# Mushroom Production: A Synthesis of Socio-economic and Economic Aspects of Review Studies

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***Abstract—*** *A review of literature on socio-economic, economic and marketing aspects of mushroom production are crucial in research because they directly impact the livelihood of farmers, contribute to the rural development by creating employment opportunities, influence market demand and price stability and ultimately determine the overall profitability and sustainability, especially for small scale producers in developing region. Literature review on socio-economic profile of mushroom production reveals that it has significant potential to improve livelihoods, particularly for marginalized communities, by providing a reliable income source, utilizing readily available agricultural waste, and offering a relatively low-cost entry point for small-scale farming, thereby contributing to enhanced nutritional security and promoting sustainable agricultural practices through its ability to generate income while simultaneously recycling waste materials; however, successful implementation requires access to proper training, market linkages, and awareness campaigns to maximize its socio-economic impact. Secondly, a review of the economic aspects of mushroom production reveals that it presents a promising opportunity for income generation, particularly for small-scale farmers, due to its high yield per unit area, ability to utilize agricultural waste as a substrate, and relatively low production costs; however, challenges like market volatility, technical requirements, and limited access to quality spawn can hinder its full economic potential, requiring targeted support and infrastructure development to maximize its benefits for rural communities and economies. Lastly but not the least, the identification of marketing channels, costs, and price spreads in mushroom production literature reveals that direct-to-consumer channels offer the highest marketing efficiency and producer share, while channels with intermediaries like wholesalers and retailers lead to higher costs and lower efficiency. This means that while direct sales provide higher profits for the grower and potentially lower prices for the consumer, they also limit market reach compared to the broader access offered by intermediaries.*

### *Highlights*

a) Literature review on Socio-economic Status of different mushroom growers.
b) Literature review on economics of different types of mushrooms.
**c)** Literature review on various marketing channels, marketing costs and margins.

***Keywords— mushroom production, socio-economic, age, education, income, profit, economics, costs and return, variable cost, fixed cost, marketing channels, price spread, , wholesaler, retailer, producer share, marketing efficiency.***

## I. INTRODUCTION

By reviewing previous research, one can gain a deep understanding of what is already known about your topic, providing a starting point for one's own investigation. Analyzing existing literature helps in pinpoint areas where knowledge is lacking, allowing one to focus in his research on addressing these gaps and contributing new insights. Reviewing previous studies ensures you are not repeating research that has already been done, saving time and resources. By understanding the current state of knowledge, you can develop focus and relevant research questions that build upon existing research. Studying previous research can guide your choice of research methods, data collection techniques, and analysis strategies. A literature review can help you identify relevant theories and concepts that can guide your research and interpretation of results. A well-conducted literature review shows that you are familiar with the existing body of knowledge in your field. By comparing your results to previous research, you can effectively interpret and discuss the implications of your study.

In this backdrop, the brief resume of relevant research work by various scholars on various aspects of mushroom cultivation in India and abroad has been evident as in the ever proliferating literature. In these contexts, a vast range of literature review has been studied by consulting various books, journals and internet sites for the topic of research on production and marketing of mushroom cultivation in Kangra valley of Himachal Pradesh and the same has been categorized into following main headings:

1) Literature review on Socio-economic Status of different mushroom growers
2) Literature review on economics of different types of mushrooms
3) Literature review on various marketing channels, marketing costs and margin

## II. LITERATURE REVIEW

### 2.1 Socio-economic Status of different mushroom growers:

Single and Goel (2016) investigated 25 women producer of mushroom to analyze the socio-economic situations and challenges experienced by them in Patiala district of Punjab. According to the research, 72 per cent of mushroom growers have improved their occupation with improvements in social status (24%), knowledge and attitude (52%), saving more money (60%), and standard of living (64%). The women faced the maximum limitation with regard to value-added products, lack of information regarding mushroom growing and higher cost of cultivation.

Shirur et al. (2017) studied the impact of the identified variables on the entrepreneurial behaviour of the Karnataka farmers. Four extension variables, six socio-psychological trait features, and five characteristics of farmers and their units were examined to see how they affected the respondents' entrepreneurial activity. Regression analysis model was used in the study. The results of the regression analysis revealed that the respondents' entrepreneurial activity was substantially influenced by their academic background, cosmopolitanism, self-reliance, engagement in mass media, extension activity, and training.

Bashir et al. (2018) analyzed that over 33 types of mushrooms are cultivated commercially around the globe, with three of them being widely grown in India: white button, oyster, and paddy straw mushrooms. White button mushrooms account for 90–92 per cent of India's total mushroom production; the remaining portion is supplied by paddy straw mushrooms and oyster mushrooms. The study was organized in three districts of Kashmir and it was found that 90 per cent of women in the district of Anantnag and 1 per cent of women in Kulgam and Pulwama felt that the increased money from mushroom farming had improved their level of living. The majority of women in the districts of Anantnag, Kulgam, and Pulwama have achieved financial independence as a result of mushroom farming. 99.00 per cent of women in district Pulwama and 100.00 per cent of women in districts Anantnag and Kulgam were able to fully support their family and were able to give their children a healthy diet and a good education because of improved revenue from mushroom cultivation.

Boin and Nunes (2018) conducted a study in Portugal where data was collected on basis of the rate of consumption, consumption by form (fresh, canned, frozen and dried) and consumption by species (five farmed and four wild mushrooms). Regression model was used to determine the results. The results indicated that there was a higher (81.9%) consumption of canned than fresh and dried/frozen mushrooms. The characteristics that had the greatest impact on consumption were gender, degree of education, and size of the household.

Shipra et al. (2018) conducted a study on 75 rural women of Samastipur district of Bihar to investigate the effects of mushroom farming on rural women's economic position through skill development. The results of the study indicate that as a result of training, rural farm women's knowledge of all the subcomponents of mushroom production had improved which empowered women to raise the standard of life for themselves and their families. It was concluded from the study that the development of entrepreneurship was the best option for rural farm women to achieve economic independence.

Koirala (2019) studied how beneficiaries' socioeconomic circumstances were affected by the growing of mushrooms and explained the respondents' socio-demographic traits. The study was conducted on 50 households of Padampur. It was found that 38 per cent of the 50 households were found to be in the age group of 40–50. The results of the field survey indicated that 46 per cent of the respondents had only completed elementary school but now data interpretation reveals that 46 per cent of households send their kids to private schools in order to provide them with a quality education. With reference to social structure of the mushroom growers, 32 per centwere janjati, 4per cent are dalit, and 20 per cent are brahaman and kshetri. The results revealed that 90 per cent grow oyster mushrooms while 4 per cent row both oyster and white button mushroom since they were quick to produce and profitable. Eighty per cent of the fifty households agreed that they were receiving better medical care than they had in the past. The study concluded that those engaged in mushroom cultivation had greater social and financial status than they had previously.

Kala and Hans (2020) conducted a study in Samastipur district of Bihar where 60 respondents in all, or fifteen from each of the listed villages, were chosen for the "Impact assessment on socioeconomic profile of women mushroom growers". The study revealed that 56.67 per cent of the respondents were fewer than 35, 91.67 per cent were married, 65per cent belonged to the lower social classes, and 71.66 per cent had a combined family. Most respondents (60%) reported that their family's annual income ranged from Rs. 50,000 to Rs. 80,000.

Pandey et al. (2020) conducted the study on the substrate of the mushroom. The study examined how commercial mushrooms are supplied with bio-waste, including wood chips, straw, and sawdust. Spent mushroom substrate (SMS) was regarded as a waste product. The study concluded that encouraging research and development was necessary to provide significant advancements that enable the efficient utilisation of mushroom bio-resources.

Koodagi et al. (2021) studied that ICAR KVK, Mandya conducted mushroom-related skill-development workshop with the aim of fostering employment and microenterprise. The study found that the trainees varied in their socioeconomic status. The study's findings showed that participants' pre- and post-training understanding of mushroom production technology ranged from 2.12 to 34.62 per cent and 42.04 to 85.87 percent, respectively and the percentage change in knowledge ranged from 26.14 to 74.91 per cent. The study concluded that right training and direction will enable interested producers to survive and make a living.

Sharma et al. (2021) in his study considered 60 mushroom growers that were chosen through a simple random sampling method.The mushroom producers were categorized into three groups according to the quantity of bags they produced: Small Group (600 or less), Medium Group (601–1200), and Large Group (more than 1200).The literacy rate of all houses showed 2.69, and 88.25 per cent of their members were literate as a whole.The acquired results revealed that mushroom yielded the highest value share of overall farm income (43.44 %) in the medium and large categories (72.18%), respectively. It is evident from the conducted studies that mushroom was the most contributing crop among the all other farm crops accounting for 49.42 per cent of the total amount.

Ashiegbu et al. (2022) studied the involvement of young people from rural areas at the Agricultural Zone of Umuahia in Nigeria in the activity of cultivating mushrooms. There was provision of 60 young people from the Umuahia Agricultural Zone to undertake a training program on mushroom production technology. The finding of this study shows that 58.3per cent of the respondents were male, 65.0 per cent had education beyond secondary level while 63.3 per cent had worked in mushroom sector for a period of one year or longer. It is therefore argued that education level, family size, years of experience and income of the respondents had significant influence level of mushroom production technology in the study area this is based on the regression analysis model that was used to analyze the data. Despite all the studied reasons for the lack of young people's involvement in mushroom farming, the government should promote younger generations to engage in mushroom production using technologies information that they could understand and apply effectively.

Kumari and Mazhar (2023) conducted a study in Dhanbad district of Jharkand to assess the adoption level of knowledge towards mushroom cultivation. The study was done on 120 growers and the respondents' knowledge of mushroom growers was divided into three categories: low, medium, and high. The results revealed that 19.17per cent 59.17 per cent and 21.66 per cent were having low, Medium and high level of knowledge respectively whereas the majority (52.20%) belonged to the medium level adoption group, whereas 29.17 per cent had a high level of adoption group for mushroom farming, while the remaining 18.33per cent of the respondents were observed in the low level of adoption group. It was found that the socioeconomic standing of mushroom farmers has significantly improved as a result of the various entrepreneurial skills that have been developed through mushroom cultivation.

To sum up, A socio-economic profile of review of mushroom production reveals that it has significant potential to improve livelihoods, particularly for marginalized communities, by providing a reliable income source, utilizing readily available agricultural waste, and offering a relatively low-cost entry point for small-scale farming, thereby contributing to enhanced nutritional security and promoting sustainable agricultural practices through its ability to generate income while simultaneously recycling waste materials; however, successful implementation requires access to proper training, market linkages, and awareness campaigns to maximize its socio-economic impact.

### 2.2 Economics of different types of mushrooms:

Chrishti et al. (2000) investigated the financial position of mushroom producers in the Rawalpindi and Islamabad region of Pakistan. The findings indicated that there were statistically significant differences in the variable costs between small and medium farms as well as between small and large farms.The larger farm holding which comprised of medium and large, had the powers to lower cost by bargaining on the purchase of bulk and by reinvesting money which could have been otherwise

used on handling and shipping. Net profits per unit area of large farm (3000 sq. ft.) were higher than small farms. The study suggested that mushroom farming cannot be carried out successfully as a viable business unless the private sector builds large farms instead of small ones.

Thakare et al. (2006) carried out a study on sixty-four growers who were chosen from three districts in the plain of Chhatisgarh: Raipur, Durg, and Bilaspur. The results indicated that the proportion of fixed costs to overall production costs was relatively low (33.58%), with variable costs accounting for 66.42 per cent of the total and the net return per kilogramme was, on average, Rs. 24.04. Large farms were found to have the highest input-output ratio, indicating that they benefit more than other growers. Lack of spawn and other acceptable mushroom species, as well as lower productivity resulting from a lack of technical know-how, were reported to be the main obstacles to mushroom cultivation.

Ram and Ram (2007) carried out the study in the Gurgaon and Sonepat District of Haryana in order to calculate the cost-benefit ratio of mushroom farming. The study found that the fixed capital investment was more than double when comparing large and medium farms to small farms. The study also revealed that the compost usage and the farm size had positive relationship. Large farmers produced mushrooms at the lowest cost when compared to small and medium farmers because they made the best use of their fixed farm resources. The study suggested that mushroom farming requires a lot of capital and grows as farms get bigger in size.

Ahmed and Rahman (2008) carried out their research in Bangladesh and reported that 49.8 per cent of the population lives below poverty line. He found that increased population, reduced income are some of the causes of poverty which can be reclaimed through mushroom cultivation. By taking this enterprise, the average net profit calculated was tk. 29300.00 which was more than the rice and wheat cultivation. He concluded that farmers have cultivated mushrooms on a modest scale and reaped direct benefits in various parts of Bangladesh. They've succeeded in adopting the technology in a more straightforward manner that allows them to make small-scale investments. They were mostly using agricultural waste, primarily straw from paddy fields and wheat fields.

Celik and Peker (2009) examined the advantages, disadvantages, and SWOT of mushroom growing as a means of diversifying rural income in a study carried out in Konya. The average production area was 1135.1m2 and the average yearly income was 45.4kg/m2 and compost output was 256.6kg/ton. The study showed that the average cost of 1 kg mushroom was USD 1.36 and average sales price was 1.54.The study came to the conclusion that boosting mushroom production was crucial to maintaining the health and growth of the rural economy, expanding and diversifying business and employment opportunities in rural areas, and supplying small family farms and underprivileged groups with income opportunities.

Barmon et al. (2012) determined mushroom profit, BCR and household income as a benefit while developing some problems associated with mushroom production in Bangladesh. The results would show that as average production cost of a mushroom per farm were Taka 41,948 and the revenue were Taka 64,826. The mean BCR per mushroom unit was approximately 1.55. It was being analyzed that marketing costs and profit margins are fairly higher than the ones that it would be in case of any other agricultural product. Following the study there were coupled by a wide range of production related problems that the producers faced which include high cost of the spawn, infestation of the fly and cockroaches as well as the high-temperature marketing, technical and awareness challenges.

Karma and Bhatt (2013) conducted a study on *Ganodermalucidum* species of mushroom to create an organic farming method using polypropylene bags in a subtropical environment. The study showed that the spawn run took 51 days to complete and after that spawn sacks were exposed to 90–95 per cent relative humidity and 30°C. It took 67 days to complete the vegetative phase and 92 days to finish the fruiting phase. The crop was planted for a total of 224 days, with a 65-day interval between each flush. The results indicated the total yield which was 570gm and no pest attack was seen during cultivation. The study recommended growing *Ganodermalucidum* species under subtropical climate.

Tahir and Hassan (2013) conducted a study on the profitability of button mushroom production on a small scale at the National Agricultural Research Centre in Islamabad, Pakistan in 2010. For this analysis, cost of production methodology was applied. Estimates for the mushroom output and gross returns were 155.6 kg $ha^{-1}$ and Rs 77,800 $ha^{-1}$, respectively. The findings showed that mushroom production is highly profitable for its growers since it may maximise net return by lowering production costs because the crop's growth depends on inexpensive agricultural raw materials.

Kangotra and Chauhan (2014) revealed in their research that the majority of the sampled mushroom farmers, who were largely middle-aged and typically between the ages of 40 to 60, had 6-7 years of experience, with the rest 5 years of experience. The results of the financial test ratios indicated that growing mushrooms on big scales was more economically feasible and profitable due to larger investment and improved marketing connections with suppliers, which guaranteed a sufficient and

consistent supply of produce. The major limitation reported were scarcity of spawned compost bags, poor quality spawned compost material, absence of remunerative prices, and the prevalence of diseases. The study proposed growing at least two crops annually with timely delivery of high quality spawned compost bags at reasonable prices to their doorsteps so as to increase the output.

Thakur (2014) studied the characteristics of the mushroom and analysed that enzymes secreted by mushroom mycelia degrade substances including cellulose and lignin, which were subsequently taken up by the hyphae. The study indicated that India and several other developing nations have a lot of potential for mushroom production because the necessary raw materials were readily available at low cost. Mushroom cultivation function as a vehicle for creating jobs, especially for young people and women from remote areas to improve their social standing. Tropical mushrooms, such as oyster (Pleurotus spp.), paddy straw (Volvariellavolvacea), and milky mushroom (Calocybeindica), were produced using agricultural wastes as they were readily available in the area, such as paddy straw, wheat, soybean, chickpea, mustard, lathyrus, cotton wastes, and lignocellulosic wastes. An estimated 15–20,000 metric tonnes of oyster mushrooms were produced in India. However, only about 10,000 tonnes of milky mushrooms and paddy straw were produced each year. It was found from the study that on a small to medium scale, oyster mushroom farming was mostly carried out by the women in self-help groups which was a significant source of revenue for them.

Sharma et al. (2016) conducted an investigation in Himachal Pradesh district of Mandi where it was found that 80 per cent of the mushroom growers grow button mushroom only. The results showed that for every 100 bags, the fixed cost of production ranged from 44.47 per cent to 22.42 per cent on small farms to large farms respectively whereas on large farms, the variable cost ranged from 77.58 per cent to 55.53 per cent on small farms. The BC ratio calculated was 1.87:1. It was estimated that both small and large farmers had different break-even outputs, ranging from 279 kg to 147 kg. The study concluded that mushroom growers faced many problems but production problems were more severe than other problems.

Singh and Singh (2018) did a study in Amritsar and Gurdaspur district of Punjab to determine the cost and return structure of white button mushroom by taking 80 samples. The study revealed that with increase in the farm size of mushroom the recurring and non-recurring expenditures per square metre of bed area spawned declined due to economics of scale. The mushroom farms were categorized on the basis of input-output ratio in which large farms (1.81) were more productive followed by medium-sized (1.47) and small-sized (1.35) mushroom farms. The results indicated that due to the greater average price realization, medium-sized mushroom farms had better gross returns, but large mushroom farms had higher net returns because of reduced costs. The study recommended farmer's training for canning and refrigerated facilities, mechanised compost preparation plants, and mushroom growing shed disinfection.

Raut (2019) did a study in Nepal to examine the current situation and various problems faced by mushroom growers. He pointed out that lack of improved technology, poor quality of the raw material, pest and disease attack, insufficient investments, lack of well organised marketing channels and high prices of the raw material are some of the main problems which the mushroom grower faces. The study also showed the increasing trend of output of mushroom cultivation which was only 30 kg in 1974 which has reached 9300 tonnes in 2016.

Acharya and Tiwari (2021) noted the current state of mushroom cultivation and related businesses in the land areas of Kalika Municipality and Bharatpur Metropolitan City. Different analytical tool were used to analyze the data. The study found that Spawn costs the highest percentage of investment, followed by straw cost and depreciation of equipment. The average production of oyster mushrooms in the Chitwan district was determined to be 4,307.71 kg per Kattha. The oyster mushrooms yielded a gross return of Rs. 808,966.61, with a total cost of production of Rs. 318,089.61. In the Chitwan district, mushroom cultivation was regarded as a lucrative agricultural endeavour with a BC ratio of 2.54. It was discovered that the majority of farmers sell their mushrooms to neighbourhood whole vendors and collectors. According to the survey, farmers don't employ any value adding strategies that would increase their profit.

Bringye et al. (2021) conducted its research to investigate the various aspects of mushroom-related consumer behaviour in Hungary. Total 1768 samples were collected and groups of connecting variables describing mushroom consumption were found using exploratory factor analysis. Four aspects of Hungarian customer behaviour were discovered by the authors: (1) medicinal and functional qualities; (2) enjoyment-based consumption; (3) additional food source; and (4) unfavourable evaluation of the product line. Three categories of consumers were distinguished through the use of cluster analysis: typical consumers, indifferent consumers, and health-conscious consumers. The result of the study showed that the socio-demographic attributes of consumers, such as age, educational attainment, marital status, and place of residence, have a noteworthy influence on their consumption behaviour of mushrooms.

Radhakrishnan et al. (2021) conducted the study in the krishi Vighan Kendra laboratory, Wayanand and gathered the information from the farmers who participated in the mushroom cultivation training course. The study revealed how mushroom experiment were conducted as front line demonstrations and on farm testing. *Pleurotuscystidiosus* species of mushroom was preferred after conducting experimental trials because of its higher yield and less day's requirement for bud initiation. The result of the study showed that banana pseudostem waste was considered as a suitable substratum for mushroom cultivation in the study area, and unorganized market structure was the biggest challenge that the farmers faced.

Mulazimogullari and Ceylan (2023) conducted a study in Turkey where the production reported was 55455 tonnes in 2020. The average producer profit per unit was estimated to be Rs24.98, whereas the average profit inefficiency was identified as 44 per cent. The stochastic profit frontier method was used to estimate the inefficiency score. The results highlights the factors which reduces the profit inefficiency which include producer's gender, degree of education, and level of contentment whereas factors contributing to inefficiency were identified as the farmer's age, the usage of composted manure in the garden, and the sale of mushrooms through middlemen.

Saikia and Bora (2023) in their study revealed that mushrooms provide significant nutritional and functional worth, medicinal attributes, nutraceutical significance, and organoleptic potential. The study mainly focused on various challenges faced by mushroom growers in Jorhat district of Assam. The snowball sampling approach was used to choose 60 samples. Nineteen problem statements were formulated to investigate the issues encountered by the participants in the cultivation of mushrooms. Respondents were classified as having a low, medium, or high level of problem based on the mean scores from the respondents and the standard deviation. The results showed that around 60.00 per cent of the participants experienced medium level of problem.

In brief, A review of the economic aspects of mushroom production reveals that it presents a promising opportunity for income generation, particularly for small-scale farmers, due to its high yield per unit area, ability to utilize agricultural waste as a substrate, and relatively low production costs; however, challenges like market volatility, technical requirements, and limited access to quality spawn can hinder its full economic potential, requiring targeted support and infrastructure development to maximize its benefits for rural communities and economies.

### 2.3 Review of literature on various marketing channels, marketing costs and margins:

Carrera et al. (2005) conducted a study to investigate the distribution networks of wild and farmed mushrooms in central Mexico between 1999 and 2004 using an institutional approach. It was found that the majority of cultivated and wild mushrooms were sold in that area. Three representative locations were chosen for the study: a rural village (Cuetzalan), two medium-sized cities (Puebla, Toluca), and a big city (Mexico). There were several marketing channels discovered and detailed, including public markets, retail food stores, wholesalers, retailers, middlemen, "tianguis," and food services. It was analyzed that the current method for marketing mushrooms developed from a modest, centralised operation to a mix of decentralised and centralised marketing procedures with a restricted number of activities. Large private companies assumed control of a number of marketing responsibilities during this wave of reforms, assisting the decentralisation process while impeding the growth of new businesses specialising in the marketing and processing of mushrooms. It was concluded from the study that Changes resulted in the market concentration of open-market sales in sizable private companies and useful wholesalers at the same time.

Zamil and Cadilhon (2009) carried out a study under the FAO portion of the UNDP-funded Local Partnerships for Urban Poverty Alleviation Project in Bangladesh. The project connects the underprivileged urban residents of Mymensingh city with the oyster mushroom specialty market. This small business endeavour seemed to be sustainable since it increased agricultural production to meet a particular need of an already-existing small marketing business. The merchant had incentive to work with the project beneficiaries who supplied the produce as long as he found market for his mushroom. This model demonstrated how a development project's catalytic effect could benefit both a merchant and incredibly tiny landholders.

Ganie and Yousuf (2010) revealed that India produced 1, 00,000 MT of mushrooms in 2006–07, which rises from 5,000 Mt in 1990. Study was conducted in Jammu and Kashmir where the mushroom cultivation was of recent origin so the majority of producers were concerned about large-scale production in such a young industry, with issues such as inadequate infrastructure, uninformed consumers, lack of technical support and required institutional support. Growers often sell the majority of their produce directly to consumers (40.37%) or to retailers (47.19%). The results analyzed that the entire cost of marketing, including profit margins, ranged from 2.50 to 10.65 rupees per kg in three most popular channels and producer's share was maximum in channel where mushroom grower sells directly to consumer. It was observed that net margins were also correlated with the expenses incurred during the marketing process.

Adinya et al. (2012) in their study in three villages in Central Cross River State, Nigeria analyzed that women and children controlled the edible mushroom market, with monthly profit margins being N60,000.00, N56,000.00, and N52,000.00 for Alesi, Ekukunela, and Ochon marketplaces per year. Regression analysis examined that the transportation had the most effect on sellers' profits. Therefore the study suggested that growers should establish a cooperative called Mushroom Grower and Marketing in order to apply for bank loans who offers less interest rate and government should implement Action-research programmes through export processing zones or cooperatives. The study concluded by recommending that significant effort be put into making market to perfect market.

Banga et al. (2013) studied that promotional materials were not being used by any of the mushroom farmers in Punjab to market their products. The finding clearly indicated that produce of every mushroom farmer was being sold packaged, but without a brand name. The study also highlights the main issues that mushroom growers deal with which were the product's high perishability and lack of popularity, low demand brought on by high costs, the absence of nearby processing facilities, and insufficient farm-to-market transportation.

Mohd et al. (2013) carried out a study in Malaysia to examine the problems and difficulties faced by growers that could slow down its development. Focus group discussions were conducted to learn about participants' perceptions, expectations, and experiences with fresh mushroom cultivation and commercialization in Malaysia. The result of the study showed that government policies, marketing, and production were the three primary areas of concern for this industry. The problems with production included controlling the hot water, getting low-quality seeds, and raising production costs. Demand exceeded supply as oyster mushroom growers could not meet the increased demand which conversely leads to increase in the prices in the Klang valley area. The study recommended some government initiatives in the form of training, subsidies for the production house, and research and development on the production system to address environmental issues.

Singh (2014) carried out a study by selecting equal number of wholesalers and retailers from Amritsar and Gurdaspur district of Punjab to ascertain the marketing structure of mushroom. Cumulative cube root frequency technique was used to divide the mushroom growers into different categories. Marketed surplus was about 99 per cent. The marketing pattern showed that the producer-consumer channel had the greatest net price paid to growers, although the marketing agency that handled the majority of the produced goods was the wholesaler. The study focused on the necessity of refrigeration and canning facilities for mushroom growers in the event of increased production to prevent distressed sales and raising public awareness of the nutritional value of mushrooms to promote their use.

Sabyasachi (2016) highlights the importance of mushroom cultivation as it doesn’t require access to land making it attractive activity for both rural farmers and pre-urban dwellers for sustainable development in North Bengal. The present study focused on analyzing the market potential for mushroom producers by taking into account the factors that affect consumer awareness and competitiveness. SWOT analysis and hypothesis testing was done to generate the information and for mathematical reasoning respectively. The study recommended that the government must provide much-needed financial and technical support on a high priority basis.

Shirur and Shivalingegowda (2016) conducted a research on consumer behavior among people. The study examined the degree of fluctuation in the average selling price across all mushroom kinds, ranging from Rs. 27 to Rs. 40, when sold to consumers, merchants, and wholesalers. No skilled workers, processing facilities, and the high rate of perishability were the main drivers of the surge in prices. The study revealed that the majority of consumers preferred button mushroom even though they have similar nutritional and therapeutic qualities to other mushroom because they were inexpensive to grow.

Singh et al. (2016) indicated that in the study area, Jammu province four marketing channels were used by the mushroom growers. The study showed that marketing efficiency was highest in case of fourth channel (mushroom grower- consumer) followed by third channel (mushroom grower- wholesaler – consumer), second channel (mushroom grower – retailer-consumer) and first channel (mushroom grower –wholesaler –retailer-consumer) with the estimated figures of 1.75, 1.25, 1.16 and 1.06 respectively. It was concluded that with enough infrastructure and supportive government policies, marketing could have been done more effectively.

Shirur and Chandregowde (2017) analyzed the constraints in mushroom entrepreneurship in the Karnataka state. 60 mushroom growers were selected and SWOT analysis was done. It was concluded from the case study and SWOT analysis that mushroom entrepreneurs require unique characteristics of entrepreneurial activity and for the success in mushroom entrepreneurship it requires the understanding of the nuances of mushroom biology, calculating profitability based on scale of economy, coming up with creative packaging and marketing ideas, figuring out ways to cut down on energy costs for temperature modulation during cropping, and being personally involved in the business.

Chattopadhyay and John (2019) highlighted the importance of mushrooms that mushrooms were nutrient-dense food that can be used in place of dairy, eggs, meat, etc despite being coming from lingo-cellulosic waste. The study analyzed that 280 of the approximately 2000 edible mushroom species were grown in India and Guchhi, the most significant mushroom, was supplied to western nations. The report showed that mushrooms were not used extensively in India even though they have a high nutritional value because of lack of awareness among people and insufficient marketing.

Sachan et al. (2019) analyzed the breakeven point, various costs and their returns, marketing system and Marketing efficiency in Haryana. The study observed that the fixed cost and its investment was twice for large and medium-sized farms when compared to small farms due to absence of availability of money to mushroom growers. The size of the farm was closely correlated with the cost of spawn and compost. The largest producer share in the consumer price was found in Channel I (consumer – mushroom grower) whereas most produce went through channel IV Mushroom Grower-Wholesaler-Retailer-Consumer). The study suggested upgrading the infrastructure to extend the crop's shelf-life.

*Lidyana et al. (2021) carried out a study in Probolinggo where the census approach was used to* pick oyster mushroom farmers. The study finding's indicated that Probolinggo oyster mushroom growers employed logs as a tool, which generated them high revenue. Oyster mushrooms use two distinct patterns in their marketing channel and second pattern (mushroom farmer-reseller- consumer) was considered more profitable than first pattern (mushroom farmers- resellers-retailers- consumers).

Dey et al. (2022) conducted a study in Dehradun district of Uttrakhand which is the second largest producer of mushroom after Punjab. In his study he observed that the channel I (producer- consumer )showed the greatest levels of marketing efficiency (36.70%) and producer share (97.28%) in consumer rupee followed by channel II (producer-retailer-consumer) and channel III (producer-wholesaler-retailer-consumer).Channel III had the highest marketing cost, marketing margin, and price spread, followed by Channel II, I.

Farooz et al. (2022) examined the particular issues and constraints that the Hardoi District of Uttar Pradesh experienced when marketing mushrooms. He pointed out that the absence of marketing structure prevents farmers from receiving a fair price and were often obliged to sell their goods at an unprofitable minimum market price after reaching crop thresholds and in need of cash.The study underlined the need for fair and appropriate mushroom marketing mechanism in the district to engage in profitable transactions. Marketing through cooperative and farmer-producer organisations needs to be promoted in order to raise the share of producers in the consumer rupee and simultaneously efforts need to be made to improve the quantity and quality terms in order to increase export of mushrooms.

Sikander et al. (2022) curtained that recycling agricultural waste, including agro-industrial waste, is one of the main ways to help achieve the goals of resource conservation and higher productivity. Multi stage random sampling technique was used to select the mushroom growers in Patiala. Button mushroom cultivators were divided into three size groups based on the quantity of bags they produce: small (<4000 bags), medium (4000-6000 bags) and large (>6000 bags). The result of the study showed that out of the three marketing channels, Channel I: Producer-Consumer Channel II: Producer-Retailers-Consumer Channel III: Producer-Wholesaler Retailer-Consumer the total marketing cost was same in channel II and III i.e. Rs.15/kg, marketing margin and price spread was maximum in channel III i.e. Rs.32/kg and Rs.42/kg respectively whereas the producer share in consumer rupee was maximum in channel I i.e. 88.75 per cent.

Andrew (2023) conducted a study in Kenya whereby the purpose was to measure the effect of farmers' marketing strategies. The results showed that 43.3 per cent of the farmers gave their goods to hotels and restaurants, while 56.7 per cent of them sold mushrooms in rural open markets. In addition, 53.3 per cent of farmers sold directly to customers, while 46.7 per cent relied on suppliers for distribution. 3.3 per cent of the packaging was done in bottles, compared to 96.7 per cent that used polythene bags. The study concluded that existing marketing strategies had a limited impact on the performance of Oyster mushroom cultivation and suggested creating cooperatives for mushrooms, cold storage facilities, creating incentive programmes, and providing extensive training.

Kumar et al. (2023) studied the marketing cost, marketing margin, price spread, marketing efficiency and marketing channels of oyster mushroom in the Kaithar district in Bihar. 120 mushroom growers were selected randomly and were grouped into three categories large, medium and small on the basis of their production and the mushroom yield for small, medium, and large farms was 0–50 kg, 50–100 kg, and 100 kg and above respectively. The two marketing channels, channel I. producer-consumer, channel II. producer-retailer-consumer were used in the study area with greater marketing efficiency in channel I (36.7%) compared to channel II (17.23%) and greater marketing cost per kg of mushroom in channel II (Rs 4.54/kg) compared to channel I (Rs 3.25/kg).

In short, the identification of marketing channels, costs, and price spreads in mushroom production literature reveals that direct-to-consumer channels offer the highest marketing efficiency and producer share, while channels with intermediaries like wholesalers and retailers lead to higher costs and lower efficiency. This means that while direct sales provide higher profits for the grower and potentially lower prices for the consumer, they also limit market reach compared to the broader access offered by intermediaries.

## III. CONCLUSION

It is evident from the above reviewed studies that most of the studies on mushroom production and marketing pertained to its cost in different parts of the country with few exception across the globe, but no study were found during the recent two decades pertaining to the different components of costs that are involved in the mushroom production and its marketing. Additionally, no study was conducted on mushroom production and its economics and marketing recently in Kangra district of Himachal Pradesh to provide input on costs and return structure which suggested that there is ample scope to conduct such an empirical case study. This literature review can be used by the planners, extension workers and policy makers to create a new plans and regulations for the welfare of mushroom producers. The review can also provide further insight into the cost of mushroom cultivation and its marketing effectiveness. Researchers will find this review study very helpful in understanding the approach on how to start mushroom cultivation as a profitable venture. The review study has further outlined the issues and offered suggestions which will be highly beneficial to the mushroom producers.

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