



# Mushroom Cultivation in Ethiopia: Status and Opportunities

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# Background

- Mushrooms are higher fungi with visible fruit bodies
- Mushrooms are predominantly saprophytic
- Only a small proportion of edible mushrooms are commercially cultivated.



# Nutritional and Medicinal Values

- High protein, vitamin, fiber content and devoid of cholesterol
- Flavour and aroma
- Immune enhancing, blood pressure lowering, antiviral and anti-tumor products
- Nutraceuticals

Comparison between mushroom and animal products.

	Raw Chicken	Raw lean beef	Stewing Steak	Fresh cod	Mushroom
Protein	20.5	20.3	20.2	17.4	12.2
Dietary Fiber	0	0	0	0	5.1
Total fats	4.0	4.6	10.6	0.7	2.9
Fats ratio	0.5	0.1	0.1	2.2	2.5
Cholesterol	69	59	65	50	0
Energy	506	514	736	318	334

Fats ratio is ratio of unsaturated: saturated fatty acids; protein in g/100g; fiber in g/100g; cholesterol in mg/100g; and energy in kJ/100g.

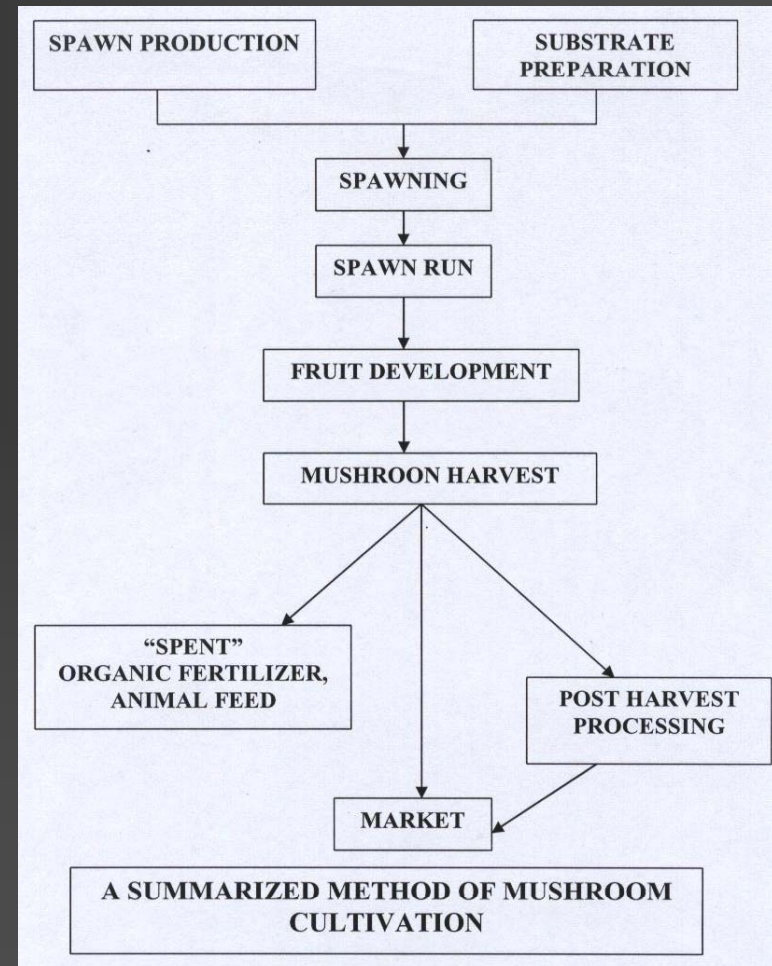
# Why Mushroom Cultivation for Ethiopia?

- Converting inedible plant biomass to nutritious food
- Requires little land and does not require light
- Production throughout the year
- Raw materials (agricultural and agroindustrial waste) are available
- Short production period
- Manpower intensive
- High value international crop with growing global market



# Cultivation Technology

- Selection of mushroom type
- Facility for quality spawn or supplier of spawn
- Evaluation of available raw materials
- Controlling environmental conditions
- Construction of appropriate growing houses
- Management of pests and diseases
- Processing and marketing



# Mushroom Cultivation Project

- A 3-year project supported by Ethiopian Science and Technology Agency
- The main objectives
  - to evaluate substrates for mushroom growing
  - to select mushroom types for cultivation under local conditions
  - to recommend feasibility of mushroom cultivation in Ethiopia.



# Substrates in Ethiopia for Mushroom Cultivation

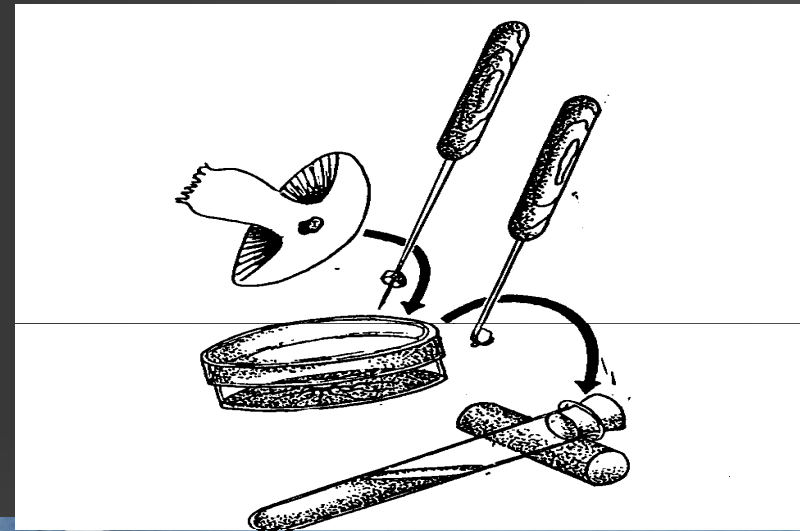
- Ligno-cellulose materials
  - Straws (grass, cereal)
  - Sawdust (hardwood)
  - Cotton/seed waste
  - Sugarcane Bagasse
  - Coffee seed waste
  - Corn cobs
  - cattle/horse dung
  - chicken manure
  - Brewers spent
  - wheat bran
  - Sorghum /maize stalk





# Spawn Preparation

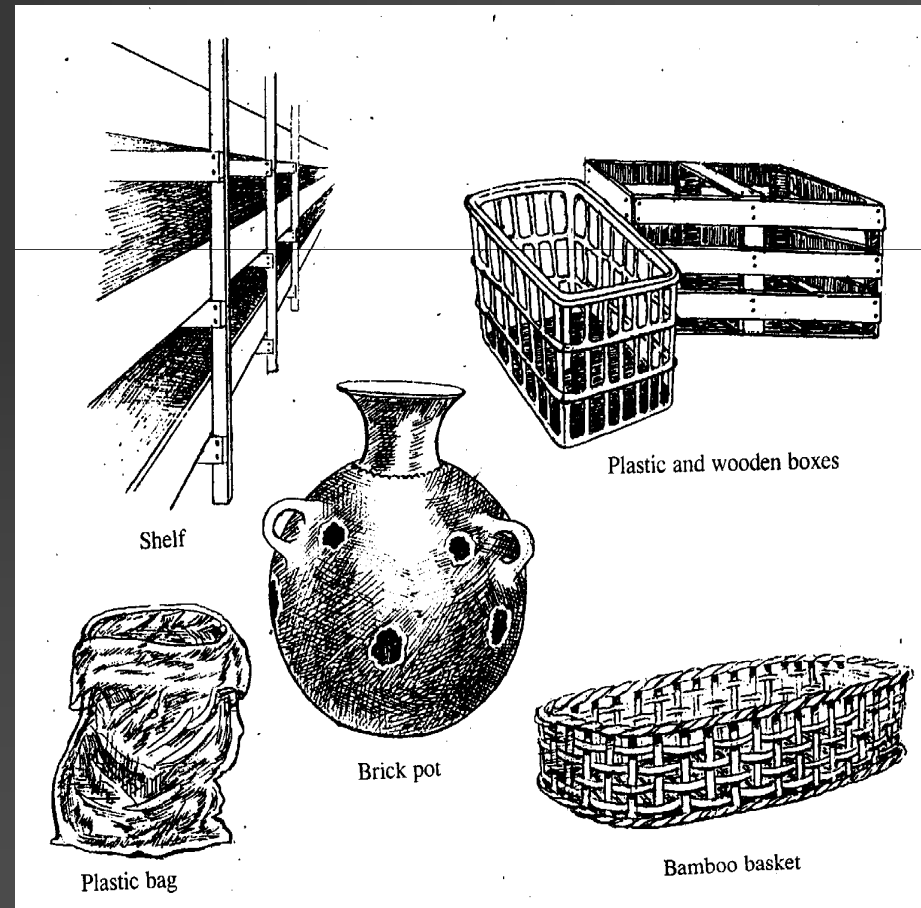
- Vegetative material of the mushroom grown in sterile moist grain
- A modest laboratory and skilled technicians needed
- Spawn production methodology for the cultivated mushrooms





# Growing the Oyster (*Pleurotus ostreatus*) mushroom

- Can utilize a wide variety of raw materials
- Has a wider range of temperature
- Convenient for Small scale production (low cost)



# Growing the Oyster (*Pleurotus ostreatus*) Mushroom

- A good choice for the beginning mushroom grower
- Can be grown in a variety of containers



# Oyster mushroom (contd.)

- The first mushroom to be introduced to the market in Ethiopia
- A few growers are engaged in the cultivation of the mushroom
- Dried mushroom acceptable





# Shiitake (*Lentinula edodes*) Mushroom

- Shiitake, the Japanese forest mushroom, is the oldest cultivated mushroom
- It is one of the most expensive of the cultivated mushrooms
- Besides the nutritional value, shiitake has medicinal values
- The log method of growing shiitake, the old Japanese method, is still one of the methods of growing shiitake





# Growing the Shiitake Mushroom

- The spawn is inoculated into holes and covered.
- After a few months, the mushroom starts to grow
- The production could continue to 4-6 years
- Has been used in traditional medicine in Japan and China for a long time



# Shiitake (contd.)

- Shiitake Mushroom
- Sawdust based substrate is the other method of growing
- Shiitake is also well known for its medicinal properties



# Growing the Button Mushroom

- Globally the most important mushroom, requires composted substrate
- The compost must be covered casing material after spawning.
- compost made of tef straw, horse dung and chicken manure
- The mushroom is relatively more difficult for a small scale grower





# Spent Compost

The Spent compost, organic material after cultivation

- for conditioning the soil and increase organic matter
- for vegetables and tree seedlings
- Casing material after leaching by rain water
- Mushroom growing is environmentally friendly





# Opportunities – Large Scale Production (Investment)

- High production e.g 1000 kg/day i.e 365 tons/year
- Temperature, humidity and CO2 controlled growing rooms, thus continuous and constant production throughout the year
- Spawn production, composting, pasteurization and canning facility must be in place
- Higher quality of mushrooms produced
- High investment cost

# Large Scale (contd.)

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- Production of 20-30 Kg/m<sup>2</sup> growing surface area, about 100kg compost /m<sup>2</sup> in 2 months
  - About 10 growing rooms, 200 m<sup>2</sup> each
  - About 2-3 times actual growing surface area (total area of shelves)
  - Optimal for button mushroom export market
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# Opportunity 2 - Small Scale Mushroom Growing

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- Is labour and management intensive
- Is not capital intensive
- Production dependent on weather conditions (about seasonal) and variable amount produced
- Oyster and shiitake mushrooms recommended
- Local market niche or larger scale grower for marketing
- Sun drying optimal for preservation

# Spawn Production and Supply

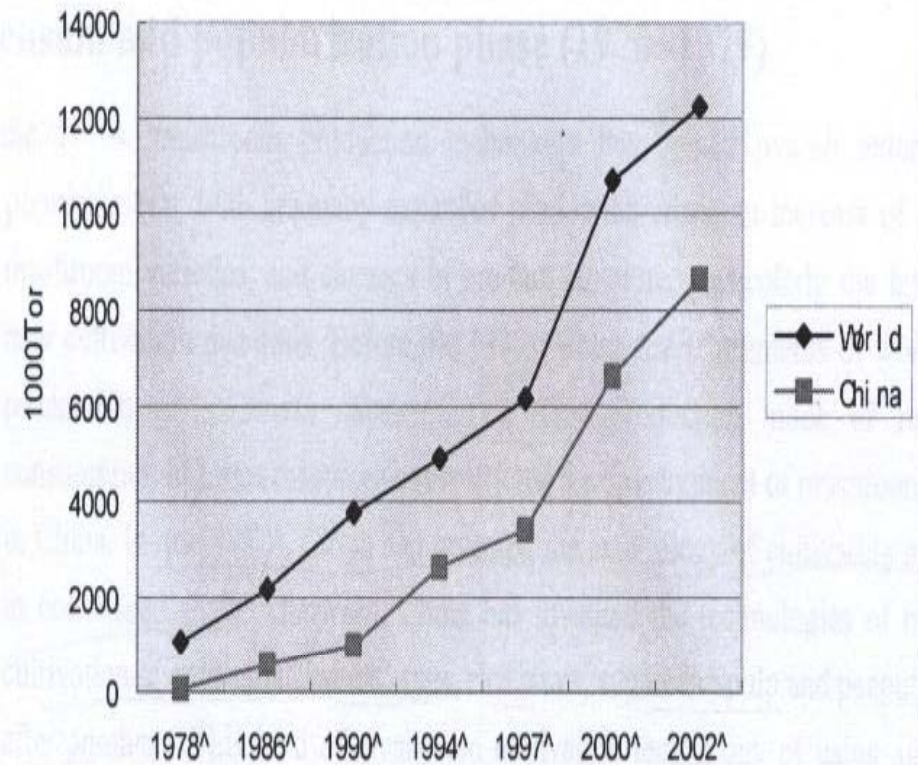
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- Spawn production requires trained specialized personnel
- A small private enterprise with the capacity to produce 50 bottles of grain spawn per day can supply 5 small scale mushroom growers
- Spawn supply occupies a very central role for value chain development of mushrooms



# The Global Mushroom Market

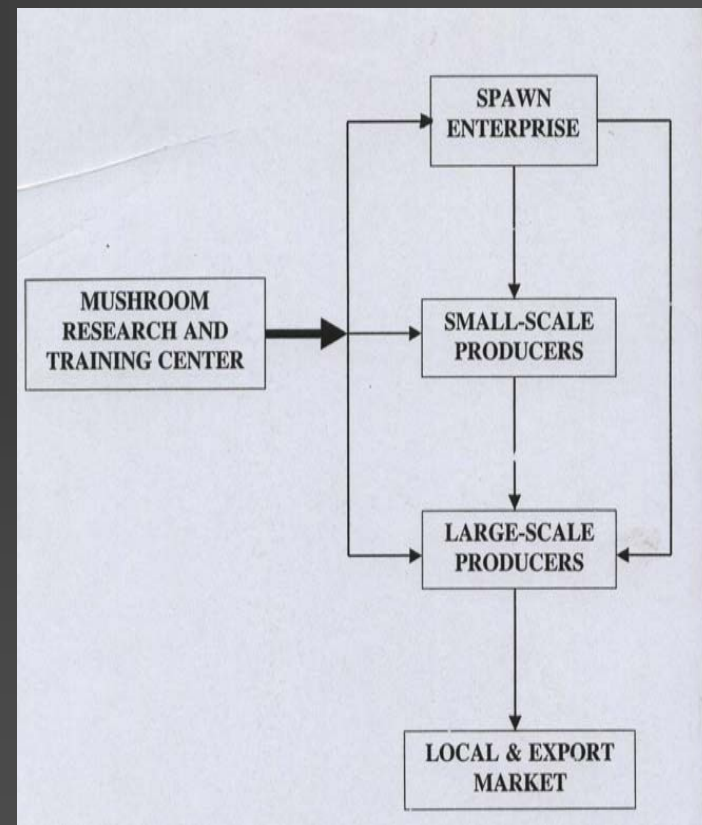
- The global commercial production of mushrooms in 2002 was 12 million tons per year worth about 45 Billion US\$.
- Production has increased 10 fold during the last 25 years and the market is still on the increase
- China produces about 60% of world production
- About 80% is through small scale production



# Sustainable Commercial Production of Mushrooms

## A Model for sustainable mushroom cultivation in Ethiopia

- Research and training support is critically needed at all stages
- Establishment of spawn enterprises is key for the industry
- Small scale producers sell their products to large scale producers
- Large scale producers, produce, buy process and export mushrooms



# A National Mushroom Research and Training Center – A Proposal

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## MAIN OBJECTIVES:

- To organize and offer training courses on mushroom cultivation
  - To publish guide books and disseminate appropriate technical information to stake holders
  - To provide overall technical support to small Scale mushroom growers in the country
  - To select appropriate varieties of cultivated mushrooms and make efforts to domesticate indigenous wild edible mushrooms.
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# Consortium of Mushroom R&D

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- Foster research beneficial to the industry
- Work for establishment of National Research and Training Centre
  - Organize training courses and workshops for technicians, extension workers and growers
  - Support establishment of private SPAWN ENTERPRISES
  - Publish appropriate guide books and simple manuals



# Strengthening the industry

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- **Ethiopian Mushroom Growers Association**

- An association of mushroom growers, processors and marketers of cultivated mushroom in Ethiopia

- With the main aim of supporting the mushroom industry in Ethiopia

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