



SURVEY ON ECONOMICS OF OYSTER MUSHROOM (*Pleurotus spp.*) CULTIVATION IN UTTAR PRADESH

Ghanshyam Verma¹, Arun Kumar, Sheetla Verma and Arti Katiyar^{4*}

¹ Deptt. of Plant Pathology, N.D. University of Agriculture and Technology, Kumarganj, Faizabad

² Department of Horticulture, Smt. Amrit Kunwar Degree College, Attara Kala, Jalaun (U.P.)

³ Deptt. of Plant Pathology, Smt. Amrit Kunwar Degree College, Attara Kala, Jalaun (U.P.)

⁴ Deptt. of Zoology/Entomology, D.B.S.P.G. College, Govind Nagar, Kanpur (U.P.)

*E-mail: artikatiyar25@gmail.com

ABSTRACT : An attempt was made to examine the existing level of sample survey on economics of oyster mushroom (*Pleurotus spp.*) cultivation on small, medium and large mushroom farms in Uttar Pradesh. Mushroom is large reproductive structure of edible fungi belonging to either ascomycotina or basidiomycotina classes. Mushroom cultivation increases the additional income of the farmers by utilizing agricultural wastes. It seems to have bright future in the state. Similarly, left over bed of mushroom may be used as proteinous cattle feed and can be converted into quality manure which generates additional income. The production technology is easy to adopt and able to provide income and employment to the farmers specially marginal and small. Marketing is very important in production of any crop. The development of any such crop depends on efficient marketing. On the basis of output : input ratio the large size units was most viable for oyster mushroom production because the ratio of output to the total cost was maximum. Thus, profitability of the mushroom cultivation was more on large size group of sample mushroom grower. With the existing output price, mushroom crop enterprise is an economically viable and employment oriented activity for sub-urban areas.

Keywords : Oyster mushroom, mushroom growers, wheat straw, production, categories, cost structure.

Mushroom has been utilized as an article of nutritious food since ancient times. The value of mushroom is comparable to fresh vegetables as well as other nutritive foods in the world. There are numerous species of *Pleurotus* which are edible and can be cultivated indoors under controlled environment but the two most commonly grown species in this country are *Pleurotus sajorcaju* and *Pleurotus flabellatus*. Both of these mushrooms have delicious flavour and are rich in protein, fibre, minerals and vitamins and low in sugars/fats. Mushrooms contain about 90 per cent moisture and are basically a low calorie food (about 30 calories/100 g fresh mushroom). Total carbohydrates content is about 4 to 5 per cent and most of it is in fibre form (Bahi, 1). In India, the total production of mushroom was 40,000 MT during 2011-12. The major mushroom growing states are Tamil Nadu, Maharashtra, Punjab, Haryana, Madhya Pradesh, Jammu & Kashmir, Uttar Pradesh, North Eastern states and Andhra Pradesh. The production of mushroom in Uttar Pradesh is of recent origin and Uttar Pradesh produced about 600 MT during 2010-11. The state has conducive climate for growing button, oyster and paddy straw mushrooms. Button mushroom can be grown in winter months from November to March, paddy straw mushroom from April to November, while oyster mushroom can be grown throughout the year in Uttar Pradesh. In Agra district of Uttar Pradesh state,

where a large number of NGOs and Governmental agencies (AICMJP & TADD) have been transferring technical know-how relevant to mushroom cultivation for last few years mushroom growing, has become a very important activity in some of the villages and a large number of farmers have taken to mushroom growing as a supplementary enterprise for generating additional income (Khurana and Sharma, 3). The commercial cultivation of mushroom in Uttar Pradesh is still in its initial stages. With growing markets in Kanpur and other big cities in Uttar Pradesh, mushroom cultivation seems to be having a good future in the state. With these consideration, a study on "Economics of oyster mushroom (*Pleurotus spp.*) production in Agra district of Uttar Pradesh" was undertaken with the specific objectives viz.,

- (i) To estimate the cost of cultivation of oyster mushroom under seasonal growing conditions.
and
- (ii) To study the profitability of oyster mushroom production in rural Uttar Pradesh.

MATERIALS AND METHODS

Agra district was selected for the study, because a large number of mushroom growers and most of the mushrooms produced in the state come from this district. Top five villages namely Rampur, Shebpur, Deori, Khojipur and Papredo, where oyster mushroom

cultivation is practiced, were selected for the study. For the selection of respondents, village wise list of mushroom growers was prepared in ascending order on the basis of quantity of wheat straw used. All the growers were classified into three categories based on quantity of wheat straw (substrate) handled per crop by individual mushroom grower. Mushroom growers having less than 1 tonne wheat straw were termed as the small, with 1 to 2 tonnes wheat straw as the medium and with more than 2 tonnes wheat straw were included in the category of the large. Six mushroom growers were selected from each village randomly as per group and out of these 2 mushroom growers in each size group were randomly selected for the study, constituting a total sample of 30 mushroom growers (5 villages, 3 categories and 2 growers in each category). For achieving the objectives of the study the required primary data were collected from finally selected mushroom growers through a comprehensively structured and pre tested survey schedule for the year 2011-12. A simple tabular analysis was done to achieve the stated objectives.

RESULTS AND DISCUSSION

Mushroom growers size groups :

Three types of mushroom growers were categorized on the basis of quantity of wheat straw used for the production of mushroom per season. The categories were:

- (i) Cat-I (Small): Mushroom growers having wheat straw for mushroom cultivation-less than 1 tonne.
- (ii) Cat-II (Medium): Mushroom growers having wheat straw for mushroom cultivation from 1 to 2 tonnes.
- (iii) Cat-III (Large): Mushroom growers having wheat straw for mushroom cultivation above 2 tonnes.

Sample size according to wheat straw :

The wheat straw used by the selected oyster mushroom growers in the study area under different categories are presented in the Table 1.

Oyster mushroom was grown by growers of all size groups viz, small (Cat-I), medium (Cat-II) and large (Cat-III) in the study area. The average sample size of three categories of mushroom growers on the basis of wheat straw used by small, medium and large mushroom growers was 0.79 tonnes, 1.72 tonnes and 2.41 tonnes per season, respectively.

Cost structure analysis of oyster mushroom cultivation :

The cost of cultivation of oyster mushroom per tonne of wheat straw in Agra district for three size groups in the year 2011-12 are presented in Table 2. An overview of results on cost revealed that cost of cultivation of oyster mushroom varied between ` 8276.76 to 14727.19 per tonne of wheat straw in Cat-III to Cat-I. The important ingredients of cost were cost of wheat straw, spawn, watering charges, family labour and interest on fixed capital. The average cost of cultivation of oyster mushroom crops was estimated as ₹ 10683.87 per tonne of wheat straw. Almost 47.53 per cent of the total cost was covered by depreciation, interest on fixed and working capital. The combined expenditure on labour was about 11.55 per cent on overall basis. The remaining 40.92 per cent of total cost was towards raw material components and miscellaneous items. The break-up of total cost in variable and fixed cost was larger on small size of units, which is a normal pattern.

Table 1: Sample size of mushroom growers according to category (Tonnes)

Sample grower number	Wheat straw used by		
	Cat-I	Cat-II	Cat-III
1	0.80	1.80	2.3
2	0.87	1.50	2.4
3	0.85	1.40	2.6
4	0.70	1.90	2.2
5	0.89	1.70	2.2
6	0.70	1.60	2.5
7	0.70	1.90	2.2
8	0.80	1.85	2.4
9	0.90	1.80	2.7
10	0.74	1.70	2.6
Total	7.95	17.15	24.1
Average	0.79	1.72	2.41

The overall labour cost of all operations was ` 1234.10 per tonne of wheat straw. Out of total labour

Table 2 : Structure of cost of cultivation of oyster mushroom on sample mushroom growers in Agra district. (₹ per tonne wheat straw)

S. No.	Particular	Cat-I	Cat-II	Cat-III	Average
A. Labour Cost					
1.	Hired human labour	419.40 (2.85)	319.00 (3.52)	261.58 (3.16)	333.32 (3.11)
2.	Family labour	1278.90 (8.68)	623.50 (6.89)	61336 (7.41)	838.59 (7.84)
3.	Bullock labour	94.5 (0.64)	53.94 (0.59)	38.13 (0.46)	62.19 (0.58)
	Sub Total	1792.80 (12.17)	996.44 (11.01)	913.07 (11.03)	1234.10 (11.55)
B. Material Cost					
1.	Wheat straw	1551.69 (10.53)	1492.05 (16.49)	1482.15 (17.90)	1508.63 (14.12)
2.	Spawn	1364.08 (9.26)	1253.61 (13.66)	1240.08 (14.98)	1285.92 (12.03)
3.	Crop protection	58.84 (0.39)	50.40 (0.55)	55.55 (0.67)	54.93 (0.51)
4.	Watering charges	961.88 (6.53)	690.43 (7.63)	81421 (9.83)	822.15 (7.69)
	Sub Total	3936.5 (26.72)	3486.48 (38.53)	3591.99 (43.39)	3671.65 (34.36)
C. Imputed Cost					
1.	Depreciation	3344.79 (22.71)	1461.89 (16.15)	1104.95 (13.35)	1970.54 (18.44)
2.	Interest on working capital	634.03 (4.30)	536.61 (5.93)	538.04 (6.50)	56956 (5.33)
3.	Interest on fixed capital	4234.98 (28.75)	1912.43 (21.13)	1466.73 (17.72)	2538.05 (23.75)
	Sub Total	8213.8 (55.77)	3910.92 (43.22)	3109.72 (37.57)	5078.15 (47.53)
D. Miscellaneous Cost					
1.	Transport & Other Cost	784.09 (5.32)	653.77 (7.22)	661.98 (7.99)	699.95 (6.55)
	Total	14727.19 (100.00)	9047.6 (100.00)	8276.76 (100.00)	10683.86 (100.00)

*Figures in parenthesis are the percentage of total cost.

Table 3: Operation wise labour cost of oyster mushroom. (₹ per tonne wheat straw)

S. No.	Particular	Cat-I	Cat-II	Cat-III	Average
1.	Substrate preparation	496.60 (27.70)	279.50 (28.05)	24927 (27.30)	341.59 (27.68)
2.	Spawning	411.80 (22.97)	228.48 (22.93)	195.94 (21.46)	277.05 (22.45)
3.	Bag filling	333.10 (18.58)	180.95 (18.16)	158.60 (17.37)	222.50 (18.03)
4.	Crop protection	147.72 (8.24)	83.50 (8.38)	88.48 (9.69)	108.23 (8.77)
5.	Watering	227.68 (12.70)	126.34 (12.68)	126.64 (13.87)	161.42 (13.08)
6.	Harvesting (picking + grading + packing)	175.51 (9.79)	97.35 (9.77)	93.86 (10.28)	122.79 (9.95)
	Total	1792.80 (100.00)	996.44 (100.00)	913.07 (100.00)	1234.10 (100.00)

*Figures in the parentheses are percentage of total labour cost.

Table 4 : Size and groupwise cost of oyster mushroom. (₹ per tonne wheat straw)

S. No.	Particular	Cat-I	Cat-II	Cat-III	Average
1	O.C.	7219.41 (48.78)	5673.35 (62.70)	5705.08 (68.92)	6199.28 (57.89)
2	O.H.C.	7579.77 (51.21)	3374.32 (37.29)	2571.68 (31.07)	4508.59 (42.10)
3	Cost A	9285.30 (62.74)	6511.74 (71.97)	6196.67 (74.86)	7331.24 (68.46)
4	Cost B	13520.28 (91.35)	8424.17 (93.10)	7663.4 (92.58)	9869.28 (92.16)
5	Cost C	14727.19 (100.00)	9047.67 (100.00)	8276.76 (100.00)	10683.87 (100.00)

cost about 78.11 per cent was used in substrate preparation, spawning, bag filling and harvesting (picking + grading + packing) as shown in Table 3. The

remaining 21.89 per cent cost was spent on other operations like watering and crop protection.

The labour cost for crop protection, watering and harvesting per tonne of wheat straw decreased with the

increase in the size of unit but the relative share in total cost increases. It may be due to reduced expenses on overhead costs on large units. On the whole, the cost of labour to perform various operations decreases as the size of mushroom unit increases. This is probably due to economy of scale.

The cost A which covers cash and kind requirements of the cultivators for the oyster mushroom was ₹ 7331.24 per tonne of wheat straw on overall basis (Table 4).

Share of cost A in total cost was almost to the tune of 62.74 to 74.86 per cent on all three size groups. Cost B shared 91.35 to 93.10 per cent of total cost on all three size groups. The shares of cost A and cost B to total cost showed an increasing trend with an increase in the size of units. Total variable cost of cultivation among various size group ranged from ₹ 5019.54 to ₹ 6435.32 per tonne of wheat straw on Cat-II and Cat-I, respectively. The important items of the cost were wheat straw, spawn, human labour and watering which together constituted about 87.44 per cent of the total variable cost. The remaining 12.56 per cent cost was shared by other items. The total variable cost decreased with increase in the size of mushroom unit. The variable cost component was almost similar in Cat-II and Cat-III except for watering and human labour components. Almost similar findings have also been reported by Chander and Dhandar (2) and Singh and Kaira (4).

The size group wise cost of production per mushroom growing unit as depicted in Table 5 revealed that production cost for small, medium and large growers was ₹ 11745.40, ₹ 15599.40 and ₹ 20187.30 per unit, respectively. However, on an average, the production cost was ₹ 15844.03 per unit. It can further be noticed that the imputed cost (fixed cost) of production varied from 54.65 per cent on small farms to 37.57 per cent on large farms. It shows that with the increase in size of unit, the proportion of imputed costs to total cost decreases due to economies to scale of production. The important items of cost were wheat straw, spawn, watering charges, family labour and interest on fixed capital. Almost 43.86 per cent of the total cost was covered by depreciation, interest on fixed and working capital. The combined expenditure on labour was about 11.41 per cent on overall basis. The remaining 44.72 per cent of total cost was towards material components and miscellaneous items.

Income and Profitability of the Oyster Mushroom Crop :

Comparison of costs, income and return per rupee for oyster mushroom crop in Agra district of Uttar Pradesh is shown in Table 6.

The average gross income was estimated as ₹ 24199.06 per tonne of wheat straw. Average net income and family labour income were ₹ 13515.19 and ₹ 14329.78 per tonne of wheat straw, respectively. The total income from mushroom cultivation ranged from ₹ 23809.60 to ₹ 24740.80 per tonne of wheat straw. The net income over variable cost was maximum in case of large size group (Cat-III) and minimum in the small size (Cat I) group i.e. ₹ 16464.04 and ₹ 9082.41 per tonne of wheat straw, respectively. The average return per rupee was estimated as 2.41. The average cost of production and average market price on average basis were ₹ 1772.8 and ₹ 4000.00 per quintal wet mushroom, respectively. The average mushroom yields from one tonne of wheat straw were almost same on different size units. The size group wise profitability per mushroom growing unit is depicted in Table 7.

The overall gross income was estimated as ₹ 39849.33 per unit. Average net income and family labour income were ₹ 24005.30 and ₹ 25200.63 per unit, respectively. The total income from mushroom cultivation ranged from ₹ 19696.00 to ₹ 58392.00 per unit. The net income over variable cost was maximum in case of large size group (Cat-III) and minimum in the small size (Cat-I) group i.e. ₹ 38204.70 and ₹ 7950.60 per unit, respectively. The average return per rupee was estimated as 2.41. The average cost of production and average market price on overall basis were ₹ 1757.73 and ₹ 4000.00 per quintal wet mushroom, respectively. The average mushroom yields earned from 4.92 q to 14.60 q per unit and overall average wet yield was 9.96 q per unit per season.

On the basis of output input ratio the large size units were most viable for oyster mushroom production because the ratio of output to the total cost was maximum. Thus, profitability of the mushroom cultivation was more on large size group of sample mushroom grower. With the existing output price, mushroom crop enterprise is an economically viable and employment oriented activity for sub-urban areas.

Table 5: Structure of cost of cultivation of oyster mushroom on sample mushroom growers in Agra district.
(₹ per unit)

S. No.	Particular	Cat-I	Cat-II	Cat-III	Average
A. Labour Cost					
1.	Hired human labour	390.00 (3.32)	550.00 (3.52)	638.00 (3.16)	526.00 (3.31)
2.	Family labour	1015.00 (8.64)	1075.00 (6.89)	1496.00 (7.41)	1195.33 (7.54)
3.	Bullock labour	75.00 (0.63)	93.00 (0.59)	93.00 (0.46)	87.50 (0.55)
	Sub Total	1480.00 (12.59)	1718.00 (11.01)	2227.00 (11.03)	1808.83 (11.41)
B. Material Cost					
1.	Wheat straw	1231.50 (10.48)	2572.50 (16.49)	3615.00 (17.90)	2473.00 (15.60)
2.	Spawn	1082.60 (9.21)	2161.40 (13.85)	3024.60 (14.98)	2089.53 (13.18)
3.	Crop protection	46.70 (0.39)	86.90 (0.56)	135.50 (0.67)	89.54 (0.57)
4.	Watering charges	763.40 (6.49)	1190.40 (7.63)	1985.90 (9.83)	131323 (8.28)
	Sub Total	312420 (26.59)	6011.20 (38.53)	8761.00 (43.40)	5965.30 (37.65)
C. Imputed Cost					
1.	Depreciation	2554.60 (22.60)	2520.50 (16.15)	2695.00 (13.34)	2623.43 (16.56)
2.	Interest on working capital	50320 (428)	925.20 (5.93)	1312.30 6.50	91357 (5.77)
3.	Interest on fixed capital	3361.10 (28.61)	3297.30 (21.13)	3577.40 (17.72)	3411.93 (21.53)
	Sub Total	6418.90 (54.65)	6792.50 (43.54)	7584.70 (37.57)	6948.93 (43.86)
D. Miscellaneous Cost					
1.	Transport & Other Cost	622.30 (529)	112720 7.22)	1614.60 (7.99)	1121.37 (7.07)
	total	11745.40 (100.00)	15599.40 (100.00)	2018730 (100.00)	15844.03 (100.00)

*Figures in parentheses are the percentage of total cost.

Table 6: Size group wise input and output on sample mushroom growers of oyster mushroom crop in Agra district (2011-12)
(₹ per unit)

S. No.	Particular	Cat-I	Cat-II	Cat-III	Average
1.	Market price (₹/q mushroom)	4000.00	4000.00	4000.00	4000.00
2.	Total income (₹/tonne wheat straw)	23809.6	24046.8	24740.8	24199.06
3.	Cost of cultivation (Rs/tonne wheat straw)	14727.19	9047.67	8276.76	10683.87
4.	Net income (N.I.) (₹/tonne wheat straw)	9082.41	14999.13	16464.04	13515.19
5.	Family labour income (FLI) (₹/tonne wheat straw)	10289.32	15622.63	17077.40	14329.78
6.	Farm business income (FBI) (₹/tonne wheat straw)	145243	17535.06	18544.13	16867.83
7.	Average yield (q/tonne wheat straw)	5.95	6.01	6.18	6.04
8.	Cost of production (₹)/q of mushroom per tonne wheat straw	2475.15	1505.10	1338.15	1772.8
9.	Return per rupees	1.61	2.65	2.98	2.41

Table 7: Size group wise profitability on sample mushroom growers of oyster mushroom crop in Agra district (2011-12).
(₹ per unit)

S. No.	Particular	Cat-I	Cat-II	Cat-III	Average
1.	Market price (₹/q mushroom)	4000.00	4000.00	4000.00	4000.00
2.	Total Income (₹)	19696.00	41560.00	58392.00	39849.33
3.	Cost of cultivation (₹)	11745.40	15599.40	20187.30	15844.03
4.	Net Income (N.I.) (₹)	7950.60	29860.60	38204.70	2400530
5.	Family labour income (FLI) (₹)	8965.60	26935.60	39700.70	25200.63
6.	Farm Business Income (FBI) (₹)	12326.68	30232.90	43278.10	28612.49
7.	Average yield (q)	4.92	10.37	14.60	9.96
8.	Cost of production ₹/q of mushroom	2385.33	1505.00	1382.88	1757.73
9.	Return per rupees	1.67	2.65	2.89	2.41

Suggestions and Recommendations :

- (i) Mushroom, being a highly technical venture, needs that the interested persons should be given practical oriented training thereby fully exploiting 'learning by doing' principle of extension education. During training, the trainees should be invited to perform with their own hands by various practices of mushroom cultivation. This will result in effective training.
- (ii) Mushroom cultivators should be made aware of various species as well as cultivars of mushroom giving special emphasis on time of their cultivation. This will enable them to cultivate mushroom throughout the year as per suitability of season for particular species or cultivar.
- (iii) Efforts should be made to establish the wheat straw units (substrate material) in various strategic areas to cater the needs of seasonal growers for the pasteurized wheat straw.
- (iv) The spawn should be given in subsidized rates to encourage the mushroom growers to cultivate mushrooms.
- (v) The agency/organization working for promotion of mushroom cultivation should develop a mechanism to purchase the produce of its clients at reasonable rates at least for few years. This will definitely give a boost to further increase in the number of mushroom production units.

REFERENCES

1. Bahi, Nita (1995) "Export Potential of Mushroom" *In Advances in Horticulture*. Malhotra Publishing House, New Delhi. Vol. 13 : 589.
2. Chander, S. and Dhandar D.G., (1995). "Mushroom cultivation in Goa". *In Advances in Horticulture*, Malhotra Publishing House, New Delhi, vol. 13, pp. 410-411.
3. Khurana, G.S. and Sharma, D.D. (1995). "Constraints in Mushroom Cultivation". *Maharashtra J. Exten. Edu.* **XIV**: 189-192.
4. Singh, S.P. and Kaira, A (1995). Economic analysis of mushroom production in district Sonapat of Haryana State. *Indian Agril. Marketing*, **9** (2) : 105-114.



Citation: Verma G., Kumar A., Verma S. and Katiyar A. (2014). Survey on economics of oyster mushroom (*Pleurotus* spp.) cultivation in Uttar Pradesh. *HortFlora Res. Spectrum*, 3(1): 45-50.