CULTIVATION OF MUSHROOM ON DIFFERENT AGRO RESIDUES TO REDUCE GLOBAL WARMING

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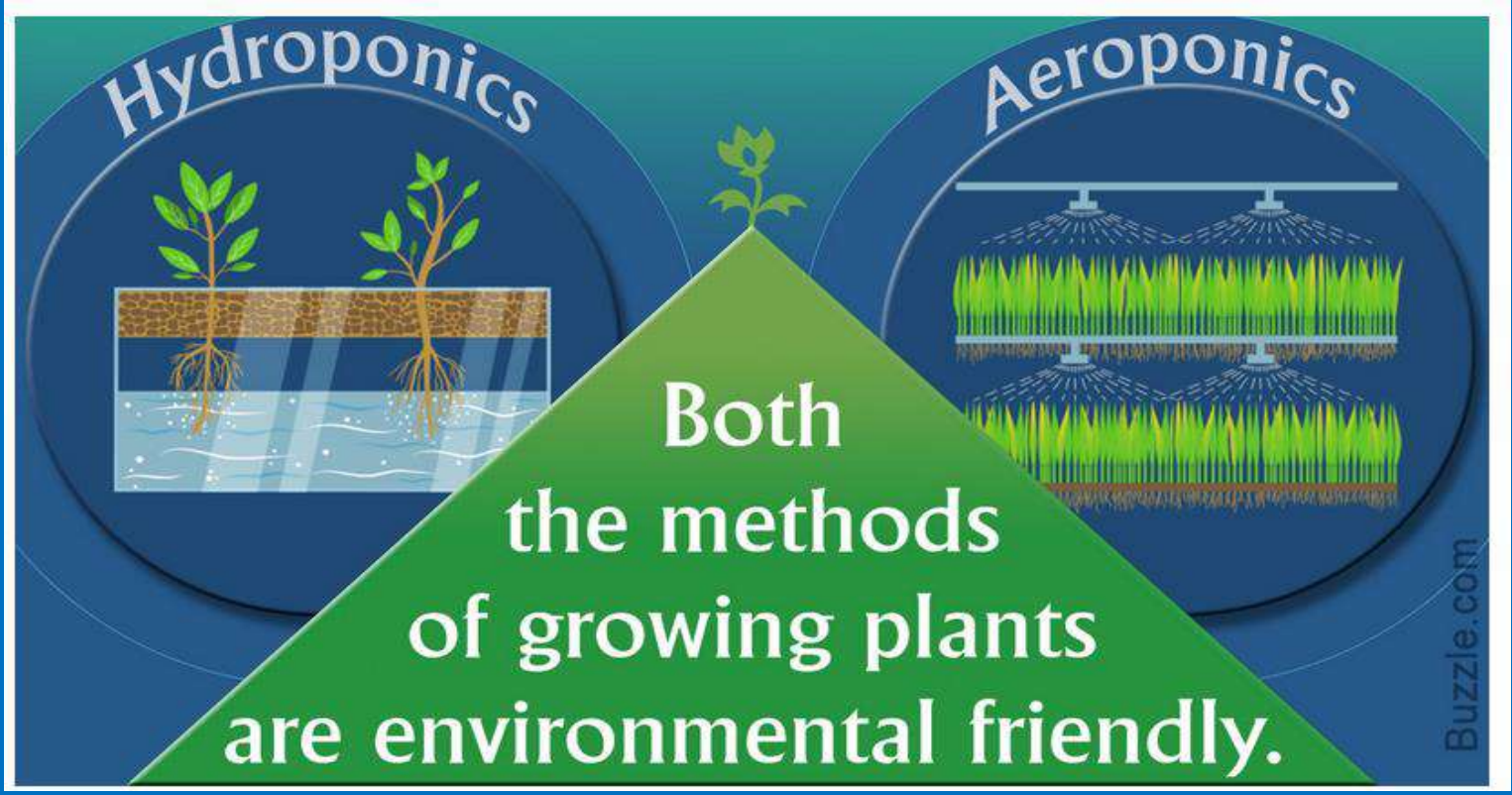
- The 20th century began with a world population of 1.6 billion. The world's population is expected to be reached 9.3 billion in 2050 from the current *world population* of 7.8 billion as of February 2020 according to the most recent United Nations estimates elaborated by Worldometer.
- This over exploring human population creates huge demand ----------
  - Nutritious health food to combat malnutrition
  - Industries for jobs and comforts
  - New cities for sheltering huge populations
  - More water for drinking as well as industries

What is the way to feed 9.3 billion of peoples in 2050 with continuous reducing area of cultivated land ?

- We need some alternative way for crop production like Aeroponics and Hydrophonics with limited land.



What is the way to feed 9.3 billion of peoples in 2050 with continuous reducing area of cultivated land ?

- **Agro waste may be the boon of mankind .**
- India generates about 350 million tones of agricultural waste every year and the ministry of new and renewable energy estimates this waste can generate more than 18,000 MW of power every year apart from generating green fertilizer for farms. The country so far failed to find its productive use in the absence of enough government push and business model to work for farmers.
- So, agro waste is the major problem of stubble burning in India.

Stubble burning……

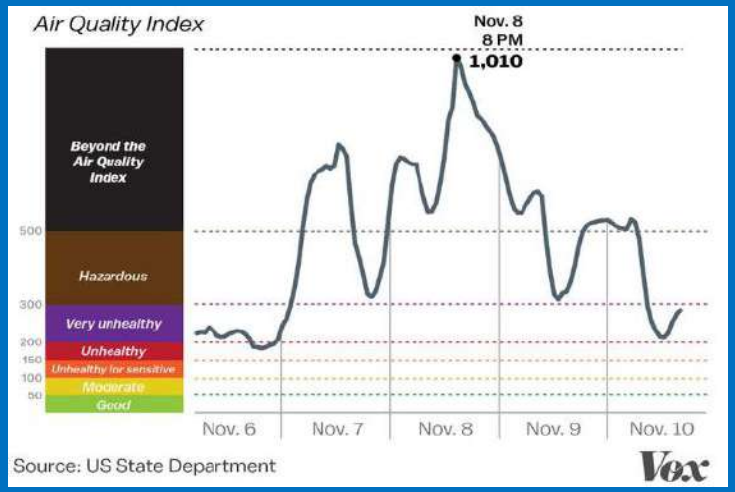
- This agricultural waste that are generally set fire on field which is called **as stubble burning** and produce untold amount of green house gases and toxic pollutants.

Stubble burning at Uttar Dinajpur, West Bengal , India in the Year 2018

Recent scenario of stubble burning at Delhi

- Much of the pollution is coming from farms in nearby states of **Punjab, Haryana, and Western Uttar Pradesh.**
- Every year, farmers of neighbouring states set fire to their own fields to clear them for the next season. Known as **stubble burning,** millions of tons of crop residue are set fire and releasing untold amounts of particulate matter into the environment.
- This belt produces an estimated **34 million tonnes (mt)** of paddy straw every season and burned within less than a month's span between mid-October and around November 10.

on November 8, 2017



Air Quality Index was 1,010 . It was above the upper limit of the hazard

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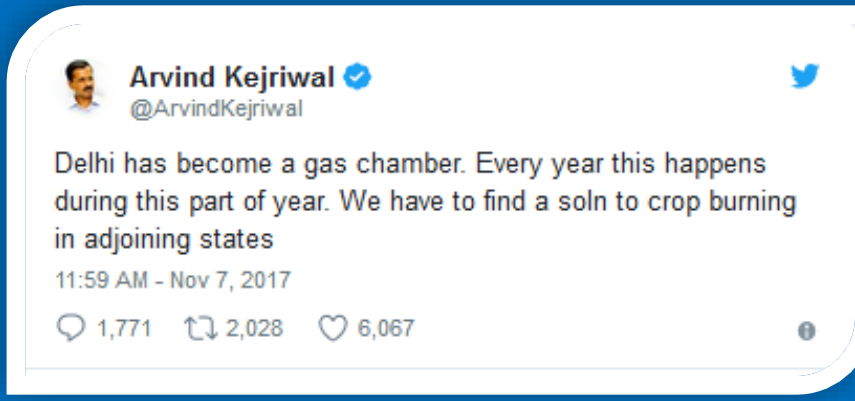
Delhi: Detereorating air quality due to burning of agricultural waste

The air quality in the national capital has deteriorated significantly and experts identified burning of agricultural wastes in neighbouring states as one of the major contributors to a visible haze over the city.

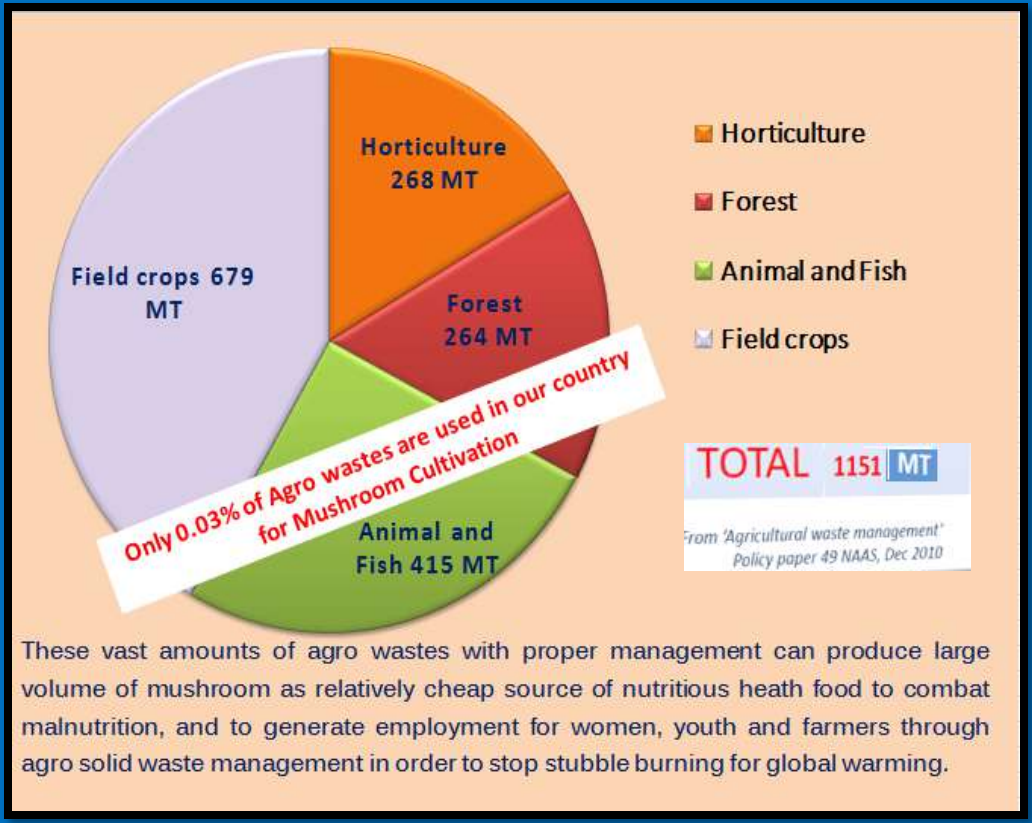
INDIA Updated: Nov 06, 2014 18:45 IST

PTI

Delhi's chief minister call his city a ----------"gas cham!



Indian scenarios of Agro waste management



These vast amounts of agro wastes with proper management can produce large volume of mushroom as relatively cheap source of nutritious heath food to combat malnutrition, and to generate employment for women, youth and farmers through agro solid waste management in order to stop stubble burning for global warming.

Mushroom can be the alternative source of food to feed over exploring population

If Earth Is Ever Hit By An Asteroid, Only Mushrooms Can Save Us From Going Extinct

- Asteroids may just be rocks that have large orbits around the Sun. And they're fine when they stay there. But when they come crashing down to Earth, they can cause a lot of damage.

- Earth surface will be covered with thousand of miles dense particulate matters , sun light will not be able to penetrate on earth surface, photosynthesis in plants would have ground to a halt, and herbivores starving to death, the carnivores preying on them following shortly after. .

Gwyn D'Mello | updated: Sep 16, 2019, 16:16 IST

- And it seems like the only thing that could stop us being wiped out is **some fungus**.

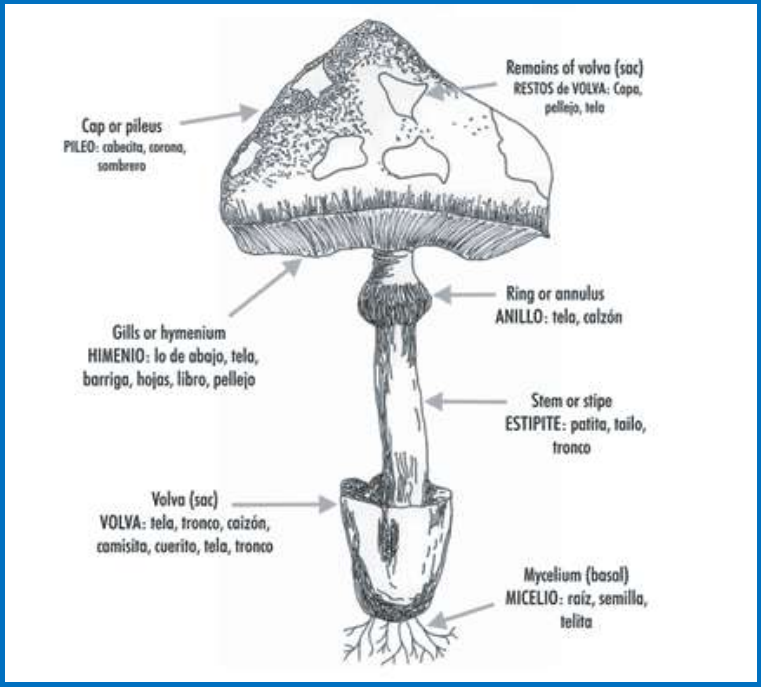
Need to change food habit

The alternative way of food as mushroom

- As our twin districts ,Uttar & Dakshin Dinajpur are agriculture based rural area with different types of cereal crops like maze, paddy, wheat, mustard etc, which generate huge quantity of agro waste as byproduct to be used as substrate for mushroom cultivation.
- **Recycling of Agro wastes by mushroom cultivation to stop stubble burning in order to reduce global worming**
- Mushroom production with proper way from huge amount of agro waste can be one of the major alternative way for food security.
- Mushroom for its food values can combat malnutrition.
- It can generate new employment for women, youth and farmers.
- The spent mushroom bed can be used for vermicomposting or can be added to the soil for good heath of soil.

WHAT ARE MUSHROOMS?

- Mushrooms are fungal form of life.
- The term mushroom is broadly defined as follows: *"a mushroom is a macrofungus with a distinctive fruiting body which can be either epigeous (above ground) or hypogeous (under ground) and large enough to be seen with the naked eye and to be picked by hand."*



•The most common type of mushroom is umbrella shaped with pileus (cap) and stipe (stem), e.g., *Lentinula edodes* and some species additionally have an annulus (ring), e.g., *Agaricus bisporus* or a volva (cup), e.g., *Volvariella volva*cea ,or have both, e.g., *Amanita phalloides* .

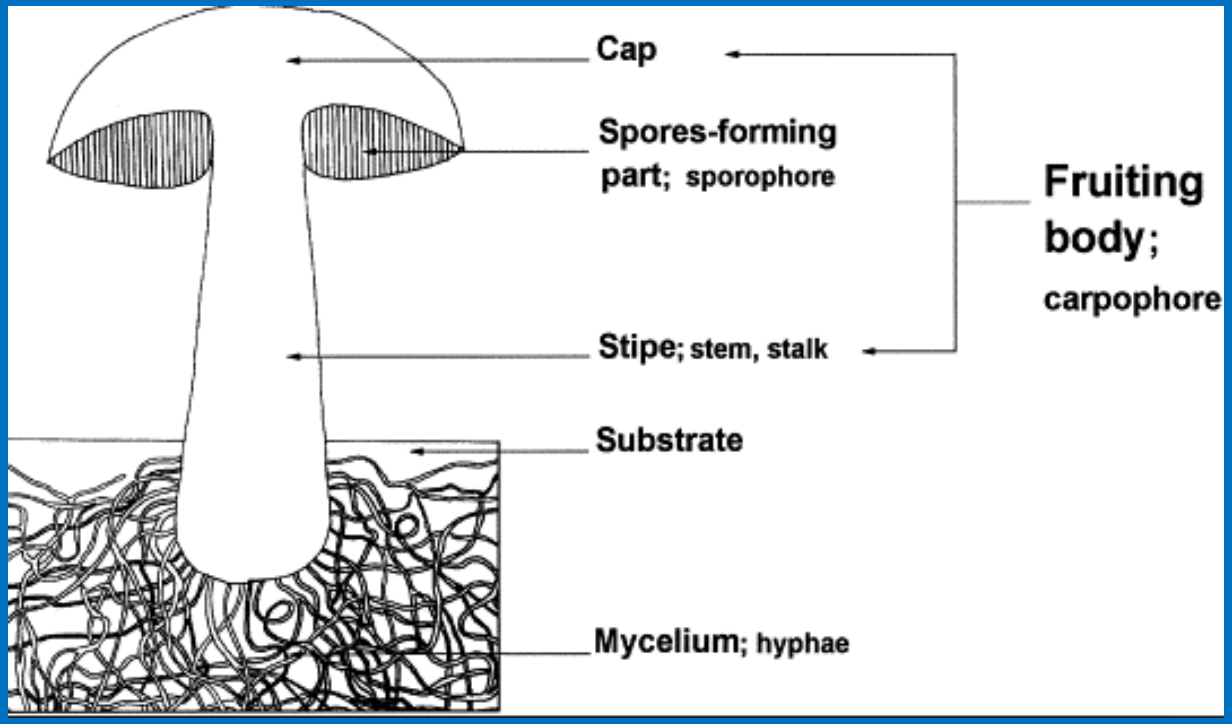
Mushroom Body

i) **Cap (pileus)**- Colour (white, grey, yellow) and shape (umbrella, kidney, cap) depend on species.

ii) **Stype (stem)-** Stype is stem like structure that supports the pileus and transports nutrients from the substrate to other parts of mushroom.

iii) **Gills** -tissues that produce spores.

iv) **Mycelia-** absorbs nutrients from substrate



Mushrooms Varieties and their scope

- There are more than 30,000 identified types of mushrooms worldwide.
- 99% of these are safely edible and roughly **1% is poisonous**.
- Yet there are still many undiscovered mushroom species and the effects of some mushrooms on human health remain unknown.
- Nowadays, almost every country devotes more attention to research, experimentation, selection and development of mushrooms cultivation technique.
- Some mushrooms have medicinal qualities and their popularity is rising too.
- They are **rich in protein** compared with other vegetables.
- Its production is one of the most promising and highly desirable in developing countries to reduce **protein malnutrition**.

Objective of Mushroom cultivation

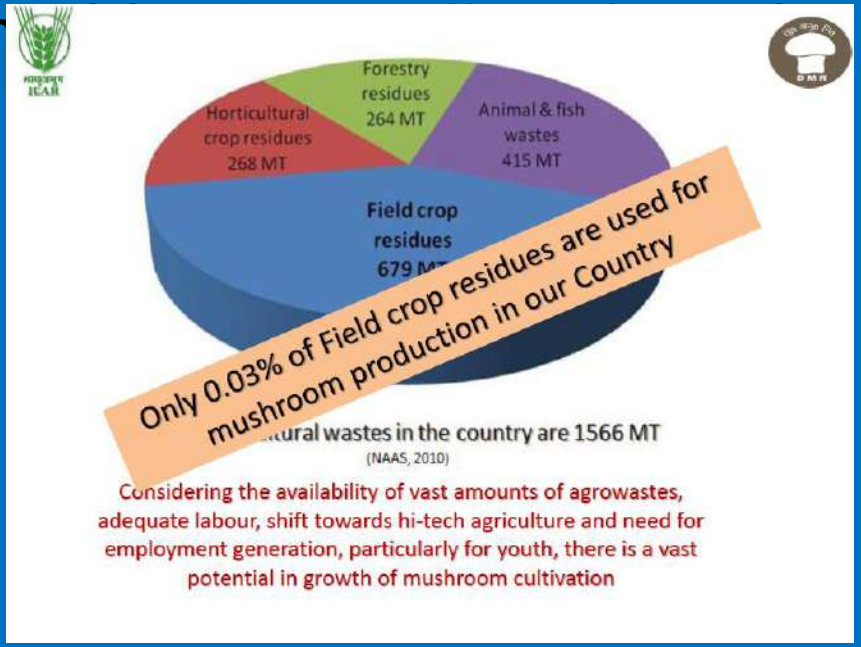
- It generate relatively **cheap source of nutrition** rich health food (to tackle shortage of food and malnutrition).
- Use for **bioconversion/ bioremediation** of large scale easily available different lignocellulosic agro waste in t[illegible] of large scale production [illegible]
c[illegible]

Agricultural Residues

(million tonnes)

	MT
Crop residues from field crops	679
Crop residues from horticultural crops	268
Total Agri-residues	**947**
Road side/ forestry/ social forestry waste	204
TOTAL	1151

From 'Agricultural waste management' Policy paper 49 NAAS, Dec 2010



Objective of Mushroom cultivation

- Mushrooms with its flavour, texture, nutritional value and high productivity per unit area are not only an excellent food source to **alleviate malnutrition** and **ensuring food security**, used mushroom bed might be used as **soil conditioner** for good health of soil.

- Therefore, mushroom cultivation can be carried out to empower the women, unemployed young people and youth.

Table 1.1: Some of the deadly and poisonous mushroom

Scientific name	Toxic chemicals
Amanita muscaria	*alpha*-Amanitin or α-amanitin, Muscarine, Ibotenic acid
Gyromitra sp	Gyromitrin
Coprinus comatus	Coprine
Cortinarius orellanus	Orellanine
Amanita smithiana, *A. phalloides*, *A. bisporiger*	Orellanine
Hygrophoropsis aurantiaca	Arabitol
Agaricus hondensis, *A. californicus*, *A. praeclaresquamosus*, *A. xanthodermus*	Unknown
Chlorophyllum molybdites	Unknown
Tricholoma pardinum, *T. tigrinum*	Unknown
Lepiota brunneoincarnata	Unknown
Galerina marginata	Unknown
Conocybe filaris	Unknown

Table 1.2: Edible mushroom cultivated all over the world

Sr. No.	Common Name	*Scientific Name*
1	White button mushroom	*Agaricus bisporus*
2	Summer white button mushroom	*Agaricus bitorquis*
3	Oyster mushroom	*Pleurotus sajor-caju*
4	Paddy straw mushroom	*Volvariella volvacea*
5	Shiitake mushroom	*Lentinula edodes*
6	Wood ear mushroom	*Auricularia* spp.
7	Giant mushroom	*Stropharia rugoso-annulata*
8	Winter mushroom	*Flammulina velutipes*
9	Milky mushroom	*Calocybe indica*
10	Reishi mushroom	*Ganoderma lucidum*
11	Maiitake mushroom	*Grifola frondosa*

Pleurotus sp. Cultivation

- Step of Mushroom Cultivation
- Spawn Preparation
  - Master spawn
  - Commercial spawn
- Mushroom bed Preparation
- Spraying of Water
- Harvesting
- Marketing

Pleurotus sp. Bed preparation

Pleurotus sp. Cultivation room and water spraying

Pleurotus sp. Pin head appearance for fructification

Yield performance of *Pleurotus* species on different agriculture wastes

Substrates	Yield*			Total yield	Biological efficiency**
	1st Flush	2nd Flush	3rd Flush		
Paddy straw	876 ±2.5	326 ±2.1	154 ±2.4	1356 ±3.8	90.4
Wheat straw	895 ±2.8	463 ±3.5	124 ±2.8	1482 ±4.1	98.8
Waste papers	362 ±2.9	164 ±2.6	32 ±1.5	558 ±2.4	37.2
Saw dust	365 ±2.4	238 ±2.1	45 ±0.5	648 ±2.8	43.2
Maize straw	734 ±3.2	342 ±2.0	154 ±1.3	1230 ±5.5	82

Averages followed by the same letter in a given column are not statistically different from each other based on the Scott-Knott test at a 5% probability level;

Data after ± indicate standard error values; *Productivity = g of fresh mushroom; **Biological Efficiency = [(g of fresh mushroom/1.5kg of dry substrate) x 100].

Economics of *Pleurotus sajor-caju* cultivation in a small scale farm with 300 bags of Mushroom bed (Each bag contain 1.5kg dry Agro waste and 250gm spawn)

Items	Amount
Cost of 150kg of wheat straw @50/-per 100kg	Rs. 150.00
Polythene bags @ 1/- per bag	Rs. 250.00
Cost of 150 packet Spawn @ 20/- per 250gm	Rs. 3000.00
Cost of labour (Own labour)	Rs. 0.00
Cost of Water and Electricity	Rs. 200.00
Pesticides, fungicides, bleaching powder, etc.	Rs. 100.00
Rent of mushroom house or spaces (Own house)	Rs. 0.00
Miscellaneous	Rs. 300.00
Total Expenditure Rs.	Rs. 4000.00
Expected yields from 300bags (Average 800g per Bag) = 240kg.	Rs. 36,000.00
So, expected returns (Minimum price @ 150/- per kg)	
Net Profit Rs.	Rs. **32,000.00**

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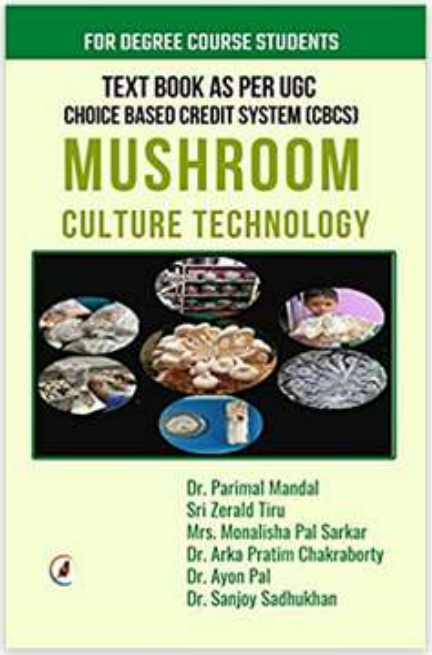


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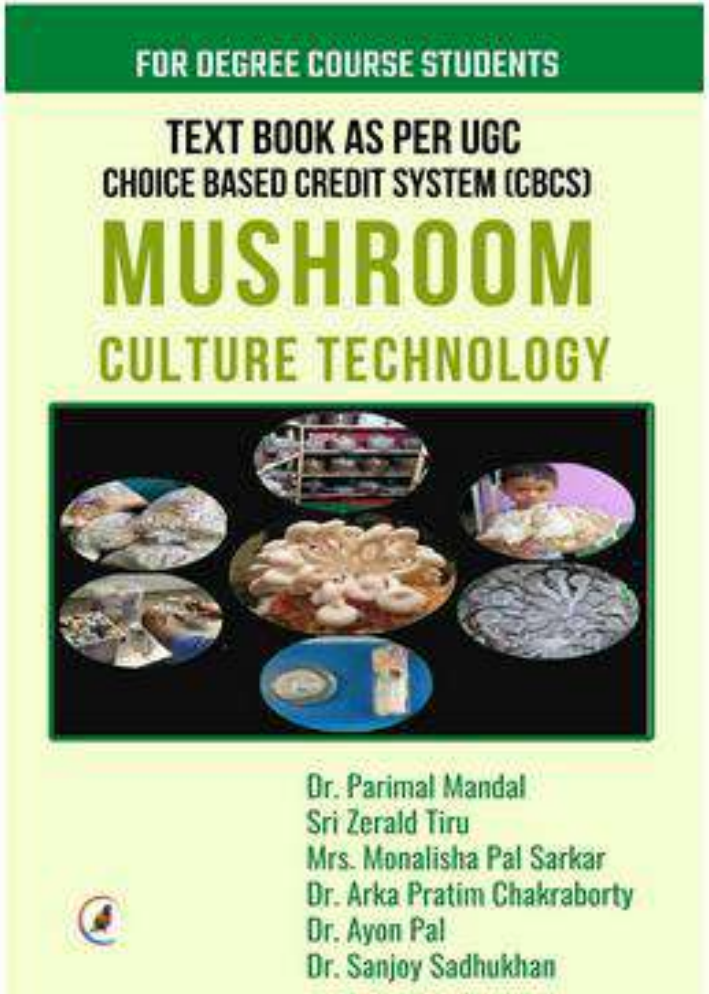

Thank You