

**Proposed by: Kings' Mushroom Production and
Marketing Enterprise**

**SHORT-TERM TRAINING
ON THE CULTIVATION,
HARVESTING AND
POSTHARVEST HANDLING,
AND MARKETING OF
MAJOR EDIBLE
MUSHROOMS**

A project proposal developed as a means of communication between the training body and other parties seeking training on the title mentioned above

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1. INTRODUCTION

Mushrooms are the edible fleshy fruiting bodies of certain fungi, which may be gathered wild or grown under cultivation. When we think of mushrooms, we think of the soft caps and stems that we see in the grocery store. Hidden underground, however, is the vast majority of the mushroom mass itself- the network of feathery mycelia. These mycelia, often seen when turning over compost, are what the mushroom uses to absorb food and moisture. The cap and stem that we commonly eat is just the fruiting body.

Today, approximately 14,000 described species of the 1.5 million fungi estimated in the world produce fruiting bodies that are large enough to be considered as mushrooms, but only 100 of these are considered to be edible. Most acceptable varieties among cultivated type are *Agaricus bisporus* (*Button mushroom*), *Pleurotus spp.* (*Oyster mushrooms*), *Lentinula edodes* (*Shiitake mushroom*), *Auricularia spp.*, *Flammulina velutipes* (*Velvet stem collybia or Gold needle mushroom*), *Tremella spp.* (*Silver ear*), and *Volvariella spp.*

1.1. HISTORY AND ORIGIN OF MUSHROOMS

Mankind has harvested wild edible mushrooms for millennia. The mushrooms were either eaten directly or preserved for later use by drying. Mushrooms have been treated as a special kind of food since earliest times. Chinese and Japanese chronicles indicate that the Shiitake mushroom was collected in the wild and was given to the emperors as a tribute. The Romans ate mushrooms on special occasions.

1.2. EDIBLE WILD AND CULTIVATED MUSHROOMS

Some fungi are edible while others are poisonous. Poisonous mushrooms are known as toadstools though this is not a scientific term.

Mushrooms have been attracting attention of mankind since ancient times. Much less controversial is the consumption of mushrooms as a food. Common edible mushrooms are still gathered in the wild in many cultures. In some cultures a tremendous fear of poisonous mushrooms exists. In England for example, people are very reluctant to pick wild mushrooms. The reason why some ethnic groups despise and other groups love mushrooms passionately has not yet been found.

2. BENEFITS OF MUSHROOMS

2.1. NUTRITIONAL ASPECTS

The use of mushrooms as food is probably as old as civilization itself and mushrooms have been treated as a special kind of food. Greeks believed mushroom provides strength in battle. The Chinese treasured mushrooms as a health food the elixir of life. Romans regarded it as food of the gods. The Egyptians regarded them as food for Pharaohs.

Mushrooms have been recognized by FAO as food contributing high protein in nutrition. Mushrooms usually contain 20-30% protein (about 3% on fresh weight basis) which is higher than most of the vegetables. Quality of mushroom protein is superior to that of vegetable protein. The proteins have high digestibility. Mushrooms are rich in essential amino acids that cannot be synthesized by our body as well as the most commonly occurring non-essential amino acids. In mushrooms, starch is absent. Moreover, cholesterol and the sterol known to be dreaded for heart patients, remain absent in mushrooms. Mushrooms are rich in Vitamin B-Complex and they contain Vitamin C. The vitamins are well retained during cooking, canning, drying and freezing. Fresh mushrooms contain relatively large amount of carbohydrate (4-5%) and fiber. And they contain significant amount of phosphorous, sodium and potassium with lesser amount of calcium and iron.

In Ethiopia the 29% malnutrition prevalence among lactating mothers, the 5-15% prevalence of vitamin deficiency diseases among the pregnant women, the 30% prevalence of iodine among the general population and the 58% child death rate are due to malnutrition. According to the 2000 CSA study, more than 50% of Ethiopian children have not grown to the level they are expected to grow, 47% of them have weight below the standard weight set for their age and 11% are extremely malnourished. Surplus food producing areas are also among the areas where problem of malnutrition is predominantly seen. As a result of this half of all pre-school children are deprived of normal nourishment, which causes various physiological disorders and leads to mental and physical retardation. Therefore to this end it is apparently clear that mushrooms will play an important role in solving the dire need of food and balanced diet in this country.

2.2.MEDICINAL USE

The value of mushrooms has recently been promoted to tremendous levels with medicinal mushrooms trials conducted for HIV/AIDS patients in Africa, generating encouraging results.

For instance, as a variety of nutritional analysis research works and clinical diagnosis indicate that oyster mushrooms have the following medicinal values if consumed daily and in proper amount:

Medicinally, they are known

- to reduce the abnormal deposition of cholesterol and cholesterol-rich lipoproteins (Arteriosclerosis),
- for antitumor, antibacterial, antioxidant, antiviral, anti-inflammatory, and immunomodulating, properties, and
- their freedom from cholesterol

2.3.ECONOMICAL ASPECTS

Presently, mushroom farming is being practiced in more than 100 countries and its production is increasing at the rate of 7 per cent per annum. Production of mushroom reaches 7 million metric tons annually in the world. The world market for the mushroom industry in 2005 was valued at over \$45 billion.

Production of mushrooms worldwide has been steadily increasing, mainly due to contributions from developing countries such as China, India, and Vietnam. China produces about 60% of world production and about 80% its mushrooms come from small scale production. Mushrooms are known for their nutritional and medicinal benefits.

In Ethiopia due to a number of constraints the economic, food, and medicinal value of mushrooms have not been exploited so far. However, currently, there is increasing interest and production endeavors in some parts of the country.

3. POTENTIALS, CONSTRAINTS, AND OPPORTUNITIES OF MUSHROOM PRODUCTION IN ETHIOPIA



3.1. POTENTIALS

Ethiopia has a favorable climate, comparatively abundant land and labor as well as reasonably good water resources that created ample opportunities for horticulture production. The range of altitude, temperature, and soil variability of the country has created an enormous ecological diversity and a huge wealth of biological resources. However, apart from the harvesting, consumption, and marketing of some wild mushrooms in some areas of the country, the commercial production and utilization of mushrooms in Ethiopia is incipient. As a result this country is not benefited from mushrooms as the rest of the world. This is mainly because of the following constraints that exist in the country long before.

3.2. CONSTRAINTS

Mushroom growing is one of the most science-based branches of agriculture and horticulture. At its large scale production, it is a sophisticated, competitive and capital-intensive industry. Together with these, lack of concept and skill on production technology, lack of research, extension, and adaptation works, lack of appreciation about the food and dietary importance of mushrooms, low infra structural development, low level of information supply both on production and marketing aspects, and the monotonous traditional diets and the conservative eating habit of the people may be the reasons that constrained the introduction of this delicious vegetable into the menu of most Ethiopians.

3.3. OPPORTUNITIES

Regardless of the constraints mentioned, there are also good opportunities that can be taken as the precursor of the product's excellent future in this country.

- Mushroom cultivation is based on recycling of agricultural residues, which are available in huge amount in every corner of the country;
- Mushroom cultivation does not require a large area of land or it can be grown in non arable land;

- Mushrooms are high yielder per unit area of land;
- Mushroom cultivation is environmentally friendly technology;
- The availability of alternative production options for marginal and small scale producers;
- Initiation of development and research projects on low cost production of mushrooms by different bodies of the country;
- The increasing level of awareness and interest about mushrooms among certain group of the society; and
- The appearances of a few mushroom growers and spawn producers in Addis Ababa and other cities of the country.

As a result, today one may encounter mushrooms in cafes and restaurants served as condiments and pizza flavoring items. Particularly in Addis Ababa there is high demand of fresh mushrooms in the market surpassing the current supply by growers in and around Addis.

3.3.1. The expected outcomes of the proposed project are:

- Increased food production, diversity, and improvement of GDP of the country;
- Unemployment reduced and the income of trainees increased;
- Provides market opportunities for local materials;
- Increased credit transaction and tax payments for the banks and the government, respectively;
- Increased foreign currency source for the country; and
- Serves as import substitution item: Ethiopia imports a huge amount of canned mushrooms from abroad;

3.3.2. Beneficiaries of the training package are:

- The unemployed urban and rural youths in general;
- The employed urban and rural dwellers having interest to run mushroom production as a par-time business and the rural poor and marginalized farmers;
- Hotels, restaurants, and cafeteria service providers; and
- The government, banks, and other institutions.

4. TRAINING OUTLINE

SHORT-TERM TRAINING ON THE CULTIVATION, HARVESTING AND POSTHARVEST HANDLING, AND MARKETING OF MAJOR EDIBLE MUSHROOMS

4.1. TRAINING MANUAL OUTLINE (THEORETICAL BACKGROUND)

1. What are mushrooms?

- 1.1 History and their origin
- 1.2 Edible wild and cultivated mushrooms
- 1.3 Edible and poisonous mushrooms

2. Benefits of mushrooms

- 2.1 Nutritional aspects
- 2.2 Medicinal use
- 2.3 Economical aspects

3. Opportunities and threats of mushroom production in Ethiopia

- 3.1 Potentials of mushroom production in Ethiopia
- 3.2 Constraints of mushroom production in Ethiopia

4. Cultivation of major edible mushrooms

4.1 Production technology

4.2 Principles and practices of Seed (or Spawn) production methods

4.3 Button mushrooms (*Agaricus bisporus*)

- 4.3.1 Preparation of growth media and control of environmental factors
- 4.3.2 Control of the environment of cropping room
- 4.3.3 Seeding (Spawning)
- 4.3.4 Casing soil
- 4.3.5 Care and management
- 4.3.6 Harvesting

4.4 Oyster mushrooms (*Pleurotus species*)

- 4.4.1 Preparation of growth media
- 4.4.2 Control of the environment of cropping room
- 4.4.3 Seeding (Spawning)
- 4.4.4 Care and management
- 4.4.5 Harvesting

4.5 Shiitake mushrooms (*Lentinula edodes*)

- 4.5.1 Cultivation on wood logs
- 4.5.2 Substrate requirement
- 4.5.3 Spawning techniques
- 4.5.4 Care and management
- 4.5.5 Harvesting

5. Postharvest handling of mushrooms

- 5.1 Nature of harvested mushrooms
- 5.2 Environmental factors affecting the postharvest life of mushrooms
- 5.3 Postharvest handling methods (grading, packaging, storing, transportation, etc)

6. Markets and marketing of mushrooms

7. Planning and establishment of simple mushroom farm

- 7.1 Selecting a site for the mushroom farm
- 7.2 Indoor cultivation
- 7.3 Mushroom growing houses

8. Pests and diseases of mushrooms and their control

9. Food types prepared from mushrooms

4.2. PRACTICAL CONSIDERATION

1. Oyster mushrooms (*Pleurotus species*)

- Preparation of growth media
- Control of the environment of cropping room
- Seeding (Spawning)
- Care and management
- Harvesting
- Postharvest handling

2. Mushroom recipes (food) preparation practical

Requirement of the training

- Interest in mushroom production and marketing

Place of training

- Bahir Dar, Ethiopia

Duration of the training

- 60 hours

Training fee

- Negotiable