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Adoption of scientific oyster mushroom production technology among growers in the Lower Brahmaputra Valley Zone of Assam

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ABSTRACT

Oyster mushroom cultivation has emerged as a promising enterprise for improving farm income, generating employment, and promoting livelihood diversification among rural households. The study assessed the extent of adoption of recommended scientific oyster mushroom production practices in the Lower Brahmaputra Valley Zone of Assam. Nalbari, Barpeta and Baksa districts were randomly selected, with two blocks from each district, and 120 growers were selected through convenience sampling with support from KVKs and Agriculture Department officials. The extent of adoption was assessed for 15 recommended oyster mushroom production practices prescribed by Assam Agricultural University, following the concept of adoption proposed by Rogers (1983) and the procedure developed by Borah (2004). Each practice was categorized as fully adopted, partially adopted, or not adopted, with scores of 2, 1, and 0, respectively. The overall adoption score was obtained by summing the scores across the selected practices. The findings revealed that the respondents were predominantly middle-aged (50.83%) and had short-term experience (75.00%) in oyster mushroom cultivation. Most had high school education (34.17%), belonged to nuclear families (59.17%). A majority had medium training exposure (60.00%) and extension contact (71.67%), while 72.50 per cent had medium mass media exposure. Nearly half (49.17%) were marginal farmers, and 63.33 per cent belonged to the low-income category. Most respondents relied on a combination of own and hired labour (63.33%) and primarily used their own financial resources (60.00%). Institutional linkage was relatively weak, with 57.50 per cent having no organizational membership. Psychologically, medium levels of economic motivation (55.83%), management orientation (60.83%) and decision-making ability (82.50%) predominated, while risk-bearing ability was distributed mainly across the medium (40.00%) and high (37.50%) categories. The majority of respondents (58.33%) had a medium level of adoption, followed by high (23.33%) and low (18.33%) adoption. Complete adoption was observed for mushroom species, cultivation time and substrate selection, while high adoption was recorded for substrate treatment (93.33%), harvesting time (94.17%) and number of spawn layers (82.50%). Major technological gaps were observed in temperature management (6.67%), chopping length (14.17%), punch-hole spacing (15.00%), spawn running (19.17%), bag size (29.17%) and disease management, which was not adopted by 78.33 per cent of respondents. The predominance of medium adoption indicates that although growers were familiar with and practicing several recommended technologies, complete adoption of the scientific production package had not yet been achieved. The findings suggest the need for strengthened extension services, regular skill-oriented training, timely availability of quality spawn and other inputs, technical guidance, and improved market support to enhance the adoption of scientific oyster mushroom production practices and thereby improve productivity, profitability, and sustainability of mushroom-based livelihoods in Assam.

Keywords: Adoption, Oyster mushroom, Scientific production practices, Mushroom grower

Introduction

Entrepreneurship has emerged as a crucial driver of economic growth, innovation, and employment generation in India, with significant policy support from initiatives such as Startup India, Stand-Up India, and the Pradhan Mantri MUDRA Yojana (PMMY). In the agricultural sector, entrepreneurial ventures in organic farming, horticulture, floriculture, and mushroom cultivation have played a vital role in transforming rural livelihoods by offering sustainable income opportunities, particularly for women, youth, and small and marginal farmers. Among these, mushroom cultivation has attracted increasing attention due to its high nutritional value, low capital requirement, short production cycle, and ability to utilize agricultural residues. It represents a woman-friendly, space-efficient, and labour-intensive enterprise that can contribute substantially to rural employment, food security, and income diversification (Chang *et al.*, 2004; Verma, 2014) [1, 2]. Globally, mushroom production has expanded rapidly, reaching nearly 50 million tonnes in 2023, with Asia accounting for over 95% of total output (FAO, 2023) [3]. India, identified as a sunrise industry in this sector,

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has witnessed steady growth in mushroom production—from 0.024 million tonnes in 2000 to 0.32 million tonnes in 2023—driven by domestic consumption, export potential, and the increasing demand for diversified diets (FAO, 2023; Sharma *et al.*, 2017) [3, 4]. Although button mushroom dominates national production, oyster mushrooms (*Pleurotus spp.*) are gaining popularity due to their adaptability, ease of cultivation, and high yield potential. The North Eastern Region (NER) of India, with its rich biodiversity, high humidity, and abundance of agro-residues, is naturally suited for mushroom cultivation. Wild edible mushrooms have long been part of local diets, and entrepreneurial ventures are now emerging around value-added products such as powders, noodles, and snacks (Yumkhaibam *et al.*, 2021) [5]. In Assam, mushroom entrepreneurship has gained momentum with support from institutions like Assam Agricultural University (AAU), ICAR–ATARI, Krishi Vigyan Kendras (KVKs), NGOs, and government programs such as the Assam Horticulture Mission and APART. The state produced about 1,650 metric tonnes of mushrooms in 2023–24, (NEDFi, 2023) [6]. Research has highlighted oyster mushroom cultivation as a profitable, low-cost enterprise well-suited to the region's agro-climatic conditions and available crop residues (Gogoi *et al.*, 2020; Das *et al.*, 2021) [7, 8].

Despite its potential, the extent of adoption of mushroom cultivation in Assam remains relatively low due to several persistent challenges, including limited awareness among farmers, inadequate access to quality spawn, weak market linkages, and insufficient post-harvest infrastructure (Saikia *et al.*, 2023) [9]. These constraints restrict wider participation, particularly among small and marginal farmers who could benefit most from the enterprise. Enhancing the extent of adoption requires targeted interventions such as capacity building, scientific training, and institutional support to ensure that more farmers are able to embrace mushroom cultivation as a viable livelihood activity. In this context, the present study seeks to analyse the extent to which oyster mushroom cultivation has been adopted as a sustainable and inclusive livelihood option for rural communities.

2. Materials and Methods

The research study was conducted in the Lower Brahmaputra Valley Zone of Assam, which was purposively selected based on considerations such as time and resource constraints, favourable socio-political conditions, and the availability of a sufficient number of oyster mushroom growers. Among the eleven districts comprising the zone, Nalbari, Barpeta, and Baksa districts were selected through simple random sampling. Subsequently, two development blocks from each selected district were purposively chosen, namely Pub Nalbari and Borigog-Banbhag blocks from Nalbari district, Barpeta and Bhawanipur blocks from Barpeta district, and Barama and Jalah blocks from Baksa district. A total of 120 oyster mushroom growers were selected as respondents for the study through convenience sampling. The identification of respondents was carried out with the assistance of local Krishi Vigyan Kendras (KVKs) and officials from the Department of Agriculture. Of the total respondents, 20 were from Pub Nalbari, 21 from Borigog-Banbhag, 19 from Barpeta, 20 from Bhawanipur, 24 from Barama, and 16 from Jalah development blocks. Following the concept of adoption proposed by Rogers (1983), the extent of adoption was considered as the dependent variable in the

present study and was measured using the procedure developed by Borah *et al.* (2004) [10]. The adoption level of 15 recommended oyster mushroom cultivation practices prescribed by Assam Agricultural University was assessed under three categories: full adoption, partial adoption, and no adoption, with scores of 2, 1, and 0, respectively. The overall extent of adoption was calculated by summing the scores obtained by the respondents across all selected practices.

3. Results and Discussion

3.1 Socio-economic and psychological characteristics profile of mushroom growers of Lower Brahmaputra Valley Zone of Assam

The study of socio-economic and psychological attributes of respondents is enabled for understanding the factors underlying farmers' adoption behaviour. Socio-economic characteristics provide insight into the farmers' resource base, social and economic conditions, while psychological attributes reflect their motivation, risk orientation, decision-making ability and managerial behaviour.

In the table 1, socio-economic, communication and psychological characteristics of the respondents revealed a predominantly middle-aged and moderately experienced group of oyster mushroom growers. Half of the respondents (50.83%) belonged to the middle-age category (36–50 years), while 38.33 per cent were young and 10.83 per cent were old. In terms of education, the largest proportion (34.17%) had completed high school, followed by higher secondary education (20.00%), primary and middle school (17.50% each), whereas only 4.17 per cent were illiterate.

A substantial majority (75.00%) had short-term experience in oyster mushroom cultivation, indicating that mushroom production was relatively new among most respondents. Nearly three-fifths (59.17%) belonged to nuclear families, while 63.33 per cent had small-sized families. Regarding training exposure, the majority (60.00%) fell in the medium category. In terms of operational landholding, nearly half (49.17%) were marginal farmers, followed by small farmers (38.33%) and semi-medium farmers (12.50%).

The income profile indicated that 63.33 per cent of the respondents belonged to the low-income group, while 32.50 per cent and 4.17 per cent belonged to the medium- and high-income groups, respectively. Regarding labour utilization, nearly two-thirds (63.33%) relied on a combination of own and hired labour. The principal source of finance was own financial resources (60.00%), followed by bank/financial institutions (22.50%) and friends and relatives (17.50%).

With respect to communication characteristics, a clear majority of respondents exhibited medium levels of extension contact (71.67%) and mass media exposure (72.50%). Institutional linkage, however, was relatively weak, as 57.50 per cent had no membership in any organization, while only 3.33 per cent served as office bearers.

The psychological characteristics further showed that more than half of the respondents had medium economic motivation (55.83%) and management orientation (60.83%). A predominant proportion (82.50%) possessed medium decision-making ability. Risk-bearing ability was comparatively more evenly distributed, with 40.00 per cent falling in the medium category and 37.50 per cent in the high category.

Table 1. Socio-economic, communication and psychological characteristics of the respondents

Sl. No.	Socio-economic characteristics	Category	Frequency (Percentage)
1.	Age	Young (18–35 years)	46(38.33)
		Middle (36–50 years)	61(50.83)
		Old (≥ 51 years)	13(10.83)
2.	Education	Illiterate	5(4.17)
		Primary school	21(17.50)
		Middle School	21 (17.50)
		High school	41 (34.17)
		Higher secondary	24 (20.00)
		Graduate and above	8 (6.67)
3.	Farming experience of oyster mushroom	Short-term	90 (75.00)
		Medium-term	24 (20.00)
		Long-term	6 (5.00)
4.	Family type	Nuclear family	71 (59.17)
		Joint family	49 (40.83)
5.	Family size	Small family	76 (63.33)
		Large family	44 (36.67)
6.	Exposure to training	Low exposure	26 (21.67)
		Medium exposure	72 (60.00)
		High exposure	22 (18.33)
7.	Operational land holding	Marginal	59 (49.17)
		Small	46 (38.33)
		Semi-medium	15 (12.50)
8.	Net annual income from mushroom	Low income group	76 (63.33)
		Medium income group	39 (32.50)
		High income group	5 (4.16)
9.	Farm labour utilization	Own labour	16 (13.33)
		Hired labour	28 (23.33)
		Both own and hired labour	76 (63.33)
10.	Source of finance	Bank/financial institution	27 (22.50)
		Friends and relatives	21 (17.50)
		Own financial source	72 (60.00)
11.	Extension contacts	Low	20 (16.67)
		Medium	86 (71.67)
		High	14 (11.67)
12.	Institutional linkage	No membership	69 (57.50)
		Member of one organization	39 (32.50)
		Member of two or more organizations	8 (6.67)
		Office bearer	4 (3.33)
13.	Mass media exposure	Low	16 (13.33)
		Medium	87 (72.50)
		High	17 (14.17)
14.	Economic motivation	Low	19 (15.83)
		Medium	67 (55.83)
		High	34 (28.33)
15.	Decision making ability	Low	13 (10.83)
		Medium	99 (82.50)
		High	8 (6.67)
16.	Risk bearing ability	Low	27 (22.50)
		Medium	48 (40.00)
		High	45 (37.50)
17.	Management orientation	Low	21 (17.50)
		Medium	73 (60.83)
		High	26 (21.67)

3.2 Extent of adoption of recommended scientific practices of oyster mushroom production

Adoption of recommended scientific practices plays a crucial role in enhancing the productivity, profitability, and sustainability of oyster mushroom cultivation. Scientific mushroom production technologies

encompass improved practices related to substrate preparation,

spawning, environmental management, pest and disease control, harvesting, and post-harvest handling. The extent to which growers adopt these recommended practices reflects their awareness, accessibility to technical knowledge, and willingness to implement improved technologies. Therefore, assessing the extent of adoption among oyster mushroom growers is essential for identifying technological gaps and formulating appropriate extension strategies. In this context, an analysis of the extent of adoption of recommended scientific oyster mushroom

production practices was undertaken among growers in the Lower Brahmaputra Valley Zone of Assam.

The data presented in the table 2, revealed that the substantial portion of the mushroom growers (58.33%) had medium extent of adoption, followed by 23.33 per cent of the respondents having high extent of adoption of recommended scientific practices of oyster mushroom production. A smaller segment of 18.33 per cent falls into the low adoption category revealing a distinct gap that could be bridged through strategic agricultural extension outreach.

Table 2. Distribution of respondents according to overall extent of adoption of recommended scientific practices of oyster mushroom production

Category	Range	Frequency	%	Mean	S.D.	C.V.
Low extent of adoption	13-15	22	18.33	18.87	2.89	15.32
Medium extent of adoption	16-21	70	58.33			
High extent of adoption	22-30	28	23.33			
Total		120	100			

The analysis indicates that the more than half of the mushroom growers exhibited a medium level of adoption of recommended scientific oyster mushroom cultivation practices. Though the growers have adopted several recommended practices into their production systems, the complete adoption of the scientific package of practices remains partial. The medium level of adoption may be due to moderate level knowledge of scientific cultivation practices. Although extension services and training programmes have increased awareness but may not be sufficient for complete adoption. It was also observed that farmers tend to adopt only those practices that are simple, affordable, and perceived to be profitable. Limited availability of quality spawn and other essential inputs may be the possible reason for medium level of adoption.

3.3 Practice wise distribution of respondents according to overall extent of adoption of recommended scientific practices of oyster mushroom production

The table 3 revealed that the recommended oyster mushroom species was fully adopted by all (100.00%) respondents and species like *Pleurotus sajorcaju*, *Pleurotus cornucopiae*, *Pleurotus ostreatus*, *Pleurotus florida* etc were the most preferred species of oyster mushroom by the respondents in lower Brahmaputra Zone. The time of cultivation is crucial determinant for oyster mushroom production as it requires specific temperatures and humidity to grow. All the respondents (100%) reported maintaining the time of cultivation and generally grow during the period of September to March, which is considered ideal for the region. All the respondents (100%) in the study areas follow the proper selection of substrate required for oyster mushroom cultivation. The straw from Sali paddy that was immediately after harvest was chosen by majority of the respondents as it is easily available in the region while only a few respondents choose to use the straw from last year, which was kept in stock and mostly they prefer to use golden coloured straw of Sali rice. A large number of respondents (94.17%) were fully adopters to the recommended harvesting time. The growth of oyster mushroom makes it possible to harvest them in 2 to 4 weeks. In the study areas majority of respondents choose to harvest mushroom before their edges start curling upwards, very few (5.83%) of them partially adopted time of harvesting. In the process of scientific oyster mushroom production, the process of treating the substrate was fully adopted by 93.33 percent respondents. While only 6.67 percent of the respondents was partially adopted the recommendation. Respondents had the option to use either chemical or boiling methods for treating the substrate. The findings indicate that 93.33 percent respondents prefer to sterilize the substrate through the boiling technique, which involves boiling it in water at 80-85 degrees for 30-60 minutes. Chemical methods for treating the substrate

are preferred by only a few respondents, who sterilize the substrate with bleaching powder or bavistin. A large proportion (82.50%) of the respondents were full adopters of recommended number of layers of spawn to be used in a mushroom bag who maintain 5 layers of substrate and 4 layers of spawn in a bag. The study indicates that 67.50 percent of those using seeds fully followed the recommended seed rate, which is between of 90 to 100 grams per bag. A sizeable proportion (36.67%) of the respondents fully adopted the moisture content in substrate. To determine the approximate 40% moisture content of the substrate before bagging, they gently touch the pasteurized cooled substrate with their palm, if they fill moisten instead of traces of water in the palm and it indicates readiness for bagging. Only 29.17 per cent of the respondent used proper size of bags to grow mushroom. In oyster mushroom production technology, the spawn running process is a crucial step where bags are kept in a dark room after the bagging process until white mycelium growth is noticed. Very few respondents (19.17%) were found to be the full adopters of Spawn running process followed by 80.83 per cent of them who partially adopted the recommended spawn running process. Majority of the respondents store the bags in the same room where they prepare them. In the case of punching of bags, only 15.00 percent were full adopters of recommended distance (10 cm) between the punch hole line. The rest 85 percent respondents partially adopted the recommended practice. The practice of chopping the substrate in proper length (2-3 inches) is always helpful in pressing and maintaining its tightly intact state inside the bag. The findings revealed that only 14.17 per cent respondents fully adopted the chopping length of the substrate. The recommended practice was partially adopted by 78.33 percent of respondents, which means they were least concerned about maintaining the chopping length of substrate. Moreover, in oyster mushroom production temperature plays an important role. It is a fact that different mushrooms require different temperatures for growth. The ideal temperature for growing of oyster mushroom is generally between 20⁰ to 33⁰. Very few (6.67%) of the respondents fully adopted the required temperature inside a mushroom growing unit, which is very rare. The temperature inside the house was determined by using a thermometer. The respondent followed a variety of practices to maintain the temperature inside the mushroom growing unit, such as adding sand to the floor, hanging wet gunny bags and planting fast-growing trees near their house. While 72.50 per cent of the respondents partially adopted the recommended required temperature inside a mushroom growing unit. While 20.83 percent of them were found non adopters in maintaining required temperature inside a mushroom growing unit. A good number of respondents (63.33%) were found partial adopters of recommended moisture content in substrate.

All the respondents (100%) in the study areas were partial adopters of recommended number of harvests of oyster mushroom. Number of harvestings was done 4-5 times at frequent intervals by the respondents. Selecting healthy spawn and maintaining hygiene is crucial to reducing the incidence of pest and diseases in mushroom. A vast majority of the respondents (78.33%) were non adopters of disease management practices because respondents did not experience any kind of

pest and disease incidence in their unit. While 21.67 per cent were found to be partial adopters of disease management. The problem of green mould and insect infestation was met with by a few respondents and took the recommended measures to manage it. Production of mushroom also depends on size of the bags and 70.83 percent of the respondents use proper size of bags while growing mushroom.

Table 3. Practice wise distribution of respondents according to overall extent of adoption of recommended scientific practices of oyster mushroom production

SN	Questions	No. of respondents		
		Fully adopted	Partially adopted	Not adopted
1	Species of oyster mushroom	120 (100.00)	0 (0.00)	0 (0.00)
2	Time of cultivation	120 (100)	0 (0.00)	0 (0.00)
3	Temperature in the mushroom unit	8 (6.67)	87 (72.50)	25 (20.83)
4	Substrate used	120 (100.00)	0 (0.00)	0 (0.00)
5	Chopping length of substrate	17 (14.17)	94 (78.33)	9 (7.50)
6	Treatment of substrate	112 (93.33)	8 (6.67)	0 (0.00)
7	Approx. moisture content in substrate	44 (36.67)	76 (63.33)	0 (0.00)
8	Size of bags	35 (29.17)	0 (0.00)	85 (70.83)
9	Distance between the punch hole line	18 (15.00)	102 (85.00)	0 (0.00)
10	Seed rate in a bag	81 (67.50)	39 (32.50)	0 (0.00)
11	No of layers of spawn	99 (82.50)	0 (0.00)	21 (17.50)
12	Spawn running	23 (19.17)	97 (80.83)	0 (0.00)
13	Disease management	0 (0.00)	26 (21.67)	94 (78.33)
14	Time of harvesting	113 (94.17)	7 (5.83)	0 (0.00)
15	No of harvest	0 (0.00)	120 (100.0)	0 (0.00)

**Figures within parentheses indicate percentage

Conclusion

The results of the study revealed that the majority of the respondents belonged to the medium level of adoption category with respect to the recommended scientific oyster mushroom cultivation practices. This indicates that although farmers have adopted several recommended production technologies, the adoption of the complete package of scientific practices remains incomplete. The medium level of adoption may be attributed to moderate knowledge of recommended practices, exposure to training and extension programmes, and the perceived economic benefits of mushroom cultivation. However, factors such as limited availability of quality spawn, inadequate technical guidance, financial constraints, lack of organized marketing facilities, and irregular follow-up support from extension agencies may have restricted the complete adoption of scientific practices. Farmers are more likely to adopt practices that are easy to implement, require less investment, and provide immediate economic returns, while relatively complex or costly recommendations are often adopted to a lesser extent. These

findings are consistent with earlier studies that reported a predominance of medium adopters among mushroom growers. The results suggest that there is substantial potential to improve the adoption of scientific oyster mushroom production technology through strengthened extension services, regular skill-oriented training programmes, timely availability of quality inputs, improved access to institutional credit, and better market support. Such interventions would contribute to increased productivity, higher farm income, and sustainable development of oyster mushroom cultivation

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