The Pharma Innovation Journal 2022; SP-11(9): 1043-1048

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; SP-11(9): 1043-1048
© 2022 TPI
www.thepharmajournal.com
Received: 22-07-2022
Accepted: 24-08-2022

Shivam Dhiman
MSc Ag Student, Department of Agricultural Economics, College of Agriculture, G.B. Pant University of Agriculture & Technology, U.S. Nagar, Pantnagar, Uttarakhand, India

Ruchi Rani Gangwar
Assistant Professor, Department of Agricultural Economics, College of Agriculture, G. B. Pant University of Agriculture & Technology, U.S. Nagar, Pantnagar, Uttarakhand, India

Somya Misra
Ph.D. Students, Department of Agricultural Economics, College of Agriculture, G. B. Pant University of Agriculture & Technology, U.S. Nagar, Pantnagar, Uttarakhand, India

Devesh Kumar Pant
Ph.D. Students, Department of Agricultural Economics, College of Agriculture, G. B. Pant University of Agriculture & Technology, U.S. Nagar, Pantnagar, Uttarakhand, India

Neha Joshi
Ph.D. Students, Department of Agricultural Economics, College of Agriculture, G. B. Pant University of Agriculture & Technology, U.S. Nagar, Pantnagar, Uttarakhand, India

Corresponding Author:
Shivam Dhiman
MSc Ag Student, Department of Agricultural Economics, College of Agriculture, G.B. Pant University of Agriculture & Technology, U.S. Nagar, Pantnagar, Uttarakhand, India

Economics of production of mushroom in Dehradun district of Uttarakhand

Shivam Dhiman, Ruchi Rani Gangwar, Somya Misra, Devesh Kumar Pant and Neha Joshi

Abstract
In Uttarakhand state, 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 rained 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. In view of this scenario, the present study was conducted in Dehradun district of Uttarakhand and 60 farmers were selected randomly from the study area during agriculture year 2018-19. The study examined cost of and returns from mushroom cultivation and resource use efficiency was also worked out in the study. The study revealed that the cost of production per bag was Rs. 134.08 against the yield 2.134 kg per bag. The net return from mushroom production was Rs. 58 per kg. The study further indicated that resource use efficiency was more than unity for most of the resources expects labours, which suggested the under-utilization of these resources. The study concluded that 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.

Keywords: Mushroom cultivation, economics of mushroom cultivation, resource use efficiency

1. Introduction
Mushrooms are one of the most varied organisms on the planet, and they have played an important part in human wellness from the dawn of time. In fungal taxonomy, a mushroom is the fleshy and spore-bearing fruiting body of a fungus that belongs to the class Basidiomycetes within the order Agaricales and is normally formed above ground on soil or on its feeding substrate. Due to its wonderful taste and flavour, nutritional attributes, and multiple therapeutic benefits, it has been utilised as a food and medicine by various cultures from ancient times. The fresh mushroom includes around 85-90 percent moisture, 3% protein, 4% carbohydrates, 0.3-0.4 percent lipids, and 1% minerals and vitamins, as well as certain health benefits such as decreasing blood cholesterol, defence against cancer, and hair growth stimulation. As per the latest FAO recommendations edible mushrooms as a food are able to meet protein requirements of developing countries where a large number of populations depends mainly on cereal crops.

Mushroom cultivation is a labour-intensive but environmentally beneficial and a successful agribusiness. The biggest advantage of mushroom production is that it does not require huge cultivable area and may be grown vertically in a little space, thus giving an edge over shrinking land holding size in recent years. Mushroom production can assist in eliminating poverty and promote livelihood by providing a high-yielding, healthy food supply as well as a steady source of income. In many places of the globe, mushrooms are farmed on a commercial basis. Mushrooms may be easily cultivated on organic substrates rich in cellulose, hemicellulose, and lignin, such as sawdust, leaves, and other agricultural leftovers.

Mushrooms are one of the potential source for accelerating socio-economic growth of our country owing to its suitability in various parts of India. Mushroom cultivation is both a source of national income and a measure of poverty reduction. As a labour-intensive management and presenting prospects for processing firms, mushroom farming generates a huge number of direct and indirect job opportunities in cultivation as well as marketing operations. Mushroom farming requires minimal cash and technical skills, and it is feasible to produce mushrooms on a small scale in an indoor environment, with a good return on investment; women may cultivate mushrooms in their homes, similar to poultry raising, with little capital.

As a result, mushroom gardening not only empowers rural women but also helps to reduce poverty.
Mushroom industry in India is primarily focused on white button mushroom which is a highly sophisticated and capital-intensive activity. Mushroom cultivation is one of the major sources of income for farmers of many states like Haryana, Uttar Pradesh, Punjab, Uttarakhand, Himachal Pradesh, and Tamil Nadu. Uttarakhand produces mainly three species of mushroom-Button, Oyster and Milky Mushroom. Button Mushroom contributes the largest share *i.e.* 80 per cent, followed by Oyster (12-13 per cent), and Milky mushroom (7-8 per cent). Mushroom production in Uttarakhand state was 12395 tonnes annually in which the contribution of Garhwal and Kumaon region was 10685 and 1710 tonnes, respectively in Dehradun district (2018-19) is evolving as a hub of mushroom production in Uttarakhand.
Uttarakhand is mainly a hilly state with around 86 per cent under hills facing various adverse climatic conditions and natural calamities, mushroom cultivation can provide a sustainable support to people engaged in agriculture. In view of the above scenario the study was undertaken with the purpose to work out the economics from mushroom cultivation and to obtain resource use efficiency of mushroom production.

2. Materials and Methods
Uttarakhand state consists of two regions *i.e.*, the Garhwal region and Kumaon Region. The share of mushroom production in the Garhwal region (86 per cent) was very high as compared to the Kumaon region (14 per cent) in the year 2017-18. Dehradun district is one of the highest mushroom producing district of Uttarakhand. Dehradun district comprises of six blocks, out of which four blocks were selected purposively for the study based on the maximum number of growers and potentiality for mushroom, cultivation namely, Vikasnagar, Sahaspur, Doiwala, and Raipur. District-wise information on several mushroom producing units was obtained from the District Department of Horticulture, Uttarakhand. Thus a random sample of 60 mushroom growers was selected for the study. After investigation, they were classified into three groups according to their size of production unit *i.e*. growing to have less than 150 bags (small growers), growing to have 150-300 bags (medium growers), and growing to have 300 bags & above (large growers) in their production units.
The economics of mushroom cultivation was obtained by working out the cost of and returns from mushroom cultivation. Total fixed cost (TFC) and Total variable cost (TVC) were added to arrive at the total cost incurred on maintaining a unit.
Gross Return were calculated by this given formula:

$$\text{Gross Return} = \text{YmxPm}$$

Gross Return from mushroom crop in rupees

Where,
Ym = Total Yield of mushroom crop in kg.
Pm = Price per kg of mushroom in rupees.

$$\text{Net Return} = \text{GrossReturn} - \text{TotalCost}$$

$$\text{Return per rupee ofexpenditure} = \frac{\text{GrossReturn}}{\text{TotalCost}}$$

Cobb-Douglas production function analysis was used as an analytical tool to compute the resource-use efficiency of mushroom production thus revealing the relationship between inputs and output of sample growers and to arrive at the conclusion. Resource use Efficiency is the ratio of marginal value product of the resources to its factor cost. And it was calculated using the formula:

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

where MVP and MFC are the marginal value of output and expenditure on various factor inputs respectively.
The decision of whether a resource is used efficiently or not 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).

3. Results
The findings obtained from this study have been discussed under the following sub-heads;

3.1 Cost of and Returns from mushroom cultivation
Before arriving at fixed and variable cost of mushroom cultivation, it is important to evaluate establishment cost and cost of compost manufacturing during mushroom production.

3.2 Category-Wise establishment Cost of mushroom producing units
The final production of any venture is mainly governed by an investment of capital. Capital investment in mushroom production units is given in Table 1. The expenditure on building for growing mushroom was the significant item of investment amounting to overall Rs 51181.74 per unit, it increases with increase of size of units.
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 growers, 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.

3.3 Cost of Compost manufacturing during Mushroom Production
Compost is a very important material used in mushroom cultivation. It is a substrate on which mushroom grows. The table-2 presented the average variable cost of various compost materials used in different sizes of a mushroom production unit in the study area. 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 on increasing the size of the unit.

Table 1: 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	26078.70	48080.79	75174.18	51181.74
2.	Bucket	95.29	115.50	174.78	133.05
3.	Thermometer	198.82	391.50	521.74	388.98
4.	Heater	181.18	424.50	2262.61	1078.14
5.	Sprayer	105.29	481.00	926.19	554.42
6.	Cooler	7235.29	10435.00	11404.30	9958.00
7.	Air Conditioner	-	11400.00	23630.40	12703.40
8.	Tullu Pump	300.00	623.00	1078.70	718.14
9.	Knife	17.05	26.25	26.31	23.56
10.	Bulb	144.12	270.50	503.92	326.95
11.	Belcha	49.41	108.00	113.04	94.92
12.	Tirpal	127.06	255.00	624.35	361.36
13.	Exhaust Fan	908.82	1632.50	3028.26	1978.81
14.	Basket/Tray	60.00	96.50	176.96	117.97
15.	Stapler	12.05	18.50	33.27	22.37
16.	Transparent Sheet	124.12	215.00	591.74	339.32
17.	Racks	-	709.50	2363.48	1161.86
18.	Wood	255.88	432.50	1367.39	743.22
19.	Bamboo	765.29	898.00	2447.17	1472.12
20.	Rope	114.71	150.00	105.65	123.39
	Total	36773.09	76763.53	126554.40	83481.35

Table 2: 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

3.4 Cost of Mushroom Production

The cost and returns analysis of mushroom cultivation helps the commercial cultivators of mushroom in analysing the best enterprise out of various agribusiness enterprises.

The component-wise allocation of different costs such as variable cost, ready-made cost, and other costs incurred in mushroom production has been presented in table-3.

Table-3 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 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 respectively, the average of which was Rs 37756.34 per unit in the sample growers. Total cost was Rs 47774.10 per unit under average conditions for the entire study area as a whole.

3.5 Yield and Returns from mushroom cultivation

The yield, gross returns and net returns from mushroom cultivation have been worked out using various cost and returns per rupee of expenditure, is presented in table-4. It is 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.

Table 3: Average Cost of 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				
12.	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

Table 4: 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

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 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 situation. The higher value of returns per rupee of expenditure in all three category of producing units revealed that there is scope to increase productivity and make the business profitable.

3.6 Cost and Return of Mushroom Production (Rupees per Bag)

Cost of production and returns from mushroom on per bag mushroom production is presented in table-5. 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 and maximum in medium (Rs 171.29) and lowest in small (Rs 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: 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, it was indicated from the study that the use of ready-made bags and compost was increased with the increase in the size of

mushroom production units.

3.7 Yield and returns from Mushroom production (Rupees per Bag)

Net returns, gross returns and returns per rupee of expenditure based on per bag have been presented in table-6. Based on the table-1.7, 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.

Table 6: Yield, Gross Return, and Net return per bag on sampleifarm (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

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. 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 is a profitable venture under overall situation. This is in line with 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.

3.8 Resource-use efficiency of Mushroom production

The Cobb-Douglas production function was used to evaluate the effect of inputs used on the output produced in the study area. The yield of mushroom cultivation was taken as output while seven variables such as number of bags, straw, spawn, chemicals, casing, labour and purchased bags were taken as inputs.

Table 7: B's coefficient from Cobb-Douglas production function

S. No.	Particulars	B's (Elasticity)
1.	Constant	-
2.	No. of bags (No.)	0.913
3.	Straw (kg)	0.014
4.	Spawn (g)	0.013
5.	Chemicals (g)	0.055
6.	Labour (man days)	-0.020
7.	Casing (g)	0.089
8.	Purchased bags (No.)	0.007
	Sum of Bi's	1.07
	R^2	0.95

The value of R^2 came out to be 0.95 which revealed that about 95 per cent variation in dependent variable is explained by independent variables (Table-7). Out of seven explanatory variables, only five variables namely spawn, chemical, number of bags, straw and labour came out to be significant at 5 per cent level of significance. Although, spawn and chemical were found to be significant at 1 per cent level of significance. The results of regression analysis revealed that an increase of 1 per cent in expenditure on number of bags, straw, casing, spawn, chemicals, and purchased bags, the yield will be increased by 0.913, 0.014, 0.013, 0.055, 0.089 and 0.007 per cent, respectively.

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-8). The result revealed that the profitability could be maximized by increasing the number of bags, wheat straw, chemicals, amount of casing and spawn. While in case of labour, it was revealed from MVP/MIC ratio *i.e*. less than unity, that the profitability in mushroom cultivation could be maximized by decreasing the number of labourers.

Table 8: 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

8. Conclusions

It is clear from the above analysis that compost, labour and spawn cost contribute significantly to total cost of mushroom cultivation and thereby affecting the gross returns from mushroom production. And return per rupee of expenditure was more than unity which is indicated that mushroom production was a profitable venture and can be substituted with traditional agriculture ventures. From the resource use efficiency analysis it was observed that in order to make the mushroom production profitable, decreasing the number of labourers could be a solution since there was an excess use of these resources. And the profitability could also be maximized by increasing by number of bags, wheat straw, chemicals, amount of casing, and amount of spawn. 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.

9. References

1. Bhatt N, Singh RP. Status of mushroom cultivation in India. Indian Farmer's Digest. 1999;32(1):10-13.
2. Shweta K. Status of mushroom production in India. Mushroom Research. 2017;26:111-120.
3. Kapoor P, Guleria J, Sharma RK, Tiwari SC. Economics of button mushroom cultivation- case study of mushroom farms in Himanchal Pradesh. Agriculture Situation in India. 1987;42(9):711-713.
4. Kumar J, Tripathi RS, Sharma ML, Dev C. Economics of

production and marketing of mushroom in the hills of UP. Project Report submitted to Hill Campus of Ranichauri, G.B.P.U&T, 1994, 84p.
5. Kumar A, Bhardwaj AK. An Economic Analysis of Production of Mushroom in Supaul District of Bihar, 2019, 514-517.
6. Sharma VP, Sudheer KA, Gautam Y, Singh M, Singh M, Shweta K. Mushroom Scenario in India. Agriculture Year Book, 2012.
7. Sharma V, Sudheer K, Gautam Y, Singh M, Kamal S. Status of mushroom production in India. ICAR-Directorate of Mushroom Research. Solan (H.P), 2017.
8. Singh R. Indian mushroom industry: a bright future. Agriwatch, 2001, 17-18.
9. Trishnalee S, Hazarikaand JP, Gogoi H. Resource use efficiency in mushroom cultivation in Jorhat district of Assam. Agriculture Update. 2014;9:37-40.