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Research Article

Resource use efficiency in mushroom cultivation in Jorhat district of Assam

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SUMMARY : The study was conducted in Jorhat district of Assam to examine the resource productivity and resource use efficiency in mushroom production. The regression co-efficient of other expenditure was positive and significant in all farms indicating that the factor had contributed significantly to gross return. Of course negative regression co-efficient of labour (significant 10 % probability level) indicated the excess use of labour in all the groups of mushroom producer with the exception of group IV. Resource use of efficiency of sample mushroom growers was analysed by comparing the marginal value product (M.V.P) of an input with its respective factor cost. The overall M.V.P. of spawn was observed to be 13.30 implying that addition of one unit of spawn would have increased gross income by Rs. 13.30. On the other hand, the overall M.V.P. of other expenditure was observed to be 1.68 which ranged from -0.558 in group III to 3.481 in group II amongst the different size group of growers. Similarly, the overall MVP of labour was estimated to be 0.974 which varied amongst the different size groups of farmers from -3.023 in groups I to 6.249 in group IV.

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BACKGROUND AND OBJECTIVES

Mushrooms are rich in nutritive value and have occupied an important place as an article of food since ancient times for its medicinal vaules. Mushroom cultivation is very much profitable, and has immense potentiality in gainful employment generation and entrepreneurship development among rural population. Cultivation technology of mushroom is very much easier, and it also involves low initial investment and cost of production.

Assam is in an advantageous position for production of mushroom on commercial basis for its congenial climatic condition and abundance of raw materials. With little modification in growing house and using heat tolerated species, oyster mushroom can be grown round the year in Assam (Anonymous, 2003). Considering all the factors, State Institute of Rural Development (SIRD) implemented a special project under SGSY to provide assistance for mushroom production as a source of income and employment generation and provided numbers of training on mushroom cultivation to a good number of SHG members under that project. Assam Agricultural University, Jorhat and Regional Research Laboratory, Jorhat also rendered training to interested entrepreneurs on mushroom cultivation from time to time. As a result of these training programmes many interested entrepreneurs and rural youth (SHG's Members) came forward and undertook the cultivation of mushroom as an enterprise. How ever, mushroom growers were having limited resources. So, utilization of their limited resources in a most efficient way is very much important for maximization of profit. Keeping in view above aspect, the present study was under taken with the objective to examine the resource use efficiency in mushroom cultivation.

RESOURCES AND METHODS

The study was undertaken in Jorhat district of Assam. A list of mushroom growing self-help groups (SHGs) in the district was prepared in consultation with SIRD, Jorhat and accordingly a total of 12 no. of SHGs were listed out. All the 12 SHGs were taken up for sampling and from each SHG, 5 mushroom growers were selected for final sample. The sample thus, selected were stratified in to 4 size groups by cumulative frequency distribution method on the basis of number of mushroom bags grown per year. Total frequency being 60, the groups were so constructed that each group composed of equal number of growers. The stratifications were as follows:

Group I: 0-50 bags (Growing 0-50 bags of mushroom)
Group II: 51-150 bags
Group III: 151-300 bags
Group IV: 301 and above.

(A bag is a standard size prepared in polythene bag of size 40 cm x 60 cm, composed of alternate layers of rice straw and spawn, capable of holding 1 kg of dry rice straw).

Primary data were collected from sample mushroom growers with the help of a specially designed pre-tested schedules and questionnaires through personal interview method.

In order to establish a functional relationship of mushroom production with its strategic input variables, Cobb –Douglas production function, $Y=aX_1^{b_1}X_2^{b_2}X_3^{b_3}$ was considered.

where,

Y = Gross return per bag (Rupees/bag)
X_1 = Expenditure on spawn (Rupees/bag)
X_2 = other expenditures (Rupees/bag)
X_3 = Expenditure on labour (Rupees/bag).

b_1, b_2 and b_3 are the elasticity of production of the input factors X_1, X_2 and X_3, respectively. The function becomes linear in logarithmic form and can be expressed as:

$$\mathbf{LogY = \log a + b_1 \log X_1 + b_2 \log X_2 + b_3 \log X3.}$$

The regression co-efficient (b_i) in Cobb – Douglas production function directly indicate the elasticity of production which measure the percentage change in output for unit percentage change in the input (Bhowmick, 1975). The Cobb–Douglas production function facilitates to examine the resources use efficiency by comparing marginal value product (MVP) to its factor cost. The marginal value product of a particular input is computed as:

$$\mathbf{MVPxi} = \left(\frac{\mathbf{dy}}{\mathbf{dx_i}}.\mathbf{p_y}\right) = \left(\frac{\mathbf{b_i}.\bar{\mathbf{y}}}{\mathbf{xi}}.\mathbf{py}\right)$$

where,

b_i is the elasticity co-efficient of x_i, $\bar{x}_i$ and $\bar{y}$ are the geometric mean of input and output, respectively.

In present study per bag gross income was regressed with per bag expenditure on spawn, polythene, labour, straw, miscellaneous expenses and other expenses. Miscellanous expenses included interest on working capital, chemicals and rope and the other expenses included depreciation and interest on fixed capital assets. The regression co-efficients thus obtained were found to be either positive or negative without statistical significance. More over, the zero order correlation matrixes showed high degree of multicollinearity among some of the independent variables. To overcome it, aggregation of variables *viz.*, polythene, straw, chemicals, depreciation of equipments and buildings, interest on working capital and fixed capital etc. were done. The new variable thus obtained was termed as others (other expenditures). The final regression analysis include only three independent variables *viz.*, spawn (X_1), other expenditures (X_2) and labour (X_3).

OBSERVATIONS AND ANALYSIS

The experimental findings obtained from the present study have been discussed in following heads:

Resource productivity of mushroom:

The ordinary least square (OLS) estimates of parameters of Cobb-Douglas production function with respect to different size group and all farm samples are presented in Table 1. It is seen from the Table that the regression co-efficient of spawn was positive and statistically significant in group I, II and IV at 10 per cent probability level and in all farms at 5 per cent probability level indicating significant contribution of spawn to the gross return from mushroom production in these groups. The regression co-efficient of

Table 1: Regression coefficients of factors influencing return across various size groups of sample mushroom growers in Jorhat district of Assam

Variables	Group I (n=17)	Group II (n=17)	Group III (n=16)	Group IV (n=10)	Pooled (n=60)
Spawn (X_1)	1.6944*** (0.5958)	2.2220***(0.8390)	0.2665(0.184)	0.3880***(0.5709)	1.2439**(0.3948)
Other(X_2)	0.0788 (0.1145)	0.4053(0.3875)	-0.0478(0.0695)	-0.3099(0.3919)	0.1385***(0.0758)
Labour(X_3)	-0.4573*** (0.1630)	0.2926(0.2966)	0.1098(0.0809)	0.8214***(0.3272)	0.1348(0.1202)
R^2	0.5830	0.4010	0.1840	0.5280	0.2640
Return to scale	1.3160	2.9190	0.3280	0.8990	1.5170

** and *** indicate significance of values at P=0.05 and 0.01, respectively, Figures in parentheses indicate standard error of estimates

other expenditure was found to be positive and significant in case of all farm which implied that the factor had contributed significantly to the gross return. The regression co-efficient of labour was found to be negative and significant at 10 per cent probability level in group I (-0.4573) which indicated the excess use of labour in the group .On the other hand it was positive and significant in group IV. It is seen from the Table 1 that the value of co-efficient of multiple determination (R^2) ranged from 18.40 per cent in group III to be 58.30 per cent in group I which explained variability in the dependent variable by the independent variables chosen in the function. The variability of dependent variable not explained by the chosen independent variables might be due to those variables which have been left out from the functional relationship such as environmental variables *viz*., rainfall, temperature. Inclusion of these variables would have improved the results of resource use efficiency.

Return to scale:

The return to scale was also estimated and result is presented in Table 1. It was found to be greater than unity in group I, group II and all farms indicating increasing return to scale. In group III and IV the return to scale was found to be less than unity which indicates decreasing return to scale.

Resource use efficiency:

Resource use of efficiency of sample mushroom growers was analysed by comparing the marginal value product (M.V.P) of an input with its respective factor cost and is presented in the Table 2. The overall M.V.P. of spawn was worked out at 13.30 which indicated that addition of one unit of spawn would have increased gross income by Rs. 13.30. Amongst the different size group of growers, it ranged from 3.23 in group III to 29.17 in group II. On the other hand, the overall M.V.P. of other expenditure was observed to be 1.68 which ranged from -0.558 in group III to 3.481 in group II amongst the different size group of growers. Similarly, the overall MVP of labour was estimated to be 0.974 and amongst the different size groups it varied from -3.023 in groups I to 6.249 in group IV. The table also shows the ratios of MVP to their factor cost for various inputs across various size groups. The ratio of MVP of spawn to its factor cost was found to be positive, but less than unity in all the size groups which indicates a decreasing return in all the groups. Thus, there is no scope for increasing the expenditure in spawn in respect of all the size groups. Similarly the ratio of MVP of other expenditure to its factor cost was found to be positive, but les than unity in group I, group II and group IV indicating a decreasing return to gross income. However the ratio was found negative (-0.072) in group III indicating excess expenses in these inputs which should be minimized to ensure significant contribution from these inputs towards gross return. In case of labour, the ratio of MVP to its factor cost was observed to be negative (-0.075) in group I which indicates excess use of labour in this group. The growers in this group incurred more expenses on labour which should be curtailed to ensure positive contribution of labour towards gross return. However, this ratio was observed to be less than unity in group II, group III and group IV indicating a decreasing return to gross income. In overall situation, the ratios of

Table 2: Resource use efficiency of various inputs across various size groups of sample mushroom growers in Jorhat district of Assam

Group	Input factor	Geometric mean	MVP in Rs.	Factor cost	Ratio of MVP to factor cost
Group I	Spawn	4.841	23.133	50.00	0.462
	Other	11.880	0.438	7.75	0.056
	Labour	10.000	-3.023	120.00	-0.075
Group II	Spawn	4.813	29.170	50.00	0.583
	Other	7.357	3.481	7.75	0.449
	Labour	11.468	1.612	120.00	0.040
Group III	Spawn	4.809	3.226	50.00	0.064
	Other	4.981	-0.558	7.75	-0.072
	Labour	8.346	0.766	40.00	0.019
Group IV	Spawn	4.888	3.891	50.00	0.077
	Other	3.882	-3.910	7.75	0.504
	Labour	6.438	6.249	120.00	0.156
All Farm	Spawn	4.933	13.300	50.00	0.266
	Other	4.342	1.683	7.75	0.217
	Labour	7.299	0.974	120.00	0.024

MVPs of spawn, other expenditures and labour to their respective factor cost were found to be less than unity.

Conclusion:

It is clear from the above analysis that spawn and other expenditure contribute significantly to the gross return from mushroom production. From the resource use efficiency, it is seen that decrease in the expenditure on labour in group I and other expenditure in group III will make the mushroom production profitable in the study area since there was an excess use of these resources. So, it is necessary for farmers to use resources properly in order to achieve potential output and thereby to earn more profit.

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