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# Waste to wealth via milky white mushroom

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**Abstract**

The present study was conducted in malnad and semi malnad regions of Karnataka to ascertain the economics and marketing of milky white mushroom production. A sample of five milky white mushroom production units were randomly selected following snow ball sampling. The net returns of Rs.89/kg and Benefit Cost Ratio of 2.25 indicated the profitability of milky white mushroom production. The assessment of marketing aspects revealed that Producer-Retailer located at distant place-Consumer was found to be the prominent marketing channel practiced by the mushroom growers though it is relatively inefficient compared to Producer-Local Retailer-Consumer. The producer's share in consumer rupee was 75.08 percent in case of predominant marketing channel indicating the existence of price spread of 24.92 percent. Prospective mushroom growers should be encouraged by the government through provision of production related subsidies and creation of infrastructure for facilitating value addition.

**Keywords:** Price spread, marketing channel, snow ball sample, benefit cost ratio

## Introduction

Mushrooms are also called white vegetables or boneless vegetarian meat having rich amount of proteins, vitamins and fibres. Milky white mushroom (*Calocybe* spp.) is the first Indian mushroom variety commercialized by IIHR, Hesaraghatta suitable for cultivation round the year. In malnad and semi-malnad regions, paddy is the predominant crop and its byproduct ie, straw is available in sumptuous quantity which could be used as a suitable substratum for production of mushroom. Mushroom has got capacity to convert ligno-cellulose which is enormously present in paddy straw or other byproducts of agricultural crops into protein rich biomass. Thus, mushroom production could be regarded as an eco-friendly alternative for efficient management of agricultural wastes. Mushroom production not only reduces environmental pollution but also generates employment and sustains livelihood of many rural poor. In the recent past, awareness among consumers about medicinal properties of mushroom has escalated its demand. The demand usually comes from those consumers who are suffering from hypertension and diabetics. Milky white mushroom possesses 32.3 percent protein on dry weight basis and fetches better price compared to oyster mushroom. It is also in demand because of its suitability in preparation of pickle, soup powder, canned and dried mushrooms.

## Significance of the study

It is imperative to probe into economics of milky white mushroom production which serves as an efficient way of managing agricultural wastes in malnad and semi malnad regions of Karnataka having sumptuous supply of paddy wastes. In addition, exploring of marketing prospects of milky white mushroom is also equally important.

With this backdrop, the present study was tailored with the following specific objectives

1. To examine the profitability of milky white mushroom production.
2. To examine and identify the efficient marketing channel for milky white mushroom production.

## Methodology

### Study Area

Paddy is the predominant crop in the malnad and semi malnad regions of Karnataka. It is exclusively being used as fodder in dairy enterprise. In addition to this, paddy straw can be efficiently used as a substratum in milky white mushroom production which not only enables management of wastes but also earns substantial returns. It could be regarded as an efficient way of converting waste into wealth. To empirically assess this hypothesis, a study has been conducted in malnad and semi malnad regions of

Karnataka wherein prospective mushroom growers have utilized paddy straw for production of milky white mushroom.

**Sampling**

A sample of five milky white mushroom producers were selected following snow ball sampling. Snow ball sampling was followed since mushroom production was an uncommon enterprise in the locality. At first, a particular respondent known for milky white mushroom production in the locality was selected and from him the details of other respondents involved in the same venture was elicited.

**Methodology**

The primary data pertaining to capital investment made on the unit, material inputs used in the production of milky white mushroom like paddy straw, spawn etc., labor use pattern, yield obtained, returns realized, middlemen involved in marketing of mushroom etc., were elicited using pretested interview schedule.

**Empirical analysis**

The data were analyzed using simple ratios, averages, enterprise budgeting techniques and market efficiency measures. Enterprise budgeting is the summary of costs, returns and profit associated with the enterprise. Total costs comprises variable and fixed costs. Variable costs included expenditure on labour, inputs like paddy straw, spawn, bleaching agents, cocopeat, polythene covers etc. Fixed costs included depreciation of assets, interest on fixed capital invested on the unit and rental charges of the land utilized for mushroom production. Gross returns was arrived at by multiplying production with the prevailing price of mushroom. Net returns or profit was arrived at by subtracting total costs from the gross returns. Benefit cost ratio was estimated by taking the ratio of gross returns and total costs. Extent of wealth generated from waste was assessed by considering the cost incurred on paddy waste and net returns/gross returns earned from the production of mushroom.

Marketing efficiency was assessed using Shephard's and Acharya's approaches. Shephar''s approach was obtained by dividing retailer's price with summation of marketing costs and margins. Acharya's approach was obtained by dividing net price received by producer by summation of marketing costs and margins. The values of these measures are expected to be higher to say that market channel is efficient. In addition to these measures, price spread (Marketing costs + Marketing margins) and producer's share in consumer rupee was estimated to reflect the efficiency of marketing channel.

**Results and Discussion**

**Capital investment on the production unit**

The details pertaining to capital investment on milky white mushroom production is presented in Table 1. The capital investment mainly included investment on rearing house, bore well, wooden racks, chaff cutter, fogger system, sprayers and other miscellaneous items. The total capital investment came to Rs. 4, 39,356. The investment on rearing house at Rs. 268000 (60.99%) formed the major chunk of the total investment. Construction of rearing house in scientific manner is crucial since it decides the quality of mushroom production. The dimension of rearing house is 25' X 40' capable of housing 600 bags per month. The wooden structure made out of bamboo will serve as platform for culturing mushroom. The investment on this structure came to Rs. 47000 (10.70%). As mushrooms prefer dark and humid environment, humidifiers (fogger system) was used to maintain optimum temperature/ air humidity. The optimum temperature of 30 to $35^0$c and relative humidity of 80 to 90 percent is desirable for better growth of mycelium. The investment on this system came to Rs. 21000 (4.78%). The investment on chaff cutter came to Rs.15000 (3.41%) and it enables mushroom growers to prepare paddy straw of desired length which serves as substratum for the growth of mycelium.

**Economics of milky white mushroom production**

The details pertaining to variable costs, fixed costs and returns from milky white mushroom production is presented in Table 2. The variable costs included expenditure on spawn, labor, paddy straw, soil and coco pit as casing materials and sterilization. The fixed costs included depreciation of machineries and rearing house, interest on fixed capital and rental value of land. The total cost incurred to produce 7300 kg of mushroom per year came to Rs. 492341. The share of total variable cost and total fixed cost was 81.18 percent and 18.82 percent, respectively. The expenditure on spawn came to Rs. 175200 (35.59%). The spawn is regarded as pure culture of mycelium growth and hence it is considered as crucial input. The quality of spawn decides the output of mushroom. The cost of mushroom production could be reduced significantly by availing spawn from agencies sponsored by line departments. Though spawn is available at affordable rates but quality of spawn is the cause of concern as expressed by mushroom growers. Labor is another major cost item which came to Rs. 109500 (22.24%). Mushroom cultivation requires labor to perform various operations such as preparation of substratum (choffed paddy straw), preparing cylindrical beds with substratum and layer spawning, sterilization of straw and casing materials, maintenance of optimum temperature and humidity, harvesting and packing of produce to final market. Packing of substratum and layer spawning is considered as major labor consuming operations in mushroom cultivation. The expenditure incurred on paddy straw came to Rs. 40004 (8.13%) and is a vital input which serves as substratum for mycelial growth. The cost incurred on sterilization (Rs. 36135) of substratum and casing materials is crucial as it decides the quality of mycelial growth. Steaming at 100 °C is the prevalent practice as it is economical and it is usually performed using large capacity drums for 2-3 hours. Sterilization avoids contamination and ensures quality of mushroom. The polypropylene covers of 35 X 45 cm size are used to prepare cylindrical beds and an expenditure of Rs. 7300 had been incurred towards its purchase. Casing is considered as important stage in milky white mushroom production. Casing refers to covering of top surface of bags after completion of spawn run with sterilized coco pit and soil. The thickness of casing should be 2-3 cm. After casing, the beds are to be incubated over racks by maintaining optimum relative humidity of 80-95 percent, temperature of 24-28 °C and light intensity of 1600

to 3200 lux. The beds should be regularly sprayed with water using automated fogger system to maintain 50 to 60 percent moisture on the casing surface. Casing provides physical support, retains moisture and allows gases to escape from substratum. Pin head reaches top layer of casing after 10 days and the first harvest starts after 6 to 8 days after pin head formation. The expenditure made on casing materials came to Rs. 22500. After the first harvest, casing should be gently ruffled slightly compacted and watered frequently to obtain second and third harvest. The expenditure made on electricity came to Rs. 3400 per annum. It is essential to run irrigation pump set and to supply light for 10 to 12 hours after 10 days of casing. Disinfectants such as bleaching powder and formaldehyde are used to maintain sanitary in rearing house and an expenditure of Rs. 4250 is made towards sanitation. The depreciation of machineries and rearing house and interest on fixed capital were considered as the major fixed cost items. The cost incurred on these two items came to Rs. 33180 (6.74%) and Rs. 58860 (11.96%), respectively. The rental value of land formed the minuscule portion of total fixed cost. With regard to yield, 6935 kg of milky white mushroom was produced from 7300 cylindrical mushroom beds. The gross returns realized at Rs. 160 per kg came to Rs. 1109600 and corresponding net returns accrued to farmer was Rs. 617259. The cost incurred and profits realized per kg of mushroom worked out to Rs. 71 and Rs. 89, respectively. The returns per rupee of expenditure or BCR of 2.25 reiterated the profitability of the venture. Waste in the form of paddy straw of worth Rs. 40004 was converted into wealth through production of 6935 kg of mushroom generating wealth of Rs. 1109600 (gross returns) and Rs. 617259 (net returns). The extent of profit realized demonstrates the remunerativeness of this venture. Thus, it could be concluded that mushroom cultivation can be practiced as a subsidiary occupation thereby by-products of agricultural activity could be efficiently reused to generate assured income and employment opportunities.

**Marketing of milky white mushroom**

Milky white mushroom reaches ultimate consumer through different marketing channels. The producer sells mushroom to ultimate consumers through local retailers or retailers located in distant places. Thus, the existing marketing channels are Producer to local retailers to consumers (MC-I) and Producer to retailers located in distant place to consumers (MC-II). The later marketing channel was considered as predominant channel since demand for the produce arises in far off places rather than in production hub. The per kg retail price of mushroom was Rs.200. Intermediaries such as producer and retailers incurred marketing cost towards packing, transportation, refrigeration, packing materials, labor and rental value. The marketing cost incurred in case of MC-I and MC-II came to Rs. 13.30 and Rs. 18 per kg, respectively (Table 3). The net price received by producer in case of MC-I and MC-II came to Rs. 155 and Rs. 150.15 per kg. The efficiency of marketing channel is reflected in terms of price spread and producer share in consumer rupee. The price spread was lower in case of MC-I (45) as against MC-II (49.85) and similar trend was observed in case of producer share in consumer rupee. The producer share in consumer rupee was 77.50 percent in case of MC-I indicating that producer gets 77.50 percent of what consumer pays. Acharya's and Shephard's approach were also performed to assess marketing efficiency. Higher the index value efficient is the marketing channel. The higher index was observed in case MC-I compared to MC-II. Thus, MC-I could be regarded as efficient marketing channel. Though, MC-I is efficient but it lacks market penetration hence, producer should have to exercise suitable marketing strategies to position and penetrate product in local market for exploration of better profits (Basanta *et al.*, 2012) [1].

**Conclusion**

Milky white mushroom production was found to be an economically efficient way of converting paddy wastes into wealth since every rupee of expenditure incurred on its production yielded gross returns of Rs. 2.25. Paddy waste of worth Rs. 40004 was converted into wealth of Rs. 1109600 and Rs. 617259 in terms of gross and net returns, respectively. Enterprise has generated employment of 365 mandays to rural labour folk.

**Policy Implications**

Considering the profitability and employment generation potential of the enterprise, prospective entrepreneurs should be encouraged through provision of production related subsidies for availing technical inputs, construction of production unit and arranging for organized marketing and value addition. Capacity building programme may be tailored to attract more of rural jobless youth towards this enterprise enabling to contain their migration from agriculture.

**Table 1:** Capital investment on milky white mushroom

| Particulars | QTY | Rate (Rs.) | Amount (Rs.) |
|---|---|---|---|
| Rearing unit (25'X40') | | | 2,68,000 (60.99) |
| 1hp motor | | | 4,328 (0.98) |
| Chaff cutter | 1 | 15000 | 15,000 (3.41) |
| Controlled fogger system | | | 21,000 (4.78) |
| Sprayer | | | 2,500 (0.57) |
| Wooden racks for incubating cylindrical beds | | | 47,000 (10.70) |
| Shade net to dry sterilized straw | 1 | 4000 | 4,000 (0.91) |
| Bore well | 1 | 63548 | 63,548 (14.46) |
| Syntax | 1 | 10380 | 10,380 (2.36) |
| Drums | 3 | 1200 | 3,600 (0.82) |
| Total | | | 4,39,356 |

**Note:** Figure in the parenthesis indicate percentage to the total capital investment

**Table 2:** Economics of Milky white mushroom production, (Rs.)

| I. Variable costs | | | |
|---|---|---|---|
| **Particulars** | **Quantity** | **Rate** | **Amount (Rs.)** |
| Paddy straw (Kg) | 7,300.00 | 5.48 /Kg | 40,004.00 (8.13) |
| Spawn (Kg) | 1,460.00 | 120 /Kg | 1,75,200.00 (35.59) |
| Labour (Man days) | 365.00 | 300 /man day | 1,09,500.00 (22.24) |
| Plastic covers to prepare cylindrical beds | 7300.00 | 1/ packet | 7300.00 (1.48) |
| Soil as casing material | | | 7,500.00 (1.52) |
| Coco pit as casing material (tons) | 6.00 | 2500/ ton | 15,000.00 (3.04) |
| Sterilization cost | | | 36,135.00 (7.34) |
| Electricity charges | | | 3400.00 (0.69) |
| Disinfectants (Bleaching powder and formaldehyde) | | | 4250.00 (0.86) |
| Thread balls | | | 1387.00 (0.28) |
| Total variable cost | | | 3,99,676.00 (81.18) |
| **II. Fixed costs** | | | |
| Depreciation | | | 33,180.00 (6.74) |
| Interest on fixed capital | | | 58,860.00 (11.96) |
| Rental value of land | | | 625.00 (0.13) |
| Total fixed cost | | | 92,665.00 (18.82) |
| Total cost | | | 4,92,341.00 |
| Gross returns | 6935 Kg | 160/kg | 11,09,600.00 |
| Net returns | | | 6,17,259.00 |
| Cost per kg | | | 71.00 |
| Net returns per kg | | | 89.00 |
| Benefit cost ratio | | | 2.25 |

**Note:** Figure in the parenthesis indicate percentage to the total cost

**Table 3:** Marketing costs, margins, price spread and marketing efficiency

| **Particulars** | **MC-I, P-$R_1$-C** | **MC-II, P-$R_2$-C** |
|---|---|---|
| Retailer's price | 200.00 | 200 |
| Total marketing costs | 13.30 | 18 |
| Total marketing margins | 31.70 | 31.85 |
| Producer's price/Net price received by producer | 155.00 | 150.15 |
| Price spread | 45.00 | 49.85 |
| Shephard's approach | 4.44 | 4.01 |
| Acharya's approach | 3.44 | 3.01 |
| Producer share in consumer rupee (%) | 77.50 | 75.08 |

P-Producer, $R_1$-Local retailer, $R_2$-Retailer in the distant places, C-Consumers

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