfied whereas the 18.2% are not satisfied. The main reason as those unsatisfied respondents pointed out problems such as lack of production place and lack of awareness of the people regarding mushroom even less concern of the government makes them unsatisfied.

Table 4.5 Degree of level of satisfaction with the production and services and duration stay of the respondents

		frequency	percentage
Degree of Satisfaction	Yes	45	81.8
	No	10	18.2
	total	55	**100.0**
Duration of stay of Respondents in mushroom agriculture	0-2 years	20	36.4
	3-5 years	27	49.1
	6-8 years	8	14.5
	total	55	**100.0**

Source: own field survey

As the above table 4.5 indicates that almost half of the respondents (49.1%) stayed in mushroom business for 3-5 years whereas 36.4% were stayed from 0-2 years only 14.5% were stayed from 6-8 years. This shows urban mushroom agriculture in Addis Ababa is a very recent phenomenon since 85.5% stayed less than 5years.

4.1.6 Job of respondents before they engaged in mushroom business

Private mushroom producers, experts and managers as well as governmental experts were asked their job before they engaged in mushroom business 34.5% were daily labourers, 30.9% was

governmental employers and 20% were involved directly from school. Only the 4% were previously engaged in unpaid family business and in NGOs, as table 4.6 below indicated.

Table 4.6 Job of respondents before they engaged in mushroom business

	frequency	percentage
Student	11	20.0
Daily labour	19	34.5
Unpaid family business	2	3.6
Unemployed	4	7.3
Government employed	17	30.9
NGO worker	2	3.6
total	55	**100.0**

Source: own field survey

4.1.7 Average monthly income of the respondents before and after they engaged in mushroom business

As table 4.7 indicates that 47.2% from the total number of respondents were have less than 1000 birr monthly income and 10.9% had an average monthly income from 2000-2500 birr. The remaining 41.9% were had a monthly income of 1000-2000 birr. One can conclude from this table 4.5, 47.2% from the total respondents' monthly income were less than 1000 birr and this makes difficult to survive and to afford basic needs. An attempt also was made to investigate an average monthly income of the population under study; all (100%) has above 2000 birr net income even they gain up to 6000 birr gross income per month.

Table 4.7 Income level of respondents before and after the engage in mushroom business in Ethiopian birr

Income **before**	Below500	500-1000	1000-1500	1500-2000	Above 2000	total
frequency	13	13	10	13	6	55
percentage	23.6	23.6	18.2	23.6	10.9	100
Income **after**						
frequency	0	0	0	0	55	55
percentage	0	0	0	0	100	100

Source: own field survey

4.1.8 Basic equipments and materials needed to produce mushroom

Interviews were made with selected producers, experts and managers used to identify, what types of basic equipments and materials are needed to start up and continue mushroom farming practices and they responded that spawn, bedroom(box), closed production place/class/, compost, water and

chemicals are the basic requirements. Respondents asked their size of production place and most of them practices on average less than $9m^2$ house.

4.1.9 Production period of mushroom

When the producers, experts and managers employed in mushroom business were asked to how much production periods are possible per year and all (100%) of the respondents were answered that it is possible to cultivate from 7-8 times per year in one bedroom and also asked an average amount of production from one bedroom then they replied; it is possible to produce from 5-7kg per one production period if the spawn is good.

Some mushrooms types such as Oyster are relatively fast growing organisms and can be harvested in 3 to 4 weeks after spawning and it takes up to 2 weeks to spawn. It is a short return agricultural business and can be of immediate benefit to the community, it gives on average from 5 to 7kg mushroom production per one bedroom and also may give up to 20,000kg per hectare in a single production period (Chang and Buswell, 1996, AAUAB, 2015).

4.1.10 Opportunities and practices of mushroom agriculture

Respondents interviewed about the opportunities in urban mushroom agriculture and majority of them replied that, it can produce in a small indoor both for home and market purposes throughout the year, it is the source of basic and supplementary income, it can be conducted by everybody of the community with a little training and it gives production with in short period usually within 30-45 days. Furthermore, respondents replied about the cultivation process and before anything, it is important to prepare appropriate production place with conducive temperature usually 10-20^{0}C, moisture content 65-75%, controlling the air and refreshing once a day, fixing the light condition (if any covering the bedroom with black plastic), preparing substrates, spawn and chemicals (to control pests and diseases), watering two times per day and harvesting after maturity finally it's advisable supplying to the market with in an hours. Urban mushroom agriculture should also far from wastes and industries to produce unpolluted and organic mushrooms.

4.2 Types of Cultivated Mushroom

There are hundreds of identified species of fungi which have made a significant global contribution to human food and medicine. Cultivated mushrooms have now become popular all over the world. The most common types of edible mushrooms including; Oyster (Pleurotus), Common (Agaricus) and Shiitake (Lentinus). These three types of mushrooms make up about 70% of the world's production (Hawks worth, 2001, Elaine and Nair, 2009).

Fig: 4.1 Oyster mushroom, Common (Agaricus) and Shiitake mushroom respectively

Urban mushroom producers, experts and managers were asked to which type of mushroom does commonly cultivated in Ethiopia and all the respondents (100%) were replied that the Oyster type of mushroom is commonly cultivated in Ethiopia, since this type of mushroom is best much to the Tropical areas and easily cultivated in short period of time. The prevailing mild temperatures in Ethiopia, particularly in the highlands, are conducive to mushroom growth. Although the low level of relative humidity during most of the year is not optimal for cultivation, this is a problem that can be dealt with by using appropriate environmentally sustainable methods of moistening the air (Gurja, 1993). The environmental factor is very important for the production of oyster mushrooms. Oyster mushrooms are a good choice for beginning mushroom cultivators because they are easier to grow , they can be grown on a small scale with a moderate initial capital investment and (Alice and Michael, 2004) a high percentage of the substrate converts to fruiting bodies with in short time this increases the potential to profitability.

4.3 BENEFITS AND IMPACTS OF MUSHROOM

Literatures indicate that urban mushroom agriculture benefits the poor and rich urban population, urban environment and the country at large. The contribution of urban mushroom agriculture is satisfying nutritional requirements of the producers, retailers and users and also improve their general health, income, saving employment opportunity, improve the asset of the participant peoples and environmental benefits are considerable. Hence, this section treats the advantages of urban mushroom agriculture for the investigated sample producers, experts, managers and users of both private and governmental in particular and the urban environment of Addis Ababa city.

4.3.1 Nutritional, medicinal and benefits of food security

As most literatures indicated that mushroom is considered to be nature's most important food and its nutritional, protein and medicinal potential is unparalleled by any other food used by human beings as it provides more essential nutrients in significant amounts than any other food. Hence, mushroom production by the selected producers tends to increase household, hotels, restaurants and cafeterias mushroom consumption. The increased mushroom consumption is therefore, assumed to

improve nutritional status of the producers. Urban mushroom agriculture ensures a regular and dependable supply of food thereby improving the health of the producers.

Urban mushroom producers are at an advantage as they produce part of their own food, whereby this activity is vital in improving the family diet and reduces food shortage and costs. Urban mushroom agriculture is also practiced as a supplement for consumer food supplies acquired from the market. The cash income derived from the sold of mushroom products is used for the purchase of food from the market. An increased income from mushroom enables producers to purchase more food and a wide variety of food whereby the income contributes to improve the nutritional status of producers.

The population under investigation were asked their opinion whether mushroom can replace food during the period of food shortage and critical conditions. Hence, 58.2% of the total respondents strongly agreed with the replacement of mushroom to food during critical times, 36.4% also agreed where as the remaining 3.6% did not agree with the replacement of mushroom to food in critical times. Generally majority (94.6%) of the respondents give their positive response to the replacement of mushroom as a food during the time of food shortage. As Elaine (2008) stated that mushrooms provide a safety net during critical times, preventing people falling into greater poverty, generally make poverty more bearable through improved nutrition and higher income or a stepping stone activity to help make people less poor, or even permanently shift them out of poverty.

Table 4.8 Agreement of respondents with advantage of mushrooms against food shortages and critical times

Advantage of mushroom as a food	frequency	percentage
Disagree	2	3.6
Undecided	1	1.8
Agree	20	36.4
Strongly agree	32	**58.2**
total	55	**100.0**

Source: own field survey

4.3.2 Income, Employment opportunity and Environmental benefits of Mushrooms

4.3.2.1 Income and employment opportunity of mushroom farms

Mushroom cultivation activities can play an important role in supporting the local economy by contributing to subsistence food security and generating additional employment and income through local, regional and national trade (Sarah, 2012).

Mushroom growing involves all members of the community (Sarah, 2012). People with disabilities can also do almost everything that is required for establishing a successful mushroom growing

enterprise. People with disabilities gained self-satisfaction, self-esteem and became physically stronger.

Table 4.10 indicates that the response of respondents regarding the role of mushroom cultivation to income and employment opportunities. When they asked to the income contribution, for basic and additional income to the livelihood and above half of them (60%) were agreed with contribution of mushroom cultivation to the people. 38.2% also strongly agreed with the role of mushrooms in contributing to income level for the participant.

Table 4.9 Role of mushroom cultivation as additional and basic income for families and the participants

Role of mushroom to income	frequency	percentage
Disagree	1	1.8
agree	33	60.0
Strongly agree	21	38.2
total	55	**100.0**

Source: own field survey

As the table below of 4.11 shows respondents were asked their agreement with the role and contribution of mushroom agriculture to the less poor and to women. They replied that 63.7% and 32.7% strongly agreed and agreed respectively. From this we see mushroom cultivation should be practiced by the poor and women they become financially independent.

Table 4.10 the role of mushroom cultivation to the less poor and women

	frequency	percentage
Disagree	1	1.8
Undecided	1	1.8
Agree	18	32.7
Strongly agree	35	63.7
total	55	**100.0**

Source: own field survey

Furthermore, peoples included in the survey were asked their agreement about the importance of mushroom cultivation for both physically and mentally disabilities. About 63.6% and 30.9% replied and showed their strong agreement and agreement respectively the high importance of mushrooms to physically disable peoples. In the case of mentally disable peoples; respondents were replied that 45.5% and 49.1% strongly agreed and agreed the role and importance of mushroom cultivation. Generally, Table 4.12 shows almost all of the respondents agreed on the importance of mushroom agriculture for both physically and mentally disable peoples. As Sarah (2012), Marshall and Nair

(2008) stated that, people with physical and mental disabilities can do almost everything that is required for establishing a successful mushroom growing enterprise.

Table 4.11 Role of mushroom cultivation for physically and mentally disables to income and employment

Mushroom cultivation helps physically disable peoples		frequency	percentage
	Undecided	3	5.5
	Agree	17	30.9
	Strongly agree	35	63.6
	total	55	**100.0**
Mushroom cultivation helps mentally disable peoples	Disagree	1	1.8
	Undecided	2	3.6
	Agree	27	49.1
	Strongly agree	25	45.5
	total	55	100.0

Source: own field survey

4.3.2.2 Economic impact of mushrooms

Respondents were also asked their agreements about the economic impacts of mushrooms to the local economy, and majority of them (92.8%) replied that, it has strong importance in supporting the local people in particular and the local economy in general.

Table 4.12 Importance of mushroom agriculture to the local economy

Mushroom agriculture is an important activity in supporting the local economy?		frequency	percentage
	Disagree	1	1.8
	undecided	3	5.5
	Agree	51	92.8
	total	55	100

Source: own field survey

4.4 Profitability and Productivity of Mushrooms

Some types of mushrooms such as Oysters are relatively fast growing organisms and can be harvested in 3 to 4 weeks after spawning. It is a short return agricultural business and can be of immediate benefit to the community. It gives on average from 5 to 7kg mushroom production per one bedroom and per one production period (Chang and Buswell, 1996, AAUAB, 2015). Respondents were asked about the amount of production of mushrooms per one bedroom and one production period. The majority 92.8% produces on average up to 6kg. Producers also have on

average of 10(ten) bedrooms. Therefore, they produce on average up to 60kg per one production period, this production sold to the private business market on an average of 55birr per one kg. So it is easy to calculate the profitability of mushroom per one production period and per year. On average with in 45days (one production period) a producer gains up to 3300birr and up to 26,400birr per annum; since it is possible to cultivate 8times in a year. Erkal and Aksu, (2000) stated that mushroom cultivation is profitable since, Cost of input is relatively low, seasonal production is possible, raw materials are easily and cheaply available for compost and casing material from local areas.

Fig 4.2: Bedroom (box), substrate and production of one oyster mushroom

From this we can say that mushroom is profitable if it give special attention, since majority (92.8%) were responded with the high profitability and productivity of mushroom business. Fertilizers, machinery and pesticides are not much used, the market price is relatively high and profit margins for mushroom crops can be considerably higher than traditional crops. This takes very little space and can produce returns within a short period of time (Erkal and Aksu, 2000).

4.5 Major Trade Partners in Mushroom Cultivation

When the mushroom producers, private experts and managers as well as governmental experts were asked the main participants in the mushroom trading activity and they were replied that table 4.16, indicates 52.7% of the producers sold their products to the private businesses (distributors) and the remaining 47.3% sold their product to the local household, vegetable distributors, hotels and restaurants. From this we can conclude that the main trade partner of mushroom producers are the private experts and managers (distributors) as well as the marketing channel is between producers and private retailers. Nair, 2008, there are typically two principal marketing routes for mushroom production: the producer can sell directly to the consumers either at the farm gate or at local markets; however, the ability to reach distant markets is limited and the producer can sell to an agent and/or to a cooperative or another farm organization who then sells the mushrooms either to local or distant markets, including exports.

Table 4.13 Major trade partner of mushroom production

Trade partner	frequency	percentage
Local households	3	5.5
Hotels and restaurants	16	29.1
Distributors of vegetables	7	12.7
Private businesses	29	52.7
total	55	100.0

Source: own field survey

The private experts and managers were also asked their main trade partner and all responded that the production they bought from producers was resold to hotels, restaurants and vegetable distributors. Nair (2008) the successful marketing strategies differ according to region, transport infrastructure, market accessibility and consumer preferences.

The governmental experts were also responded local markets, private businesses, hotels and restaurants, and the vegetable distributors are the major agents in the marketing channel of mushroom production.

4.6 Major Challenges of Mushroom Agriculture during Start up and Operational Stages

There is a need to investigate the factors that affect urban mushroom agriculture in the beginning and operational stages. The respondents were requested to point out their main problems during start up and operational phases and their responses are summarized as follows

4.6.1 Challenges related to flying pests and disease

As shown in Table 4.18 below from the total respondents in the study above half (52.8%) pointed they faced flying pests, and diseases such as virus, fungus and germs that negatively affect the cultivation process at the beginning and also operational stages while the 47.2% were free from these problems. Since mushrooms are mostly grown in enclosed places their risk to diseases and pests spread with in the crop is high. Therefore, it is important to sterilize the growing room and cleanliness is critical in controlling environmental production system to avoid pests and insects which in turn ensure high quality of mushroom production with no toxic contamination. Good management practice of production place and strict hygiene can reduce mushrooms from being affected by pests and diseases (Noble, 2005, Danny and Chang, 1996 and Gurja, 1993).

Table 4.14 problem related to flying pests and diseases during start up and operational stages

Do you face flying insects and mushroom diseases?	frequency	percentage
Yes	29	52.8
No	26	47.2
total	55	100.0

Source: own field survey

4.6.2 Problems related to high and / or low temperatures (Climatic condition)

According to Gurja (1993) and the AAUAB (2015); various mushrooms are known to be sensitive to the environmental condition and environmental factors such as very high and extreme low temperature which negatively affect mushroom production. Mycelia changed to mushroom in a place having 10-20^{0}C and also the mushroom grows between 13-21^{0}C amounts of temperatures. Respondents were asked whether they faced the problem of very high or very low temperatures at the beginning and during their practices, above 58.2% replied that one of their challenges is related to high temperature conditions. Therefore; the high temperature of the production place that is above 22^{0}C cannot support mushroom growth.

4.6.3 Challenges related to capital investment

The population under study were asked whether they had shortage of capital investment at the beginning and operational stages. One can seen from Table 4.19, below majority (89.1%) faced difficulty of capital; even they have had a loan that is in high interest rates only the 10.9% have had an access to capital. Financial resources are more important to scale up, start up and operating an enterprise in contrary to this low investment of capital on mushroom cultivation negatively affects the amount, quality of production and the market level (FAO, 2008, Noble, 2005).

Table 4.15 Problem of respondents relating to capital investment

Did you face shortage of capital?		frequency	percentage
	Yes	49	89.1
	No	6	10.9
	total	55	**100.0**
Do you have a financial support from governments and NGOs?	Yes	0	0
	No	55	100
	total	55	**100.0**

Source: own field survey

As Table 4.19 above indicates mushroom producers, experts and managers were asked whether they have a financial support from governments and NGOs and 100% replied that, they did not get any financial support from the government. The respondents told that the sector is at its infancy level and hence, it could not attract much attention of the government.

4.6.4 Problems related to Inputs and Physical materials

As Simsek 1998 stated that from the most important problem of producers who cultivate by renting a work place was lack of space such as buildings built for producing mushroom only with conducive temperature and moisture and also the problem of spawn. Many of the physical assets to undertake mushroom agriculture helps to meet the needs of the livelihood including communication infrastructure. It is clear that the more developed the infrastructure, the easier to establish and undertake mushroom cultivation (FAO, 2008). Inputs such as shelter, spawn and physical materials like safe production place are more important in start up and operating mushroom agriculture. Respondents were asked whether they have these materials and inputs or not and replied that about 58% from the total population included in the survey have had lack of spawns as table 4.20 shows. 94.5% of the respondents also have not an access to appropriate land (production place). As Gurja (1993) stated that; the main challenges of mushroom agriculture in Africa is the lack of spawn, since spawn supply didn't exist in Africa and the quality spawn from abroad is expensive. In Ethiopia the access of land required for mushroom cultivation is small since it needs shelves of indoors. Therefore; mushroom can be produced and harvested throughout the year with no much access of inputs and physical materials (Gurja, 1993), appropriate production place helps to improve cultivation techniques, access to variety of spawns and post harvest care (FAO, 2008).

Table 4.16 Access to production place and inputs such as spawn of respondents

Do you have an easy access of inputs such as spawn?		frequency	percentage
	Yes	23	42.3
	No	32	57.7
	total	55	**100.0**
Do you have easy access of production place?	Yes	52	5.5
	No	3	94.5
	total	55	**100.0**

Source: own field survey

4.6.5 Problems related to Experience, Training and Labour

As table 4.21 indicates large proportion of the respondents (62.8%) did not face difficulty of training, experience and labour shortage but the remaining 37.7% had shortage of the above elements. Technical guidance and support is beneficial to most mushroom growers particularly in the initial stage (Noble, 2005 and Gurja, 1993). Mushroom cultivation requires experts in the technique of spawn making, substrate preparation, composting, pest and disease control, harvesting as well as packing. Mushroom cultivation is both a science and an art. The science is developed through research whereas the art is perfected through curiosity and practical experience (Chang and Tam, 1987). Mushroom agriculture can use family labour thus providing employment for all of the family labour and this is not a problem in the tropical countries (Chang and Miles, 1992).

Table 4.17 Problems of respondents regarding training, experience and labour shortage

Do you face training, experience or labour shortage?		frequency	percentage
	Yes	20	37.2
	No	35	62.8
	total	55	**100.0**

Source: own field survey

4.6.6 Problems related to support and Cooperation

As one can see from Table 4.22; when respondents were asked to reveal whether there is cooperation between government and private mushroom businesses and also asked whether they have any financial, spawn distribution and/or training support from government and other bodies such as NGOs, majority of them (90%) replied there did not have any cooperation with and support from government. Only 10% replied that they got support from governments and also have had cooperation and integration between governments and other private organizations involving in similar business. Cooperation of private mushroom businesses with governments, NGOs and other private organizations helps them to learn new skills and technology transmission as well as cooperating with others helps them to share transport cost, distributing of spawn and other

equipments Simsek (1998). Moreover; Erkal and Aksu (2000) suggested that improving local skill and knowledge strengthen cooperation and partnership between local mushroom producers helps them to develop production technology, increases productivity, ensures low cost of raw materials, increasing the efficiency of storage, transportation, packaging, promotion and advertisements as well as increasing and diversifying business and employment opportunities.

Table 4.18 problems of respondents to cooperation and support with other bodies

Did you have any cooperation and support with other/from organizations?		frequency	percentage
	Yes	5	10
	No	50	90
	total	55	**100.0**

Source: own field survey

Funding to promote production and consumption of mushroom is limited. Local governments and NGOs can play vital role to develop mushroom agriculture (Aksu, Isik and Erkal, 1996). In the case of Ethiopia the funding to promote the production and consumption of mushrooms is very limited (Gurja, 1993). Table 4.22 indicates that whether there were technical support from governments and NGOs and majority of the respondents (87.3%) did not have any support rather they did have technical training by the effort of themselves with the help of private mushroom businesses. Since mushroom agriculture is a very recent activity and there are not experts specifically in this field.

4.6.7 Problems related to Culture and Marketing

Out of the total population covered by the study, majority (80%) of the respondents had a great challenge related to culture and awareness of mushrooms contribution to food, employment and income as well as its culinary. As they responded that even though there is a mushroom production but the people's awareness to mushrooms consumption, collection and processing is too limited (Source: own field survey).This affects the production and marketing level of mushroom. As Gurja, 1993 discussed that mushrooms are not traditional crops in Ethiopia and the low level of researches, advertisement and training in mushroom cultivation is the main problem hampering the cultural development of mushroom production which in turns the people to low level of practice and consumption.

Marketing and awareness of people to consume is very important of this business. If producers do not sell their production at a reasonable profit margin, they are forced to shut down their businesses. Elaine (2008) also suggests that market problem affects local consumers, local traders, intermediates, regional wholesalers, local restaurants and hotels, shops and farmers cooperation.

One can see from the below table 4.24, consumption level of mushroom by people as a food, medicine and in cafeterias, hotels and restaurants and the respondents replied that of 74.5% of the

respondents proved that there are no peoples consumed mushrooms as a food, 72.7% from the total respondents replies there are no peoples used mushrooms as a medicine whereas only 16.4% knows the presence of mushrooms in cafeterias, hotels and restaurants. This shows the consumption level of mushrooms as a food, as a medicine as well as in cafeterias, hotels and restaurants in Addis Ababa is still very low. Now a day's mushrooms are found in markets throughout America, Europe and Asia with little in Africa (Chang and Miles, 1992).

Table 4.19 Problems related to consumption of mushroom

Are there mushroom consumers as a food?		frequency	percentage
	Yes	14	25.5
	No	41	74.5
	total	55	**100.0**
Does mushroom used as a medicine?	Yes	15	27.3
	No	40	72.7
	total	55	100.0
Are there consumers of mushroom in Cafeterias, Hotels and Restaurants?	Yes	9	16.4
	No	46	83.6
	total	55	100.0

Source: own field survey

4.6.8 Communication problems between producers, retailers and users

The respondents were asked for their suggestion of market communication starting from producers to users and vice versa, 31% of the total respondents reported they have had problems and gap of communications between producers and retailers, producers and users as well as retailers and users. Only about 69% of the respondents have had no any gap of market and communication.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusion

Addis Ababa has a potential mushroom production area. It has a favourable climatic condition. Currently the demand for mushroom is relatively high and can be expected to grow because of fast growth rate of the population, high income and demand for mushroom products and the absence of job opportunity favourable for the development of mushroom agriculture in the city.

As the mushroom cultivation practice, the great majority of the urban mushroom cultivation participants directly and indirectly (58.2%) were between 30-39 years of age and females are a little bit greater than males in the cultivation system (54.5%). About 65.5% of the participants were married. Out of the total mushroom cultivation participants 60% of them belong to the Orthodox Christianity religion. About 80% of the mushroom farm participants were have 1-4 family members and 60% of the participants were have from grades 5 up to collage of educational level.

Hence, it is safe to conclude that orthodox Christian with a limited family size, females and people in the middle age groups with medium (grades 5 - collage) level of education predominate the urban mushroom agricultural practice directly and indirectly.

About 85.5% of the total mushroom agricultural businesses were stayed from 0-5 years. This shows mushroom agriculture is a very recent phenomenon in the city.

As for monthly income level before and after joining mushroom activity, almost half of the participants' monthly income was less than 1000birr before them joining in this activity but latter after they engaged their monthly income become increases to above 2500birr. Therefore, mushroom agriculture is important in raising income level.

The permanent job of majority of the respondents (65.4%) in the study was also daily labourer and governmental employers. From these participants majority of them (81.8%) are satisfied with mushroom's agricultural business. So engaging in mushroom agriculture is more important than being daily labourer and governmental employer.

It is possible to cultivate above seven and/or eight times per year in a single bedroom and also gives on average 5 to 7kg in one production period per one bedroom, if the spawn is good. All of the producers cultivated the oyster mushrooms in its scientific name called Pleurotus, are relatively fast growing organisms as comparing with the other types and can be harvested in 3 to 4 weeks after spawning and it takes two weeks for spawning, above all oyster also suitable and easily can adapted the tropical climatic condition of Addis Ababa. Therefore, governments and private mushroom experts should train the people how to cultivate oyster mushrooms.

The advantages of urban mushroom agriculture for the respondents and users in particular and the urban environment in general in Addis Ababa city administration are listed as follows;

1. Mushrooms are very importantly used as a source of income, nutrition, and medicine and food. Mushroom's nutritional, protein and culinary potential is unparalleled by any other food types. 94.6% of the respondents were having a positive agreement with the replacement of mushrooms to food. So mushrooms can use as a food during critical and food shortage periods. Furthermore, 89.1% were agreed with a high content of protein, vitamin, minerals and medicinal values of edible mushrooms.
2. Mushroom agricultural activities can play an important role in supporting the local economy in general and households in specific by contributing to the subsistence food security, generating employment and additional income through mushroom trade. 98.2% of the respondent believes with the positive role of mushroom to the poor, vulnerable groups, producers, retailers, distributors and disabilities.
3. Mushrooms are grown on agricultural wastes and manures from livestock and, this become reduce environmental pollutions. Mushrooms have the capability of transforming polluting substances to valuable food staff through the process of bioconversion. Therefore, mushroom agriculture is advisable to conduct in Ethiopia since; there is large number of livestock's and agricultural wastes.

Twelve species of edible and/or medicinal mushrooms discovered by scientists, but the world market is dominated the shiitake, Lentinus and oysters.

Mushroom can be potentially cultivated about 7-8 times per year (100%) of the respondents proved this. About 92.7% also are satisfied with the mushroom production and profitability in the business process.

The major challenges in mushroom agriculture includes the following

1. Majority of the respondents under investigation's sold their production to the private businesses where as very small production sold directly to the hotels and restaurants and local households. Therefore, the producers and private businesses are the major agents in mushroom agricultural practice by market determination of private business sectors. 31% of the total respondents have a communication gap with their trade partners. This also affects the whole mushroom agricultural practice of producers which is resulted to low marketing of mushroom spawn and production.
2. Flying pests, diseases and high temperature conditions are one challenge in the mushroom agriculture. The very high and extreme low temperatures alternately and 58.2% were have

such types of problems. Therefore; trainers and governments should provides chemicals and prepare better production place with conducive climatic condition

3. Problems related to initial capital investments mostly at the beginning, even though oyster mushrooms does not require much more initial capital, it's difficult to afford such amount of money to a single individual, this also the problem of 89.1% of the participants. So that lack of capital to begin is a challenge for producers.
4. Problems related to safe production place, spawn and shelter also affects about 57.7% of the respondents. So that providing production place increases the productivity and profitability of producers.
5. Lack of experience and training is other problem of producers. 37.7% of the respondents does not have any access to training and experience sharing rather than their first training. Therefore, government, NGOs and local authorities should arrange for training and experience sharing to and among producers.
6. Problems relating to support from government, NGOs, other local and private businesses as well as cooperation with other stakeholders especially with other mushroom producers. The majority (90%) did not have an access to supports and also have not any support, cooperation and integration from/and with other bodies. This also affects the quality, quantity and profitability of the producers, participants and consumers. Contrary to this, it is found that most of the producers have fear of eviction and do not know whether urban mushroom agriculture will be recognized by the government and still many of them do not have any idea of government's attitude towards urban mushroom agriculture.
7. The population cultural consciousness to mushroom cultivation and consumption, collection and processing is very limited and about 80% also responds the cultural problems is one of their challenges. Since mushroom is not a traditional crop in Ethiopia as well as low researches, lack of modern advertisements and low training in mushroom cultivation hampering the cultural development of mushroom production.

5.2 Recommendations

The following points are recommended based on the findings of the research:

1. Governmental institutions should create appropriate, encouraging and working environment for the mushroom agriculture. Through more appropriate production technology available through research, improved management and investment in mushroom agriculture particularly and in human resource development in general.
2. Linking urban agriculture with sustainable urban development programmes in order to support mushroom agriculture with education, nutritional and environmental issues.
3. Regular information on mushroom agriculture should be provided to the city administration about urban mushroom cultivators including how they produce, their motives and the materials being used, and about environmental impacts of mushrooms in order to make right policy decisions.
4. The number of cultivators and the level of growth in mushroom production should grow at a faster rate by making use of improved and easy access to seeds and appropriate management of the city government.
5. There should be a mechanism of motivating private sector in the mushroom agricultural practice by providing adequate legislative and regulatory frameworks and all the necessary support the producers need to have good opportunities to the cultivation process.
6. The city government specifically should give attention to solve the major challenges and problems of producers.
7. The city government urban agriculture extension should form a self help mushroom cultivator groups by way of establishing voluntary mushroom associations which organize mushroom collection, processing and distribution, for information and experience exchange and credit availability.
8. Educating the people through variety of methods such as child care services, nutrition, popular magazines, the press, radio and television and included in the education policy is crucial to underline in the popular mind of mushroom in human.
9. Finally, Universities should undertake researches on the methods of cultivation and practices of mushroom to do in a modernized as well as commercialized level and also needs to be expanded the importance, productivity and profitability of mushroom agriculture. This opens the door for improvements to tackling mushroom production problems, identifying basic materials required and improving quality of mushroom products.

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QUESTIONNARES

This questionnaire is prepared as an instrument to conduct an academic research for the partial fulfilment of Masters of Art (M A) in Addis Ababa University college of social science, Department of Geography and Environmental studies (Urban and regional development planning). The main objective of the research is to assess urban mushroom agricultural activities in Addis Ababa. Therefore the information you will provide is very important for the research. Furthermore, the information you give will be used for only the academic research.

Thanks in advance for your cooperation.

I. Questions answered by mushroom agriculture producers, managers and experts.

1. Age…….
2. Sex.....
3. Religion…….
4. Ethnicity……
5. Educational level……..

Illiterate	1-4 Grade	5-8	9-10	11-12	college	university

6. Marital status

Single	Divorce	Married	widow

7. Family size……..
8. What is your job title? Producer..... Expert..... Manager.....
9. What is your job type? Governmental..... Private..... NGO.....
10. Are you satisfied with the product and service of your current mushroom supplier?

Yes _____ No _____

11. How many years are you involved in mushroom agriculture?

0-2 years	3-5 years	6-8 years	>9yers

12. What was your Job before joining mushroom agriculture? Please make this "X" mark.

No.	*Prior job type*		No.	*Prior job type*	
1	Student		5	Employed in similar business	
2	Daily labourer		6	Government employer	
3	Unpaid family business		7	NGO office worker	
4	Unemployed		8	Household worker	

If other please specify…….

II. Basic information

13. What is your Duration of stay in mushroom business?

0-2 years	3-5 years	6-8 years	>9 years

14. What was your monthly average income before you join in mushroom agriculture?

<500birr	500-1000birr	1000-1500birr	1500-2000bir	2000-2500bir	>25000birr

15. What is your monthly average income after joining this business?

<500birr	500-1000birr	1000-1500birr	1500-2000bir	2000-2500bir	>2500birr

16. What equipments and materials are needed for start up and operational mushroom agriculture? Please make "X" mark.

17. Which equipments and materials do you have?

18. How many production periods per year, you have in your mushroom cultivation?

1	2	3	4

19. What is your average mushroom production in kg per one production period?

20. In your experience, do you face the following problems during start up and operational levels? Please make this "X" mark.

No.	The major problem faces you during cultivation and start-up	Yes	No
1	Flying and pests e.g. cockroaches		
2	Air cooler problem(high temperature problem)		
3	Virus, fungus and germ problem		
4	High price of raw material such as spawn		
5	Lack of good mother spawn		
6	Shortage of Capital to start up and operational		
7	Difficulty of loan process		
8	High interest rate for borrowing		
9	Labour shortage		
10	Lack of skilled personnel		
11	Lack of production place		
12	Unaffordable tax		
13	Inadequate support from government, NGO and others		
14	Lack of working capital		
15	Lack of access for training		
16	Lack of experience		
17	Licensing bureaucracy		
18	Lack of appropriate equipment such as shelter		
19	Lack of regional cooperation among enterprises		
20	Culture problem / lack of awareness to consume/		
21	Lack of local people awareness about collection and processing techniques		
22	Market problem		

If other, please

specify……

21. Degree of satisfaction of producers and experts of mushroom, please make "X" for the following **1 = HIGHLY SATISFIED, 2 = SATISFIED, 3 = UNDICIDED, 4 = UNSATISFIED AND 5 = HIGHLY UNSATISFIED**

No	Character	1	2	3	4	5
1	Amount of production					
2	Access of market					
3	Supply of seeds					
4	Consumption level of the people					
5	Employment creation					
6	Providing appropriate environment					
7	Profitability					
8	Access to land					
9	Materials /equipments/					
10	Demand of consumers					

22. What are the major problems related to marketing and production? Please make this "X" mark.

No.	The major problem faces you during marketing	Yes	No
1	Communication gap between producers and retailers		
2	Communication gap between retailers and users		
3	Lack of awareness of the people		
4	culture of the people towards mushroom		
5	High cost of modern advertising		
6	Lack of information about mushroom production		
7	Lack of proper market knowledge and access		
8	Lack of interest of government for its cultivation in the suitable areas		
9	Failure of government to include in the agriculture policy and quality of offspring		
10	Less need for packaging, storage and transportation		

If others, please specify_____

_____

23. Please make "X" mark on your agreement with the following mushroom cultivation practices. Please use the numbers **1 = STRONGLY DISAGREE, 2 = DISAGREE, 3 = UNDICIDED, 4 = AGREE AND 5 = STRONGLY AGREE**

NO.	Item	1	2	3	4	5
1.	Mushroom cultivation is profitable					
2.	It doesn't require much more initial investment					
3.	Mushroom Cultivation is labour intensive					
4.	Mushroom farming gives profit in short period					
5.	Mushrooms cultivation requires traditional farming activity					
6.	Mushroom cultivation requires practical experience and scientific knowledge					
7.	Mushroom farming is a complex practice					
8.	Mushroom farming is a simple process					
9.	There is easy access of raw materials for mushroom cultivation					

10.	Mushroom can be produced and harvested throughout the year					
11.	Technical Support is needed to improve mushroom cultivation					
12.	Raw materials are easily and cheaply available for compost and covering material					

24. What is the mushroom type you cultivate, please make "X" mark.

NO.	Mushroom Type	
1.	oyster(Pleurotus)	
2.	Button	
3.	shiitake(Lentinus)	
4.	Agaricus /Common mushroom /	
5.	Straw (Volvariella)	
6.	Lion's Head or Pom Pom (Hericium)	
7.	Bosporus	
8.	Ear (Auricularis)	
9.	Ganoderma (Reishi)	
10.	Maitake (Grifola frondosa)	
11.	Winter (Flammulina)	
12.	White jelly (Tremella)	
13.	Nameko (Pholiota)	
14.	Shaggy Mane mushrooms (Coprinus)	

25. Do you believe with the presence of the following elements?

No.	***Basic Element***	***YES***	***NO***
1.	Strong agricultural policy		
2.	Mushroom department and policy under the Ministry of Agriculture		
3.	Experts in mushroom cultivation		
4.	Distributors and exporters of mushroom		
5.	Technical Support from Government		
6.	Financial Support from Government		
7.	Technical Support from NGO's		
8.	Financial Support from NGO's		
9.	Mushroom consumers as a food		
10.	Mushroom consumers as a medicine		
11.	Mushroom consumers in cafes and restaurants		

26. What is your opinion with advantages of mushrooms? Please use the **numbers 1 = STRONGLY DISAGREE, 2 = DISAGREE, 3 = UNDICIDED, 4 = AGREE AND 5 = STRONGLY AGREE**

No.	Advantage	1	2	3	4	5
1.	Safety net during critical times					
2.	a good activity to help people less poor					
3.	permanently shift out people from poverty					
4.	an employment opportunity for jobless people					

5.	Trade of mushroom serves as additional employment for producers, suppliers and distributers					
6.	It provides employment for suppliers of substrates (spawn and raw materials)					
7.	Important source of cash income for producers, suppliers, distributers and users.					
8.	Mushrooms are sources of nutrients and proteins					
9.	useful in preventing diseases					
10.	mushrooms have medicinal values					
11.	Reduce environmental pollution through Bioconversion.					
12.	serve as means of generating employment for vulnerable groups					
13.	provide additional vegetable of high quality, and enrich with high quality of proteins, minerals and vitamins					
14.	Additional family income					
15.	Exported and brings foreign exchange					
16.	Brings immediate benefit to the producers and retailers due to short period of harvest					

27. Who are your main trade partner and customer in mushroom marketing?

No.	**Customer**	
1.	Local households	
2.	Hotels and Restaurants	
3.	Distributors/supplements/ vegetable shops	
4.	Exporters	
5.	Processing Industries	

28. In your opinion; do you agree with impact of mushroom on the following factors? Please make "X" mark on your choice. Please use the numbers **1 = STRONGLT DISAGREE, 2 = DISAGREE, 3 = UNDICIDED, 4 = AGREE AND 5 = STRONGLY DISAGREE**

No.	Impact of Mushroom	1	2	3	4	5
1.	Mushroom cultivation plays an important role in supporting the local economy					
2.	Mushroom cultivation contributes to subsistence food security					
3.	Mushroom cultivation can generates additional income					
4.	Mushrooms cultivation can reduce environmental pollution					

5.	Mushrooms cultivation can be of great benefit, for small-scale cultivators					
6.	Cooperation with other mushroom growers helps to share transport costs and market contacts					
7.	Cooperation with others enables cultivator to establish local production, processing, or packaging facilities to increase harvest output					
8.	Mushrooms cultivation give the opportunity to women for financial independence, farming skills and higher self-esteem					
9.	Mushroom cultivation helps People with disabilities to self-satisfaction, self-esteem and become physically stronger					
10.	Mushroom cultivation can be practiced by Peoples with mental disabilities and chronically ill or weak people					
11.	Mushroom growers increase their income status, which in turn creates confidence in their ability to grow mushroom profitably for disabilities					