



An Economic Analysis of Production of Button Mushroom in Solan District of Himachal Pradesh, India

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

The present study was carried out to find the cost of cultivation, various cost concepts, and the benefit-cost ratio in the Solan district of Himachal Pradesh. Here, farmers of different categories were selected based on the production of button mushrooms: small farmers with a production of 1 quintal of mushrooms, medium farmers with a production of 1–3 quintals of mushrooms, and large farmers with a production of 3 quintals of mushrooms. The research was undertaken in the Solan block of Solan district, which was selected purposefully because it has the largest number of mushroom growers in the state. Solan District has the highest number of mushroom producers in the state. 73 respondents were selected purposefully from 4 panchayats in the Solan block. The cost of cultivation of mushrooms per 100 square feet was maximum for small farmers at Rs.

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3179.20, medium farmers at Rs. 2735.13, and large farmers at Rs. 2666.02. The cost concepts for various farm lots per 100 square feet for Cost A1 were Rs. 2288.55 for a small lot, Rs. 2046.37 for a medium lot, and Rs. 1985.69 for a large lot. Cost A2 was similar to Cost A1 because farmers were not taking the land from the government for cultivation, so there was no rent paid to government land. Cost A2 was highest in the small category (Rs. 2359.2), followed by the medium category (Rs. 2115.13) and the large category (Rs. 2046.46). Cost C was greater in the case of small growers, which was Rs. 3159.2, followed by medium growers at Rs. 2715.13, and large growers were incurring the minimum cost, which was Rs. 2646.46. The benefit-cost ratio was paramount in large category 1:2.9; after that, it was medium category 1:2.7; and the rest was in small category 1:2.1. The maximum total yield was in large farm lots (71.01 kg), followed by medium farms (68.54 kg), and the minimum yield was in small farm lots (62.65 kg). The majority of mushroom farmers were found in the small category. Age was found to be an important socio-economic factor that affects the decision-making ability of an individual. The study in the Solan block justified that the maximum profit was earned by large growers.

Keywords: Button mushroom; cost of cultivation; benefit-cost ratio; yield per Kg.

1. INTRODUCTION

In India, white button mushrooms were the main subject of the first mushroom studies conducted in Himachal Pradesh in the 1960s [1]. The main mushroom-growing districts in Himachal Pradesh are Sirmour, Kullu, Solan, and Shimla. In the state, Solan is ranked second for mushroom cultivation, behind Shimla. Button mushrooms (*Agaricus bisporus*), classified taxonomically under the Fungi kingdom and *Agaricaceae* family, thrive without chlorophyll, sustaining themselves on decomposing organic matter. Recognized for their umbrella-shaped fruiting bodies, button mushrooms have a rich history of cultivation dating back to 1650 in France, followed by widespread artificial cultivation in China during the tropical and sub-tropical regions [1].

In Europe, cultivation expanded during the 16th and 17th centuries, utilizing caves and greenhouses. It is a prehistoric food, and it was consumed by the Romans, Europeans, Middle and South Americans, and many others centuries ago. People had many myths and false conceptions related to mushrooms [2]. The Egyptians considered mushrooms to be a plant of immortality. The Romans related the mushrooms to the gods and considered them food of the gods [3-6]. The Chinese and Japanese have been using mushrooms for medicinal purposes for thousands of years. Globally, China leads mushroom production with a staggering 41.127 million metric tons annually, underscoring its agricultural prowess. In contrast, India ranks sixth globally, producing 0.243 million metric tons annually (source: FAOSTAT 2023). Within India, Bihar emerges as the largest

producer with an output of 28.00 metric tons, while Himachal Pradesh contributes 14.80 metric tons annually (ICAR-DMR). Mushrooms are an exemplary source of vitamins, minerals, protein, folic acid, and carbohydrates. The white button mushroom is consumed as a fresh mushroom, or it can be canned and ready to eat as soups, sauces, pickles, and other food products. It is the most widely consumed variety in domestic and export markets [7,8,9]. This variety ranks first in terms of production as well as consumption. Nutritionally, button mushrooms are valued for their high content of vitamins, minerals, protein, folic acid, and carbohydrates. Widely consumed fresh or processed into soups, sauces, and pickles, the white button variety dominates both domestic and export markets due to its popularity and versatility [10-14].

2. MATERIALS AND METHODS

A multi-stage sampling technique was used in the study for the purposeful selection of districts, blocks, panchayats, and growers/respondents. Among the 4 selected panchayats, a total of 73 respondents were selected for the study from the Solan block of district Solan. They were selected using a random sampling technique. The respondents were classified into three groups according to their production levels. The first group consisted of farmers producing less than 1 quintal; the second group included those producing between 1 and 3 quintals; and the third group comprised farmers producing more than 3 quintals. Data and primary information were collected using a well-structured questionnaire. This questionnaire included various questions aimed at understanding the socioeconomic profile of mushroom growers and

the different activities involved in mushroom cultivation. To know the approximate profitability of mushroom farmers, a benefit-cost ratio was applied. By doing a summation of all the costs, the cost of cultivation was calculated, like the cost of spawn, the cost of straw, the cost of FYM, the cost of fertilizer, the cost of irrigation, and the cost of hired labour. The secondary data was taken from different books, journals, and the Directorate of Mushroom Research website.

Analytical tools:

Cost and return per hectare of mushroom in the study area:

Cost A1

- Value of hired labor
- Cost of spawn
- Cost of straw
- Cost of FYM
- Cost of fertilizer
- Cost of plant protection
- Depreciation on implements and farm buildings
- Irrigation charges
- Land revenue, cases and other taxes
- Interest on working capital
- Miscellaneous expenses (artisans etc.)

Cost A2: Cost A1 +rent for leased in land

CostB1: Cost A1 + interest on value of owned fixed capital assets (excluding land)

Cost B2: cost B1 + rental value of owned land (net of land revenue) and rent paid for leased – in land

Cost C1: cost B1 + imputed value of family labour

Farm business income = Gross income – Cost A1 or A2
Family labour income = Gross income – Cost B

Net income = Gross income – Cost C

Farm investment income = Farm business income – Imputed value of family labour

Benefit -Cost Ratio

Formula:

$$B:C = \frac{\text{Gross Revenue}}{\text{Total Cost}}$$

3. RESULTS AND DISCUSSION

(Total number of respondents = 73) From Table 1, it was estimated that the number of mushroom farmers was grouped into various categories, like small (28), medium (32) and large (13) respondents, respectively. A total of 73 respondents were selected for the analysis. Out of the total available land with the growers, the total cultivated land of small farmers was 0.85 hectares, medium farmers cultivated land was 2 hectares, and large farmers were cultivating 3.5 hectares of land. The total sample average of land cultivated was about 2.11 hectares.

In Table 2, the composition based on their age is shown. The maximum number of members were in the age group of 15–60 years; they were 49.20%. The second category was below 15 years (28.05%), and very few family members were in the age group of above 60 years (22.75%).

Table 3 shows that the maximum cultivation cost was incurred by small farms, which was Rs. 3179.20 per 100 square feet, and then it was for medium farms, which was Rs. 2735.13 per 100 square feet, and less cost was incurred by large farms, which was Rs. 2666.06 per 100 square feet. The highest cost was found to be invested in depreciation on fixed capital, hired labor, and the cost of straw, with a sample average of Rs. 571.03, Rs. 433.33, and Rs. 424.18, respectively. The cost of straw was incurred most by small farmers (Rs. 435.12), followed by medium farmers (Rs. 422.25) and large farmers (Rs. 415.16). The cost incurred by plant protection was less among all the costs, with a sample average of Rs. 43.59. Small farms incurred the maximum cost of plant protection (Rs. 50.11), followed by medium and large farms (Rs. 40.33) each. The land revenue paid to the government was zero for all the farm categories because no land was taken on rent for the cultivation of mushrooms. The rental value of the property was Rs. 20 per 100 square feet for all three farm groups.

Table 4 signifies the cost concepts of different categories of farm per 100 square feet. Cost A1 and Cost A2 were the same because land revenue paid to the government was zero. So, the cost and cost A2 were maximum in the small category (Rs. 2288.55 per 100 sq. ft.), followed by medium farms (Rs. 2046.37 per 100 sq. ft.), and minimum in the case of large farms (Rs. 1985.69 per 100 sq. ft.). Cost B was found to be

maximum in small farms (Rs. 2359.2 per 100 sq. ft.), followed by medium farms (Rs. 2115.13 per 100 sq. ft.), and lesser cost was found in large farms (Rs. 2046.46 per 100 sq. ft.). Cost C was recognized as the as the highest in small farms (Rs. 3159.2 per 100 sq. ft.), followed by medium farms (Rs. 2715.13 per 100 sq. ft.), and the minimum cost was in large farms (Rs. 2646.46 per 100 sq. ft.).

Table 1. Complete description of the cultivated land holdings on different size of farm categories

Particulars	Size of farm Group			Sample Average
	Small	Medium	Large	
Size of farm group (in no.)	28	32	13	24.33
Average land holdings (ha)	0.85	2	3.5	2.11

Table 2. Family members age composition

S. No.	Age Categories	Small	Medium	Large	Sample Average
1	Below 15 years	1(17.85)	2(33.33)	2.3(31.50)	5.3(28.05)
2	15 – 60 years	2.8(50)	2.5(41.66)	4(54.79)	9.3(49.20)
3	Above 60 years	1.8(32.14)	1.5(25)	1(13.69)	4.3(22.75)
Total		5.6(100)	6(100)	7.3(100)	18.9(100)

Table 3. Various costs incurred in mushroom cultivation per 100 square feet in different farm groups

S. No.	Particulars of farm operation	Size of farms groups			Sample average
		Small	Medium	Large	
1	Hired Labor	500 (15.72)	400 (14.62)	400 (15.00)	433.33 (15.15)
2	Cost of Spawn	120.25 (3.78)	95.5 (3.49)	90.56 (3.39)	102.10 93.56
3	Cost of Straw	435.12 (13.68)	422.25 (15.43)	415.16 (15.57)	424.18 (14.83)
4	Cost of Fertilizer	105.05 (3.30)	101.5 (3.71)	95.6 (3.58)	100.72 (3.52)
5	Cost of FYM	150.6 (4.73)	145.75 (5.32)	140.6 (5.27)	145.65 (5.09)
6	Cost of Bavistin	110.05 (3.46)	105.05 (3.84)	94.6 (3.54)	103.23 (3.60)
7	Cost of Irrigation	80.63 (2.53)	65.66 (2.40)	61.11 (2.29)	69.13 (2.41)
8	Cost of Plant Protection	50.11 (1.57)	40.33 (1.47)	40.33 (1.51)	43.59 (1.52)
9	Interest on Working Capital @ 8%	124.14 (3.90)	110.08 (4.02)	107.04 (4.01)	113.75 (3.97)
10	Depreciation on Fixed Capital @ 10%	612.6 (19.26)	560.25 (20.48)	540.25 (20.26)	571.03 (19.96)
11	Rental Value of Owned Land	20 (0.62)	20 (0.73)	20 (0.75)	20.00 (0.69)
12	Land Revenue paid to Govt.	0 (0)	0 (0)	0 (0)	0.00 (0)
13	Interest on Fixed Capital	70.65 (2.22)	68.76 (2.51)	60.77 (2.27)	66.73 (2.33)
14	Imputed Value of family Labor	800 (25.16)	600 (21.93)	600 (22.50)	666.67 (23.30)
Total Cost of Cultivation		3179.20 (100)	2735.13 (100)	2666.02 (100)	2860.12 (100)

Table 4. Cost concepts for different farm lots

S. No.	Cost Concepts	Size of Farm groups			Sample Average
		Small	Medium	Large	
1	Cost A1	2288.55	2046.37	1985.69	2106.87
2	Cost A2	2288.55	2046.37	1985.69	2106.87
3	Cost B	2359.2	2115.13	2046.46	2173.59
4	Cost C	3159.2	2715.13	2646.46	2840.26

Table 5. Cost and Return in Mushroom per 100 Sq. feet in different size of farm groups

S. No.	Particulars	Size of Farm groups			Sample Average
		Small	Medium	Large	
1	Total cost of Cultivation (Rs. /100 Sq. feet)	3179.2	2735.13	2666.02	2860.12
2	Yield (Kg)	62.65	68.54	71.01	67.40
3	Cost of Production (Rs. / 100 Sq. feet)	50.74	39.9	37.54	42.73
4	Selling Price (per Kg)	110	110	110	110
5	Gross Return per 100 sq. feet	6891.5	7539.4	7811.1	7414
6	Net Return Per 100 Sq. feet	3712.3	4804.27	5145.08	4553.88
7	Family Labor Income	4532.3	5424.27	5764.64	5240.40
8	Family Business Income	4602.95	5493.03	5825.41	5307.13
9	Farm Investment Income	3802.95	4893.03	5225.41	4640.46
10	Benefit Cost Ratio	1:2.1	1:2.7	1:2.9	1:2.5

Table 5 displays that the total cost of cultivation was greater in the case of small farm lots (Rs. 3179.2 per 100 sq. ft.). Small farmers purchased the inputs in less quantity, so the cost of the inputs was incurred by them the most. The cost incurred by medium farmers was Rs. 2735.13 per 100 sq. ft., and a lesser cost was incurred by large farmers (Rs. 2666.02 per 100 sq. ft.). The maximum yield was obtained by large respondents (71.01 kg), followed by medium respondents (68.54 kg), and small farmers mushroom yield was 62.65 kg. The cost of production was highest on small farms (Rs. 50.74 per 100 sq. ft.), followed by medium farms (Rs. 39.9 per 100 sq. ft.), and large farms (Rs. 37.54 per 100 sq. ft.). Family labour income was generated maximum in large farms (Rs. 5764.64), followed by medium farms (Rs. 5424.27), and small farms (Rs. 4532.3).

The benefit-cost ratio was 1:2.1 in small farms, which means that by investing one rupee, small farmers earned a profit of 2.1 rupees. In medium farms, it was 1:2.7, and in large farms, it was 1:2.9. The maximum profit was earned by a large category of farmers.

4. CONCLUSION

The field survey was conducted in four panchayats of Solan block in Solan district of

Himachal Pradesh. A total of 73 respondents were taken. The respondents were divided into three categories: small (28), medium (32) and large (8). Maximum respondents were found in medium farms category. Age was found to be an important socio-economic factor that affects the decision-making ability of an individual. Maximum respondents were between the age group of 15-60 years, they were 49.20%. The second category was below 15 years (28.05%), and very few family members were in the age group of above 60 years (22.75%). The study in the Solan block also justified that maximum profit was earned by large growers. By using the minimum cost of cultivation, large farmers earned the maximum profit, which was 1:2.9.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

I hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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