

**ECONOMICS OF PRODUCTION AND MARKETING
OF MUSHROOM IN DEHRADUN DISTRICT OF
UTTARAKHAND**

Thesis

Submitted to the



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By

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This Thesis is dedicated to my Family

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**Pantnagar
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**(Shivam Dhiman)
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CERTIFICATE

This is to certify that the thesis entitled “**Economics of Production and Marketing of Mushroom in Dehradun District of Uttarakhand**”, submitted in partial fulfilment of the requirements for the award of the degree of **Master of Science in Agriculture**, with a major in **Agricultural Economics** from the **College of Agriculture of G.B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand** is a record of *bonafide* research work carried out by **Mr. Shivam Dhiman Id No.- 53937** under my guidance and supervision and no part of this thesis has been submitted for any other degree or diploma.

The assistance and help received during investigations and sources of literature have been fully acknowledged.


Pantnagar
December, 2020



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We, the undersigned, members of the advisory committee of **Mr. Shivam Dhiman, Id No. - 53937**, a candidate for the degree of **Master of Sciences in Agriculture** with a major in Agricultural Economics, agree that the thesis entitled **“ECONOMICS OF PRODUCTION AND MARKETING OF MUSHROOM IN DEHRADUN DISTRICT OF UTTARAKHAND”** submitted to the **G. B PANT UNIVERSITY OF AGRICULTURE & TECHNOLOGY, PANTNAGAR** in partial fulfilment of requirements for the degree.



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Introduction

*“Start by doing what is necessary, then what is possible,
And suddenly you are doing the impossible”*

St. Francis of Assisi



India is divided into various agro-climatic zones which are conducive for the cultivation of a wide variety of agricultural and horticultural crops such as wheat, rice, vegetables, fruits, mushroom, ornamental, tuber crops, spices, medicinal and aromatic crops, plantation crops, floriculture, etc. Presently, the horticulture sector plays a very crucial role in the Indian economy, because it has moved from rural to commercial ventures due to improvised production techniques and expertise. In the process of economic development, we neglected agriculture and it's allied mainly due to activities such as industrialization, the rapid growth of population, as a consequence, the share of agriculture was reduced from 1951 to 2019 which contributes 56 and 14 per cent only. It is known that India has small, medium, and landless farmers who spend their total income on family consumption and their needs. Every person on the earth intake food for sustaining the biological activities of the body as food is a source of vitamins, minerals, and calories, hence mushroom production contributes a significant portion to the total production of horticultural crops. Mushroom farming has come a long way in becoming one of the major sources of income and employment for farmers (Kapoor *et al.*, 1987). Mushroom industry in India is primarily focused on white button mushroom which is a highly sophisticated and capital-intensive activity. The recent data of state-wise production in table-1.2 showed that the share of button mushroom in India is maximum amounting to about 73 per cent followed by oyster mushrooms which contributed about 16 per cent.

1.1 History of Mushroom

The mushroom was first introduced by Hippocrates and he told the medicinal value of mushroom in 400 B.C while Mushroom was introduced as a separate field in 1652. The cultivation of button mushroom was started first in France in 1630. Whereas, the first record of year-round commercial production was started in the year 1780 in Pennsylvania, which is referred to as the mushroom capital of the world.

During the year 1917, the first successful mushroom cultivation was reported by Falck. After this initiative, a scheme "Development of mushroom cultivation in Himachal Pradesh" was started at Solan by the state government of Himachal Pradesh

in alliance with I.C.A.R in 1961. This was the first serious attempt at the cultivation of *button mushroom* in the country. Cultivation of *button mushroom* on an experimental basis was started by the State Government of J&K and CSIR in 1964. The ICAR sanctioned the formation of the National Centre for Mushroom Research and Training (NCMRT) during VIth five-year plan on October 23, 1982, with the objectives of researching mushroom, utilizing, preservation, and to impart training to teachers, scientists, extension workers, and interested growers. All India Coordinated Project on Mushroom (AICRPM) was started during VIth Five-Year Plan on 01-04-1983 with its headquarter at National Research Centre for Mushroom, presently known as Directorate of Mushroom Research.

1.2 Importance of Mushroom

Mushroom is mostly used as food. From the nutrition point of view, mushrooms are placed between meat and vegetables. These are rich in carbohydrates and vitamins. Mushroom possesses low caloric value, high protein, high fiber content, and high K: Na ratio so it is ideally suited for hypertension patients and diabetics. They are a rich source of proteins (2.72%) as compared to cereals, fruits, and vegetables. They also contain carbohydrates (3.35 %), fat (0.36%), water (92%), and minerals (0.6 %) based on fresh weight. Mushrooms contain all the essential amino acids which are required for human growth. Mushrooms are also an excellent source of vitamin-A, C, D, K B1, B2, niacin, pantothenic acid, biotin, and folic acid which are retained even after cooking (Table-1.1).

India is primarily an agriculture-based country and blessed with a varied agro-climate, an abundance of agricultural waste, and manpower, making it most suitable for the cultivation of all types of mushroom. It can profitably be started by landless farmers, landless labour, unemployed youths, etc. It is an indoor activity so it requires less land as compared to other crops.

Therefore, mushroom cultivation is not only has economic importance but also has proven an important role to play in integrated rural development programs by increasing employment and income opportunities for farmers, women, landless labour, and village youths to make them financially independent.

Mushrooms show potential antimicrobial, antiviral, anti-tumor, anti-allergic, anti-inflammatory, hypoglycemic, and hepatoprotective abilities. Thus, mushrooms are proven sources of dietary supplements that can tackle under nutrition. Since Mushroom is fat and cholesterol free and also rich in anti-oxidants, anti-fungal, and anti-cancerous properties.

Table 1.1: Nutritional composition of Fresh Mushroom

Content	Composition(quantity per 100 gm of fresh mushroom)
Moisture	92.72
Fat	0.36
Protein	2.72
Crude Fibre	1.87
Ash	0.84
Dietary Fibre	2.39
Iron	1.70
Calorie	27.53 kcal
Carbohydrate	3.35

Source: Gloria I. Solano-Aguilar, Saebyeol Jang, Sukla Lakshman, Richi Gupta, Ethiopia Beshah, Masoumeh Sikaroodi, Bryan Vinyard, Aleksey Molokin, Patrick M. Gillevet and Joseph F. Urban.

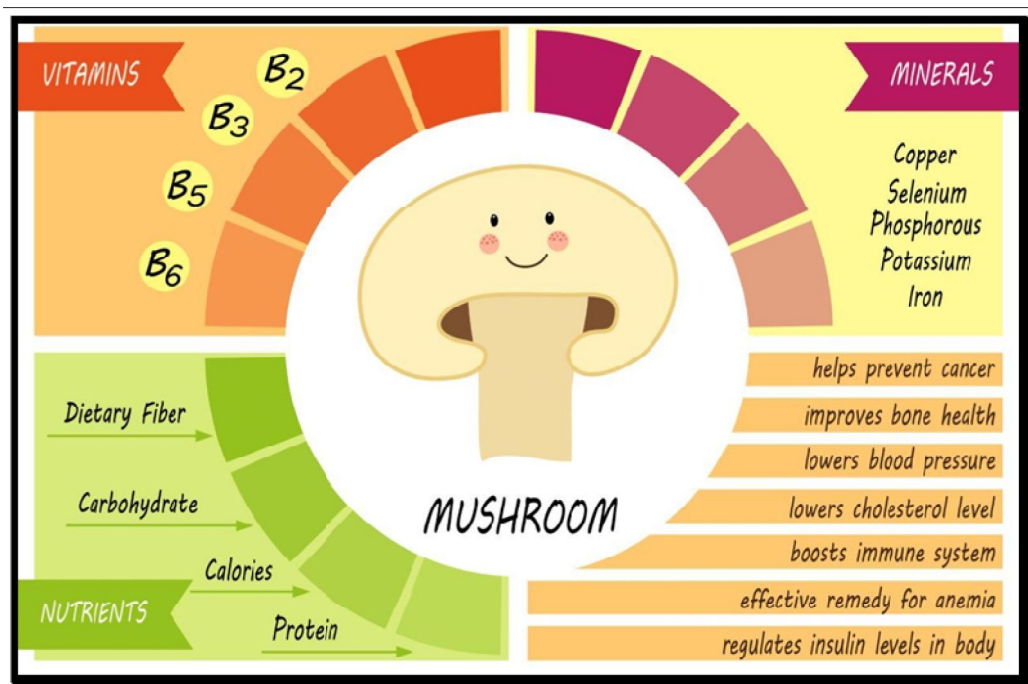


Figure 1.1: Health Benefits of Mushroom

1.3 World and Indian Scenario in mushroom production

The most popular species is *white button mushroom* and *Oyster Mushroom*, which is considered safe for people to eat and button mushroom is very popular globally because it has mainly grown in controlled, sterilized environments. The global mushroom industry has expanded very rapidly (Bhatt & Singh, 1999). World production of mushroom was about 25 million tonnes in which Asia contributes 80.7 per cent (FAO, 2017). China is the largest producer of mushrooms in the world followed by the USA and Netherlands whereas India holds 8th rank in mushroom production with a share of 1.5 per cent (about **98246 metric tonnes** (2017, FAO Data) in total mushroom production (Singh, et. al, 2016).

Mushroom cultivation is now one of the major sources of income for farmers of many states like Haryana, Uttar Pradesh, Punjab, Uttarakhand, Himachal Pradesh, and Tamil Nadu. In India, Punjab contributes 14 per cent to mushroom production followed by Haryana, Odisha, Maharashtra, Uttarakhand, and Tamil Nadu (table-1.2). The total area and production under a mushroom in 2017- 2018 was 183 thousand hectares and 459 metric tons (table-1.3).

Table 1.2: State- Wise Production and value of the output of Mushroom

(Production in Metric Tonne)

S.No.	State	Button Mushroom	Oyster Mushroom	Milky Mushroom	Other Mushroom	Total
1.	Andhra Pradesh	3000	500	15	0	3515
2.	Arunachal Pradesh	20	5	0	1	26
3.	Assam	20	100	5	0	125
4.	Bihar	950	1500	150	0	2600
5.	Chhattisgarh	20	200	35	89	344
6.	Delhi	3000	50	20	0	3070
7.	Goa	4200	20	0	0	4220
8	Gujarat	10000	1200	0	0	11200
9.	Haryana	15000	50	50	0	15100
10.	Himachal Pradesh	9000	110	30	10	9150
11.	J&K	515	15	50	0	580
12.	Jharkhand	200	20	0	0	220
13.	Karnataka	700	320	160	0	1180

14.	Kerala	0	500	300	0	800
15.	Maharashtra	10000	200	50	0	10250
16.	Madhya Pradesh	10	5	0	0	15
17.	Manipur	0	10	0	50	60
18.	Meghalaya	25	2	0	0	27
19.	Mizoram	0	50	0	0	50
20.	Nagaland	0	75	0	250	325
21.	Odissa	126	6310	0	9550	15986
22.	Punjab	16000	2000	0	0	18000
23.	Rajasthan	100	1000	0	200	1300
24.	Sikkim	1	2	0	0	3
25.	Tamil Nadu	6500	2000	1500	0	10000
26.	Tripura	0	100	0	0	100
27.	Uttarakhand	8189	1228	819	0	10236
28.	Uttar Pradesh	7000	100	0	0	7100
29.	West Bengal	50	15000	0	500	15550
30.	Andaman & Nicobar	0	300	0	0	300

Source:- National Research Centre of Mushroom, Solan, HP (2016)

Table 1.3: Share of some crops in Indian Horticulture (2016-17 Data)

Crops	Area(000,Ha)	Production (000,MT)
Tomato	809	19697
Apple	277	2242
Mango	2263	19687
Potato	2164	46546
Mushroom	183	459
Cabbage	807	8971
Almond	12	8
Banana	858	29163
Capsicum	46	327
Cut Flowers	309	1643
Onion	1270	21564
Coconut	2092	15339

Source: Horticulture Statistics Report, 2017

1.4 Consumption Pattern

- According to ICMR, the daily requirement of Mushroom per person is 90 grams. But per capita consumption of India (30- 40 g) is comparatively low as compared to Europe and the USA (1 to 2 kg) due to inadequate demand.
- According to the International Society for mushroom sciences, the Per capita consumption is 15 to 20 grams.

1.5 Mushroom Production Scenario in Uttarakhand State

Uttarakhand is a hilly state which lies within the Himalayan ranges and it shares its border with countries like Nepal & China. It stretches within a geographical area of about 53, 483 km² and about 25 per cent of the area under agriculture and 63.48 per cent area is occupied by forest. Mushroom growers in Uttarakhand have had a golden harvest. The mushroom industry in the state has witnessed a windfall in production in the last few years with its output almost doubling in this period. The state produces three species and contributes a large share i.e. Button Mushroom (80%), Oyster mushroom (12- 13%), and Milky Mushroom (7-8%) (Fig.: 1.2). Mushroom production in Uttarakhand state was 12395 tonnes annually in which the contribution of Garhwal and Kumaon region was 10685 and 1710 tonnes in 2018-19 (table-1.4). Dehradun is evolving as a hub of mushroom production. Mushroom cultivation is a profitable agri-business in the Dehradun district of Uttarakhand. Dehradun has only 136 mushroom growers which contribute 172 Quintal of mushroom in total production in 2018- 19.

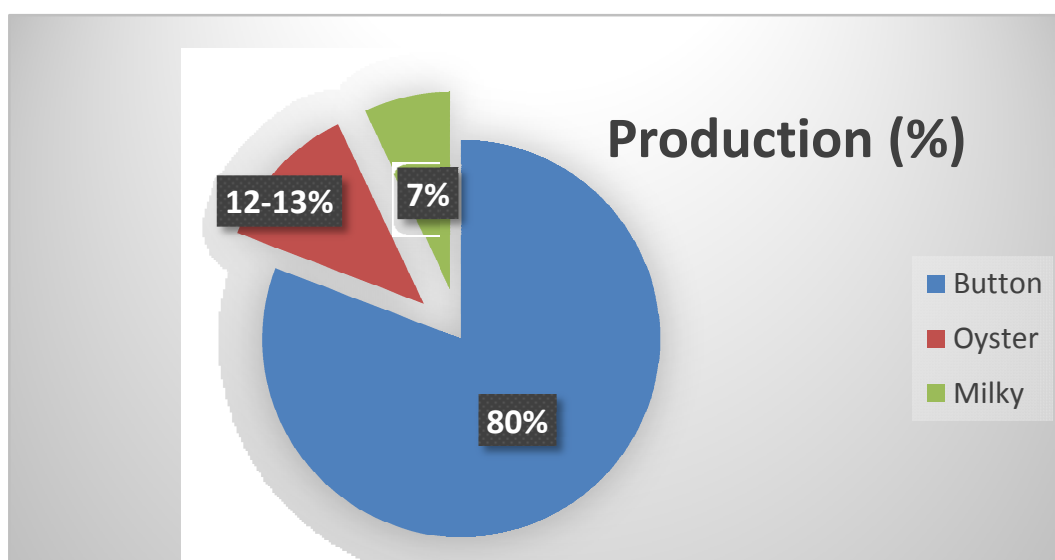


Figure 1.2: Share of Mushroom Species in Uttarakhand

Table 1.4: Mushroom Production Scenario in Uttarakhand (2018-19)

S. No.	Year	Kumaon (tonne)	Garhwal (tonne)	Total (tonne)
1.	2014- 15	1360	8620	9980
2.	2015- 16	1400	8836	10236
3.	2016-17	1665	9000	10665
4.	2017- 18	1710	10685	12395

Source: District Department of Horticulture, Uttarakhand

1.6 Problem Statement:

The total geographical area of the state is 53483 km² in which 25 per cent under agriculture and 63.48 per cent area is covered by forest. The population of the state is 1.01 crore (2011 census) and the average size of landholding is 0.95 ha. Horticulture is considered to be the backbone of the state. In this state, the major problem which grows concerned is the low income formation, unemployment, the small size of landholding, high rate of migration, and subsistence nature of farming. Mushroom cultivation acts as one of the subsidiary occupations which can provide employment to the small, medium farmers and youth of the state and supplement their income. It is a labour-intensive indoor activity, no arable land is required, and can be easily taken by landless, small, and medium farmers successfully. Because of this, the state has got a conducive climate for mushroom production.

The problem arises in mushroom production are lack of motivation, lack of technical knowledge, lack of skilled labour, no proper disposal of produce, inadequate storage facilities and no facility to for climate control for small and medium farmers. Although the produce of mushroom in India is continuously is increasing still its potential has not been fully utilized due to inappropriate technical know-how, lack of necessary inputs, same situation prevailed in Uttarakhand state. Thus, in this context, it seems imperative to assess how existing inputs are being used, and what possibilities exist for improving the efficiency of mushroom production under given resource constraints. With this view, it was thought appropriate to undertake a study to find out “Economics of Production and Marketing of Mushroom in Dehradun

District of Uttarakhand”. The present study was undertaken with the help of the following objectives:-

1. To work out the cost of and returns from mushroom cultivation.
2. To examine resource use efficiency of Mushroom production.
3. To identify the existing marketing channels and determine their marketing efficiency.
4. To identify and rank various constraints faced by mushroom growers.



Review of Literature



*“If you do not know history, you don’t know any thing
You are a leaf that doesn’t know its part of the tree”*

Michael Crichton



The review provides the basic background for the formulation of the objectives and selection of appropriate analytical tools for the achievement of the same. This section is divided into four sub-sections. These cover studies related to cost and returns from mushroom cultivation, resource-use efficiency, marketing channels, and their efficiency, and various constraints faced by mushroom growers.

2.1 Cost and Return from Mushroom Cultivation

Peethambaran (1977) examined that the white button mushroom cultivation was popular in Himachal Pradesh and adjacent areas. He also revealed that mushroom cultivation was a profitable agri-business as one could earnings Rs 40/season from one m² spawned area.

Rai and Bhatia (1981) estimated the break-even analysis of the mushroom growers and reported that 378 kg mushroom was produced by large unit having more than 400 mt² space spawned per season followed by 688kg by medium unit having 200-400 mt² spawned area and 189 kg of mushroom for a small unit having less than 200 mt² spawned area per season.

Chang (1982) observed that mushroom available for eating is considered as a healthy food since its mineral content exceeds that of meat, fish, and vegetable. Further, it is also known mushrooms have twice the protein content of vegetables and about 4 times that of oranges.

Shandilya and Agarwal (1982) compared the economics of mushroom cultivation in controlled experimental conditions (CEC) and natural environment conditions (NEC). They reported that a mushroom unit of 100 trays would yield Rs. 5443 in CEC and Rs. 5795 in NEC. They also pointed out that the creation of controlled environment conditions was possible up to a certain limit only when the majority of the population was poor.

Kapoor and Bahl (1983) formulated the economics for the cultivation of white button mushroom and indicated a net profit of Rs 8/kg of mushroom.

Kapoor et al. (1987) analyzed the economics of button mushroom cultivation in Himachal Pradesh. They concluded that the cultivation of mushroom could provide off-season employment and also add to their income to farm families if adopted as a subsidiary occupation.

Kumar et al. (1995) analyzed the economics of mushroom production in the hills of Uttar Pradesh (now in Uttarakhand). A district-wise list of mushroom producing units of 1987-88 was prepared. The study area was i.e. Garhwal and Kumaun. The establishment cost of mushroom producing unit was found Rs. 17, 818.20. The cost of house and cost of trays jointly constituted 93.65 per cent of the total establishment cost of mushroom eight producing units in hill areas of Uttar Pradesh. The average cost of compost material had been estimated at Rs. 1,832.90 per mushroom producing unit which comes to Rs. 14.87 per tray. The results show that the average cost of mushroom cultivation per unit was Rs. 4, 638.97. The gross returns per tray and per kg of mushroom were estimated as Rs. 65.34 and Rs. 25.36 respectively. The annual income from this crop was worked out was Rs. 1,635 per unit.

Bhatt and Singh (1999) analyzed the status of mushroom cultivation in India. This study emphasized on mushroom industry in India was developing fast, especially the cultivation of white button mushroom because it is good for export purposes. During the decades of 1996, the production increased in India by five-time more. Moreover, in 2002 the mushroom production has been expected to cross 10, 100, 1000 tonnes per annum due to the cultivation of mushroom by Modern technology.

Singhal and Kala (2000) worked out cost & benefit analysis of mushroom enterprise run by tribal women in Ranchi district of Bihar state. Out of the five units, four units were selected randomly for the study. The conclusion indicated that the depreciation value on fixed cost was 2.42 percent while the cost of raw material was 33.87 percent. The average fixed cost and variable costs were 12.34 per cent and 87.66 percent of the total cost of production, respectively. The total average cost of production worked out to be Rs. 7,748.65 for producing 395 kg of mushroom. Per kg net return of large unit was obtained maximum at Rs. 11.06 due to the low cost of production. The average cost-benefit ratio was 1:1.53 indicating the economic viability of the enterprise.

Baysal (2003) conducted a study on paper waste supplemented with chicken manure, rice husk, and peat for *Oyster mushroom* cultivation. The highest yield for fresh weight was recorded as 350 grams in the substrate containing 20% rice husk.

Dehemy et al. (2007) observed that the production of mushroom significantly increased by 0.15 thousand tons per year. The study revealed that the production of Mushroom is a profitable enterprise for small investors in Egypt. Total production costs per year were about Rs 8000. This small project gives two work opportunities and an income of Rs 12000 per year. The Internal rate of return of the enterprise is about 35% and the payback period is about three years. Therefore, the study recommended encouraging young-people enterprises in rural communities in new lands to cultivate mushroom, by introducing technical consults, financial resources for small investors.

Rahman and Ahmed (2008) observed the profitability of rice, wheat, and mushroom and they also found that mushroom cultivation is a lucrative venture. We considered one acre of land for rice and wheat cultivation, and 30'×18' in size growing house for mushroom cultivation. After four months, the net income of rice and wheat were 12,240 and 24,360 taka where the total cost was 11,760 and 7,640 taka, respectively. At the same time, the cost and benefit of mushroom were taka 30,700 and 29,300 takas, respectively. Interestingly within these four months, the mushroom was cultivated two times where the average production cost and the benefit was 20,000 and 10,000.00 taka for the first round (costs including the house), and 10,700.00 and 19,300 taka's for the second round (costs excluding house), respectively. After the harvesting, the profitability of these three crops, they found mushroom cultivation is more profitable.

Saran et al. (2008) estimated the economics of mushroom cultivation and examines the different difficulties in marketing and scope of development of mushroom farming in six agro-climatic zones in Punjab. He observed that the small farmers adapt to growing mushroom around the year followed in two rotations i.e. White button straw mushroom and Dinghri mushroom. From a small farm of hundred square feet each for white button mushroom and oyster, the grower took a net profit of Rs. 12167 in the first rotation and the later rotation Rs.10921 has been earned.

Singh et al. (2010) conducted their study in the Sonipat and Gurugram districts of Haryana and work out the benefit-cost ratio of mushroom cultivation. He examined mushroom cultivation is capital intensive and also increases with the increase in farm size.

Singh et al. (2010) examined the average mushroom production on small, medium, and large growers were 2639 kg, 6978 kg, and 21910 kg, respectively. Thus, a positive relationship existed between mushroom production and farm size. The gross returns ranged between Rs 88202 and Rs 735100 across different categories of farms. The average gross returns were computed to be Rs 351567 from the average mushroom production of 10509 kg and the average selling price of mushroom was Rs 33.37 per kg. The gross returns increased with an increase in the quantity of compost used. The net returns from mushroom production, which ranged from Rs 33519 to Rs 33792 across different farm categories, depicted an increase with an increase in farm size. The study observed that the 'economies of scale' operated very well on large-size farms. It was also supported by the benefit-cost ratio, which was higher on large (1.83) than small (1.61) and medium (1.78).

Barmon et al. (2012) found that mushroom is an economically profitable agricultural enterprise in Bangladesh. Usually, small, marginal, and landless farmers are engaged in mushroom cultivation mainly because of a small piece of land, and little amount of income. The average production cost of mushroom per farm was Taka 41,948 and revenue was Taka 64,826. Therefore, the average profit and gross margin per farm were Taka 22,888 and Taka 38,790, respectively. The benefit-cost ratio (BCR) was about 1.55. Mushroom production helps to reduce poverty and create employment opportunities in Bangladesh.

Bhatt and Kamra (2013) revealed that the spawn run has been found to complete in 51 days. Then spawn bags have been exposed to 90-95 per cent Relative Humidity (RH) and 30 ± 1 °C temperature. The first primordial initiation has been noticed after 35 days. A vegetative and fruiting phase was completed in 67 days and 92 days respectively. The gap between these two flushes was 65 days and the total period of the mushroom crop takes 224 days. The total yield was 570.10 Gms per bag. But there is no pest attack during cultivation. The economics of artificial cultivation has been encouraging and promising.

Chauhan and Kangotra (2014) conducted a study to evaluate the economic viability of white button mushrooms in Himachal Pradesh and proposed that the overall level per unit investment on major and minor items was 35.29 per cent and 64.71 per cent of the total investment of Rs. 45,000. On all units, the highest share from iron racks accounted for 25 per cent of farm investment. The capital turn-over ratios of the two units were raising 2.64, 2.69, and 2.67 for small, medium, and overall units, respectively. It indicated that the total return per unit of rupee invested on fixed 13 assets whereas the corresponding figures of gross ratios for raising two crops were 0.79, 0.56, and 0.65. It observed that large mushroom units were more economical but the total cost per unit of total returns was the lowest.

Thakur and Singh (2014) observed that mushrooms have various nutritious that serve as food, tonic, and medicine. The production of tropical mushrooms like oyster, paddy straw, and milky mushroom utilized locally available agricultural wastes viz., wheat, paddy straw, chickpea, soybean, mustard, lathyrus, lignocelluloses, and cotton wastes was exploited. The production of oyster mushroom in India was estimated to be around 18,000-21,000 metric tonnes per year. However, the production of milky and paddy straw mushroom was about 11,000 tonnes each. Oyster mushroom farming was mostly done by the women of the SHGs on a small to medium scale. It constitutes an important source of their employment and income. Milky mushrooms can be cultivated throughout the year. It was hoped that the vocation of mushroom farming will become a very important venture in the Integrated Rural Development Programme.

Sharma et al. (2016), observed that the per capita consumption of mushrooms in India is less than 50 gm against over a kg in other countries. *Volvariella* mushrooms account for only 16% of the total production of cultivated mushrooms in the world. Paddy straw mushroom (*V. volvacea*) is an edible mushroom of the tropics and sub-tropics.

Singh et al. (2016) reported that worldwide more than 3000 mushrooms have been identified as edible, of which more than 200 types are reported to have been produced under controlled conditions. India is home to more than 100 varieties of mushrooms found in the wild. The global mushroom production (in tonnes) ranks as per FAO Statistics-2016 was estimated *i.e.*, China produces 7797929 tonnes followed

by the USA produces 260140 tonnes while India produces 29992 tonnes of Mushroom in 2016-17.

Yogesh *et al.* (2017) found that mushroom mainly used as a vegetable but yet it finds a regular place among the Indian consumers. Despite favorable agro-climate, relatively low-cost labour, an abundance of agro wastes, and rich fungal biodiversity, India has witnessed a lukewarm response in its growth. In the present scenario, the total mushroom production in India is approximately 0.13 million tons. From 2010-2017, the mushroom industry in India has registered an average growth rate of 4.3 per cent per annum. Out of the total mushroom produced, white button mushroom contributed 73% followed by oyster mushroom (16%), paddy straw mushroom (7%), and milky mushroom (3%). Compared to other vegetables, the per capita consumption of mushrooms in India is low per year. In the year 2016-2017, the Indian mushroom industry generated revenue of Rs. 7282.26 lacs by exporting 1054 quintals of white button mushroom in canned and frozen form. By considering the production statistics, the spawn demand in India is estimated at 8000-10000 tons per annum. The majority of this commercial spawn to the growers is being supplied by the private units and the contribution of public sector organizations in spawn supply was limited to 10% only.

Aditya *et al.* (2018) revealed that the mushroom production for economic empowerment of farm women is a profitable venture. There is an urgent need to impart technical know-how to women to adopt mushroom production as an income and employment generating activity for enhancing the additional income of their family. The KVK intervention on mushroom production through training and demonstration during 2012-2017 showed that a total of 380 farm women were trained for mushroom production and 350 front line demonstrations were conducted during 2012- 2017. To assess the social acceptability a structured interview schedule has been prepared and a survey was carried out in 100 randomly selected rural farm women of Patna District. The economic viability of the mushroom production and yield ranged from 80 to 120 kg/100 kg wheat straw and total income from 100 kg wheat straw ranged from Rs. 6400-12000 with a net profit of Rs.4650-12000 in six months. Sixty percent of farm women socially accepted mushroom production as an income generation activity.

Chitra et al. (2018) examined that the total expenditure was about Rs.5760. Spawn is the main input of mushroom production. The average cost of spawn per bag was about Rs.30. The economic analysis further revealed that the cost of production per kg of mushroom was Rs. 60.63. Gross return was Rs. 20000/-. The net return was about Rs.14240. The returns per kilogram came about Rs. 149.89.

Osalusi and Usman (2018) showed that the average profit margin of mushroom production in the study area was Rs 732,500, which means that the business of mushroom production is a profitable venture.

Kumar et al. (2019) showed that the per 100 sq. ft. cost of cultivation of mushroom varied from Rs 2982.86 on small farm growers to Rs 2387.54 on large growers with an average cost of Rs 2676.25. On average, total fixed and variable costs were Rs 540.41 and Rs 1474.31 which constituted 20.19 per cent and 55.33 per cent of the total cost, respectively. Average mushroom production per 100 ft² area across small, medium, and large growers was 56.23 kg, 57.77 kg, and 58.65 kg, respectively.

2.2 Resource use efficiency of Mushroom Production

Garcha (1980) reported on the scope of mushroom cultivation in Punjab because of easier and cheaper availability of raw materials required for the enterprise along with faster means of marketing and communication, the good purchasing power of the people, and above all good receptive and responding farming community. He also suggested two year old spent compost and farmyard manure (1:1) as good casing material.

Lakshmanan, (1990) attempted the re-thinking of technology for small farming. He emphasized ways and means through which the Indian economy of Indian villages could be improved. He considered mushroom cultivation as one such venture in which waste like a cotton waste, straw waste, and other biomass could be used in growing mushroom.

Saini and Prashar (1993) reported that the yield of white button mushroom is greatly affected by the quality of casing media. Out of the seven casing media selected, a mixture of farmyard manure addition of waste compost and the addition of soil (2:1:1) gave the highest yield. Among all the combinations the casing media

prepared with different ratios of farmyard manure waste compost and soil proved better as far as mushroom yield is concerned.

Sharma & Gupta (1993) found that India had about 2500 million tonnes of agricultural waste. Around 50% of this straw were remained unused and was burnt in-situ. If mushroom will be grown on this agricultural straw would not only reduce environmental hazards and also helps in disposal of these wastes but also produce a mushroom crop for an edible purpose which provides us various nutrition.

Singh (2001) pointed out that demand for mushroom was minimal in India, both because customers largely not aware of the existence and qualities of edible mushroom along with high prices.

Beetz and Kastudia (2004) concluded that mushroom cultivators should have the ability to carry out the operation on time. However, they have the potential to innovate, who can use the existing facilities at a low-cost.

Rath et al. (2007) observed that mushroom production for the economic empowerment of women is a profitable activity. There is an urgent need to impart technical know-how to women to adopt mushroom production as an income-generating activity for enhancing the additional income of their family.

Saikai Trishnale (2014) was analyzed by comparing the marginal value product (M.V.P) of input with its respective factor cost and the stratifications were as follows: Group I: 0-50 bags Group II: 51-150 bags Group III: 151-300 bags Group IV: 301 and above. The overall M.V.P. of spawn was observed to be 13.30 implying that the addition of one unit of spawn would have increased gross income by Rs. 13.30. On the other hand, the overall M.V.P of other expenditures was observed to be 1.68 which ranged from -0.558 in group III to 3.481 in group II amongst the different size group of growers. Similarly, the overall MVP of labour was estimated to be 0.97 which varied amongst the different size groups of farmers from -3.023 in group I to 6.249 in group IV.

Thakur (2014) observed that Mushroom farming is becoming a successful venture because of the cost of its very low inputs. In India, mushroom growing can be highly rewarding because of the climate. As a livelihood diversification option, mushroom cultivation has helped to improve food security and income generation

being fast yielding and nutritious food with great medicinal value. The technology can be profitably considered in areas where land is a limiting factor and agricultural residues are available easily. Cultivation does not require any significant capital investment or access to land, as mushrooms can be grown on a substrate prepared from any clean agricultural waste. It can be carried out on a part-time basis, requires maintenance, and is an able and attractive activity for rural, semi-urban, and urban dwellers, in particular women and people with disabilities. Through the provision of income and improved nutrition, successful cultivation and trade in mushrooms can strengthen livelihood assets, which not only reduce vulnerability to shocks but enhance an individual's or a community's capacity.

Gowda *et al.* (2017) revealed that the commercial button mushroom must be encouraged to concentrate on export demand. Such units must be enabled to receive financial support, subsidized electricity, and cold chain facility to avoid post-harvest losses. Under Indian conditions and more particularly in rural areas, awareness of mushroom consumption needs to be heightened for reaching the larger mass. The institutional mechanism for raining, capacity building must be emphasized at regular intervals. National Horticulture Mission has received appreciation for its support to the horticultural sector in Karnataka; however, it appears to be the right time for NHM to focus more on developing the mushroom industry in the state.

Kumar, *et al.* (2018) observed Mushroom cultivation provides self-employment and additional income to youth. By mushroom cultivation, waste material will be used as bio- compost for the agriculture field. With the help of mushroom cultivation, waste material converted into various nutrients, it also helps in soil water holding capability and decreases soil erosion also. Mushrooms are used in pharmaceutical factories and thousands of mushroom species help to improve our health.

Singh, R, and Singh, J.M (2018) worked out the component-wise cost-return structure of mushroom growing along with the returns realized by the mushroom growers in the state of Punjab. It is seen that mushroom growing is a labour-intensive enterprise and it is the most important constituent of the variable cost, followed by expenses on composting and spawning. A negative association is observed between the total costs per m² of bed area spawned with the increase in the farm-size revealing

the economies of scale. The net returns have been found higher on large mushroom farms, followed by medium and small farms. He also revealed that the judicious use of pesticides to control diseases labour-use in compost preparation and casing operations can help in enhancing the value productivity of mushrooms significantly. Thus, there is a scope of decreasing the cost of mushroom production along with increasing the returns per square metre of bed area spawned by increasing the farm size.

2.3 To identify the existing marketing channels and determine their efficiency.

Sharma, M.L *et al.* (1994) identified the channels and the agencies involved in the marketing of mushroom in the hills of Uttarakhand. They also calculated the gross marketing margins of agencies and the price spread in various marketing channels. They concluded that mushroom producer's received a low price for their produce while intermediaries took high margins. There was the importance of processing facilities and the regulation of marketing activities of intermediaries in the area so that the margins of intermediaries will be reduced, and mushroom cultivation will be made more remunerative and viable for the producers.

Khatkar *et al.* (2005) examined the cost of and returns from mushroom production as well as the margins and marketing cost of mushroom in the Haryana state of India. Marketing data were collected from the Azadpur (Delhi) market while production data of the year 2001-02 were obtained from a sample of 30 mushroom growers in Sonipat district. Thus it indicated that mushroom production was an economically viable venture but the middlemen got the highest share in the consumer's rupee. Thus, it was proposed that processors and cooperative marketing should be encouraged to increase the producer's margin.

Kumar (2008) conducted a study in Jharkhand state and reported that there are four prominent marketing channels used for the disposal of mushroom, while NGOs and Co-operative marketing societies are played a major role in the marketing of mushroom. The study proposed that complaints against NGOs and Co-operative were reported, for the low unit price paid to the growers and discouraging the growers to boost this enterprise to maximize their production.

Bishnoi et al. (2010) conducted their study on the disposal pattern of mushroom through different marketing channels and it reveals that the maximum quantity of more than 80 % of mushroom was sold through channel-I, in which there was the involvement of all the stakeholders, i.e. grower, wholesaler, retailer, and consumer. The channel-II, in which the retailer was present, could attract marketing of around 10 per cent production of mushroom from all the categories of growers. The marketing of mushroom through a channel-III in which wholesaler was present, was 4-5 per cent of their produce by small and medium farmers and 10 per cent by large farmers. And Channel- IV is the direct selling of mushroom by growers to consumers was practically not followed by large farmers, but small and medium farmers did sell 2-4 per cent of their produce through this channel. Thus, the order of disposal of mushroom through different channels was:

channel-I > channel-II > channel- III > channel-IV

He also showed the share of the producer in consumer rupee was maximum in channel-IV (91.51%) and minimum in channel-I (62.62%). But, the price received by the grower was highest in channel-IV (Rs 35/kg) and minimum in channel-I (Rs 32/kg). The marketing cost of producer across different channels was highest in channel-II (10.66%), followed by channel-I (9.90%), channel-IV (8.49%) and channel-IV (6.56%), but in absolute terms it was maximum under channel-I (Rs 4.37/kg), followed by channel-II (Rs 4.27/kg). The marketing cost as well as net margin of wholesaler under channel-I and channel-II were almost equal. The consumers paid Rs 44/kg, Rs 40/kg, Rs 43/kg, and Rs 35/kg on purchasing mushroom through channels I, II, III, and IV, respectively.

Singh et al. (2010) examined the cost, returns, and break-even point of mushroom production on different categories of farm units, and also investigated the existing marketing facilities along with marketing cost, margins, and marketing efficiency in the district of Sonapat and Gurugram in Haryana during the year 2003-04. They found that

- (i) The use of compost has a positive relationship with the unit size.
- (ii) The fixed capital investment was more than double in large and medium farms as compared to the small farms

- (iii) Large farmers have the lowest cost of mushroom production as compared to small and medium farms due to efficient utilization of fixed farm resources
- (iv) There is a positive relationship between mushroom production and farm size
- (v) The producer share in consumer rupee is highest in the channel (Mushroom grower----- Consumer), followed by channels (Mushroom grower → wholesaler/Commission agent → Consumer), (Mushroom grower →Retailer → Consumer) and (Mushroom grower →Wholesaler/Commission agent → Retailer → Consumer,) respectively. The channel (Mushroom grower to Consumer) was the least efficient due to the existence of large number of middlemen. The study has suggested that
 - (a) Mushroom cultivation is capital-intensive; the financial assistance through institutional agencies at a cheaper interest rate would be the desirable
 - (b) Mushroom is a highly perishable commodity and susceptible to high temperature, and marketing infrastructures would be of very importance.

Trishnale et al. (2013) conducted a study in the Jorhat district of Assam to examine the disposal pattern and constraints faced by the mushroom growers. The average production of mushroom was found to be 211.37 kg per grower per season which varied from 30.70 kg to 599.60 kg in different sizes of production units. Percentage of marketed surplus to total production was found lowest in a small unit (89.00%) and Highest in the large unit (92.11%) which showed a decreasing trend with the increase in farm size. Out of the total marketed surplus, 87.20 per cent was sold within the state markets, while the remaining 12.80 per cent was marketed outside the state markets.

Chauhan and Sharma (2015) conducted studied on production potential, economic viability, and marketing of varied size mushroom units in Himachal Pradesh. The study revealed that channels involved (Growers----Wholesaler----Retailer----Consumer) and channel (Growers---- Retailer----Consumer) was the most important marketing channels followed by 16.25 and 28.81 per cent growers, respectively through which the corresponding disposal was found to be 57.59 and 27.64 per cent. The mushroom growers could get a net price of Rs. 96 to Rs. 123 per kg in the study area. The total marketing cost incurred in the sale of mushrooms was

found to vary from Rs. 2.04 to Rs. 24.69 depending upon the length of the marketing channel. The net margins of middlemen were in the range of 19 Rs. 20 to Rs. 29 per kg. The producer's share in consumer's rupee varied from 64 per cent to 99 per cent.

Shirur et al. (2015) conducted their study in the Karnataka state of India. The information of mushroom marketing channels was collected from 50 mushroom growers in which 36 have very small units (less than 10 kg per day), 11 were small units (11- 50 kg per day), medium (51- 100 kg per day), and 2 was very big (more than 500 kg per day) units. It was observed that large units mushroom growers sell their produce to wholesalers while small units growers sell their produce to consumers and retailers, While very small units mushroom growers sell their produce to the consumer directly whereas medium mushroom growers unit sells their produce to the retailer directly. Small units are not branding their produce while big units are branding and packing their produce by 160- 180 GSM polythene. The price variation is observed by the growers while selling directly to consumers and retailers whereas selling their produce to the wholesaler.

2.4 Various constraints faced by mushroom growers.

Mehta (1982) examined the study on problems faced by mushroom growers in Punjab reported that spawn and compost availability, transportation of raw materials, non-availability of spawn and compost, and high cost of compost were the main problems.

Tiwari and Kapoor (1988) analyzed the economics of mushroom cultivation in Himachal Pradesh. Mushroom cultivation was a profitable proposition and labor-intensive business. At the same time, they also emphasized the problem faced by mushroom growers on training, finances, availability of compost, timely availability of high-quality spawn, and marketing of mushroom including its processing.

Ferchak and Croucher (1996) observed that India has grown slowly since its beginning in the 1960s. Reasons for this slow growth were such factors as traditional fears of mushrooms because of poisonous species, and avoidance of Brahmin classes, lack of quality spawn and substrate, lack of capital and expertise & lack of government support for an extension.

Suresh and Singh (2007) revealed that the fixed capital investment of small farms was more than double as compared to large and medium farms, the use of compost with farm size was a positive relationship, and there was a positive relationship between mushroom production and farm size as well as the low cost of mushroom production. The major problems of mushroom production were lack of finance, lack of availability of good quality spawn high price of spawn, and problems of insect, pests, etc.

Nasib et al. (2008) identified that fluctuating prices prevailing in the market, lack of cold storage, and non-availability of drying equipment were found to be the important constraints perceived by 100 per cent of the respondents. The other important constraints were lack of current information about marketing (90%), lack of finance (84.66%), lack of transportation facility (76.36%), inadequate knowledge about mushroom technology (75%), and non-availability of quality spawn (69.72%).

Geetha and Job (2010) conducted their study on *Pleurotus* mushroom which indicated that mushroom cultivation would be taken as an agri-business and was an ideal enterprise for housewives to earn an additional income. The major contributor of working capital was the material input (78 %) and the rest by hired labor. Explicit costs increased as the size of the operation increased while implicit costs showed a decreasing trend. Low yield due to the incidence of disease and pests was the most important production constraint followed by the high price of inputs and low yield due to seasonal variation. The major marketing problem was a lack of awareness and nutritional qualities of mushrooms.

Gautam et al. (2014) reported the marketing constraints faced by the trained respondents arranged in descending rank order. Lack of proper marketing channels was ranked first (MSV 0.98) followed by Proper markets being distantly located ranked second (MSV 0.88), No marketing of mushroom in local markets ranked third (MSV 0.69), and Lack of remunerative mushroom prices ranked fourth (MSV 0.49). Since in India there are no proper market places in rural areas if markets are available in their places then it will be for a short duration like a weekly or quarterly market. Markets are properly available only in urban areas which are far from their places, so Lack of proper marketing channels and Proper markets being distantly located were reported major constraints by the respondents.

Chauhan S. K and Kangotra Arti (2014) studied shows that the business principles like training prior adoption of activity, lack of knowledge, market survey, etc. were given due consideration and one-half of them started an enterprise with a small scale of 50 or less number of spawned compost bags each weighing 20 kg with an average unit investment of Rs 45,428 only. The majority (80%) could grow in a single crop with an average yield of 3.62 kg per spawned compost bag which increased with the size from 3.52 kg on small to 3.64 kg per bag on large units showing the low cost of production on large units due to economies of scale.

Divya et al. (2016) examined problems faced by mushroom growers have been categorized into three sub-heads viz, production, marketing, and institutional problems. The main problem related to production was that of insect-pest attack and the incidence of diseases was high and about 50.55 percent of the respondents recited this problem, a major market-related problem expressed by the growers due to its high cost (27.75%) followed by inadequate facilities for grading and storage (27.25%) and lack of market information (24.55 %). In the study area growers also reported institutional problems. Another main problem was the non-availability of spawned compost bags (30.85%). Problem-related to lack of awareness (17.55%) was also observed. About 38 and 25 per cent of the respondents reported that the package of practices on available and training facilities was not adequate. 32 per cent of family members were not interested in mushroom production and 8 per cent of members were having the problem of inadequate space for mushroom production.

Osalusi and Usman (2018) revealed that fly and cockroach, inadequate cultivation house, inadequate spawn, hot temperature were the constraints faced by mushroom production in the study area. Other constraints include; the high price of raw materials, inadequate capital, fungi infection, and inadequate loan facilities.

Grace, Arowosoge (2018) examined that the high-cost of spawn, poor production technology, and inadequate funding were the major problems faced against the production of mushroom. Research Institute of Nigeria should be committed to training mushroom producers on how to produce spawn so as it reduces the cost of production and encourages more people to produce mushroom.



Description of the Study Area

*“Everyone has a will to win
But very few have the will to prepare for win”*

Vinci



This chapter provides a general description of the study area where the present study has been conducted. Knowledge about the geographical profile and demographic characteristics of the study area is of great importance as it helps to understand the problem clearly and to draw inferences accordingly. The present study was conducted in the Dehradun district of Uttarakhand. This chapter has been divided into three sections. The first section 3.1 gives a brief description of the geographical, demographic, and agricultural features of Uttarakhand. Section 3.2 describes the geographical, demographic, and other important features of Dehradun district. Section 3.3 deals with the information about different blocks of Dehradun district which was selected in my study.

3.1 General features and geographical structure of Uttarakhand

3.1.1 Geographical features

Uttarakhand is located at the foothills of the Himalayan mountain ranges. The state was carved out from northern Uttar Pradesh on 9th November 2000 as the 27th State of India. Uttarkhand is mainly a hilly state having international boundaries with China (Tibet) in the north and Nepal in the east. On its North-West lies the Himachal Pradesh, while on the South is Uttar Pradesh. It lies between 28°43' north latitudes to 81°02' east longitudes. Its geographical area includes both hill and plain areas, with hills covering an area of about 46035 sq. km and plains covering an area of 7448 sq. km with a total of 53483 sq. km. (Table 3.1). The length and the width of the Uttarakhand state is 358 km and 322 km, respectively. It has a wide variety of geographical features ranging from snow-capped mountain peaks in the north to tropical forests in the south; its climate and vegetation vary accordingly.

Uttarakhand state has two major administrative units viz., Kumaon (South-East portion) and Garhwal (North-West portion) region composed of a total of 13 districts. Garhwal consists of the remaining 7 districts of the state which include Dehradun, Haridwar, Pauri, Chamoli, Rudraprayag, and Tehri, while Kumaon consists of 6 districts viz, Nainital, Bageshwar, Almora, Pithoragarh, Champawat, and Udham Singh Nagar.

Table 3 .1: General features of Uttarakhand

S. No.	Particulars	Unit	Uttarakhand
1.	Total geographical area	Sq. Km	53483
2.	Number of Divisions	No.	02
3.	Number of Districts	No.	13
4.	Number of Tehsils	No.	110
5.	Number of Towns	No.	86
6.	Development blocks	No.	95
7.	Gram Panchayat	No.	7791
8.	Nyaya Panchayat	No.	670
9.	Municipal Corporation	No.	08

Source: Uttarakhand at a Glance (2017-18)

3.1.2 Demographic features

The total population of Uttarakhand state is 10, 086,000 with a rural population of 703,700 and an urban population of 305,000. Out of the total population, males and females are 513800 and 413800, respectively.

Table 3.2: Demographic features of Uttarakhand

S. No.	Particulars	Unit	Uttarakhand
1.	Area	Sq. Km	53483
2.	Total population	Lakh	100.86
a.	Male	Lakh	51.38
b.	Female	Lakh	41.48
3.	Rural population	Lakh	70.37
4.	Urban population	Lakh	30.50
5.	Sex ratio	Per 1000	963
6.	Literacy rate	Per cent	78.80
a.	Male	Per cent	87.40
b.	Female	Per cent	70.00
7.	Density of Population	Per sq.km	189

Source: Census 2011, Government of India

3.1.3 Land utilization pattern

The land use pattern of Uttarakhand has been shown in Table-3.3. Out of the total reported area, the net sown area was 672530 ha which accounts for about 11.20 per cent of the total area. The maximum portion of Uttarakhand is under forests with 3811662 ha, which is 63.48 percent of the total area. Cultivable waste land contributes 5.39 per cent and the area under barren and un- cultural land occupies 4.15 per cent of the total area.

Table 3.3: Land use pattern in Uttarakhand

S. No.	Particulars	Area in Uttarakhand (ha)
1.	Total reported area	6004313 (100.00)
2.	Forest Area	3811662 (63.48)
3.	Cultural waste land	323731 (5.39)
4.	Current fallow	73284 (1.22)
5.	Fallow land other than current fallow	86325 (1.44)
6.	Barren and un-cultural land	249520 (4.15)
7.	Land under non-agricultural use	185836 (3.09)
8.	Permanent pasture and other grazing lands	207804 (3.46)
9.	Orchard and shrubs not included in net sown area	393621 (6.55)
10.	Net area sown	672530 (11.20)

Source: Uttarakhand at a Glance (2017- 18)

(Figures in the parentheses indicate percentage to total reported area)

3.1.4 Land holding pattern

The distribution of land holdings in Uttarakhand is shown in Table-3.4. The table shows that 74.71 per cent of individuals consist of marginal land holdings followed by small farmers who share 16.89 per cent and the remaining come under medium and large holdings with 8.82 and 1.13 per cent respectively.

Table 3.4: Distribution of landholdings in Uttarakhand

Category of farm	Number of holdings	Per cent to total holdings	Total area occupied (ha)	Per cent to area occupied
Marginal holdings (<1 ha)	6,59,000	74.71	2,84,000	38.01
Small holdings (1-2 ha)	1,49,000	16.89	2,06,000	25.58
Semi-medium and medium holdings (2-10 ha)	73,000	8.82	2,34,000	31.32
Large holdings (>10 ha)	1,000	1.13	23,000	3.08
Total	8,82,000	100.00	7,47,000	100.00

Source: Uttarakhand at a Glance (2018-19)

3.1.5 Sources of Irrigation

Uttarakhand holds net irrigated area of 328756 ha. Tube wells and Canals are the major source of irrigation in Uttarakhand which contributes 56.76 and 22.38 per cent of net irrigated area respectively. (Table 3.5)

Table 3.5: Source-wise irrigated area in Uttarakhand (2017-18)

S. No.	Source of irrigation	Net irrigated area (ha)	Percentage of net irrigated area
1	Canals	73584	22.38
2	Tube wells	186613	56.76
3	Other Wells	46931	14.27
4	Tanks	04	0.0012
5	Other sources	21624	6.58
	Total	328756	100.00

Source: Uttarakhand at a Glance (2018-19)

3.1.6 Classification of workers

Table-3.6 shows that the total population of Uttarakhand is 100.86 lakh. The majority of its population lives in rural areas (70.37 lakh) while the population of urban areas is 30.50 lakh. Its total working population is 38.72 lakh with a majority of workers are from rural areas (28.85 lakh) while remaining from urban areas (9.86 lakh).

Table 3.6: Classification of workers in Uttarakhand

(In lakhs)

S. No.	Particulars	Uttarakhand		
		Total	Rural	Urban
1.	Total population	100.86	70.37	30.50
2.	Total working population	38.72	28.85	9.86
3.	Total main workers	28.71	19.97	8.73
4.	Total marginal workers	10.01	8.82	1.134
5.	Total Non-workers	62.14	41.51	20.62
6.	Male population	51.37	35.19	16.18
7.	Male working population	25.51	17.26	8.25
8.	Male main workers	20.70	13.22	7.48
9.	Female population	49.48	35.17	14.30
10.	Female working population	13.20	11.58	1.61
11.	Female main workers	7.99	6.74	1.25

Source: Agricultural Statistics at a glance, 2018-19

3.1.7 Cropping pattern

The area under different crops in Uttarakhand is shown in Table-3.7. This revealed that wheat and paddy were the most important crops contributing 30.20 and 23.70 per cent area of their cropped area, respectively.

Table 3.7: Area under different crops in Uttarakhand

S. No.	Crops	Area (ha)	Percentage of total cropped area
1.	Wheat	326999	30.20
2.	Paddy	256632	23.70
3.	Barley	23226	2.14
4.	Maize	20785	1.19
5.	Mandua	91937	8.49
6.	Total cereals	775821	71.65
7.	Total pulses	59874	5.53
8.	Total food grains	865037	79.89
9.	Oilseeds	29342	2.71
10.	Sugarcane	91233	8.43
11.	Potato	26448.52	2.44
12.	Vegetables	70822.98	6.54
13.	Fruits	180468.79	16.67
13.	Total cropped area	1082706	100.00

Source: Uttarakhand at a Glance (2017-18)

(Figures in the parentheses indicate percentage to total cropped area)

3.1.8 Livestock Population

The state is capable of varieties of livestock like sheep, cattle, buffalo, goat, poultry, etc. The livestock population is presented in table-3.8.

Table-3.8: Livestock Population in Uttarakhand

Population of Livestock	Rural	Urban	Total
Livestock	4689261	105469	4794730
Poultry	4567486	74451	4641937
Total	9256747	179920	9436667

Source: Livestock Census 2018-19

3.2 General features of Dehradun district

3.2.1 Geographical features

Dehradun is the capital of Uttarakhand state of India. The district Dehradun is a micro-geographical area covering 3088 sq. km. It also irregular parallelogram in shape, located between 77⁰ 35' and 78⁰ 20' longitude east district tract. Geographically, the district is surrounded by the Himalaya mountain on the north, while Shivalik hills on the south and the river Ganga south-east and the river Yamuna on the north-west. Its elevation ranges from 315 to 2500 m and the gradient varies between 7 and 10 km. This district receives 137.3 cm to 188.6 cm rainfall annually depending upon other climatic factors. In general, the temperature varies with the maximum range of 16 ° C to 36⁰ C in summer (April to July) and 2⁰ C to 24⁰ C in winter (November to February). It has got its own identity since it includes urban, rural, and forest area. Most of the part of this district is plain and river.

Table 3.9: General features of Dehradun district

S. No.	Particulars	Unit	Statistics
1.	Total geographical area	Sq. km	3088
2.	Number of Tehsils	No.	07
3.	Development blocks	No.	06
4.	Gram Panchayat	No.	401
5.	Nyaya Panchayat	No.	36

Source: Sankhiyiki Patrika 2019.

3.2.2 Demographic features

Dehradun district of Uttarakhand has a population of 1696700 with a rural population of 754750 and an urban population of 941940. The average literacy rate was 84.25 per cent and the population density was 549 per square km.

Table 3.10: Demographic feature of Dehradun district

S. No.	Particulars	Unit	Dehradun
1.	Total population	No.	1696700
2.	Rural	No.	754750
3.	Urban	No.	941940
4.	Literacy	Per cent	84.25
	a. Male	Per cent	89.40
	b. Female	Per cent	78.53
5.	Sex- Ratio	No.	902
6.	Population density	Per sq. km	549

Source: Statistical Bulletin, Dehradun district, Uttarakhand (2019)

3.2.3 Land use pattern

Table 3.11 shows that the total area available is 3088 sq km. Out of this, 65.36 per cent cover under forest, followed by cultivable waste (17.36 per cent), net sown area (11.76 per cent), etc.

Table 3.11: Land use pattern in Dehradun district

S. No.	Particulars	Units	Area	Percentage of total reported area
1.	Total reported area	Sq. km	3088	100.00
2.	Forests	Ha	201830	65.36
3.	Cultivable waste	Ha	53629	17.36
4.	Land under non-agriculture use	Ha	22816	7.39
5.	Permanent pastures	Ha	9744	3.15
6.	Land under misc. tree crops & groves	ha	14108	4.57
7.	Barren & uncultivable land	Ha	2342	0.758
8.	Current fallows	Ha	3974	1.28
9.	Other fallows	Ha	11705	3.79
10.	Net sown area	Ha	36337	11.76
11.	Total Cropped Area	Ha	66300	21.47

Source: State Agriculture Plan 2012- 2017

3.2.4 Occupational distribution of the population

Most of the population in the district was involved in the other work (79.77 per cent) for their livelihood. Farmer and agricultural labourers accounted for 12.36 and 4.18 per cent. (Table 3.12)

Table 3.12: Occupational distribution of population Dehradun district

S. No.	Particulars	Total number	Percentage of total worker
1	Total workers	582768	100.00
Main workers			
a.	Farmers	60373	12.36
b.	Agricultural labourers	20424	4.18
c.	Household industry worker	17960	3.68
d.	Other workers	389404	79.77
e.	Subtotal	488161	100.00
Marginal Growers			
94607			

Source: Statistical Bulletin, Dehradun district, Uttarakhand (2018-19)

3.2.5 Sources of irrigation

The major source of irrigation in the district is canals, covering about 77.79 per cent of the total irrigated area, while 13.97 percent area was irrigated by government tube wells. (Table 3.13)

Table 3.13: Source-wise irrigated area of Dehradun district

S. No.	Source of irrigation	Area (ha)	Percentage of net irrigated area	
1.	Canals	14998	77.79	
2.	Tube wells	Government	2694	13.97
		Private	-	-
3.	Wells	73	0.38	
4.	Ponds	04	0.026	
5.	Others	1509	7.83	
6.	Total	19278	100.00	

Source: Statistical Bulletin, Dehradun district, Uttarakhand (2018- 19)

3.2.6 Cropping pattern

Table 3.14 reveals that Kharif crops were the most important followed by Rabi and Kharif crops while the share of fruit was also high. The least share was from spices and Potato.

Table 3.14: Area under different crops in Dehradun district

S. No.	Crop	Area (Ha)	Percentage
1.	Kharif Crops	37103	28.33
2.	Rabi Crops	21730	16.59
3.	Sugarcane	5400	4.12
4.	Potato	2655	2.027
5.	Floriculture	20978	16.02
6.	Vegetables	14847	11.34
7.	Fruit	27085.84	20.69
8.	Spices	1138.38	0.87
	Total	130937.22	100.00

Source: Statistical Bulletin, Dehradun district, Uttarakhand (2018-19)

3.2.7 Livestock Population in Dehradun District

This revealed that the maximum number of Poultry was there in the Livestock population followed by Cattle and Goat.

Table 3.15: Livestock Population in Dehradun district

S. No.	Animals	Units	No. of Animals
1.	Cattle	Number	180907
2.	Sheep	Number	11721
3.	Poultry	Number	400940
4.	Buffalo	Number	52845
5.	Goat	Number	136729

Source: Uttarakhand Livestock Census, 2012

3.3.1 Geographical features of selected blocks (study area)

Vikasnagar was formerly known as Chauhadpur Nardidih. It has an average elevation of 452 metres (1,483 feet). Vikasnagar lies along the river Yamuna, nearly 40 km north-west of Dehradun. Vikasnagar and adjoining Herbertpur and Dakpathar are collectively known as "Gateway to Jaunsar".

Sahaspur block is bounded by Vikasnagar Tehsil towards North Sahaspur summer highest day temperature is between 21 ° C to 38°. Average temperatures are 8 ° C to 34 °C.

Doiwala is located at 30.18°N 78.12°E. It has an average elevation of 485 metres (1,591 feet). The place comes under Doon Valley's Terai and Bhabhar region. It is notable for its location near the centre of the triangle formed by the three important metropolitan and cultural regions of Uttarakhand.

Raipur is located at 30.306°N 78.098°E. It has an average elevation of 663 metres (2,175 feet).

Table 3.16: Demographic features of selected blocks

S. No.	Particulars	Unit	Vikasnagar	Sahaspur	Raipur	Doiwala
1.	Total area	Sq. km	249.96	303.92	264.42	205.35
2.	Male population	No.	86465	96807	85531	115070
3.	Female population	No.	79198	87574	79855	106443
4.	Total population	No.	165663	184381	165386	221513
7.	Literate	No.	106766	134044	155350	172029

Source: Census of India, 2011,

3.3.2 Cropping pattern

Table 3.17 depicts that Kharif and Rabi were the main crops grown in different selected blocks together. It was further observed that the horticultural crop was another important crop grown in selected blocks.

Table 3.17: Area under different crops in selected blocks

S. No.	Crops	Vikasnagar	Sahaspur	Raipur	Doiwala
		Area (ha)	Area (ha)	Area (ha)	Area (ha)
1.	Kharif Crops	5438	3695	4175	7454
2.	Rabi Crops	1589	6427	4241	5825
3.	Zaid Crops	1045	435	372	443
4.	Potato	360	434	419	502
5.	Vegetables	1573	1720	1548	1991
6.	Fruits	4017	3756	3006	2276

Source: Sankhiyiki patrika 2018-19

3.3.3 Land use pattern

According to the given Table 3.18, Doiwala, Sahaspur, Raipur, Vikasnagar block has a geographical area and forest area of 43372, 40235, 23737, 28022 hectares, respectively. The Doiwala block has more forest cover than the remaining three blocks. Sahaspur block has a more reported area than Vikasnagar, Raipur, and Doiwala Block. Land under misc. trees and groves were 1843 high in Raipur as compare to other blocks.

Table 3.18: Land utilization pattern of selected blocks

S. No.	Particulars	Unit	Vikasnagar	Sahaspur	Raipur	Doiwala
1.	Total reported area	Ha	42672	60132	50100	57045
2.	Forests	Ha	28022	40235	23737	43372
5.	Permanent pastures	Ha	525	810	285	251
6.	Land under misc. tree crops & groves	Ha	404	799	1843	693
7.	Barren & uncultivable land	Ha	891	450	262	65
9.	Other Land for cultivation	Ha	3617	4966	8066	2566
11.	Area sown more than once	Ha	1641	1389	3141	7313
12.	Net sown area	Ha	5445	3585	2716	5853
13.	Gross Sown Area	Ha	7110	4971	5196	8979

Source: Sankhiyiki patrika 2018-19

3.3.4 Sources of irrigation

Table 3.19 depicts that the Vikasnagar and Doiwala block has 5266 and 4270 canals which are highest than other blocks. Tube wells were the second source, there were only government tube wells as showed in the table.

Table 3.19: Sources of irrigation in selected blocks

S. No.	Source of irrigation		Vikasnagar	Sahaspur	Raipur	Doiwala
1.	Canals		5266	2657	1949	4270
2.	Tube wells	Government	774	846	703	371
		Private	-	-	-	-
3.	Wells		0	35	24	14
4.	Ponds		4	-	-	-
5.	Others		91	181	133	734
6.	Total					

Source: Sankhiyiki patrika 2018-19

3.3.5 Work participation rate

Table 3.20 illustrates that the maximum workforce in the Doiwala block followed by Vikasnagar, Sahaspur, and Raipur Block.

Table 3.20: Classification of workers in different selected blocks

Block		Vikasnagar	Sahaspur	Raipur	Doiwala
1.	Total workers	49266	46988	37353	70290
a.	Farmers	7298	4334	4582	7446
b.	Agricultural labourers	6493	2951	816	3908
c.	Household industry worker	898	1485	1137	2668
d.	Other workers	23888	28314	24124	39186
2.	Marginal Worker	10689	9904	6694	17082

Source: Sankhiyiki patrika 2018- 19

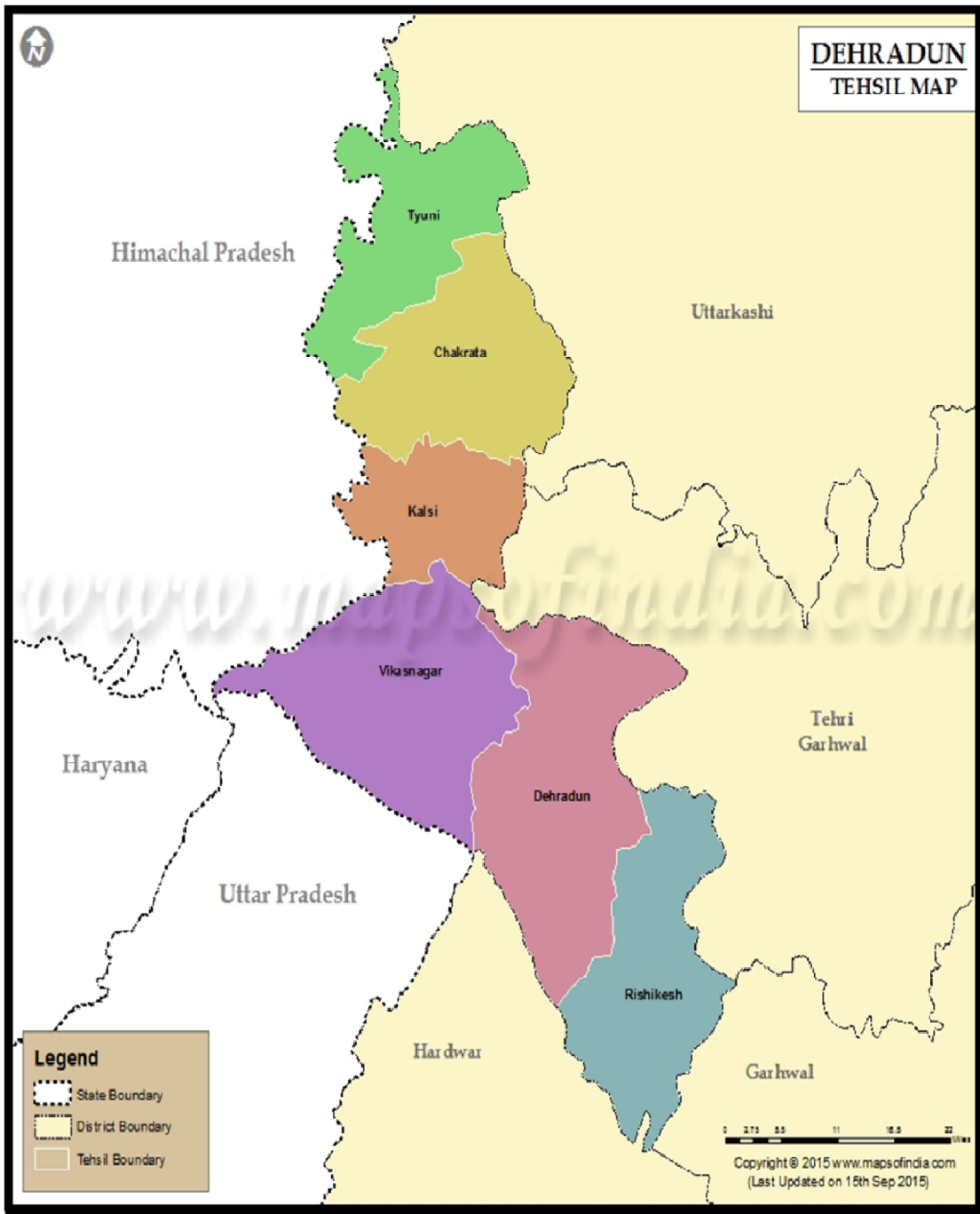


Figure 3.1: Map of Dehradun State



Methodology

*“Do not believe in anything because it is presented so
It is said to you, unless and until you, yourself,
explore the truth”*

Swami Vivekanand



In this Chapter, the proposed study will highlight the mushroom cultivation in the Dehradun district of Uttarakhand and also their marketing and constraints. The evidence gained from the proposed study gives an idea about “how the research work can be done systematically”. This chapter is categorized into various sections, i.e. study area, sample design, collection, and description of data and analytical framework. That was employed for achieving the following objectives of the research work.

1. To work out the cost of and returns from mushroom cultivation.
2. To examine the resource-use efficiency of Mushroom production.
3. To identify the existing marketing channels and determine their marketing efficiency.
4. To identify and rank various constraints faced by mushroom growers.

4.1 Study area

4.2 Sources of data

4.3 Sampling design

4.4 Analytical framework

4.1 Study area

Mushroom production has played an important role in the economy of Uttarakhand. The Uttarakhand state consists of two regions i.e., the Garhwal region and Kumaon Region. The share of mushroom production in the Garhwal region (about 86 per cent) was very high as compared to the Kumaon region (about 14 per cent) in the year 2017-18 (table-4.1). Garhwal region of Uttarakhand has seven districts namely, Dehradun, Haridwar, Tehri, Pauri, Rudraprayag, Chamoli, Uttarakashi. The study was conducted in the Dehradun district of Uttarakhand. Dehradun is evolving as a hub of mushroom production as well as mushroom units. (Table- 4.2).

Table 4.1: Pattern of mushroom production from 2014 to 2018 in the Garhwal region of Uttarakhand

S. No	Year	Kumaon (tonne)	Garhwal (tonne)	Total
1.	2014- 15	1360	8620	9980
2.	2015- 16	1400	8836	10236
3.	2016-17	1665	9000	10665
4.	2017- 18	1710	10685	12395

Source- District Department of Horticulture, Uttarakhand

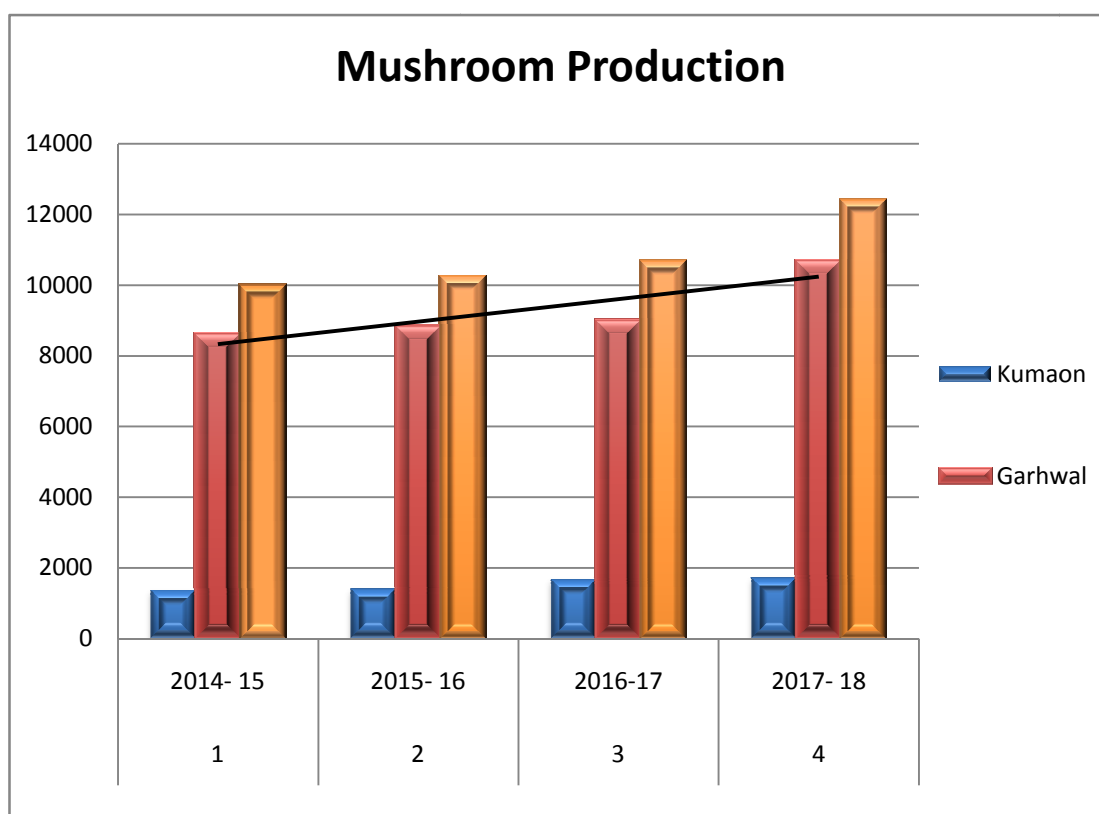


Figure 4.1: Increasing pattern of mushroom production in Uttarakhand State

Figure-4.1 indicated that there was an increasing pattern of mushroom production. It was mainly because the Garhwal region production was very high as compared to Kumaon region. Mushroom production is increased at an increasing rate.

Table 4.2: District-wise number of mushroom producing units established in 2018- 19.

District	Dehradun	Haridwar	Tehri	Pauri	Rudraprayag	Chamoli	Uttarkashi	Total
Amount of Spawn (kg)	2154	65	535	516	15	50	305	3640
Number of Growers	136	04	30	25	01	03	15	214
Production (Qtl)	172	06	43	41	1.2	04	24.4	292.1

Source:- District Department of Horticulture, Uttarakhand

4.2 Sampling design

The sampling procedure for the study includes different components- selection of study area, selection of mushroom growers, selection of marketing channels, and various constraints faced by mushroom growers.

4.2.1 Selection of Study Area

Dehradun is the capital of Uttarakhand and the district comprises six blocks namely, Vikasnagar, Sahaspur, Doiwala, Raipur, Kalsi, and Rishikesh. Out of these six blocks, four blocks were selected purposively based on the maximum number of growers and potentiality for mushroom cultivation. These blocks are Vikasnagar, Sahaspur, Doiwala, and Raipur.

4.2.2 Selection of Mushroom Growers

District-wise information on several mushroom producing units was obtained from the District Department of Horticulture, Uttarakhand. For selecting mushroom growers, a list of all mushroom growers was prepared for four blocks. As the list of mushroom growers, according to the size of their production units were not available. A random sample of 50 per cent growers was taken for detailed investigation from each block. Thus a total sample of 60 mushroom growers was selected for the study. The detailed list was given in table-4.3. After investigation, they were classified into three groups according to their size of production unit i.e. growing to have less than 150 bags, growing to have 150-300 bags, and growing to have 300 bags & above in their production units. The number of total mushroom growers and number of growers selected under both categories are given in table- 4.3.

Table 4.3: Selection of Mushroom growers from each block.

S. No.	Blocks	Number of Mushroom Growers		Number of Grower of Different Categories		
		Total	Selected	Below 150 bags	150-300 Bags	300 bags & above
1.	Vikasnagar	37 (30.83%)	18 (30%)	5 (29.41%)	7 (35%)	6 (26.08%)
2.	Sahaspur	28 (23.33%)	14 (23.33%)	3 (17.65%)	5 (25%)	5 (21.74%)
3.	Doiwala	26 (21.67%)	13 (21.67%)	4 (23.53%)	3 (15%)	6 (26.08%)
4.	Raipur	29 (24.17%)	15 (25%)	5 (29.41%)	5 (15%)	6 (26.08%)
Total		120 (100%)	60 (100%)	17 (100%)	20 (100%)	23 (100%)

(Figures in parentheses indicate percentage to total)

4.2.3 Selection of Marketing Channels

The mushroom produce is mainly sold to the nearby areas of the Dehradun district. For the study, a sample of 5 wholesalers and a sample of 9 retailers were selected randomly.

4.3 Sources of Data

Primary Data of the establishment of mushroom producing units (2018-19), various equipment, prices of inputs, output, etc are collected from selected growers through personal interviews. And data related to marketing such as channels involved for selling mushroom production, the price received and the price paid by different growers, marketing cost incurred, etc. were collected from a personal interview of selected mushroom growers and market intermediaries. And also covered data related

to various constraints faced by mushroom growers in mushroom production and marketing.

While Secondary Data was collected from various sites, journals, Uttarakhand at a glance, Sankhiyiki Patrika, Department of District Horticulture, District Extension Office, Dehradun, Uttarakhand, etc.

4.5 Concept and Definitions

i) Total Cost

Total Cost can be classified into two types: Fixed Cost and Variable Cost.

I. Fixed cost

TFC is the total fixed cost which includes the interest on the present value of fixed capital assets and depreciation value on equipment and machinery.

II. Variable costs

TVC is the total variable cost, which included the following items

- a) Cost of Straw used.
- b) Cost of spawn
- c) Cost of the casing
- d) Cost on Transportation
- e) Cost of labour (Hired + owned)
- f) Cost on chemicals
- g) Miscellaneous expenses
- h) Interest on working capital (@ 10 %)

ii) Evaluation of Resources used in compost preparation

All the resources used in the preparation of mushroom compost for cultivation have been evaluated based on the purchase cost and current market prices.

iii) Cost of Spawn

It is most important for mushroom production. Most of the growers had purchased spawn from various sources i.e., government agencies, private mushroom traders, NGOs, SHGs, etc.

iv) Cost of Purchased Bags

Many of the growers had many constraints such as low availability of land, lack of knowledge, lack of skilled labour, etc. so they bought mushroom compost and bags from various sources.

v) Value of Permanent and Hired Human Labour

Permanent human labour was formulated through Actual wages was paid to them and the remaining hired human labour was calculated through current wages paid to them.

vi) Electricity and Water Charges

Charges paid by the mushroom growers are based on the use of electricity in mushroom producing units.

vii) Depreciation on Implements

It is defined as the loss or decline in the value of assets like equipment, building, due to wear and tear. For this straight-line method was used.

viii) Cost of Casing and Miscellaneous

All the growers used casing for getting more harvesting so they used various resources like soil, sand, coco-peat, FYM, etc. And the value of these and other materials was calculated based on the purchasing price.

ix) Interest on Working capital and Fixed Capital

Interest addition to working capital such as labour, spawn, chemicals, casing, water and electricity charges which was used in production. The interest rate was 10 per cent per annum. While interest addition on fixed capital assets which are fixed year by year and the interest rate was 12 per cent per annum.

x) Cost of Chemicals

These were paid at the current cost incurred by the mushroom producers.

4.4 Analytical framework

Statistical analysis of data is an important aspect of any research work, as it facilitates classification, tabulation, and interpretation of the data. Data were analyzed in light of the objectives of the study.

4.4.1 To analyze the Costs of and returns from Mushroom production

To estimate the cost of and returns from mushroom production, data related to expenditure on different components of growers and returns from the sale of mushroom were analyzed using simple descriptive statistical tools. In the present study, cost and returns were estimated for the unit.

Cost of Mushroom production

Total fixed cost (TFC) and Total variable cost (TVC) were added to arrive at the total cost incurred on maintaining a unit.

Returns from Mushroom Production

Returns were estimated as illustrated below

Gross Return will be calculated by this formula:

$$\text{Gross Return} = Y_m \times P_m$$

Gross Return from mushroom crop in rupees

Where

Y_m = Total Yield of mushroom crop in kg.

P_m = Price per kg of mushroom in rupees.

$$\text{Net Return} = \text{Gross Return} - \text{ot Cost}$$
$$\text{Return per rupee of expen iture} = \frac{\text{Gross Return}}{\text{ot Cost}}$$

4.4.2 Resource Use Efficiency

To compute the Resource-use efficiency of mushroom production, Cobb-Douglas production function analysis was used as an analytical tool to reveal the relationship between inputs and output of sample growers and to arrive at the conclusion.

To derive marginal physical product (MPP), the average value of resources was multiplied by their elasticity coefficients.

$$MPP = \frac{Y}{X} \times b_i$$

Where, b_i - Elasticity coefficient of i^{th} inputs

Y is the mean of output and X is the mean of factor inputs.

Using the above specifications and the output and input prices,

Marginal Value Products (MVPs) were computed as follows:

$$MVP = P \times MPP$$

And lastly, Resource use Efficiency is the ratio of marginal value product of the resources to its factor cost. And it was calculated as shown below:

$$Resource\ Efficiency = \frac{MVP}{MFC}$$

Where P_y and MFC are the prices of output and expenditure on various factor inputs respectively.

The decision of whether a resource is used efficiently or not, it is based on the value of resource use efficiency. If it is equal to one ($= 1$), then the factor input is efficiently utilized, hence the farmer is considered allocative efficient (Hopper, 1965). The factor input is over-utilized if the value is less than 1 (< 1). The factor input is under-utilized if the value is greater than 1 (> 1).

4.4.4 Identify existing marketing channels and determine their efficiency

To identify the marketing channels and find out the marketing efficiency of these channels were worked out through these following components:

Marketing Channels: A marketing channel is the route of product where producers, wholesalers, and activities necessary to transfer the ownership of goods from the point of production to the point of consumption.

Marketing Cost (MC): Cost of marketing refers to the amount spent by the producer, seller, and intermediaries in the sale or purchase of a commodity from the time of its harvest till it is finally sold to the ultimate consumer. Cost of marketing comprises the cost on account of packaging, transportation and several other functions involved.

Marketing margin (MM): MM refers to the difference between the price paid and received by the specific marketing agencies such as single retailer or wholesaler or by any type of marketing agency.

Price spread: It refers to the difference between price paid by the consumer and price received by the producer for an equivalent quantity of mushroom product. This spread consists of marketing costs and margins of the intermediaries.

Producer's share (FP): It is computed from farm retail price spread and is the farm value expressed as a percentage of the retail price of goods received by the producer.

$$Ps = \frac{Pf}{Pr} \times 100$$

Where,

Ps- Producer's Share

Pf- Producer Share in Consumer Rupee

Pr- Retail Price

Marketing efficiency (ME): It is the movement of goods from producer to consumer at the low cost consistent with the provision of services consumer desire (FAO).

Marketing efficiency was formulated by Acharya's Method:

$$MME = \frac{P}{MC + MM}$$

Where FP- Farmer's Price

MC- Marketing Cost incurred by growers

MM- Marketing Margins

4.4.5 Constraints faced in Production and marketing

The information related to various problems in mushroom production in case of production, marketing, and others. It was collected and formulated by Garrett Ranking Method.

Garrett's score Ranking–

$$\text{Per cent Position} = \frac{R_{ij} - 0.5}{N_j} \times 100$$

R_{ij} = Rank given for the i^{th} variable by j^{th} respondents

N_j = Number of variables ranked by j^{th} respondents



Results and Discussion

*“If you think you can, you can
If you think you can't, you are right”*

Henry Ford



The present chapter has been divided into five major sections. And these sections are deals with:-

1. Socio-Economic Status of the mushroom growers,
2. Cost of and returns from the mushroom cultivation,
3. Resource-use efficiency of the mushroom cultivation,
4. Identified marketing channels and determine their marketing efficiency,
5. Ranking of Constraints faced by mushroom growers.

5.1. Socio-Economic Status of the Mushroom Growers

The socio-economic characteristics of the mushroom growers selected from the Dehradun district are discussed in this chapter. The socio-economic status of the mushroom growers are categorizing into three categories namely, less than 150 bags, 150-300 bags, and 300 & above bags (table- 4.3). It does not only help in classify the mushroom growers into various socio-economic strata but also furnished a base for the next coming planning and development of mushroom cultivation. The socio-economic characteristics comprise the distribution pattern of mushroom growers, family composition, education status, the occupation was worked out and presented in this section.

5.1.1 Distribution pattern of Mushroom Growers

The Mushroom growers are classified into three categories based on the number of bags per unit such as small, medium, and large growers. The table-5.1 was analyzed that the maximum percentage of growers covered in large group (38.34%) followed by medium group (33.33%) and small group (28.33%), respectively.

Table 5.1: Distribution of Mushroom growers based on bags

Category	No. of Bags	Number of Growers	Percentage of Growers from Total
Small Growers	Less than 150	17	28.33 %
Medium Growers	150-300	20	33.33%
Large Growers	More than 300	23	38.34%

5.1.2 Structure of Family of sample growers

Table- 5.2 showed that the majority of the families in the study area mainly has individual families, with a higher percentage of about 70 percent in small and medium growers while about 57 per cent in large growers. Nuclear families range just between 4.9 to 4.11 in the study area. It can be concluded that the study area following the modern family system in the area.

Table 5.2: Structure of Family on sample growers

Particular	Small Growers	Medium growers	Large Growers
Number of Families	17.00	20.00	23.00
Single Family	12.00 (70.58%)	14.00 (70.00%)	13.00 (56.52%)
Joint Family	5.00 (29.41%)	06.00 (30.00%)	10.00 (43.47%)
Overall Size of Family	4.11	4.9	4.9
Average Age of Growers	32.23	32.92	36.63

(Figures in parentheses indicate percentage to number of families)

5.1.3 Educational status of Sample Growers

In the field of mushroom production, the role of education is very important. Educated people got a better place and adopt various technologies. An educated person is more efficient and aware of “what going in the field of the various development processes”. They also use their resources in an optimum way. The large-sized growers have the highest educational level followed by medium and small size growers (table-5.3). The maximum number of growers has the degree of college and the diploma (about 48.33%) followed by intermediate level (23.33%), post-graduation (13.34%), high school level (10%), and primary level of education (5%).

Table 5.3: Educational Status of Sample Growers

Category	Primary	High School	Intermediate	College/ Diploma	Post Graduation
Small Growers	0.00 (0%)	2.00 (11.76%)	5.00 (29.41%)	9.00 (52.94%)	1.00 (5.88)
Medium Growers	3.00 (15%)	4.00 (20%)	7.00 (35%)	13.00 (65%)	3.00 (15%)
Large Growers	0.00 (0%)	0.00 (0%)	2.00 (8.69%)	7.00 (30.43%)	4.00 (17.39%)
Total	3.00 (5%)	6.00 (10%)	14.00 (23.33%)	29.00 (48.33%)	8.00 (13.34%)

(Figures in parentheses indicate percentage to total)

5.1.4 Occupation-Wise distribution of Sample Growers

The table-5.4 gives the population break-up of the respondents based on their occupation. It was observed that the maximum number (40%) of the respondents had mushroom production as their occupation followed by government employees (28.33%), farmers (16.67%), and businessmen (15%). From the table-5.4 it is evident that mushroom cultivation as an enterprise played an important role to increase the income and employment of growers as a subsidiary enterprise.

Table 5.4: Occupation pattern of Sample Growers

Particular	Size Group			
	Small	Medium	Large	Overall
i. Mushroom Grower	07 (41.18%)	6 (30%)	11 (47.83%)	24 (40%)
ii. Farmer	04 (23.53%)	02 (10%)	04 (17.39%)	10 (16.67%)
iii. Government Employees	05 (29.41%)	07 (35%)	05 (21.74%)	17 (28.33%)
iv. Businessman	01 (5.88%)	05 (25%)	03 (13.04%)	09 (15%)
Total	17 (100.00)	20 (100.00)	23 (100.00)	60 (100.00)

(Figures in parentheses indicate percentage to total)

5.2 Cost of and Returns from Mushroom production

5.2.1 Category-Wise establishment Cost of mushroom producing units

The final production of any venture is mainly governed by an investment of capital. In this section, an attempt was made to examine capital investment in various materials used in mushroom production units in the study area. Capital investment in mushroom production units is given in Table 5.5. The expenditure on building for growing mushroom was the important item of investment overall Rs 50659.50 per unit, it is increased with increases the size of units. The second important component was the Air conditioner and cooler occupies Rs 12703.40 and Rs 9958.00 per unit. The average establishment cost for large grower's category rising, it was mainly because of more use of a thermometer, air conditioner, tullu pump, exhaust fan, bulb, etc. The overall average total establishment cost was about Rs 83481.35 which varies from Rs 36773.09, Rs 76763.53, and Rs 126554.40, in small, medium, and large sizes, respectively. Further, analysis of capital investment showed that there was a direct and positive relationship between the size of the mushroom production unit and capital expenditure. There was a significant variation in capital investment on small-sized units as compared to medium and large-sized units. This indicates that with an increase in the size of the production unit, capital expenditure also increases.

Table 5.5: Category-wise establishment Cost of Mushroom production on different sample farm

(Rs per Unit)

S. No.	Items	Small Growers	Medium Growers	Large Growers	Overall
1.	Farm Building	25923.53	47676.47	74281.82	50659.50
2.	Area (Sq ft)	155.17	404.32	892.36	522.24
3.	Bucket	95.29	115.50	174.78	133.05
4.	Thermometer	198.82	391.50	521.74	388.98
5.	Heater	181.18	424.50	2262.61	1078.14
6.	Sprayer	105.29	481.00	926.19	554.42
7.	Cooler	7235.29	10435.00	11404.30	9958.00
8.	Air Conditioner	-	11400.00	23630.40	12703.40

9.	Tullu Pump	300.00	623.00	1078.70	718.14
10.	Knife	17.05	26.25	26.31	23.56
11.	Bulb	144.12	270.50	503.92	326.95
12.	Belcha	49.41	108.00	113.04	94.92
13.	Tripal	127.06	255.00	624.35	361.36
14.	Exhaut Fan	908.82	1632.50	3028.26	1978.81
15.	Basket/Tray	60.00	96.50	176.96	117.97
16.	Stapler	12.05	18.50	33.27	22.37
17.	Transparent Sheet	124.12	215.00	591.74	339.32
18.	Racks	-	709.50	2363.48	1161.86
19.	Wood	255.88	432.50	1367.39	743.22
20.	Bamboo	765.29	898.00	2447.17	1472.12
21.	Rope	114.71	150.00	105.65	123.39
	Total	36773.09	76763.53	126554.40	83481.35

5.2.2 Cost of compost material used in mushroom production

Compost is a very important material used in mushroom production. It is a substrate on which mushroom grows. These were various items used by mushroom growers to prepare compost and their cost is given below in table- 5.6.

The table-5.6 revealed the average use and cost of various compost materials used in different size of a mushroom production unit in the study area. Big growers used many items such as formalin, bavistin, urea, gypsum, poultry manure, and wheat straw as compared to small and medium growers. Some of the mushroom growers also purchased prepared compost and bags from the medium and large growers. Compost material has been worked out to Rs 2088.93, Rs 6232.91, and Rs 14921.59 in small, medium, and large mushroom units, respectively. The overall cost of compost was about Rs 8373.38 per unit. It showed the positive impact of increasing the size of the unit.

Table 5.6: Average Variable Cost of Compost of Mushroom Production on sample farm units

(Rs per Unit)

S. No.	Items	Units	Small Growers	Medium Growers	Large Growers	Overall
1.	Wheat Straw	Qtl	1301.18	3662.12	10751.17	5745.37
2.	CAN	Kg	12.35	35.52	27.62	25.76
3.	M.O.P	Kg	9.12	24.31	25.74	20.49
4.	Gypsum	Kg	18.82	37.68	62.18	41.79
5.	Choker	Kg	34.71	74.21	80.00	65.08
6.	Nimagaon	Ltr	5.00	18.42	17.17	14.06
7.	Furadon	Gm	12.00	10.00	21.75	15.15
8.	B.H.C	Gm	6.18	20.52	23.04	17.37
9.	Linden	Gm	6.18	11.57	29.56	17.03
10.	Vinegar	Gm	10.58	24.73	41.82	27.32
11.	Urea	Kg	44.71	102.63	97.39	83.89
12.	Super phosphate	Gm	13.23	22.10	50.00	30.42
13.	DDT Powder	Gm	14.12	29.75	33.48	26.69
14.	Formalin	Ltr	76.53	181.05	342.18	213.74
15.	Poultry Manure	Kg	41.87	49.47	84.54	60.87
16.	Calcium Carbonate	Gm	16.29	32.12	33.96	28.27
17.	Bavistin	Kg	63.00	322.12	340.43	254.59
18.	Ammonium Sulphate	Kg	23.24	15.89	36.78	26.15
19.	Neem cake Oil	Kg	25.65	23.16	34.91	28.45
20.	Purchased Compost	qtl	278.82	1288.94	2110.91	1270.17
	Total		2088.93	6232.91	14921.59	8373.38

5.2.3 Cost of Production of Mushroom

The cost of mushroom production and returns analysis of the mushroom production helps the growers in getting better results hence to achieve the first

objective of the study the cost, returns, and profitability analysis has been work out and the result has been shown through this section.

The component-wise allocation of different costs such as variable cost, ready-made material cost, and other costs incurred in mushroom production has been presented in table-5.7. Table 5.7 revealed that the overall per unit establishment cost was Rs 10017.76, whereas the maximum in the large group Rs 15186.53 and the minimum in the small group Rs 4412.78 per unit.

The expenditure incurred on compost material, packing material, water charges, labour charges, electricity charges, spawn, purchased bags, miscellaneous items and interest on working capital, etc on a per unit basis are given in below table-5.7. The cost of all these items was lower in small units (Rs 10232.68) and highest in large (Rs 54632.75) per unit. The total cost of production without establishment cost was Rs 5819.90, Rs 21916.80, and Rs 39446.22 on small, medium, and large units, the average of which was Rs 37756.34 per unit in the sample growers. To distribute the total establishment cost of the mushroom producing units into different years of production, 12 per cent interest rate has been assumed for one year. This fraction has been added to work out the total annual cost of mushroom production. This cost was Rs 47774.10 per unit under average conditions for the entire study area as a whole.

Table 5.7: Average Cost of and Returns from mushroom production on sample farm units.

(Rs per Unit)

S. No.	Material	Small	Medium	Large	Overall
		17	20	23	60
A.	Fixed Cost				
1.	Establishment Cost of Fixed Capital @ 12%	4412.78	9211.62	15186.53	10017.76
B.	Variable Cost				
1.	Compost (own making and purchased compost)	2088.93	6232.91	14921.59	8373.38
2.	Spawn	270.58	583.68	1453.48	805.08
4.	Transportation	140.58	275.78	576.08	327.96

5.	Electric Charge	143.52	943.15	2370.00	1268.98
6.	Water Charge	58.65	140.00	162.83	125.45
7.	Labour	1181.75	5526.84	7308.26	4969.32
8.	Casing	69.41	432.89	1592.17	780.08
9.	Miscellaneous	151.23	500.00	965.22	613.06
10.	Packaging	201.18	236.60	327.50	255.09
11.	Interest on Working Capital @ 10%	1299.94	6076.53	8039.09	5466.25
Ready-Made Materials					
11.	Purchased Bags	214.12	968.42	1730.00	14771.69
	Total Variable Cost	5819.90	21916.80	39446.22	37756.34
	Total Cost	10232.68	31128.42	54632.75	47774.10

5.2.4 Yield and Returns from Mushroom Production

The yield gross returns and net returns from mushroom production have been worked out over various cost and returns per rupee of expenditure which is the main technique used to work out the most profitable unit of mushroom production is showed in table 5.8. It has been depicted from the table that on average yield came out to be 1124.56 kg, 408.32 kg, 174.58 kg per unit from a large group, medium group, and small group. The gross return per unit for a season was Rs 20949.60, Rs 48998.42, and Rs 134947.20 on small, medium, and large-sized units of mushroom production, respectively.

The gross return in the overall situation was Rs 72000.00. And the net return in overall condition was Rs 24225.90 as a whole, which made mushroom production profitable under an average situation. The unit wise 1.67 times maximum net return from small to medium and 4.5 times from medium to large group of mushroom growers.

The returns per rupee of expenditure was highest 2.48 on large size units and lowest on medium-size units (1.57). This returns per rupee of expenditure was more than one on all size units in the overall situations; the returns per rupee of expenditure

was 2.48 which indicates mushroom production is profitable in the study area. The higher value of returns per rupee of expenditure on small, medium, and large producing units indicates that there is scope to increase productivity and make them profitable.

Table 5.8: Average Gross Return, net return from mushroom production on sample farm units

(Rs per Unit)

Particular	Small Grower	Medium Grower	Large Grower	Overall
Average Yield (Kg per unit)	174.58	408.32	1124.56	600.00
Gross Return	20949.60	48998.42	134947.20	72000.00
Net Return	10716.92	17869.98	80314.45	24225.90
Return per Rupee of Expenditure	2.04	1.57	2.48	1.51

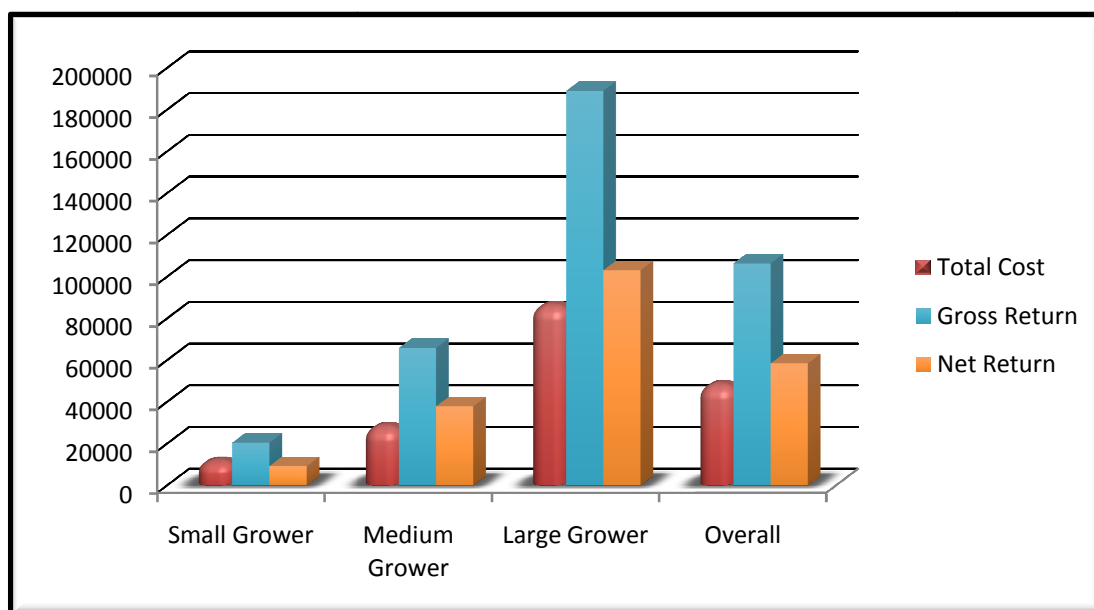


Figure 5.1: Total Cost, Gross Return and net return from mushroom production (Rs/Unit)

5.2.5 Cost of Production Rupees per Bag

The various components for the cost of production of mushroom indicated variable importance. Cost of production and returns from mushroom on per bag mushroom production presented in table-5.9. The table showed that at the overall

level, per bag cost of production of mushroom in the study area worked out to Rs 134.08 in which maximum in medium (Rs 171.29) and lowest in small (142.45). A breaking up of variable cost showed that the purchased bags has the highest share of Rs 28.13 and the lowest in water charges Rs 0.72.

Table 5.9: Cost of Mushroom Production on a sample farm unit

(Rs Per Bag)

S. No.	Material	Small	Medium	Large	Overall
A.	Fixed Cost				
1.	Establishment Cost of Fixed Capital @ 12%	64.92	59.87	56.84	41.21
B.	Variable Cost				
1	Compost Material	31.73	27.56	29.41	28.01
2.	Spawn	3.93	3.00	2.56	3.19
3.	Transportation	2.36	2.00	1.78	2.05
4.	Electric Charge	2.00	3.63	3.89	3.16
5.	Water Charge	0.72	0.59	0.71	0.72
6.	Labour	18.50	22.16	17.04	19.44
7.	Casing	0.92	1.78	2.05	1.583
8.	Miscellaneous	1.55	2.84	1.44	1.94
9.	Packaging	2.18	1.37	1.00	1.12
10.	Interest on Working Capital @ 10%	1.85	2.22	1.704	1.944
C.	Ready-Made Materials				
11.	Purchased Bags	11.76	28.42	41.03	28.13
	Total Variable Cost	77.48	111.42	102.614	92.87
	Total Cost	142.45	171.29	159.45	134.08

The category-wise cost utilization for mushroom production indicated that when the size of the production unit increased, labour utilization going to decline but the use of straw, casing, and chemicals bag was almost the same. However, the use of ready-made bags and compost was increase with an increase in the size of the mushroom production unit. Large growers bought the highest number of ready-made bags.

5.2.6 Yield and returns from Mushroom Production Rupees per Bag

The values of the Gross return, net return, and returns per rupee of expenditure from the mushroom production based on per bag have been presented in table- 5.10. Based on the table, the overall yield per bag was 2.134 kg, it varies from 2.62 kg in a large group, 2.082 in a medium size group, and 1.681 in a small size group. It indicates the yield per bag production increases with the increase in the size group due to an increase in some cost items in mushroom units and improved mushroom production. While the gross return in per bag increases with the increase of size groups i.e., Rs 201.72, Rs 249.84, and Rs 314.40 for small, medium, and large groups of mushroom production units, respectively.

Net return for small units was very low i.e. Rs 59.27 per bag while in the case of large groups it was Rs 154.95 per bag. It showed a positive impact on the adoption of a large unit of mushroom production in the study area. The returns per rupee of expenditure was less in small (1.42) and high in large units (1.97) which came to 1.91 under the overall situation. These figures indicated that mushroom production was a profitable venture under average conditions.

Table 5.10: Yield, Gross Return, and Net return per bag on sample farm

(Rs per Bag)

Particular	Small	Medium	Large	Overall
Average yield Per bag	1.681	2.082	2.62	2.134
Gross return	201.72	249.84	314.40	256.08
Net Return (Per Bag of Mushroom)	59.27	78.55	154.95	122
Net Return (Per Kg of Mushroom)	35.26	37.73	59.14	57.17
Return per Rupee of Expenditure	1.42	1.46	1.97	1.91

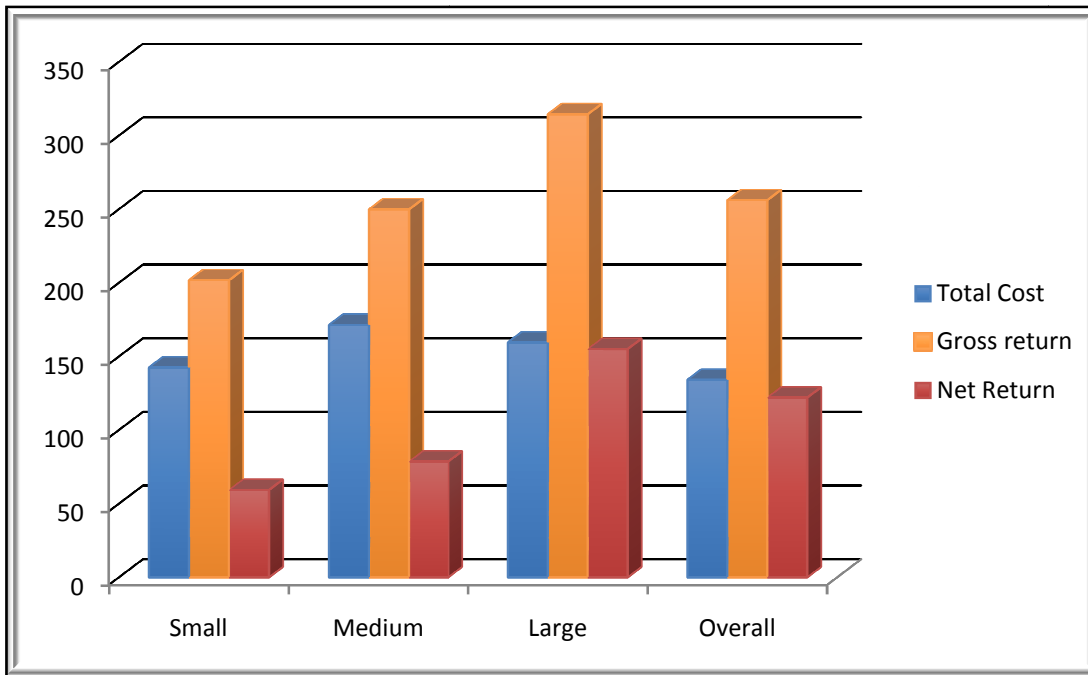


Figure 5.2: Total Cost, Gross Return and net return from mushroom production (Rs/Bag).

These can be indicated by the economies of scale of large-sized units because the decrease in fixed cost, while an increase in production. The scope for reduction in the cost of mushroom production lies with optimum utilization of resources, by increasing productivity.

5.3 Resource-use efficiency in Mushroom production

The Cobb-Douglas production function was used to determine how significantly the output is affected by the input ensured that there was no sign of multi-collinearity among the variables, the zero-order correlation matrix has been used (appendix-3). The yield of mushroom was taken as output while all these seven variables such as number of bags, straw, spawn, chemicals, casing, labour, and purchased bags were taken as inputs.

The value of R^2 came out to be 0.95 revealed that explanatory variables included in the model explain 95 per cent variation of the dependent variable. Out of the seven variables in the model, only five variables came out to be significant (5% level of significance). The output elasticity of spawn (0.013), chemical (0.055), came out to be positive and statistically significant at a 1% level of significance, while, the

output elasticity of Number of Bags (0.913), Straw (0.014), Labour (-0.020), Casing (0.089) and purchased bags (0.007) statistically significant at 5 per cent level of significance. This shows that if there is an increase in 1 per cent in expenditure on numbers, straw, casing, spawn, chemicals, and purchased bags there will be the probability that yield will be increased by 0.913, 0.014, 0.013, 0.055, 0.089, and 0.007 per cent, respectively. (Table-5.11)

One variable was significant out of seven, labour (-0.020) was negative and statistically significant at a 5% level of significance revealed that 1% increase in these inputs was probably decreasee the yield by 0.020.

Table 5.11: B's coefficient from Cobb-Douglas production Function

S. No.	Particular (60 Growers)	B's (Elasticity)
	Constant (a)	-
1.	No. of Bags (No.)	0.913**
2.	Straw (kg)	0.014**
3.	Spawn (gm)	0.013*
4.	Chemicals (gm)	0.055*
5.	Labour(man days)	-0.020**
6.	Casing (gm)	0.089**
7.	Purchased Bags (No.)	0.007**
	Sum of Bi's	1.07
	R Square	0.95
	F - Value	206.17

*Significant at 1 per cent level of Significance

**Significant at 5 per cent level of Significance

5.3.1 Resource-use efficiency of Mushroom production

The value of MVP/MIC for number of bags (1.36), straw (1.16), spawn (1.29), casing (3.18), chemicals (1.46) were more than unity indicated that these resources were under-utilized by the sample growers which mean there is a greater scope of using these resources to increase the yield. (Table-5.12)

Table 5.12: Formulation of Resource-use efficiency of mushroom production

Variables	MVP	MIC	MVP/MIC
No. of Bags	144.86	105.95	1.36
Straw (kg)	38.59	33.23	1.16
Chemicals (gm)	12.74	8.70	1.46
Spawn (gm)	8.87	6.84	1.29
Purchased Bags (No.)	-	-	-
Labour (mandays)	1.89	15.15	0.12
Casing (gm)	2.678	0.84	3.18

The result revealed that the profitability could be maximized by increasing by number of bags, wheat straw, chemicals, amount of casing, and amount of spawn. While in the case of Labour, it was seen that the MVP/MIC ratio was less than unity and revealed that the profitability in mushroom production could be maximized by an decreasing the number of labours.

5.4 Marketing of Mushroom Production

Marketing plays an important role, not only in stimulating production and consumption but in accelerating the pace of economic development. An Efficient marketing leads to optimization of resources-use and output management. The higher level of income of growers also depends on the marketing system available for the commodity produced. An efficient system guarantees the producers get better prices for their products. If the producers don't have an easily accessible market outlet where he can sell his output, he has little incentives to produce more. It is, therefore, very important to have a good marketing system to provide incentives to producers for increased production.

In the marketing system, marketing channels exercise an important role in the flow of products from producers to consumers and also in the marketing cost. Marketing channels are the route through which products move from producer to consumer. The length of channel varies from product to product depending upon the form of consumer demand, quantity to be marketed, and degree of specialization in production. The length of the marketing of mushroom, marketing margins paid by intermediaries, price has to be paid by the consumers.

5.4.1 Details of Existing Marketing Channels on study area:-

In the present study, it was thought necessary to find out the channels through which mushroom was disposed-off their produce by growers to intermediaries. On the investigation from growers, it was found that the following marketing channels were prevailing in the study area for the sale of mushroom. Thus, in the study of selected blocks, the marketing channels were the same as mentioned below:

Channels	Intermediaries
Channel- I	Growers → Consumer
Channel-II	Growers → Retailer → Consumer
Channel-III	Growers → Wholesaler → Retailer → Consumer

Channel-I: Growers-Consumer

This is the shortest channel wherein only two trading partners are involved. None of the intermediaries are engaged and the grower sells their produce directly to the consumers. Generally, consumers visited the farm to buy mushroom and producers also sell to the consumer directly on the demand of the consumer.

Channel-II: Grower- Retailer- Consumer

This channel includes one intermediary i.e. Retailer. Retailers from the nearby area of Dehradun district and come to buy mushroom from the growers and growers also sell them directly and in turn, sells it to the consumer.

Channel-III: Grower- Wholesaler- Retailer- Consumer

In this channel, two intermediaries are engaged in the marketing of mushroom. The wholesaler buys produce from the grower and sells it to the retailer. Then mushroom produce will be sold by retailers to the consumer. There was some wholesaler who collected the mushroom production from the grower's place.

5.4.2 Different marketing channels adopted by Mushroom growers

Various channels of marketing are involved in the study area and the data regarding the channels adopted for marketing by the various mushroom growers for selling their mushroom produce has been depicted in table- 5.13. From the table, it can be said that the maximum sale of mushroom of the small growers sells their produce via channel I (58.82%), medium growers by channel III (40%), and large growers mostly used channel III (73.91%) for selling their produce. Also, with the overall number of growers, Channel III (45%) becomes the channel that sells the maximum number of mushroom produce followed by channel II (30%) and least by Channel I (25%). The result depicted that channel I being the most price-efficient and profitable for the growers as well as consumers and cover only about 25 per cent.

**Table 5.13: Adoption of different marketing channels through sample growers
(Numbers of Growers)**

Channels	Small	Medium	Large	Overall
Channel-I	10 (58.82%)	05 (25%)	00 (0%)	15 (25%)
Channel-II	05 (29.41%)	07 (35%)	06 (26.09%)	18 (30%)
Channel-III	02 (11.76%)	08 (40%)	17 (73.91%)	27 (45%)
Total	17 (100%)	20 (100%)	23 (100%)	60 (100%)

(Figures in parentheses indicate percentage to the total)

5.4.3 Disposal of mushroom through various marketing channels

The mushroom produce marketed through existed marketing channels are shown in table - 5.14. The maximum produce is sold through channels III followed by channel II and the smaller quantity of products through channel I. Among the share of mushroom produce sold through various channels, channel III sells maximum produce (49.36%), followed by channels II (31.94%) and channel I (18.7%).

Small-sized growers sell maximum produce through channel I (42.89%), followed by channel II (32.58%) and channel I (24.53%). Medium-sized growers sell their produce through channel III (43.39%), remaining produce through channel II (32.95%) and channel I (23.66%). Large-sized growers have a big quantity of produce so they prefer more than 50 per cent sold their produce through channel III (55.71) and the remaining sold through channel II (32.77%) and channel I (11.52%).

Hence, only small-sized growers used channel I i.e., directly selling to the consumer as they operate on a small scale and have a lesser quantity of mushroom produce. The large-sized growers adopted channel III for marketing as they operate on a large scale. The channel which was the most dominated channel III covered about 38 per cent shows the dominance of the middlemen in mushroom marketing.

Table 5.14: Disposal of mushroom through various marketing channels

Channels	Small Grower		Medium Grower		Large Grower		Overall	
	Disposed (Kg)	Disposed (%)	Disposed (Kg)	Disposed (%)	Disposed (Kg)	Disposed (%)	Disposed (kg)	Disposed (%)
Channel- I	74.87	42.89	96.63	23.66	129.55	11.52	112.20	18.7
Channel-II	56.88	32.58	134.53	32.95	368.54	32.77	191.65	31.94
Channel-III	42.83	24.53	177.16	43.39	626.47	55.71	296.15	49.36
Total	174.58	100.00	408.32	100.00	1124.56	100.00	600	100

(Figures in parentheses indicate percentage to total)

5.4.4 Marketing Cost, Price Spread and Marketing Efficiency

The prices of mushroom produce has been decided by the mandi of Dehradun district, on per kg weight of the mushroom produce. Detail regarding the marketing cost and margins are described in the table- 5.15. From the table, it is clear

that in channels II and III, the total marketing cost was Rs 18.16 and Rs 19.11 per kg respectively. Hence, channel III includes two intermediaries that's why the total cost of marketing was high as compared to channel II where includes only one middleman. The net margin received by the retailer in channel II was Rs 8.52 per kg while in the case of the wholesaler in channel III was Rs 7.08.

The marketing cost incurred by the wholesaler in channel III was Rs 21.17 per kg which includes labour cost, transportation cost, shop rent, and other miscellaneous expenses and the gross marketing margins of the wholesaler in channel III were Rs 26.90 per kg. On the other hand, the retailer's total cost in channel III was Rs 19.11 per kg and the gross margin of the in-channel III retailer was Rs 25.19 per kg. The net margin received by the wholesaler in channel III was Rs 5.73 per kg. The total margins in channel II and III were Rs 8.52 and Rs 6.08 per kg respectively. The portion of total marketing cost in channel II and III was 12.42 and 11.96 per cent of consumer's rupee, respectively, and the total marketing margins in channel II and III were 5.82 and 3.81 per cent of consumer's rupee, respectively.

Price spread in the three marketing channels is shown in table-5.15. It is evident from the table that the price spread in channel II was found to be lower (28.68 Rs/kg) than channel III (Rs 52.09/kg) because less number of intermediaries were involved in channel II. In channel I there was no middleman, so the producer's share in consumer rupee was highest followed by channel II and channel III. In channel I, the benefits of both grower and consumer as the net price received by the grower was highest as compared to the other two channels. But practically adoption of a channel I do not possible for a large amount of produce to be disposed to an individual consumer.

Marketing efficiency of different channels was formulated by using Acharya's modified marketing efficiency method and it is presented in the table-5.15 The modified marketing efficiency (MME) for channel I was highest due to no intermediaries are involved. In channels II and III, MME was found to be 4.40 and 4.27, respectively. Therefore, the efficiency of channel II was higher as compared to channel III.

Table 5.15: Marketing Cost, Price Spread and Marketing Efficiency

Channels					
Particular	I	II	Percentage to consume rupee	III	Percentage to consume rupee
	G-C	G-R-C		G-WS-R-C	
Grower					
Producer's selling price	130.35	117.49	-	107.58	-
Wholesaler					
The cost incurred by the wholesaler	-	-	-		
Transportation cost	-	-	-	3.78	2.37
Labour cost	-	-	-	5.82	3.64
Shop rent	-	-	-	5.16	3.23
miscellaneous expenses	-	-	-	6.41	4.00
Total	-	-	-	21.17	13.25
Wholesaler Gross Margin	-	-	-	26.90	16.85
Wholesaler Net Margin	-	-	-	5.73	3.59
Wholesaler gross selling price	-	-	-	134.48	84.22
Retailer					
The cost incurred by the retailer	-	-	-		
Transportation cost	-	3.18	2.18	3.42	2.14
Labour Cost	-	4.38	2.00	4.34	2.72
Shop Rent	-	5.04	3.44	5.27	3.30
miscellaneous expenses	-	5.56	3.80	6.08	3.80
Total	-	18.16	12.42	19.11	11.96
Retailer Gross Margin	-	28.68	19.62	25.19	15.78
Retailer Net Margin	-	8.52	5.82	7.08	4.43
Consumer Purchasing Price	130.35	146.17	100.00	159.67	100.00
Total Margins	-	8.52	5.82	6.08	3.81
Total Marketing Cost	-	18.16	12.42	19.11	11.13
Price Spread	-	28.68	19.62	52.09	15.78
Marketing Efficiency	-	4.40	-	4.27	-
Producers share in consumer Rupee (%)	100.00	80.38	-	67.38	-

5.3 Constraints in mushroom production.


Mushroom cultivation serves as a subsidiary occupation and generates additional income and employment. This enterprise suits most of the small and medium growers who have a poor financial base. However, it is not free from constraints coming in the route of taking up this enterprise successfully. Some of the important issues of production and marketing were covered in this section. Table-5.16 indicated the rank of various constraints with Garrett score, the inadequate marketing facilities such as disposal problem (77), inadequate storage facilities (87), etc. were the major problem faced by growers. It was found that many of the wholesalers did not purchase from the small and medium growers, they purchased only in tonnes of mushroom produce by large growers.

Other issues and constraints faced by mushroom growers were High expenses of ready-made compost and compost bags (71.35) and Poor Quality of ready-made Compost and compost Bags (67.56). And the most significant issue of growers was the high cost of spawn with its garret score of about 63.08. While more than 50 garret scorers faced the problem of lack of quality spawn, followed by a shortage of skilled labour and the growers didn't have proper training facilities.

While analyzing the constraints faced in that activity of mushroom production it was evident development of marketing facilities is a pre-requisite which will also aid to the promotion of mushroom production and ensuring the remunerative price of the produce. However other constraints hold at par important, but the solution of a marketing problem and thereby availability of fair price would go in a long way in encouraging and adopting this enterprise as a source of generating additional income and employment in the study area.

Table 5.16: Mean score and Ranks of different constraints faced by mushroom growers

S. No.	Constraints		
	Types of Constraints		
A.	Production Constraints	Score	Rank
1.	Flies or Insect Control	43.05	12
2.	Disease Management	47.96	11
3.	Power Supply	40	13
4.	Lack of Quality Spawn	60	06
5.	Shortage of Skilled Labour	57.48	07
6.	High price of Spawn	63.08	05
7.	High cost of Compost and Compost Bags	71.35	03
8.	Poor Quality of Compost and Compost Bags	67.56	04
9.	Lack of Knowledge	33.12	15
10.	Inadequate support from the government for investment and marketing	36.5	14
11.	Consider Mushroom Poisonous	13.44	18
12.	Don't have proper training	54.5	08
B.	Marketing Constraints		
13.	Problem of Disposal	77	02
14.	High Transporting Cost	23	17
15.	No separate marketing Channels	48.23	10
16.	Total Demand is inadequate	51.43	9
17.	Problem in Packing	28.64	16
18.	Problem in Storage	87	01



Summary and Conclusion

*“When you achieve the goal,
Let’s remember the former’s role”*

Anonymous



In Uttarakhand, farmer's income is low due to small, fragmented, and undulated land holdings, inadequate agricultural and marketing facilities, and a high degree of risks and uncertainty in crop cultivation due to rainfed conditions. As a result, farmers are required to adopt a diversified farming system. Mushroom production may be one of the important subsidiary enterprises for raising the income of the farmers. Thus, in view of low level of farm income and employment in agriculture of Dehradun District, mushroom production may serve as an important source for generating additional income and utilizes surplus family labour during the lean period.

Mushroom production has made some dent in few pockets of Uttarakhand but large-scale adoption is still handicapped due to the prevalence of various types of constraints. Therefore, studies are needed to investigate these constraints and the economic aspects of mushroom production in the study area. Consequently, the present study was taken up in Dehradun district of Uttarakhand. It especially aims at accomplishing the following objectives:

1. To work out the cost of and returns from mushroom cultivation.
2. To examine resource use efficiency of Mushroom production.
3. To identify the existing marketing channels and determine their marketing efficiency.
4. To identify and rank various constraints faced by mushroom growers.

The study was conducted in Dehradun District of Uttarakhand. It was purposively selected taking into account the high production of mushroom and maximum number of mushroom units. Vikasnagar, Sahaspur, Doiwala and Raipur blocks were selected purposively because of the availability of maximum number of growers and potentiality of mushroom growers.

A list of all the mushroom growers was obtained from the District Department of Horticulture, Uttarakhand. As the list of mushroom growers, according to the size of their production units were not available. A random sample of 50 per cent growers

was taken for detailed investigation from each block. Thus a total sample of 60 mushroom growers was selected for the study.

Sample Data on the cost of production, returns from produce, and marketing of mushroom was collected through personal interviews from the growers for the year 2019 by survey method with the help of a specially designed pre-tested schedule. There were three marketing channels in which produce move from Mushroom Grower to the point of Consumer.

The cost and returns by using simple descriptive statistics like average and percentage. To achieve the other objectives, the information on these aspects was gathered from mushroom growers and the channels followed in the marketing of their produce were recorded and marketing cost, marketing margins, and price spread for each channel were estimated separately.

The average number of mushroom bags grown by the small, medium and large growers was 75.35, 246.6 and 676.96 bags per unit, respectively. At the overall, number of bags grown was 360.73.

At the overall level of 60 growers, per unit establishment cost in mushroom production units in the study area is estimated at Rs 83481.35. The category-wise establishment cost of mushroom production units was the highest in the large-sized units (Rs 126554.40) followed by medium (Rs 76763.53) and small (Rs 36773.09) units. The expenditure incurred on the building was very high Rs 50659.50 per unit which was increases with the increase in the size of units. And the second most important component was the air conditioner and cooler occupies Rs 12703.40 and Rs 9957.63. The average establishment cost for large growers category was rising it was mainly because of more use of the cooler, air conditioner, tullu pump, exhaust fan, bulb, etc. As we showed that there was a positive relationship between the size of a mushroom production unit and investment of capital expenditure.

There were various items used by mushroom growers to prepare compost and their costs are as mentioned above in table-5.6. And the cost of Compost material has been worked out to Rs 2088.93, Rs 6232.91, and Rs 14921.59 in small, medium, and large mushroom units, respectively. The overall cost of compost was about Rs 8373.38 per unit. Large growers used most items such as formalin, bavistin, urea,

gypsum, poultry manure, and wheat straw as compared to small and medium growers. It showed the positive impact of increasing the size of the unit.

According to the result, the share of variable cost and the fixed cost was Rs 37756.34 and 10017.76, respectively. And the material-wise variable cost per farm unit resulted that the purchased bags had the highest share (30.92%) followed by compost material (14.87%), labour share (10.40%), purchased compost (2.6%), and the interest on working capital (11.44%). The remaining variable costs were distributed among Spawn (1.68%), casing (1.63%), and electricity (2.65%).

When keeping down the cost of production, after that the optimum use of resources needs to be improved. Foregoing analysis divulged that mushroom production is a skilled labour venture. It was found that purchased bags, compost material and spawn is a very important material used in mushroom production in the study area, so the cost of purchased bags, compost material and spawn should be low. This will bring down the production cost. The analysis found that there is a direct relationship between the cost of mushroom production and production unit size, as the cost of production increases then the production unit also increases.

It has also resulted in an average yield that came out to be 174.58 kg, 408.32 kg, and 1124.56 kg per unit from a small group, medium group, and large group. And the gross and the net returns per unit from this yield were the highest in the large size (Rs. 134947.20 and Rs. 80314.45) followed by medium size (Rs. 48998.42 and Rs. 17869.98) and small size unit (Rs. 20949.6 and Rs. 10716.92), respectively, while at the per unit gross and net returns for overall mushroom production were Rs. 72000.00 and Rs. 24225.90, respectively.

The unit wise two times maximum net return from small to medium and 4.5 times from medium to large group of mushroom growers. The Benefit-Cost Ratio was highest 2.48 on large size units and lowest on medium-size units (1.57). Higher the value of the benefit-cost ratio of mushroom producing units indicates that there was scope to increase productivity and make them profitable.

At the overall level, the per bag cost of mushroom production in the study area was worked out to Rs 134.08 in which maximum in medium (Rs 171.29) and lowest in small growers (142.45). A breaking up of total variable cost showed that the

purchased bags has the highest share of Rs 28.13 and the lowest in water charges Rs 0.72.

The share of purchased bags was highest in total variable cost because many consultants, wholesalers, mushroom bags seller, compost maker, the trainer are in the field mushroom venture so many of the growers were purchased ready-made compost, ready-made bags from them. Most of the growers sell their produce to the same dealers from whom they took purchased bags.

The remaining growers were also purchased compost and Spawn from the District Department of Horticulture, Dehradun, and some were made by own while spawn was purchased by the district department of horticulture and private biotechnological labs. It was concluded that the use of ready-made was increase with an increase in the size of the mushroom production unit. Large growers bought the highest number of ready-made bags.

The yield per bag production increases with the increase in the size group due to an increase in some cost items in mushroom units and improved production. While, the gross return per bag increases with the increase of size groups i.e., Rs 201.72, Rs 249.84, and Rs 314.40 for small, medium, and large groups of mushroom production units respectively and Net return for small units was very low i.e. Rs 59.27 which is 2.6 times low as compared to large growers Rs 154.95 per bag.

It showed a positive impact on the adoption of a large unit of mushroom production in the study area. This benefit-cost ratio was more than one on all per bag in the overall situation, indicated that mushroom production was profitable under average condition. This can be indicated by the economies of scale of large-sized units because the decreases in fixed cost while an increase in production.

The value of MVP/MIC for number of bags (1.36), straw (1.16), spawn (2.78), casing (1.69), and chemicals (1.46) were more than unity indicated that these resources were under-utilized by the sample growers which mean there is a greater scope of using these resources to increase the yield. The result revealed that the profitability could be maximized by increasing by number of bags, wheat straw, chemicals, amount of casing, and amount of spawn.

To fulfill the objective of marketing channels and determine their marketing efficiency in this analysis, growers followed various marketing channels to move their produce from growers to the point of consumers. And these channels are mentioned below:

- (i) Grower ----consumer,
- (ii) Grower ----Retailer----Consumer and
- (iii) Grower ----Wholesaler-----Retailer----Consumer

The maximum sale of mushroom of the small growers sold their produce from channel I (58.82%), medium growers by channel III (40%), and large growers mostly used channel III (73.91%) for selling their produce. Also, with the overall number of growers, Channel III (45%) becomes the channel that sells the maximum number of mushroom produce followed by channel II (30%) and least by Channel I (25%).

The result depicted that channel I being the most price-efficient and profitable for the growers as well as consumers and cover only about 28 per cent because only small-sized growers used channel I i.e., directly selling to the consumer as they operate on a small scale and have a lesser quantity of mushroom produce while large-sized growers adopted channel III for marketing as they operate on a large scale.

Among the share of mushroom produce disposed of through various channels, channel III sells maximum produce (49.36%), followed by channels II (31.94%) and channel I (18.7%). Small-sized growers disposed of maximum produce through channel I (42.89%), followed by channel II (32.58%) and channel I (24.53%). Medium-sized growers disposed of their produce through channel III (43.39%), remaining produce through channel II (32.95%), and channel I (23.66%). Large-sized growers have a big quantity of produce so they prefer more than 50 per cent sold their produce through channel III (55.71) and the remaining sold through channel II (32.77%) and channel I (11.52%). The channel-III was most dominated covered about 38 per cent of the middlemen in mushroom marketing.

It was found that in channels II and III, the total marketing cost was Rs 18.16 and Rs 19.11 per kg respectively. Hence, channel III includes two intermediaries that's why the total marketing was high as compared to channel II where includes only one middleman. The net margin received by the retailer in channel II was

Rs 8.52 per kg while in the case of the wholesaler in channel III was Rs 7.08. The marketing cost incurred by the wholesaler in channel III was Rs 21.17 per kg which includes labour cost, transportation cost, shop rent, and other miscellaneous expenses and the gross marketing margins of the wholesaler in channel III was Rs 26.90 per kg. On the other hand, the retailer's total cost in channel III was Rs 19.11 per kg and the gross margin of a retailer in channel III was Rs 25.19 per kg.

The net margin received by the wholesaler in channel III was Rs 5.73 per kg. The total margins in channel II and III were Rs 8.52 and Rs 6.08 per kg respectively. The portion of total marketing cost in channel II and III was 12.42 and 11.13 per cent of consumer's rupee, respectively, and the total marketing margins in channel II and III were 5.82 and 3.81 per cent of consumer's rupee, respectively.

Wholesaler and Retailers, they buy the commodity for resale to a consumer at higher prices and take our margins. The price spread in channel II was found to be lower (28.68 Rs per kg) than channel III (Rs 52.09 per kg) because less number of intermediaries were involved in channel II. In channel I there was no middleman, so the producer's share in consumer rupee was highest followed by channel II and channel III. In channel I, the benefits of both grower and consumer as the net price received by the grower was highest as compared to the other two channels. But practically adoption of the channel I cannot possible for a large amount of produce to be disposed to an individual consumer.

Marketing efficiency of different channels was formulated by using Acharya's modified marketing efficiency method and it is presented in table-5.16. The modified marketing efficiency (MME) for channel I was highest due to no intermediaries are involved. In channels II and III, MME was found to be 4.40 and 4.27, respectively. Therefore, the efficiency of channel II was higher as compared to channel III.

However, it is not free from constraints coming in the route of taking up this enterprise successfully. It revealed that the rank of various constraints with Garrett score, the inadequate marketing facilities such as disposal problem (77), inadequate storage facilities (87), etc. were the most important hurdles faced by growers. It was observed that many of the wholesalers did not purchase from the small and medium growers, they purchased only in tonnes of mushroom produce.

Other important issues and constraints faced by mushroom growers were the High cost of ready-made Compost and Compost Bags (71.35), Poor Quality of ready-made Compost and Compost Bags (67.56). The most significant problem of growers was high price of spawn with its Garrett score of about 63.08. While more than 50 Garrett scorers faced the problem of lack of quality spawn, followed by a shortage of skilled labour and the growers didn't have proper training facilities.

While analyzing the constraints faced in that activity of mushroom production it was evident development of marketing facilities is a pre-requisite which will also aid to the promotion of mushroom production and ensuring the remunerative price of the produce. However other constraints hold at par important, but the solution of a marketing problem and thereby the availability of fair price would go in a long way in encouraging and adopting this enterprise as a source of generating additional income and employment in the study area.

6.2. Conclusions and Policy Implications

From the summary as presented above, the following conclusion and policy implications were drawn.

1. On average, per unit establishment cost @ 12% in mushroom production was Rs. 10017.76 which indicates that mushroom production is capital intensive.
2. The average variable cost of mushroom production per farm was Rs. 37756.34.
3. Average no. of mushroom bags per category was 75.35, 246.60, and 676.96 on the small, medium, and large unit groups.
4. The gross return and net return in the overall situation was Rs 72000 and Rs 24225.90 which made mushroom production profitable under an average situation.
5. The B: C ratio was more than unity which is indicated that mushroom production was a profitable venture.
6. The study also revealed that the cost of production per bag was Rs 134.08. And the net return from the production was Rs 122.

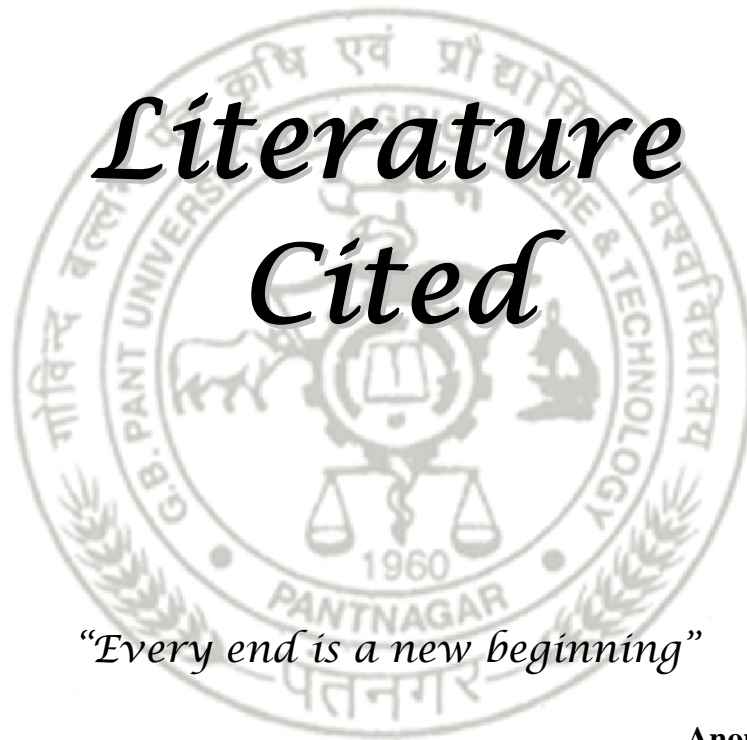
7. The result revealed that the profitability could be maximized by increasing by number of bags, wheat straw, chemicals, amount of casing, and amount of spawn.
8. The highest quantity of mushroom was sold through channel-III because the wholesaler bought in large quantity and sold it to the retailer and the lowest quantity was sold through Channel- I.
9. Producer's share in consumer rupee was found highest (80.38%) on channel II, while it was the lowest in channel III (67.38%).
10. Channel- II (4.40) was more efficient than Channel-III (4.27).
11. High price of spawn, quality of compost, spawn and skilled labour problems were the major production constraints.
12. The growers of the area were also facing the problem of inadequate marketing facilities such as disposal problem, storage problem, etc.
13. Thus, for the promotion of mushroom production in the area, the development of marketing facilities for ensuring remunerative prices of the produce was essential.

6.3. Policy Implications

1. The result of the analysis revealed that mushroom production is the profitable subsidiary occupation in the study area. Hence effort should be made to promote more farmers to adopt mushroom production as a source of income and employment.
2. Resource-use efficiency analysis revealed that some of the resources (number of bags, straw, chemicals, casing, spawn, and labour) were used above and below their optimum level. Hence, effort should be made to aware growers of how to use inputs optimally by organizing training in collaboration with agricultural universities and extension activities.
3. Government should encourage to establish processing units and effective marketing infrastructure to reduce the marketing margins.
4. Government should promote and support the mushroom growers financially and technically.



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“Every end is a new beginning”

Anonymous



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ABSTRACT


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Mushroom cultivation may be one of the important subsidiary enterprises for raising income and employment of small and marginal farmers. Thus, in view of the low level of farm income and employment in Dehradun District, mushroom may serve as an important source of additional income and utilize surplus family labour. Therefore, studies were needed to investigate economics aspects of mushroom production. The study was conducted in Vikasnagar, Sahaspur, Doiwala, and Raipur blocks of Dehradun District of Uttarakhand with the following objectives.

- 1) To work out the cost of and returns from mushroom cultivation.
- 2) To examine resource use efficiency of Mushroom production.
- 3) To identify the existing marketing channels and determine their marketing efficiency.
- 4) To identify and rank various constraints faced by mushroom growers.

The data for fulfilling different objectives were procured for selected mushroom growers and various concerned offices (District Department of Horticulture). In total 60 number of growers were selected from the study area.

The study revealed that the cost of production per bag was Rs 134.08. However, the yield of mushroom per bag was obtained 2.134 kg. The average price received per kg of mushroom by the mushroom grower in the study area was Rs 120. Net returns from mushroom cultivation were Rs 58 per kg. The value resource use efficiency for number of bags (1.36), straw (1.16), spawn (2.78), casing (1.69), and chemicals (1.46) came out to be greater than unity indicated under-utilization of these resources. However, for labour value of MVP/MIC came out to be less than unity revealed the over-utilization of the resource. With the presence of three marketing channels in the study area, the channel-II (4.40) was found more efficient as compared to channels-III (4.27). The most important and severe constraints prevail were marketing of produce and lack of non availability of suitable marketing for produce for the sale of mushroom at low prices. There is an urgent need for re-organizing the various agencies involved in promotion and development of production of mushroom production, need for adequate and well technical qualified staff for providing extension facilities, imparting necessary training and for supplying inputs and there should be a competitive market for the marketing of produce.


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प्रमुख विषय : षि अर्थशास्त्र
प्रसंग का शीर्षक : "उत्तराखंड के देहरादून जिले में मशरूम के उत्पादन और विपणन की अर्थशास्त्र"
सलाहकार : ड. रूची रानी गंगवार

मशरूम की खेती छोटे और सीमांत किसानों की आय और रोजगार बढ़ाने के लिए महत्वपूर्ण सहायक उद्यमों में से एक हो सकती है। इस प्रकार, देहरादून जिले में षि आय और रोजगार के निम्न स्तर को देखते हुए मशरूम अतिरिक्त आय के महत्वपूर्ण स्रोत के रूप में काम कर सकता है और अधिशेष पारिवारिक श्रम का उपयोग कर सकता है। इसलिए मशरूम उत्पादन के अर्थशास्त्र पहलुओं की जांच के लिए अध्ययन की जरूरत थी। यह अध्ययन उत्तराखंड के देहरादून जिले के विकासनगर, सहसपुर, डो वाला और रायफुलों में निम्नलिखित उद्देश्यों के साथ किया गया।

1. मशरूम की खेती से लागत और रिटर्न का काम करना।
2. मशरूम उत्पादन की संसाधन उपयोग दक्षता की जांच करना।
3. मौजूदा विपणन चैनलों की पहचान करना और उनकी विपणन दक्षता निर्धारित करना।
4. मशरूम उत्पादकों के सामने आने वाली विभिन्न बाधाओं की पहचान करना और उन्हें रैंक करना।

चयनित मशरूम उत्पादकों और विभिन्न संबंधित कार्यालयों (जिला उद्यानिकी विभाग) के लिए विभिन्न उद्देश्यों को पूरा करने के लिए आंकड़े खरीदे गए थे। अध्ययन क्षेत्र से कुल 60 उत्पादकों का चयन किया गया। अध्ययन से पता चला है कि प्रति बैग उत्पादन की लागत 134.08 रुपये थी। हालांकि, प्रति बैग मशरूम की उपज 2.134 किलो प्राप्त की ग थी। अध्ययन क्षेत्र में मशरूम उत्पादक द्वारा प्रति किलो मशरूम प्राप्त औसत मूल्य 120 रुपये था। मशरूम की खेती से शुद्ध रिटर्न 58 रुपये प्रति किलो था। बैग (1.36), भूसे (1.16), स्पान (2.78), आवरण (1.69), और रसायनों (1.46) के लिए मूल्य संसाधन उपयोग दक्षता इन संसाधनों के उपयोग के तहत इंगित एकता से अधिक हो बाहर आया था। हालांकि, एमवीपी/एमआ सी के श्रम मूल्य के लिए एकता से कम होने के लिए संसाधन के अधिक उपयोग का पता चला। अध्ययन क्षेत्र में तीन विपणन चैनलों की उपस्थिति, चैनल-II (4.40) चैनल-III(4.27) की तुलना में अधिक कुशल पाया गया। सबसे महत्वपूर्ण और गंभीर बाधाएं उपज के विपणन और कम कीमतों पर मशरूम की बिक्री के लिए उत्पाद के लिए उपयुक्त विपणन की अनुपलब्धता की कमी थी। इसमें शामिल विभिन्न एजेंसियों को पुन आयोजन करने की तत्काल आवश्यकता है।


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