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Cost benefit analysis and marketing of oyster mushroom in Kangra valley, Himachal Pradesh, India

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Abstract

This study examines the cost and return structures, breakeven level, production and disposal, marketing channels and pattern and disposal of oyster mushroom between two farm categories. Total cost of production on small farms was found out to be Rs. 17055 which was more than large farms of Rs. 12,051 because of economies of scale. The total production /100 bags and gross return also show the same trend, but on the other hand in case of net return the result was opposite due to the fact that cost of production was more on small farms than on large farms. The break even analysis suggested that the growers were in no profit and no loss situation when they kept 39 compost bags with a break even output of 100 kgs in overall situation. The study also suggested that as the farm size increases, the marketed surplus also increases. From marketing perspective, only two marketing channels were adopted by the oyster mushroom growers for disposal of their produce in the study area; first one is Oyster mushroom grower-------Consumer and the second one is Oyster mushroom grower-----Retailer-----Consumer. It was found that channel-2 was the widely used channel by which 88.65 per cent of the total produce was marketed by 57.69 per cent of the total growers.

Keywords: Oyster mushroom, mushroom growers, marketing channel, cost and return

Introduction

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 are practicing mushroom production on commercial line and earning handsome income.

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 in this paper 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.

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.

Methods and Materials

The study was conducted in Kangra district of Himachal Pradesh. This district was selected purposively because the Indo Dutch Mushroom Project Palampur, which is run by the State Directorate of Horticulture and located in the CSKHPKV Palampur, provides spawned compost to mushroom producers in several districts. Secondly, the centre for mushroom research and training (CMRT) CSKHPKV, Palampur also provides spawned compost bags and spawn of different kind of mushrooms i.e. button and Oyster mushrooms. Thirdly, training on many different aspects of mushroom farming is also provided by the directorate of extension education CSKHPKV Palampur. And lastly, large number of mushroom growers is also present in the district and no study was conducted in the recent years that are why the Kangra district was selected purposively.

Simple random sampling design was employed for the selection of mushroom growers. The complete list of mushroom growers of the district was prepared in consultation of the officials of the Indo-Dutch mushroom Project, Palampur. From the list prepared a sample of 60 mushroom growers were selected randomly from seven randomly selected blocks of the district. The selected mushroom growers were categorized into two categories i.e. small and large by using square root frequency method. The distribution of sample mushroom growers is given in table1.

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	$\geq$300	20	33.33
	Total		60	100.00

Data Collection

In order to meet out the specific requirements of the study, both primary as well secondary data were collected. Primary data were collected from 60 mushroom growers and secondary data were collected from annual reports of the government departments and related websites. Survey schedule was prepared for collection of detailed primary data which was pre-tested in the two villages of the study area to examine the relevance of questions on different production and marketing aspects of the mushroom cultivation. The primary data were collected through survey method. The data was collected on well designed and pre-tested schedules from the selected mushroom growers through personal interview method. The data were collected pertaining to the agricultural year 2023-24. The secondary data were also collected from statistical outline of Himachal Pradesh, Indo-Dutch mushroom project, Palampur, Department of Horticulture, Shimla and Department of Horticulture, Kangra.

Analytical Framework

The collected data was compiled properly and analyzed by employing appropriate mathematical and statistical tools. In order to meet out the objective, tabular analysis using averages, ratios and percentages were used to study the input use, costs and returns, break-even output and pattern and disposal of mushroom through different channels.

Cost and Return analysis

The costs and net returns from mushroom production were calculated in order to determine the economic viability of the mushroom.

Cash Variable expenses (recurring expenditure) include the items

1. Spawned Compost bags
2. Packing material
3. Crop protection material
4. Electricity charges
5. Transportation charges
6. Miscellaneous charges (crop washing material, other chemicals etc…..)
7. Interest on variable capital for half of the growth period of crop i.e. 1.5 months at the rate of 12 per cent per annum

Total Recurring Expenditure (Totals Variable Cost) - Cash variable expenses+ Human labor

Fixed Cost (Non-Recurring Expenditure)

1. Interest on fixed capital at the rate of 12 per cent per annum
2. Depreciation charges on mushroom unit at the rate of 2 per cent per annum
3. Depreciation charges on implements at the rate of 10 per cent per annum

Total Expenditure (Total costs) = Recurring Expenditure+ Non-Recurring Expenditure

Returns

1. Computation of Gross Returns

The gross returns were calculated as follows:

$GR=TP_M*P_M$

Where,

GR= Gross Returns from mushroom crop (Rs./100 bags)

TP_M= Total Production of the mushroom (kg)

P_M =Price of the mushroom per kilogram (Rs.)

2. Computation of Net Returns

1. Net returns over variable cost= Gross Returns- Variable Cost
2. Net returns over total cost= Gross Returns- Total Cost

$$\text{Net returns per rupee of investment} = \frac{\text{Gross returns}}{\text{Total costs}}$$

3. Computation of Benefit-Cost ratio

Benefit- cost ratio implies per rupee invested on inputs used in the production process.

$$\text{Benefit} - \text{Cost ratio} = \frac{\text{Gross returns}}{\text{Total costs}}$$

4. Break-even analyses

The amount of production needed to pay all the production cost is known as break-even output and the output below this level would led into net loss to the producer. The break-even output is calculated by the formula:

$$\text{Break} - \text{even output} = \frac{\text{TFC}}{\text{Py} - \text{AVC}}$$

Where,
TFC = Total fixed cost in rupees
Py = per unit price of mushroom
AVC =Average Variable cost in rupees
$AVC = TVC/TP_M$
TVC = Total Variable Cost
TP_M = Total mushroom production in kilogram

Marketable surplus

The marketable surplus is the residual left with the producer after meeting their requirements for family consumption, kind payment to labour and gifts and marketable surplus of the oyster mushroom crop was estimated as follows:

$MS_i = TP_i - TRi (i = 1, 2, 3 \ldots 60 \text{ growers})$

Where,
MS_i= Marketable surplus of mushroom with i^{th}grower
TP_i= Total production of the mushroom with i^{th}grower
TRi = Total requirements of the i^{th} mushroom grower

Marketed surplus

Marketed surplus was the actual quantity of mushroom that the producer sold in the market irrespective of its requirements and it was estimated as follows:

$MT_i = MS_i - LM_i$

Where,
MT_i= Marketed surplus by the i^{th}producer
MS_i=Marketable surplus of the i^{th}producer
LM_i= Losses incurred by the i^{th} producer

Marketing Channels

Marketing channels refers to various intermediaries which were involved for the transfer of mushroom produce from mushroom growers to consumers. The personal survey of various intermediaries involved in the marketing process was done to assess the different marketing channel that the mushroom growers in the research area used to market their mushrooms.

Results and Discussion

Input use Pattern

Table 2 depicts the various inputs which were used in oyster mushroom production. It can be viewed from the table that for 100 bags, 10kg of spawn was used by both small and large farms. Plant protection is one of the crucial steps in oyster mushroom production as they were used to control the different diseases and thereby to enhance the yield of the crop. In this context, the overall bavistin and formalin used was 18and 161mililitre respectively. The small farms were using more the quantity of bavistin and formalin with quantity of 19 and 174 mililitre respectively than the large farms with a quantity of 16 and 148 mililitre respectively. The overall packing material per 100 bags of oyster mushroom was1.39 kg with small farms were used slightly higher quantity of packing material than large farms as the total production of oyster mushroom per 100 bags on small farms were slightly higher than the large farms (Table4). Human labour plays indispensable role in oyster mushroom production and the total family labour used for 100 bags was 4.74 man days with small having 4.58 man days and large having 4.91 man days. The miscellaneous charged accounted for res 231 on overall farm.

Table 2: Input use pattern of Oyster mushroom on sample farms (Per 100 bags)

Sr. No.	Particulars	Units	Farm Size		
			Small	Large	Overall
	Number of mushroom growers	**Number**	**40**	**20**	**60**
1.	Spawn	Kg	10	10	10
2.	Spawned compost bags	10 kg	100	100	100
	Crop protection material				
i)	Formalin	Millilitres	174	148	161
ii)	Bavistin	Grams	19	16	18
3.	Electricity Charges	Rs.	291	213	253
4.	Family Labour	Man days	4.58	4.91	4.74
5.	Packing Material	Kilograms	1.4	1.38	1.39
6.	Miscellaneous	Rs.	252	208	231

Cost of production

The cost required to produce 100 compost bags of oyster mushroom has been calculated and presenting in table 3. It can be seen from the table that on overall farms the total cost of production of oyster mushroom was Rs. 14,290 per 100 bags. It can be viewed from the table that the major components of variable costs were labour, spawned compost bags, spawn and the chemicals accounting for 15.03, 10.37, 9.80 and 7.17 per cent of the total cost respectively. When comparison was made between small and large farms, it was found that the total cost of production on small farms (Rs. 17,055) was more than the large farms (Rs. 12,051) per 100 compost bags due to economies of scale. Similar results were obtained by Kumar et.al (2023) [15] from Bhagalpur district of Bihar. It is important to mention here that there were only fifteen oyster mushroom growers in the study area because of less demand and less awareness of the oyster mushroom.

Table 3: Cost of production of oyster mushroom on sampled farms (Rupees per 100 bags)

Sr. No.	Particulars	Farm Size		
		Small	Large	Overall
A.	**Fixed Cost**			
i)	Interest on fixed capital @12%	4,015	2,342	2,845
		(12.27)	(9.66)	(9.84)
ii)	Depreciation Charges			
a)	Buildings (@2% p.a.)	2,463	1,178	1,564
		(14.44)	(9.78)	(10.94)
b)	Depreciation on implements (@10%)	3,346	1,952	2,963
		(19.62)	(16.20)	(20.73)
	Total Fixed cost	9,824	5,472	7,372
		(57.60)	(45.41)	(51.59)
B.	**Variable Cost**			
i)	Spawn	1,400	1,400	1,400
		(8.21)	(11.62)	(9.80)
ii)	Spawned compost bags	1,500	1,463	1,482
		(8.80)	(12.14)	(10.37)
iii)	Crop Protection Material	1,102	935	1,025
		(6.46)	(7.76)	(7.17)
iv)	Electricity Charges	291	213	253
		(1.71)	(1.77)	(1.77)
v)	Labour charges	2,300	1,988	2,148
		(13.49)	(16.50)	(15.03)
vi)	Packing Material	279	275	277
		(1.64)	(2.28)	(1.94)
vii)	Miscellaneous	252	208	231
		(1.48)	(1.73)	(1.62)
viii)	Total (i to vii)	7,124	6,482	6,816
		(41.77)	(53.79)	(47.70)
ix)	Interest on variable cost	107	97	102
		(0.63)	(0.80)	(0.71)
	Total variable cost	7,231	6,579	6,918
		(42.40)	(54.59)	(48.41)
C.	**Total Cost (A+B)**	17,055	12,051	14,290
		(100.00)	(100.00)	(100.00)

Note: Figure in parentheses indicate the percentage to the total in each category

Cost and Return analysis of oyster mushroom: Table-4 depicts the cost and returns of oyster mushroom on sampled farms. It can be visualized from the table that the total production per hundred bags of small farms (186kg) was more than that of large farms (180 kg). The gross return also showed the similar trends i.e. gross returns of small farms was more than that of large farms but in case of net returns, the results were opposite i.e. the net returns of large farms was more than that of small farms. It was due to the fact that the total cost of small farms was more than the large farms. The gross returns of small farms were found to be Rs. 22,320 whereas it was Rs. 21,600 for large farms. It was discovered that in small farms, net return over total cost per 100 bags was Rs. 5,265 and Rs. 15,089 respectively whereas it was Rs. 9,549 and Rs. 15,021 for large farms. The net returns per kg over total and variable costs on overall farms were Rs. 41.91 and Rs. 82.20 respectively. With regard to benefit cost ratio of oyster mushroom, it was found to be 1.31, 1.79 and 1.54 on small, large and overall farms respectively. It can also be seen from the table that net return over variable cost from oyster mushroom per hundred bags were also more which indicate that oyster mushroom is a profitable venture.

Table 4: Return and benefit cost analysis of oyster mushroom on sample farm (Per 100 bags)

Sr. No.	Particulars	Units	Farm Size		
			Small	Large	Overall
1.	Total cost	Rs/100 bags	17,055	12,051	14.290
i)	Fixed cost	Rs/100 bags	9,824	5,472	7,372
ii)	Variable cost	Rs/100 bags	7,231	6,579	6,918
2.	Total Production	Kg/100 bags	186	180	183
3.	Gross Returns	Rs/100bags	22,320	21,600	21,960
4.	Net Returns over Total cost	Rs/100 bags	5,265	9,549	7,670
5.	Net Return over Total cost	Rs/kg	28.31	53.05	41.91
6.	Returns over Variable cost	Rs/100 bags	15,089	15,021	15,042
7.	Net returns over variable cost	Rs/kg	81.12	83.45	82.20
8.	Benefit-Cost Ratio	Ratio	1.31	1.79	1.54

Break even analysis of oyster mushroom: Break even output is the level of output at which the mushroom growers will neither face profit nor loss. Table-5 shows the break even analysis of oyster mushroom. Break even analysis for small and large in the table reveals that if the large units obtained 53 kg of mushroom valued at Rs. 7,420 and small units obtained 97 kg mushroom valued at Rs. 13,580 then these units will be at no profit and no loss situation. On the overall farms, there will be no profit and no loss situation when there will be total production of 72 kg valued at Rs. 10,080. The break even output in physical terms reveals that small and large farms would be at no profit and no loss situation if they place at least 52 and 27 compost bags respectively. However, in case of overall farms, the number of compost bags to be placed to have no profit and no loss situation was 39.

Table 5: Break- even Analysis for oyster mushroom in sampled farms (Rupees per 100 bags)

Sr. No.	Particulars	Farm Size		
		Small	Large	Overall
1.	**Cost of Production**			
i)	Fixed Cost	9,824	5,472	7,372
ii)	Variable Cost	7,231	6,579	6,918
iii)	Total Cost	17,055	12,051	14,290
2.	Average variable cost	38.88	36.55	37.8
3.	Total Production(kg)	186	180	183
4.	Selling Price of oyster Mushroom(Rs/Kg)	140	140	140
5.	Break-even output(mushrooms in kg)	97	53	72
6.	Break-even point (no. of compost bags)	52	27	39

Production and disposal pattern of oyster mushroom

Table-6 highlights the production and disposal pattern of oyster mushroom on sample farms. The overall production of oyster mushroom in the sample farms was found to be 101.33 kg. Out of the total production, 8.16 per cent of the production was consumed at home; the respective figures for small and large growers were 9.49 and 6.67 per cent respectively. The proportion of production given in the form of gifts was 2.87 per cent with small and large farms having percentage of 4.38 and 1.11 per cent respectively. The overall marketed surplus of oyster mushroom was 82.83 per cent and in this case also the marketed surplus had a positive relation with the size of farm. As the size of the farm increases, the marketed surplus also increases.

Table 6: Production and disposal pattern of oyster mushroom on sample farms (Kg/farm)

Sr. No.	Particulars	Farm Size		
		Small	Large	Overall
1.	Production	88.89	120.00	101.33
		(100.00)	(100.00)	(100.00)
2.	Self-Consumption	8.44	8.00	8.27
		(9.49)	(6.67)	(8.16)
3.	Payment in kinds	1.22	2.50	1.73
		(1.37)	(2.08)	(1.71)
4.	Gifts	3.89	1.33	2.87
		(4.38)	(1.11)	(2.83)
5.	Marketable surplus	75.34	108.17	88.46
		(84.76)	(90.14)	(87.30)
6.	Losses	2.89	7.00	4.53
		(3.25)	(5.83)	(4.47)
7.	Marketed surplus	72.45	101.17	83.93
		(81.51)	(84.31)	(82.83)

Note: Figure in parentheses indicate the percentage to the total in each category

Marketing channels for oyster mushroom in the study area: Marketing channel are the route through which the produce they changes hands from producer to consumer. Marketing functionaries serve as a link between the producer and consumers throughout the entire marketing process. Marketing channels significantly impact the disposal and the sale of the produce. There was only one intermediary that was involved between producer and consumer i.e retailers in case of oyster mushroom in the study area. Effective utilization of the marketing channels can help mushroom growers to increase the profitability from the produce. The two main marketing channels that were involved in the marketing of oyster mushroom in the study area were as follow:

Channel-1. Oyster mushroom Grower ------- Consumer
Channel-2. Oyster mushroom Grower-----Retailer-------- Consumer

Marketing of oyster mushroom on sample farms: It is evident from the table -7 that only two channels were used in the disposal of oyster mushroom i.e. Channel-1 and Channel-2 . Channel-2 (Mushroom grower--- Retailer-------- Consumer) was the widely used channel by which 88.65 per cent of the total produce was marketed by 57.69 per cent of the total growers. Only 11.35 per cent of the total produce was disposed of by channel-1. Channel -3 in which wholesaler and retailer are involved between producer and consumer was not used because there were very less number of oyster mushroom grower. Also, very less number of oyster bags were kept by the mushroom growers as the demand for the oyster mushroom is not much because the people are not much aware of this species of mushroom.

Table 7: Pattern and disposal of Oyster mushroom on sample farms

Sr. No.	Particulars	Farm Size					
		Small		Large		Overall	
		No.	Qty. (kg)	No.	Qty.(kg)	No.	Qty.(kg)
1.	Mushroom Grower →Consumer	7	7.67	4	12.33	11	9.53
		(43.75)	(10.59)	(40.00)	(12.19)	(42.31)	(11.35)
2.	Mushroom Grower →Retailer	9	64.78	6	88.83	15	74.40
		(56.25)	(89.41)	(60.00)	(87.81)	(57.69)	(88.65)
3.	Mushroom Grower →Wholesaler	-	-	-	-	-	-
		-	-	-	-	-	-
	Total	16	72.45	10	101.16	26	83.93
		(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)

Conclusion

To sum up, the study on the economics and marketing aspects of oyster mushroom brought out the following points: first, in relation to input use, small farms were used higher quantity of packing material than large farms as the total production of oyster mushroom per 100 bags on small farms were higher than large farms. Second, the total cost of production on small farms was more than large farms which was because of economies of scale. It is important here to mention here that there were only 15 oyster mushroom growers in the study area because of less demand and less awareness of this mushroom. Third, total production per hundred mushroom bags on small farms were more than that of large farms. The gross return also shows the similar results but, in case of net return the results were opposite. It was due to the fact that total cost of production was more on small farms than on large farms, but the return per rupee invested on large farms were more than small farms. It is also interesting to note in this study that net return over variable cost from oyster mushroom production per hundred bags was also more which suggested that oyster mushroom is a profitable venture in the study area. Fourth, the break-even analysis suggested that the growers were in no profit and no loss situation when there will be a total production of 72 kg valued at Rs. 10,080 in the overall farm situation. Lastly, in relation to marketing aspect of oyster mushroom, the overall marketed surplus was found out to be 82.83 per cent and in this case marketed surplus had a positive relation with the size of farms. Marketing channels significantly impact the disposal and sale of the produce. The effective utilization of the marketing channels can help growers to increase the profitability from the produce. In this context, only two marketing channels were operated in the study area and these were: Channel-1 Oyster mushroom growers----- Consumer; and Channel-2 Oyster mushroom Grower------- Retailer-----Consumer. Channel-2 was the widely used channel by which 88.65 per cent of the total produce was marketed by 57.69 per cent of the total growers. It was also important to mention here that there were very less number of oyster bags kept by the mushroom growers as the demand for the oyster mushroom is not much as the people are not much aware of this species of mushroom.

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