Study on production and marketing challenges encountered by mushroom enterprises in the western region of Tamil Nadu

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Abstract
Mushroom production is significant as it provides the farming community with non-agricultural employment and income opportunities. Intensive mushroom farming could offer small family businesses strong alternate revenue sources as they lack adequate area for crop cultivation and livestock production. The study examines the challenges faced by mushroom farmers in the Western zone of Tamil Nadu, which accounts for the highest share of mushroom production in the state. The study focuses on production and marketing challenges, aiming to identify constraints and provide insights for improvement. A sample size of 40 mushroom farmers was selected using simple random sampling from the Coimbatore and Erode districts. Data were collected through face-to-face interviews and analyzed using Garrett’s ranking technique. The identification of production challenges such as labor availability, pest and disease control, lack of extension facilities, and availability of quality spawn. Marketing challenges involve irregular demand, high involvement of intermediaries, lack of government support, and high transportation costs. The study reveals that the mushroom industry faces significant challenges in production and marketing, which can be addressed through improved labor management, better pest control, and enhanced market access. Providing technical support, financial assistance, and fostering stronger market linkages can help increase adoption and success among mushroom farmers.

Keywords: Mushroom enterprises, production and marketing challenges, garrett ranking

1. Introduction
In the current era of diet consciousness, mushrooms are increasingly regarded as a future vegetable due to their medicinal and nutritional value. Additionally, mushroom demand has significantly risen in the 21st century (Sharma et al., 2013) [12]. Mushroom production is significant as it provides the farming community with non-agricultural employment and income opportunities (Huchchannanavar et al., 2020) [9]. Intensive mushroom farming could offer small family businesses strong alternate revenue sources as they lack adequate area for crop cultivation and livestock production (Sultan et al., 2021) [17]. Mushroom cultivation not only imparts diversification but also aids in resolving issues with food quality, human health, and the environment (Gupta et al., 2022) [4]. Recycling of agricultural waste, including agro-industrial waste, is one of the key areas that can help attain the goals of resource management and increased productivity (Singh et al., 2021) [16]. Usage of these wastes for mushroom cultivation can boost income and ensure environmental sustainability. Commercial mushroom farming produces healthy food (mushrooms) by biologically converting domestic, industrial and agricultural wastes (Kosre et al., 2021; Palanichamy et al., 2023) [9, 10]. Indoor mushroom cultivation makes use of vertical space and is considered the greatest protein producer per unit of time and space and is around 100 times more effective than traditional agriculture and animal rearing (Keshamma et al., 2022) [8]. This advanced horticulture development provides a potential opportunity to address the food shortages without overburdening the land. Mushroom is a great source of vitamin D and protein, which is not found in other foods or dietary supplements (Pinto et al., 2020) [11]. Mushrooms contain fewer calories, and a little amount of sodium and do not contain cholesterol, fat & gluten. Mushrooms are said to have a wide range of nutritional benefits, including the ability to treat or prevent conditions including Parkinson's, Alzheimer's, hypertension, and a higher risk of stroke (Arya, 2022) [1].
Due to their anticancer properties, they are also used to lessen the possibility of cancer invasion and metastasis (Valverde et al., 2015) [20]. It is seen that in many developing nations, mushroom cultivation provides employment opportunities to rural and urban poor people. The Western zone of Tamil Nadu is a major hub for mushroom production, contributing approximately 21-30% to the state's total output. Although mushroom cultivation is considered a profitable enterprise, its adoption among farmers remains suboptimal due to a variety of challenges. These include shortages in essential materials such as spawn and compost, obstacles in securing loans, inadequate marketing support, lack of awareness regarding the nutritional benefits of mushrooms, limited technical guidance, inconsistent production levels, the perishable nature of mushrooms, difficulties in transportation, labor-intensive compost preparation, limited post-harvest processing options, and a lack of regulatory frameworks. Despite these hurdles, mushroom cultivation presents a low-risk, lucrative opportunity in agribusiness due to its high market prices. This research paper will examine the production and marketing challenges faced by mushroom enterprises in the Western zone of Tamil Nadu. By identifying and analyzing the constraints related to raw material availability, financing, marketing, technical support, and post-harvest processing, this study seeks to provide insights into how these challenges can be addressed to improve the adoption and success of mushroom cultivation among local farmers.

2. Literature review
Tijani (2019) [19] study discovered that 94.4% of the participants knew about mushroom production. The primary challenge faced by mushroom farmers was poor sales, with 72.7% experiencing this constraint. Training requirements were identified in various aspects including substrate mixing/exposure period (42.9%), maintaining infection-free conditions (91.4%), chemical preservation (88.8%), and quick freezing (71.8%). Overall, a majority of the farmers (63.3%) expressed high training needs. Karthick and Hamsalakshmi (2016) [7] research on marketing issues faced by mushroom cultivation and disease management, including spawn unavailability, lack of technical information, and exploitation by consultants. The rising labor wages emphasize the need for mechanization in various cultivation activities. Thilakaratna and Pathirana (2018) [18] carried out a study on the challenges encountered by farmers in mushroom cultivation. They found that the main issues included limited knowledge of mushroom cultivation and disease management, inadequate financial support, and challenges in accessing local markets and producing value-added mushroom products. Singh and Singh (2014) [15] revealed the challenges faced by mushroom growers in production and marketing include insufficient and low-quality spawn, lack of market assurance, price fluctuations, inadequate canning and processing units, and the absence of refrigeration facilities. To achieve higher production levels and increase consumption, there is a need for refrigeration facilities, emphasizing the nutritional importance of mushrooms, and raising public awareness for better sales outcomes. Kangotra and Chauhan (2014) in their study identified key constraints in mushroom production that demand urgent attention from policymakers. These constraints include insufficient supply of compost bags with spawn, poor quality of compost material, low prices, and the prevalence of diseases. Gautam et al. (2014) [3] in their study identified key constraints affecting the adoption of mushroom production enterprises. These constraints included the absence of suitable marketing channels, the distant location of proper markets, and insufficient government support. These factors significantly contributed to the low adoption and limited growth of mushroom production ventures. Singh et al. (2015) [14] carried out a study in Haryana, India, to identify the factors constraining mushroom production and marketing. Factor analysis revealed 11 factors, including marketing infrastructure, input infrastructure, farmers' leadership and skill, institutional infrastructure, farmers' service societies, advisory-cum-facilitating infrastructure, farmers' illiteracy and finance, debt management and marketing services, technical know-how service, production risk, human resource management service, and production-promoting infrastructure, which explained about 65% of the variations in the specified variables.

3. Materials and Methods
The Western part of Tamil Nadu has been chosen as a study area since it accounts for the highest share of total mushroom production in Tamil Nadu. The Coimbatore and Erode districts of the western zones of Tamil Nadu were specifically chosen as it is the leading growing region of the state. The participants for the present analysis are preferred using simple random Sampling. The study sample size was 40. The study respondents were mushroom farmers who have been growing mushrooms on small, medium, and big scales, under the study's objectives. For each of the chosen areas, a list of mushroom-growing farmers, wholesalers, and retailers was compiled independently. Primary data were collected from the mushroom enterprises, wholesalers and retailers through face-to-face interviews using a well-structured interview schedule.

Table 1: Distribution of Sample in the Study Area

<table>
<thead>
<tr>
<th>No. Sample Respondents</th>
<th>Coimbatore</th>
<th>Erode</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mushroom Enterprise</td>
<td>20</td>
<td>20</td>
<td>40</td>
</tr>
<tr>
<td>Wholesalers</td>
<td>5</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Retailers</td>
<td>5</td>
<td>5</td>
<td>10</td>
</tr>
</tbody>
</table>

3.1 Conventional analysis
Age, education levels, and cultivation experience are socioeconomic factors that have been studied using simple average and percentage analyses.

3.2 Percentage analysis
Percentages were employed in the descriptive analysis to facilitate comparisons. The percentage for a given cell was derived by multiplying the frequency of that cell by 100 and then dividing it by the total number of respondents within that specific cell.

\[
\text{Percentage (%) = } \frac{\text{Number of respondents}}{\text{Total Number of respondents}} \times 100
\]
3.3 Average
This average denotes the central or representative value within a dataset, typically expressed as the mode, median, or mean. It is obtained by dividing the sum of all values in the set by the total number of values.

\[
\text{Average} = \frac{\text{The sum of all values}}{\text{Total number of values}}
\]

3.4 Garrett’s ranking technique
Dhanavandan (2016) \(^2\) used a scoring method for converting ranks into scores, specifically designed to handle cases where the number of ranked items varies among respondents called the Garrett ranking technique. Participants were requested to rank the challenges encountered by the mushroom enterprise in both production and marketing aspects. Garrett's ranking technique involves transforming these ranks into percentage positions using a specific formula.

\[
\text{Percentage position} = \frac{100 \times (R_j - 0.5)}{N_j}
\]

Where,
- \(R_j\) = Rank given for ith factor by jth individual
- \(N_j\) = Number of factors ranked by jth individual

Based on Garrett's table, the percentage position estimate is transformed into scores for each constraint. The scores of all respondents are then aggregated, and the mean value is calculated. Subsequently, these means are arranged in descending order. The factor with the highest mean value is considered the most significant and is assigned the highest rank, while the one with the lowest mean value is given the lowest rank.

4. Results and Discussion
4.1 General Characteristics of Respondents
The General characteristics of the sample respondents such as age, educational status, gender, occupational status, experience in mushroom entrepreneurship, mushroom type etc., would serve as the prerequisite for a better understanding of mushroom enterprises in the western region of Tamil Nadu in table 2.

Table 2: Demographic profile

<table>
<thead>
<tr>
<th>Factors</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Young Age(&lt;35 years)</td>
<td>19</td>
<td>47.50</td>
</tr>
<tr>
<td>Middle Age(36-50 years)</td>
<td>14</td>
<td>35.00</td>
</tr>
<tr>
<td>Old Age(&gt;50 years)</td>
<td>7</td>
<td>17.50</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>31</td>
<td>77.5</td>
</tr>
<tr>
<td>Female</td>
<td>9</td>
<td>22.5</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Illiterate</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Primary</td>
<td>1</td>
<td>2.5</td>
</tr>
<tr>
<td>Secondary and Higher Secondary</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>Graduation</td>
<td>26</td>
<td>65</td>
</tr>
<tr>
<td>Post-Graduation and Above</td>
<td>9</td>
<td>22.5</td>
</tr>
<tr>
<td>Occupational Status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student</td>
<td>3</td>
<td>7.5</td>
</tr>
<tr>
<td>Employed</td>
<td>1</td>
<td>2.5</td>
</tr>
<tr>
<td>Self-employed (Business Owner/Freelancer)</td>
<td>23</td>
<td>57.5</td>
</tr>
<tr>
<td>Homemaker</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Retired</td>
<td>11</td>
<td>27.5</td>
</tr>
<tr>
<td>Experience in Mushroom Entrepreneurship</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 2 years</td>
<td>22</td>
<td>55.00</td>
</tr>
<tr>
<td>Two-Five years</td>
<td>12</td>
<td>30.00</td>
</tr>
<tr>
<td>Above Five years</td>
<td>6</td>
<td>15.00</td>
</tr>
<tr>
<td>Mushroom type</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oyster Mushroom (Pleurotus spp.)</td>
<td>9</td>
<td>22.50</td>
</tr>
<tr>
<td>Milky Mushroom (Calocybe indica)</td>
<td>5</td>
<td>12.50</td>
</tr>
<tr>
<td>Oyster + Milky Mushroom</td>
<td>22</td>
<td>55.00</td>
</tr>
<tr>
<td>White Button Mushroom</td>
<td>33</td>
<td>36.67</td>
</tr>
</tbody>
</table>

4.2 Category of Mushroom Enterprise
The information in table 3 indicates that the mushroom growers were divided into three segments: small (up to 500 bags), medium (>500-1000), and large (>1000) farmers, categorized by the cumulative frequency total method based on the number of bags used for mushroom production.

Table 3: Profile of growers categorized by the quantity of bags

<table>
<thead>
<tr>
<th>S. No.</th>
<th>No. of Bags</th>
<th>Categories</th>
<th>No. of Respondents</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Up to 500</td>
<td>Small</td>
<td>25</td>
<td>62.5</td>
</tr>
<tr>
<td>2</td>
<td>500 to 1000</td>
<td>Medium</td>
<td>12</td>
<td>30</td>
</tr>
<tr>
<td>3</td>
<td>&gt; 1000</td>
<td>Large</td>
<td>3</td>
<td>7.5</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td>40</td>
<td>100</td>
</tr>
</tbody>
</table>
The classification of mushroom growers based on the quantity of bags used for production reveals distinct categories. The majority, constituting 62.5%, falls within the small category, utilizing up to 500 bags. The Medium category, involving 500 to 1000 bags, comprises 30% of the respondents. A smaller yet notable proportion of 7.5% belongs to the large category, using more than 1000 bags. This distribution reflects the varying scale of mushroom cultivation practices among the surveyed growers, providing insight into the diversity of production methods within the industry.

4.3 Production challenges encountered by enterprises

The challenges encountered by Enterprises in Production were evaluated through the Garrett Ranking Technique, and the outcomes are presented in table 4.

Table 4: Production challenges encountered by enterprises

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Production Constraints</th>
<th>Garrett Score</th>
<th>Mean Score</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Lack of labour availability</td>
<td>86</td>
<td>79.67</td>
<td>I</td>
</tr>
<tr>
<td>2.</td>
<td>High pests and diseases attack</td>
<td>76</td>
<td>74.98</td>
<td>II</td>
</tr>
<tr>
<td>3.</td>
<td>Lack of extension facilities (E.g.: Marketing linkage)</td>
<td>70</td>
<td>71.28</td>
<td>III</td>
</tr>
<tr>
<td>4.</td>
<td>Non-availability of spawn</td>
<td>65</td>
<td>68.00</td>
<td>IV</td>
</tr>
<tr>
<td>5.</td>
<td>Availability of labour at Higher wages</td>
<td>61</td>
<td>62.40</td>
<td>V</td>
</tr>
<tr>
<td>6.</td>
<td>Damage during Harvesting</td>
<td>57</td>
<td>56.38</td>
<td>VI</td>
</tr>
<tr>
<td>7.</td>
<td>Lack of improved technology</td>
<td>54</td>
<td>54.13</td>
<td>VII</td>
</tr>
<tr>
<td>8.</td>
<td>Lack of training</td>
<td>50</td>
<td>49.28</td>
<td>VIII</td>
</tr>
<tr>
<td>9.</td>
<td>Compost &amp; quality spawn preparation/availability</td>
<td>47</td>
<td>47.38</td>
<td>XI</td>
</tr>
<tr>
<td>10.</td>
<td>High wastage due to Mismanagement</td>
<td>44</td>
<td>44.25</td>
<td>X</td>
</tr>
<tr>
<td>11.</td>
<td>Lack of awareness</td>
<td>40</td>
<td>39.50</td>
<td>XI</td>
</tr>
<tr>
<td>12.</td>
<td>Non-availability of equipment</td>
<td>36</td>
<td>33.73</td>
<td>XII</td>
</tr>
<tr>
<td>13.</td>
<td>Poor harvest management</td>
<td>31</td>
<td>29.93</td>
<td>XIII</td>
</tr>
<tr>
<td>14.</td>
<td>Lack of knowledge</td>
<td>25</td>
<td>27.55</td>
<td>XIV</td>
</tr>
<tr>
<td>15.</td>
<td>Non-availability of compost bags</td>
<td>17</td>
<td>20.58</td>
<td>XV</td>
</tr>
</tbody>
</table>

The table 4 presents a comprehensive assessment of production challenges faced by enterprises involved in mushroom cultivation, ranked based on their mean scores obtained through the Garrett Ranking Technique. The scores reflect the severity of the constraints. The top five challenges include the lack of available labour ranked as the top production challenge, with a mean score of 79.67 poses a significant obstacle. This constraint impacts efficient mushroom cultivation and harvesting processes, potentially leading to reduced productivity and increased costs. The challenge of high pests and diseases attacks with a mean score of 74.98, stands as the second-ranking issue. This constraint negatively affects mushroom quality and yield, demanding effective pest management strategies to maintain healthy production. The lack of extension facilities, including essential marketing linkages, presents a notable challenge ranked third with a mean score of 71.28. This hinders the enterprises’ ability to access broader markets and gain valuable insights into market trends and demand. Non-availability of spawn (Rank IV, Mean Score 68.00) underscores the criticality of ensuring a consistent supply of quality mushroom spawn. The availability of labour at Higher wages (Rank V, Mean Score 62.40) emphasizes the challenges posed by labour costs. These ranked constraints shed light on the core issues impeding successful mushroom cultivation and provide valuable insights for strategizing interventions to enhance production efficiency and overcome these obstacles.

4.4 Marketing challenges encountered by enterprises

The challenges encountered by Enterprises in Marketing were evaluated through the Garrett Ranking Technique, and the outcomes are presented in table 5.

Table 5: Marketing challenges faced by mushroom enterprises

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Marketing Constraints</th>
<th>Garrett Score</th>
<th>Mean Score</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Lack of Regular Demand</td>
<td>86</td>
<td>79.18</td>
<td>I</td>
</tr>
<tr>
<td>2.</td>
<td>High involvement of Intermediaries</td>
<td>76</td>
<td>73.88</td>
<td>II</td>
</tr>
<tr>
<td>3.</td>
<td>Lack of Government Support</td>
<td>70</td>
<td>71.18</td>
<td>III</td>
</tr>
<tr>
<td>4.</td>
<td>Commercial rate of electricity tariff</td>
<td>65</td>
<td>67.48</td>
<td>IV</td>
</tr>
<tr>
<td>5.</td>
<td>High Transportation Charges</td>
<td>61</td>
<td>63.03</td>
<td>V</td>
</tr>
<tr>
<td>6.</td>
<td>Lack of market information</td>
<td>57</td>
<td>56.78</td>
<td>VI</td>
</tr>
<tr>
<td>7.</td>
<td>Uncontrolled price structure</td>
<td>54</td>
<td>54.23</td>
<td>VII</td>
</tr>
<tr>
<td>8.</td>
<td>Lack of Infrastructure (Storage facilities, etc.)</td>
<td>50</td>
<td>50.18</td>
<td>VIII</td>
</tr>
<tr>
<td>9.</td>
<td>Lack of regulated markets</td>
<td>47</td>
<td>46.95</td>
<td>XI</td>
</tr>
<tr>
<td>10.</td>
<td>Delayed payments</td>
<td>44</td>
<td>44.30</td>
<td>X</td>
</tr>
<tr>
<td>11.</td>
<td>Lack of grading standards</td>
<td>40</td>
<td>39.88</td>
<td>XI</td>
</tr>
<tr>
<td>12.</td>
<td>Pre-cooling &amp; storage facility</td>
<td>36</td>
<td>33.73</td>
<td>XII</td>
</tr>
<tr>
<td>13.</td>
<td>Marketing facility improvement</td>
<td>31</td>
<td>30.40</td>
<td>XIII</td>
</tr>
<tr>
<td>14.</td>
<td>Lack of remunerative Price for mushroom</td>
<td>25</td>
<td>26.65</td>
<td>XIV</td>
</tr>
<tr>
<td>15.</td>
<td>Lack of quality control and certification</td>
<td>17</td>
<td>21.00</td>
<td>XV</td>
</tr>
</tbody>
</table>

The table 5 presents the marketing challenges faced by mushroom enterprises, ranked according to their mean scores. The top-ranked challenge of Lack of Regular Demand (mean score of 79.18) reflects the inconsistent market dynamics for mushrooms. This constraint points to fluctuating consumer preferences and inadequate demand forecasting mechanisms, causing uncertainty for mushroom enterprises in terms of production planning and market supply. High Involvement of Intermediaries ranked second (mean score of 73.88), underscores the role of intermediaries in the marketing process. This challenge suggests that multiple layers of intermediaries can lead to reduced profit margins for growers. The presence of intermediaries often leads to increased prices for consumers and reduced returns for growers. At the third rank (mean score: 71.18), the lack of Government Support highlights the need for stronger policy backing to facilitate mushroom marketing. This challenge indicates that limited policy interventions and inadequate initiatives to promote mushroom cultivation and marketing are hindering the growth of the industry. Government support could enhance infrastructure, training, and market linkages, fostering a conducive environment for mushroom enterprises. The issue of the Commercial rate of electricity tariff ranks fourth (mean score: 67.48), impacting the cost structure. High Transportation Charges rank fifth (mean score: 63.03), indicating the cost burden of transporting mushrooms to various markets. These top-ranked constraints underscore the complex interplay of demand, intermediaries, governmental support, cost factors, and transportation challenges, shaping the marketing landscape for mushroom enterprises.

5. Conclusion

The growing interest in mushrooms as a nutritious and medicinal food source has driven their popularity as a future vegetable. Their cultivation offers economic benefits to
farming communities and opportunities for non-agricultural employment, as it can help small family businesses diversify their income sources. Additionally, mushroom farming aids in the recycling of agricultural waste, contributing to environmental sustainability.

However, challenges in production and marketing are significant barriers to the adoption of mushroom cultivation. Farmers face issues such as lack of access to quality spawn and compost, high labor costs, and difficulties in obtaining financial support. Marketing challenges include inconsistent demand, the presence of intermediaries, and lack of government support. These constraints impact both productivity and profitability. Research in Tamil Nadu, a major mushroom-producing region, highlights the need for interventions in technical training, infrastructure, and policy support to address these challenges. By improving access to resources and market linkages, and promoting the nutritional benefits of mushrooms, farmers can achieve greater success in mushroom cultivation.

In conclusion, overcoming these constraints can lead to enhanced mushroom production and marketing, ultimately benefiting local farmers and contributing to food security and sustainable agricultural practices.

6. References