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Socio-Economic Features, Production and Marketing Status and Challenges in Mushroom Cultivation: Observation's from Mid Hills of Kangra Farms in Himachal Pradesh, India

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ABSTRACT **Original research paper**

With the growing need for high-quality food, mushroom cultivation has emerged as a significant agricultural activity across various regions of the country. This practice requires minimal land and offers a viable employment avenue for small-scale and landless farmers, as well as educated youth and women. Mushroom farming not only generates supplementary income but also utilizes agricultural waste efficiently, thereby enhancing the socio-economic well-being of farming households. In light of these factors, the present study was conducted to assess the socio-economic conditions, production economics, and marketing systems of different mushroom varieties, and to identify key challenges faced by growers in the selected region. Primary data were obtained from 60 mushroom farmers across seven randomly selected blocks in Kangra district, which was chosen purposively. Farmers were classified into small and large categories based on the number of compost bags used, using the cumulative square-root frequency method. Data collection was carried out through a structured and pre-tested questionnaire focusing on various dimensions of mushroom cultivation and marketing. The information was analyzed using suitable mathematical and statistical techniques. Results indicated that the average family size across farms was 5.22, with smaller farms having slightly larger families (5.43) compared to larger farms (4.8). A greater proportion of respondents belonged to joint families (51.67%) than nuclear families (48.33%). Interestingly, none of the mushroom cultivators was under the age of 25. Among the larger farms, 85% of household heads were in the 40–60 age group. The overall sex ratio stood at approximately 994, with large farms exhibiting a higher ratio (1087) compared to small farms (955). Literacy levels among mushroom growers were found to be high, and a notable portion considered mushroom cultivation as either a primary or supplementary occupation. Agriculture was the main source of livelihood for 62% of the population surveyed, with small farms showing a higher dependency on this sector. The data further revealed an inverse relationship between mushroom unit size and landholding size,i.e., as mushroom production increased, the total and cultivated land area declined. On average, cultivated land accounted for 0.3033 hectares, representing 74.34% of the total holding. An economic analysis of button mushroom production showed that net returns both over total and variable costs increased with farm size. Conversely, the opposite trend was observed for oyster mushrooms. The mushroom sector in Himachal Pradesh is experiencing steady growth, signifying its increasing prominence within the state's agricultural framework. For button mushrooms, fixed costs per 100 bags ranged from 32.80% on small farms to 22.97% on large farms, while variable costs ranged from 67.20% to 72.21%, respectively. Gross returns per 100 bags varied between ₹40,587 and ₹47,109. Net returns per kg ranged from ₹34.08 on small farms to ₹63.73 on large farms. The break-even production level for button mushrooms was found to be 100 kg overall, with small farms needing 150 kg and large farms needing only 69 kg to break even. Key

factors influencing production included the number of compost bags, labor availability, plant protection expenditures, and the management index. Regarding marketing practices, three channels were identified. Among these, Channel-2 (Grower → Retailer → Consumer) was most widely used, accounting for 48.16% of the marketed produce and used by 40.60% of growers. Channel-1 (Direct sale to consumers) offered the highest producer share (98.87%) but was used for only 10.55% of the total output. Channel-2 was the most dominant in terms of volume and participation, with 73.65% of the consumer price reaching the producer. In the case of oyster mushrooms, small farms incurred higher production costs (₹17,055 per 100 bags) compared to large farms (₹12,051), primarily due to economies of scale. Although production volume and gross returns followed similar patterns, net returns were lower for small farms due to their higher costs. The break-even point for oyster mushrooms was 100 kg with 39 compost bags. Marketable and marketed surpluses both increased with farm size. Oyster mushroom growers utilized only two marketing channels, with Channel-2 again being the most popular used by 57.69% of growers and accounting for 88.65% of marketed produce. A comparative assessment between button and oyster mushrooms revealed that button mushrooms generated significantly higher gross returns (₹45,148 per 100 bags) compared to oyster mushrooms (₹21,960 per 100 bags). Button mushroom cultivation involved greater input costs but also provided superior returns, making it more profitable. Fixed costs for button mushrooms (27.31% of total cost) were roughly half that of oyster mushrooms (51.59%). Variable costs were higher for button mushrooms (72.69%) than oyster mushrooms (48.11%), but so were the net returns. In terms of break-even output, button mushrooms required 100 kg while oyster mushrooms required 72 kg to reach a no-profit-no-loss point. While three marketing channels were used for button mushrooms, oyster mushrooms relied on only two. Overall, the study highlights that button mushrooms outperform oyster mushrooms in terms of profitability, due to better consumer demand and more established marketing avenues in the Kangra region. Feedback from farmers and market stakeholders identified several constraints, namely production-related issues, marketing inefficiencies, institutional gaps, and social factors that prevent large-scale adoption of mushroom farming as a full-time agricultural enterprise.

Keywords: Button mushroom, oyster mushroom, family structure, farmer demographics, education, occupation, production cost, gross return, net return, breakeven analysis, production determinants, market surplus, marketing channels, producer share, marketing margins, price spread, efficiency, farming constraints.

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Introduction

Mushrooms, also known as toadstools, are the umbrella–shaped fruiting bodies that are members of the fungal kingdom and are often grown above ground on their feeding substrate. There are about 1.5 million species of mushrooms worldwide, out of which only 2,327 species are identified as edible and are of medicinal use. Button (*Agaricus bisporus*), Shitake (*Lentinula edodes*), and Oyster (*Pleurotus spp.*) mushrooms are the three primary species of commercialized mushrooms. These species have been utilized for food and medicine since ancient times because of their amazing flavor, taste, nutritional qualities, and numerous therapeutic advantages. The regular consumption of mushrooms lowers the chance of developing several diseases, including cancer, high cholesterol, and other conditions, in addition to a balanced diet. Mushrooms are one of the vegan foods that are high in protein, with over 3.3 g of protein per 100g of mushrooms.

The demand for mushrooms is continuously increasing mainly on account of increasing awareness among people about their nutritive and medicinal values, improvement in socio-economic status, increasing population, etc. This offers an opportunity to the farming community for adoption and expanding the scale of mushroom production. In general, the average size of land holdings is continuously declining on account of increasing population, which results in the division of holdings. On this account, the scope of increase in farm income from field crops alone got restricted. Thus, there is a need to introduce those enterprises in farm production that do not compete potentially with crops for land. Such potential enterprises are mushroom production, hi-tech horticulture, dairy farming, beekeeping, etc. Among these, mushroom

production has the advantage and is a good subsidiary occupation because the raw material required for the production is readily available on the farm. The leftover mushroom bag can also be utilized to generate revenue by turning it into high-quality manure or as crop manure.

India is renowned for having varied agro-climatic conditions that are ideal for the growth of various kinds of mushrooms. The growth of mushrooms has a significant positive impact on rural residents' health and quality of life through nutritional, medicinal and economic benefits. Thomas, at the Agricultural College in Coimbatore, cultivated paddy straw mushrooms and made the first mushroom cultivation known in India in 1943 (Prakasam,2012). The first button mushroom cultivation was started in 1961 at Solan which is also known as city of mushrooms. At present, 0.155 million tones of mushrooms are produced in India annually but its consumption is less than 100g per person annually (Sharma et al. 2017). According to the National Horticulture Board, the top producer of mushroom in India is Bihar where over 28,000 tones of mushrooms were produced in 2021-22, accounting for 10.82 per cent of the nation's total mushroom production.

Mushroom cultivation is particularly well-suited to regions like Himachal Pradesh due to its diverse climatic conditions, the predominance of marginal and small farmers (constituting around 88% of the farming population), and the availability of strong technical support. Farmers in the state benefit from guidance and expertise provided by institutions such as State Agricultural Universities (SAUs), Krishi Vigyan Kendras (KVKs), and the ICAR-Directorate of Mushroom Research located in Solan.

Since the 1980s, the State Department of Horticulture has been actively promoting mushroom farming by offering farmer training programs and providing subsidized compost during the initial stages. Mushroom cultivation is also included as a component in several key schemes and projects, such as the Agricultural Technology Management Agency (ATMA), Rashtriya Krishi Vikas Yojana (RKVY), and the Japan International Cooperation Agency (JICA) initiative.

Initially, adoption of mushroom cultivation among farmers was relatively slow, primarily because only button mushrooms were grown, and that too during the winter months. However, with the development and availability of new strains like oyster and milky mushrooms that can thrive under natural conditions throughout the year, a growing number of farmers have now begun cultivating mushrooms on a commercial scale, generating substantial income from the enterprise (Saina et al., March 2025).

The Kangra region, with its temperate climate, is especially favorable for mushroom farming. Its moderate temperatures and high humidity levels create ideal conditions for cultivating a variety of mushrooms, including button, oyster, and milky mushrooms (Saina et al., March 2025). Both the central and state governments support mushroom growers through subsidies, financial assistance, and training initiatives, helping new and existing farmers to expand their operations.

Furthermore, the proximity to an agricultural university and the Indo-Dutch Department in Kangra enhances access to technical expertise, advanced cultivation technologies, and improved mushroom strains. In this context, the present study was conducted in the Kangra valley of Himachal Pradesh with the following objectives: to evaluate the socio-economic impact of mushroom cultivation across different categories of growers; to analyze the economics of various mushroom types; to explore marketing channels, costs, and margins; and to identify key constraints preventing wider adoption of mushroom farming as a sustainable livelihood option.

Methodology

The base of any scientific investigation is systematic methodology, which enhances the validity, precision, and reliability of the findings in relation to the research problem. It is essential for doing quality research work as it has a direct impact on the reliability of the research findings. Future researchers in the same or similar field will find it useful to have an elaborate picture of the material and methods used in the study when assessing the data requirements. The methodology used and the various tools that were utilized to obtain and analyze the findings of the research are given hereunder:

Study Area and Sampling Design

The research was conducted in the Kangra district of Himachal Pradesh, which was deliberately selected due to several key factors. Firstly, the Indo-Dutch Mushroom Project in Palampur, managed by the State Directorate of Horticulture and situated within CSKHPKV, Palampur, plays a pivotal role in supplying spawned compost to mushroom cultivators across various districts. Secondly, the Centre for Mushroom Research and Training (CMRT) at CSKHPKV, Palampur, offers both spawned compost bags and spawn for different mushroom varieties, including button and oyster mushrooms. Thirdly, the Directorate of Extension Education, also at CSKHPKV Palampur, regularly conducts training sessions on multiple aspects of mushroom farming. Finally, Kangra has a relatively large number of active mushroom growers, and given the lack of recent studies in the region, it was chosen as a purposive sampling location (Mahajan et al., May 2025).

Sampling Framework

Primary data were collected from seven randomly selected blocks within Kangra district: Nagrota, Sullah, Palampur, Bhawarna, Jaisinghpur, Panchrukhi, and Baijnath. These blocks are all located near Palampur, a central hub for

technical support, training, and the supply of spawned compost and mushroom spawns.

A Simple Random Sampling method was employed to select 60 mushroom growers from these blocks. The sample was drawn from a comprehensive list of all mushroom growers in the district. The selected growers were classified into two categories, small and large, based on the number of compost bags used, using the Cumulative Square Root Frequency (CSRF) method.

Small-scale growers: Used less than 300 compost bags; total of 40 respondents.

Large-scale growers: Used 300 or more compost bags; total of 20 respondents
(Mahajan et al., May 2025; Mahajan et al., October 2025)

Rationale for Farmer Classification

The classification of growers into small and large categories was based on the number of compost bags, which serves as a practical indicator of their production capacity and scale of operations. This metric directly correlates with the volume of mushrooms a grower can produce, and hence their potential income and resource requirements.

This categorization allows for more targeted analysis and policy recommendations:

Small farmers typically benefit from support related to input access (such as compost and spawn), technology, and training.

Large farmers may require assistance related to market access, logistics, and scale-based efficiencies.

Understanding these distinctions enables policymakers and program designers to tailor interventions according to the unique needs of each group. For example, a farmer using a few hundred compost bags would be considered small-scale, while one operating with several thousand bags would be classified as large-scale.

The methodology for growing button mushrooms adhered to the standard protocols prescribed by the Directorate of Mushroom Research (DMR), Solan.

Sample Distribution

A full list of mushroom cultivators in Kangra district was compiled, from which the final sample of 60 growers was randomly selected. The distribution of these respondents across the selected blocks is presented in Table 1 (not shown here).

Table 1: Distribution of mushroom growers among different categories using square root frequency method

Sr.No.	Category	Number of compost bags	Number of mushroom growers	Percentage of mushroom growers
1.	Small	<300	40	66.67
2.	Large	≥300	20	33.33
	Total		60	100.00

Data Collection

To fulfill the objectives of the study, both primary and secondary data were gathered.

Primary data were collected from a sample of 60 mushroom growers, selected from various blocks in Kangra district. A detailed survey schedule was designed specifically for this purpose. Before its implementation, the schedule was pre-tested in two villages within the study area to ensure the relevance and clarity of the questions, especially those related to different aspects of mushroom production.

Data collection was carried out using the personal interview method, and the finalized, pre-tested survey tool was used to obtain in-depth information. The data relate to the agricultural year 2023–24 (Mahajan et al., May 2025; Mahajan et al., October 2025).

The primary data covered a wide range of variables, including:

i. Demographic characteristics: age, gender, family size, education level, and experience in mushroom cultivation;
ii. Household features: landholding size, livestock ownership, and investment in mushroom farming units;
iii. Production details: types and quantities of inputs used, labor employed, input costs, and prevailing market prices;
iv. Economic analysis: cost and return structure, marketing practices, marketing costs, and revenue;
v. Marketing: channels used for selling mushrooms, producer share, and pricing;
vi. Constraints: challenges faced in production, marketing, and accessing resources or institutional support.

In addition, secondary data were obtained from various official sources, including the Statistical Outline of Himachal Pradesh, the Indo-Dutch Mushroom Project, Palampur, and reports from the Department of Horticulture in Shimla and Kangra. These data provided background information on the study area, including demographic and literacy statistics, zonal mushroom production (both public and private sectors), and the overall growth trends and development of mushroom cultivation in Himachal Pradesh (Mahajan et al., September 2025).

Analytical Framework

The collected data were systematically compiled and analyzed using relevant mathematical and statistical techniques aligned with the study objectives. The analysis included both descriptive and functional methods to interpret the socio-economic, economic, and marketing aspects of mushroom cultivation.

1. Descriptive Analysis

Tabular analysis was employed using averages, percentages, and ratios to study:

i. Demographic characteristics
ii. Land use and cropping patterns
iii. Input usage
iv. Occupational structure
v. Investment patterns in mushroom units
vi. Labour utilization
vii. Cost and return metrics

These tools helped provide an overview of the basic features of mushroom growers and their operations.

2. Production Function Analysis

To examine the key factors influencing mushroom productivity, the Cobb-Douglas production function was applied. Although both linear and Cobb-Douglas models were tested, the latter was found to yield more reliable and statistically significant results.

The variables included in the regression model were:

1. Number of compost bags
2. Labour input (in man-days)
3. Expenditure on crop protection materials
4. Management Index, which included:
    i. Temperature control
    ii. Maintenance of relative humidity
    iii. Hygiene standards
    iv. Use of formalin sprays

This functional analysis helped quantify the contribution of each factor to overall mushroom yield.

(Mahajan et al., October 2025)

3. Growth Rate Estimation

To evaluate trends in mushroom production across both public and private sectors over ten years (2013–14 to 2022–23), Compound Annual Growth Rates (CAGR) were calculated using time-series data.

(Mahajan et al., September 2025)

4. Socio-Economic Profiling

Socio-economic characteristics of mushroom growers were analyzed using tabular methods to study parameters such as:

i. Family structure and size
ii. Age distribution
iii. Educational attainment
iv. Occupation types
v. Cropping patterns
vi. Input usage and labor distribution

(Saina et al., April 2025)

5. Cost and Return Analysis

The economic viability of mushroom farming was assessed through detailed cost and return analysis. Costs were divided into:

i. Fixed Costs: Depreciation on mushroom infrastructure and tools, and interest on fixed capital.
ii. Variable Costs: Expenses on compost bags, packing materials, crop protection chemicals, electricity, transportation, wages, and miscellaneous costs.

Gross returns were calculated based on output (kg per 100 compost bags) multiplied by market price (₹/kg).
Net return over variable cost = Gross return – Variable costs
Net return over total cost = Gross return – Total costs
Benefit-Cost Ratio (B: C Ratio) = Gross return / Total cost
This ratio measures the economic return for every rupee invested.

(Mahajan et al., May 2025; Saina et al., March 2025; Mahajan et al., October 2025)

6. Break-even Analysis

Break-even output represents the production level at which total revenue equals total cost, meaning zero profit or loss. It was computed using:

$$\text{Break-even Output} = \frac{\text{Total Fixed Cost}}{\text{Price per Unit} - \text{Average Variable Cost}}$$

This analysis identifies the minimum production volume required to avoid losses.

(Mahajan et al., May 2025; Saina et al., March 2025; Mahajan et al., October 2025)

7. Marketable and Marketed Surplus

i. Marketable surplus: Quantity remaining after fulfilling household consumption, gifts, and in-kind labor payments.
ii. Marketed surplus: The actual quantity sold in the market, regardless of household needs.

These measures provided insights into how much produce is available for sale versus what is actually sold.

(Mahajan et al., May 2025; Saina et al., March 2025; Mahajan et al., October 2025)

8. Marketing Channels

Marketing channels refer to the pathways through which mushrooms move from growers to end consumers. A field survey identified various intermediaries and marketing routes used in the study area.

(Mahajan and Thakur, March 2025; Mahajan et al., May 2025; Saina et al., March 2025)

9. Marketing Costs, Margins, and Price Spread

i. Marketing cost: All charges incurred from local collection to retailing.
ii. Middleman's margin: Difference between sale price and total costs (purchase price + marketing costs).
iii. Price spread: Gap between what the consumer pays and what the producer receives is indicative of market efficiency.

Producer's share in consumer rupee =

$$\left\{\frac{\text{Price received by grower}}{\text{Retail price}}\right\} \text{X } 100$$

Smaller price spreads reflect higher marketing efficiency. *(Mahajan and Thakur, March 2025)*

10. Marketing Efficiency

Shepherd's formula was used to assess the efficiency of various marketing channels:

Marketing Efficiency =

$$\left\{\frac{\text{Retailer's Sale Price}}{\text{Marketing Costs + Marketing Margins}} - 1\right\}$$

This calculation helped identify the most cost-effective and profitable marketing routes.
(Mahajan and Thakur, March 2025)

11. Identification of Constraints

To determine the key challenges in mushroom farming, a constraint analysis was carried out using Garrett's Ranking Technique. Respondents ranked the severity of different problems, which were grouped under four categories:

i. Production-related issues
ii. Marketing problems
iii. Institutional challenges
iv. Social constraints

The ranking process involved converting respondent rankings into percentage positions, which were then transformed into scores using Garrett and Woodworth's (1969) table. Average scores were computed for each factor, ranked in descending order, and used to identify the most significant constraints.
(Mahajan and Thakur, March 2025)

Results and Discussion

1. Socio-Economic Characteristics of Mushroom Growers

Mushroom cultivation offers notable socio-economic benefits, particularly in rural regions. It provides a dependable income source for farmers, contributes to improved family nutrition, creates employment opportunities, and utilizes agricultural by-products, thereby supporting sustainable farming and reducing poverty. The increasing urban demand for mushrooms allows farmers to access markets easily and sell their produce at favorable prices. As a livelihood activity, mushroom farming has the potential to empower rural communities by enhancing economic independence and improving social standing. *(Saina et al., April 2025)*

Assessing the socio-economic profile of mushroom growers is critical for understanding their current circumstances. This analysis not only helps in identifying issues faced by farmers but also aids policymakers in designing need-based interventions and programs. A detailed examination of their socio-economic conditions supports the formulation of strategies aimed at improving their livelihood status. *(Saina et al., April 2025)*

1.1 Family Structure and Size

Family size and structure are key determinants of a farm's labor availability and overall sustainability. Larger families can contribute more to labor-intensive agricultural activities, often increasing productivity and operational efficiency. The analysis showed that the average household size among mushroom growers was 5.22 members, with small farms averaging 5.43 members and large farms averaging 4.8. Small farms had more males (2.78), while large farms had a slightly higher number of females (2.5).

Further, joint families accounted for 51.67% of households, slightly more than nuclear families at 48.33%. Joint families were more prevalent among small farms (52.5%), whereas nuclear families were more common in large farms (50%). Most households had 4 to 8 members, with 33.33% falling into each of the 4–5 and 6–8 member categories, and only 8.34% had more than 8 members. *(Saina et al., April 2025)*

1.2 Age Distribution

Understanding the age composition of household members helps determine the available active labor force and generational dynamics within farming households. Younger members are generally more open to adopting new technologies, while older members often play a pivotal role in decision-making.

Age Distribution of Household Heads

The majority of household heads (63.33%) were between 40–60 years, followed by 25–40 years (33.33%), with only 3.33% aged over 60. Notably, there were no household heads below 25 years. Among large farm holders, 85% were aged 40–60, while 42.5% of small farm holders fell into the 25–40 age group. The working population was 100% in large farms and 95% in small farms. *(Saina et al., April 2025)*

Age Distribution of Family Members

Among male members, the largest group was aged 15–25 (40.13%), followed by those under 15 (17.76%) and 40–60 (16.45%). Among females, the majority were 25–40 years (36.94%), followed by 15–25 (27.39%). About 71.25% of the population fell within the economically active age range (15–

60 years). Small farms had a slightly higher proportion (71.43%) of working-age individuals compared to large farms (70.83%). The overall sex ratio was 994, with large farms at 1087 and small farms at 955. *(Saina et al., April 2025)*

1.3 Educational Status

Education is a key enabler of technology adoption, efficient farm management, and access to government support programs. Educated farmers are better equipped to make informed decisions and capitalize on available opportunities.

Education Level of Household Heads

Most household heads had completed matriculation (38.33%), followed by senior secondary education (31.67%). Only 8.33% were illiterate. Among large farms, 50% of female heads had matriculation-level education compared to 40% in small farms. The overall literacy rate among household heads was 91.67%, with male literacy at 95.12% and female literacy at 84.21%. Literacy was slightly higher in small farms (92.5%) than large farms (90%). *(Saina et al., April 2025)*

Education Level of Family Members

Overall, 96.49% of the population was literate, with male literacy at 99.36% and female literacy at 93.49%. Interestingly, more females (13.5% higher) had completed middle school than males. However, female participation in higher education (diploma and graduation) was lower than that of males. The highest proportion of family members were educated up to senior secondary (27.16%), followed by matriculation (25.24%) and middle school (12.46%). Only 3.51% of the population was illiterate, with a higher percentage of illiterate females (6.41%) than males (0.64%). Small farms had a 2.25% higher literacy rate compared to large farms. *(Saina et al., April 2025)*

1.4 Land Utilization Pattern

Land is central to agricultural productivity. Efficient land utilization reflects a household's ability to optimize resources. The average landholding size was 0.408 ha, with leased-in land accounting for 14.88% of this total. Small farms leased in more land (17.61%) compared to large farms (6.58%).

Interestingly, as the size of mushroom units increased, the overall landholding and cultivated area tended to decrease. The average cultivated land was 0.3033 ha, comprising 74.34% of total landholding. Small farms had a higher percentage of cultivated land than large farms, with a 17.52% difference. Large farms had more area under permanent pastures and miscellaneous uses. *(Saina et al., April, 2025)*

1.5 Occupational Pattern

This analysis offers insights into the primary and secondary occupations of farming households.

Occupation of Household Heads

Over half of the household heads (51.69%) reported mushroom cultivation as their primary occupation. This was higher in large farms (60%) than in small farms (49.38%). Agriculture was the second most common livelihood activity (28.81%), followed by private employment (5.93%), self-employment (10.29%), and government employment (1.69%). Among small farms, 11.11% of heads were self-employed, compared to 8.57% on large farms.

For subsidiary occupations, mushroom cultivation dominated with 68.97% engagement. It served as a supplementary activity for 80.49% of small farms and 38.89% of large farms, indicating greater economic dependence on mushrooms in small farms. *(Saina et al., April 2025)*

Occupation of Family Members

Agriculture was the main occupation for 62% of household members, with higher dependency in small farms (64%) than in large farms (59%). Private sector jobs (21%) were the next major source of income, especially among large farms (25%) compared to small farms (19%). Engagement in businesses (8%) and government jobs (9%) also contributed to household income, with more self-employment in small farms (8%) than in large farms (6%). *(Saina et al., April 2025)*

1.6 Cost and Return Analysis

Button Mushroom

Production per 100 compost bags (20kg each) was higher on large farms (362.38 kg) than on small farms (312.21 kg). Gross returns followed a similar trend: ₹47,109 for large farms and ₹40,587 for small farms.

1. **Small farms**:
   i. Net returns over total cost: ₹10,640
   ii. Net returns over variable cost: ₹20,464
2. **Large farms**:
   i. Net returns over total cost: ₹23,096
   ii. Net returns over variable cost: ₹28,568

Net returns per kg:

i. Over total cost: ₹52.27
ii. Over variable cost: ₹73.50
(Saina et al., April 2025)

Oyster Mushroom

In contrast, small farms produced slightly more (186 kg) than large farms (180 kg) per 100 bags. Gross returns were ₹22,320 for small farms and ₹21,600 for large farms. However, net returns were higher on large farms due to lower total costs.

1. **Small farms**:
   i. Net return over total cost: ₹5,265
   ii. Net return over variable cost: ₹15,089

2. **Large farms**:
   i. Net returns over total cost: Rs 9,549
   ii. Net returns over variable cost: Rs 15021

Net returns per kg:
   i. Over total cost: Rs 41.91
   ii. Over variable cost: Rs 82.20

2. Production Economics and Marketing Aspects of Button Mushroom

2.1 Trends and Growth rates of mushroom production in H.P.

Mushroom production in Himachal Pradesh is an activity of both the public and private units, and the state has witnessed an increase in its production from 6312.71 tons in 2013-14 to 16256.02 tons in 2022-23.Private units produce more mushrooms compared to government units, and it has increased from 98.92 per cent in 2013-2014 to nearly 99.55 per cent in 2022-23. There was a decrease in production of mushrooms in the case of government units, i.e., from 1.08 per cent in 2013-14 to 0.45 per cent in 2022-23. The maximum production of mushrooms was in the year of 2021-22, after which it decreased. The total compound annual growth rate of 11.15 per cent was recorded over the last decade. The public units indicate the growth rate of just 1.57 per cent, whereas the private farms recorded the highest percentage of growth rate, 11.22 per cent. This indicates that there is a significant growth in the government as well as private units over the ten years (Mahajan*et al*., September 2025).

Studies indicate that button mushroom cultivation is a profitable venture in Himachal Pradesh, with farmers achieving a good net return on investment. Mushroom farming is a secondary source of income for many rural families, particularly for landless farmers or those with small landholdings, as it requires only a small area. Mushroom production creates employment opportunities in rural areas, contributing to the livelihoods of the local population. Button mushrooms are a good source of protein and other essential nutrients, making them a valuable food source, especially for vegetarians. The state's agro-climatic conditions are suitable for mushroom cultivation, including button mushrooms, which have the potential for export and earning foreign exchange. The cost of cultivation is relatively low, and the yield is high, making mushroom farming a cost-effective venture. Spent mushroom compost holds significant value as a nutrient-rich organic manure that can be effectively utilized in cultivating other field crops, thereby increasing the overall economic returns from mushroom farming. Additionally, mushrooms are not only highly palatable but also offer substantial health benefits. They are an excellent source of essential nutrients, including proteins, vitamins, and minerals, making them a valuable component of a balanced and nutritious diet.

Mushroom production is gaining popularity among farmers, women and youths in Himachal Pradesh. Thus, Button mushroom cultivation in Himachal Pradesh is economically important, providing a profitable venture for farmers, contributing to rural income generation, and offering a valuable source of protein and other nutrients. (Mahajan, *et al*., October, 2025).

2.2 Input Use Pattern of Button Mushroom

On average, 100 compost bags (each weighing 20 kg) were used per production unit across all farms. Packing material usage averaged 2.43 kg per 100 bags, with large farms consuming more packing material due to their higher production volumes. Plant protection measures are crucial in mushroom cultivation to manage diseases and boost yields. Formalin was used to sterilize rooms before placing the bags; the average amount used was 173.45 ml per 100 bags, with small farms using 160.30 ml and large farms 186.60 ml. Transportation costs averaged ₹488 for all farms, and these costs were higher in small farms compared to large ones.

Human labor is integral to every stage of mushroom farming. Across all farms, labor usage was 19 man-days per 100 bags, with small farms using 18 man-days and large farms 20 man-days. Miscellaneous costs covering crop washing materials and other plant protection inputs averaged ₹380 overall, with small farms spending ₹411 and large farms ₹366. *(Mahajan et al., October 2025)*

2.3 Labour Utilization

Mushroom farming is labor-intensive, requiring work from bag placement to harvesting, watering, cleaning, packing, etc. To standardize across farms, labor inputs were converted to man-days. *(Mahajan et al., October 2025)*

i. Total labor for 100 bags ranged from 18 man-days (small farms) to 19 man-days (large farms).
ii. Harvesting consumed the highest share of labor (34.97%), followed by washing & packaging (28.47%).
iii. Watering and chemical spraying accounted for 24.83%, and other operations (miscellaneous) used 8.98%.
iv. In large farms, a greater share of labor was allocated to watering (26.66%) and washing/packaging (29.62%) compared to small farms.
v. Family labor averaged 16 man-days across all farm's small farms: 17 man-days; large farms: 15 man-days.
vi. Hired labor usage was minimal overall, with large farms using slightly more hired labor than small farms. *(Mahajan et al., October 2025)*

2.4 Cost Components

Costs were categorized into fixed and variable components:

i. Fixed costs: Depreciation on infrastructure, interest on fixed capital.
ii. Variable costs: Expenses for compost bags, packing material, plant protection, electricity, transport, labor, and miscellaneous items.

Findings:

i. Fixed costs accounted for 27.31% of the total cost overall. For small farms, the proportion was 32.80%, and for large farms, 22.79%.
ii. Variable costs comprised 72.69% of the total cost. Large farms invested more in variable costs (77.21%) than small ones (67.20%).
iii. Among variable costs, the largest component was compost bag investment, amounting to ₹10,100 per 100 bags (37.41% of total cost).
iv. Labor costs made up 28.05%, and transport costs 1.81% of the total cost.
v. Large farms allocated a higher share of cost to compost and labor than small farms.
vi. Spending on crop protection materials was relatively small, at 0.77% of total cost. *(Mahajan et al., October 2025)*

2.5 Costs and Returns: Button Mushroom

i. Production per 100 compost bags:
Large farms: 362.38 kg,
Small farms: 312.21 kg

ii. Gross returns:
Large farms: ₹47,109
Small farms: ₹40,587

iii. Net returns:
Small farms:
Over total cost: ₹10,640
Over variable cost: ₹20,464
Large farms:
Over total cost: ₹23,096
Over variable cost: ₹28,568

iv. Net returns per kg:
Over total cost: ₹52.27
Over variable cost: ₹73.50

v. Benefit–Cost Ratio (B:C):
Overall: 1.67
Small farms: 1.36
Large farms: 1.96
(Mahajan et al., October 2025)

2.6 Break-even Analysis

Break-even output is the level of production where the farmer neither gains nor loses. Results:

i. Small units: 150 kg of mushrooms (valued at ₹19,500) is required to break even.
ii. Large units: 69 kg (valued at ₹10,350) is the break-even point—lower due to a lower average variable cost (₹51.16 per kg).
iii. Overall: The break-even output is 100 kg of mushrooms.
iv. In terms of compost bags:
Small farms need to place at least 50 bags, Large farms require at least 23 bags to break even. *(Mahajan et al., October 2025)*

2.7 Production Function Analysis

To model the relationship between inputs and output, regression analysis using the Cobb-Douglas production function was applied. This form showed a better fit, indicated by a higher adjusted R^2 and more significant variables. The explanatory variables were:

i. $X1_1$: number of compost bags
ii. $X2_2$: labor (man-days)
iii. $X3_3$: expenditure on crop protection materials
iv. $X4_4$: management index (based on temperature control, humidity, hygiene, formalin spray)

Key findings:

i. Compost bags ($X1_1$), labor ($X2_2$), and management index ($X4_4$) positively and significantly influenced yield.
ii. A 1% increase in compost bags leads to a 1.0528% increase in yield.
iii. A 1% increase in labor yields a 0.1091% increase, and in the management index, a 0.5169% increase.
iv. Interestingly, expenditure on crop protection ($X3_3$) had a significantly negative effect—suggesting scope for optimizing this cost.
v. The adjusted R^2 was 0.9786, meaning 97.86% of the variation in yield is explained by these variables, with the remaining ~2–3% due to other un
vi. modeled factors. *(Mahajan et al., October 2025)*

2.8 Marketing of Button Mushroom

An efficient marketing system is essential for ensuring that producers receive fair prices. The marketing chain involves all agents and processes that move mushrooms from growers to consumers. If the marketing system is weak, producers might not get remunerative pricing, reducing production incentives. *(Mahajan & Thakur, March 2025)*

Production and Disposal Pattern

i. Average production per farm: 8.36 quintals, with small farms producing 3.39 quintals and large farms 18.3 quintals.
ii. Self-consumption accounted for 1.91% of total production, with small farms consuming more.
iii. Around 1% of production was gifted to relatives, neighbors, etc.
iv. Kind payments to labor: higher in large farms (0.38%) than in small farms (0.09%).
v. There was a positive relationship between farm size and marketed surplus:
- Large farms: 95.19% marketed
- Small farms: 91.45% marketed
- Overall marketed surplus: 94.26%

vi. The remainder (~3%) was used for home consumption, gifts, kind payments, or lost. *(Mahajan & Thakur, March 2025; Mahajan et al., October 2025)*

2.9 Marketing Channels for Button Mushrooms

Marketing channels define the routes through which mushrooms travel from producers to consumers. Intermediaries like wholesalers and retailers link growers to final consumers. The choice and efficiency of channels significantly influence disposal and profitability.

In the study area, two main types of intermediaries were present between growers and consumers: retailers and wholesalers. Optimal utilization of these channels can enhance growers' profits.

The principal marketing channels identified in the study area include:

Channel-1. Mushroom grower ⟹ Consumer

Channel-2. Mushroom grower ⟹ Retailer ⟹ Consumer

Channel-3. Mushroom grower ⟹ Wholesaler ⟹ Retailer ⟹ Consumer

Marketing Channels of Button Mushroom

The marketing system for button mushrooms in the study area involved three primary channels:

Channel-1: Direct sale — Mushroom grower → Consumer

Channel-2: Retailer-based — Mushroom grower → Retailer → Consumer

Channel-3: Wholesaler and retailer — Mushroom grower → Wholesaler → Retailer → Consumer

Channel Utilization:

Channel-2 was the most commonly used route, adopted by 40.60% of growers, and handled 48.16% of the total mushroom volume.

Channel-3 accounted for 41.30% of the marketed produce but was used by only 24.06% of growers.

Channel-1, though used by 35.34% of growers, facilitated only 10.55% of the total mushroom sales.

When comparing farm sizes:

Small farms favored Channel-2, which handled 69.58% of their marketed produce.

Large farms primarily relied on Channel-3, accounting for 48.91% of their marketed output.

(Mahajan and Thakur, March 2025)

2.10 Marketing Costs, Margins, and Price Spread

Price spread reflects the gap between the consumer's purchase price and the amount the producer actually receives. A smaller spread indicates a more efficient marketing system. The producer's share in the final price and the margins of intermediaries (retailers and wholesalers) are essential to assess the fairness and efficiency of the marketing process.

Key Findings:

Channel	Net Price to Grower (₹/kg)	Retailer Margin (₹)	Price Spread (₹)
channel-1	₹148.30		—
Channel-2	₹147.30	₹21.00	₹50.00
Channel-3	₹132.30	₹14.20	₹69.00

Growers earned the highest net return per kg via Channel-1 (₹148.30), followed by Channel-2 (₹147.30), and then Channel-3 (₹132.30).

The widest price spread was observed in Channel-3, due to the involvement of more intermediaries.

The retailer's profit margin peaked in Channel-2 at ₹21 per kg, suggesting higher profitability for retailers in that pathway.

These trends reinforce that increased intermediary involvement leads to greater price dispersion, ultimately reducing the grower's share.

(Mahajan and Thakur, March 2025; Singh, 2014 – Punjab)

2.11 Marketing Efficiency

Marketing efficiency reflects how effectively mushrooms are moved from growers to consumers with minimal cost and maximum satisfaction. It was calculated using Shepherd's Formula, which assesses the ratio of total value of goods sold to the total marketing cost.

Efficiency Scores:

Channel	Marketing Efficiency	Producer's Share in Consumer Rupee	Share of Total Production
Channel-1	87.24	98.87%	10.55%
Channel-2	2.80	73.65%	48.16%
Channel-3	1.85	Lower	41.30%

Channel-1 had the highest marketing efficiency (87.24) and the largest producer share, but absorbed a minimal portion (10.55%) of the total mushroom production due to its limited scalability.

Channel-2 struck a balance with moderate efficiency (2.80) and handled the largest share (48.16%) of total marketed produce, making it the most significant channel in practice.

Channel-3, with the lowest efficiency (1.85), reflected the negative impact of multiple intermediaries on both cost and returns.

(Mahajan and Thakur, March 2025; Koundal and Kumar, 2024 Solan, Himachal Pradesh)

3 Production Economics and Marketing Aspects of Oyster Mushroom

Mushroom cultivation is suitable for the regions like Himachal Pradesh where the climatic conditions are quite diversified, majority of farmers are marginal and small and technical support is readily available to the farmers from the experts of State Agricultural University, Krishi Vigyan Kendras and ICAR-Directorate of Mushroom Research, Solan. The state department of horticulture is promoting mushroom production since 1980s by way of providing training to farmers and providing subsidized compost in the initial periods. It is also one of the activities of major ongoing schemes like Agricultural Technology Management Agency (ATMA), Rashtriya Krishi Vikas Yojana (RKVY), and Japan International Cooperation Agency (JICA), etc. Earlier, the pace of adoption of this enterprise by the farmers was low mainly due to the fact that at that time only the button mushroom was used to be grown and that too only winter months of the year. At present, there are different strains of the mushroom like oyster mushroom, milky mushroom which can be grown successfully round the year under natural climatic conditions. As a result, good number of farmers in the state is practicing mushroom production on commercial line and The Kangra region has a temperate climate which is ideal for mushroom cultivation. The moderate temperatures and high humidity levels provide a conducive environment for growing mushroom species such as button mushroom, oyster mushroom and milky mushroom. Therefore, an attempt has been made to examine the cost and return structure, break-even level of production and to find out the pattern and disposal of oyster mushroom through different marketing channels in Kangra district (Saina *et al.*, March, 2025).

Oyster mushroom production can be cost effective because the raw materials are easily available and the cultivation techniques are simple. It is a good source of protein, fibre, vitamin and minerals. It can be grown in a variety of climates without requiring complex environmental conditions. It can be a sustainable way to use waste materials to produce nutritious food and can be environmentally friendly way to produce food. Oyster mushroom production can help to address food insecurity in developing countries and can improve the economic well-being of the rural communities. This mushroom is popular for its rapid growth, nutritional value and adaptability. Studies on the economic aspects of oyster mushroom production help to understand the potential of this crop as a source of income for the rural communities. These studies also help to identify ways to improve the economic viability of oyster mushroom production through different marketing channels (Saina *et al.*, March, 2025).

3.1 Input Use Pattern of Oyster Mushroom

For every 100 compost bags, both small and large farms used approximately 10 kg of spawn. Plant protection is a key component in oyster mushroom cultivation, as it helps prevent diseases and supports yield enhancement. The total usage of bavistin and formalin per 100 bags was found to be 18 ml and 161 ml, respectively. Interestingly, small farms used slightly more of these chemicals (19 ml bavistin and 174 ml formalin) than large farms (16 ml bavistin and 148 ml formalin).

In terms of packing material, the average used was 1.39 kg per 100 bags. This was slightly higher for small farms, which could be attributed to their marginally higher production per 100 bags compared to large farms. Human labour plays a crucial role in oyster mushroom cultivation, especially in activities such as spawning, bag handling, watering, harvesting, and packaging. The total family labor used per 100 bags was 4.74 man-days, with small and large farms using 4.58 and 4.91 man-days respectively. The miscellaneous expenses (such as washing materials, plant protection inputs, etc.) amounted to Rs. 231 per 100 bags across all farms.

(Saina et al., March 2025)

3.2 Cost of Production

The cost analysis revealed that the total production cost per 100 bags of oyster mushroom on an overall farm was Rs. 14,290. Key variable cost components included:

i. **Labour**: 15.03%
ii. **Spawned compost bags**: 10.37%
iii. **Spawn**: 9.80%
iv. **Chemicals (bavistin, formalin, etc.)**: 7.17%

A comparison between farm sizes indicated that small farms incurred higher production costs (Rs. 17,055) compared to large farms (Rs. 12,051), mainly due to the lack of economies of scale on smaller holdings.

(Kumar et al., 2023 – Bhagalpur, Bihar; Saina et al., March 2025)

3.3 Cost and Returns Analysis

The data showed that small farms produced slightly more per 100 bags (186 kg) compared to large farms (180 kg). Although gross returns followed the same pattern, net returns were higher on large farms due to their lower production costs.

Farm Size	Gross Returns (₹)	Net Returns over Total Cost (₹)	Net Returns over Variable Cost (₹)
Small	₹22,320	₹5,265	₹15,089
Large	₹21,600	₹9,549	₹15,021

The **net return per kg** was **₹41.91 over total cost** and **₹82.20 over variable cost**. The **Benefit-Cost Ratio (BCR)** was:

i. **Small farms**: 1.31
ii. **Large farms**: 1.79
iii. **Overall**: 1.54

This highlights the profitability of oyster mushroom cultivation, especially when cost-efficiency is maintained. *(Saina et al., March 2025)*

3.4 Break-even Analysis

Break-even output determines the production level at which growers neither gain nor lose.

Farm Size	Break-even Output (kg)	Break-even Revenue (₹)	Break-even Compost Bags
Small	97 kg	₹13,580	52 bags
Large	53 kg	₹7,420	27 bags
Overall	72 kg	₹10,080	39 bags

The lower break-even point for **large farms** reflects their greater cost-efficiency.
(Saina et al., March 2025)

3.5 Production and Disposal Pattern

On average, each farm produced **101.33 kg** of oyster mushrooms. The **disposal pattern** was as follows:

1. **Home consumption**: 8.16% overall
   i. Small farms: 9.49%
   ii. Large farms: 6.67%
2. **Gifts (to friends/relatives)**: 2.87% overall
   i. Small farms: 4.38%
   ii. Large farms: 1.11%
3. **Marketed Surplus**: 82.83% overall
   i. Increased with farm size

These figures indicate that **larger farms not only produce more** but also **market a higher share** of their output. *(Saina et al., March 2025)*

3.6 Marketing Channels of Oyster Mushroom

In the study area, only one type of intermediary retailers was involved in the marketing process. Two major marketing channels were identified:

1. **Channel-1**: *Mushroom Grower → Consumer* (Direct sale)
2. **Channel-2**: *Mushroom Grower → Retailer → Consumer*

Retailers played a vital role in connecting producers with consumers, as no wholesalers were involved in the oyster mushroom trade in this region. The **proper selection of marketing channels** is essential to improve returns for the producers. *(Saina et al., March 2025)*

Channel-1. Mushroom grower ⇨ Consumer

Channel-2. Mushroom grower ⇨ Retailer ⇨ Consumer

In the sampled farms, only two marketing channels were used for the sale of oyster mushrooms:

i. Channel-1: *Mushroom Grower → Consumer*
ii. Channel-2: *Mushroom Grower → Retailer → Consumer*

Channel-2 was the most widely adopted, with 88.65% of the produce marketed through this route by 57.69% of the growers. Only 11.35% of the produce was sold directly via Channel-1. Channel-3, which typically includes wholesalers and retailers, was not used. This is attributed to the low number of growers and limited production, stemming from low demand and lack of consumer awareness about oyster mushrooms.
(Saina et al., March 2025)

4. Comparative Aspects: Button vs. Oyster Mushroom

4.1 Cost and Cultivation Requirements

1. Oyster mushrooms are comparatively cheaper to cultivate due to:
   i. Simple infrastructure needs
   ii. Use of low-cost substrates like straw or sawdust
   iii. Faster crop cycle
2. Button mushrooms require:
   i. composting
   ii. Specialized Environmental control systems (temperature, humidity)
   iii. Skilled labour and longer cultivation cycles
   iv. Higher investment in infrastructure

4.2 Returns

1. Button mushrooms tend to fetch higher market prices due to:
   i. Greater consumer familiarity
   ii. Established demand

2. Oyster mushrooms have lower market prices and may experience local oversupply, reducing per-kg profitability.

4.3 Marketing

- Button mushrooms enjoy broader recognition and require less marketing effort.
- Oyster mushrooms require consumer education and awareness campaigns, though they can be positioned as a sustainable product due to their low-input, eco-friendly production methods.
  (Mahajan et al., May 2025)

4.4 Capital Investment

The primary component of capital investment across farms was the mushroom house, accounting for 76.74% of total investment:

Item	Small Farms (%)	Large Farms (%)	Overall (%)
Mushroom house	78.63	75.12	76.74
Iron racks	–	–	11.81
Wooden racks	–	–	8.49
Other equipment	21.37	24.88	23.26

1. Total Capital Investment:
   i. Large farms: ₹3,96,055
   ii. Small farms: ₹1,69,931
   iii. Overall average: ₹2,45,304

4.5 Crop Frequency Among Growers

Out of 60 mushroom growers, the cropping patterns were:

i. One crop of button mushroom/year: 50%
ii. Two crops of button mushroom/year: 25%
iii. One button + one oyster mushroom crop: 8.33%

Farm size influence:

i. 75% of small farms grew one button mushroom crop
ii. 70% of large farms took two button mushroom crops

4.6 Input Use Pattern

Input	Button Mushroom	Oyster Mushroom
Compost bags (20 kg)	100	100
Spawn	Not applicable	10 kg/100 bags
Packing material	2.43 kg/100 bags	1.30 kg/100 bags
Plant protection (Bavistin/Formalin)	Higher	Lower
Transportation cost	₹488	Nil
Labour per 100 bags	19 man-days	4.74 man-days

4.7 Labour Utilization

Labour in button mushroom cultivation is significantly higher due to complexity in operations. Labour distribution across activities per 100 bags:

Activity	% of Total Labour
Harvesting	34.97%
Washing & Packaging	28.47%
Watering & Spraying	24.83%
Other tasks	11.73%

1. Labour use (per 100 bags):
   i. Small farms: 18 man-days
   ii. Large farms: 19 man-days
2. Family labour contribution:
   i. Overall: ~16 man-days
   ii. Small farms: 17 days
   iii. Large farms: 15 days
   (Mahajan et al., May 2025)

4.8 Cost of Production

Type	Total Cost/100 Bags	Fixed Cost Share	Variable Cost Share
Button Mushroom	₹26,966	27.31%	72.69%
Oyster Mushroom	₹14,290	51.59%	48.41%

Major Cost Components:

1. Button Mushroom:
   i. Compost bags: ₹10,100 (37.41%)
   ii. Labour: 28.05%
   iii. Transportation: 1.81%
2. Oyster Mushroom:
   i. Labour: 15.03%
   ii. Spawn: 9.80%
   iii. Chemicals: 7.17%

4.9 Cost and Return Analysis

Type	Production (kg/100 bags)	Gross Return (₹)	Net Return (Total Cost) (₹)	Net Return (Variable Cost) (₹)
Button Mushroom	347.3	₹45,149	₹18,153	₹25,525
Oyster Mushroom	180	₹21,960	₹7,670	₹15,042

1. Net Return per kg (Total Cost):
    i. Button: ₹52.27
    ii. Oyster: ₹41.91
2. Net Return per kg (Variable Cost):
    i. Button: ₹73.50
    ii. Oyster: ₹82.20
3. Benefit-Cost Ratio (BCR):
    i. Button: 1.67
    ii. Oyster: 1.54

Though oyster mushrooms yield higher per-kg returns over variable costs, button mushrooms are overall more profitable due to higher volumes and prices.

4.10 Break-even Analysis

Type	Output Required	Value (₹)	Bags Required
Button Mushroom	100 kg	₹13,000	33 bags
Oyster Mushroom	72 kg	₹10,080	39 bags

Lower break-even output for oyster mushrooms is due to lower variable cost/kg (~₹37.8).

4.11 Production and Disposal Pattern

Type	Avg. Production per Farm	Home Consumption (%)	Gift (%)	Marketed Surplus (%)
Button Mushroom	8.36 quintals	1.91%	0.60%	94.26%
Oyster Mushroom	101.3 kg	8.16%	2.87%	82.83%

Losses in button and oyster mushroom were estimated at around 3% and 4%, respectively.

4.12 Mushroom Marketing Channels

Marketing systems in the study area involved the following routes:

1. Oyster Mushroom:
    i. *Channel-1:* Grower → Consumer
    ii. *Channel-2:* Grower → Retailer → Consumer
2. Button Mushroom:
    i. *Channel-2:* Grower → Retailer → Consumer
    ii. *Channel-3:* Grower → Wholesaler → Retailer → Consumer

Marketing efficiency depends on the number of intermediaries. Button mushroom marketing is more structured due to scale, whereas oyster mushroom requires awareness-building and market linkage development.

	Button Mushroom	Oyster Mushroom
Channel-1	Mushroom Grower—Consumer	Mushroom Grower---Consumer
Channel-2	M. G. ---R. -----C.	M. G. ------R. --------C.
Channel-3	Mushroom Grower—Wholesaler —Retailer—Consumer	Missing

It was observed that, for button mushrooms, 40.60% of growers marketed their produce via Channel-2 (Grower → Retailer → Consumer), accounting for 48.16% of total output. The next significant route was Channel-3 (Grower → Wholesaler → Retailer → Consumer), through which 41.30% of production passed, handled by 24.06% of growers. Only 10.55% of output was sold via Channel-1 (Grower → Consumer), though this route was utilized by 35.34% of growers (Mahajan et al., May 2025).

By contrast, oyster mushroom marketing relied on just two channels: Channel-1 and Channel-2. Most of the produce (88.65%) was sold via Channel-2, used by 57.69% of growers, while 11.35% went through Channel-1. Channel-3 was not employed, largely due to the small number of oyster growers and low production volumes, which in turn reflect limited demand and low public awareness of oyster mushrooms (Mahajan et al., May 2025).

5. Problems and Constraints in Mushroom Cultivation

Beyond technical and marketing investigations, a critical part of the study was to diagnose the main constraints mushroom growers face. These constraints were grouped into production, marketing, institutional, and social categories. Garrett's ranking technique was used to quantify and rank them (Mahajan & Thakur, March 2025).

5.1 Production Constraints

i. The topmost constraint was insect pests and diseases, with an average Garrett score of 65.00.
ii. Next were untimely availability of spawned compost bags and scarcity/expensiveness of labour, scoring 59.07 and 49.68, respectively.
iii. The lack of appropriate insecticides and fungicides scored lowest (37.30) among production constraints.

5.2 Marketing Constraints

i. Inadequate storage facilities was the highest-ranked marketing issue (73.75), followed by difficulty in disposing produce due to lack of specialized agencies (57.33).
ii. High transport costs was third (score: 55.00).
iii. Other noteworthy constraints included low producer price, lack of marketing information, lack of processing knowledge, and low marketed surplus, with scores ranging from 49.58 down to 36.25.

5.3 Institutional Constraints

i. The absence of package-of-practice materials in the local language (Hindi) was the most critical institutional issue (mean score 58.23).
ii. Insufficient extension staff followed (55.70).
iii. Lack of adequate training facilities was considered least problematic (score 36.04).

5.4 Social Constraints

i. Lack of family members' interest in mushroom farming was the major social hurdle (score 54.33).
ii. Limited physical space for farming came next (45.67).

Conclusion and Policy Implications

With the growing demand for high-quality foods, mushroom cultivation is emerging as a promising enterprise across many parts of the country (Mahajan & Saina, September 2025). It requires relatively little land and can provide income opportunities for smallholders, landless farmers, educated youth, and women. This study was designed to assess socio-economic impacts, economic viability, marketing channels, and constraints of both button and oyster mushroom cultivation in the Kangra Valley of Himachal Pradesh.

Key Findings

i. Farmers were categorized into small (<300 bags) and large (≥300 bags) groups via the cumulative square-root frequency method, and data were collected from 60 respondents across seven blocks.
ii. The predominant household sizes fell into 4–5 and 6–8 members (each ~33.33%). Small farms leaned toward 4–5 members; large farms toward 6–8.
iii. Over half the families were joint (51.67%).
iv. A majority of growers (63.33%) fell in the 40–60 year age bracket. Notably, none were under 25.
v. Literacy rates were high: 91.67% among household heads, and 96.49% among all family members (male: 99.36%, female: 93.49%).
vi. Larger mushroom units often corresponded to smaller overall land holdings and cultivated land shares.
vii. More large-farm heads listed mushroom farming as their primary income source (60%) compared to small farms (49.38%).
viii. In button mushroom economics, net returns (over total and variable cost) increased with farm scale; for oyster mushrooms, the inverse trend was observed.
ix. Fixed cost share was higher in small farms (32.80%) than large farms (22.79%).
x. Gross returns per 100 bags of button mushroom ranged from ₹40,587 (small farms) to ₹47,109 (large farms).
xi. The benefit–cost ratio for the overall button production was 1.67, with 1.376 for small farms and 1.96 for large.
xii. The break-even output for button was 100 kg (33 bags).
xiii. Marketed surplus for button mushrooms was ~94%, compared to ~83% for oyster mushrooms.
xiv. Regression via Cobb-Douglas function showed that compost bags, labour, crop protection cost, and the management index significantly influenced mushroom yield.
xv. Marketing analysis revealed that direct-to-consumer (Channel-1) had the highest producer share but handled only ~10.55% of total volume. Channel-2 processed ~48.16% of production, with 73.65% producer share. The more intermediaries involved, the greater the price spread and lower marketing efficiency.

For oyster mushrooms, despite lower overall profitability, the higher net return over variable cost suggests viability under cost-efficient production. The break-even output was ~72 kg, and the marketed surplus was ~82.83%. Only two marketing channels were used, with Channel-2 being dominant (88.65%).

From a comparative standpoint:

1. Button mushrooms are more profitable overall due to higher demand and established marketing.
2. Oyster mushrooms are more cost-efficient in certain respects and have growth potential with improved marketing and awareness.

Major constraints across both cultivation types included pests/diseases, lack of timely input supply, labor issues, inadequate storage and marketing infrastructure, and institutional gaps (language, extension staff). Social constraints — such as low family interest — also emerged as real barriers. Additionally, challenges like short shelf-life, environmental control requirements, and disease management limit scale expansion.

Policy Recommendations

1. Strengthen input supply chains: Ensure timely availability of spawn and compost bags.
2. Improve extension services: Provide training materials in local languages and deploy more field staff.
3. Enhance marketing infrastructure: Invest in cold storage, aggregation centers, and streamlined channels to reduce intermediaries.
4. Promote consumer awareness: Educate the public about oyster mushrooms through campaigns, cooking demos, and nutritional messaging.
5. Encourage direct marketing: Facilitate growers' direct linkages to retailers or consumers to maximize producer share.
6. Support disease and environment control technologies: Subsidize equipment and share best practices to manage microclimate and pests.

7. Foster supportive policies for small growers: Provide incentives, credit support, or cooperatives to reduce dependency on middlemen.

Limitation of the Study

Like any empirical inquiry, this study has limitations:

i. The findings are context-specific to Kangra valley and may not generalize to other regions.
ii. The sample size was only 60 mushroom growers, selected within resource constraints.
iii. Many respondents did not keep formal records, so data were collected via recall during interviews, which may introduce occasional inaccuracies or memory bias.

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