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A Review on Economic Viability and Challenges in Mushroom Agribusiness in Tamil Nadu, India

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Authors' contributions

This work was carried out in collaboration among all authors. 'All authors read and approved the final manuscript.

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Review Article

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ABSTRACT

The global mushroom industry has witnessed significant growth due to rising consumer awareness of mushrooms' nutritional and medicinal benefits. Mushroom farming, appealing for its high-value crop status and low initial investment, has become popular among small-scale farmers and entrepreneurs, especially in developing countries. This trend underscores the potential of mushroom cultivation as a tool for poverty alleviation and rural development. This review examines the economic aspects of mushroom cultivation, focusing on production, productivity, market dynamics, marketing strategies, channels, and price spread. By systematically analyzing existing literature, the study identifies key factors influencing the viability of mushroom farming as an

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agribusiness. The methodology involves a comprehensive review of peer-reviewed articles, research reports, and books, ensuring a robust analysis. Results indicate that while mushroom cultivation offers significant economic opportunities, it faces challenges such as high initial investment, technical expertise requirements, market volatility, and regulatory compliance. The review provides insights into enhancing profitability and addressing constraints, contributing to the literature on sustainable agribusiness practices and informing future research and policy interventions.

Keywords: Mushroom enterprises; economic analysis; marketing; constraints.

1. INTRODUCTION

Mushroom cultivation, also known as fungiculture, is the practice of growing mushrooms for food, medicine, or other purposes [1]. This form of agriculture has emerged as a viable agribusiness, offering significant economic opportunities, particularly for small-scale farmers and entrepreneurs. Unlike traditional crops, mushrooms can be cultivated year-round in controlled environments, requiring relatively small land areas and utilizing agricultural by-products as substrates. This makes mushroom cultivation an attractive option for sustainable agriculture and waste management [2].

The global mushroom industry has experienced substantial growth in recent years, driven by increasing consumer awareness of the nutritional and medicinal properties of mushrooms. As a high-value crop that can be cultivated on a small scale with relatively low initial investment, mushroom farming has gained popularity among small and marginal farmers, as well as entrepreneurs seeking profitable agricultural ventures. This trend is particularly notable in developing countries, where mushroom cultivation is seen as a potential tool for poverty alleviation and rural development [3].

Mushroom cultivation has emerged as a viable agribusiness, offering significant economic and social benefits [4]. This review article aims to delve into the multifaceted aspects of mushroom production and marketing, exploring how these elements interplay to influence the overall economic viability of mushroom farming. By analyzing key principles and previous studies, this article provides a comprehensive understanding of production, productivity, market dynamics, marketing strategies, marketing channels, and price spread in the context of mushroom cultivation.

According to NHB, Tamil Nadu contributed 12.6 MT (4.8 per cent) of the total production of mushrooms in the country during 2021. Among Tamil Nadu, Coimbatore and Erode emerged as the top producers of mushrooms, accounting for 21 - 30 per cent of the state's overall output. Namakkal, Salem, Dharmapuri and Krishnagiri contribute 11 to 20 per cent of total mushroom production in Tamil Nadu (Table 1).

1.1 Production Trend in Tamil Nadu

However, despite its potential, mushroom cultivation as an agribusiness faces several constraints that challenge entrepreneurs and enterprises. One of the primary challenges is the high initial investment required for setting up controlled cultivation environments. While small-scale operations can be started with minimal infrastructure, scaling up to commercial production often requires significant capital for climate control systems, sterilization equipment, and specialized growing rooms.

Technical expertise is another crucial factor in successful mushroom cultivation. The process involves precise control of environmental conditions such as temperature, humidity, and light, as well as knowledge of spawn production, substrate preparation, and disease management. Many new entrants to the industry struggle with mastering these technical aspects, leading to crop failures and economic losses.

Market volatility and price fluctuations pose significant challenges for mushroom agribusinesses. The perishable nature of fresh mushrooms necessitates quick marketing and distribution, while seasonal variations in demand can lead to oversupply or shortages. Entrepreneurs often grapple with establishing reliable supply chains and maintaining consistent quality to meet market demands. Access to quality inputs, particularly spawn and substrate materials, can be a constraint for many mushroom cultivators, especially in developing regions. The lack of reliable suppliers and the need for frequent replenishment of these materials can disrupt production cycles and impact profitability.

Table 1. Mushroom production in Tamil Nadu

Year	Production (In ' 000 Metric Tonne)	
	Tamil Nadu	India
2018-2019	11.48	182.0
2019-2020	11.48	210.9
2020-2021	11.00	242.9
2021-2022	13.52	285.1
2022-2023(Adv Estimate)	13.80	299.2

Source: FAO Statistics, FAO (2023)

Post-harvest management and value addition present both opportunities and challenges for mushroom agribusinesses. While processing can extend shelf life and open new market avenues, it requires additional investment in equipment and technology. Many small-scale producers lack the resources or knowledge to engage in value-added processing, limiting their market reach and profit potential.

Regulatory compliance and food safety standards pose additional challenges, particularly for enterprises looking to expand into international markets. Meeting stringent quality control measures and obtaining necessary certifications can be costly and time-consuming for small and medium-sized enterprises. The lack of awareness among consumers about different mushroom varieties and their uses can limit market demand. Educating consumers and creating demand for diverse mushroom products requires sustained marketing efforts, which can strain the resources of small agribusinesses.

This review article aims to synthesize the existing knowledge on the economic aspects of mushroom production and marketing, providing a comprehensive understanding of the factors that influence the viability of mushroom cultivation as an agribusiness. By examining the interplay between production techniques, market dynamics, and economic outcomes, this article seeks to contribute to the growing body of literature on mushroom cultivation and inform future research and policy interventions in this field.

2. METHODOLOGY

This review article employs a comprehensive and systematic approach to analyze the economic aspects of mushroom production and marketing. The methodology focuses on a thorough examination of existing literature, including peer-reviewed journal articles, research reports, and relevant books published within the last two decades.

The review process begins with a conceptual framework (Table 2) that outlines the key components of mushroom cultivation economics, including production, productivity, market dynamics, marketing strategies, marketing channels, and price spread. This framework serves as a guide for organizing and synthesizing the diverse literature on the subject. Developing a positive and deeper understanding of the research problem from the appropriate scale would result from an analysis of the key principles and relevant prior research. As a result, this chapter examines and presents related concepts and also how they have been used in previous studies.

To ensure a comprehensive review, multiple academic databases and search engines are utilized, including Google Scholar, Web of Science, and AGRIS. The search strategy employs a combination of keywords related to mushroom cultivation, economics, production, marketing, and constraints. The initial search yields a large number of articles, which are then screened based on relevance, methodological rigor, and significance of findings.

Table 2. Conceptual framework

Conceptual review	Past studies for review
Production	Economic Analysis of Mushroom Production
Productivity	Marketing of mushroom
Market	Production and marketing constraints
Marketing	
Marketing channel	
Price Spread	

The selected articles are critically analyzed to extract relevant information on various aspects of mushroom cultivation economics. Special attention is given to studies that provide empirical evidence on the economic viability of mushroom farming, factors affecting productivity, marketing channel efficiency, and constraints faced by growers.

To ensure the reliability and validity of the review, the methodology includes a cross-referencing process to verify key findings and identify any conflicting results or gaps in the existing literature. This process helps in highlighting areas that require further research and in providing a balanced view of the current state of knowledge on mushroom cultivation economics.

The methodology also includes a synthesis of the reviewed literature to develop a comprehensive understanding of the economic aspects of mushroom production and marketing. This synthesis aims to identify key factors that influence the economic viability of mushroom cultivation and to provide insights into potential strategies for enhancing profitability and addressing constraints.

3. CONCEPTUAL REVIEW

3.1 Production

Bhange [5] views production as an activity aimed at satisfying desires through exchange. Koutsoyiannis [6] describes it as the combination of input factors required to produce a single unit of output. Sickles and Zelenyuk [7] define production as the process of combining physical and non-physical inputs to create output for consumption. In this study, production is defined as the set of factor inputs necessary to produce one unit of output.

3.2 Productivity

Singh [8] defines productivity as the result of the interaction between agrarian structure, resource supply, and innovation, measured as output per resource unit. Sekhar and Nagaraj [9] uses garlic production per hectare as a measure of productivity. In this study, productivity is defined as the amount of mushroom produced per unit area.

3.3 Market

Acharya and Agarwal [10] explain that a market is not restricted to a geographical location but is influenced by supply and demand quality. Keller [11] defines a market as a place where goods and services are exchanged between buyers and sellers to satisfy specific needs. Sivagurunathan [12] describes the market as a place for trading activities with price negotiation. In this study, the market refers to the place where mushroom supply chain transactions between the producer and the intermediary or customer occur.

3.4 Marketing

Pride and Farrell [13] define marketing as the process of creating, delivering, promoting, and pricing goods, services, and ideas in a market-driven environment to foster profitable consumer relationships. Kotler et al. [14] describe marketing as planning and executing the creation, pricing, promotion, and distribution of goods, services, and ideas to achieve individual and organizational goals through exchanges. In this study, marketing is considered as the sequence of operations performed by the producer and intermediaries before the commodity reaches the consumer.

3.5 Marketing Channel

Pelton et al. [15] define marketing channels as economic transactions that provide value to the consumer through buying, using, and disposing of products and services. Acharya [16] describes marketing channels as pathways for agricultural products from producers to consumers, with varying lengths depending on the commodity, transfer amount, customer demand, and regional production specialization. Dhanapal [17] states that marketing channels transfer goods from producers to consumers. In this study, the marketing channel is defined as the route taken from the primary producer to the ultimate consumer in the mushroom movement.

3.6 Price Spread

Venkataramana and Gowda [18] state that price spread is a key indicator of market efficiency, representing the producer’s share of the consumer’s expenditure. Subba Reddy [19] defines the price spread as the difference between what consumers pay and what producers receive. Jadav et al. [20] describe price spread as the difference between the price paid by the end consumer and the price received by the farmer, including marketing costs and margins of involved agencies. In this study, the price spread represents the discrepancy between the net price obtained by the mushroom grower and the final consumer's purchase.

4. PAST STUDIES REVIEW

4.1 Economic Analysis of Mushroom Production

Thakare and Gupta [21] found that mushroom production in Chhattisgarh and Maharashtra has significant variable costs (66.42%) compared to fixed costs (33.58%). Larger farms benefit more due to a higher input-output ratio, preferring sales through retailers, whereas smaller farms favor direct sales to consumers. Marketing costs differ by channel, impacting the producer's share of consumer rupees, which is highest in direct sales channels. Similarly, Khatkar et al. [22] noted that middlemen take a significant share in Haryana, and emphasized the need for cooperative marketing to improve producer margins. Rani et al. [23] showed that operating costs are substantial (82.43%) with economies of scale favoring larger farms in Haryana. Singh and Suresh [24] concluded that larger farms in Haryana have more fixed capital investment and benefit from economies of scale, recommending financial assistance for growth. Rahman and Imtiaj [25] found that mushroom cultivation in Bangladesh is more profitable than traditional crops, suggesting that support from local governments and NGOs can boost production and alleviate poverty. Celik and Peker [26] demonstrated that mushroom production is a viable income diversification strategy in Kenya and Turkey, with potential to promote rural development. Mohapatra et al. [27] highlighted issues with conventional farming methods, such as low yield and bio-efficiency. Job and Geetha [28] found that oyster mushroom cultivation in Kerala provides additional income for women despite challenges like seasonal fluctuations and high input costs. Singh et al. [29] noted that large farms in Haryana achieve lower production costs due to better resource utilization. Mehta et al. [30] pointed out that mushroom cultivation in India has become popular but faces perishability issues. Barmon et al. [31] found that mushroom cultivation in Bangladesh is profitable for small and marginal farmers, with higher marketing costs compared to other crops. Thakur and Singh [32] reported the use of agricultural wastewater for mushroom cultivation, emphasizing the economic viability of oyster, paddy straw, and milky mushrooms in India. Kangotra and Chauhan [33] showed that button mushroom cultivation in Himachal Pradesh benefits from economies of scale, reducing production costs for larger units. Chauhan and Sharma [34] found that mushroom production in Himachal Pradesh is economically viable, with large units exhibiting higher capital turnover ratios. Sharma et al. [35] highlighted the economic viability of mushroom production in Himachal Pradesh, identifying insect-pest attacks and lack of marketing facilities as major issues. Sharma et al. [36] observed that primary investment in mushroom cultivation in Himachal Pradesh is in building structures, with economies of scale reducing costs per kilogram as farm size increases. Singh and Singh (2018) found that large farms in Punjab yield higher net returns due to lower costs, with economies of scale benefiting larger farms.

4.2 Marketing of Mushrooms

Singh et al. [37] studied mushroom marketing in Punjab, revealing four marketing channels with direct sales to consumers offering the highest producer share. Sawant et al. [38] found that small and medium growers in big cities sell through commission agents, who take a significant share of consumer rupees. Beetz and Greer [39] emphasized the importance of timely operations and effective public relations for successful mushroom marketing, suggesting direct sales for better pricing. Carrera et al. [40] found that Mexico's mushroom marketing system evolved from centralized to a mix of centralized and decentralized approaches, with large private enterprises dominating. Mabuza et al. [41] highlighted the challenges in Swaziland's mushroom market, recommending solutions based on the socio-economic status of producers. Sachan et al. [42] categorized mushroom producers in Uttar Pradesh, identifying three marketing channels with varying costs and margins. Mukandezi [43] identified different stakeholders in the mushroom value chain, noting a preference for fresh, non-refrigerated mushrooms among buyers. Mishra et al. [44] analyzed oyster mushroom supply chains in Chhattisgarh, finding that direct sales offer higher returns and better market efficiency.

4.3 Production and Marketing Constraints

Singh and Kalra [45] identified insufficient spawn quality, limited marketing channels, and financial resources as key challenges for mushroom cultivators. Gogi and Talukdar [46] noted inconsistent production patterns and inadequate marketing facilities as major constraints. Pattnaik and Mishra [47] highlighted issues like perishability and spawn contamination, emphasizing the need for technical knowledge and government support. Sukhjet and Pandey

(2008) found marketing challenges in Punjab, with small-scale farmers practicing year-round cultivation. Singh et al. (2008) observed fluctuating market prices and lack of cold storage as significant constraints in Haryana. Pradhan and Nayak (2009) emphasized the need for quality straw to promote mushroom cultivation among landless farmers. Chakravarty [48] stressed the importance of mushroom farming amid environmental pressures, noting limited research in the field. Wakchaure [49] identified the lack of organization in India's mushroom market, suggesting the need for better processing and storage facilities. Trishnalee et al. [50] revealed production, marketing, financial, and social constraints in Assam, emphasizing the need for scientific facilities and government initiatives. Singh and Singh [51] noted challenges like insufficient spawn and price fluctuations, suggesting refrigeration facilities and public awareness for better sales outcomes. Kangotra and Chauhan [33] identified issues like compost bag supply and disease prevalence in mushroom production. Gautam et al. [52] found that the absence of suitable marketing channels and government support hampers mushroom production. Singh et al. (2015) identified multiple factors affecting mushroom production and marketing in Haryana, emphasizing the need for better infrastructure and technical know-how. Thilakaratna and Pathirana [53] noted challenges like limited knowledge and financial support in mushroom cultivation. Shirur et al. [54] identified major constraints in mushroom cultivation, such as spawn unavailability and high electricity costs, suggesting capacity-building programs for improvement.

5. CONCLUSION

In conclusion, the mushroom industry holds promise for economic growth and rural development, particularly in developing countries. Mushroom cultivation provides additional income to farmers along with the utilization of agricultural wastes and thus has bright future in Tamil Nadu. Given the growing demand and importance of mushroom production for promising enterprises, the study is important. Despite the challenges of high initial investment, technical requirements, market volatility, and regulatory hurdles, mushroom cultivation offers significant opportunities for income diversification and poverty alleviation. Addressing these challenges through targeted support, capacity building, and improved infrastructure can enhance the economic viability of mushroom farming. Future research and policy interventions should focus on optimizing production techniques, strengthening market channels, and promoting consumer awareness to fully harness the potential of this promising agribusiness sector.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Ferraro V, Venturella G, Pecoraro L, Gao W, Gargano ML. Cultivated mushrooms: Importance of a multipurpose crop, with special focus on Italian fungiculture. Plant Biosystems-An International Journal Dealing with all Aspects of Plant Biology. 2022;156(1):130-142.
2. Mahari WAW, Peng W, Nam WL, Yang H, Lee XY, Lee YK, Lam SS. A review on valorization of oyster mushroom and waste generated in the mushroom cultivation industry. Journal of Hazardous Materials. 2020;400:123156.
3. Ferdousi J, Riyadh ZA, Hossain M, Saha SR, Zakaria M. Mushroom production benefits, status, challenges and opportunities in Bangladesh: A review. Annual Research and Review in Biology. 2020;34(6):1-13.
4. Dey A, Patel S, Rashid MM. Small-scale mushroom production unit for the up liftment of rural economy and women empowerment in India: A Review. Current Journal of Applied Science and Technology. 2020;39(2):38-46.
5. Bhange BS. An Introduction to Economics Analysis, Bombay" Voro and Co.Publisher Private Ltd; 1962.
6. Koutsoyiannis A. Modern Micro Economics. Mac Millan Press: Hong Kong. 2003;105- 107.
7. Sickles RC, Zelenyuk V. Measurement of productivity and efficiency: Cambridge University Press; 2019.

8. Singh B. Productivity and resource structure: A case study of agricultural development of Gujarat. Indian Journal of Agricultural Economics 1980;35(902-2018-1678):34-50.
9. Sekhar C, Nagaraj R. Production and Marketing of Garlic in India. Lambert Academic Publishing: Germany. 2015;102-110.
10. Acharya S, Agarwal N. Agriculture marketing in India OXFORD. IBH. 2004.
11. Keller. Marketing Management. New Delhi: Prentice-Hall India Pvt. Ltd; 2005.
12. Sivagurunathan. Sourcing of major vegetables from Coimbatore. (Unpublished M.Sc., (Ag) Thesis, Submitted to Department of Agricultural Economics, Tamil Nadu Agricultural University, Coimbatore); 2005.
13. Pride and Farrell. Marketing Management. South Western College Publication. 2005;253-291.
14. Kotler P, Keller KL, Koshy A, Jha M. Marketing Management, Dorling Kindersley (India) Pvt. Ltd; 2007.
15. Pelton LE, Strutton D, Lumpkin JR. Marketing Channels: A Relationship Management Approach; 1996.
16. Acharya SS. Agricultural marketing in India: Oxford and IBH publishing. Agricultural Marketing-Delhi. 2004;48(1):2.
17. Dhanapal. To study the supply chain of major fruits and vegetables from Oddanchatram to Spencer's Retail Outlet. (Unpublished M.Sc., (Ag) Thesis, Submitted to Department of Agricultural Rural Management, Tamil Nadu Agricultural University, Coimbatore); 2007.
18. Venkataramana M, Gowda MS. Channels and price spread in tomato marketing-a study in Kolar district. Agricultural Marketing-Delhi. 1996;39:42-44.
19. Subba Reddy S, Raghu Ram P, Neelakanta Sastry TV, Bhavani Devi I. Agricultural Economics. New Delhi: Oxford and IBH Publishing Company Pvt. Ltd; 2004.
20. Jadav K, Leua A, Darji V. Economic analysis of supply chain of fresh potato in middle Gujarat. Indian Journal of Agricultural Research. 2011;45(4):266-274.
21. Thakare A, Gupta S. Marketing of mushroom in Chhattisgarh plain. Indian Journal of Agricultural Marketing. 2004; 18:23-27.
22. Khatkar R, Rathee A, Singh V. Marketing of fresh mushroom in Haryana; 2005.
23. Rani V, Chauhan R, Singh K, Goyal S. Economic and factor productivity analysis of mushroom cultivation in Haryana; 2015.
24. Singh R, Suresh R. Cost-benefit analysis of mushroom cultivation. Indian Journal of Agricultural Research. 2007;41(4):256-261.
25. Rahman SA, Imtiaj A. Economic viability of mushrooms cultivation to poverty reduction in Bangladesh. Tropical and Subtropical Agroecosystems. 2008;8(1):93-99.
26. Celik Y, Peker K. Benefit/cost analysis of mushroom production for diversification of income in developing countries. Bulgarian Journal of Agricultural Science. 2009;15(3):228-237.
27. Mohapatra K, Behera B, Mahapatra S. Influence of spawn quality on biological efficiency of paddy straw mushroom, Volvariella volvacea. Indian J. Mushrooms. 2010;28(1&2):8-12.
28. Job E, Geetha D. Economic analysis of oyster mushroom production in Kerala; 2010.
29. Singh R, Bishnoi D, Singh A. Cost benefit analysis and marketing of mushroom in Haryana. Agricultural Economics Research Review. 2010;23(1): 165-172.
30. Mehta B, Jain S, Sharma G, Doshi A, Jain H. Cultivation of button mushroom and its processing: An techno-economic feasibility. International Journal of Advanced Biotechnology and Research. 2011;2(1): 201-207.
31. Barmon BK, Sharmin I, Abbasi PK, Mamun A. Economics of mushroom (*Agaricus bisporus*) production in a selected Upazila of Bangladesh. The Agriculturists. 2012;10(2):77-89.
32. Thakur M, Singh HK. Advances in the cultivation technology of tropical mushrooms in India. JNKVV Res J. 2014;48(2):120-135.
33. Kangotra A, Chauhan S. Economic viability of button mushroom cultivation in Himachal Pradesh, India. Indian Journal of Agricultural Research. 2014;48(2):134-139.
34. Chauhan S, Sharma K. A study on production potential, economic viability and marketing system of varied size mushroom units in Himachal Pradesh. Department of Agricultural Economics, Extension Education and Rural Sociology, CSK HP Krishi Vishavidyalaya, Palampur. Publication73. 2015;121.

35. Sharma D, Kumar A, Guleria J. Economic viability, technological gap and problems of mushroom cultivation in Mandi district of Himachal Pradesh. Himachal Journal of Agricultural Research. 2016;42(1):47-54.
36. Sharma N, Vaidya MK, Kayastha R, Kumari M, Kumari B. Economic analysis of production of white button mushroom (*Agaricus bisporus*) in Himachal Pradesh: A Case Study of Shimla district. International Journal of Chemical Studies. 2018;6(3):97-100.
37. Singh R, Mann G S and Vatta K. Marketing of mushrooms in Punjab: A case study of Amritsar and Gurdaspur districts. B J Agric Mktg. 2000;8:281-288.
38. Sawant S, Naik V, Talathi J. Marketing of mushroom. Indian Journal of Agricultural Marketing. 2001;15(2):88-94.
39. Beetz AE, Greer L. Mushroom cultivation and marketing: Citeseer; 2004.
40. Carrera DM, Nava D, Sobal M, Bonilla M, Mayett Y. Marketing channels for wild and cultivated edible mushrooms in developing countries: The case of Mexico. Micología Aplicada International. 2005;17(2):9-20.
41. Mabuza M, Ortmann G, Wale E. Factors constraining the participation of Swaziland's mushroom producers in mainstream markets. The 19th international farm management congress proceedings. SGGW, Warsaw, and Poland; 2013.
42. Sachan B, Singh K, Kumar N, Kumar J. Production and marketing of mushroom in Kanpurnagar district of Uttarpradesh; 2013.
43. Mukandezi A. Which marketing strategies can lead to a higher value share in the mushroom value chain? Van Hall Larenstein. Mushroom Research. 2014;19(2):94-100.
44. Mishra BN, Sahu HK, Dinesh Kumar. Supply chain analysis of oyster mushroom in Raipur district of Chhattisgarh. International Journal of Agricultural Sciences. 2018;10(17):7061-7063.
45. Singh S, Kalra A. Economic analysis of mushroom production in District Sonepat of Haryana State. Indian Journal of Agricultural Marketing. 1995;9: 105-114.
46. Gogi M, Talukdar RK. Impact of mushroom cultivation training with special reference to knowledge and adoption level. Proc. 5th Agril. Science Congress on Sustainable Development of Mountain Agriculture, April 4-7, Guwahati, Assam. Hort Flora Research Spectrum. 2001;2(1):14-19.
47. Pattnaik T, Mishra S. Constraints in adoption of mushroom cultivation technology. Asian Journal of Home Science. 2008;3(1):86-89.
48. Chakravarty B. Trends in mushroom cultivation and breeding. Australian Journal of Agricultural Engineering 2:102-109 Conference Proceedings. 2011;8(5):1255-1260.
49. Wakchaure G. Production and marketing of mushrooms: Global and national scenario; 2011.
50. Trishnalee S, Horindra G, Hazarika J. Disposal pattern and major constraints of mushroom production in Jorhat district of Assam. Agriculture Update. 2013; 8(1/2):125- 128.
51. Singh R, Singh J. Marketing scenario and problems of mushroom growing in Punjab. Indian Journal of Economics and Development. 2014;10(1a):131-140.
52. Gautam AK, Singh P, Mishra D, Kumar A, Singh AP. Constraints in adoption of mushroom production enterprise. Indian Journal of Extension Education. 2014;50(1&2):39-41.
53. Thilakaratna W, Pathirana P. Prospects and challenges of mushroom production in Kuruwita, Sri Lanka: Comparative report on two consecutive years; 2018.
54. Shirur M, Shivalingegowda N, Chandregowda M, Rana RK. Technological adoption and constraint analysis of mushroom entrepreneurship in Karnataka. Economic Affairs. 2016;61(3):427-436.

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