PROBLEMS, POTENTIAL AND ECONOMICS OF MUSHRROOM CULTIVATION – A STUDY IN HIMACHAL PRADESH, UTTAR PRADESH AND BIHAR

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CHAPTER - I

INTRODUCTION

Mushrooms are the fruiting bodies of some members of lower group of plants, called fungi. Due to this reason the mushrooms are also called fleshy fungi. The fungus and hence mushrooms are characterised by the absence of chlorophyll which is responsible for imparting green colour to plants. Due to absence of chlorophyll, mushrooms are not able to synthesise their own food and have to depend upon outside sources for their nutritional requirements. It is because of this that mushrooms grow sparophytically on dead organic matter or parasitically with other living matter. The mushrooms are fruit bodies or reproductive structures emanating from mycelium, which under natural conditions remain buried under the soil.

1.1 HISTORY

Mushrooms have attracted the attention of man from ancient times. The references of mushrooms can be traced back to classical texts of Indian, Greek and roman literature. The wild growing mushrooms were picked for their aroma and palatability. The first cultivation of mushrooms was reported from France during 1650 where from these spread to England, America and some other countries. In Asia, China, South Korea and Taiwan were the first cultivators of mushrooms. At present Taiwan is considered to be the largest contributor of mushrooms to the world market.

The first efforts in cultivation of mushrooms in India started way back in 1940 at college of Agriculture, Coimbatore. Here the work was started on paddy straw mushrooms. Later trials were started at many other research stations in India. During 1961, Indian Council of Agricultural Research started a project in collaboration with H.P. Govt. named “Development of Mushroom Cultivation in Himachal Pradesh”. The main aim was to grow mushrooms in the state with technology available within the country but some times with technology imported from abroad. It was realised that the imported technology was not compatible with the Indian conditions and hence the research work was taken up at different institutions in India to develop the indigenous technology for mushroom production. In 1970, the scientists started feeling that the indigenous

mushroom production technology was standardised and could be made available to farmers. This induced the H.P. Govt. to establish a mushroom centre at Solan, in collaboration with United Nations Development Project (UNDP), with the objectives of providing technical know how to farmers along with critical inputs. The main aim was to induce large number of farmers to take up this activity. All efforts were concentrated on popularising the cultivation of white button mushrooms (Agaricus bisporus). This project started at the cost of Rs.1.26 crores had following specific objectives.

- To boost the research and development of mushrooms in the state.
- To make available quality spawn and compost.
- To make available latest production technology.
- To strengthen the marketing facilities for mushrooms.

The time period of project exhausted in 1982 after which the Department of Horticulture, H.P. is looking after the project activities. In addition to this the ICAR during 1982-83 established 'National Centre for Mushroom Research and Training' at Solan with the objectives of solving the problems faced by farmers in production of mushrooms and providing training to scientists, teachers, extension workers and mushroom cultivators regarding modern technique of mushroom cultivation.

Chronologically, the historical development can be summarized as follows:

Year	**Event**
1896-97	Chemical analysis of mushroom germinated in caves and mines by Dr. B.C. Roy of Calcutta Medical college.
1908	Invention by Sir David Prein of eatable varieties of mushrooms.
1921	Dr.Bose got success of cultivating two varieties of mushroom on compost. They were demonstrated in India Science congress in Nagpur in 1926.
1939-45	Cultivation of mushroom was done on paddy straw by Agriculture Department of Madras State.
1947	For taking increased production on paddy straw one layer of gram-floor was mixed by Mr. Asthana.
1961	Himachal Pradesh Government is cooperation with Indian Council of Agriculture Research Launched a project for cultivation of White Button mushrooms. It was the primary effort in such direction.
1964	Council for Scientific and Industrial Research in collaboration with the government of

	Jammu and Kashmir launched a project for cultivation of White Button Mushroom in Srinagar on experimental basis.
1965	Mushroom scientist Dr. Mental a famous scientist from FAO guided in the establishment of air conditioned laboratory for the preparation of span comparative analysis was done of agriculture wastes and other materials in preparation of compost.
1966	First Unit for Commercial Cultivation of White Button Mushrooms was established in Chail.
1974	Famous mushroom scientist from FAO gave valuable suggestions for compost, pasteurisation in connection with cultivation of White Button mushrooms.
1977	Mushroom Development Programme was started by horticulture department of Himachal Pradesh under 4 NDP programme with the cost of 1.27 crores of rupees in supervision and guidance of James Tonney. In this project one chamber for preparation of pasteurised compost was completed. From this pasteurised compost was given to the cultivators. This programme of 4 NDP is being run by Horticulture Department since 1982.
1982	Indian Council of Agriculture Research established on 23rd October 1982, National Mushroom Research and Training Institute in Solan of Himachal Pradesh.
1983	In Sixth Five Year Plan, Indian Council of Agriculture Research established All India Mushroom Development Project. Under this, six mushroom Research Centres were established throughout the country. They were established in G.B. Pant Agriculture and Technology University, Pant Nagar (U.P.) Punjab Agriculture University, Ludhiana, Tamilnadu Agriculture University, Coimbatore, B.C. Agriculture University, Kalyani (West Bengal), Mahatma Phule Agriculture University, Pune (Maharashtra) and in CS Azad Agriculture Technology University, Kanpur (U.P.). After that centres from Kanpur and Kalyani were removed and Indira Gandhi Agriculture University, Raipur (M.P.) and Rajasthan Agriculture University, Udaipur were made the Centres.
1989	Modern Mushroom Production Laboratory was established in GB Pant Agriculture University and Technology, Pant Nagar.
1998	Mushroom Research Laboratory of GB Pant University of Agriculture and Technology, Pant Nagar was extended as full-fledged Mushroom Research Centre. At present many agriculture Universities, Research Institutes etc. are imparting training in mushroom cultivation.

Ref. "Mushroom Utpadan Technique by Prof. R.P. Singh others page 4 to 7.

1.2 WORLD SCENARIO

There are about 100 countries all over the world where mushrooms are cultivated which together are producing about 50 lakh tonnes of mushrooms. Of the total mushroom production, 50 percent is accounted by Europe, 27 percent North America and about 14 per cent by East Asian Countries. Presently, the production of mushrooms is increasing at a rate of 7 per cent the world own whereas in India this growth rate is 30 to 40 per cent. It is expected that the world production of

mushroom would increase to 70 lakh tonnes per annum by the year 2010 and to 110 lakh tonnes by the year 2021. According to estimates of National Research Centre for Mushrooms the production in India was 40,000 MT during 1996-97 which is expected to increase to 1 lack MT by the year 2002. It is further estimated that this production would increase to 3 lakh MT. by year 2010 and 6 lakh MT by the year 2025. The world scenario of mushroom production has been summarized in Table 1.1.

TABLE: 1.1 PRODUCTION OF MUSHROOMS IN THE WORLD.

Mushrooms(Types)	1986		1989		1994	
	Net-weight (x-1000 tonnes)	%	Net-weight (x-1000 tonnes)	%	Net-weight (x-1000 tonnes)	%
Agericuspores vice	1.227	56.2	1.424	37.8	184.60	37.6
Lentil Idodis	314	14.4	393	10.4	826.2	16.8
Wall verilla	178	8.2	207	5.5	298.8	6.1
Plurotus species	169	7.7	909	23.9	797.4	16.3
Aricularia species	119	5.5	400	10.6	420.1	8.5
Others	175	8.0	430	11.5	720.8	14.7
Total	2.182	100	3763	100	4909.3	100

Source: Mushroom Utpadan Technique, by professor R.P. Singh and others page –2.

1.3 INDIAN SCENARIO

The exports from India, during 1993, were insignificant but presently, it is reported that, India has pushed back Taiwan to gain position of top exporter of whole white button mushroom in the world. India has also gained the second position in the export of cut mushrooms. During 1997-98 total export of fresh, dried and covered mushrooms touched 57 crore rupees. Haryana, Himachal Pradesh, Uttar Pradesh, Punjab and Tamil Nadu are the main mushroom producing states in India. Table 1.2 presents details in this respect.

TABLE: 1.2 PRODUCTION OF WHITE BUTTON MUSHROOM IN DIFFERENT STATES OF THE COUNTRY.

States	Production in (metric tonnes)
Andhra Pradesh	2500
Gujrat	100
Haryana	4000
H.P.	500
Jammu & Kashmir	400
Karnatka	600
Kerala	100
M.P.	2000
Maharashtra	7000
Orissa	700
Punjab	4000
Rajasthan	50
Tamilnadu	10.000
Uttar Pradesh	4000
West Bengal	250
Others	2000

Mushroom Utpadan Technique by Prof. R.P. Singh & Others page 3.

Presently the major share of the export from India is of Morels (Gucchi) for which the major markets are Switzerland, France and Germany. The exports of preserved mushroom in 1991-92 were at the level of Rs.381 lakhs, the major market being USA, Switzerland and France. These exports had increased substantially to Rs.1081.8 lakh in 1992-93.

1.4 IMPORTANCE

More than 80 per cent of population of the state depends upon agriculture for its livelihood. The increasing population has put increasing pressure on scarce and fixed land resource with a consequence that about 80 per cent of the holdings have become marginal or small. As a result the income generation from farms is continuously going down. The limited availability of land has made extension of farm limits almost impossible. The only viable alternative is the introduction of non-land based activities having good income generation capacity.

Any region, which is about 2000 ft above MSL, temperature varies between 10 to 30oC and has humidity of 75-85 percent have good potential for cultivation of mushrooms. The importance of mushroom cultivation also stems out from following facts.

- Mushroom cultivation generates direct and indirect employment.
- It requires very little land, as it is cultivated in closed rooms.
- The used compost can be reused as good manure in other field crops.
- It has capacity of being exported and earning foreign exchange.
- It provides rich diet to vegetarians.
- Being rich in proteins and low in carbohydrates and fat, it is very good for the patients of heart, diabetes and obesity etc.

The upper regions of the state have been identified for the cultivation of white button mushrooms and lower regions for 'Dhingri' (Plutorus sages kaju). Similarity, there are many hilly areas in U.P. and Bihar were natural cultivation of mushrooms in possible. In other places the conductive situation in artificially created.

1.5 FOOD VALUE

The mushrooms are not only highly palatable but are very good for health as well. It has rich amounts of various proteins, vitamins, minerals etc. along with certain essential amino acids, which are normally not found in other vegetables. It has good amount of vitamin-B and C, which are good for beriberi, heart patients and healthy teeth of children. The acids like Niacin and

pentathenic found in mushrooms are good for skin diseases. The folic acid found in mushroom can cure anaemia.

The composition of white button mushrooms (percent on wet weight basis) has been presented in following table:

TABLE: 1.1 COMPOSITION OF WHITE BUTTON MUSHROOMS.

CONSTITUENT	PERCENT
WATER	89.60
PROTEIN	3.94
FAT	0.19
EXTRACT MATTER	4.01
FIBBER	1.09
ASH	1.26

From nutritional point of view, the white button mushrooms have following constitution.

TABLE 1.2 NUTRITIONAL VALUE OF MUSHROOM

CONSTITUENT	PERCENT
CALCIUM	0.0022
PHOSPHORUS	0.5
POTASSIUM	0.15
IRON	19.5 PPM
COPPER	1.35 PPM

The fresh white button mushrooms have the following vitamins.

TABLE: 1.3 VITAMINS IN FRESH WHITE BUTTON MUSHROOMS

(MG/100gms)

VITAMIN	QUANTITY
VITAMIN B (THIAMINE)	0.12
VITAMIN B (RIBOFLAVIN)	0.52
VITAMIN C (ASCORBIC ACID)	8.60
VITAMIN K	Insignificant
NIACIN	5.85
PENTATHENIC ACID	2.38

The nutritional advantage provided by mushrooms along with its capacity of income and employment generation have prompted the scientists to strongly advocate the cultivation of white button mushrooms in the state. This could be step towards solving the problems of unemployment income generation and malnutrition among rural population. However, as is generally found there are gaps between expectations and realisation. There are also various problems and bottlenecks in production and marketing which can be solved with proper remedial measures taken well in time. Such remedial measures can go a long way in popularising this enterprise in the state and to establish it on commercial lines for better employment and income generation.

It is with this background that the present study has been carried out in H.P., U.P. and Bihar with following specific objectives.

1.6 OBJECTIVES

The study is based on following objectives:

1. To study on going government schemes and programmes for development of mushrooms in the state.

2. To study the socio-economic profile of mushroom cultivators.

3. To work out economics of mushroom cultivation on different sizes of farms.

4. To study the financial efficiency of mushroom cultivation.

5. To study the relationship of productivity with capital and labour.

6. To examine the different marketing channels, margins and costs.

7. To study the socio-economic constraints and problems in production and marketing of mushrooms.

CHAPTER -II

REVIEW OF LITERATURE

The present chapter presents the review of literature. The review of literature is necessary for having an idea about the results and methodology of the similar studies conducted in the past. The following text provides some of the literature reviewed prior to initiation of the study and also during the course of the study. This chapter also includes the success stories of two of the entrepreneurs who had very humble beginning but due to their hard work and the concerted efforts have gained a solid foothold in the mushroom scenario of the State.

2.1 REVIEWS

Success in button mushroom in Himachal Pradesh caught the attention of research workers and growers in Uttar Pradesh. It resulted in exploratory trials on mushroom cultivation and the same was conducted at Vivekanand Laboratory, Almora and Food Research Station. Chaupatia (Chadda 1944). In early seventies, NBRI Lucknow, C.S.A. University of Agricultural and Technology. Kanpur and G B Pant University of Agriculture and Technology. Pant Nagar imitated well-planned research and development of All India Coordinated Mushroom Improvement Projects at Pant Nagar and Faizabad Agriculture Universities in 1983 and 1993 respectively. Besides these, the Banaras Hindu University, Varanasi, Horticulture Research Stations. Saharanpur and Srinagar, Garwal and also conduct research on mushroom cultivation Singh and Chaulbe in 1995 did Commendable works on mushroom flora in the state. Tondon et-al (1975) observed a higher yield of bispros on wheat straw compost as compared to paddy straw compost. Bist ad Harsh (1984) demonstrated the utility of millets and waste on tealeaves. Jain and Roy (1985) studied properties of casing soils found highest yield and maximum number of buttons is Jyolikot soil. The compost having 1.5-2.0% nitrogen (Singh. Et.al. 1986. Singh, 1988). The Mixture of F.Y.M. + soil sand (3:1:1) was found to be a better casing material for cultivation of this Mushroom (Singh 1991).

Ajit Samachar (1999) published in its daily paper that the total production of mushroom was 40 thousand MT and it is estimated that the production will increase about one lack MT up to 2002. This is all due to the assistance provided by Government of India for development of mushroom cultivation. For this development GOI launched a central sponsored scheme during eighth plan. But during 9th plan no target for production and export was fixed by the government.

Department of Horticultural in Himachal Pradesh (1999) stated in its perspective plan that Mushrooms are popular for their delicacy, flavour as well as food value. The agro-climatic conditions prevailing in many parts of the State provides ample scope for the cultivation of mushrooms, both for domestic consumption as well as for export purposes. Mainly two types of mushroom viz; white button mushroom (Agaricus bisporous) and Dhingri (pleurotus app.) are being cultivated in the State. The modern technology in commercial cultivation of mushroom was introduced under two externally aided projects implemented in the State viz. FAO/UNDP. Mushroom Development Project, Chambaghat (Solan) during 6th Five-Year Plan and Indo-Dutch Mushroom Development Project at Palampur (Distt. Kangra) during the 7th Five Year Plan. Two bulk pasteurisation units for compost have been established under these projects with total capacity of production of 1350 M.T. of pasteurised compost (Chambaghat -350 M.T. of pasteurised compost and Palampur 1000 M.T.). The pasteurised compost from these units is being made available to registered mushroom growers of Shimla, Solan, Sirmour, Kangra, Chamba, Hamirpur, Una and Bilaspur Districts. The small and marginal farmers and unemployed graduates are being given preference under these projects.

Shulini Samachar (1999) published that during 1960-61 ICAR introduced an alternative for agriculture production in the shape of mushroom cultivation at Solan district of Himachal Pradesh, which was considered an origin of mushroom cultivation in India. Thereafter, government of Himachal Pradesh established a mushroom development project through Department of Horticulture during 1977. The main objective of the project was to develop research work on mushroom cultivation and to assist growers for availability of better quality compost and seed; to provide technology to growers and to facilitated marketing process of mushroom. This project completed in 1982 and thereafter department of horticulture of the state is providing assistance

through supplying compost and training programmes to the growers and providing various subsidies. At the same time for the progress of mushroom cultivation in the state a number of units have been started for preparing compost so that growers in different districts can avail the facility of compost. On the other hand about 4300 trainees of state could be able to get training through horticulture department.

Yogesh (1999) reported in a paper Shulini Samachar that computer can play a better role for the production of mushroom. Computer is fully capable to indicate the situation of temperature, carbon dioxide and oxygen of the room where crop is grown. Further, it has also been mentioned that now Robot can be used against human labour in cultivation of Mushroom. In this regard programme of various works used to be fed in the computer so that Robot can be utilized for various type of works especially harvesting operation can be conducted through this system.

Mamta et. Al (1998) observed that a relatively small share of the total produce by large farms was sold to HOPCOMS compared to medium and small farms. This is because the production capacity of large growers being more per day, they were forced to sell the excess quantity to retailers or other market intermediaries. They were also observed that the average price spread among the various marketing channels was around 68 per cent. This implied that mushroom marketing is quite efficient in Bangalore. Subrahmanyam (1998) conducted studies on marketing of mushroom in India and found that producer-consumer, producer-retailer-consumer, producer-co-operative society-retailer-consumer, etc. are the most important marketing channels followed by mushroom growers. In this study the author suggested the strategies for improving marketing through creation of awareness among consumer, proper display of the produce and sale strategies.

Khader (1997) reported that economics of mushroom cultivation mainly depends on the equipments, materials used, their initial cost and yield performance. The initial non-recurring expenditure in oyster mushroom was found to be high for the cultivator from low-income group. The cost could be reduced if cultivator could share the non-recurring expenditure collectively. The net income varies and depends on the sale price of spawn. The cost of cultivation is much less

when done by rural people. This results in increase in profit. After proper training and demonstration, the respondents have changed their attitude, as they have shown positive attitude towards mushroom cultivation. If the spawn multiplication would be done by cultivator as a co-operative venture and mushroom cultivation could be undertaken at household level as an income generating activity.

NABARD has done Ex-post Evaluation study on mushroom cultivation in Dehradun in Uttar Pradesh in 1997. In this evaluation study, the scheme implemented by Uttar Pradesh Sahkari Gram Vikas Bank was evaluate to study various aspects of mushroom cultivation. The study was aimed to evaluate the impact of such financing on poverty and income generation. The study found that out of 76 units surveyed 45 units generated substantial income and rendering employment opportunities.

Dr.Sarkar, Jayashree (1994) made an observations in her paper published in (Times of India Patna, Bihar Daily) that a good number of people have been trained and many of them are growing mushroom in the country side "It is sad we cannot make them stick to it". Analysing the reason, she pointed out that the lack of proper marketing system is the main bottleneck. A villager may have a small quantity of mushroom for sale and he cannot be expected to come to town incurring an expenditure much higher than his profit to sell this.

NABARD, (1992) reported through their publication, "Model Bankable project on Button Mushroom for Export", that there is a large scope for export potential and markets of mushroom in the world. The Ministry of Commerce, Government of India has identified mushroom as extreme focus segment for export purposes. India produced about 12,000 tonnes of mushrooms in 1992-93, which includes all the cultivated types and those collected from the forest. The country exported 49.174 tonnes dried and 1174.76 tonnes processed mushroom, valued at Rs.1222 lakhs and Rs.381.19 lakhs respectively in 1991-92. While India's production is meagre, world production was 3.7 million tonnes of mushrooms, of which the share of button mushroom was 1.4 million tonnes in 1989-90. The major producers of button mushroom are USA, China, France, Holland, UK, Taiwan, Italy, Spain and Germany. The per capita consumption of mushrooms in the

developed countries varies from 2.9 kg/annum (Germany) to 1.8kg/per annum (USA). Six countries share 85% of the total consumption of button mushrooms, USA (30%), Germany (17%), UK and France (11%) each, Italy (10%) and Canada (6%).

Tewari (1990) Rakwal (1992) and Tewari and Singh (1991) studied the occurrence of undesirable fungi reducing yield of a. bistros and identified six fungal species namely Trichoderma harzianum. T. longibra chiatum. Chaetomium globosum, Epicoccum nigrum. F.moniliforme and NwueoapoeAP. Prof R.P. Singh, Project Co-ordinator, Mushroom Research Centre G.V. Pant University of Agri. & Techi. Pant Nagar and Others are doing Commendable works in field of Mushroom. He along with others has written a book in Hindi also Mushroom Utpadan Technique so that the growers know the entire aspect of mushroom cultivation.

National Research Centre For Mushroom at ICAR Solan (1989) investigated the utilisation of spent Mushroom Compost with a view to recycle the spent mushroom compost (SMC) and to promote Farming System Research (FSR), an experiment was laid out at NRCM, Solan, during Kharif, 1998, utilizing two years old spent mushroom compost as a manure for maize cultivation. The varied doses of SMC were kept as treatments and no SMC application was used as a control. In the experiment, Kanchan hybrid was used for cultivation and no pesticides and only a single dose of urea @ 400g/16m2 plot as top-dressing was applied as a starter dose. The highest grain yield of 10.58kg/16m2 plot was recorded in treatment wherein SMC @ 24 kg per plot was applied. An enhancement of 79% grain yield over control was obtained in the above treatment. However, it was observed that higher doses of SMC (28 kg and 32 kg/plot) resulted in lower grain yield.

Tiwari and Kapoor (1988) conducted a study in two major growing district of Himachal Pradesh. In this study it was observed that the net returns over cost C from mushrooms on small, medium and large farms were found to be Rs.(-) 5010.33, Rs. 1238.00 and 8790.60 respectively. The study indicated that large mushroom farms in the study area were better managed. The average net return from mushrooms was about 13.45 per annum per square metre of spawned area. On an average, the output input ratio was 1.05. Further study revealed that the share of producer in consumer's rupee was the highest in case of the channel where producer is directly selling to

consumer. It was also observed that more than 90 per cent of the labour requirement of the mushroom farms was met from the farm family.

Bali (1984) emphasized that mushroom cultivation does not compete with the agricultural land as its cultivation can be done in jhuggies. By taking this enterprise, farmers can supplement their income without making much investment as it was a labour intensive activity with simple methodology.

Mehta (1982) highlighted the problems being faced by mushroom growers. He pointed out that compost and spawn availability, transportation of raw materials, high cost and non-availability of compost and spawn were the main problems.

Shandilya and Agarwala (1982) reported that yield of mushroom depends upon the availability of suitable environmental condition for the development of fruiting bodies. This involves maintenance of temperature, humidity and regular air supply. Further they have pointed out that in India provision of controlled environmental conditions is possible to a limited extent since majority of the population is poor.

Lane (1981) stressed that mushroom marketing must encompass several vital aspects including the post harvest techniques, distribution, co-operatives, advertising and promotional incentives the universal product code, grading and increasing per capita consumption of mushrooms.

Rai and Bhatia (1981) worked out the break-even analysis for the three categories of mushroom growers and reported that large farms having more than 400 square meter space spawned per season should produce 3781 kg. Medium farms with 200 to 400 sq. Meter space spawned per season should produce 688 kg. And small farms with less than 200 sq. meter space spawned per season should produce 189 kg. of mushroom to meet their total expenses.

Rana, et.al (1980) worked out the gross ratio and operating ratio for small farms, medium farms and large farms. They discovered that gross ratio was 0.56, 0.74 and 0.65 and operating ratio

were 0.37, 0.48 and 0.32 on the respective farms. Thus by the analysis it was concluded that large farms are more efficient as compared to small and medium farms.

Hayes (1978) regarded the introduction of mushroom cultivation to the developing countries as an evolutionary progression. In view of the potential of mushroom production in the under developed countries, increased world production was inevitable. In order to sustain the progress of mushroom cultivation, the consumption of fresh mushrooms should be encouraged, its values food be projected, new outlets sought, production cost lowered and a great degree of international collaboration both in research and marketing should be encouraged.

Line (1978) established that recycling of the agricultural wastes can be done by undertaking mushroom cultivation in rural areas. He emphasized that it will augment farmer's income and will also utilize agricultural wastes, which, other wise cause environmental pollution.

Patel (1977) reported that there is an immense scope and possibility of developing mushroom cultivation on commercial scale both for export and for domestic consumption. He advocated that location of mushroom farm is an important factor in respect of market convenience.

Kaushal and Tewari (1974) reported that large mushroom farms having more than a thousand square feet of space spawned per season were obtaining a net return of s.8, 489 only and small farms having less than a thousand square feet of space spawned per season were getting Rs.3690 only as net returns in Solan district.

2.2 SUCCESS STORIES OF HIMACHAL PRADESH

2.2.1 Success Story of Vikas Banal

Vikas Banal born in Samlech village of district Solan in 1966. After getting the Masters degree in commerce from Himachal Pradesh University Shimla Banal preferred to establish a mushroom unit instead of migrating to urban area for seeking job. For the establishment of mushroom unit Banal invested Rs.6500 in 1991 and purchased 200 bags of mushroom compost for starting cultivation of white button mushroom at Solan. At present Banal is cultivating 2000 bags of compost and has

started cultivation by air-conditioning the entire system which is the most suitable system for growing mushroom throughout the year. During last nine years Banal has gained popularity in the field of mushroom cultivation and has encouraged other youth of the area for joining in this enterprise for their livelihood. This way Mr. Banal has not only gained success himself but has been instrumental in the spread of the activity in district Solan. After a few years of successful operation he established his own pasteurisation unit for preparing compost. This is an example of vertical integration and now he is supplying compost regularly to the other growers. This has helped him not only in augmenting his income but has facilitated the adoption of mushroom cultivation by other farmers as they now don't have to depend upon the government source for compost. At present he has generated employment for about 10 persons in his unit and his father Sh. Mohan Lal looks very happy and satisfied with the achievements of his son.

2.2.2 Success Story of Koushalya Jinha

Koushalya born in rural area of Shimla district and after her marriage she generally used to think about generating income and employment through private enterprise so that she may help her husband and also this may act as an example for other rural people who may be motivated to generate their own livelihood. In 1981 she planned to cultivate mushroom crop in Shimla city where she could be able to collect mushroom compost easily from Solan about 60 km away from her unit. She also took into consideration the fact that Shimla city would provide her ready market. Initially she started cultivation of mushroom through 50 bags of compost but her continuous efforts and interest ultimately led her to production of quality mushroom in Shimla district. At present Koushalya is growing mushrooms in about more than 2000 bags. The venture ultimately turned out to be so successful that her husband, Sh. Mohan Jinha was compelled to join her in this enterprise by leaving his government job. Like Mr. Vikas she has now decided to go in for the production of compost. In fact, the construction work is under way in Ganahati, about 15 Kms. from Shimla. Koushalya has a secret desire to be able to provide compost to different new growers in Shimla district. And now she is about to materialise her dream. Her aim will definitely be achieved because Koushalya has created an environment for mushroom cultivation among all of her family members. Mr.Jinha expressed that once in the morning at 10.30 AM he was surprised to see 160 kg of mushrooms plucked by her wife, which in fact is a job of two labourer. Her efforts

for reaching to the top is really a matter of proud for all who are concerned with mushroom cultivation or even those who are not concerned with it. This is also a live example of the emerging women power in our society.

2.3 SUCCESS STORIES OF UTTAR PRADESH

Success in cultivation of button mushroom showed the way of establishing small units hill tracts of Kumaon Garhwal and Allahabad regions. Leaving aside the long-term method compost preparation the marginal and small-scale seasonal growers of the state prepare compost by short method.

In Dehradun, Nainital, Merut, Kanpur, Lucknow, Varanasi, Allahabad and Ghazipur, numbers of farmers have adopted mushroom cultivation as a source of additional employment and income. Some of the small growers have their own facilities for bilk pasteurisation of compost. Some of the marginal and small growers particularly in Kumaon region directly purchase pasteurised compost from "Indo-Dutch Mushroom Project" located at Jyolikot in Nainital.

There are big entrepreneur's in this venture also. Flex Food Dehradun, Baba Agrotech, Aligarh, S.R. Cannery, Allahabad. Moon Mushroom farm Rampur, Sahas Agro, Meerut, Baba Agrotech Aligarh and Subhagya Agrotech, Jaunpur etc. are some of the big units doing successfully mushroom cultivation. Following Tables shows some units engaged in mushroom cultivation and marketing along with their production quantum.

1. Mr. Vijoy Kumar Sanwal of the village Lachhivala, block dorewala district Dehradun has got tremendous success in mushroom cultivation. After doing post graduation, he ran for the service but could not get it. After that the jumped into mushroom cultivation. He and his postgraduate wife cultivate mushroom on scientific basis, produced 37 qtls. Earned the profit of Rs. 1,63,500 not only this now he is Chairman of Doon Valley Mushroom Society.
2. Another success story is of Mrs. Rewati Bist of Indira Nagar Ranibag, Bheemtal, and Nainital. She has formed 'Nani Swayam Sahayta Samooh'. Ladies members produce mushroom and has developed contacts with marketing centres, hotels etc. They sell

under their brand name. Starting from simple housewife earning nothing in cash, she produced 4 qtls. Of white but on mushrooms and earned gross profit of Rs.26,000.

2.4 SUCCESS STORIES OF BIHAR

2.4.1 Indrajeet Pandey Mr. I. Pandey is an old graduate of 52 years. He was born and brought up in Hazaribagh district of jharkhand state. For the last few years, he has been running a ravel agency, a telephone booth and a restaurant too. Besides these, he has been engaged in mushroom cultivation for the last 5 to 6 years. He was inspired to commence mushroom cultivation by the local K.V.K. at Holy Cross Society near Kanhari hills, Hazaribagh. Initially, he started producing mushroom on a small-scale say 50-60 bags. But he had to face the problem of disposal of the produce in the beginning and this compelled his to rethink whether to continue the production or not. To overcome the problem, he decided not to leave the field but to use his innovative ideas for consuming the entire produce by introducing a new recipe of mushroom in his own restaurant. As his restaurant is situated at Hazaribagh adjoining the capitals of the two states (Bihar and Jharkhand), the recipe became a popular dish among the passer-by and also among the local populace. This resembled in increase in demand for recipe leading to increased production of mushroom. Simultaneously he started to motivate other small growers to produce more and assured them that he would purchase their entire produce. This resulted in increased mushroom cultivation, which created more income and employment to the local growers in general, and a number of persons in his own enterprise in particular. Besides, for sustaining and supporting the small growers he has also been meeting the spawn requirements of the growers through his own spawn-producing unit. This has provided him with additional income and employment to a number of persons also. In this way he has became the source of inspiration for other mushroom.

2.4.2 Ms Shanti Guria: Ms Guria is a matriculate and is 45 years old. She is the Secretary of Nutan Mahila Vikas Sahyog Samittee Ltd. (NMVSSL) Reg. No. 19R/2989, P.O. – Doranda, Ranchi covering south andboth chhotanagpur and Santhal Paragana Divisions of Jharkhand State. Besides, encouraging various self-employment activities among its members, the NMVSSL has also been imparting training programme for mushroom cultivation since 1993. While organising

the training programme, the Secretary herself was inspired and started growing mushroom in 200 bags. Though she, grew mushroom in small quantities yet, she is considered a successful motivator among the beneficiaries. Actually she has created an environment among the rural women to supplement their family incomes by involving themselves in this venture. Being the Secretary of the Samittee, she has of repeated and usual opportunities to interact with the rural women, who thus are able to have not only the technical know-how but other aspects like availability and manageability of inputs and marketing as well as at their own places. She is not only acting as a motivator but facilitator also. As regards this, she gets feedback from academicians, government officials and others as and when required. Besides, she has made contracts with several hotels, restaurants and VEGFED also for marketing the produce. She has ensured marketing of the unsold produces of the rural growers through her own channels which the growers cannot tap individually because they use to produce in small quantities. At the same time the problem of rural growers in solved by their securing access to new and distant markets and thus they are saved from the clutches of middlemen and local traders. Hence there is no wonder she is taken to be mother of activities, which generate income and employment for rural women living in the tribal region of Jharkhand.

CHAPTER - III

METHODOLOGY

The present chapter includes study design, analytical methods, data collection and other related issues.

3.1 STUDY DESIGN

3.1.1 HIMACHAL PRADESH

A complete list of registered growers indicated that there were 876 registered growers of mushrooms in the state by the end of December 1999. However, only 112 were actually engaged in mushroom production. There are also many unregistered mushroom cultivators who are also engaged in the activity. But no information on their number, location or scale of operation is available from any source. Thus, study design has been based only on the registered growers.

The data reveals that out of 112 registered growers who actually were growing mushrooms 49 were located in district Shimla, 55 in Solan six in Sirmour and only two in Bilaspur. Thus, districts Solan and Shimla were purposely selected for the detailed study. It was decided to draw a sample of 40 growers from each district. For this purpose in each of the districts, five locations were identified where maximum number of growers was located. These locations were identified with the help of officials of Horticulture department and Table 3.1 presents the details.

TABLE: 3.1 LOCATIONS IDENTIFIED FOR DETAILED STUDY.

	District Solan	District Shimla
LOCATIONS	Chambaghat	Kotkhai
	Saproon	Theog
	Barog	Mashobra
	Oachghat	Sanjauli
	Basal	Shoghi

The requisite sample of 40 producers was selected randomly in district Solan but it was found that in Shimla the requisite number of 40 producers could not be contacted due to very thin spread of

activity. In the above stated locations a sample of only 30 registered growers could be obtained. Thus, the study is based on 70 mushroom cultivators located in two districts and ten locations.

The sampled producers were divided in to three size classes on the basis of scale of the operation. The producers having less than 100 trays have been categorised as small, 101 to 250 trays as medium and those having more than 251 trays were categorised as large mushroom producers. During data collection it was found that almost all of the producers were using polyethene bags instead of wooden trays. In terms of input use and out put, it was determined that four polyethene bags are equivalent to one wooden tray. Accordingly, the polyethen bags were converted to wooden trays for the purpose of determination of their size class. The distribution of mushroom producers according to their scale of operation has been presented in Table 3.2.

TABLE: 3.2 DISTRIBUTION OF MUSHROOM CULTIVATORS, ACCORDING TO SIZE OF THE OPERATION.

DISTRICT	CATEGORY			
	SMALL	MEDIUM	LARGE	TOTAL
SOLAN	12(30)	13(33)	15(37)	40(100)
SHIMLA	10(33)	18(60)	2(7)	30(100)
TOTAL	22(31)	31(44)	17(25)	70(100)

NOTE: Figures in parenthesis are percentages to total.

It may be seen from the table that 31 per cent cultivators belong to small category, 44 percent to medium and remaining 25 per cent belong to large category.

3.1.2 UTTAR PRADESH

In U.P., the proper list of registered mushroom growers is not available. However, 50 growers benefited by Government in any form have been selected for the study. The districts of Nainital and Dehradun that have better performance in mushroom cultivation have been purposely selected. The better cultivation regions of the districts in consultation with the horticulture officer of Mushroom Department have been selected from both the districts. Following Table 3.3 reveals the location of the identified growers:-

TABLE 3.3 LOCATIONS IDENTIFIED FOR DETAILED STUDY

Locations	District Nainital	District Dehradun
	Bhimtal	Sahaspur
	Haldwani	Vikash Nagar
	Kathgodown	Doiwala
	Jeolckot	Raipur

Sample of 50 growers from 8 locations has been selected from two districts. A few locations from both the districts had to be left after verification on the spot. Thus from Nainital and Dehradun 25 growers each were selected for the study. As there was no choice in sample selection, it may be termed as purpose on this aspect also.

The sampled growers were divided into three categories on the basis of scale of operations. Their categories were small, medium and large. Those who have below 100 polythene bags were termed as small, between 100 to 250 polythene bags as medium and owners of 251 polythene bags and above were termed as large. It was found that bags were used instead of wooden or iron trays. Following is the position of selected mushroom growers according to their scale of operations.

TABLE 3.4 DISTRIBUTION OF MUSHROOM CULTIVATORS ACCORDING TO THE SIZE OF THE OPERATION.

District	Category			
	Small	Medium	Large	Total
Nainital	16 (64.00)	8 (32.00)	1 (4.00)	25 (100.00)
Dehradun	13 (52.00)	4 (16.00)	8 (32.00)	25 (100.00)
Total	29 (58.00)	12 (24.00	9 (18.00)	50 (100.00)

Note: Figures in brackets are percentages to total.

It is clear from the Table 3.4 that out of 50 selected growers 29 (58%) belongs to small 12 (24%) to medium and remaining 9 (18%) to large category.

3.1.3 BIHAR

In absence of sufficient information regarding district wise data for area under mushroom cultivation and the number of mushroom growers, the selection of districts was based on our several round discussions with the Director, Horticulture, and Government of Bihar. He suggested to select Ranchi and Hazaribagh district of Bihar on the basis of highest number of mushroom growers in the state.

Subsequently, with a view to enlist mushroom growers in both the districts, discussions were also held with the experts of Plant Protection Department of Birsa Agricultural University, Ranchi. We came to know that some of the organisations in both the districts have been imparting training for mushroom cultivation for the last one-decade. A complete list of trained mushroom growers was obtained from such organisations like Ram Krishna Mission, Morabadi, Ranchi, Society for rural Industrialisation (SRI) Ranchi, Krishi Gram Vikash Kendra, Rukka, Ranchi, Holy Cross Social Service, Hazaribagh, Adivasi Sarwangin Vikas Parishad, Bagjogra, Hazaribagh, Nutan Mahila Vikas Sahyog Samiti Ltd., Anandpur, Ranchi, for the years 1996-97, 1997-98 and 1998-99 which

totalled 195 growers, comprising 115 from Ranchi and 80 from Hazaribagh. Further, these mushroom growers were classified in three size groups i.e. small growers (having less than 100 polythene bags), medium growers (having more than 100 but less than 250 polythene bags) and large growers (having more than 250 polythene bags) in each of the selected district. Thereafter, 50 growers were randomly selected from each of the selected district. The details of which are given in Table 3.5.

TABLE 3.5 DISTRIBUTION OF MUSHROOM CULTIVATORS ACCORDING TO SIZE OF OPERATION.

DISTRICT	CATEGORY			
	SMALL	MEDIUM	LARGE	TOTAL
RANCHI	24 (48)	15 (30)	11 (22)	50 (100.0)
HAZARIBAGH	27 (54)	17 (34)	06 (12)	50 (100.0)
TOTAL	51 (51)	32 (32)	17 (17)	100 (100.0)

Note: Figures in parenthesis are percentage to total.

The Table 3.5 presents the detailed information regarding the sampled respondents of the study area. The table reveals that out of 50 sampled growers in Ranchi district 24 were from small size, 15 from medium size and 11 from large size whereas in Hazaribagh district 27 from small size,17 from medium size and 6 from large size. An altogether 100 mushroom growers (50 from each district) forms the sample size of the present study. The farm size wise distribution shows that 51 were from small size, 32 from medium size and 17 from large size.

During the data collection it was found that all the producers were exclusively using polythene bags. So far as the size of polythene bag is concerned, it varied from one sample respondent to another. However, the size of bags was 40x42 cm, 42x30 cm and 50x35 cm. The ratio of input output was 2:1 to 1.25.

3.2 ANALYSIS OF DATA

Various concepts and analytical tools used have been described in this section.

3.2.1 Cost Concepts The costs A, cost B and cost C have been used and explained below:-

Cost A_1: Included value of hired labour, hired machinery charges, value of spawn, compost, insecticides and pesticides, water and electricity charges, depreciation on implements, interest on working capital etc.

Cost A Cost A + rent-paid for leased in shed/building

Cost B Cost A + imputed rental value of own shed/building + interest on own fixed capital

Cost C Cost B + imputed value of family labour

3.2.2 Financial Efficiency The financial efficiency has been measured by using following ratios.

1. Capital Turn over Ratio: Measures efficiency of capital invested and is measured as
   Capital turn over ratio = Gross Income /Fixed capital investment
2. Operating Ratio = Total operating & maintenance cost / Gross profit
3. Gross Ratio = Total cost of cultivation / Gross farm income
4. Rate of Return on capital = Net farm income /Fixed capital investment

3.2.3 Production Function Analysis The production function analysis has been used in order to study the relationship of mushroom yield (exogenous variable) with total working capital and human labour (endogenous variables). The Linear Production function having following form was used:-

$Y = aX^{b1}{}_1 X^{b2}{}_2$

where

Y = Mushroom yield

X_1 = Total working capital

X_2 = Human labour

a = Constant

b_i = Regression coefficients

The return to scale was calculated by adding up the elasticity coefficients i.e.

Returns to scale = $\sum_i^2 bi$

The marginal value products (MVPs) have been computed as under

$MPV_{xi} = (biy / xi).Py$

Where b_i = Regression coefficient of i^{th} input

Y = Geometric mean of output

x_i = geometric mean of i input

and P_y = price of output

The MVP of factor cost ratio has been calculated as:

MVP of factor cost ratio = $MVPx_i/Px_i$

Where MVP = Marginal value product

MVP_{xi} = MVP of i^{th} input

P_{xi} = Price of i^{th} input

Optimum Resource Use: The optimum level of inputs has been calculated as:

$MPP\ x_i = Px_i / P_y$

3.3 DATA COLLECTION

The primary data was collected on a predesigned schedule, which was pretested in order to know the shortcoming before hand. The data was collected by personal interview method by the trained and experienced investigators. The primary data has been supplemented by secondary data mainly from Directorate of Horticulture.

3.4. REFERENCE PERIOD Reference period of the study is 1999, calendar year.

CHAPTER – IV

CULTIVATION PRACTICES

WHITE BUTTON MUSHROOMS

There are various types of mushrooms cultivated the world over. Out of these eight are important viz. button, oyster, straw, shiitake, woody ear, silver ear, winter and namekno which account for 99 per cent of total world production. In India, only three types of mushrooms viz. button, oyster and straw are commercially cultivated. Of these button mushrooms account for about 90 per cent of India's production, about 38 per cent of total world production of mushroom is bottom mushroom.

The white button mushrooms can be grown in the state around an altitude of 2000 M above MSL and it is possible to take five crops in a year. There are certain places in the H.P. like Chail, Shimla, and Mandi etc. where the cultivation is possible throughout the year except artificial heating during the winters. Three crops a year are possible in places like Kasauli, Dalhousi and Dharmasala and one to two crops are possible in places like Solan, Kotgarh, Palampur, Jagjeet Nagar etc.

The mushroom production is a complex process and requires special technical skills for raising the crops. For its growth it requires two type of temperatures, 23-28oc for spawn run or vegetative growth and 12-18oc for fruit body formation. The humidity during fructification should be 80-90 per cent with proper ventilation. The cultivation involves three basic steps.

1. Production or procurement of spawn
2. Preparation of compost
3. Production of crop.

The details of each of these steps have been presented in the following text for white button mushrooms.

4.1 PRODUCTION OR PROCUREMENT OF SPAWN FOR WHITE BUTTON MUSHROOMS (H.P. AND U.P.)

4.1.1 PROCUREMENT OF SPAWN

The spawn can be procured from the following sources within Himachal Pradesh.

1. HPKVV, Palampur
2. Dr. Y.S. Parmar University of Horticulture & Forestry, Solan.
3. Mr. Chander Mehta, Pearless Quality spawn lab, saproon, Solan.
4. Other private institutions.

The sources for spawn procurement in Uttar Pradesh are following:

1. GVPK and Prayodogic Viswa Vidyalaya, Pant Nagar, Udham Singh Nagar.
2. Indian Agriculture Research Institute, Poosa, New Delhi.
3. CS Azad Agricultural University, Kanpur.
4. Private Institutions.

4.1.2 PRODUCTION OR PROCUREMENT OF SPAWN

Button mushroom like other plant species, require the seed for their cultivation, which in this case is popularly known as spawn. Spawn is a pure culture of mushroom mycelium grown on a solid substrate such as cereal grains. Before the introduction of cereal grain spawn, the spawn was prepared on sterilised composted manure and was known manure spawn. In northern India most of the spawn is prepared on wheat grain while in south India, Jawar is used as a substrate for spawn production. Though, there are number of methods for production of mushrooms i.e. tissue culture, multi spore culture and single spore culture but a typical method for making spawn from wheat grains is the popular one in Himachal Pradesh. In this concern method for preparation of substrate for spawn is as follows.

Clean whole grains are taken for the purpose. Broken grains would be avoided. Boiling in water for 20-30 minutes permits the grains. This raises the moisture content of the grains (about 50 per cent) and at the same time makes them soft enough for mycelium to grow on it. Boiling for a longer period will result in breaking of grains and they will become too soft and sticky which should be avoided. After boiling, excess water is drained off by spreading the grains on a wire mesh. Grains are now mixed with gypsum(calcium sulphate) and chalk powder (calcium carbonate) at the rate of 2 per cent and 0.5 per cent respectively on dry weight basis. More elaborately 10 kg of wheat grains will require about 200 grams gypsum and 50 grams chalk powder (Mehta and Kumar, 1988). This will help the check the Ph value of the medium and will prevent sticking of grains with one another. The grains are now filled in containers (glucose bottles or polypropylene bags) and mouth of the containers plugged with non-absorbent cotton. These are then sterilised in an autoclave at 22 lb p.s.i pressure for 1 to 2 hours. This gives a uniform temperature of 126.5^{o}C, which is sufficient to kill bacterial and other contaminants, which might spoil the culture afterwards. The grains are now allowed to cool to room temperature and inoculated with mushroom mycelium. From time to time different workers have given different formulations depending upon the availability of the basic raw materials. Formula given by mushroom research laboratory Solan for short method is as follows.

Wheat straw	**1000 Kg.**
Chicken Manure	400 Kg.
Brewers grain	72 kg.
Urea	14.5 kg.
Gypsum	36 kg.

For inoculation of grain spawn the mycelium grown on specific medium such as wheat extract agar is transferred to containers under sterile conditions and resulting spawn is called the master spawn. This master spawn is further used to inoculation of large number of bags, bottles and the resultant is commercial spawn. The commercial spawn is used for inoculating the compost beds. Now it becomes essential to discuss about the preparation of compost, which is the second major component for mushroom cultivation.

4.1.3 PREPARATION OF COMPOST

There are two methods i.e. long and short methods for preparation of compost. The long method of composting has many shortcomings hence, to overcome these shortcomings, Sinden and Hauser (1950,1953) came out with a novel method which is termed as short method of composting in which the compost is ready in about 16-20 days as compared to 28 days in long method. Compost obtained by such a method is free from the disease and pests and gives 18-25 kg mushrooms from every 100 kg of compost. Short method of composting primarily consists of two parts, out door composting for 10-20 days (Phase-1) followed by pasteurisation and conditioning of the compost inside an insulated room by free circulation of steam and air under set conditions (Phase-II). The main purpose of conditioning/pasteurisation is to kill or inactivate insects, pests and other competitors, which may, if present, hamper the spawn, run and reduce the yield.

Steam pasteurisation is done in a well-insulated room designed for the purpose. This process of pasteurisation completed in an insulated room where walls, roof, ducts, which carry steam, and doors are insulated by proper insulating material. Boiler is required to produce the steam while a blower is needed to below air. The 'short method' of composting was introduced in India, by Hayes and Shandilya in 1977. It is completed in two stages. In first phase all the ingredients are allowed to ferment under uncontrolled conditions for 10-12 days. After giving turning to various components 3 times in 6 days and adding Gypsum, the compost gets ready for pasteurisation for IInd phase. To start the procedure, firstly the peak heating room is heated with dry heat to bring the temperature of the room to around 48oc. After that compost from phase one is immediately transferred to minimise the heat losses in transit. All the doors and ventilators are closed and fan is switched on for two hours, to have uniform distribution of air on the second day live steam is introduced in the room to raise the temperature to 48-52^{0}C. This temperature is maintained for 2-4 days. After that fresh air is introduced for 15-20 minutes then all the doors and ventilators are closed and steam is injected to raise the temperature to 58-60^0 C for 4 hours. Steam supply is then cut off and fresh air is gradually introduced in the room to lower the temperature in the room. Temperature of the room is maintained at 48 to 52^0 C for 4 days. This temperature is maintained for the conditioning of the compost. During this period compost is generally freed from ammonia

and compost temperature is further reduced to 24^0 C by introduction of fresh air. If there is no smell of ammonites it is ready for the spawning.

4.1.4 PRODUCTION OF CROP

Mushroom cultivation is still done seasonally under natural conditions in India. There are two systems of cultivation of mushroom in India i.e. cultivation in wooden trays and polythene bags. Due to shortage and control on wood cutting, bag cultivation has proved very suitable because of its easy availability, low cost, being easily disposable and due to very low threat of contamination due to use of fresh bags every time. A polythene bag of 35"x24" of 150 gauge thickness is large enough to accommodate 15.20 kg compost up to a depth of 30-37 cm. These bags after filling are kept in the growing rooms in racks. Five modern mushroom farms use shelf system for cultivation of crop of 72 days duration each. In Himachal Pradesh number of crops vary as per the climate and availability of technology, which results into various levels of production in different pockets where mushroom is cultivation.

4.1.5 SPAWNING

The process of mixing spawn (seed) in fully prepared compost is called spawning. Four main methods of spawning have frequently been used with grain spawn i.e. spot spawning, surface spawning, layer spawning and 'through' or mixed spawning. The last method is the most efficiently and widely used method and gives and early and uniform spawn run. For proper growth of crop, recommended dose of spawn is, 500gms to 750gms for 100 kg of compost. After spawning, the beds are pressed gently to have uniform surface. The best temperature for the growth of mycelium in compost is about 23^0 C. During winters it may become necessary to heat the rooms with dry heat/stream to bring the room temperature within this range. Heating with steam is a better alternative as steam has high latent heat of vaporization and will also maintain the humidity in the room. During summer however, cooling is required to bring the room temperature to optimum level for mycelia growth of button mushrooms. The temperature of the compost should not be allowed to go beyond 30^0C. Sufficient air should be circulated in the spawn running room to obtain uniform temperature throughout the room. As soon as the spawned compost gets the right temperature, the spawn grain becomes fluffy and mycelium starts to grow into the compost.

Growth of mycelium in compost can be visualized in the form of circular spread of whitish silky mycelial threads spreading on all sides from grain spawn, 4 to 5 days after spawning. If the optimum conditions have been provided it takes about 12-15 days for compost to be fully impregnated with the mycelium.

4.1.6 CASING AND CROP MANAGEMENT

To introduce fruit body formation the compost surface has to be covered with a layer of casing soil. The process of applying casing layer over the compost bed is called 'Casing' of mushroom beds. It is normally believed that mushrooms do not fruit unless some stress is provided. There is however other reasons also which necessitate the application of casing soil on compost beds, which are:

(1) casing supplies water for growth and development of fruit bodies and regulates the flow of nutrients from compost to developing fruit bodies;
(2) It prevents compost surface from drying out and act as a blanket;
(3) The casing soil provides physical support to growing fruit bodies etc.

For preparation of casing peat is a universally accepted medium of mushroom cultivation. But, in Himachal Pradesh due to non-availability of peat a mixture of 2 years old farm yard manure and loam soil in the ratio of 2:1 is to be used for preparation of casing. for killing various pests and disease, casing soil is treated chemically or pasteurised with steam and casing layer about 3-4 cm thick is applied uniformly over the entire surface of compost. Application of casing takes place after the mycelium has completely colonized the compost.

Temperature of the cropping room is maintained 23 ± 2^0 C for about a week to allow the mushroom mycelium to spread into casing layer. A very light spray of formalin is given after the casing has been done over the surface of casing soil. Normally after casing, the mycelium takes 7 days for spreading in casing soil before the fruit body formation starts. Casing soil provides moisture to growing fruit bodies therefore it is essential to keep the casing layer moist. This can be achieved by frequent watering of casing layer. Water is sprayed with the help of an ordinary foot sprayer in the form of mist. In about a week's time mycelium spreads in the casing soil. Now the stage comes when temperature toward to 14-18 C. Fruit body initials, which appear in the form of

pinheads start growing and gradually developed into button stage. Harvesting is done at the button stage i.e. before caps expand and gills are closed. Consumer due to inferior quality and shorter shelf life does not accept open mushrooms.

Mushrooms are picked or harvested by gently holding the mushroom between the thumb and fingers, twisting slightly and gently pulling out. Lower position of the fruit body where mycelium threads and soil particles adhere is cut and discarded and the upper position is kept for human consumption.

4.2 METHOD OF OYSTER MUSHROOM CULTIVATION (BIHAR)

The oyster mushroom (Pleurotus spp.) also known as "Dhingari" or "Abalone" is one of the popular varieties of edible mushrooms. This mushroom is called oyster mushroom because of the tongue shaped pilens (cap) with an eccentric leteral stripe (stalk). There are several edible pleurotus spp. But in Bihar State Pleurotus sajor-kaju, P. Florida and p. Flabellatus are more popular for commercial cultivation.

The environmental factors play important role in the production of mushroom. A temperature of around 25^0C and relative humidity of 80-90 per cent are ideal for its cultivation. A fairly good crop can be obtained up to 30^0 C. The required Ph of the substrate for its cultivation is 5.6, the oyster mushroom cultivation method consists of the steps like substrate preparation, Spawning, Cropping, Harvesting.

I. Substrate Preparation

Oyster mushroom can be grown on various substrates, namely paddy straw, wheat straw, hulled maize cob, maize stalks, banana pestidostem, wooden log, saw dust and vegetable plant residues. The paddy/wheat straw is widely used for the purpose since it is easily available in most parts of the state/country. Fresh, clean and well-dried paddy/wheat straw should always be preferred.

Oyster mushroom is usually grown on chopped paddy straw filled in polythene bags. The paddy straw is chopped in 2.5-4 Cm. long and is soaked in water for 12-16 hours. This helps in the removal of surface contamination and the straw absorbs moisture. The wet straw is spread on wire mesh or sloping surface to drain off excess moisture. The wet straw is spread on wire mesh or sloping surface to drain off excess moisture. Sterilization of the straw is required to check weed mould problem and also for higher biological efficiency. Adopting either of the following two methods can do it:

A: Hot Water Treatment:

Dip the wet straw in hot water having temperature 70^0C to 80^0C for 30 minutes. After sterilization straw is placed on wire mesh/sloping surface for cooling and draining of excess water. The moisture content should remain 70 per cent.

B: Chemical Treatment

It is done by using chemical like formaldehyde and bavistin before soaking the straw in water. 100 ml formaldehyde and 5 gm. Bavistin are mixed in 100 litres of water in a drum or cemented trough. Nearly 10 kg. chopped straw is dipped in this solution and mixed properly. Usually, it is kept for 10 hours soaking so that contamination problems are minimized and the substrate gives higher and almost constant yield. The straw is removed and is placed on wire mesh or sloping surface so that the excess water drains off and the straw retains nearly 70 per cent moisture content.

II. Spawning

Spawning and filling of sterilized straw in the ploythene bag (35cm x 50 cm, 150 gauge) or polytropylene bags (35 cm x 50 cm, 150 gauge) are done simultaneously. Straw is filled in the bag and pressed gently to a depth of 8-10 cm and spawn is broadcast over it.

Similarly, 2^{nd} and 3^{rd} layers are put and simultaneously spawn and bags are closed. Few holes are made on each side of the bag for better mycelium development. 10 per cent spawn is required

by dry weight of the substrate, i.e., straw. However, it has been found that increase in spawn quantum increases the yield.

Spawned bags are stacked in racks in neat and clean cropping room in close position. Temperature 25+4$0^0$C and relative humidity 80±5 per cent are maintained inside the cropping room by spraying water on walls and floors. At this stage, room should remain nearly dark and fresh air requirement is also minimum. It takes about three weeks when the bags will be fully covered with white mycelium.

III: Cropping

Once bags are fully white because of complete mycelial ramification, polythene covers are removed. The open blocks are kept in racks about 20 cm apart. There should be 60 cm gap between two rows of racks to working for having a good crop. Two vital factors maintaining proper humidity (80-90 percent) and congenial temperature (25+5^{0}C) within the cropping room are needed. Too much variations in the temperature and humidity of the cropping room may delay the cropping and also reduce the yield. For first 2-3 days after opening of bag watering on blocks should be avoided. After 2-3 days, light sprinkling of water is given on blocks. This is the time when small pinheads appear. When the pinheads are of 2-3 cm size a little more water is sprayed on blocks. The beds should not be over-watered which may cause rotting of the straw and hindrance to the fruit body formation. The crop bicycle continues for about 60 days.

IV Harvesting

Mushroom should be harvested when they attain size of 6-8 cm. However, the optimum time for plucking is just before starting the inward rolling of the margins of the fruit body. Mushroom should not be allowed to shed spores as it results in poor quality of mushrooms. The fruit bodies should be harvested by twisting them, so that broken pieces are not left out on the bed surfaces, which may cause bacterial infections and rotting of beds. After harvesting, the first flush of the outer layer of the block should be scraped 0.5 to 1 cm. Deep. This helps to clean remainants of first flush and to initiate 2nd flush, which appears in about 10 days of the first one. Similarly, 3rd and sometime 4th flush will appear in 8-10 days intervals. However, almost 85 per cent of the crop

came out in Ist, 2nd and 3rd flush, hence many growers take only three flushes. The production of mushroom may range between 50-75 per cent of the dry straw used depending upon the care and hygienic programme maintained during cropping period. A small size mushroom farm takes 4 to 5 crops during the season (August to January).

CHAPTER - V

GOVERNMENT SCHEMES FOR DEVELOPMENT OF MUSHROOMS IN HIMACHAL PRADESH

5.1 HIMACHAL PRADESH

The government of Himachal Pradesh has been providing various incentives to marginal and small farmers, scheduled caste and schedule tribe families. Such incentives are being provided under Mushroom Project, Chambaghat (Solan) for the districts Solan, Shimla and Sirmour and under Indo-Dutch Project, Palampur for districts Kangra, Mandi, Chamba and Hamirpur. The following incentives are available.

5.1.1 TRAINING

In order to provide technical know-how to farmers, ten-day training programmes are organised by department of Horticulture, Himachal Pradesh. Such programmes are organised from time to time. The participants of such programmes belonging to the state are given training allowance at the rate of Rs. 50.75 per day.

5.1.2 REGISTRATION

The cultivators who are desirous of getting themselves registered with department of Horticulture are registered according to the category they belong to. It is necessary for the persons who have obtained training and belonging to H.P. to get themselves registered according to their category (like SC,ST etc.). For getting themselves registered a person has to obtain the certificate of being bona fide resident of H.P., certificate of his category from SDM office and submit these along with the training certificate to the department of Horticulture, H.P. Mushroom Project. After this they are issued a registration number. This number is important for getting compost or spawn and claiming subsidy on these.

5.1.3 BANK LOANS

The registered mushroom cultivators are recommended by the govt for obtaining loans from nationalised banks. Under this scheme a loan of Rs.35,000/- is recommended for the construction of mushroom house for accommodating 100 trays. Under this scheme a subsidy of 10 per cent subject to the maximum of Rs. 3500/- is admissible to SC & ST, magical and small farmers. A subsidy of 3 per cent is also available on the bank interest. The state department of civil supply provides consent, steel etc. on priority for construction of mushroom houses.

5.1.4 SUBSIDY

The registered SC and ST mushroom growers are eligible for a subsidy of 50% on the purchase of compost. The extent of subsidy on this account for marginal and small farmers and unemployed graduates is 25 per cent. Hundred percent subsidy is available for transportation subjected to the maximum of 400 trays.

5.1.5 TECHNICAL KNOW-HOW

Since mushroom cultivation is highly technical and skilled job it is essential that they get technical know-how. The technical officers provide the required knowledge to farmers by visiting their mushroom houses. Any problem is solved on the spot and the officers provide guidance on their visits.

5.1.6 MODEL BANKABLE PROJECT ON BUTTON MUSHROOM FOR EXPORT

The National Bank for Agriculture and Rural Development (NABARD) has prepared a 'Model Bankable Project on Button Mushrooms for Export' for refinance to commercial banks. The Bank accords top priority to this activity for providing refinance support to the turn of 90 per cent. The interest rate charged by NABARD for such refinance is 40 per cent less than the financing banks interest rate charged from the entrepreneur. The total cost of the project is Rs.213.32 lakhs including working capital for one year. The repayment of the loan starts from second year. It has

been estimated that the Benefit-Cost Ratio (BCR) of the project at 15% rate is 1.31 and Internal Rate of Return (IRR) of 31 per cent.

5.2 GOVERNMENT SCHEMES FOR DEVELOPMENT OF MUSHROOMS IN UTTAR PRADESH

In the state of U.P. Government have many schemes for the development of mushrooms. Schemes under state sector and centre sectors are being carried out under various heads. Training is imparted to the prospective mushroom cultivators. Facilities for compost and span at reasonable rate are provided to the growers.

5.2.1 Training

Training was imparted to 100 cultivators under state sector and 156 were also covered under central sector with financial involvement of Rs.50 thousand each in both the schemes. In the entire state thousand of persons have get the training.

5.2.2 Span Production and Supply

Production and supply of span of button, dhingri and valveria varieties of mushrooms were undertaken by the Govt. of Uttar Pradesh. Two thousand five hundred kilograms of span were produced and supplied by mushroom lab. Aligunj, Lucknow, Saharanpur and Basti.

5.2.3 Compost Production and Supply

Compost production was undertaken in compost pasteurisation plant Bareilly, Mathura, Saharanpur and Narendra Deo Agricultural University, Faizabad.

5.2.4 Technical Guidance

The mushroom cultivation experts give technical guidelines from time to time to the growers.

5.2.5 Indo-Dutch Project

Indo-Dutch project was established for development of mushroom in Jyalicote of Nainital district. Since its establishment it has been doing commendable work. It is engaged in span and compost production and distribution to the mushroom cultivators. It also imparts training, undertake research and registers mushroom growers.

5.2.6 Mushroom Development Work in U.P.

The Uttar Pradesh Government has taken mushroom development work in 1999-2000 on very strong footing. Centre sector and state sector schemes were launched for such purpose. Under state sector training centres were established in Sitapur, Barabanki, Lakhimpur Khiri, Pilibhit, Hardoi, Rae Bareily, Bareilly and Fatehpur. State Mushroom Laboratory, Aligan; was also made an important place of training.

Under Central Sector Scheme, training centres were established in Saharanpur, Meerut, Bulandsahar, Muzaffarnagar and Ghaziabad. In Saharanpur also training centres have also been established. Government also undertakes the work of spawn-supply of button, dhinpi etc. according to the requirement Mushroom Laboratory, Aligan; Lucknow, Saharanpur and Basti do the work. One compost pasteurisation plant was established in Narendra Deo Agriculture and Technology, University of Faizabad.

5.3 BIHAR

A pasteurised compost unit has been established in Rajendra Agricultural University, Pusa (Samastipur) Bihar for the development of mushroom cultivation with the financial support from Government of Bihar. This is a cent per cent central government sponsored scheme. It is also proposed to establish this unit in Birsa Agricultural University, Kanke, Ranchi (Jharkhand) state.

In Rajendra Agricultural University a well-established mushroom spawn and compost-producing unit is successfully under operation since last two years. Arrangements have also been made in the university campus to impart training to farmers engaged in mushroom cultivation. The Government of Bihar has sanctioned Rs.500/- as stipend to be paid to each trainee growers. But it

is unfortunate to note that the Rajendra Agricultural University authority is not responsive to this scheme in positive direction. The district horticulture officers of the selected districts are entrusted with the job of recommending the name of beneficiaries.

Besides above, the following agencies have also been involved in the development of mushroom cultivation in Bihar:

1. The R.K. Mission imparted training to the rural poor through Biotechnology Scheme during 1990-95. This scheme was provided by CAPART.

2. Kvass got sanctioned a project by ICAR in 1999 on the production of spawn and training to the interested farmers for mushroom cultivation.

3. In July, 1986 the KVK, Hazaribagh established a spawn production laboratory under central sector scheme with the help of the district administration.

The main objectives of this scheme were:

1. To produce mushroom spawn.

2. To conduct experiments and demonstration of mushroom production.

3. To identify the key constraints in producing spawn as well as cultivating mushroom.

4. To organise training programme on scientific cultivation of mushroom for the beneficiaries to be identified and selected by the district administration.

5. To ensure regular and timely supply of mushroom spawn to the interested farmers, and

6. To ensure quality of the produce of the farmers and creating market facilities of the same.

7. Targeted Beneficiaries:

The Directorate of Horticulture, Government of Bihar has set both physical and financial targets for nineteen districts of Bihar for the year 1999-2000.

CHAPTER -VI

SOCIO-ECONOMIC BACK GROUND OF MUSHROOM FARMERS IN H.P.

The present chapter intends to provide insight into the socio-economic background of mushroom farmers in the states of H.P.,U.P. and Bihar. The socio-economic parameters form the basis for the production efficiency. These parameters have been discussed in the following text.

6.1 FAMILY SIZE

The family size forms the basis for determination of working force available for farm activities. Though it is affected by the occupational structure and age composition etc., it still remains the starting point. The average family size of the sampled farmers has been presented in Table 6.1 and it is 5.99 persons per family at overall level. The family size is high in Bihar (6.32) and least in U.P. having 5.40 persons per family. Among different categories the highest family size is among medium farmers (6.49).

TABLE: 6.1 AVERAGE FAMILY SIZE OF MUSHROOM CULTIVATORS

(NO.)

DISTRICT	CATEGORY			
	SMALL	MEDIUM	LARGE	ALL FARMS
H.P.	5.72	6.32	5.58	5.95
U.P.	5.65	5.58	4.33	5.40
BIHAR	5.90	7.00	6.29	6.32
OVERALL	5.79	6.49	5.60	5.99

6.2 EDUCATIONAL LEVEL

The literacy levels and more importantly the formal education plays a great role in opening the minds of people to venture into the new fields. About 58 per cent of the persons at overall level were observed to be literate and about 24 per cent had obtained some formal qualifications.

There is great variation in the position of literacy in the three states. The highest member of illiterates (32.75%) are to be found in Bihar. It was personally observed during data collection in Himachal Pradesh that those entrepreneurs who graduates or attended colleges, were doing very good business and had expended their level of production many times since the humble beginning with equivalent of 100 trays (400 bags). This clearly indicates the importance of education especially in such unconventional and highly technical vocation like mushroom cultivation.

TABLE: 6.2 EDUCATIONAL LEVEL OF FAMILY MEMBERS OF MUSHROOM CULTIVATORS.

(%)

PARTICULARS	CATEGORY			
	SMALL	MEDIUM	LARGE	ALL FARMS
H.P.				
ILLETERATE	4.91	10.33	8.71	8.32
LITERATE	70.32	84.85	79.61	80.77
FORMALLY EDUCATED	24.77	4.82	11.68	10.91
TOTAL	100.00	100.00	100.00	100.00
U.P.				
ILLETERATE	3.05	4.48	0.00	2.96
LITERATE	9.16	1.49	0.00	5.93
FORMALLY EDUCATED	87.89	94.03	100.00	91.11
TOTAL	100.00	100.00	100.00	100.00
BIHAR				
ILLETERATE	39.86	27.68	24.30	32.75
LITERATE	60.14	72.32	75.70	67.25
FORMALLY EDUCATED	N.C.	N.C.	N.C.	N.C.
TOTAL	100.00	100.00	100.00	100.00
OVERALL				
ILLETERATE	21.86	16.80	13.05	18.21
LITERATE	47.84	66.17	61.40	57.62
FORMALLY* EDUCATED	30.30	17.03	25.55	24.17
TOTAL	100.00	100.00	100.00	100.00

*** Does not include Bihar. But average has been computed from total sample.**

6.3 OCCUPATIONAL PATTERN

The occupation pattern of all the workers was analysed and it was revealed that despite all of the sample being those of mushrooms farming households, only 21.60 per cent persons were engaged in mushroom production (Table 6.3) in Himachal Pradesh None of the sampled farmer in Uttar Pradesh has mushroom production as main occupation, where as this figure for Bihar is 13.89 per cent. The agriculture still remains the largest employer with about 62 per cent workers engaged in it in H.P. and Bihar. This position has been clinched by service among the sampled farmers of U.P. At overall level the agriculture remain the main occupation of highest number of persons (47.36%) followed by service (23.49%), trade and business (15.76%) and mushroom farming (13.38%).

TABLE: 6.3 OCCUPATIONAL PATTERN OF MUSHRROOM CULTIVATORS (MAIN OCCUPATION)

(%)

CATEGORY	OCCUPATION				
	AGRI.	SERVICE	TRADE	MUSHROOM FARMING	NO. OF WORKER
H.P.					
SMALL	57.22	12.95	6.37	23.47	94
MEDIUM	65.83	6.99	7.56	19.62	158
LARGE	60.28	9.81	6.55	23.36	73
TOTAL	62.06	9.38	6.96	21.60	325
U.P.					
SMALL	37.93	44.83	17.24	0.00	113
MEDIUM	13.33	66.67	20.00	0.00	69
LARGE	22.22	44.40	33.34	0.00	18
TOTAL	28.30	50.94	20.75	0.00	200
BIHAR					
SMALL	49.0	15.68	18.63	16.69	102
MEDIUM	41.48	22.34	23.40	12.78	94
LARGE	47.61	28.52	14.28	9.54	42
TOTAL	45.69	20.58	19.74	13.89	238
OVERALL					
SMALL	47.63	23.38	15.59	13.41	309
MEDIUM	47.04	23.09	16.31	13.56	321
LARGE	47.30	24.45	15.21	13.01	133
TOTAL	47.36	23.49	15.76	13.38	763

6.4 SUBSIDIARY OCCUPATION

It was observed that in total 577 out of the total of 763 workers persons have some subsidiary occupation, opted mainly for augmentation of income. The most popular subsidiary occupation of sampled farmers is mushroom farming, 43.06 per cent persons gone for it at overall level (Table 6.4). This was followed by agriculture accounting for 35.74%. In H.P. no person has subsidiary occupation of service and trade. The state wise and category wise analysis indicates that there are no large variations present.

TABLE: 6.4 OCCUPATIONAL PATTERN OF MUSHROOM CULTIVATORS (SUBSIDIARY OCCUPATION)

(%)

CATEGORY	OCCUPATION				
	AGRI.	SERVICE	TRADE	MUSHROOM FARMING	NO. OF WORKERS
H.P.					
SMALL	50.00	0.00	0.00	50.00	80
MEDIUM	43.96	0.00	0.00	56.04	119
LARGE	45.27	0.00	0.00	54.73	64
TOTAL	46.78	0.00	0.00	53.75	263
U.P.					
SMALL	31.25	6.25	43.75	18.75	67
MEDIUM	37.50	0.00	25.00	37.50	41
LARGE	25.00	0.00	25.00	50.00	18
TOTAL	32.15	3.57	35.71	28.57	126
BIHAR					
SMALL	35.43	11.02	5.51	48.03	82
MEDIUM	31.00	17.00	5.00	41.00	66
LARGE	14.75	22.95	72.78	29.52	40
TOTAL	32.98	15.62	9.02	42.38	188
OVERALL					
SMALL	37.38	7.29	15.05	40.13	229
MEDIUM	37.40	7.25	6.13	46.66	226
LARGE	28.96	9.07	18.19	43.78	122
TOTAL	35.74	7.62	12.62	43.06	577

6.5 OFF FARM INCOME

The mushroom farmers have been deriving off-farm income mainly from two sources viz. govt. or private job and trade/business. It was found that each family at overall level, derived an annual income of Rs.45236/- (Table 6.5). The off-farm income was found to be directly related to category of household. The off-farm in U.P. was substantially higher (Rs.74680/year/H.H.) as compared with H.P. where it was Rs.44243/H.H./year and Bihar having off-farm income of Rs.31210/- per H.H./Year.

TABLE: 6.5 OFF-FARM INCOME GENERATION.

(Rs./ANNUM/H.H.)

DISTRICT	CATEGORY			
	SMALL	MEDIUM	LARGE	OVERALL
H.P.	9094	45774	86941	44243
U.P.	57241	90833	109333	74680
BIHAR	7162	45187	77415	31210
OVERALL	21817	52733	87861	45236

6.6 LOCATION OF FARMS

Table 6.6 reveals that average distance of farm from road head is 1.29 kms for overall sample and was 0.29 kms for H.P., 1.16 km for U.P. and 2.06 kms for Bihar. The smaller the category, greater was the distance in case of H.P. & U.P. It may have been due to the reason that the mushroom farmers located on or very near to road head might have expended the scale of operation and with the time may have come into large category of farmers. The mushroom farms in H.P. are located either on the road head or very near to it.

TABLE: 6.6 LOCATION OF FARM (AVERAGE DISTANCE FROM ROAD HEAD).

(Km)

DISTRICT	CATEGORY			
	SMALL	MEDIUM	LARGE	OVERALL
H.P.	0.44	0.26	0.13	0.29
U.P.	1.89	1.00	0.25	1.16
BIHAR	2.06	1.89	2.38	2.06
OVERALL	1.66	1.07	1.04	1.29

6.7 LAND RESOURCES

The land resources owned by the sampled farmers have been presented in Table 6.7 where in it may be seen that each household at overall level own 2.88 Ha. of land of which 2.35 Ha. is cultivated. The land resources in Bihar are considerably higher 4.64 Ha per household of which 4.02 Ha are under plough, as compared with H.P. where these figures stand at 1.97 Ha and 1.20 Ha. Respectively and U.P. having total land of 0.64 ha. Of which 0.61 has is cultivated. The large mushroom farmers have the highest amount of land followed by small and medium (It may be recalled here that present categorisation is on the basis of scale of mushroom cultivation and not on amount of land).

TABLE: 6.7 LAND RESOURCES OF SELECTED MUSHROOM CULTIVATORS.

(Ha./Farm)

PARTICULARS	CATEGORY			OVERALL
	SMALL	MEDIUM	LARGE	
H.P.				
TOTAL LAND	1.68	1.37	3.43	1.97
CULT. LAND	0.86	0.71	1.64	1.20
U.P.				
TOTAL LAND	0.58	0.09	1.58	0.64
CULTI. LAND	0.56	0.09	1.50	0.61
BIHAR				
TOTAL LAND	2.33	3.91	16.74	4.64
CULTI. LAND	1.97	3.38	16.64	4.02
OVERALL				
TOTAL LAND	1.69	2.25	8.30	2.88
CULTI. LAND	1.33	1.75	7.54	2.35

6.8 CROPPING PATTERN

6.8.1 Himachal Pradesh: The study of cropping pattern (Table 6.8) reveals that during kharif season maize and tomato are the main crops, 0.28 and 0.23 Ha. of area devoted for these by each household at overall level. The potato accounts for other 0.10 Ha. The number of crops

during rabi season is more and most important, from area allocation points of view is wheat accounting for 0.28 Ha. per farm. This is followed by peas (0.22 Ha.) and cabbage (0.10 Ha.). Barley and cauliflower each accounted for 0.05 Ha on each farm.

6.8.2 Uttar Pradesh: The most important kharif crop in U.P. is paddy with average area allocation of 0.33 ha/H.H. This is followed by maize (0.13 ha.) and sugar cane (0.07 ha). Potato and garlic are other kharif crops of the state. Among Rabi crops wheat far surpasses other crops in importance as 0.45 ha area is allocated by each household as compared by 0.02 ha. For tomato and by each household as compared by 0.02 ha. For tomato and 0.01 ha. For peas. Cauliflower is grown only by small farmers.

6.8.3 Bihar: Like U.P. paddy is most important kharif crop, each household allocating 1.51 ha. For this crop. Maize accounts for 0.21 ha. And other minor crops together account for 0.28 ha. In rabi season wheat is grown on 0.16 ha. And gram on 0.04 ha. Other minor rabi crops together account for 0.17 ha.

TABLE: 6.8 CROPPING PATTERN ON THE FARMS OF SELECTED MUSHROOM CULTIVATORS

(Ha/Farm)

PARTICULARS	CATEGORY			OVERALL
	SMALL	MEDIUM	LARGE	
H.P.				
KHARIF				
1. Maize	0.33	0.15	0.46	0.28
2. Potato	0.14	0.08	0.09	0.10
3.Tomato	0.19	0.15	0.40	0.23
RABI				
1. Wheat	0.37	0.15	0.39	0.28
2. Barley	0.06	0.02	0.08	0.05
3.Cauliflower	0.02	0.02	0.15	0.05
4. Cabbage	0.08	0.06	0.18	0.10
5.Peas	0.16	0.24	0.26	0.22
U.P.				
KHARIF				
1. Paddy	0.38	0.02	0.58	0.33
2. Maize	0.03	-	0.61	0.13
3. Potato	0.06	0.02	0.09	0.06
4. S.Cane	0.05	0.02	0.22	0.07
5. Garlic	0.03	-	-	0.02
RABI				
1.Wheat	0.41	0.02	1.17	0.45
2. Tomato	0.02	0.01	-	0.02
3. Cauliflower	0.01	-	-	0.00
4. Peas	0.01	-	0.02	0.01
BIHAR				
KHARIF				
1. Paddy	0.85	1.36	3.76	1.51
2. Maize	0.09	0.11	0.72	0.21
3. Others	0.04	0.21	1.12	0.28
RABI				
1. Wheat	0.07	0.13	0.48	0.16
2. Gram	0.01	0.03	0.12	0.04
3. Others	0.06	0.14	0.54	0.17

6.9 PRODUCTION PATTERN

6.9.1 Himachal Pradesh: The production pattern of different crops indicates the availability of such produce for home consumption or disposal in the market, which is the main purpose of cash crops like vegetables etc.. The production pattern on the farms of different categories of mushroom farmers has been presented in Table 6.9. It may be seen from the table that in H.P. 4.30 Qtls. of maize is produced on an average farm, which is primarily meant for home consumption. The other two kharif crops viz. potato and tomato are mainly disposed of in the market and their production is 6.98 Qtls and 5.97 Qtls per farm respectively. During rabi season each farm at overall level produce 4.60 Qtls. of wheat and 0.69 Qtls. of barley. The other crops are vegetable crops. The production of cauliflower, cabbage and peas was found to be 4.12, 5.55 and 8.34 Qtls per farm respectively at overall level.

6.9.2 Uttar Pradesh: In Uttar Pradesh highest production among kharif crops is that of sugarcane, 30.80 Qtls/farm. This is meant for sale, to be further processed as sugar or Jaggary. The production of paddy is 7.24 Qtls/farm and that of maize 1.61 Qtls/farm. Each farm on an average produces 2.08 Qtls potato and 0.14 Qtls of garlic. The rabi crops are dominated by production of wheat 5.54 Qtls followed by vegetables like tomato 1.05 Qtls, cauliflower 0.84 Qtls and peas 1.83 Qtls/farm.

6.9.3 Bihar: Paddy and maize are main kharif crops accounting for an average production of 392.47 Qtls and 57.34 qtls per farm. In rabi season, there is an average production of 66.81 Qtls of wheat and 5.53 Qtls of gram on each farm.

6.10 LIVESTOCK PROFILE

The livestock profile for the sampled mushroom farmers has been presented in Table 6.10 wherein it may be seen that at overall level each farmers has on an average 1.20 cows, 0.37 buffaloes and

1.38 heads of other livestock. This gave them an income of Rs.8694 per year. The income from livestock is highest in H.P. followed by U.P. and Bihar and there is very vide variation in this. Income in H.P. is about 10 times that of Bihar.

6.11 CONCLUSIONS

It is indicated that Bihar has highest family size but U.P. leads as far as literacy and especially formal education is concerned. Agriculture is the main occupation of workers and households though many are engaged is service, trade and mushroom farming. Mushroom farming is not the main source of livelihood of any of the respondents in U.P. About half of the respondents who have some subsidiary occupation are seen to have mushroom farming as their subsidiary occupation. U.P. leads as far as off farm income generation is concerned.

TABLE: 6.9 PRODUCTION PATTERN ON THE FARMS OF SELECTED MUSHROOM CULTIVATORS.

(Qtls./Farm)

PARTICULARS	CATEGORY			OVERALL
	SMALL	MEDIUM	LARGE	
H.P.				
KHARIF				
1. Maize	6.31	2.70	4.58	4.30
2. Potato	10.77	5.06	5.58	6.98
3. Tomato	14.04	11.83	26.00	5.97
RABI				
1. Wheat	5.81	2.58	6.70	4.60
2. Barley	0.85	0.29	1.23	0.69
3. Cauliflower	2.22	1.06	12.17	4.12
4. Cabbage	4.86	2.93	11.23	5.55
5. Peas	6.31	8.64	10.41	8.34
U.P.				
KHARIF				
1. Paddy	7.98	0.21	14.19	7.24
2. Maize	0.43	0.00	7.56	1.61
3. Potato	2.54	2.00	0.72	2.08
4. S. Cane	19.31	10.00	95.96	30.80
5. Garlic	0.25	0.00	0.00	0.14
RABI				
1. Wheat	10.58	0.83	25.72	5.54
2. Tomato	1.19	1.49	0.00	1.05
3. Cauliflower	1.45	0.00	0.00	0.84
4. Peas	2.84	0.00	0.99	1.83
BIHAR				
KHARIF				
1. Paddy	346.02	371.84	570.54	392.47
2. Maize	47.58	35.83	127.14	57.34
RABI				
1. Wheat	53.23	59.52	121.26	66.81
2. Gram	3.05	6.26	11.59	5.53

TABLE: 6.10 LIVESTOCK PROFILE ON THE FARMS OF SELECTED MUSHROOM CULTIVATORS.

(NO./FARM)

LIVESTOCK	CATEGORY			OVERALL
	SMALL	MEDIUM	LARGE	
H.P				
COWS	1.45	1.45	1.70	1.51
BUFFALOES	1.13	0.64	0.47	0.75
OTHERS	0.72	0.87	0.76	0.80
INCOME (RS/YEAR/ FARM)	18010	18392	22364	19237
U.P				
COWS	1.76	0.42	0.89	1.28
BUFFALOES	0.45	0.08	0.89	0.44
OTHERS	1.28	0.08	0.56	0.86
INCOME (RS/YEAR/FARM)	9495	1500	8611	7417
BIHAR				
COWS	0.78	1.34	1.29	0.95
BUFFALOES	0.04	1.13	0.12	0.07
OTHERS	2.15	1.88	2.18	2.05
INCOME (RS/YEAR/FARM)	1280	2523	2900	1953
OVERALL				
COWS	1.20	1.24	1.37	1.20
BUFFALOES	0.39	0.76	0.42	0.37
OTHERS	1.59	1.17	1.28	1.38
INCOME (RS/YEAR/FARM)	7224	8919	11790	8694

CHAPTER -VII

ECONOMICS OF MUSHROOM CULTIVATION

The profitability of an enterprise is a result of inter-relationship between the costs and returns. The level of each determines the net flow of cash to farm to be used for on farm investments or consumption by farm families or to build up cash reserves. The two aspects have to be dealt separately for enhancing the net profits. In present chapter the costs and returns from mushroom cultivation have been analysed to work out the economics of this venture on different categories of farms in all the three states viz. H.P., U.P. and Bihar. An attempt has been made to present different costs involved and pattern of output and returns. The nature of costs stems out from type and extent of inputs used and the returns from the quantum of output.

7.1 TYPE OF MUSHROOMS

The National Research Centre from Mushrooms, Solan has propagated the cultivation of white bottom mushrooms (Agaricus bisporus) as a result the cultivation of only this type of mushrooms has caught on in H.P. and U.P. Table 7.1 reveals that all the sampled mushroom cultivation's were growing only white bottom mushroom in these two states. But in Bihar Oyster mushrooms are grown. Only four percent of small mushroom farmers of this state are growing varieties other than oyster.

TABLE: 7.1 TYPE OF MUSHROOM GROWN.

(%)

TYPE	CATEGORY			OVERALL
	SMALL	MEDIUM	LARGE	
H.P.				
WHITE BUTTON	100.00	100.00	100.00	100.00
OTHERS	0.00	0.00	0.00	0.00
U.P.				
WHITE BUTTON	100.00	100.00	100.00	100.00
OTHERS	0.00	0.00	0.00	0.00
BIHAR				
OYSTERS	96.00	100.00	100.00	98.00
OTHERS	4.00	0.00	0.00	2.00

7.2 TYPE OF BUILDING

The mushroom farming is an indoor activity because of strict temperature and humidity requirements, which can only be regulated indoors. Thus, this activity has to be carried out with in the buildings, residential or constructed separately for the specific purpose of mushroom farming, tents or green houses etc. The enquiries revealed, that majority of mushroom farmers began with the cultivation in some room, usually unused, in the residential house, but later due to profitability of the venture, constructed separate buildings for the purpose. Table 7.2 reveals that all the sampled mushroom farmers of H.P. have been cultivating mushroom in a separate building. Such buildings are predominantly cemented. The cultivation of mushrooms in tents or green houses is totally absent among the sampled farmers of H.P. The situation in U.P. and Bihar is entirely different. The mushroom cultivation in these two states takes place largely in residential houses, 62 per cent farmers using residential houses for the purpose. In UP, 66 percent farmers are using cemented buildings and 30 per cent mud plastered buildings for the cultivation. Four percent farmers have been using tents or green houses. In Bihar, 34 per cent farmers have been using tents/green houses and the same number were using mud plastered building and rest the cemented building for the mushroom farming.

TABLE: 7.2 TYPE OF BUILDING USED FOR MUSHROOM CULTIVATION.

(%)

CATEGORY	CULTIVATION IN		TYPE OF BUILDING		
	SEPARATE BUILDING	RESIDENTIAL HOUSE	CEMENTED	MUD PLASTERED	TENTS/GREEN HOUSE
H.P.					
SMALL	100.00	0.00	100.00	0.00	0.00
MEDIUM	100.00	0.00	90.32	9.68	0.00
LARGE	100.00	0.00	100.00	0.00	0.00
OVERALL	100.00	0.00	95.71	4.29	0.00
U.P.					
SMALL	37.93	62.07	57.72	11.38	6.90
MEDIUM	8.33	91.67	75.00	25.00	0.00
LARGE	77.78	22.22	88.89	0.00	11.11
OVERALL	38.00	62.00	66.00	30.00	4.00
BIHAR					
SMALL	23.53	76.47	19.60	31.37	49.03
MEDIUM	43.75	56.25	37.50	40.62	21.88
LARGE	64.70	35.30	58.82	29.41	11.77
OVERALL	38.00	62.00	32.00	34.00	34.00

7.3 AREA DEVOTED FOR CULTIVATION OF MUSHROOM

Although, the quantum of production can be increased by housing the activity in a separate building, the main consideration is the area available and devoted for the cultivation. The analysis in this regard indicates that each farmer was devoting about 131 Sq. Meters of area for cultivation at overall level in H.P. (Table 7.3). The area devoted does not necessarily means the floor area of the building as cultivation is carried out on racks having 3-5 tiers. The farmers of U.P. had devoted considerably lower area (29.72 sq. M) as compared with Bihar farmers who had devoted an average of 26.71 Sq. Meters for the purpose.

TABLE: 7.3 AREA DEVOTED FOR CULTIVATION OF MUSHROOM

(SQ.METERS/H.H.)

DISTRICT	CATEGORY			
	SMALL	MEDIUM	LARGE	OVERALL
H.P	33.00	68.45	370.58	130.68
U.P.	20.34	30.42	59.00	29.72
BIHAR	6.54	14.28	110.66	26.71

7.4 NUMBER OF POLYTHENE BAGS

After the analysis of area devoted for the cultivation of mushrooms, it was thought to be pertinent to include the number of trays or bags used for the cultivation. The analysis revealed that none of the sampled farmers were using the wooden trays for the purpose (Table 7.4). The reason was the comparative economics. The wooden trays were reported to be costly and lasted only for two years. The capacity of wooden tray has been reported to be four times that of the polythene bags, which have 10-12 kgs of compost. The analysis indicates that in H.P. each farmer has about 1165 polythene bags. The U.P. farmers were using only 171 bags and the Bihar 183 bags. Thus, the higher area means higher number of bags used for cultivation.

TABLE: 7.4 NUMBER OF POLYTHENE BAGS USED.

(No.)

PARTICULARS	CATEGORY			
	SMALL	MEDIUM	LARGE	OVERALL
H.P.	237	618	3365	1165
U.P.	42	151	612	171
BIHAR	72	166	547	183

Note: Capacity of 1 polythene bags = 10-12 KG

7.5 COST OF CULTIVATION

The cost of cultivation of mushrooms has been worked out on per bag basis. Further cost A, B and C have been worked out and presented in Table 7.5. It may be seen from the table that cost A and B are almost same and were about Rs.50.51 per bag and B about Rs. 50.53 in H.P. The cost C for H.P. has been observed to be Rs.63.80 per bag. The highest cost was observed to be in case of medium farmers followed by small and large. In U.P. the costs are almost similar to that in H.P. The cost A is Rs.44.59 per bag whereas cost B has been Rs.50.14 per bag. The cost C is slightly higher than H.P. and is Rs.64.67 per bag. Here the costs decreased as the holding size of farmer increased. The costs in Bihar were significantly lower them other two states. The main reason for this is the lower capacity of polythene bags being used in Bihar. Each polythene bag used in Bihar has a capacity of 1.5 kg as against the capacity of 10-12 kg. of those being used in H.P. and U.P. consequently, the cost A in Bihar was Rs.13.73 per bag and cost B Rs.17.16 per bag. The cost C increased to Rs.19.84 in this state.

TABLE: 7.5 COST OF CULTIVATION OF MUSHROOMS.

(Rs./bag)

CATEGORY	COST A	COST B	COST C
H.P.			
SMALL	34.46	35.54	65.23
MEDIUM	48.65	48.68	69.24
LARGE	52.84	52.85	61.80
OVERALL	50.51	50.53	63.80
U.P.			
SMALL	41.67	44.40	67.45
MEDIUM	46.12	49.30	64.27
LARGE	44.75	51.70	64.19
OVERALL	44.59	50.14	64.67
BIHAR			
SMALL	12.64	14.81	18.83
MEDIUM	13.12	16.21	19.03
LARGE	14.36	19.17	21.19
OVERALL	13.73	17.16	19.84

7.6 COST OF PRODUCTION

The cost of mushroom production has been presented in Table 7.6 indicating that cost of producing mushroom in H.P. has been Rs.23.83 per kg. The cost was lower in U.P. (Rs.21.61/Kg) and Bihar (Rs.19.44/kg). The large farmers of H.P. and Bihar appear to be most efficient registering lowest cost of production. The medium farmers are the most efficient having lowest cost of production in U.P.

TABLE: 7.6 COST OF PRODUCTION OF MUSHROOM.

(RS./KG.)

DISTRICT	CATEGORY			
	SMALL	MEDIUM	LARGE	OVERALL
H.P.	24.95	26.41	22.87	23.83
U.P.	21.38	21.00	21.87	21.61
BIHAR	19.32	19.67	19.07	19.44

7.7 PRODUCTION PATTERN

The production pattern of mushrooms depends upon number of crops grown in a year and number of harvests. The farmers were observed to be taking 2-3 crops a year in H.P. whereas this number is 3-4 in Bihar. The number of harvests or pickings depends upon the maturity of individual fruits and market demand. It was observed that during the tourist season in H.P. the farmer tend to increase the number of pickings as they did not want to wait and prefer to take advantage of good prices. The details have been presented in Table 7.7. It may be seen from the table that number of harvests were 75 for H.P. and 72 for U.P. In Bihar mushroom is harvested only 16 times a year. The low number of harvests in Bihar is more than compensated by quite high average production per harvest, which is observed to be 168 kg per harvest per farm. This figure is about 84 kg. for H.P. and only about 7 kg in U.P. The large proportion of the total production is of grade 'A' in H.P. and U.P., 69 and 80 per cent respectively. This is followed by grade 'B' and 'C'. The grade wise data for production is not available for Bihar.

TABLE: 7.7 PRODUCTION PATTERN OF MUSHROOM AT SAMPLED FARMS.

(Per Farm)

PARTICULARS	CATEGORY			
	SMALL	MEDIUM	LARGE	OVERALL
		H.P.		
NO.OF HARVESTS/YEAR	73	75	78	75
AV.PROD./HARVEST(KG.)	19.15	43.14	241.60	83.79
% OF GRADE A	73	66	71	69
% OF GRADE B	20	24	23	23
% OF GRADE C	7	10	6	8
		U.P.		
NO.OF HARVESTS/YEAR	71	73	70	72
AV.PROD./HARVEST(KG.)	1.87	6.32	25.10	7.13
% OF GRADE A	80	80	80	80
% OF GRADE B	15	16	15	15
% OF GRADE C	5	4	5	5
		BIHAR		
NO.OF HARVESTS/YEAR	13	15	20	16
AV.PROD./HARVEST(KG.)	108.93	140.26	227.58	168.16
% OF GRADE A	NA.	NA.	NA.	N.A
% OF GRADE B				
% OF GRADE C				

7.8 DIFFERENT COST COMPONENTS IN VARIABLE COST

7.8.1 H.P.: The share of different components in total variable cost indicates the relative importance of different heads in total production sequence. The results of analysis have been presented in Table 7.8 wherein it may be seen that total variable cost at overall level was Rs.59804 per season (or per crop) in H.P. The highest percentage of this was required for purchase of compost, which accounted for about 54 per cent. The cost of compost also includes the cost of casing oil and limestone as the compost supplied by private traders includes these and it was very difficult to separate their costs. This was followed by labour cost, consuming about 29 per cent of the total variable cost. The miscellaneous expenditure including electricity and water charges, interest and depreciation etc. accounted for other 9.5 per cent of total variable cost. Only about five percent of variable cost was incurred on spawn.

7.8.2 U.P. In U.P. the largest cost component of the total variable cost was compost, accounting for about 43 per cent of total variable cost, which was only Rs. 7624, substantially lower than H.P. The next in importance was hired labour consuming about 29 per cent and miscellaneous expenditure accounting for about 17 per cent of total variable cost. The other heads of cost were spawn, casing oil and medicines. The time stone is not used in U.P.

7.8.3 Bihar The total variable cost in Bihar was still lower and stood at only Rs.2485 per crop season. Here the largest cost component was hired labour accounting for about 34 per cent of total variable cost followed by spawn, about 29 per cent. The casing oil and limestone were not used in Bihar for production of mushrooms. Medicines accounted for about 17 per cent and miscellaneous expenditure about 8 per cent of total variable cost. In all the three states the variable cost per crop season was directly proportional to size of farm.

TABLE: 7.8 SHARE OF DIFFERENT COST COMPONENTS IN TOTAL VARIABLE COST.

(%)

ITEM	CATEGORY			
	SMALL	MEDIUM	LARGE	OVERALL
H.P.				
1. COMPOST	79.36	65.38	48.43	53.92
2. SPAWN	6.92	5.13	4.73	4.94
3. CASING OIL	-	-	-	-
4. LIME STONE	-	-	-	-
5. MEDICINES	3.59	2.68	2.06	2.28
6. HIRED LABOUR 7. MISCELLANEOUS	- 10.13	17.00 9.81	35.34 9.44	29.30 9.56
TOTAL COST RS/FARM	10543	30054	177805	59804
U.P.				
1. COMPOST	54.28	47.31	38.73	42.70
2. SPAWN	6.15	5.56	5.25	5.44
3. CASING OIL	3.96	3.56	3.57	3.62
4. LIME STONE	-	-	-	-
5. MEDICINES	1.10	1.36	1.83	1.63
6. HIRED LABOUR 7. MISELLANEOUS	13.78 20.73	23.90 18.31	34.07 16.55	29.12 17.49
TOTAL COST RS.	1765	6956	27394	7624
BIHAR				
1. COMPOST	15.51	14.88	13.24	14.13
2. SPAWN	29.39	28.43	29.67	29.28
3. CASING OIL	-	-	-	-
4. LIME STONE	-	-	-	-
5. MEDICINES	9.73	16.53	20.17	17.22
6.HIRED LABOUR 7. MISELLANEOUS	41.37 4.00	35.35 4.81	30.02 6.90	33.60 5.77
TOTAL COST RS.	904.39	2149.33	7851.47	2485.05

7.9 Labour Distribution

The pattern of labour use for mushroom production in all the three states has been presented in Table 7.9 where in it may be seen that total labour used in H.P. at overall level was 664 days.

This was in very sharp contrast with Bihar where labour use extent was only 16.9 days per farm at overall level. The analysis indicates that crop management including maintenance of temperature, water of bags and overall supervision was the largest component accounting for 66.56 per cent of labour in H.P. In other states also this is the largest component and accounts for 53.23 per cent in U.P. and 44.52 per cent of total labour in Bihar. The other operations have also been presented in this table and importance of individual operations varies from state to state.

TABLE: 7.9 OPERATION-WISE DISTRIBUTION OF LABOUR.

(%)

OPERATION	CATEGORY			
	SMALL	MEDIUM	LARGE	OVERALL
H.P.				
1. STERILISATION OF TRAYS ETC.	1.13	1.12	0.49	0.61
2. FILLING OF COMPOST	5.11	5.62	6.02	5.72
3. SPAWNING	14.77	9.27	4.46	6.78
4. CASING	17.05	19.10	3.87	8.58
5. CROP MANAGEMENT	50.57	53.93	73.05	66.56
6. CLEANING ETC.	8.23	8.71	9.58	9.34
7. MISCELLANEOUS	2.84	2.25	2.53	2.41
TOTAL LABOUR USED (DAYS/SEASON)	176	350	1859	664
U.P.				
1. STERILISATION OF TRAYS ETC.	1.70	1.28	1.67	1.59
2. FILLING OF COMPOST	5.37	4.46	5.00	4.95
3. SPAWNING	9.05	9.67	8.95	9.11
4. CASING	18.37	20.83	18.82	19.14
5. CROP MANAGEMENT	53.32	51.75	53.66	53.23
6. CLEANING ETC.	8.63	8.82	8.80	8.77
7. MISCELLANEOUS	3.61	3.19	3.10	3.21
TOTAL LABOUR USED (DAYS/SEASON)				
BIHAR				
1. STERILISATION OF TRAYS ETC.	11.60	10.52	9.59	10.37
2. FILLING OF COMPOST	9.92	8.77	8.33	8.91
3. SPAWNING	6.97	5.94	4.79	5.76
4. CASING	5.73	7.25	8.82	7.46
5. CROP MANAGEMENT	46.28	44.63	43.22	44.52
6. CLEANING ETC.	11.27	8.71	7.72	9.02
7. MISCELLANEOUS	8.23	14.18	17.53	13.96
TOTAL LABOUR USED (DAYS/SEASON)	9.3	16.4	40.4	16.9

7.10 SOURCES OF LABOUR

In this analysis the extent of labour from family and hired sources have been analysed and result presented in Table 7.10. It may be seen from the table that at overall level in H.P. about 53 per

cent labour was contributed by hired hands and rest from family sources. The percentage of hired labour was lower in U.P. (47%) and Bihar (23.40%). The category wise analysis indicates that whereas small farmers were using no hired labour in H.P. it was very low in other states. The use of hired labour increased with the holding size.

TABLE: 7.10 SOURCES OF LABOUR USED.

(%)

SOURCE	CATEGORY			
	SMALL	MEDIUM	LARGE	OVERALL
H.P.				
HIRED	-	28.69	67.59	52.73
FAMILY	100.00	71.31	32.41	47.27
TOTAL	100.00	100.00	100.00	100.00
U.P.				
HIRED	19.94	42.45	54.90	47.15
FAMILY	80.06	57.55	45.10	52.05
TOTAL	100.00	100.00	100.00	100.00
BIHAR				
HIRED	3.50	23.37	37.26	23.40
FAMILY	96.50	76.63	65.94	76.60
TOTAL	100.00	100.00	100.00	100.00

NOTE: Percentages from respective totals.

7.11 NET RETURNS

The net returns from mushroom farmers are seen to vary according to scale of operation and investment. The investment and labour use etc. were highest in H.P. and so were the net returns. The net returns at overall level in H.P. were Rs.50386 per farm and were directly related with size of operation. Same was the case in other two states. But net returns in U.P. were only about 20 per cent of H.P. and stood at Rs.10749 per farm. In Bihar net returns were only Rs.2406 per farm.

TABLE: 7.11 NET RETURNS FROM MUSHROOM CULTIVATION.

(RS./FARM)

PARTICULARS	CATEGORY			
	SMALL	MEDIUM	LARGE	OVERALL
H.P.				
TOTAL YIELD (KG.)	800	1600	9094	3171
GROSS INCOME	31044	66301	357458	125930
TOTAL COST	19395	42773	207965	75544
NET RETURNS	11649	23528	149493	50386
U.P.				
TOTAL YIELD (KG.)	134	462	1796	572
GROSS INCOME	6056	21418	73070	21805
TOTAL COST	2856	9694	39296	11056
NET RETURNS	3200	11724	33774	10749
BIHAR				
TOTAL YIELD (KG.)	534	131	522	158
GROSS INCOME	1711	4934	21236	6062
TOTAL COST	1348	3120	11589	3656
NET RETURNS	363	1814	9647	2406

7.12 OUTPUT INPUT RATIO

The output-input ratios have been presented in Table 7.12 for different categories of farmers and over different costs. The results of analysis indicate that farmers of U.P. are most efficient. They have highest in put-output ratio over costs A,B and C. U.P. is followed by Bihar and H.P. stands at last position in this respect.

TABLE: 7.12 OUTPUT-INPUT RATIOS.

COSTS	CATEGORY			
	SMALL	MEDIUM	LARGE	OVERALL
H.P.				
COST A	2.94	2.21	2.01	2.11
COST B	2.93	2.20	2.01	2.10
COST C	1.60	1.55	1.72	1.66
U.P.				
COST A	3.43	3.08	2.67	2.86
COST B	3.22	2.88	2.31	2.54
COST C	2.12	2.21	1.86	1.97
BIHAR				
COST A	1.89	2.29	2.70	2.44
COST B	1.67	1.85	2.02	1.91
COST C	1.27	1.58	1.83	1.66

7.13 BREAK-EVEN ANALYSIS

The break-even volume is that volume of production at which the farmers have no profit or loss. For this purpose the cost has been taken to be variable cost plus depreciation and interest on fixed cost. The results have been presented in Table 7.13, which indicates that farmers at overall level in H.P. need to produce only about 747 kg of mushroom per season whereas the actual production was observed to be about 3170 kg. The respective figures for U.P. are 263 and 512 kgs and for Bihar 2769 and 4244 kg respectively. This clearly indicates that the profitability of mushroom cultivation has motivated the farmers to take up this activity in their earnest and producing quantities almost double than the break-even point. In H.P. the scale of operation is the largest with current production standing at almost four times the break-even volume.

TABLE: 7.13 BREAK EVEN ANALYSIS.

COSTS	CATEGORY			
	SMALL	MEDIUM	LARGE	OVERALL
H.P.				
Total Fixed cost/year	884	1272	3016	1574
Total Variable cost/year	10544	3054	177806	59805
Average sale price 1 kg.	39.85	40.91	3969	40.85
Break-even volume (kgs)	143	385	2116	747
Actual Production kg/season	777	1621	9094	3171
U.P.				
Total Fixed cost/year	116	480	4257	948
Total Variable cost/year	1892	9913	38137	10341
Average sale price 1 kg.	49	46	41	43
Break-even volume (kgs)	41	226	1034	263
Actual Production kg/season	134	462	1796	512
BIHAR				
Total Fixed cost/year	22587	31020	63442	32231
Total Variable cost/year	46148	68816	133565	68263
Average sale price 1 kg.	32.03	37.52	40.68	38.35
Break-even volume (kgs)	2146	2661	4843	2769
Actual Production kg/season	2723	4208	8876	4244

CHAPTER – VIII

PRODUCTION FUNCTION ANALYSIS

The present chapter deals with the financial ratios and the production function analysis. Four types of financial ratios viz. Capital turn over ratio, Gross ratio, Operating ratio and Rate of return on capital have been worked out for studying the financial structure of the mushroom cultivation in the selected states. On the other hand the production function analysis has been carried out by taking the productivity of mushrooms per tray as dependent variable and the per tray use of labour and capital invested as independent variables. The linear production function has been used in the present analysis.

8.1 FINANCIAL RATIOS

The financial ratios as described above have been presented in Table 8.1 wherein it may be seen that the Capital turn over ratio in H.P. was 1.0728 and it varied between 0.7053 and 1.1914 for small and large farms respectively. This indicated that on an average each rupee of fixed investment, the gross revenue was Rs. 1.0728 only. Similarly this indicated that each rupee of fixed investment yielded Rs. 1.40 and Rs. 1.29 in U.P. and Bihar respectively. Among different categories, the highest capital turn over ratio was among large farmers and the least among small farmers. The higher magnitude of this ratio also indicated the efficiency of the farmers in utilizing the fixed capital.

The next ratio worked out was gross ratio, which is the ratio of the total cost to the gross returns. Thus, to be more efficient in this respect the magnitude of the ratio should be least possible. The analysis indicated that the gross ratio in H.P. stood at 0.6203 and it varied between 0.5690 and 0.6451 for large and medium farmers. This ratio has been 0.5070 in U.P. and 0.603 in Bihar. This indicated that the mushroom farmers U.P. are little more efficient than the farmers of other two states.

The operating ratio, which is the ratio of total operating and maintaining cost to the gross profits, should have lowest possible value to be more efficient. The analysis indicated that the operating ratio at overall level of the sample was 0.4263 and it was observed to be 0.3607 in U.P. and 0.409 in Bihar. This indicated the higher level of efficiency obtained by the U.P. mushroom farmers.

Finally, the Rate of return on capital, which is the ratio of net farm income to the fixed capital investment was found to be 0.3730 in H.P. This ratio was found to be 0.6408 and 0.782 in U.P. and Bihar respectively. Most efficient farmers at overall level on this consideration were observed to be the Bihar farmers. The other details of various categories may also be referred to from this table.

TABLE: 8.1 FINANCIAL RATIOS.

RATIOS	CATEGORY			
	SMALL	MEDIUM	LARGE	OVERALL
H.P.				
CAPITAL TURN OVER RATIO	0.7053	0.8216	1.1914	1.0728
GROSS RATIO	0.6246	0.6451	0.5690	0.6203
OPERATING RATIO	0.3372	0.4537	0.4948	0.4263
RATE OF RETURN ON CAPITAL	0.2647	0.3799	0.5007	0.3730
U.P.				
CAPITAL TURN OVER RATIO	0.8578	1.0922	1.9417	1.4000
GROSS RATIO	0.4717	0.4526	0.5378	0.5070
OPERATING RATIO	0.2402	0.2733	0.4272	0.3607
RATE OF RETURN ON CAPITAL	0.4532	0.5979	0.7816	0.6408
BIHAR				
CAPITAL TURN OVER RATIO	0.96	1.27	1.42	1.29
GROSS RATIO	0.787	0.632	0.545	0.603
OPERATING RATIO	0.528	0.435	0.369	0.409
RATE OF RETURN ON CAPITAL	0.819	1.871	1.310	0.782

8.2 PRODUCTION FUNCTION ANALYSIS

The analysis of costs and returns, which has been presented in the previous chapter, does not provide clear picture on the efficiency with which the resources of production are being utilized for the mushroom production. In other words, the efficiency of resource allocation is not appropriately highlighted, although, it provides a good indication of the overall productivity on mushroom farms. The specific contribution of input factors is necessary for the determination of efficiency of factor proportions. It is with this background that an attempt has been made to derive more precise measure of efficiency in the resource allocation in mushroom cultivation. For this purpose production function analysis has been attempted. The linear production function has been used as it was found to be giving the satisfactory results.

For fitting the production function the production of mushrooms per tray has been taken to be the dependent variable. The independent variables included in the study are the working capital invested per tray and the labour used per try. The unit of the former was taken to be the rupees per tray per season and for the labour it has been actual hours utilized per tray. It may be mentioned here that for the labour the units of rupees was also tried but the this led to unsatisfactory results.

The results of the analysis have been presented separately for each of the size class in each of the districts and also for each class category pooled for both the districts. The results have been presented in tables 8.2 to 8.13 and discussed below for each district and for the pooled sample.

8.2.1 HIMACHAL PRADESH

SMALL CULTIVATORS: The analysis reveals that in present case the value of coefficient of multiple determination is 0.8944 (Table 8.2). The individual coefficients stood at0.3973 and 0.1243 for working capital and labour. Both of the coefficients were significant at one per cent level of probability. The returns to scale stood at 0.6289. The resource allocation was found to be inefficient as the values of MVP-factor Cost Ratio were at variance from unity. The optimum

allocation required that the working capital be slashed by about 50 per cent and he use of labour by 25 per cent.

TABLE: 8.2 REGRESSION COEFFICIENTS, T-VALUES, MVP FACTOR COST RATIO FOR SMALL MUSHROOM CULTIVATORS OF H.P.

FACTOR	COEFFICIENT	MVP	MVP-FACTOR COST RATIO	EXISTING LEVEL	OPTIMUM LEVEL
TOTAL WORKING CAPITAL (XI)	0.4831* (6.4845)	1.6055	0.4986	43.8	21.87
HUMAN LABOUR (X2)	0.1358* (11.4117)	4.6532	0.7755	4.25	3.30

R^2 = 0. 8944 RETURNS TO SCALE = 0.6189

NOTE: Figures in parenthesis are t – values.

* Significant at 1% level of probability

MEDIUM CULTIVATORS: The value of R^2 in case of medium farmers was found to be 0.7966 (Table 8.3) indicating that the present model explains about 80 per cent of the variations in the mushroom output. The regression coefficients, which were significant at one per cent level of probability, were 0.3973 and 0.1243 for working capital and labour respectively. In this case also the returns to the scale were diminishing. The resource allocation was inefficient as there was over use of the resources. The working capital should be reduced from its present level of Rs.45.77 per bag to Rs. 15.97 and in same manner the labour use should be curtailed to 3.63 hours per bag from present level of 4.77 hours.

TABLE: 8.3 REGRESSION COEFFICIENTS, T-VALUES, MVP FACTOR COST RATIO FOR MEDIUM MUSHROOM CULTIVATORS OF H.P.

FACTOR	COEFFICIENT	MVP	MVP-FACTOR COST RATIO	EXISTING LEVEL	OPTIMUM LEVEL
TOTAL WORKING CAPITAL (XI)	0.3973* (5.9738)	1.4681	0.3321	45.77	15.97
HUMAN LABOUR (X2)	0.1243* (7.3186)	4.4010	0.7335	4.77	3.63

R^2 = 0. 7966 RETURNS TO SCALE = 0.5216

NOTE: Figures in parenthesis are t – values.

* Significant at 1% level of probability

** Significant at 5% level of probability.

LARGE CULTIVATORS: The model applied to large cultivators of both the districts together returned the value of R^2 as 0.9360 (Table 8.4) and the coefficients stood at1.4007 and 0.1161 for working capital and labour respectively. The coefficients were significant at one per cent level of probability. The results of the analysis indicate that the use of working capital should be reduced from Rs. 45.29 per bag to Rs. 14.43 and the labour from 4.76 hours per bag to 3.35 for getting the production to the optimum level.

TABLE: 8.4 REGRESSION COEFFICIENTS, STANDRED ERRORS, MVP FACTOR COST RATIO FOR LARGE MUSHROOM CULTIVATORS OF H.P.

FACTOR	COEFFICIENT	MVP	MVP-FACTOR COST RATIO	EXISTING LEVEL	OPTIMUM LEVEL
TOTAL WORKING CAPITAL (XI)	0.4007* (7.4963)	1.5216	0.3170	45.529	14.43
HUMAN LABOUR (X2)	0.116* (10.8512)	4.4316	0.7386	4.5294	3.3454

R^2 = 0. 9360 RETURNS TO SCALE = 0.5168

NOTE: Figures in parenthesis are t – values.

* Significant at 1% level of probability

OVERALL SAMPLE: At over all level of all sample of both the districts, the model was able to explain 86.47 per cent variations in the mushroom output, the value of R^2 being 0.8647 (Table 8.5). The value of returns to scale was found to be 0.5432 indicating that in the state if both the inputs under consideration are increased by one per cent the output of mushroom would on an average increase by 0.5432 per cent. Still the diminishing returns to scale have been observed in the present case. The MVP-factor cost ratio in case of working capital was only 0.3348 considerably lower than unity indicating the over use of this resource. On the other hand, this statistics for labour was comparatively closer to unity, being 0.7303. But still this resource was also being overused. The analysis indicates that the working capital should be curtailed from present level of Rs. 44.83 per bag to Rs. 15.06 to attain optimum level of production. These figures for labour stood at 4.76 and 3.48 hour per bag.

TABLE: 8.5 REGRESSION COEFFICIENTS, STANDRED ERRORS, MVP FACTOR COST RATIO FOR ALL MUSHROOM CULTIVATORS OF H.P.

FACTOR	COEFFICIENT	MVP	MVP-FACTOR COST RATIO	EXISTING LEVEL	OPTIMUM LEVEL
TOTAL WORKING CAPITAL (XI)	0.4169* (11.0349)	1.5367	0.3348	44.83	15.01
HUMAN LABOUR (X2)	0.1263* (15.5925)	4.3819	0.73032	4.76	3.48

R^2 = 0. 8647 RETURNS TO SCALE = 0.5432

NOTE: Figures in parenthesis are t – values.

* Significant at 1% level of probability

8.2.2 UTTAR PRADESH

SMALL CULTIVATORS The analysis reveals that in present case the value of coefficient of multiple determination is 0.5519. The individual coefficients stood at 0.7429 and 0.8086 for working capital and labour respectively. Both the coefficients were significant at one percent level of probability. The returns to scale came as 0.4885. There was no optimum allocation of working capital and labour as they should be Rs.10.85 per poly bag instead of Rs.41.75 per bag in case of working capital. In the same way labour hours use should be 3.49 hours per bag as against 6.35 hours per bag at present. (Table 8.6).

TABLE: 8.6 REGRESSION COEFFICIENTS, STANDRED ERRORS, MVP FACTOR COST RATIO FOR SMALL MUSHROOM CULTIVATORS OF U.P.

FACTOR	COEFFICIENT	MVP	MVP-FACTOR COST RATIO	EXISTING LEVEL	OPTIMUM LEVEL
TOTAL WORKING CAPITAL (XI)	0.7429* (2.0484)	1.8521	0.6275	41.75	10.85
HUMAN LABOUR (X2)	0.8086* (2.0484)	1.0521	0.8855	6.35	3.49

R^2 = 0. 5519 RETURNS TO SCALE = 0.4885

NOTE: Figures in parenthesis are t – values.

* Significant at 1% level of probability

MEDIUM CULTIVATORS The value R^2 was found to be 0.1729, it means 17.29 percent in variation of mushroom yield was explained by the model. The regression coefficients, which were significant at one percent level of probability, were 0.4158 and 0.5810 for working capital and labour respectively. The resource allocation was inefficient as both working capital and labour were used as Rs. 42.75 per bag and 6.75 hours respectively. They should be Rs.10.25 per poly bag and 4.28 hours per bag respectively. (Table 8.7).

TABLE: 8.7 REGRESSION COEFFICIENTS, STANDRED ERRORS, MVP FACTOR COST RATIO FOR MEDIUM MUSHROOM CULTIVATORS OF U.P.

FACTOR	COEFFICIENT	MVP	MVP-FACTOR COST RATIO	EXISTING LEVEL	OPTIMUM LEVEL
TOTAL WORKING CAPITAL (XI)	0.4158* (2.2009)	2.1554	0.7821	42.75	10.25
HUMAN LABOUR (X2)	0.5810* (2.2009)	1.8756	1.0775	6.75	4.28

R^2 = 0. 1729 RETURNS TO SCALE = 0.4825

NOTE: Figures in parenthesis are t – values.

* Significant at 1% level of probability

LARGE CULTIVATORS In case of large cultivators the value of R^2 stood as 0.7376 and the coefficients were 0.8588 for working capital and 0.8479 for human labour respectively. The coefficients were significant at one percent level of probability. Here in this category also there has been inefficient use of working capital per bag Rs.46.25 while the optimum level is Rs.13.75 per poly bag. Similarly in case of labour use, it should be 5.39 hours per bag instead of 6.85 hours per bag at present level. (Table 8.8).

TABLE: 8.8 REGRESSION COEFFICIENTS, STANDRED ERRORS, MVP FACTOR COST RATIO FOR LARGE MUSHROOM CULTIVATORS OF U.P.

FACTOR	COEFFICIENT	MVP	MVP-FACTOR COST RATIO	EXISTING LEVEL	OPTIMUM LEVEL
TOTAL WORKING CAPITAL (XI)	0.8588* (2.3060)	2.1575	0.8721	46.25	13.75
HUMAN LABOUR (X2)	0.8479* (2.3060)	1.8875	0.8985	6.85	5.39

R^2 = 0. 7376 RETURNS TO SCALE = 0.5335

NOTE: Figures in parenthesis are t – values.

* Significant at 1% level of probability

OVERALL SAMPLE At overall level of all the selected sample of both the districts, it was found that the value of R^2 was 0.8425. It means that the model explained 84.25 percent variations of mushroom yield. The value of returns to the scale was found as 0.6867. It means that if both inputs (working capital and labour are increased by one percent, the output of mushroom would increase on an average by 0.6867 percent. At overall level also, inefficient use of working capital and labour was found. Working capital per bag was used as Rs.40.35 per poly bag as against Rs.10.12 per bag of optimum level. Similarly in case of labour it was 6.05 hours per bag against the optimum level of 4.35 hours (Table 8.9).

TABLE: 8.9 REGRESSION COEFFICIENTS, STANDRED ERRORS, MVP FACTOR COST RATIO FOR OVERALL MUSHROOM CULTIVATORS OF U.P.

FACTOR	COEFFICIENT	MVP	MVP-FACTOR COST RATIO	EXISTING LEVEL	OPTIMUM LEVEL
TOTAL WORKING CAPITAL (XI)	0.9179* (2.0095)	2.1172	0.8775	40.35	10.12
HUMAN LABOUR (X2)	0.9265* (2.0095)	1.8731	0.6992	6.05	4.35

R^2 = 0. 8425 RETURNS TO SCALE = 0.6867

NOTE: Figures in parenthesis are t – values.

* Significant at 1% level of probability

8.2.3 BIHAR

SMALL CULTIVATORS The analysis reveals (Table 8.10) that in present case the value of coefficient of multiple determination is 0.4918. The individual coefficients were 0.5613 and 0.0572 for working capital and labour respectively. Only one coefficient for total working capital was significant at 1 per cent level of probability. The other factor viz., human labour was statistically non-significant. The returns to scale stood at 0.6185 showing diminishing returns to scale. The resource allocation was found to be inefficient as the values of MVP and factor cost ratio were at variance from unity.

TABLE: 8.10 REGRESSION COEFFICIENTS, STANDRED ERRORS, MVP FACTOR COST RATIO FOR SMALL MUSHROOM CULTIVATORS OF BIHAR.

FACTOR	COEFFICIENT	MVP	MVP-FACTOR COST RATIO	EXISTING LEVEL	OPTIMUM LEVEL
TOTAL WORKING CAPITAL (XI)	0.5613* (0.0896)	9.4226	0.6572	10.58	9.57
HUMAN LABOUR (X2)	0.0572 NS (0.0400)	0.1904	0.0442	53.41	19.39
Yield (Grms)	-	-	-	676.10	405.86

R^2 = 0.4918 RETURNS TO SCALE = 0.6185

NOTE: Figures in parenthesis are t – values.

- Significant at 1% level of probability

NS = Non-significant

MEDIUM CULTIVATORS The value of R^2 in case of medium farmers was found to be only 0.1285 indicating 13 per cent variation in the mushroom output was explained by the present model. The regression coefficient for capital and labour were 0.4310 and 0.5673 respectively both were statistically non-significant. In the this case also, the returns to scale were diminishing. The

resource allocation was inefficient as there was over use of the resources. The working capital should be reduced from its present level of Rs.10.95 per bag to Rs.3.96 and in the same manner, the labour use should be curtailed to 21.34 minutes per bag from the present level of 46.12 minutes per bag. Thus, the proper use of the resources and better management will help the medium cultivators to harvest optimum yield at 1909.49 grams per bag as compared to the present level at 800.66 grams.

TABLE: 8.11 REGRESSION COEFFICIENTS, STANDRED ERRORS, MVP FACTOR COST RATIO FOR MEDIUM MUSHROOM CULTIVATORS OF BIHAR

FACTOR	COEFFICIENT	MVP	MVP-FACTOR COST RATIO	EXISTING LEVEL	OPTIMUM LEVEL
TOTAL WORKING CAPITAL (XI)	0.4310^{NS} (0.5903)	11.6810	0.7402	10.95	3.96
HUMAN LABOUR (X2)	0.5673^{NS}	3.0211	0.9350	46.12	21.34
Yield (Grms)	-	-	-	800.66	1909.49

R^2 = 0.1285 RETURNS TO SCALE = 1.9983
NOTE: Figures in parenthesis are t – values.
NS = Non-significant

LARGE CULTIVATORS With the application of the above model, keeping together large cultivators of both the districts, the value of R^2 calculated was 0.8564 (Table 8.12) and the coefficients stood at 0.0622 and 0.7181 for working capital and labour respectively. The coefficient of human labour was statistically significant at one per cent level of probability. The results of the analysis indicate that the use of working capital should be reduced from Rs.11.97 per bag to Rs.4.38 and the labour from 33.50 minutes per bag to 18.27 minutes per bag for getting the production to the optimum level. For large cultivators like that of medium cultivators the existing level of yield was lower than the optimum level of yield. This may be probably because of overuse of the resources as well as improper management.

TABLE: 8.12 REGRESSION COEFFICIENTS, STANDRED ERRORS, MVP FACTOR COST RATIO FOR LARGE MUSHROOM CULTIVATORS OF BIHAR.

FACTOR	COEFFICIENT	MVP	MVP-FACTOR COST RATIO	EXISTING LEVEL	OPTIMUM LEVEL
TOTAL WORKING CAPITAL (XI)	0.4310^{NS} (0.5903)	11.6810	0.7402	10.95	3.96
HUMAN LABOUR (X2)	0.5673^{NS}	3.0211	0.9350	46.12	21.34
Yield (Grms)	-	-	-	800.66	1909.49

R^2 = 0.1285 RETURNS TO SCALE = 1.9983

NOTE: Figures in parenthesis are t – values.

NS = Non-significant

OVERALL SAMPLE For overall level of all samples of both the districts, the value of R^2 was estimated to be 0.6202 (Table 8.13), which indicated that the model was able to explain about 62 per cent variation in the mushroom output. The value of returns to scale was worked out as 0.9655 indicating that if both the inputs under consideration are increased by one per cent the output of mushroom would on an average, increase by 0.9655 per cent. Still the diminishing returns to scale was observed in the present case. The analysis further indicates that the MVP factor cost ratio in case of labour was only 0.6182 considerably lower than unity indicating the over use of these resources. On the other hand, the result for capital was comparatively closer to unity, being 0.8849. But still this resource showed excessive use. In fact, the working capital should be reduced to Rs.5.30 per bag from Rs.10.93 per bag at present level in order to reach at the optimum yield level. Similarly, the human labour should also be decreased from the present level of 47.12 minutes per bag to 16.19 minutes per bag. The analysis also indicated the optimum yield level at 1593.48 grams as compared to the present level of 796.87 gram.

TABLE: 8.13 REGRESSION COEFFICIENTS, STANDRED ERRORS, MVP FACTOR COST RATIO FOR OVERALL MUSHROOM CULTIVATORS OF BIHAR.

FACTOR	COEFFICIENT	MVP	MVP-FACTOR COST RATIO	EXISTING LEVEL	OPTIMUM LEVEL
TOTAL WORKING CAPITAL (XI)	0.6212* (0.0612)	14.9468	0.8849	10.93	5.30
HUMAN LABOUR (X2)	0.3438* (0.0314)	1.9260	0.6182	47.12	16.19
Yield (Grms)	-	-	-	796.87	1593.48

R^2 = 0.1285 RETURNS TO SCALE = 1.9983

NOTE: Figures in parenthesis are t – values.

NS = Non-significant

8.3 CONCLUSIONS

From the above discussion it may be concluded that the mushroom production in Himachal Pradesh is operating in the state of diminishing returns to scale. The regression coefficients have turned out to be invariably significant and hence can be used for the planning purpose. The values of R^2 in different cases indicate that the working capital and labour are the most crucial inputs but are being overused in all the cases. It is recommended that their use may be curtailed to the optimum level. There is need of educating the farmers regarding this aspect. This can be achieved various extension agencies concerned with this job.

It may be concluded that there is ample scope of mushroom production. If there is proper planning on the basis of regression coefficient also and the most important inputs of working capital and labour are used at optimum level, there is ample scope for increasing yield of mushrooms. There should be proper extension channels for educating optimum use of different kinds of inputs of mushroom crop.

In Bihar the production of mushroom in the selected project area was operating at diminishing returns to scale. The R^2 value in most of the cases reveals that the two factors under

consideration viz., total working capital and human labour came out as the most dominant inputs, but these were overused in almost all the cases. The values of regression coefficients were by and large, statistically significant and, therefore, these factors may be considered by the planners and policy makers in the planning process. The optimum yield level in most of the cases was found to be higher in comparison to the present yield level. Hence, it is recommended that the use of resources (viz., labour and capital) may be curtailed to the optimum level. The growers in the project area may be apprised and cautioned with these facts by extension machinery of the state and non-governmental organisations to spread the mushroom technology in this region.

CHAPTER -IX

MARKETING OF MUSHROOMS

The production cannot be said to be complete unless steps are taken to transfer the production to the hands of the consumers. It is a consumer who ultimately pays for every thing. Thus, it is very important to provide place utility to the final product and this is where the role of marketing becomes crucial. The aim should be to make available the product to consumer in fresh form and at the least possible price, providing sustainable incentives to all engaged in production and marketing. The ideal marketing system should also take into account the changing tastes and preferences, future demand and supply, processing, stabilisation of demand and prices etc.

Although the mushroom production is picking up in all the three states, the marketing arrangements are still not adequate. In H.P. the state government and National Mushroom Research Centre are providing research inputs. The results of latter are also benefiting the other states. In al the three states under study the marketing of mushrooms has been identified as main bottleneck in its popularity.

In the present chapter, an attempt has been made to study the existing marketing system of mushroom. The chapter includes marketing channels, pattern of disposal, mode of transportation, marketing margins and costs etc.

9.1. Marketing Channels

The various marketing channels being used by the sampled mushroom cultivators of H.P. and U.P. are following:

1. Producer-Retailer-Consumer
2. Producer-Consumer
3. Producer-Co-operative-Retailer-Consumer

In addition to these three channels, in Bihar, the growers are using two more channels, making it the following five.

1. Producer – Retailer – Consumers
2. Producer – Consumers
3. Producer – NGO – Retailer – Consumers
4. Producer – Co-operative – Retailers – Consumer
5. Producer – Out side collector – Wholesaler – Retailer - Consumer

9.2 PATTERN OF MUSHROOM DISPOSAL

All the production of mushroom is disposed off through the above listed marketing channels. The percentage of produce finding its way through different channels varied in each state. The following provides details.

9.2.1 H.P. At overall level channel-III was most commonly used channel, about 53 per cent of 2219.50 Qtls of mushrooms finding their way through this channel. The next in importance is the channel-I, 34.32 per cent of marketed mushroom being disposed of through this channel. About 12 per cent of mushroom was marketed directly to consumers at overall land.

9.2.2 U.P. As overall level, it was found that channels III was commonly used channel. Through this channel out of 22.72 Qtls kgs of mushrooms marketed, as much as 61.70 per cent found its way through this channel.

9.2.3 BIHAR At overall level, different categories of mushroom growers were adopting different channels and was disposing-off varying proportion of their produce through these channels. The percentage quantity of mushroom sold through various channels by different categories revealed that more than 49 per cent of total quantity marketed by small farms was sold to NGOs through channel III. More than 30 per cent of the total marketed quantity on medium and large farms were sold to retailer through channel I. The overall category wise observation indicated that about 30.23 per cent of marketable surplus was disposed through channel I i.e.,

through retailer followed by 27.21 per cent through channel III through NGOs, more than 11 per cent through channel IInd and IV i.e., consumer and co-operatives and only about 19 per cent through outside collector at overall level.

TABLE: 9.1 PATTERN OF DISPOSAL OF MUSHROOMS.

(% OF TOTAL QTY)

CHANNEL	CATEGORY			
	SMALL	MEDIUM	LARGE	OVERALL
		H.P.		
CHANNEL-1	48.69	53.36	26.53	34.32
-II	11.54	16.05	11.02	12.19
-III	39.77	30.59	62.45	53.49
TOTAL QTY.MARKETED(Qtls)	171.00 (100.00)	502.50 (100.00)	1546.00 (100.00)	2219.50 (100.00)
		U.P.		
CHANNEL-1	18.12	23.68	18.00	19.10
-II	43.41	46.41	6.38	19.20
-III	38.47	29.91	75.62	61.70
TOTAL QTY.MARKETED(Qtls)	1.44 (100.00)	3.83 (100.00)	17.76 (100.00)	22.72 (100.00)
		OVERALL		
CHANNEL-1	11.65	30.77	35.17	30.23
-II	26.94	14.62	6.02	27.21
-III	49.83	24.43	22.18	27.21
- IV	11.58	14.19	10.16	11.45
- V	-	15.99	26.47	19.46
TOTAL QTY.MARKETED(Qtls)	15.59 (100.00)	25.70 (100.00)	55.93 (100.00)	97.22 (100.00)

9.3 GRADING

The grades provided by the National Centre for Mushroom Research and Training have become more or less accepted norms for producers as well as buyers. These in descending order are:

1. **Buttons** Where cap of mushroom is between 1-2 inches in diameter and membrane is intact. This most superior grade.
2. **Cups** In cups the membrane is breaking and has second position in grading.
3. **Flats/Opens/Umbrella** Where the gills are fully visible and is most inferior or third grade.

9.4 PACKING

In H.P. and U.P. the fresh mushrooms are packed only in polythene bags of 200 gms. This is the only size packed and available in the market. These bags are further packed in cfb cartons for taking these to market. The capacity of these cartons is around 10 kg each. The cartons are collected back after delivery and are re-used two to three times. The packing details of oyster mushroom in Bihar are not available.

9.5 MODE OF TRANSPORTATION

The modes of transportation were observed to be different for local and distant markets. Far local markets these were as head load, cycle scooter or being sold at farm itself (Table 9.2). It is observed that majority of produce in H.P. and U.P. finds its way to distant markets. For H.P. these markets are Shimla located within the state and Chandigarh located outside the state. In U.P. the sampled growers were seen using as many an five markets viz. Rainkhat, Almora, Haldwani, Dehradun and Massorie. The information regarding the distant markets being used by Bihar growers is not available but the produce being sent to these markets was very low as compared with other two states.

9.5.1 H.P. In H.P. about 72 percent of total marketed quantity of mushrooms was sent to distant markets using buses. In local market 1.82 percent was marketed by carrying as head load, 19.44 per cent by using cycle/scooter and the rest 6.58 percent was disposed of at the farm gate to consumers.

TABLE: 9.2 MODE OF TRANSPORTATION ADOPTED.

(% of produce)

MODE	LOCAL MARKET	DISTANT MARKETS
H.P.		
HEAD LOAD	1.82	-
CYCLE	19.44	-
BUS	-	72.16
TRUCK	-	-
AT FARM	6.58	-
U.P.		
HEAD LOAD	5.00	-
SCOOTER	-	11.42
BUS	-	70.74
TRUCK	-	-
AT FARM	12.83	-
BIHAR		
HEAD LOAD	23.34	-
CYCLE	37.58	-
BUS	19.16	11.64
TRUCK	-	-
AT FARM	8.28	-

9.5.2 U.P. Here majority of produce, about 71 per cent was dispatched to distant markets using buses and in addition about 11.5 percent was sent using scooters. To local markets the mushroom were carried manually and about 5 per cent produced was marketed in this manner. The rest about 13 per cent was sold at farm itself.

9.5.3 Bihar In Bihar only 11.64 per cent produce was sold in distant markets, the rest being consumed in local markets. Most popular means of local transportation were bicycle (37.58% of produce) followed by head load (23.34%) and bus (19.16%). About 8 per cent produced is disposed of at farm gate.

9.6 MARKETING COSTS AND MARGINS

The marketing process for mushrooms has to be very quick and efficient because due to high parishability the produce has to reach the consumer within least possible time. The high parishability also dictates that the marketing channels have to be short so that least possible time is consumed in marketing process. In this regard, the study of mushroom marketing assumes greater importance because from it a judgement regarding efficiency of marketing can be made and idea can be had as to weather various intermediaries are providing the services at reasonable rates or not. The marketing margins for various intermediaries have been worked out for different channels in both the district and results presented in Table 9.3 and 9.4, the following test provides the details.

9.6.1 HIMACHAL PRADESH

SOLAN All the three marketing channels detailed in 9.1 above are present in Solan.

Channel -I This channel refers to the produce being directly sold to retailers from whom the consumers purchase it. Many growers, over the years, have developed contacts with local retailers and dispose of the mushroom through them. it has been observed that in this channel the average price paid by the consumer was Rs.64.06 per kg. Out of this amount producers share is 67.06 percent. But he has to incur expenses on packing, transportation and other items like labour etc. This his net margin turned out to be 61.19 per cent or Rs.39.20 per kg. The retailers purchase price was Rs.42.96 per kg. The expenses born by retailer were Rs.4.75 per kg. and they were observed to be taking a profit margin of Rs.16.35 per kg.

Channel-II In this channel the producer directly sell the mushrooms to consumers who visit their farms for to purpose. Though this is a most profitable channel, the transaction through this is very low. The consumer were observed to be paying are average price of Rs.45 per kg of mushroom on farm gate. The only expenses the producer has to incur is packing which amounted to only Rs.0.58 per kg. Hence, the producer could earn Rs.44.82 per kg or 98.71 per cent of the price paid by the consumer.

Channel- III This channel refers to involvement of co-operative in the marketing chain. When the produce is sent to Shimla market it is brought to a shop which is rented by the group of mushroom growers and they have posted a person to look after further marketing process. This co-operative is not a registered co-operative but all the functions of marketing co-operatives are performed. All the members get pooled prices after payments for shop, marketing assistant, other expenses etc. Under this channel average price paid by the consumers was observed to be Rs.66.76 per kg. Of this Rs.44.67 was the producers share but after deducting for his expenses of Rs.4.17 per kg the net margin of grower was observed to be Rs.40.50 per kg or 60.66 per cent of the consumer price.

TABLE: 9.3 MARKETING MARGINS AND COSTS THROUGH DIFFERENT MARKETING CHANNELS IN SOLAN GROWERS

(RS/KG)

PARTICULARS	CHANNEL-I	CHANNEL-II	CHANNEL-III
1. PRICE RECEIVED BY GROWER	42.96(67.06)	45.00(100.00)	44.67(66.91)
2. MARKETING COSTS INCURRED BY GROWER	3.76	0.58	4.17
-PACKING	0.58	0.58	0.58
-TRANSPORTATION	0.11	-	0.30
-OTHERS	3.07	-	3.29
3. NET MARGIN OF GROWER	39.20(61.19)	44.42 (98.71)	40.50(60.66)
4. MARKETING COST BY CO-OPERATIVE - PACKING	-	-	1.94 -
- WASTAGE AND SPOILAGE	-	-	-
-MARKET FEE	-		0.43
- HANDLING	-	-	0.50
- RENT FOR SHOP	-	-	0.81
- WAGES FOR LABOUR	-	-	0.20
5. RETAILERS PURCHASE PRICE	42.96	-	46.61
6. EXPENSES BY RETAILERS	4.75	-	4.75
- CARRIAGE	0.20	-	0.25
- LOSSES	3.92	-	4.30
- HANDLING	0.20	-	0.20
- MARKET FEE	0.43		-
7. RETAILERS MARGIN	16.35	-	15.40
8. CONSUMER PRICE	64.06(100.00)	45.00(100.00)	66.76(100.00)

Note: Figures in parenthesis are percentage from total.

SHIMLA In Shimla only two channels viz. retailers and directly to consumers were found. No marketing through co-operative or whole sales was prevalent. The details have been presented in Table 9.4.

Channel - 1 The average price paid by consumer was observed to be Rs.67.03 per kg. The grower received an average of Rs.45.83 per kg and after deducting his expenses of Rs.3.67 per kg the net margin of grower was 64.21 per cent. The expenses incurred by retailers were Rs.5.10 per kg and their margin of profit was Rs.16.10 per kg.

Channel- II Under this channel average sale price of mushroom was Rs.47.00 per kg and net margin of grower was 98.62 per cent.

It may be concluded from the above that marketing channels for mushroom for local and Shimla market are fairly efficient, the net margin of growers in the range of 60 per cent. This is higher as compared with apple and vegetable marketing channels where this margin is in the range of only 40-50 per cent of consumers price. The length of marketing channels is also short as compared with other commodities.

TABLE: 9.4 MARKETING MARGINS AND COSTS THROUGH DIFFERENT MARKETING CHANNELS IN SHIMLA GROWERS

(RS/KG)

PARTICULARS	CHANNEL-I	CHANNEL-II
1. PRICE RECEIVED BY GROWER	45.83(68.37)	47.00(100.00)
2. MARKETING COSTS INCURRED BY GROWER	3.67	0.65
-PACKING	0.65	0.65
-TRANSPORTATION	0.17	-
-OTHERS	2.85(64.21)	-
3. NET WHOLESALE PRICE	42.98	46.35(98.62)
4. RETAILER PURCHASE PRICE	45.83	-
5. RETAILERS EXPENSES	5.10	-
- CARRIAGE	0.25	-
- LOSSES	4.22	-
- HANDLING	0.20	-
- MARKET FEE	0.43	-
6. RETAILER'S MARGIN	16.10	-
7. CONSUMERS PRICE	67.03(100.00)	47.00(100.00)

Note: The figures in parenthesis are percentages from the total.

9.6.2 UTTAR PRADESH

NANITAL The details of each of the two channels have been provided in Table 9.5 and the following provides details.

Channel –I In this channel involving retailer, the consumer price was Rs.90 per kg of which rs.55 were received by the grower. He spent Rs.10 per kg on packing and transportation also. Net wholesale price was Rs.70 per kg and retailers margin Rs.10 per kg.

Channel – II It was found that the price received by the producer was only Rs.50 per kg. He spent Rs.10 per kg on packing and transportation and mushrooms were available to consumer at a lower rate of Rs.60 per kg.

Table 9.5 MARKETING MARGINS AND COSTS THROUGH DIFFERENT MARKETING CHANNELS IN NAINITAL.

(Rs/Kg.)

Particulars	Channels-I	Channel-II	Channel-III
1.Price Received by growers (Rs.)	55	50	-
2.Marketing Cost incurred by growers			
-Packing	5	5	-
-Transportation	5	5	-
-Others	-	-	-
3. Net Whole Sale Price	70	-	-
4. Retailers Purchase Price	70	-	-
5.Retailers Expenses			
-Carriage	2	-	-
-Losses	5	-	-
-Handling	3	-	-
-Market Fee	-	-	-
6. Retailer's Margin	10	-	-
7. Consumer Price	90	60	-

Note: The Figures in Parenthesis are Percentages to total.

Dehradun All the three channels were used by Dehradun producers for disposing of the produce (Table 9.6).

Channel –I The price received by growers was Rs.44 per kg Retailers after purchasing it for Rs.50 per kg spent Rs.3 for carriage, handling etc. and after taking a profit of Rs.7 sold it for Rs.60 per kg.

Channel –II In this channel the consumer price was Rs.50 per kg. of which Rs.43 per kg. was net price received by growers. The rest was spent on packing and transportation etc.

Channel – III In this channel involving cooperative, the net price received by grower was highest (Rs.45/kg). The cooperative purchased it for Rs.50/kg and sold it to the retailers after taking the profit of Rs.2/kg. the consumer price was Rs.60/kg.

TABLE: 9.6 MARKETING MARGINS AND COSS THROUGH DIFFERENT MARKETING CHANNELS IN DEHRADUN.

Particulars	Channels-I	Channel-II	Channel-III
1.Price Received by growers (Rs.)	44	43	45
2.Marketing Cost incurred by growers			
-Packing	1	1	0.75
-Transportation	2	2	2
-Others	1	1	1
3. Net Whole Sale Price	49	-	50
4. Retailers Purchase Price	50	-	52
5.Retailers Expenses			
-Carriage	1	-	1
-Losses	1	-	1
-Handling	1	-	1
-Market Fee	-	-	-
6. Retailer's Margin	7	-	5
7. Consumer Price	60	50	60

The marketing margins for different agencies are worked out and presented in Table 9.7 for Ranchi district and in Table 9.8 for Hazaribagh district.

RANCHI

It can be observed from the table that the shares of producer in consumer's rupee were the highest in the case of channel II and cannel III. The price spread ranged between 68.20 and 98.92 per cent among the channels I,II,III and IV. It is interesting to note that sample growers realised higher unit price when sold directly to consumers and retailers than through NGO and co-operatives. Growers complained that low unit price paid by NGOs and co-operatives is discouraging them from maximising their production. From the table it may also be seen that NGO and co-operative incurred a higher handling cost of Rs.4.11 and Rs.4.44/kg. of mushroom compared to retailer (Rs.2.71). The transportation cost was Rs.0.45 per kg. (maximum cost) borne by all the agencies. The net margin of growers were found higher in channel II (Rs.38.55) followed by channel I (Rs.36.51), channel III (Rs.30.52) and channel IV (Rs.30.03).

HAZARIBAGH

Channel – I In this channel, consumers were found to be paying average price of Rs.47.25 per kg. of mushroom. Under this channel mushroom was sold directly to the retailers from whom consumers purchased it. Out of the average price paid by the consumer, producer share is 70.41 per cent. The retailers' purchase price was Rs.35.40 and the net margin turned out to be Rs.7.69 per kg. The rest amount is expenses on transportation, spoilage, handling and marketing fee.

Channel – II Under this channel, it has been witnessed that producers directly sold the produce to the consumers. It may be seen from the table that this is the most profitable channel but the transaction through this is very limited. The consumer was paying an average price of Rs.36.90 per kilogram of mushroom. The only cost incurred by the growers is in packing which amounts to Rs.0.52 therefore, the producer could earn Rs.36.38 per kg. or 98.59 per cent of the price paid by the consumer.

Channel – III This channel refers to involvement of non-governmental organisations. Under this channel growers sold their produce to these agencies and average price per kg. received was Rs.32.75. Marketing cost through NGOs was Rs.3.13 per kg. and they sold it to the retailer at the

rate of Rs.34.90 per kg. The expense borne by the retailers was found Rs.2.66 per kg. The net earnings of the retailers were Rs.5.24 per kg. The consumers were paying Rs.42.80 per kg. through this channel. The producer's share in consumer's rupees was calculated to be 70.56 per cent. Through the above analysis, it maybe clear that for all the categories of farm producers first preference sale was through channel I to retailers at local market followed by NGOs and cooperatives. Only large growers could take advantage of distant markets because of their large quantity of produce. Medium and large growers in limited quantities did direct sale to the consumers whereas small category of growers sold it in large quantity in almost all the cases.

TABLE: 9.7 MARKETING MARGINS AND COSTTHROUGH DIFFERENT MARKETINGCHANNELSIN RANCHI DISTRICT.

(Rs./Kg.)

Particulars	Channel-I	Channel-II	Channel-III	Channel- IV
1.Price Received by Grower	38.50 (85.55)	39.0 (100.0)	33.50 (74.86)	32.80 (75.22)
2.Marketing Costs Incurred by Grower	1.99	0.45	2.98	2.77
i. Packing	0.45	0.45	0.45	0.45
ii. Transportation	0.39	-	0.53	0.47
iii. Miscellaneous	1.15	-	2.0	1.85
3. Net Margin Growers	36.51(81.13)	38.55(98.92)	30.52(68.20)	30.03(68.87)
4. Marketing Cost by Co-operative & NGOS	-	-	3.13	2.15
i. Packing	-	-	-	-
ii. Wastage & spoilage	-	-	0.78	0.66
iii. Transportation	-	-	0.28	0.31
iv. Handling	-	-	0.64	0.52
v. Market Fee	-	-	0.39	-
vi. Rent for Shop	-	-	0.78	0.44
vii. Labours Wage	-	-	0.26	0.22
5. Retailer Purchase Price	38.50	-	37.75	37.00
6. Expenses by Retailer	3.79	-	2.89	2.16
i. Transportation	0.40	-	0.45	0.39
ii. Spoilage	1.75	-	2.30	1.65
iii. Handling	1.38	-	0.14	0.12
iv. Market Fee	0.26	-	-	-
7. Retailer's Margin	2.71	-	4.11	4.44
8. Price Paid by Consumer	45.0	39.0	44.75	43.60
9. Producer's Share in Consumer rupee	(81.13%)	(98.92)	(68.20)	(68.87)

Note: Figures in parenthesis are percentage of total.

TABLE: 9.8 MARGINS AND COSTTHROUGH DIFFERENT MARKETING CHANNELS IN HAZARIBAGH DISTRICT

(Rs.)

Particulars	Channel-I	Channel-II	Channel-III
1.Price Received by Grower	35.40 (74.92)	36.90 (100.0)	32.75 (76.52)
2.Marketing Costs Incurred by Grower	2.13	0.52	2552.55
i. Packing	0.52	0.52	0.52
ii. Transportation	0.23	-	0.39
iii. Miscellaneous	1.38	-	1.64
3. Net Margin Growers	33.27 (70.4)	36.38 (98.59)	30.20 (70.56)
4. Marketing Cost by Co-operative & NGOS	-	-	3.13
i. Packing	-	-	0.69
ii. Wastage & spoilage	-	-	0.34
iii. Transportation	-	-	0.87
iv. Handling	-	-	0.24
v. Market Fee	-	-	0.67
vi. Rent for Shop	-	-	0.32
vii. Labours Wage	-	-	34.90
5. Retailer Purchase Price	35.40	-	-
6. Expenses by Retailer	4.16	-	2.66
i. Transportation	0.51	-	0.48
ii. Spoilage	2.29	-	1.88
iii. Handling	0.98	-	0.30
iv. Market Fee	0.38	-	-
7. Retailer's Margin	7.69	-	5.24
8. Price Paid by Consumer	47.25	36.90	42.80
9. Producer's Share in Consumer rupee	(70.41)	(98.59)	(70.56)

Note: Parenthesis indicates percentage.

CHAPTER -X

PROBLEMS FACED BY MUSHROOM FARMERS

During the course of investigation it was observed that in H.P. there were 876 registered mushroom farmers spread in five district of the state. But at the time of data collection only 112 were actually cultivating mushrooms, the rest had either temporarily or permanently given up the vocation. Such a scenario could emerge only because the vocation is riddled with many problems. Such problems were envisaged on two stages viz. production stage and marketing stage. Thus, the problems related with these aspects were listed and analysed with the help of multiple response analysis. In this analysis it was felt that responses of those farmers who had currently given up the operations carried more weight because they faced these to such an extent that they were force to give up the vocation temporarily or permanently. Thus, such farmers who were registered mushroom cultivators but presently not growing mushrooms were also included in analysis of problems. Same scenario was observed in other two states also.

10.1 PRODUCTION STAGE PROBLEMS

The results of analysis have been presented in Table 10.1 and elicited below.

10.1.1 PRODUCTION TECHNIQUE

About 49 percent farmers felt that they lacked up to date knowledge of production techniques and it was difficult to clear any doubts about production techniques. The percentage of farmers reporting this problem was as high as 64 per cent in U.P. and only 28 per cent in Bihar. It was reported that trainers imparted only theoretical knowledge and practical aspects are usually ignored. Thus, it was felt that frequent demonstration crops should be held to take up practical aspects.

10.1.2 CAPITAL

The lack of capital is a big hurdle in undertaking the activity and further increasing the scale of operation. Infect, this is most important problem, more that 71 per cent farmers reporting it in H.P.,

This problem was most acute in U.P. with 90 per cent farmers facing it . About 65 percent of Bihar growers reported to be facing the problem. This problem was more acute for smaller categories of farmers.

10.1.3 LABOUR

The cultivation of mushrooms being highly scientific endeavour, requires specialised labour for the purpose. About 31 per cent farmers of H.P. reported that it is very difficult to find required labour force conversant with the activity. The problem was observed to be absent in U.P. In Bihar also only six percent farmers faced this problem. Thus, it may be concluded that this problem is confined only to H.P.

10.1.4 INPUTS

The inputs required for mushroom cultivation like spawn have to prepared by employing proper scientific techniques therefore and not easily available except from Govt. agencies or a few private traders. A few sources of critical inputs, many times, create problems of their availability, 51 per cent farmers reporting this problem in H.P. However, the problem is more acute in UP where 70 per cent persons faced it and in Bihar where about 78 per cent encountered the unavailability of inputs.

10.1.5 CREDIT

The mushroom cultivation being highly capital-intensive venture, makes provision of credit an important issue. Although the banks have a provision of credit for this activity and NABARD has refinance scheme for commercial banks for loans granted for this activity, the farmers usually face many difficulties in obtaining credit for either taking up this activity or increasing the scale of operation. The long procedures and difficult requirements are reported to be the main cause. About 53 per cent farmers in H.P., 46 percent in UP and 39 percent in Bihar faced problems in obtaining credit for mushroom cultivation.

10.1.6 OTHERS

There are various other miscellaneous problems being faced by the mushroom cultivators in its production. The most important among these is the higher electricity charges. The State Electricity Board charges the mushroom farmers at commercial rates, which are higher than domestic charges. Seventy percent farmers reported that the electricity consumed for the activity should be charged at domestic rates rather than commercial rates.

10.2 MARKETING STAGE PROBLEMS

The results of analysis regarding problems faced during marketing of mushrooms have been presented in Table 10.2 and described below.

10.2.1 LOW VOLUME

Majority of the mushroom farmers are small and as a result have low volume of production. The marketing of small quantities increases the per unit cost of marketing resulting in lower profits. This problems as reported by about 61 per cent farmers in H.P. was 22 in UP and 44 in Bihar.

10.2.2 FAR AWAY MARKETS

The mushroom producers are usually situated in countryside whereas the consumption centres are the cities, which are located at a distance. This combined with low volume of production creates many problems in marketing. The problem of markets being situated far away was most acute in Bihar with 62 percent farmers reporting this. In H.P. this problem was faced by only 16 per cent farmers and in U.P. only by 14 per cent farmers.

TABLE: 10.1 PROBLEMS FACED BY MUSHROOM FARMERS DURING PRODUCTION STAGE.

(MULTIPLE RESPONSE %)

PROBLEMS	CATEGORY			
	SMALL	MEDIUM	LARGE	OVERALL
H.P.				
1. LACK OF KNOWLEDGE OF PROD.TECHNIQUE	73	39	35	49
2. LACK OF CAPITAL	64	87	53	71
3. LACK OF LABOUR	36	35	18	31
4. UNAVAILABILITY OF INPUTS	59	58	29	51
5. LACK OF CREDIT	59	61	29	53
6. OTHER	59	71	82	70
U.P.				
1. LACK OF KNOWLEDGE OF PROD.TECHNIQUE	66	67	56	64
2. LACK OF CAPITAL	69	33	22	90
3. LACK OF LABOUR	-	-	-	-
4. UNAVAILABILITY OF INPUTS	66	92	67	70
5. LACK OF CREDIT	59	33	22	46
6. OTHER	79	83	44	74
BIHAR				
1. LACK OF KNOWLEDGE OF PROD.TECHNIQUE	18.0	18.0	3.0	28.0
2. LACK OF CAPITAL	35.0	1	12.0	65.0
3. LACK OF LABOUR	2	27	3	6
4. UNAVAILABILITY OF INPUTS	38	9	13	78
5. LACK OF CREDIT	20	19	10	39
6. OTHER	28		5	52

10.2.3 LOW LOCAL DEMAND

The local demand here means the demand by the households located within the village itself where the farm is situated. The local marketing naturally reduces the marketing cost especially with low marketable quantities. About 36 per cent farmers thought that it would have been ideal if their entire produce is consumed within the village and they would be saved from marketing problems and its costs. In the process they were ready to forego higher profits and contend with

lower returns. The percentage of farmers feeling a like was 40 per cent in U.P. and 55 per cent in Bihar.

10.2.4 PERISHABILITY

As described earlier the highly perishable nature of mushrooms poses problems during marketing and the time available is quite low. This is especially true in absence of processing which increases the shelf life. This problem was reported by about 56 per cent farmers in H.P. and was more pronounced in U.P. whereas only 38 percent farmers were concerned with problems posed by perishability in Bihar.

10.2.5 LOW PRICES

Although not many farmers complained of low prices, about 24 per cent farmers in H.P. and only 12 per cent in U.P. felt that prices are low in comparison with other fresh vegetables and these are also not increasing in tune with other vegetables. The farmers of Bihar were more concerned with problem of low prices, 53 per cent reporting this problem.

10.2.6 MARKETING COST

About 53 per cent farmers in H.P. felt that marketing cost of mushrooms was quite high. The problem was less acute in U.P. 28 percent farmers complaining on this account and Bihar with 39 per cent farmers.

10.2.7 MARKET INFORMATION

Those farmers who either were marketing the produce in distant markets or were planning to do so complained that no market information for these markets was available. In absence of this it was impossible to tap full potential and comparative advantage of these markets. About 29 per cent farmers at overall level had complained in this respect. The problem was little more acute with 36 percent farmers feeling lack of market in formation in U.P. and Bihar where 47 per cent farmers reported this problem.

10.3 CONCLUSIONS

It may be concluded from the above discussion that the production of mushrooms is riddled with many problems. Some of these e.g. lack of knowledge of production techniques will go on reducing with time as the spread of the activity further widens. Same is true for lack of specialised labour. More and more persons are being trained and hence the problems will go on reducing. Same is true for availability of inputs as more and more persons are undertaking the supply of inputs. However, the govt. will have to look into supply of credit by further streamlining the operations. On the marketing front govt. should include the mushroom prices in price bulletins so that farmers can get ready information on prices. The processing of mushrooms require boost to tackle problem of perishability.

TABLE: 10.2 PROBLEMS FACED BY MUSHROOM FARMERS DURING MARKETING STAGE.

(MULTIPLE RESPONSE %)

PROBLEMS	CATEGORY			
	SMALL	MEDIUM	LARGE	OVERALL
H.P.				
1. LOW VOLUME OF PRODUCTION	77	68	29	61
2. FAR AWAY MARKETS	23	10	18	16
3. LOW LOCAL DEMAND	45	45	6	36
4. HIGHLY PERISHABLE	59	55	53	56
5. LOW PRICES	32	19	24	24
6. HIGH MARKETING COST	50	58	47	53
7.LACK OF MARKET INFORMATION	32	32	18	29
U.P.				
1. LOW VOLUME OF PRODUCTION	38	-	-	22
2. FAR AWAY MARKETS	10	17	22	14
3. LOW LOCAL DEMAND	62	42	11	40
4. HIGHLY PERISHABLE	66	75	56	66
5. LOW PRICES	3	17	33	12
6. HIGH MARKETING COST	-	8	11	28
7.LACK OF MARKET INFORMATION	41	33	22	36
BIHAR				
1. LOW VOLUME OF PRODUCTION	57	41	12	44
2. FAR AWAY MARKETS	73	56	41	62
3. LOW LOCAL DEMAND	51	47	82	55
4. HIGHLY PERISHABLE	43	34	29	38
5. LOW PRICES	49	50	71	53
6. HIGH MARKETING COST	27	50	53	39
7.LACK OF MARKET INFORMATION	33	53	24	47

CHAPTER – XI

CONCLUSIONS AND POLICY IMPLICATIONS

From data collection, analysis, personal observations and discussions with the experts in the field of mushroom cultivation many points emerge which have been presented in the following text.

11.1 PRELIMINARY

The cultivation of mushrooms is important as it would help in reducing the population pressure on the scarce land resource. The generation of additional employment opportunities would be able to ease the unemployment situation, may be in whatever smaller degree. With this in mind the mushroom cultivation was introduced but the growth rate of adoption of this activity did not touch the desired level. Even those farmers who initially adopted this activity, later on abandoned it due to one reason or another. Most important from these were the high technicality involved in mushroom production and this venture being highly capital and labour intensive. It has been observed that farmers have to depend on purchased inputs like spawn and compost, which is some times not easily available; the capital requirements may not be easy to meet with.

11.2 METHODOLOGY

The present study is a consolidation of three separate studies conducted independently in Himachal Pradesh, Uttar Pradesh and Bihar. The study has been based on 70 mushroom cultivators located in two districts viz Solan and Shimla of Himachal Pradesh. In U.P. the study was based on 50 mushroom farmers located in districts of Dehradun and Nainital. The study was conducted in Bihar with 100 mushroom farmers a sample located in two districts viz. Ranchi and Hazaribagh. The sample has been divided in to three categories, small, medium and large depending upon the scale of mushroom cultivation.

11.3 GOVERNMENT INITIATIVE

The state government of Himachal Pradesh on its part has been providing many incentives and initiated many schemes to boost this activity in the state. The farmers are being provided training for imparting the production technology. Bank loans are arranged to meet with the capital requirements. There is also a provision of subsidy for marginal and small farmers, unemployed youth and schedule caste and schedule farmers.

Government of Uttar Pradesh is leaving no store unturned for the optimum level of mushroom industry in the state. Government provides many incentives to the prospective entrepreneurs. It imparts training, provides or facilities in spawn and compost procurement, helps in getting bank loan and provides many other facilities regarding plant-protection and marketing.

A pasteurised compost unit has been established in Rajendra Agricultural University, Pusa (Samastipur), Bihar and another unit proposed to be established in Birsa Agricultural University, Kanke, Ranchi (Jharkhand) state. This is a cent-per-cent Central Government sponsored scheme. Arrangements have also been made by Rajendra Agricultural University to impart training to farmers engaged in mushroom cultivation. The government of Bihar has sanctioned Rs.500/- as stipend to be paid to each trainee grower. But it is unfortunate to note that the Rajendra Agricultural University authority is not responsive to this scheme in positive direction. CAPART, and ICAR are also running schemes in this direction in the state.

11.4 BACKGROUND OF MUSHROOM CULTIVATORS

The analysis reveals that the average family size of mushroom cultivators in H.P. was 5.95 persons per family of which about 81% were literate and about 11% were formally educated. This indicates that due to high level of technology involved only those persons have adopted this activity that had some formal education or at least were literate. Despite good returns only about 22% persons had mushroom cultivation as their primary occupation, agriculture still remains the main source of employment. About 54% farmers had mushroom farming as their secondary occupation. The mushroom farms were invariably located very near to road head or on the road

head it self. The mushroom farmer of the state were observed to be having about two hectares of farm land of which only 1.20 hectares was cultivator.

Background presents the picture of family structure education level and occupation-pattern of the selected mushroom cultivators. The overall average family size of the mushroom growers in U.P. was 5.40 persons. As far as the education level of the selected mushroom cultivators, as much as 91.11 percent of the growers of both the districts were formally educated. Despite remunerative occupation, no cultivator has followed its cultivation as the main occupation. Out of 50 selected cultivators, as much as 59.91 percent cultivators followed service as their main occupation followed by 28.30 percent as agriculture and 20.75 per cent as trade.

In Bihar 100 mushroom growers (50 each from Ranchi and Hazaribagh districts) were interviewed. The average family size works out at 6.32 persons per household. The educational level reveals that 67.25 percent of the growers were literate and 32.75 were illiterate. Occupational structure indicates that out of 238 number of workers only 13.89 per cent of them were reported to be engaged in mushroom cultivation 20.58 percent were engaged in service, 19.74 per cent in trade and 45.69 per cent in agriculture as their main occupation. Land resources indicate that at overall level average holding size per household were 4.64 ha. Out of the total land 4.02 ha was under cultivation. Cropping pattern used by the sample growers in both the districts consisted of paddy, maize and wheat as prominent cereals but gram among pulse crops. Besides this, the respondent farmers grew many other crops like oilseeds, vegetables and coarse cereals. The livestock profile of the sampled mushroom growers had been worked out and found that per household average number of cows, buffaloes and others were 0.95, 0.07 and 2.05 respectively. The overall per household income generation from the livestock is rs.1953.39 per annum.

11.5 ECONOMICS OF MUSHROOM CULTIVATORS

HIMACHAL PRADESH

The mushroom farmers of H.P. were observed to be cultivating only white button mushrooms that were invariably cultivated in separate buildings. In most of the cases these buildings were cemented. At overall level about hundred 30 sq.mts. of area was devoted for mushroom cultivation by each farmer. The use of wooden trays for cultivation was found to be non-existent and polythene bags were used for the purpose as these were reported to be cheep. The cost A of cultivation was observed to be Rs. 50.51 at overall level were as cost B and C were Rs.50.53 and Rs.63.80 per bag respectively. The cost of production of mushroom at overall level was Rs.23.83 per kg and it was highest in medium farmers and lowest in case of large farmers. They were observed to taking about 75 harvest of mushroom per year and average production per harvest was about 84 kgs. About 70 per cent of the total production were of grade A about 23% grade B and the rest grade C. Compost has been observed to be the highest cost component followed by the labour. Highest amount of labour was absorbed by crop management, which was followed by spawning and filling of compost in the bag. About 53% of the labour came from higher sources and rest belongs to family. The average net returns at overall level from mushroom cultivation were observed to be about Rs. 50 thousand per farm. The output-input ratios were observed to be quite favourable and farmers were observed to be growing about four times the quantity of mushrooms than the break-even volume.

The analysis further revealed that the financial ratios like capital turn over ratio, gross ratio, operating ratio and rate of return over the capital are favourable for the cultivation of mushroom in the state. The production function analysis indicated that total working capital and human labour are the important inputs determining the yield of mushroom in the state. However, both these inputs were being used in quantities that were in excess of the optimum values.

UTTAR PRADESH

The mushroom cultivators of U.P. were cultivating mainly white Button Mushroom. It was found that 62% of selected mushroom cultivators used their residential buildings for mushroom cultivation. As mush as 66% used cemented building and 30% used mud-plastered buildings. Remaining 4% used tent/green house. As much as 24.12 square meter of the area per household was devoted for mushroom cultivation. The cultivators used only polythene bags for cultivation. Each farmer used 170.90 bags. As far as cost structure is concerned , it was found that cost A,B and per bag falls Rs.44.59, 50.14 and Rs.64.67 in their respective order. Cost of production at overall level was Rs.21.61 per bag. The cost of production at overall level was Rs.21.38, 21.00 and Rs.21.87 per kgs of small, medium and large farmers respectively. In total 72 harvests were taken in U.P. with average production of 7.13 kgs per harvest.

That total variable cost at overall level stood as Rs.7641. The highest percentage of it was on compost, which accounted for 42.70%. This was followed by labour cost, absorbing about 29.12% of total variable cost. Other expenditures such as expenditures on span, casing-soil, medicines and miscellaneous expenditures shared 5.44%, 3.62%, medicines and 1.63% of variable costs respectively.

BIHAR

In Bihar about 98 per cent of the sampled cultivators were found growing Oyster mushroom on commercial basis. About 38 per cent of the growers used separate building for mushroom cultivation and 62 per cent used residential houses at overall level. The picture emerges differently in both the districts. In case of using residential houses for mushroom cultivation mushroom growers of Ranchi district were found using higher percentage (72.0%) in comparison to Hazaribagh district (54.0%). The analysis also indicates that at overall level the growers used 34 per cent each for mud plastered and tents followed by 32 per cent cemented buildings.

The analysis indicates that at overall level the total area devoted for mushroom cultivation on an average by small category was 70.39 sq. feet or 6.54 sq. metre, medium category (153.72 sq. feet

or 14.28 sq. metres), large category (about 1191 sq. feet or 110.66 sq. metres) and, at overall level, 287.0 sq. feet or 26.71 sq. metres. Analysis showed that none of the growers was found using wooden trays for its cultivation due to higher cost. They use polythene bags only for the production of mushroom. The analysis further indicates that at overall level, on an average, different number of polythene bags were used by small category (71 bags), medium category (166 bags) and large category (547 bags), whereas at overall level, each farm was using around 182 bags.

The cost of cultivation of mushroom has been worked out on the basis of per farm and per bag for different size groups of farm. The costs like cost A, cost B and cost C have been separately analysed for the purpose. The cost of cultivation for the above costs was Rs.13.73, Rs.17.16 and Rs.19.84 respectively. From the analysis it was found that large category growers incurred higher cost in comparison to other categories because they generally used hired labour and proper package of practices in their farms. Average cost of mushroom production at overall level was assessed and found in case of small farms to be highest (Rs.18.05 per kg.) whereas in Hazaribagh district it was found highest in medium category farms (Rs.22.66 per kg.) During the field investigation it was found that growers were taking about 3 to 4 crops in a season from oyster mushroom. The number of harvest was found ranging between an average 13 at overall level in small category to 20 in large category. The average production per harvest varies between 108.93 kg. in small farms 227.58 kg. in large category. On an average, a mushroom farm in the study area earned a net farm income of about Rs.2406.13, which comes to Rs.13.18 per bag. The calculation of break-even, the total cost (fixed and variable with depreciation and interest) was taken into account. The growers at overall level need to produce about 0.522 kg. of mushroom per bag whereas the actual production was found to be about 0.865 kg./bag. The analysis of financial ratios indicate favourable scenario for mushroom production in the state. The production function analysis indicated that the values of regression coefficients were, by and large, statistically significant and, therefore, working capital and human labour may be considered by the planners and policy-makes in the planning process. The optimum yield level in most of the cases was found to be higher in comparison to the present yield level. Hence, it is recommended that the use of resources (viz., labour and capital) may be curtailed to the optimum level. The growers in the

project area may be apprised and cautioned with these facts by extension machinery of the state and non-governmental organisation to spread the mushroom technology in this region.

11.6 MARKETING

HIMACHAL PRADESH

The marketing of mushroom was observed to be very risky process as the mushrooms are highly perishable and have to reach the final consumer with in least possible time. Three marketing channels were existence for accomplishing this task. For marketing the mushrooms are packed in polythene bags of two hundred grams, each which in turn are packed in cfb cartons for transporting these to the markets. Shimla is the main market for disposal of the produce, some quantity from Solan is also sent to Chandigarh. The mode of transportation for distant markets is the bus where as for local market it is either head load or scooter/cycle etc. are used for transporting mushrooms to local market. About 7% of the produce is sold at the farm gate. The producer share in consumer rupee was observed to be varying between 43 and 45 per cent in Solan depending upon the channel used where as it was about 47 per cent in district Shimla.

UTTAR PRADESH

Mushroom is extremely perishable produce and if it is not processed or consumed it gets damaged. Therefore, marketing of mushroom is most important factor is mushroom production activities. Three marketing channels are in operation for marketing of mushrooms. For marketing of the mushrooms, small poly bags are prepared. Nainital, Ranikhet, Almora and Halduani are the main markets of the Nainital produce. In case of produce of Dehradun, Dehradun and Mushorie are the main markets. For distant places, buses and scooters are main modes of transport. Head loads are also practiced. About 16% of total produce of Nainital and 12.83% of produce of Dehradun are sold at farms itself.

BIHAR

The mushroom growers of Bihar were using five channels for disposal of produce. It is indicated that about 30.23 per cent of produce was disposed through retailers followed by 27.21 per cent through channel of NGO's, more than 11 per cent through channel in valuing consumer and co-

operatives and only about 19 per cent through local petty traders. The bicycle and head load are two main modes of transportation. The analysis found that the sample growers realised higher unit price when sold directly to consumers and retailers than through NGO and Co-operative incurred a higher handling cost of Rs.4.11 and Rs.4.44/kg. of mushroom compared to retailer (Rs.2.71). the net margin of growers was found higher in channel II (Rs.38.55) followed by channel I (Rs.36.51), channel III (Rs.30.52) and channel IV (Rs.30.3). From the analysis, it is clear that all the categories of farm producers' first preference sale was through channel I to retailers at local market followed by NGO's and co-operatives. Only large growers could take advantage of distant market because of their large quantity of produce. Medium and large growers in limited quantities did direct sale to the consumers whereas small category of growers sold in large quantity in almost all the cases.

11.7 PROBLEM FACED

The highly technical nature of production of mushrooms put various problems to the farmers on this front. Many farmers complained about the lack of knowledge of production techniques. Other common problems faced by farmers include lack of capital and labour, unavailability of inputs and lack of credit. On the other hand low volume of production was the most common complained in the market scenario. The other problems faced during marketing include far away markets, low local demand, high parishability, low prices and high marketing cost.

In Bihar unavailability of inputs was identified as the main problem during production stage. Lack of capital was also reported by majority of farmers. During marketing the problems like for away markets, low local demand, low prices and lack of market information emerged out as main problems encountered.

11.8 POLICY IMPLICATIONS

HIMACHAL PRADESH

1. The private units for production of compost and spawn be encouraged as these are the inputs whose availability is critical for the adoption and spread of the activity.

2. The benefit of training should be extended to larger number of people. More persons can be motivated for attending these training by increasing the daily allowance and other benefits can be included as a package e.g. some quantity of free compost or spawn or other inputs like polythene bags etc.

3. The importance of the activity and the training programme schedules and importance should be widely advertised in local Hindi newspapers, read in rural areas.

4. Transportation subsidy should be provided on the produce for bringing it to the market.

5. The extension services should be geared up for providing technical advice on the doorstep of the farmers.

6. The department of horticulture should provide the compost not only to registered growers but also to any one who grows mushrooms, whether registered or not.

7. The farmers are advised to reduce the use of labour for mushroom cultivation

8. The working capital per bag needs reduction.

9. None of the mushroom growers was observed to be processing the mushrooms. The importance of this should be told to them.

10. The extent of the activity can be increased many times without having any fear of market demand. The present production is not sufficient to meet the demand of even Shimla city.

UTTAR PRADESH

1. Wide publicity should be done for producing mushrooms by marginal, small and land less persons as its cultivation creates gainful employment to them.

2. Private entrepreneurs should be encouraged for production of spawn and compost.

3. No. of beneficiaries for training should be increased. Their Daily-allowance should be increased.

4. The nos. of demonstrations should be increased so that the producers may follow the same.

5. Frequent and cheap raw materials should be made available to the producers.

6. Transport subsidy should be provided.

7. Proper marketing information should be made available to the producers.

8. Bank-credit should be provided.

9. Mushroom cultivation should be considered at far with other agricultural food grains.

10. All facilities available to the producers of other crops and vegetables should also be provided to the mushroom growers.

BIHAR

1. Training should be organised at micro level so that growers may be familiarised with proper production technique. (Atten. Director of Horticulture, Government of Bihar).

2. Financial assistance should be provided to promote commercial cultivation of crop (Atten.ABARD and government of Bihar).

3. To make available high quality and required quantity of the spawn to the growers, more and more spawn production laboratories should be established (Atten. Deptt. of Biotechnology, Government of India and Government of Bihar).

4. A programme in the name of 'Mushroom development Programme' should be initiated as like that of oilseeds and pulses development programme. (Atten. Ministry of Agriculture, Government of India and Government of Bihar)

5. Extension mechanism be strengthened for promoting production and consumption. (Atten. Directorate of Extension, Government of Bihar and Ministry of Agriculture, Government of India).

6. A scheme like 'Mushroom for all' should be launched, keeping in view its nutritive value. (Atten. Ministry of Agriculture, Government of India and National Centre for Mushroom Production, Solan, H.P.).

7. The information regarding selling points and stock position is imperative for consumers and producers as well. (Atten. VEGFED, Government of Bihar).