Asian Journal of Advances in Agricultural Research

Volume 22, Issue 3, Page 1-8, 2023; Article no.AJAAR.100751
ISSN: 2456-8864

Constraints and Suggestions Regarding Supply Chain of Mushroom Cultivation in Dehradun District of Uttarakhand, India

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

Article Information

DOI: 10.9734/AJAAR/2023/v22i3439

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/100751

Original Research Article

Received: 25/03/2023
Accepted: 27/05/2023
Published: 31/05/2023

ABSTRACT

The cultivation of mushrooms has gained significant attention as an alternative agricultural practice due to its high nutritional value, medicinal properties, and eco-friendly nature. However, the effective management of the supply chain in mushroom cultivation presents numerous challenges. This research paper aims to identify the constraints associated with the supply chain of mushroom cultivation and provide suggestions for their improvement.The study was conducted in 2023 (February – March) in the Raipur block of Dehradun. The data were collected via questionnaire and direct interview from 60 growers and 20 traders. Region was specifically chosen due to the significant presence of growers and traders. The reason behind this selection was the growers' shift towards mushroom cultivation as a result of untimely rains and crop damage. Mushroom cultivation

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offered a controlled indoor environment, mitigating the risks associated with unpredictable weather conditions. However, over time, both the growers and traders encountered challenges in the management aspects of cultivation, as well as post-harvesting. Grower perceived major constraints were Inadequate supply of spawn at appropriate time, Unfavourable climatic conditions, no cold storage facilities, poor marketing avenues and people regard mushroom as a non-veg food were ranked first. It is therefore recommended that constraints should be checked to maximize the production. To do that, extension agencies should take up skill-oriented training programmes and awareness programmes, cold storage facilities should be provided to accelerate the self-life.

Keywords: Supply chain; mushroom; constraints.

1. INTRODUCTION

Mushroom cultivation has gained significant recognition as a promising agricultural practice due to its nutritional value, versatility, and potential for sustainable food production. However, the efficiency and profitability of mushroom cultivation are heavily influenced by the constraints within its supply chain. The supply chain encompasses various stages, including raw material sourcing, production processes, distribution, and marketing, which are interconnected and crucial for the success of the industry. The supply chain of mushroom cultivation faces numerous challenges that limit its potential for growth and optimization. These constraints can be attributed to factors such as the availability and quality of raw materials, production process variability, distribution inefficiencies, and marketing limitations. Addressing these constraints is essential to unlock the full potential of mushroom cultivation and ensure a sustainable supply chain that meets the growing demand for mushrooms [1-3].

The purpose of this research paper is to explore the constraints and challenges faced within the supply chain of mushroom cultivation and provide suggestions to overcome these hurdles. By identifying and addressing these constraints, stakeholders can enhance the efficiency, quality, and sustainability of the mushroom supply chain, ultimately benefiting both producers and consumers alike.The paper will delve into the various aspects of the supply chain, starting with the constraints associated with raw material sourcing. This includes examining the availability and quality of mushroom spawn, sourcing of substrate materials, and the dependence on seasonal availability of raw materials. Next, the production process constraints will be analyzed, focusing on suboptimal cultivation techniques, the lack of standardized production practices, and inconsistent quality control measures. Furthermore, the paper will explore the distribution constraints within the mushroom cultivation supply chain, including challenges related to transportation infrastructure, storage and handling facilities, and the implementation of cold chain management practices. Lastly, the marketing constraints, such as limited consumer awareness and education, inadequate branding and packaging, and insufficient market research and segmentation, will be examined.

By addressing the constraints within the supply chain of mushroom cultivation and implementing the suggested measures, stakeholders can foster a more efficient, sustainable, and profitable industry. This research aims to contribute to the existing knowledge and understanding of the challenges and opportunities in the mushroom cultivation supply chain, providing valuable insights for practitioners, researchers, and policymakers to support the growth and development of the industry.

2. REVIEW OF LITERATURE

- Deliya et. al. [4] reported wastages of nearly 30% of food commodities and also less remuneration for the farmers due to non-availability of cold storage and unorganized market and retail prices.

- Negi and Anand [5] found that cold chain facilities, fragmented supply chain, linkage and integration between the partners, taxation issues, infrastructure facilities, cost packaging material, technology and techniques, supply inefficiency, supply chain losses are the factor which constitute serious challenge and are affecting the overall growth of the agricultural growth of India.

- Rais and Sheoran [6] reported that India is the world largest producer of many horticultural produces including mushrooms, but there still exist huge gap

between per capita demand and supply due to enormous waste during post-harvest storage and handling caused by lack of temperature-controlled vehicles, unavailability of cold chain facilities in various parts of country for preserving the produce which results in immense losses to the nation.

- Rahman et al. [7] emphasize the significance of lack of capital, poor quality seed, insect attack, high temperature in summer and inappropriate trimming of production were major problems he suggested removing middleman, proper monitoring, training for the growers and expansion of market.

- Vibhav Gupta et al. [8] Concluded that lacks of family support, lack of knowledge, dominance of male members in the family are the constraints faced by farm women. Farm women faced major constraints in decision making process about various agriculture related activities were: social/cultural norms and lack of self confidence in decision. The major suggestions offered by farm women to overcome the constraints were more technical guidance regarding scientific farming should be given to farm women and training should be imparted at village level.

- Singh Manjot et al. [9] categorized major problems as production, financial, marketing and transportation in which he found that preparation of compost, ventilation, lack of subsidies, in mushroom cultivation, fluctuating market prices and lack of transport.

3. OBJECTIVE

- To investigate the constraints faced by various stakeholders and traders.
- To provide practical suggestions and recommendations to address the identified constraints and challenges.

4. RESEARCH METHODOLOGY

Study was conducted in Dehradun District of Uttarakhand State due to great production of mushroom and availability of growers and traders. Various levels of screening were performed for the selection of district, block, villages and respondents. Out of 13 districtsDehradun was selected, as the production of mushroom there was high. There is total 6 blocks in Dehradun out of which Raipur block was selected due to the maximum availability of mushroom growers and traders. The data was collected from the respondents on the basis of purposive sampling.

Primary data was collected from personal interview and pre-structured questionnaire. Further secondary data was collected from total 80 respondents, out of which 60 were growers (Small- 35, medium- 27 and large- 18 growers and the growers were divided on the basis of their annual income) and 20 were traders (Wholeseller- 8 and retailer- 12).

4.1 Analytical Tools and Techniques

The data were analyzed using Garret ranking. The results have been presented using tables. Garrett ranking technique was employed to determine the most faced factor (constraints) in supply chain of mushroom. On the basis of primary and secondary datarespondents' perception was analyzed and suggestion were gathered.

5. RESULTS AND DISCUSSION

The objective of this project shows various constraints faced by stakeholders and traders. From cultivation to providing the produce to end customers various procedures are there and with it comes various constraints.

According to the response received from the growers. It was found that the main problems faced by the growers regarding input were problem of inadequate supply of spawn at appropriate time was ranked I^{st} (with mean score60.76). Farmers having problem of poor quality of spawn ranked II^{nd} (with mean score 58.28), problem of procurement of raw material at III^{rd} rank (with mean score 56.21), unavailability of chemical ranked IV^{th} (with mean score 49.46), lack of technical and training knowledge ranked V^{th} (with mean score 47.85), non-availability of compost when needed ranked VI^{th} (with mean score 45.08) and difficulty in arranging loan was ranked VII^{th} (with mean score 40.83) as presented.

Table 1. Input constraints

Factors	I	II	III	IV	V	VI	VII	Garret value	Garret score	Total	Mean	Rank
Poor quality of spawn	16	12	9	7	8	5	3	7.14	78	3497	58.28	**II**
Procurement of raw material is time consuming	15	10	9	8	7	6	5	21.42	66	3373	56.21	**III**
Inadequate supply of spawn at appropriate time	18	12	10	9	6	4	1	35.71	58	3646	60.76	**I**
Non availability of compost when needed	3	6	12	6	10	11	12	50	50	2705	45.08	**VI**
Unavailability of chemicals	7	6	5	12	10	12	13	64.28	43	2968	49.46	**IV**
Lack of training and technical knowledge	5	10	8	8	9	10	10	78.57	35	2871	47.85	**V**
Difficulty in arranging loan	1	4	7	10	10	12	16	92.85	22	2450	40.83	**VII**

Table 2. Challenges related to crop management

Factors	I	II	III	Garret value	Garret score	Total	Mean	Rank
Frequent occurrence of diseases in mushroom	10	15	35	16.6	69	2525	42.08	**III**
Poor and irregular production	15	25	20	50	50	2905	48.41	**II**
Unfavourable climatic condition	35	20	5	83.3	31	3570	59.5	**I**

Table 3. Infrastructural/ transportation constraints

Factors	I	II	III	IV	V	Garret value	Garret score	Total	Mean	Rank
No cold storage facility	22	18	12	6	2	10	75	3618	60.3	**I**
Seasonal activity	5	9	14	10	22	30	60	2543	42.38	**IV**
Lack of space	3	7	12	14	24	50	50	2381	39.68	**V**
Lack of refrigerated vans	16	15	12	12	5	70	40	3300	55	**II**
High cost of transportation	14	11	10	18	7	90	24	3098	51.63	**III**

Table 4. Marketing constraints faced by stakeholder in mushroom supply chain

Factors	I	II	III	IV	V	VI	VII	VIII	IX	X	Garret value	Garret score	Total	Mean	Rank
Distant location of markets	0	0	5	5	7	7	8	5	8	11	5	81	2256	37.6	**X**
Poor marketing avenues	11	12	10	8	8	4	3	1	2	1	15	70	3672	61.2	**I**
Less demand for mushroom	1	1	3	5	7	7	5	9	9	13	25	63	2368	39.46	**IX**
Non availability of proper agency to purchase mushroom	8	11	8	7	5	4	4	4	6	3	35	58	3324	55.4	**IV**
Erratic local demand for mushroom	13	10	9	7	6	5	4	3	2	1	45	52	3633	60.55	**II**
Malpractices of middlemen (less share of producer in consumer rupees)	7	9	6	6	6	5	7	6	5	3	55	48	3190	53.16	**V**
Lack of transport facility	2	1	1	7	4	8	10	8	8	11	65	42	2439	40.65	**VIII**
Perishable commodity result in losses	10	10	7	5	7	5	6	4	2	4	75	37	3375	56.25	**III**
No demand of other varieties of mushroom	3	2	4	6	5	8	9	9	7	7	85	29	2667	44.45	**VII**
No control over price fixation	5	4	7	4	5	6	7	8	8	6	95	18	2836	47.26	**VI**

Table 5. Social constraints

Factors	I	II	III	IV	Garret value	Garret score	Total	Mean	Rank
Negative attitude of society toward women entrepreneur	7	10	18	25	12.5	73	2538	42.3	**IV**
People regard mushroom as a non-veg food	24	19	10	7	37.5	56	3445	57.41	**I**
Misconception about mushroom consumption is injurious to health	18	17	16	9	62.5	44	3213	53.55	**II**
Lack of awareness about nutritional value of mushroom	11	14	16	19	87.5	27	2804	46.73	**III**

According to the response received from the growers, it was identified that major problem farmer facing during crop management was 'unfavourable climate condition at Ist rank 9with mean score 59.5), followed by poor and irregular production at IInd rank (with mean score 48.41) and frequency of disease in mushroom at IIIrd rank (with mean score 42.08) respectively.

According to the response received from the farmers. It was found that the major problem in infrastructural/ transportation was 'lack of cold storage facility' at Ist rank (with mean score 60.3), followed by lack of refrigerated vans at IInd rank (with mean score 55), high cost of transportation at IIIrd rank (with mean score 51.63), seasonal activity at IVth rank (with mean score 42.38) and lack of space at Vth rank (with mean score 39.68) respectively.

Response received from the farmers shows that "poor marketing avenues" has been ranked Ist (with mean score 61.2), "erratic local demand for mushroom" has been ranked IInd (with mean score 60.55), "high perishable commodity causes losses" has been ranked IIIrd (with mean score 56.25) as their major problem.Due to high perishability and lack of refrigerated transport, farmer sells the majorproduce in nearby region.

This response includes the entire three stakeholders in mushroom supply chain i.e., producer, commission agent and retailer.

Social constraints regarding mushroom which effects the sales was, "people regard mushroom as nonveg" has been ranked Ist(with mean score 57.41) as the major problem, followed by "people misconceive it as poisonousfood" has been ranked IInd (with mean score 53.55),rest is represented in the table and the ranks are given accordingly.

5.1 To Provide Practical Suggestions and Recommendations to Address the Identified Constraints and Challenges

The constraints within the supply chain of mushroom cultivation pose significant challenges to the efficiency and profitability of the industry. However,valuable suggestions and recommendations to address these constraints and enhance the overall effectiveness of the mushroom supply chain are addressed below:

- **For input problems**

Most mushroom producers had limited choice to spawn and substrate. As a result, they are constrained to produce mushroom using only wheat straw. Therefore, having substitute substrate ensure sustainable mushroom production in addition, spawn should be available in terms of quantity, quality and sustainability. Thus, there is a need to link higher educational and research institutes to KVKs and producers to scale up suitable spawn and substrate technologies.

- **Establishment of small cold storage near Mandi**

To extent the self-life and maintain round the year mushroom supply cold storage is recommended. This will reduce the post-harvest losses.

- **Processing of mushroom**

In the studied region most of the mushroom is sold in raw form no value addition is being done in any stage. Mushroom is perishable vegetable cash crop and producers have limited market options. As a result, they dispose it during over supply. Therefore, there is a need to increase the shelf life through value addition process.

- **For market problems**

Mushroom and spawn market are concentrated in the hands of spawn suppliers which makes mushroom market imperfect. As a result, most of the mushroom producers are exploited and discouraged. Therefore, government intervention required in terms of generating mushroom market information like other agricultural commodities, establish standard and quality control mechanism and link producers with potential markets. In addition, producers should communicate with each other and establish cooperatives and unions to overcome the problem.

- **Awareness**

In addition, continuous promotion may contribute to improve the awareness of the society about the nutritional and medicinal values of mushroom. Moreover, providing mushroom processing technologies at fair price needs focus of relevant body.

- Addressing these constraints and implementing the suggested improvement can lead to more efficient and sustainable mushroom supply chain. It would benefit not only traders and stakeholders but also the entire industry, consumer and the economy as well.

6. CONCLUSION

The study showed that problem of inadequate supply of spawn at appropriate time has been ranked Istas input constraint. In the study area it was found that highly ranked problem that growers are facing during crop management was unfavourable climatic conditions. According to the responses it was found that most ranked problem in infrastructural/ transportation constraint was lack of cold storage. The study revealed that highly perishable commodity causes losses, faced by stakeholders has been considered as a major marketing constraint. It was noticed that the major social constraint is people regard mushroom as a non-veg got the first rank. To overcome the constraintsit is recommended that, extension agenciesshould take up skill-oriented training programmes and awareness programmes,cold storage facilities should be provided to accelerate the self-life through value addition process.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/100751