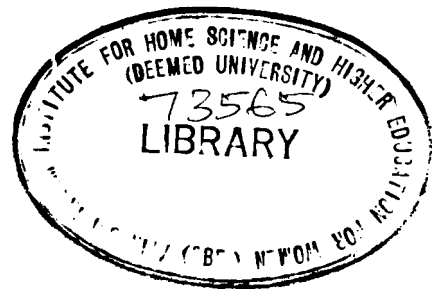


Mushroom Cultivation as an Income Generating Activity

By

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INTRODUCTION

India is rich in its cultural heritage and natural resources. It has chosen the path of formalised planning by using the available resources to increase the production of goods and services since its independence. Thus for the past four decades, it has embarked on the path of planned economic, social, intellectual and spiritual development so as to provide the highest possible quality of life to its people.

Inspite of the plans chalked out, the problems faced before the country are vast. The problems has its roots in over population, low productivity, unemployment, illiteracy, malnutrition and low income, thus making rapid development inadequate for the people (Joshi, 1984; Agrawal et al., 1987; Chopra, 1988 and Kasthuri, 1989).

Unemployment in India is so conspicuous and the problem arising out of that is so vexing. Especially a large number of unemployed and under employed persons in rural areas indicate the wastage of available resources of man power. Unemployed persons in rural areas have increased from 8.15 million in 1978 to 8.98 million in 1983 (India, 1986 and Ranga, 1988). The constant rise in unemployment and under employment had suppressed many families below poverty line. The economic pressure in the families naturally affect the food they can afford leading to malnutrition (Atkins,

1974; Adiseshiah, 1985; Perumalswamy, 1985; Samuelson et al., 1987 and Krishna Raj, 1988).

This poverty and nutritional deficiencies can be tackled by generating better employment opportunities in agriculture and allied activities and producing low cost non conventional nutritious foods which require no special apparatus and elaborate cooking methods(Sharma, 1986; Pushphashukla, 1988 and Rai and Sohi, 1988).

Mushroom cultivation is an answer to many problems raised above. It is a labour-intensive industry which will open up new avenues of employment. It is an alternative source of food, rich in protein, minerals and essential amino acids apart from being a delicacy in food. It also cures certain ailments. The production procedure is simple and the profitability is manifold, besides it will provide additional income to our farmers who wish to take up this work during the lean period of their farming activity. Mushroom farms can be built on waste or unarable lands. It is done indoors in trays and is protected from rigours of nature and large quantity of assured food can be produced from a much smaller areas. Hence mushroom cultivation is a useful small scale venture(Munjla and Anand, 1979 and Kaul and Abraham, 1988). Despite the various good potential for producing cultivated mushroom, India has made a dint on her mushroom market(Guleria, 1980).

In order to increase production of mushroom cultivation the consumption of fresh mushroom should be

encouraged, its value as food be projected, new outlets sought, production cost lowered and a great degree of research and marketing should be encouraged(Hayes, 1978).

If mushroom cultivation is collectively organised and patronised by government, cooperatives, and voluntary agencies, it will develop in the right perspective. It would certainly revolutionize our ailing rural economy and health making agriculture a very attractive proposition and also will earn much needed foreign exchange for our country(Purkayastha, 1985; Dewett and Varma,1985).

Therefore if this technology is transferred to the rural sector may solve the many problems facing the country like poverty, malnutrition, under employment, unemployment etc. Hence the investigator has taken up this study to find out the techniques, problems faced in mushroom cultivation and to understand the economic aspects involved in mushroom cultivation with the following objectives:

1. Gaining knowledge on mushroom cultivation,
2. Gathering information on various aspects involved in mushroom cultivation,
3. Finding out the suitability of using various substrata for mushroom cultivation and
4. Introducing mushroom cultivation as a income generating activity in selected households.

It is hoped that by studying the techniques and economic aspects involved in mushroom cultivation and by introducing it in the rural community will help the selected

families to augment their income and thereby this technology can become popular among them in future which in turn may help in solving many of the problems stated above.

**"A Journey of thousand miles starts
from a single step."**

Review of Literature

II. REVIEW OF LITERATURE

The review of literature pertaining to the study on **"Mushroom Cultivation as an Income Generating Activity"** includes the following aspects:

- A. Suitability of Mushroom Cultivation in India
- B. Cultivation Techniques
- C. Conditions Required for Cultivation of Mushroom
- D. Mushroom as a Food and Medicine and
- E. Economic aspects of Mushroom Cultivation.

A. Suitability of Mushroom Cultivation in India:

Mushrooms were picked wild and eaten by mankind from time immemorial. Greeks and Romans have called Mushroom as **"Food of the Gods"**. As the wild growth dependent on the natural climatic condition and the productivity is variable there was no firm commitment of this commodity. However, now man has tried and succeeded in producing some of these edible types under artificial condition (Maria and Maravigga, 1975; Kibby, 1977; Kannaiyan and Ramaswamy, 1980 and PTI Science Service, 1986).

Over the last few decades mushroom production has grown continuously all over the world. In India, it was started since 1965, due to dedicated efforts of scientist and entrepreneurs. Many of the mysteries associated with the growth of mushroom have been resolved by research. Knowledge gained now provides the basis for development of not only growing mushroom, but also low cost techniques which can be practiced by rural illiterates, marginal and poor farm

families and destitute women(Dorairaj, 1987). Besides mushroom growing can be highly rewarding in India due to the suitable climate.

Kaul (1978) and Munjal and Anand(1979) reveals that mushrooms are the ideal protein food for our villages and are now increasingly sold as "Health foods" as the protein derived from them is of very high grade useful for building young brain tissue. It is popularly named as "vegetarian food", as it is equal to muscle protein in quality, cheap, attractive and palatable, especially for the large population in India who are vegetarian. This is a low cost technology with a short life span. It can be considered profitable in areas where land is a limiting factor as it needs no soil and available in places where agricultural residues are abundant. It is a means of recycling 25 million tonnes of agriculture and woody wastes available in India into nutritious foods. Besides experiments revealed that the product of the decomposed spawned straw is rich in nitrogen compounds that is easily digestible, nutritious in protein can also be used for cattle feeding (PTI Science Service, 1988 and Chadha, 1988).

Seymour (1979) and Gupta (1986) points out that there were about 40,000 species of edible mushrooms available all over the world. The following are well established varieties adopted for large scale culture in India.

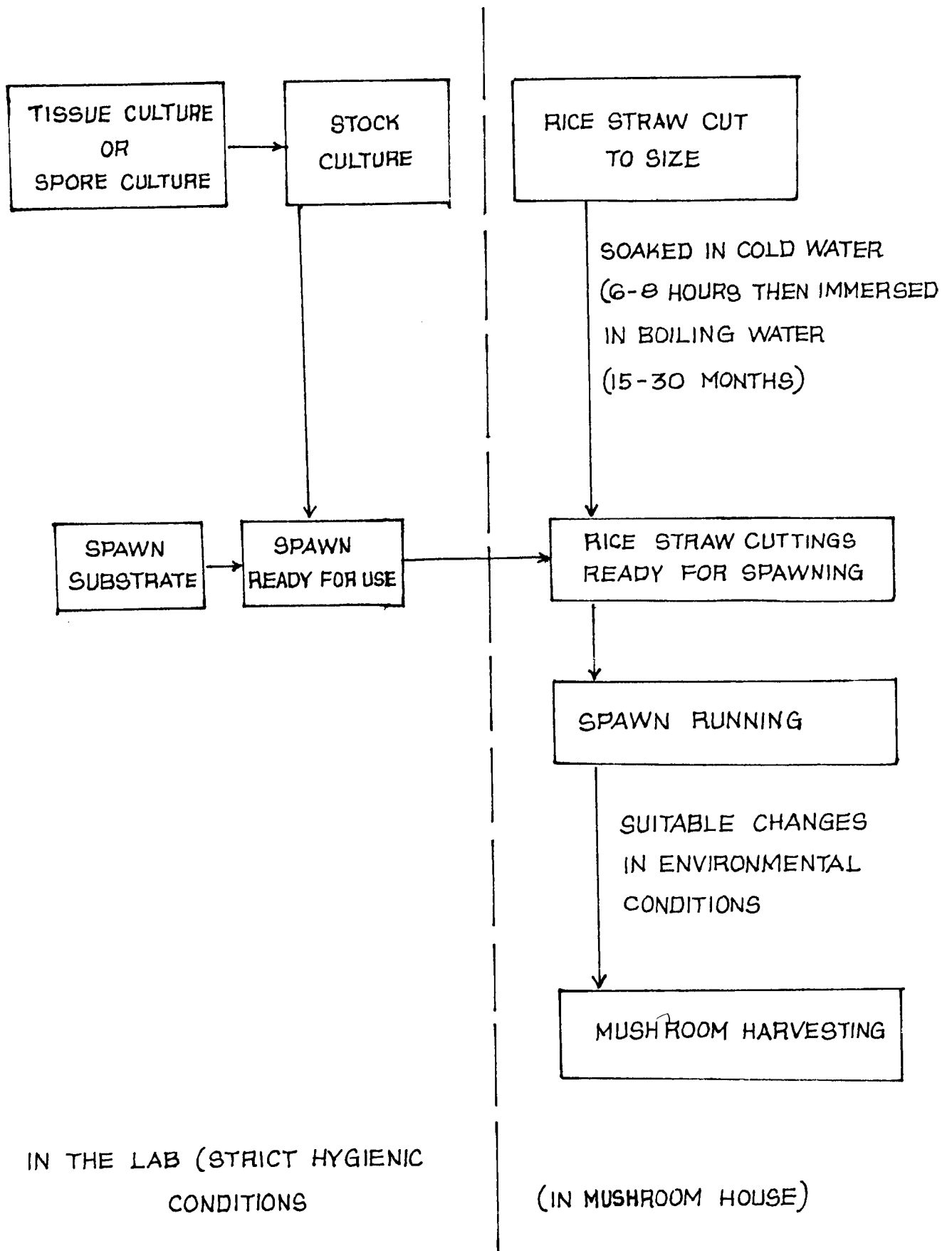
1. Agaricus species .. Temperate mushrooms
15°C to 25°C
2. Volvariella species .. Tropical mushrooms
28°C to 49°C
3. Pleurotus species .. Oyster mushroom
25 ± 5°C

Of the three, Oyster mushroom is cultivated widely in India due to its practicability in cultivation. It can be cultivated in a sort of kitchen garden for the family table. Since the harvest is quite bountiful, it can also prove to be a profitable hobby. Many outlets such as restaurants, green grocers, and departmental stores could be found interested in buying the produce in every neighbourhood (Dwivedi and Lohani, 1978 and Sohi, 1978).

B..Cultivation Techniques:

Mushrooms belong to the large groups of flowerless plants called fungi and they have no leaves. It can be grown on commercial scale on various substrates like paddy straw, wheat straw, maize stalks, saw dust, sugarcane bagasse, pearl millet, sorghum stalks and leaves, cotton stem and leaves, paper waste, coir, dried stems of sesbania and other vegetable plant residues. Since paddy and wheat straw are easily available throughout the year in most parts of the country it is widely used for the cultivation of mushroom (Alexopoulos and Bold, 1967; Chinery, 1983; Bano and Patwardhan, 1986 and Capart Press Clippings, 1988).

Mushroom cultivation involves various operational procedures. Figure 1 gives the operational procedures involved in mushroom cultivation. The steps involved in



PROCESS INVOLVED IN MUSHROOM CULTIVATION

Figure-1

mushroom cultivation are:-

1. Pure culture: Pure culture of the oyster mushroom can be done by the following techniques either by tissue culture method or by multispore or single spore culture method. The isolation of pure culture requires skill as well as aseptic conditions. If not, contaminants(both bacteria and moulds) would overgrow the culture.

2. Culture media: Generally two medias, the potato dextrose agar (PDA) medium, or malt extract agar can be used for the isolation and maintenance of pure culture of oyster mushroom.

1(a) Tissue culture method: Fresh mature mushrooms (picked straight from the bed) are selected and washed gently under running water to remove the surface dirt. The surface should be blotted and wiped gently with 70% alcohol. Using a sterile knife a small slit is made at the bottom of the mushrooms and split into two halves without touching the inner surface. A few pieces of tissue(Pseudoparenchyma) is then transferred from the centre of mushrooms to the media in slants.

1(b) Spore culture: The surface of a mature(open) mushroom is disinfected by wiping gently with 70% alcohol. The stipe is removed and the cap placed with gills-downwards on a piece of sterile white paper. A sterile inoculating loop is dipped in the spore-suspension and a streak is gently made across the surface of agar plates. The plate is incubated for few days until the white mycelium mass resulting from the growth of germinated spores become evident.

3. Preparation of spawn: Known quantity of healthy grains (sorghum/maize/wheat) are washed several times and soaked in water for 18-24 hours. Later the grains are boiled for about 15 minutes, air dried and mixed with 2% gypsum (to adjust the pH). They are taken in bottles, by covering with non absorbent cotton plugs and sterilised in an autoclave twice at 20 lbs pressure for 30 minutes and allowed to cool. These bottles are usually inoculated with mycelial suspension and incubated for 2-3 weeks. When the mycelium has run over on the surface the spawn is ready for use (Edmond et al., 1977; Purkayastha, 1985; Sreedharan and Seemanthini, 1987).

4. Preparation of substratum, spawning and spawn-running: Fresh and well dried paddy straw 500 gms per bed is preferred. The substratum is cut into small bits of 3 to 5 cm and soaked in cold water for 24 hours. For sterilization the substratum is then immersed in boiling water for (89-90°C) 30 minutes and drained off excess water. Then the sterilized substrate has to be cooled down to room temperature and then used. The *spawn is removed* from the bottle using a small iron rod with hook on one side. The rod is treated with antiseptic solution before use. The spawn is separated into four lots. The sterilised substrate has to be filled in polythene bags of 150 gauge and gently pressed to a depth of 8 to 10 cm and the spawn is broadcast above it. Similarly with the second, third and fourth layer of straw bits and the spawning is repeated. Then the final layer with straw bits are filled upto 5 cm height. The

spawned bags are closed and gently pressed for spawn running. It may be stacked in racks in neat and clean places. It takes 20-25 days to cover the bags with white mycelium, throughout the bed (Moore, 1972; Smith and Berry, 1975; Kaul and Abraham, 1988).

5. Cropping and harvesting: After the spawn running period, the polythene cover is removed and kept in the rack. The relative humidity about 75% is maintained by spraying water on the floor and gunny screens, but avoided watering on beds for first two days. In the first two or three days several pin-heads appeared and at this stage a little heavier watering is done. First harvest can be made 24 to 26 days after spawning it should be picked in the early hours of the day, by light twisting so that the broken stumps (stubs) are not left over in the trays and the small developing mushrooms are not disturbed. Two to three harvest can be done at 7-10 days interval. Each bunch of straw will yield mushrooms equivalent to 60% of the dry weight straw (Esvarmurthy, 1987). After completion of seven to ten days of mushroom yield, the straw can be used as a good source of compost (Saxena, 1975 and Ramaraj et al., 1988).

6. Marketing: The harvested mushroom can be kept fresh at 5-8°C for 2 days. It must be cut at the sapline and packed neatly in 250 gm or 500 gm packing in perforated polythene bags or in paper bags. Mushrooms unlike other fruits and vegetable are highly perishable and require great deal of care after harvest. They are marketed either as a fresh

product or after processing. Sethi and Anand(1978) and Van Griesvan (1987) stress that even crop meant for fresh sale has to be given extreme care in transportation and during the process of cultivation. Nitabahl(1984) points out that mushrooms can be preserved by vaccum cooling, freeze drying, controlled atmosphere, stepping preservations, dehydration and canning.

C Conditions Required for Cultivation of Mushrooms:

Mushrooms can be grown in any climate and in any season where the essential conditions may be found obtained or controlled(Lambert, 1961). The essential conditions as stated by Singh and Duivedi(1986), Seth and Parmar(1987), Sharma and Singh (1988) are:

1. Temperature: A uniform temperature ranging from 53° to 60°F is required throughout the growth of the crop. When too cold, the development of the spawn will be retarded or arrested. A high temperature will favour the development of molds and bacteria which will soon destroy the spawn or the growing crop.

2. Moisture: The mushroom requires an atmosphere nearly saturated with moisture and get the direct application of water on the beds and more or less to the growing crop. It is therefore essential that the beds when made contain the requisite amount of moisture. They should be protected from a dry atmosphere or strong droughts, where watering becomes necessary it should be applied in a fine spray around the beds with a view of restoring the moisture to the atmosphere.

3. Ventilation: Pure air is essential to a healthy crop. Provision should therefore be made for a gradual renewal of the air in the mushroom house.

4. Suitable medium or bed: The most common type of beds is known as the "flat bed". It is made on the floor or on shelves. It is usually about 10" deep. It is not practicable to raise another crop of mushroom in the material of an old bed. The old material should be entirely removed. The mushroom house should be thoroughly cleared before the new beds are made. If this precaution is omitted the next crop will suffer from the disease or enemies of the mushroom.

5. A good spawn: It should be true to type, and in the form of lumps. The grain should be fully covered by the mycelium. The spawn should be free from all contamination. It should be fully matured and freshly prepared. Spawn should be on the wheat or jowar grains. It should have typical mushroom smell and off smell indicates that spawn is not pure and healthy.

6. Cleanliness and sanitation: Mushroom are subjected to many/fungal, bacterial and viral diseases. Even a little carelessness in the different steps during the cultivation can play havoc with the mushrooms. Therefore absolute cleanliness and hygiene at each stage of cultivation is essential if damage to crop by such trouble is to be prevented.

Disinfectants also play an important role in maintaining good sanitation. It is an integral part for the

elimination of pests and diseases. The effective one of disinfectants on the farm is greatly aided by the physical conditions. Almost all the disinfectants are toxic to mushroom mycelium or sporophores and must always be used with care near the crop. Lindane (1 kg/300 trays) dusting is quite effective in the control of pest, without any toxic effects. Dusting of 10% BHC (Benzene Hexa Chloride) will also help to reduce the pests (Fletcher et al., 1986).

D. Mushrooms as a Food and Medicine:

Mushrooms were in use since vedic period. Mushrooms all over the world have till recently have been consumed only for their flavour and condiment value. "The precious Pearl of Cookery", as described by Ian (1973) is considered to be useful and delicious member of the Vegetable Kingdom. They are also called fleshy fungi and one of delicacy in food and focus. Hence it is one of the choicest table dishes (Keshwal et al., 1974 and Sharma, 1975; Janhelley, 1987).

Nutritive value of mushroom: Earlier it was considered that mushrooms are food without any nutritive value but recent findings reveals that they are valuable sources of nourishment and easy in digestion (Saxena, 1975). As food the nutritional value of mushroom lies between meat and vegetables. They provide a rich addition to the diet in the form of proteins, carbohydrates, valuable salts and vitamins (Janardhanan, 1975 and Dickie, 1985; Indian Mushroom Growers Association, 1984-85 and Kaushik, 1988).

Protein: As viewed by Tripathi and Sharma (1988)

mushroom contain 20-35% of protein on dry weight basis (about 3% on fresh weight). This is higher in quality and present in several vegetables and fruits. Mushroom when supplemented with cereals can be helpful in eliminating dependence on animal protein which is useful for building young brain tissue.

Carbohydrates and fats: Mushrooms are good source of energy as one pound ^{of} mushroom contains 120 K.calories (Hager and Hadad). Gopalan et al (1985) reports that mushroom contain 0.1 - 1.8% fat and 2.6 - 4.2% of carbohydrates. Mac Connel and Escelen (1947) observed that fresh mushroom contain 0.95% of mannitol, 0.28% reducing sugar, 0.59% glycogen, 0.91% hemicellulose. Analysis of Hughes (1962) disclosed that mushroom are rich in linoleic acid 70% which is an essential fatty acid.

According to Dorairaj (1987) mushrooms do not contain any starch and have a low sugar content and deficient in cholesterol. Hence suitable for diabetics and heart diseases.

Vitamins: Rai and Sohi (1988) revealed that vitamins of B complex group and vitamin C are in significant quantities in mushroom. They contain thiamine (0.12 mg), riboflavin (0.52 mg), biotin (0.018 mg per 100 gm fresh weight), ascorbic acid (8.6 mg), nicotinic acid (5.82 mg), pantothenic acid (2.38 mg) and niacin (Kezeli and Dzabraidze, 1944). Folic acid and vitamin B₁₂ which are absent in

vegetable foods are present in mushrooms although in small quantities (Rai and Sohi, 1988). Hence, Saxena (1975) and Dorairaj (1987) view that they help in removal of deficiency disease such as beri beri, pellagra and burning of hands and feet. They are also rich sources of Vitamin C which is a cure for scurvy and gingivitis and in vitamin D which is a substitute of sunshine. Anderson and Fellers (1942) signify that Vitamin A, D, E and K are almost absent in mushrooms.

Amino acids: Mushrooms are very rich in lysine and tryptophan and can effectively supplement the cereals in our diet. It is rich in linoleic acid (70%) an essential fatty acid and also leucine, iso-leucine, valine, alanine, cysteine and threonine to overcome the amino acid (lysine) deficiency.

Minerals: Ash analysis given by Anderson and Feller (1942) shows that mushrooms contain high amount of potassium, phosphorus, copper, zinc, iron and sulphur, but the calcium is low. Gopalan et al (1985) stated that due to high potassium and low sodium ratio, they are ideal for people with blood pressure.

Mushrooms have also been found to contain certain anti-cancerous ingredients. It helps to preserve a good eye sight, strong teeth and bones. Due to high content in cellulose it is helpful in excretion of waste and prevention of constipation (Kaul and Abraham, 1988 and Murali, 1988).

E. Economic Aspects of Mushroom Cultivation:

Sharma and Oberoi (1987), and Chuhān (1988) confirm that mushroom growing is a profitable enterprise through which the farmers can get appreciable returns.

The yield of mushroom greatly depends upon the technical knowledge of the growers, the equipment used and the hygiene provided in the farm. The amount of yield greatly affects the cost price and this factor largely determines the grower's income.

Pathak and Kasthuri (1986) point out that 200 sq.m. of gross area (150sq.mt. net area) of mushroom cultivation is found to be profitable. Eight crops of mushroom can be successfully cultivated in a year. The economics worked out for the production of 5 kg/per day by Tamil Nadu Agricultural University reveals that the fixed cost which include construction of shed and platforms is estimated at Rs. 30,000 and working cost of cultivation for one crop(45 days duration) is about Rs. 3,500.00. Anticipated yield per annum under optimum environmental conditions is 1800 kg. The average price is generally Rs. 15.00 per kg. The farmer can thereby get a profit of Rs. 27,000.00 per annum. It confirms that mushroom growing is a profitable enterprise, through which the farmers can get appreciable returns. Tentative cost economics for the cultivation of oyster mushroom is given in Table I.

TABLE - I

TENTATIVE COST ECONOMICS FOR THE CULTIVATION OF OYSTER MUSHROOM

Details	For 5kg/day		For 20 kg/day	
	Qty.	Amount Rs.	Qty.	Amount Rs
A. <u>Capital Investment</u>				
i) Pressure Cooker	1	800	-	..
ii) Autoclave	1	8,000	1	8,000
iii) Mechanised chaff cutter	-	..	1	3,500
iv) Sprayer, boiler, bunsen burner	1 each	2,700	1 each	4,500
v) Inoculation hood	1	2,000	1	2,000
vi) Chaff cutter	1	1,500	-	..
vii) U.V.Lamp for inoculation room	1	500	1	500
viii) Advance for LPG Gas Cylinder for spawn preparation	-	500	-	500
ix) Bottles for spawn preparation±	500	200	2000	800
x) Mushroom house with racks	-	3,800	-	16,200
Total		20,000		37,300
*Conversion of an existing room into a culture room				
B. <u>Working Expenditure</u>(per year)				
i) Paddy straw	4 tonnes	1,600	16 tonnes	6,400
ii) Polythene bags for cultivation	50 kg	1,500	200 kg	6,000
iii) Polythene bags with vents for packing the mushroom	25 kg	750	100 kg	3,000
iv) Sorghum grain for spawn preparation	1000 kg	2,000	4000 kg	8,000
v) Calcium carbonate for spawn preparation	20 kg	160	80 kg	640
vi) Cotton for plugging the spawn bottles 40x500 g		375	160x500 g	1,500
vii) Fungicides and insecticides		215		500
viii) Electricity, gas		600		1,960
ix) Labour and miscellaneous charges		6,000		20,000
Total		13,200		48,000
C. <u>Yield</u>				
Anticipated yield per annum under optimum environmental conditions	1800 kg		7200 kg	
Income from sale at Rs.15/kg	Rs. 27,000		Rs. 1,08,000	

Design of the Study

III. DESIGN OF THE STUDY

The study on "Mushroom Cultivation as an Income Generating Activity" consisted of the following main aspects.

- A. Training Experience on Mushroom Cultivation
- B. Survey to Gather Information on Mushroom Cultivation
- C. An Experiment on Mushroom Cultivation using Selected Substrata and
- D. Introducing Mushroom Cultivation in Selected Households as an Income Generating Activity.

A. Training Experience on Mushroom Cultivation:

The investigator underwent one day training programme organised by Horticulture Department, Tamil Nadu Agricultural University on ^(TNAU) September 5th, 1988. This training programme is conducted regularly by TNAU on 5th of every month for interested people at free of cost. Experts in the field give training to the people on various aspects involved in mushroom cultivation. The programme extended from morning 9 a.m. to evening 5 p.m. All the doubts raised by the participants were clarified by them. Practical experience were also given to the people especially in preparing the bed and spawning.

B. Survey to Gather Information on Mushroom Cultivation:

Survey was conducted among twenty five mushroom growers so as to gather information on mushroom cultivation. The survey included the following steps:

1. Selection of sample
2. Selection of method of study
3. Framing the tool
4. Conduct of the survey and
5. Analysis and presentation of data

1. Selection of sample: Twenty five samples residing in city of Coimbatore and its outskirts were selected for the study. Purposive sampling was used for selecting the sample.

According to Bailey (1982), purposive sampling in one which the investigator does not necessarily have a quota to fill from within various strata as in quota sampling, neither does he or she just pick the nearest warm bodies as in convenient sampling rather the researcher uses his or her own judgement, and picks only those who best meet the purposes of the study. A common strategy of purposive sampling is to pick cases that are judged to be typical of population in which one is interested (Wilkinson and Bhandarkar, 1982).

2. Selection of method of study: Interview method was chosen for collecting information on mushroom cultivation, because of its convenience, comprehensiveness and possibility of obtaining genuine information. Goodbar and Skates (1975) expresses that, "Interview is gathering data directly from others in face-to-face contacts". Rummel (1975) states this method of collecting data requires the actual physical proximity of two or more persons and generally requires all the normal channels of communication be open to their use.

According to Rangaswamy (1976), "Direct personal interview method is a best method for collecting data due to its merits such as positive response and accurate information".. Hence interview method was chosen for this study.

3. Framing the tool: A schedule was framed to collect the required information for the study. A schedule refers to a set of statements or questions to be answered by the respondent in a face-to-face interview and filled in by the interviewer or by the respondent(Chowdri, 1976).

The schedule prepared by the investigator was pretested in three households, so as to know the extend of response by the sample towards the Schedule. It also helps one to delete unnecessary questions and to include viable questions if any. Based on the pilot study conducted the schedule was modified. The modified schedule is given in Appendix-2.

4. Conduct of the survey: The selected samples were approached by the investigator personally at their convenience. A good rapport was developed before starting the survey. The purpose of the study was explained to them and the framed questions were putforth to them. The answers were recorded carefully in the prepared schedule.

5. Analysis and presentation of the data: The collected information were analysed and presented in Chapter IV.

C. An Experiment on Mushroom Cultivation Using Selected Substrata:

According to Best (1975), "Experimental research is the description and analysis of what will be or what will occur under carefully controlled situation". Borg states that "it is the ultimate form of research design providing the most rigorous test of hypothesis that is available to the scientist". Experimentation is an important aspect of laboratory research. It consists of making an event occur under well defined, known condition whereas many extraneous influences as possible are controlled, as specified by Devadas et al.(1976).

An experimentation includes preliminary arrangement such as pilot testing, a trial was carried out, before the conduct of actual experiment. The results of the trial carried out is given in Appendix 1.

The experiment was carried out under the following heads:

1. Selection of place
2. Selection of the substratum
3. Cultivation of the mushroom and
4. Recording and analysing the data

1. Selection of place: The investigator conducted the experiment in her residence due to availability of space, facilities and ease of supervision.

A room with thatched roof of size(8 x 4') was constructed for the purpose. The room was surrounded by wet gunny screens so as to control the temperature inside the room.

2. Selection of substrata: Mushrooms can be cultivated only on a substratum that has high cellulose content. Hence various substrata rich in cellulose content such as paddy straw, cotton waste, maize stalks, paper waste, coir and cotton stalks were selected for cultivation. Three trials were conducted for each substrata.

3. Cultivation of the mushroom: Cultivation of mushrooms involved the following three main steps.

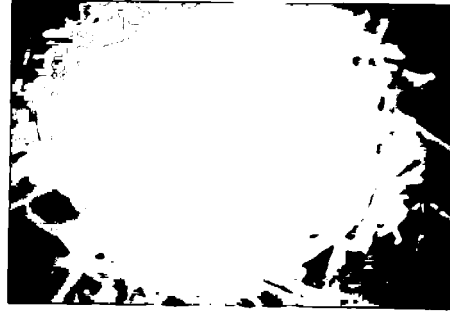
- a) Preparing the bed
- b) Spawning or spawn running and
- c) Harvesting

a) Preparing the bed: The selected substratum was cut into small pieces of 3 to 5 cms length (figure 2) and soaked in water for ten hours (figure 3). Then the excess water was drained and dipped in water and boiled for one hour (figure 4) so as to kill the germs and insects present in the substratum. This substratum is dried in a shade for two hours so as to bring it to room temperature.

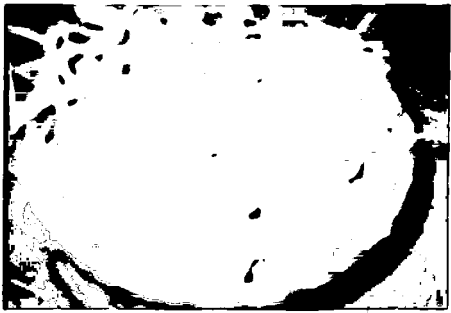
b) Spawning or spawn running: Each polythene bag of size 14" x 24" was filled with 500 gms of selected sterile substratum. The bed was prepared in five layers. Each layer was pressed gently and made compact. Fresh spawns produced by Horticulture Department, Tamil Nadu



COTTON



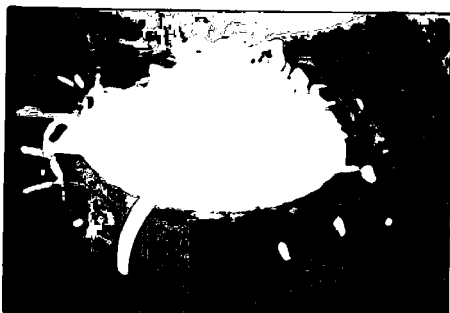
PADDY STRAW



MAIZE STALKS



COTTON STALKS



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COIR

SELECTED SUBSTRATUM USED FOR MUSHROOM CULTIVATION

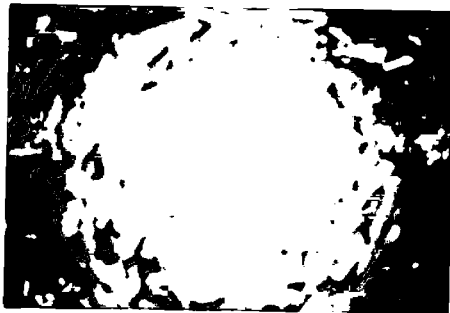
Figure : 2



COTTON



PADDY STRAW



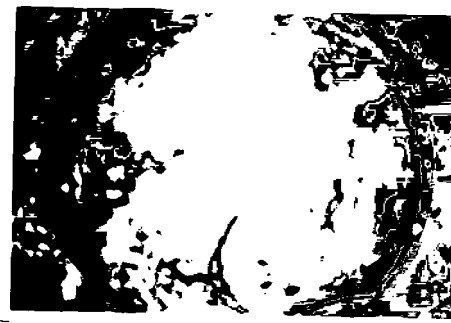
MAIZE STALKS



COTTON STALKS



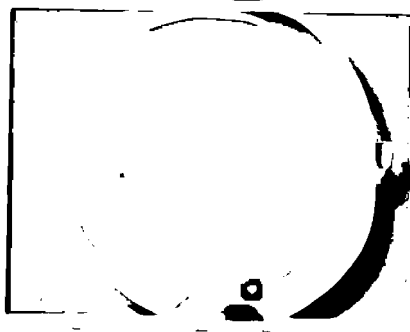
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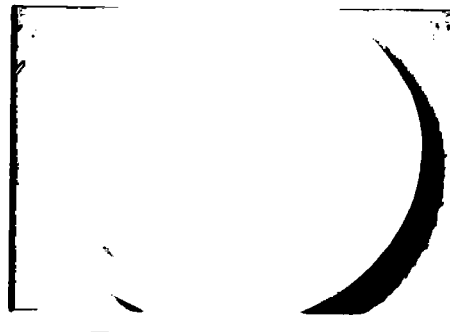
COIR

SOAKED SUBSTRATUM USED FOR MUSHROOM CULTIVATION

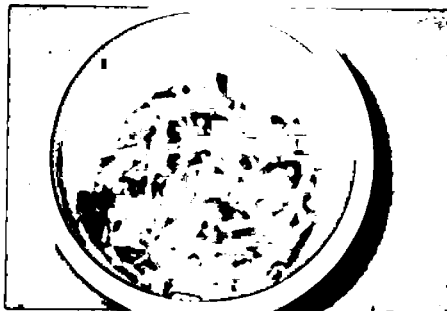
Figure : 3



COTTON



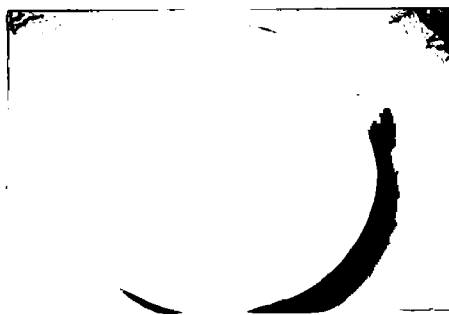
PADDY STRAW



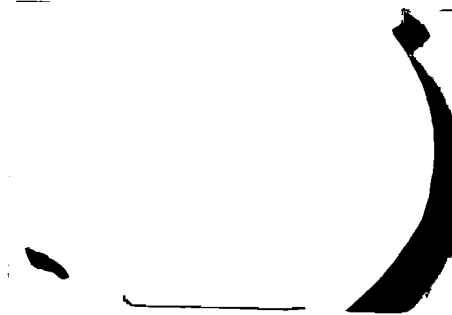
MAIZE STALKS



COTTON STALKS



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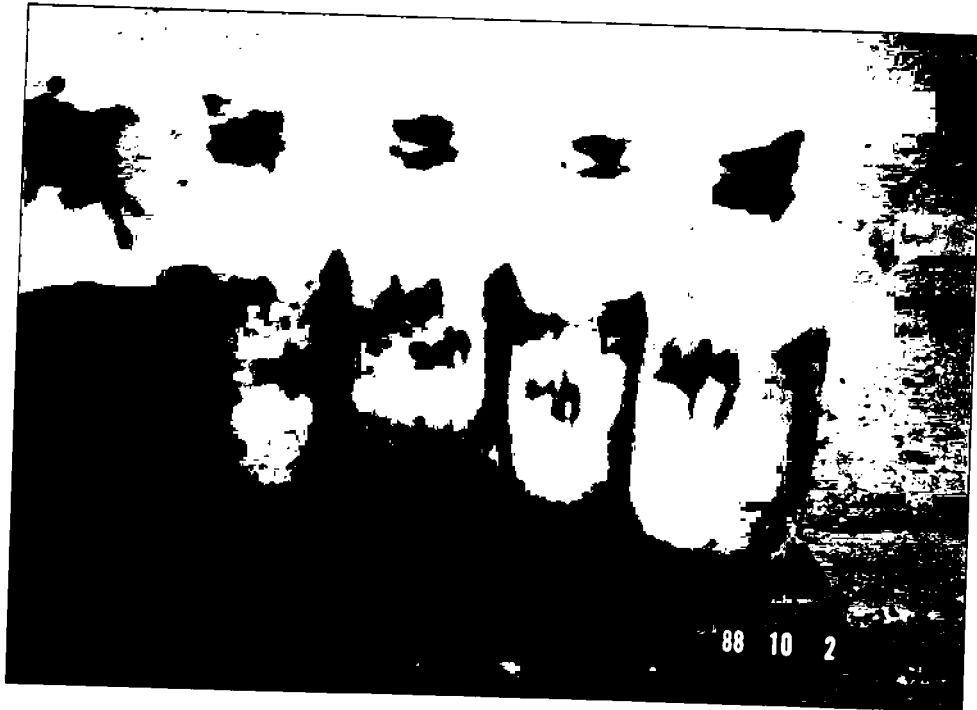
STERILE SUBSTRATUM USED FOR MUSHROOM CULTIVATION

Figure: 4

Agricultural University shown in Figure 5 was broadcasted along the periphery of each layer. Thus the substratum was filled until 3/4th the height of the bag. Then the mouth of the bag was tied tightly. Three to four holes were punched at the bottom of the bag for aeration. Thus the bed was prepared as given in Figure 6.

c) Harvesting or picking: The bag was left in a cool and shady place under a controlled temperature of 24°C for twenty days. After the period white cottony growth of mycelium was noticed inside the bag fusing all layers of substrates together into compact cake like block. Then the bag was cut open and left in a well ventilated place. Little water was sprinkled on it twice a day. In about 3 to 4 days after opening, the oyster mushroom were seen sprouted all around the bag. It is allowed to mature for 3 days until they are ready for harvest. The mature mushroom on various substrata are shown in figure 7. Two to three harvest or picking is done at 7-10 days interval. Scraping out 1 cm of the outer layer of the bed after the first and second harvest helped in hastening early development of mushrooms.

4. Recording and analysing the data: The collected information were recorded and analysed in Chapter IV.



SPAWNS USED FOR CULTIVATION OF MUSHROOM

Figure : 5



BED PREPARED USING POLYTHENE BAG SYSTEM

Figure: 6



COTTON



PADDY STRAW



MAIZE STALKS



COTTON STALKS



PAPER



COIR

MATURED MUSHROOM ON VARIOUS SUBSTRATUM

Figure : 7

D. Introrucing Mushroom Cultivation in Selected Households as an Income Generating Activity:

Mushroom cultivation was introduced as a income generating activity in five households located within Coimbatore city. Their enthusiasm in plunging into a new venture and the necessity to increase their income, ease of approach of the investigator, were the main criterias considered for selection of the samples. The purpose of the study was explained to them. A good rapport was established with the selected samples and were motivated to take up this enterprise. They underwent one day training conducted by the Horticulture Department, Tamil Nadu Agricultural University so as to gain more technical knowledge on this. The investigator helped them to start mushroom cultivation and provided necessary suggestions and guidance whenever required by them. The investigator observed the samples until the first crop was over and the yield obtained were carefully weighed and noted down. Chapter IV presents the details of the selected samples the yield obtained, benefits accrued and the problem faced by the selected samples. The model questionnaire used to collect the information of the samples is given in Appendix II.

CHAPTER - IV

Results

IV. RESULTS AND DISCUSSION

The results of the study on "Mushroom Cultivation as an Income Generating Activity" consisted of the aspects given below:

- A. Information regarding mushroom cultivation
- B. Yield of mushroom using various substrata and
- C. Economic benefits of mushroom cultivation.

A. Information Regarding Mushroom Cultivation:

- 1. Socio economic structure of selected households
- 2. Details on mushroom cultivation
- 3. Problems faced by mushroom growers and
- 4. Opinion on Mushroom cultivation.

1. Socio economic structure of selected households

The details of family background and general details of mushroom growers is discussed under this heading.

a) The details of family background: The details of family background such as type and size of the family and total family income is given in Table II.

TABLE II
DETAILS OF FAMILY BACKGROUND

S.No.	Family background	Number	Percentage
1.	<u>Family type:</u>		
	a) Nuclear family	19	76
	b) Joint family	6	24
2.	<u>Family size:</u>		
	a) Small family - (2-3)	4	16
	b) Medium family - (3-6)	18	72
	c) Large family - Above 7	3	12
4.	<u>Family income:</u>		
	a) Less than 1000	1	4
	b) 1000 - 2000	19	76
	c) 2000 - 3000	4	16
	d) Above 3000	1	4

i) Family type: Family is the basic social as well as economic unit. The survey of the selected households revealed that on an average a majority of 76 per cent of them belong to nuclear type indicating the slow disintegration of joint family system.

ii) Family size: The data presented reveals that a majority of 72 per cent of the selected households belonged to medium size family, 16 per cent of them had a small family and the remaining 12 per cent had a large family.

iii) **Total family income:** The total family income has a great influence on cultivation of mushroom. A majority of 76 per cent of the households belonged to middle income group, earning Rs. 1000 - Rs. 2000 per month. Only four per cent of the household had an earning capacity of more than Rs. 3,000. As cultivation of mushroom needs capital investment, only middle upper middle and high income group has taken up this enterprise either to enhance their income, as a hobby or as a main source of income.

b) General details of mushroom grower: The general details of the mushroom such as person involved in mushroom cultivation, their educational status and occupation is stated in Table III.

TABLE III

GENERAL DETAILS OF MUSHROOM GROWER

S.No.	Details	Number	Percentage
i.	<u>Person involved in mushroom cultivation:</u>		
	a) Head of the family	8	32
	b) Homemaker	7	28
	c) Son	10	40
ii.	<u>Educational status:</u>		
	a) Illiterates	12	48
	b) Higher Secondary	4	16
	c) College	9	36
iii.	<u>Occupation:</u>		
	a) Agriculture	11	44
	b) Business	4	16
	c) Office	6	24
	d) Teacher	1	4

i) Person involved in mushroom cultivation: Head of the families were mainly involved in mushroom cultivation in only 32 per cent of the households. Sons and homemakers have also taken up this enterprise among 40 per cent and 28 per cent of the households respectively. They were assisted by the other family members. Paid help were engaged only by the mushroom growers who cultivate mushroom in a large scale.

ii) Educational status: Regarding the educational status of the mushroom growers a majority of 52 per cent of them were educated (higher secondary level 16 per cent and college level 36 per cent). Only 48 per cent were illiterates. This indicates that education is almost an essential requirement for mushroom growers because the enterprise require scientific training. Even the illiterate mushroom growers were assisted by their other educated family members.

iii) Occupation: Among the selected samples, 88 per cent of them reported mushroom cultivation as their subsidiary occupation and only 12 per cent, had taken up this as their main occupation. Among those who have taken mushroom cultivation as their subsidiary occupation the main source of income were from agriculture(44 per cent) office(28 per cent), business(12 per cent) and teaching(4 per cent).

2. Details of Mushroom Cultivation: This aspect includes basic details of mushroom cultivation, techniques involved, economic aspects considered and marketing of harvested mushroom.

A. Basic details on mushroom cultivation:

The basic details regarding mushroom cultivation gives information on reasons for cultivation of mushroom, source of information, location of mushroom house, training of mushroom growers, and experience gained in growing mushroom. Table IV presents the details stated above.

TABLE IV

GENERAL DETAILS OF MUSHROOM CULTIVATION

S.No.	General details	Number	Percentage
1.	<u>Reasons for cultivation of mushroom:</u>		
	a) Increase income	22	88
	b) Hobby	3	12
2.	<u>Source of information:</u>		
	a) Friends and relatives	13	52
	b) Radio and television	6	24
	c) Magazines	6	24
3.	<u>Location of Mushroom house:</u>		
	a) Portion of a house	5	20
	b) Separate shed	20	80
4.	<u>Training of Mushroom growers:</u>		
	a) Trained	24	96
	b) Untrained	1	4
5.	<u>Experience in growing mushroom:</u>		
	a) <u>Years of experience:</u>		
	1 - 2 years	10	40
	3 - 4 years	13	52
	5 - 6 years	1	4
	6 and above	1	4

i) Motivational factor: A majority of 88 per cent of the selected mushroom growers have taken up mushroom cultivation as a subsidiary occupation, mainly to increase their income. The remaining 12 per cent have taken up this as a hobby.

ii) Source of information: The source of information received on mushroom cultivation was mainly through friends and relatives (52 per cent) who have already taken up this venture. Radio and television (24 per cent) and magazines (24 per cent) also have influenced a few. This indicates that the publicity on mushroom cultivation is still in the beginning stage. This certainly has to go a long way through, so as to increase mushroom production in our country.

iii) Location of mushroom house: With regard to the location of mushroom house the data revealed that a majority of 80 per cent had a separate house for cultivation of mushroom among which four per cent had air-conditioned house whereas the remaining 76 per cent cultivated mushroom in a simple house constructed using thatched roof and wall. However, 20 per cent of the selected mushroom growers have utilized the space available inside the bathroom for the same. They did not construct a separate house due to lack of space and funds and due to availability of water inside the bathroom. The humidity maintained inside also had helped them to grow mushroom in bathrooms.

Water is one of the major requirement for mushroom cultivation. It was noted that all the selected households had ample water supply required for cultivation of mushroom. Except four person who had airconditioned the mushroom house all the others were sprinkling water three to four times a day on the floor and gunny screen and beds(during harvesting) to minimize the temperature and to hasten the growth of mushrooms.

iv) Training of mushroom growers: Cultivation of mushroom is highly scientific. An entrepreneur cannot undertake this enterprises successfully without being trained by the experts. Except four per cent all the selected mushroom growers willingly had attended one day mushroom training course organized by Horticulture Department, Tamil Nadu Agricultural University to understand technical aspects required for the field. The remaining did not under go any training but ^{had received} technical assistance from the University few years back as they had started the enterprise before such courses were planned and organised by them.

v) Experience in growing mushroom: Mushroom growing is a recent technology in agriculture. A majority of 92 per cent of the mushroom growers had the experience of growing mushroom only for less than four years. A minority of four per cent were engaged in this enterprise for a longer period of six and 12 years respectively.

b) Techniques involved:

Mushroom cultivation though simple involves various techniques for maximum yield. This part of the results gives details on variety of mushroom cultivated, method adopted, in preparing the bed, substrata used, spawning and harvesting. Table V represents the techniques involved in mushroom cultivation.

TABLE V
TECHNIQUES INVOLVED IN MUSHROOM CULTIVATION

S.No.	Techniques involved	Number	Percentage
i)	<u>Method adopted:</u>		
	a) Polythene bag system	24	96
	b) Tray system	1	4
ii)	<u>Substrata Used:</u>		
	a) Paddy straw	21	84
	b) Maize stalks	4	16
iii)	<u>Mode of procurement of substratum:</u>		
	a) Free of cost	17	68
	b) Purchased	8	32
iv)	<u>Amount spent on substratum in Rs.:</u>		
	a) Less than 100	4	16
	b) 100 - 500	3	12
	c) 500 -1000	1	4
v)	<u>Disposal of the used Substratum:</u>		
	a) Manure	13	52
	b) Cattle feed	1	4
	c) Not used	11	44
vi)	<u>Mode of obtaining the spawns:</u>		
	a) Prepared	6	24
	b) Purchased	19	76

Oyster mushroom is the variety mainly cultivated by all the selected mushroom growers due to its suitability and simplicity in cultivation.

i) Method adopted in preparing the bed: All of them were using polythene bag system for cultivation of mushroom. However, four per cent of the selected mushroom growers who were cultivating mushroom on a large scale were also following the tray system.

ii) Substrata used: Paddy straw was the substratum widely used by everybody. However 16 per cent of the mushroom growers also used maize stalks when available. Availability and suitability of the substratum were the main criterias considered by them for selection of substratum.

iii) Mode of procurement of substrate: Among the selected mushroom growers, 68 per cent of them indicated that the substratum used were obtained free of cost from their land, whereas the remaining 32 per cent purchased it.

iv) Amount spent on substratum: The amount spent on substratum varied from less than Rs. 100 to Rs. 1,000/- which mainly depended on the amount invested and the quantity of mushroom produced.

All the growers took utmost care for cleanliness and sanitation in raising mushroom, as their enterprise may be affected if not so. The substratum were sterilized by all the mushroom growers before spawning by boiling it for 30 to 60 minutes.

v) Disposal of the used substratum: The used up substratum were utilized as a manure by 52 per cent of the mushroom growers. Whereas, four per cent used it as a cattle feed also. The remaining 44 per cent did not use the substratum for any purpose. Maximum benefit could be obtained if the substratum are effectively used.

vi) Mode of obtaining the spawns: The quality of mushroom produced mainly depends on the spawns used. These spawns were produced only by 24 per cent of mushroom growers. The prepared spawns were utilized generally by 20 per cent of them who prepared 10-30 bottles of spawns per day. The remaining four per cent of the mushroom growers who carry out this enterprise as a large scale industry sold out the spawn bottles to the farmers in various other places. It is astonishing to note that this enterprise prepared around 300 bottles per day. The other mushroom growers who do not prepare spawn bottles purchased the freshly prepared, good quality spawns for reasonable price from Horticulture Department, Tamil Nadu Agricultural University.

vii) Harvesting: Mushroom was harvested three to four times from a single bed, by all the mushroom growers. Number of crop taken per year on mushroom farm directly affects its profitability. The information collected reveals that only 12 per cent of the surveyed mushroom growers who carried mushroom cultivation as a major

occupation were growing eight crops per year. The remaining cultivators cultivated four to six crops per year. Generally the mushroom was not cultivated by them, during summer due to high atmospheric temperature and water scarcity.

c) Economic aspects considered:

Economic aspects are considered under source of financial assistance, amount of capital investment and variable investment and cost returns from mushroom cultivation. The details are given in Table VI.

TABLE VI

ECONOMIC ASPECTS CONSIDERED IN MUSHROOM CULTIVATION

S.No.	Economic aspects	Number	Percentage
1.	<u>Source of financial assistance:</u>		
	a) Loan	1	4
	b) Own	24	
2.	<u>Amount of capital investment:</u>		
	a) Lessthan Rs. 3,000	2	8
	b) 10,000 - 15,000	1	4
	c) 15,000 - 20,000	1	4
	d) 1 lakh	1	4
	e) 3.5 lakhs	1	4
3.	<u>Amount of variable investment</u>		
	<u>Rs./month:</u>		
	a) 25 - 300	20	80
	b) 500 -5000	5	20

i) Sources of financial assistance: Except four per cent all the others have invested their own fund for this enterprise. The mushroom grower who runs, this as a large scale enterprise only had received a loan amount of Rs. 10,000/- from Indian Overseas Bank mainly for expanding his business. This may be due to non availability of loan and unpopularity of mushroom cultivation. Though at present mushroom cultivation has been introduced as a small scale industry the banks still hesitate to disperse loan for the rural people, due to possibility of mishandling the loan received by the beneficiaries.

ii) Capital investment: The capital amount invested by the mushroom grower varied according to the size of the enterprise. It is revealed from the Table that 84 per cent of the selected mushroom growers have invested less than Rs. 3,000/- for the same. The others have invested Rs. 15,000/-(four per cent) Rs.20,000/-(four per cent), 1 lakh(four per cent) and 3.5 lakhs(four per cent).

iii) Amount of variable investment: The amount of variable investment includes cost of substratum, spawns and labour invested for running the mushroom cultivation varied between Rs. 25 and Rs. 300/- among a majority of 80 per cent of mushroom cultivators. The remaining mushroom cultivators were spending Rs. 500 - Rs. 5,000 depending upon the capital investment and yield obtained.

iv) Cost returns from mushroom cultivation: Profitability of mushroom business can be detected from the relationship between the money invested and the returns accruing from it. An attempt made to analyse the proportion of profit obtained per month by the selected mushroom growers revealed that 84 per cent of them who had invested upto Rs. 8,000/- in this enterprise could get 50 per cent of the money invested as profit every month.

It is interesting to note that as the amount invested goes up, the proportion of profit obtained becomes less. The analysis indicates that those who invested upto Rs. 20,000 could obtain a profit of 40 per cent and those who invested more than one lakh could get only 30 per cent of the capital investment as profit. This may be due to inclusion of labour cost in the variable investment.

d) Marketing of the mushrooms collected:

The study revealed that all the mushrooms growers harvested the matured mushrooms daily. The collected mushrooms, were taken to the fruit stalls by the concerned person everyday after the collection and packing among 88 per cent of the households. They also sold it out for the local people if demanded. The mushrooms from 12 per cent of the enterprises were collected only by the shop keepers of the fruit stalls regularly based on the agreement made by them.

3. Problems faced by mushroom growers:

The problems faced by the mushroom growers in various stages is given in Table VII.

TABLE VII
PROBLEMS FACED BY MUSHROOM GROWERS

S.No.	Problems faced	Number	Percentage
A.	<u>Initial stage:</u>		
	Lack of fund for investment	1	4
B.	<u>Cultivating the Mushroom:</u>		
	1. Contaminant of beds and bottles	11	44
	2. Nuisance of insects and rodents	4	16
C.	<u>Marketing</u>		
	1. Lack of facility for preserving the mushrooms	4	16
D.	<u>No problem</u>	13	52

During initial stage lack of fund for investment was the main problem faced by four per cent of the mushroom growers. It is essential that the government should popularise this cottage industry and disperse loan for the needy person.

With regard to the cultivation of mushroom, contamination of beds ^{and} spawn bottle were the main problem faced by 44 per cent of the mushroom growers. This indicate the need of cleanliness and sanitation required

for mushroom cultivation. Nuisance of insects and rodents were also faced by 16 per cent of the surveyed mushroom growers.

Lack of facility for storing the cultivated mushroom was stated by 16 per cent of the mushroom growers as it get spoiled if stored for long hours at room temperature.

However, a majority of 52 per cent revealed that they did not face any major problem in running the enterprise until now.

4. Opinion of Mushroom cultivation:

The opinion of the mushroom growers regarding mushroom growing as an *income generating activity* is given in Table VIII.

TABLE VIII
OPINION OF THE MUSHROOM GROWERS

S.No.	Opinion	Number	Percentage
1.	Excellent Cottage industry	4	16
2.	Profitable business	3	12
3.	Should be recognized by the Government	18	72

Mushroom growing was thought to be an excellent cottage industry by 16 per cent of the mushroom growers. Twelve per cent felt that it is a profitable business. However, 72 per cent revealed that if this business is

patronized by the government and other voluntary agencies it will certainly flourish.

B. Yield of Mushroom Using Various Substrata:

Mushroom was cultivated by the investigator using various substrata. Three trials were done using each substrata and three pickings were obtained from each bed. The details of mushroom obtained from each bed for each picking for three trials is given in Appendix III. Table IX gives the details on the effect of substrata and picking intervals on mushroom yields.

TABLE IX

EFFECT OF SUBSTRATA AND PICKING INTERVALS ON MUSHROOM CULTIVATION

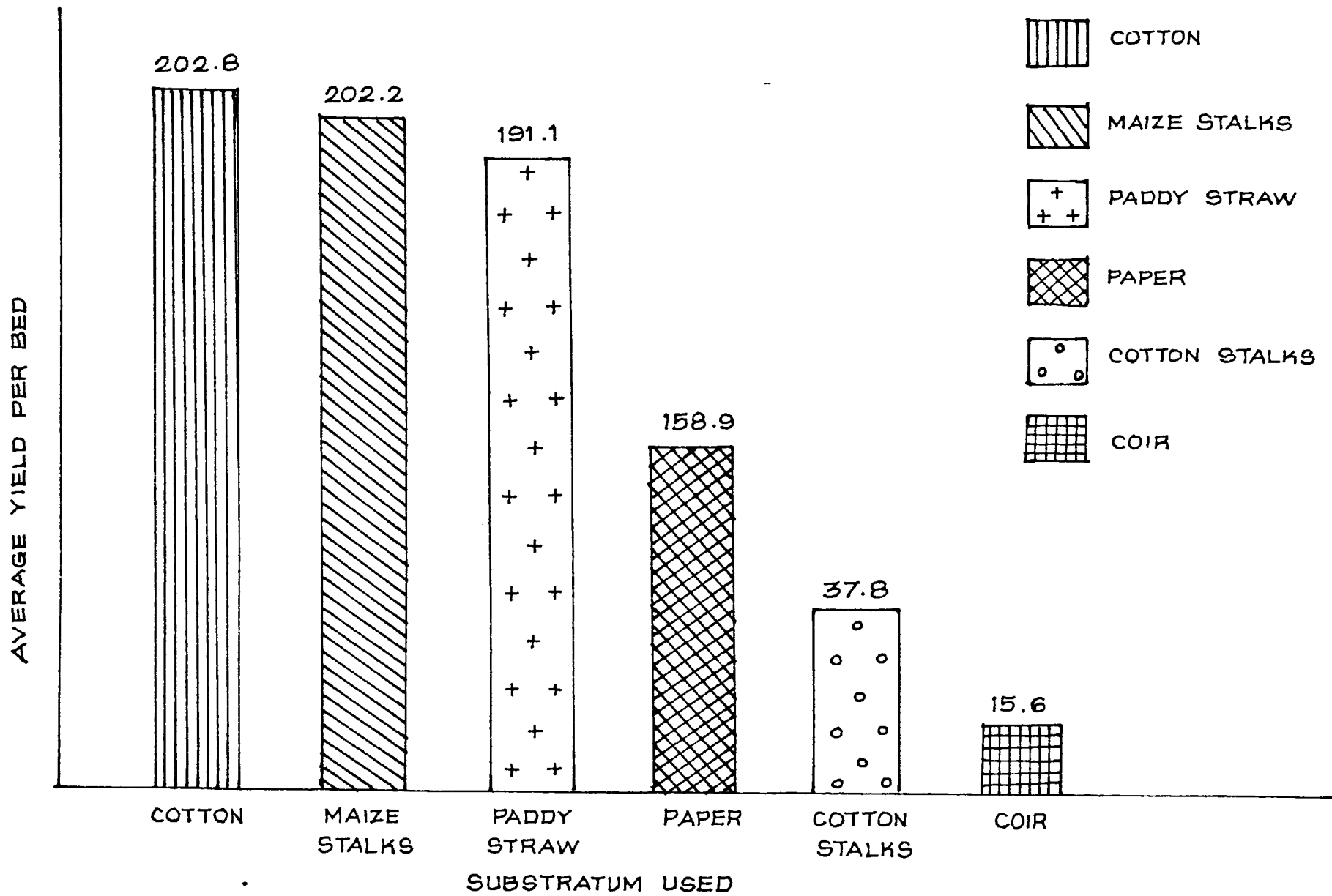
S.No.	Substrata	Interval of picking			Average
		I picking	II picking	III picking	
1.	Cotton waste	303.5	245.0	60.0	202.8
2.	Maize stalk	271.7	220.0	115.0	202.2
3.	Paddy straw	281.7	231.7	60.0	191.1
4.	Paper waste	185.0	171.7	120.0	158.9
5.	Cotton stalk	75.0	26.7	11.7	37.8
6.	Coir	20.0	15.0	11.7	15.6
	Average weight of Mushroom per picking	189.5	151.7	63.7	404.2
	Percentage	47	37.5	15.5	131.7

Table IX gives the effect of substrata and picking yields on mushroom cultivation. The total yield of mushroom on various substrata ranges from 202.8 gms to 15.6 gms. Highest mushroom yield was obtained from cotton waste and lowest from coir. The yield of mushroom on various substrata is depicted in Figure 8.

The yield was statistically analysed and it was found that there was no statistically significant difference in mushroom yield in the substrata cotton waste, paddy straw and maize stalks. All the three are superior to other substrata as they are rich in mineral content required for the growth of mushroom when compared to other three substrata. Besides paper waste, cotton stalks and coir contains lignin content which affect the growth of the mushroom.

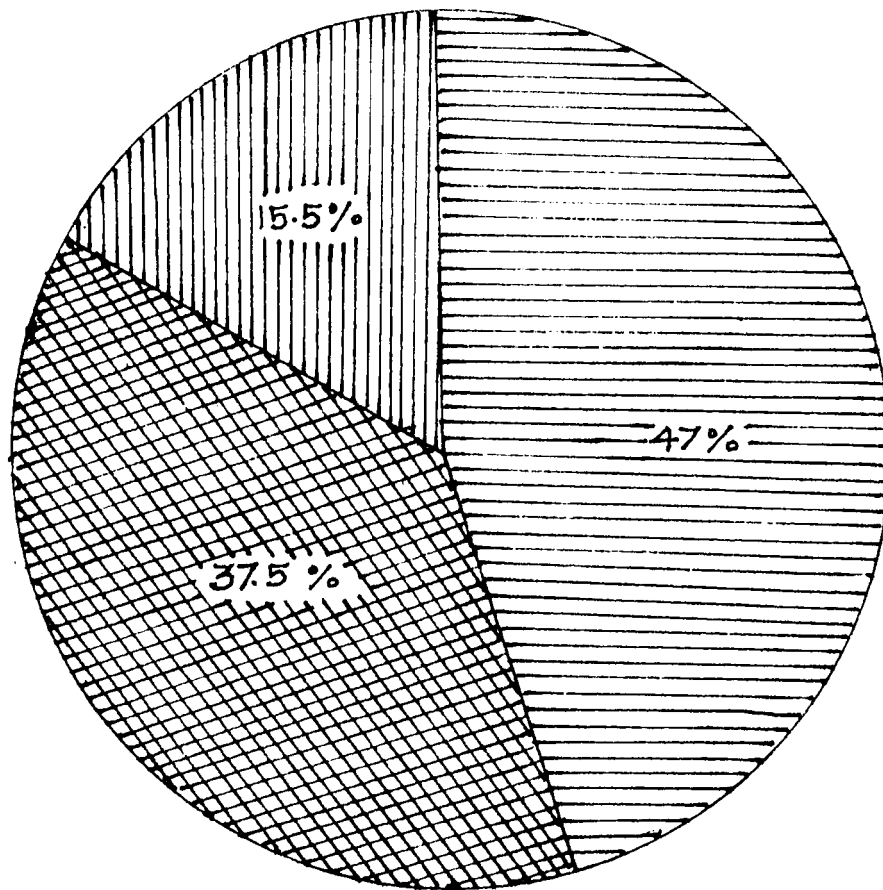
Irrespective of the substrata used maximum yield of 189.5 gms was obtained in the first picking, 151.7 gms in the second picking and 63.77 gms in the third picking. This works out to an yield of 47% of the total yield in the first picking followed by 37.5% in the second picking, 15.5% in the third picking. The percentage of mushroom per picking is given in Figure 9.




Thus there is a critical difference of 27.59 and 19.51 at 1% level between the substrata used and three pickings(Appendix IV).



EFFECT OF SUBSTRATA ON MUSHROOM YIELDS

Figure: VIII



-  Ist Picking
-  IInd Picking
-  IIIrd Picking

PERCENTAGE OF MUSHROOMS PER PICKING

Figure : IX

C. Economic Benefits of Mushroom Cultivation:

Mushroom cultivation can be taken up by anybody for augmenting their income. The results of an attempt made to introduce mushroom cultivation as a ^{income generating} ~~activity~~ ^{income generating} activity, among five households is discussed under the following headings.

1. Socio economic background
2. Technical details
3. Economic benefits and
4. Opinion regarding mushroom cultivation.

1. Socio economic background:

Among the selected households four samples belonged to nuclear type and one sample belonged to joint family. Mushroom was cultivated by three head of the families and two homemakers among the selected samples. Among the head of the families who are involved in mushroom cultivation two of them were educated till college level and the other till higher secondary level. The selected homemakers were educated only upto school level. The well educated head of the families were occupied as agriculture officer and in business. The others were engaged in agriculture. The main reason for taking up mushroom cultivation was to enhance their income.

2. Technical details:

Oyster mushroom was cultivated by all samples. All of them had a temporary shed constructed in the available space. Mushroom cultivated inside a temporary

shed of one sample is shown in Figure 10. The shed had thatched roof and temporary brick walls which are lined with gunny screens. All of them had adequate water facility. The selected samples were assisted by the other family members when required. All of them adopted polythene bag system using paddy straw as the substratum. The spawns required for spawn running were purchased at a reasonable cost from Horticulture Department, Tamil Nadu Agricultural University. The number of beds prepared by the selected household varied between 12 and 16. All the beds were prepared at a time, each bed weighing 500 grms of paddy straw approximately.

3. Economic benefits:

The amount invested on this small scale enterprise ranged between Rs. 200 and Rs. 300. This amount was mainly invested on the temporary shed, rack, substratum and the spawns. The yield of mushroom ranged between 7.2 kgs to 8.3 kgs. The mushroom were sold in the fruit stall mainly by four samples, one sample sold the product to a nearby co-operative store. The profit by the end of the first crop other than the variable investment ranged between Rs.130 and Rs.150, the proportion of profit received approximately being 50 per cent of the capital investment.



MUSHROOM CULTIVATED BY SELECTED SAMPLE

Figure : X

4. Opinion regarding mushroom cultivation:

All the sample felt that mushroom growing is a profitable small scale enterprise. Everybody has future plans to expand their business. They suggested that government should encourage this enterprise by dispersing loan and technical assistance for required people.

CHAPTER - V

Summary

V. SUMMARY AND CONCLUSION

The study on "**Mushroom Cultivation as an Income Generating Activity**" was dealt under the following main aspects.

- A. Information regarding mushroom cultivation
- B. Yield of mushroom using various substrata and
- C. Economic benefits of mushroom cultivation.

The findings of the study are summarised and given below:

A. Information Regarding Mushroom Cultivation:

Twenty five mushroom growers located within Coimbatore district were selected for the study. The survey revealed that majority of the households belonged to nuclear type, middle income families.

Sons, head of the families and homemakers were mainly involved in mushroom cultivation among which majority of them were educated upto higher secondary and college level. Eighty eight per cent of the mushroom grower reported mushroom cultivation as their *income generating activity*.

The source of information received on mushroom cultivation was mainly through friends and relatives. Majority of mushroom growers had a separate house for cultivation of mushroom and all the selected households had ample water supply required for cultivation. All the mushroom growers had undergone one day training or had received technical advice and assistance from Horticultural

Department, Tamil Nadu Agricultural University. A majority of 92 per cent of the mushroom growers had experience of growing mushroom for less than four years.

With regard to the technical details regarding mushroom cultivation, Oyster mushroom was cultivated by everybody due to its suitability and simplicity in cultivation. Polythene bag system was adopted for cultivation of mushroom. Paddy straw was the substratum widely used by everybody. The substratum was obtained free of cost by majority of them from their field. The rest of them purchased the substratum. The selected substratum was boiled for 30-60 minutes before preparing the bed. The used up substratum were utilized as manure or cattle feed by majority of 56 per cent of them. The spawns required for spawning were purchased from Horticulture Department, Tamil Nadu Agricultural University by majority of 76 per cent of the mushroom growers the others prepared the required spawn. The matured mushroom was harvested three to four times from a single bed and four to six crops per year by a majority of mushroom growers.

To start the enterprise all of them had invested their own fund. Among the mushroom growers, a majority of 84 per cent of them had invested less than Rs. 3000 for the same and had spent Rs. 25 and Rs. 300 as variable investment every month for which they could get 50 per cent of the total money investment as profit every month.

The matured harvested mushrooms were picked daily, packed neatly and sold out to fruit stall by everybody.

Lack of fund for investment, contamination of beds and bottles, nuisance of insects and rodents, lack of facility for preserving the mushrooms were the problems faced by 48 per cent of the mushroom growers.

Though mushroom cultivation was opined to be an excellent cottage industry and profitable business 72 per cent felt that this business was not yet recognized by government.

B. Yield of Mushroom Using Various Substrata:

The total yield of mushroom on various substrata ranged between 202.8 gms and 15.6 gms. Highest mushroom yield was obtained from cotton waste and lowest from coir. Percentage of mushroom per picking when analysed worked out to 47 per cent of the total yield in the first picking followed by 37.5 per cent in the second picking and 15.5 per cent in the third picking.

C. Economic Benefits of Mushroom Cultivation:

Among the selected five samples majority of them belonged to nuclear family. Mushroom was cultivated by educated head of the families and homemaker. The main reason for mushroom cultivation was to enhance their income.

Oyster mushroom was cultivated by all of them in a temporary shed with thatched roof and adequate water facility. Polythene bag system using paddy straw as the substratum ^{was} adopted by everybody. The spawns required were purchased by everybody. Twelve to sixteen beds were

prepared by them initially through which they could obtain a yield of 7.2 kgs to 8.3 kgs. Around fifty per cent of the capital invested were obtained as profit every month.

All of them felt that though mushroom cultivation is a profitable small scale enterprise, it has to be nurtured and developed by the government for its success.

Suggestions for developing Mushroom Cultivation in India:

The suggestions for developing mushroom cultivation in India are:

1. The Government agencies and other organisations should give training to all the prospective growers. Refresher Courses should be conducted to exchange ideas and to know the practical problems and solutions.
2. Government should help the intending growers by providing financial help in the form of subsidy or loan and simplify the procedure to avoid delays.
3. Good quality spawn should be made available to the mushroom growers and
4. As mushroom are highly perishable and prone to high temperature, government should help in marketing the product.

Future research can be done on use of various combination of substrates for improving the yield of mushroom. A low cost storage unit should be designed for

the use of the mushroom growers. Various methods of processing and canning of mushrooms should be formulated.

Thus with the further advancement of science and technology in mushroom cultivation can become one of the most promising enterprises capable to recycle agricultural wastes and generating new employment opportunities for the unemployed people. Besides, mushroom cultivation can augment income of the rural households. The malnutrition problems in our country can be solved by introducing mushroom a protein rich food in their diet.

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Appendices

APPENDIX - I

MUSHROOM CULTIVATION AS AN INCOME GENERATING ACTIVITY

- I. 1. Name of the Interviewer :
- 2. Name of the Interviewee :
- 3. Address :

II. General Information:

- 1. Type of family : Nuclear/Joint
- 2. General family background:

=====

S.No.	Name of the family members	Relation with the head of the family	Age	Educa- tion	Occupa- tion	Total income
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3. Income from other sources:

- a) Farm ()
- b) Dairy ()
- c) Poultry ()
- d) Interest ()
- e) Any other ()
(specify)

III. Details of Mushroom Grower:

1. Person involved in Mushroom cultivation
 - a) Head of thce family ()
 - b) Children ()
 - c) Homemakers { }
 - d) Son []
 - e) Any other(specify) []

2. Factor which influenced to take up mushroom cultivation
 - a) To increase income []
 - b) Hobby []
 - c) Any other(specify) []

3. Sources of information obtained regarding mushroom cultivation
 - a) Friends and relatives []
 - b) Radio and Television []
 - c) Magazines []
 - d) Any other (specify) []

4. Organizations which rendered training to the mushroom cultivation
 - a) Tamil Nadu Agricultural University/Coimbatore []
 - b) Youth Club []
 - c) Mahalir Mandals []
 - d) Others(specify) []

IV. General Details of Mushroom Cultivation:

1. Facilities available in the house for cultivation of mushroom:
 - a) Water []

b) Separate shed []

V. Technical Details:

1. Type of mushroom cultivated

2. Method adopted for cultivation

Polythene bag []

Tray system []

3. Substratum used:

4. Place of obtaining the substratum:

Purchased []

Free of cost []

5. Amount spent for purchase of substratum []

6. Mode of obtaining the spawn

7. Units of prepared seeds/day

8. Place of purchasing

9. Method of sterilizing the substratum

a) Boiling []

b) Chemicals []

10. Method of maintaining of required temperature in the mushroom house
11. Number of harvest obtained from a single bed []
12. Number of crops obtained per year
13. Frequency of collecting the mushroom for sale
14. Dealers who purchase the produced mushroom
 - a) Hotels []
 - b) Supermarket []
 - c) Cooperatives []
 - d) Local sale []
15. Method of disposal of the used substratum:
16. General opinion about mushroom cultivation as an generating activity

VI. Economic Details of Mushroom

1. Sources of Financial assistance
 - a) Loan []
 - b) Own []
2. Amount of capital investment:
3. Scheme and agency which rendered loan

4. Amount of loan received []
5. Amount spent on initial payment []
6. Rate of Interest []
7. Period and method of repayment
8. Amount of variable investment(Rs./month)
9. Cost returns on mushroom cultivation/month
10. Problems faced by the mushroom growers at each stage if any:
 - a) Initial stage []
 - b) Cultivating the mushroom []
 - c) Marketing of mushroom []
 - d) Any others []

APPENDIX - II

INTRODUCING MUSHROOM CULTIVATION

1. Name of the Interviewer :
2. Name of the interviewee :
3. Address :
4. Socio-economic background of the family:
 - A. Type of Family : Nuclear / Joint
 - B. Total Family income :
5. Details of the selected sample:
 - A. Person involved in mushroom cultivation :
 - B. Educational status :
 - C. Occupation :
 - D. Reason for taking up mushroom cultivation:
6. Technical Details:
 - A. Type of mushroom cultivated
 - B. Place of cultivation
 - C. Facilities available for cultivation of mushroom in the house:
 - i) Water []
 - ii) Space []
 - D. Method of maintaining the required temperature in the mushroom house
 - E. Method adopted for cultivation

- F. Substratum used for cultivation
 - G. Mode of obtaining the substratum
 - H. Mode of obtaining spawns used for cultivation
 - I. No. of beds prepared initially:
7. Economic benefits:
- A. Capital Investment :
 - B. Total Quantity of Mushroom obtained per crop
 - C. Place of marketing of harvested mushroom
 - C. Profit obtained
 - E. Opinion regarding mushroom cultivation

APPENDIX - III

YIELD OF MUSHROOM USING VARIOUS SUBSTRATA

	Bed	1st	2nd	3rd	Total	Average
Cotton	1st	300	240	70	610	
	2nd	310	230	50	590	
	3rd	300	265	60	625	
	Total	910	735	180	1825	608 gm/bed
Paddy Straw	1st	270	240	70	580	
	2nd	290	220	50	560	
	3rd	285	235	60	580	
	Total	845	695	180	1720	573 gm/bed
Maize stalks	1st	275	220	185	680	
	2nd	260	230	135	625	
	3rd	280	210	125	515	
	Total	815	660	345	1720	540 gms/bed
Paper waste	1st	185	195	130	570	
	2nd	195	170	110	475	
	3rd	175	150	120	445	
	Total	545	545	360	1490	497 gm/bed
Cotton stalks	1st	80	30	10	120	
	2nd	70	25	15	110	
	3rd	75	25	10	110	
	Total	225	80	35	340	113 gms/bed
Coir	1st	15	10	10	35	
	2nd	25	25	15	65	
	3rd	20	10	10	40	
	Total	60	45	35	140	47 gms/bed

APPENDIX - IV

'F' TEST TO FIND THE SIGNIFICANCE RELATIONSHIP BETWEEN THE
SUBSTRATUM AND THE YIELD

EFFECT OF SUBSTRATA AND PICKING INTERVALS ON MUSHROOM
YIELDS

S.No. Substrata	Interval of Picking			Average
	I Picking	II Picking	III Picking	
1. Cotton waste	303.5	245.0	60.0	202.8
2. Maize stalk	271.7	220.0	115.0	202.2
3. Paddy straw	281.7	231.7	60.0	191.1
4. Paper waste	185.0	171.7	120.0	158.9
5. Cotton stalk	75.0	26.7	11.7	37.8
6. Coir	20.0	15.0	11.7	15.6
Average weight of Mushroom per Picking	189.5	151.7	63.7	404.2
Percentage	47	37.5	15.5	131.7

<u>SOURCE</u>	<u>DF</u>	<u>S.S</u>	<u>MS</u>	<u>F Value</u>	<u>Total Value</u>
Replication	2	1344.4	672.2	1.45	
Substrata	5	328954.2	65790.8	142.1	2.49
No.of Picking	2	151519.6	75759.7	163.7	3.28
Interaction	10	78413.9	7841.4	16.9	2.12
Error	34	15738.9	462.9		
Total	53	575970.8			

Substrate	SE	7.17
	CD at 5%	20.59
	CD at 1%	27.59

Picking	SE	5.07
	CD at 5%	14.56
	CD at 1%	19.51

Interaction	SE	12.43
	CD at 5%	35.66
	CD at 1%	47.78

DF : Degrees of Freedom

SS : Sum of Squares

MS : Means of Squares

SE : Standard Error

CD : Critical Difference