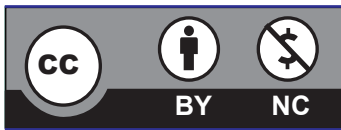


Research

## Prospects and Challenges of Mushroom Cultivation in Godavari Municipality, Nepal

Gopal Khadka

Lecturer, Department of Rural Development; Patan Multiple Campus,  
Tribhuvan University, Kathmandu, Nepal



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### INFO

#### Corresponding Author

**Gopal Khadka**

Lecturer,

Department of Rural  
Development,

Patan Multiple Campus,  
Tribhuvan University,  
Kathmandu, Nepal

#### E-mail

khadkajigopal@gmail.com

#### Orcid

<https://orcid.org/0009-0009-3655-1940>

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### ABSTRACT

Mushroom cultivation is a viable option for farmers in Nepal due to the availability of raw materials and a favorable environment. Oyster mushrooms are the preferred variety among Nepalese farmers, and they cultivate them throughout the year. This article focuses on the prospects and challenges of mushroom cultivation in Godavari Municipality, based on primary and secondary sources of data.

The primary data were collected through interviews with 20 farmers involved in mushroom farming. The study found that mushroom cultivation has high prospects due to its rich source of nutrition, source of income, and medicinal use. Additionally, mushrooms are a ready-to-eat food in various forms, such as fried, crispy, noodles, and more. They can also be used to make delicious pickles, chutney, cake, tea, and biscuits. Furthermore, mushrooms can be processed into powdered form, capsule form, canned products, and mushroom-enriched cosmetics such as soap, toothpaste, cream, oil, etc. By diversifying agricultural production and generating significant employment opportunities, mushroom farming can become a lifeline for rural and semi-urban areas. However, the study also found that mushroom cultivation faces challenges such as the high cost of raw materials, lack of labor, and an imperfect market. To mitigate these challenges, the local government must formulate effective policies to promote mushroom farming in the Nepalese context.

Mushroom cultivation has significant prospects in Godavari Municipality, Nepal, due to its nutritional value, medicinal uses, and various forms of consumption. However, there are also challenges that farmers face, such as the high cost of raw materials and lack of labor. By implementing effective policies, the local government can help to mitigate these challenges and promote mushroom farming as a viable and profitable crop for Nepalese farmers.

**Keywords:** oyster, super-food, labor-intensive, integrated farming, lifeline

## Introduction

Mushroom cultivation can become a viable and attractive activity for generating side-income for rural farmers and peri-urban dwellers since it does not require a lot of land, and the business scale depends on modest to low capital investment and labor use (Zhang et al., 2014; ECHOcommunity.org, 2015; FAO, n.d.; Prospects for Increasing Commercial Mushroom Production in Malaysia, 2016). Women and elders are reportedly suitable labor for the more labor-intensive aspects of the industry, such as filling substrate into plastic bags and harvesting (Marshall & Nair, 2009; Zhang et al., 2014). This can enhance their empowerment, allowing them to gain other farming skills, greater financial independence, and self-respect (Zhang et al., 2014). In several Asian countries such as China and Vietnam, mushroom farming is closely integrated into rice farming. After harvesting, rice straw is used as a substrate for growing straw mushrooms (Marshall & Nair, 2009). In China, contract farming has been emerging on a large scale. Farmers are provided with substrate bags, and the products are collected by the integrated enterprise (Zhang et al., 2014).

Mushrooms have a long history, and their description can be traced back to classical texts of Sanskrit, Greek, and Roman literature. The wild-growing mushrooms were picked for their aroma and palatability. France introduced the first cultivation of mushrooms in 1650, and the cultivation of mushrooms spread to England, America, and some other countries. In Asia, China, South Korea, and Taiwan were the first cultivators of mushrooms (Mychampi, 2018). The initial cultivation technique of mushrooms was foraging, picking them from their natural habitats in the woods. During this period, mushrooms were thought to be mysterious fruits and were only accessible by the wealthy. Mushroom farming is believed to have started in 600 A.D. Mass production of the fungi in Asia was not established until the 16th century, and it was not until the 19th century that this large-scale mushroom farming operation found its way to Europe. Today, there are thousands of types

of mushrooms, and they require little to thrive, making mushroom farming a low-risk business opportunity that has become a booming industry across the globe (FAO, 2018). According to the Food and Agriculture Organization of the United Nations statistics from 2016, China is the world's leading mushroom producer, while the United States and Italy are second and third. The total production was more than 10 million tons in 2016 (FAO, 2018).

## Problem Statement

Mushroom cultivation has become a popular choice for farmers in Nepal due to the availability of raw materials and a favorable environment. However, there are challenges that farmers face, such as the high cost of raw materials and lack of labor. Additionally, the market for mushrooms is imperfect, which can lead to difficulties in selling the crop. Therefore, there is a need to explore the prospects and challenges of mushroom cultivation in Godavari Municipality, Nepal (Raut, 2019; Science Publishing Group, 2019; Shrestha, 2011). The research aims to provide insights into the current scenario of the mushroom enterprise in the region and analyze its future prospects. The study also attempts to identify the mitigating measures that can be taken to promote mushroom farming as a viable and profitable crop for Nepalese farmers.

## Research Objective

This article is prepared to assess the problems and prospects of mushroom farming in Godavari, Lalitpur Nepal.

## Methodology

The research methodology employed in this study is a descriptive and analytical research design (Raut, S., 2019). The study aims to identify the prospects and constraints of mushroom farming in rural settings of urban areas from the producers' perspective. The study area is Lalitpur district Godavari municipality ward no 3, where 30 households cultivate mushrooms. Among them, 20 households were selected as respondents through a purposive sampling procedure for a detailed

study of mushroom farming in its natural real-life context. The study is based on both primary and secondary data (Raut, S. (2019):. Science Publishing Group. (2019). The primary data were collected through in-depth face-to-face structured interviews and observations. The secondary data were collected by reviewing mushroom farming-related literature through search engines (Raut, S. (2019). The questions of the in-depth structured interview were pretested before data collection Raut, S. (2019). The collected data was checked, coded, categorized, organized, and converted into a master data sheet. The data was presented in tables using MS-word and MS-excel. The data was analyzed descriptively through the Likert scale (Raut, S. (2019). The study provides valuable insights into the prospects and challenges of mushroom cultivation in Godavari Municipality, Nepal, and identifies mitigating measures that can be taken to promote mushroom farming as a viable and profitable crop for Nepalese farmers. The study is supported by several references, including research articles and studies related to mushroom farming in Nepal (Archives of Agriculture and Environmental Science).

## Results and Discussion

### Prospects of Mushroom Farming

Mushrooms are considered a unique ingredient in gourmet cuisine due to their great nutritional value (Valverde et al., 2015). Processing mushrooms into value-added products is an option to reduce losses due to quality deterioration and boost consumption (Kumar et al., 2014). Popular mushroom products available in markets include snacks, fried mushrooms, burgers, pastries, nuggets, popcorn, pickles, biscuits, ketchup, soup powder, and candy (Kumar et al., 2014).

Mushrooms are rich in water percentage, fiber carbohydrates, riboflavin, vitamins, and minerals, and most of them have antioxidant properties that can fight against diseases such as cancer, diabetes, blood pressure, and tumors, and boost immunity

against colds, influenza, and other viruses (Singh, 2007). Among the 12,000 species of mushrooms worldwide, at least 2,000 species show various degrees of edibility, but only about 35 species have been cultivated commercially, and about 20 are currently on an industrial scale (Kumar et al., 2014). Mushrooms are in prime focus in the food industry for their multi-functional benefits.

Nepal has a wide range of diversity in geographical conditions, and numerous species of mushrooms are found in its forests. Among the 1,300 wild mushroom species recorded in Nepal, some have high medicinal importance, 147 species are edible, and 100 species are poisonous (Bang et al., 2014; Adhikari, 2014). Due to urbanization and awareness of the health benefits of mushrooms, people have started cultivating mushrooms widely. Edible mushrooms can be grown in open places (field, forest, shade) and indoors (huts, tunnels, houses) and supplied in the markets. Farmers are able to cultivate mushrooms year-round in natural environments with different varieties like Shitake, oyster, and red mushrooms in Nepal. Mushroom cultivation is a fast-growing sector of agriculture practices because of its low input and high return in a short time, making it a potential milestone in the traditional agriculture system of Nepal. There are about 5,000 mushroom growers within Kathmandu valley and 6,000 growers in other districts.

Table 1 clarifies that all farmers agreed that mushrooms are a rich source of nutritious food. 90% of farmers consider it as an optimum utilization of farm residues, 70% of farmers realized the prospects of mushroom farming as a source of additional income and the best vegetarian food available, 65% of farmers confirm that it generates wealth from waste and can produce various kinds of food items, and 60% of farmers view the prospects of mushroom farming as low input and high output. The majority of respondents realized that it is the generator of self-employment, has medicinal value, and is sustainable manure-based farming.

**Table 1: Prospects of mushroom farming**

SN	Categories	(1)	(2)	(3)	(4)	(5)	Total
1	Rich sources of Nutritious food	50 %	50 %	-	-	-	100 %
2	Optimum utilization of farm residues	40 %	50 %	10 %	-	-	100 %
3	Source of additional income	30 %	40 %	10 %	10 %	10 %	100 %
4	Generator of self-employment	20 %	35 %	20 %	10 %	5 %	100 %
5	Development of new food products	25 %	40 %	15 %	10 %	10 %	100 %
6	Low input and high output	20 %	40 %	25 %	10 %	5 %	100 %
7	Medicinal used	20 %	35 %	20 %	10 %	5 %	100 %
8	Generating wealth from waste	25 %	40 %	15 %	10 %	10 %	100 %
9	Sustainable manure-based farming	20 %	30 %	20 %	15 %	15 %	100 %
10	Best vegetarian food available	30 %	40 %	10 %	10 %	10 %	100 %

*Strongly Agree (1), Agree (2), Don't Know (3), Disagree (4), Strongly Disagree (5) Source: field survey, 2022*

Mushroom farming is a sustainable practice that generates wealth from waste. The spent mushroom substrate can be processed into manure, promoting sustainable manure-based farming. Mushroom cultivation not only produces quality food but also creates a healthy environment, leads to employment generation, and empowers women. Mushroom cultivation utilizes vertical space and requires minimal land, making it possible to promote mushrooms in peri-urban and urban areas. Mushrooms are considered to be the highest protein producers per unit area per unit time.

Historically, mushrooms were collected from forests and fields and were considered food for the elite. Nowadays, mushrooms are widely available and are considered quality food with health benefits. In fact, mushrooms are among the best vegetarian food available. They are a rich protein source with essential amino acids and high digestibility.

Mushroom cultivation has emerged as an important activity for educated individuals, school dropouts, women, and landless people in rural areas. Considering the demand for quality foods, mushroom cultivation has become an important avocation. Many commercial units that grow mushrooms under controlled conditions have also been set up in different parts of Nepal.

Mushrooms are a low-calorie food with no starch and are rich in antioxidants, making them a delight for diabetics. They are also rich in fiber, making them good for the intestine and digestive system. They are a good source of vitamins, especially vitamin B complex. Mushrooms are the only vegetarian source of vitamin D and also have vitamin B12, which is not available in plants. They are also rich in minerals, including copper (heart-protective) and selenium (anti-cancer) Raut, S. (2019): Adhikari, M. K. (2014): Singh, R. B. (2007): Kumar, S., et al. (2014)& Shrestha, M. (2018).

#### **Problems Confronting during Production**

Mushroom farming is a challenging industry in Nepal. The initial investment required for improved technology is very high, and there are unstable farm-gate prices and profit margins. Additionally, the supply to the market is poor, and the increasing price of materials, such as rice straw, increases the investment. There is also a high risk of poor-quality mushroom spawn and the threat of diseases and pest attacks. Furthermore, there are no clear policies formulated for mushroom farming, trade, and quality control in Nepal, and the plans and policies presented by the government are inadequate. These challenges make it difficult for producers to operate in the mushroom industry (Adhikari, B., & Bhattarai, S. (2022): Shrestha, M. (2011).

**Table 2: Problems confronted during production**

SN	Categories	(1)	(2)	(3)	(4)	(5)	Total
1	Lack of cultivation house	-	-	10 %	40 %	50 %	100 %
2	lack of capital	40 %	50 %	10 %	-	-	100 %
3	Insects attack (flies and cockroaches)	30 %	40 %	20 %	5 %	5 %	100 %
4	Lack of the availability of quality spawn	30 %	40 %	10 %	5 %	5 %	100 %
5	The high price of raw materials	40 %	30 %	20 %	5 %	5 %	100 %
6	Lack of modern equipment	30 %	40 %	10 %	5 %	5 %	100 %
7	Lack of trained and experienced labor	30 %	50 %	10 %	5 %	5 %	100 %
8	Heavy rainfall during monsoon	30 %	50 %	10 %	5 %	5 %	100 %
9	The very low temperature in winter	40 %	40 %	20 %	-	-	100 %
10	Inappropriate timing of production	20 %	20 %	50 %	5 %	5 %	100 %

*Strongly Agree (1), Agree (2), Don't Know (3), Disagree (4), Strongly Disagree (5) Source: field survey, 2022*

On the basis of table-2, there are no problems with the cultivation house. During production, 90 percent farmers face the problems of capital shortage. 80 percent farmers face problems of low temperature during winter seasons, and lack of experienced labor force, and heavy rainfall during monsoon season. 70 percent respondents confronted with insect attacks, lack of quality spawn, lack of modern equipment during the production of mushroom.

Based on Table-2, the majority of farmers did not face any problems with the cultivation house. However, during production, 90% of farmers faced the problem of capital shortage, which is consistent with a previous study (Poudel, S., & Bajracharya, A., 2011). Additionally, 80% of farmers faced problems with low temperature during winter seasons, lack of experienced labor force, and heavy rainfall during the monsoon season. This is also consistent with a previous study that identified unstable weather conditions as a challenge for mushroom cultivation in Nepal (Shrestha, M. (2019). Furthermore, 70% of respondents faced insect attacks, lack of quality spawn, and lack of modern equipment during the production of mushrooms. These challenges have also been identified in previous studies as major constraints for mushroom cultivation in Nepal (Shrestha, M.

(2019). Overall, the results of Table-2 suggest that farmers in Godavari Municipality face similar challenges to those faced by mushroom farmers in other parts of Nepal.

#### **Problems Confronted during Marketing**

Based on Table-3, the majority of farmers faced challenges during the marketing of mushrooms. Specifically, 90% of farmers agreed that the absence of storage facilities is a barrier to marketing. This finding is consistent with a previous study that identified the lack of proper storage facilities as a major constraint for mushroom cultivation in Nepal (Raut, 2019). Additionally, 70% of respondents believed that high transportation costs, a large number of middlemen, a very limited wholesale market, and a lack of branding were problems during the marketing of mushrooms. These challenges have also been identified in previous studies as major constraints for mushroom cultivation in Nepal (Raut, 2019; Science Publishing Group, 2019). Furthermore, 60% of respondents indicated that the lack of advertisement was a barrier to the marketing of mushrooms. Overall, the results of Table-3 suggest that farmers in Godavari Municipality face similar challenges to those faced by mushroom farmers in other parts of Nepal.

**Table 3: Problems confronted during the marketing**

SN	Categories	(1)	(2)	(3)	(4)	(5)	Total
1	Lack of available markets	5 %	5 %	50 %	20 %	20 %	100 %
2	High transportation cost	30 %	40 %	20 %	5 %	5 %	100 %
3	A large number of middlemen	30 %	40 %	20 %	5 %	5 %	100 %
4	Very limited wholesale market	20 %	50 %	15 %	5 %	10 %	100 %
5	Unknown product to general consumers	-	-	20 %	30 %	50 %	100 %
6	Lacking advertising	20 %	40 %	30 %	5 %	5 %	100 %
7	Absence of storage facilities	40 %	50 %	10 %	-	-	100 %
8	Lack of branding	30 %	40 %	20 %	5%	5%	100 %

*Strongly Agree (1), Agree (2), Don't Know (3), Disagree (4), Strongly Disagree (5) Source: field survey,2022*

### Measures to Promote Mushroom Farming

Mushroom farming is a promising industry in Nepal, particularly the cultivation of oyster mushroom species, which is extensively grown throughout the year. Mushroom is considered a nutritious food and dietary supplement in Nepal, and small-scale mushroom farming provides opportunities for disadvantaged groups, such as landless, rural women, illiterate, adolescents, old age and physically disabled people, schedule caste people, and indigenous people. Mushroom farming is an alternative form of agriculture that plays a vital role in informal employment creation and economic development, especially in rural areas. However, there are challenges in production and marketing, such as the absence of proper

storage facilities, unstable farm-gate prices, high transportation costs, a large number of middlemen, a very limited wholesale market, lack of branding, and lack of advertisement. To promote the sustainable development of mushroom farming, the government should formulate effective plans and policies, provide skilled development training, awareness programs, subsidies, and workshops by mushroom experts to farmers and the young generation. The concerned authority should also research various issues of mushroom production, distribution, and consumption. The findings of this study are consistent with previous research on mushroom farming in Nepal(Poudel, S., & Bajracharya, A. (2011): Bhattarai, S. P., & Shrestha, M. (2022): Philmush. (2013): Karki, S. (2015)& Bhattarai, S. P., & Shrestha, M. (2019). .

**Table 4: Measures to Promote Mushroom Farming**

SN	Categories	(1)	(2)	(3)	(4)	(5)	Total
1	Strengthening technical support	30 %	40 %	20 %	5 %	5 %	100 %
2	Easy procedures of capital supply	15 %	40 %	35 %	5 %	5 %	100 %
3	Provision of soft loan	50 %	50 %	-	-	-	100 %
4	Provision of quality raw materials	30 %	30 %	30 %	10 %	-	100 %
5	Provision of the labor force	20 %	35 %	20 %	15 %	10%	100 %
6	Provision of quality spawn	40 %	60 %	-	-	-	100 %
7	Establishment of an effective and perfect market.	40%	50%	10%	-	-	100 %
8	Promotion of mushrooms in new areas	20%	35%	35%	5%	5%	100 %
9	Establishment of storage facilities	40%	50%	10%	-	-	100 %
10	Strengthening the institutional framework	25 %	30 %	20 %	15 %	10%	100 %
11	Provision of insurance facilities	30 %	30 %	30 %	10 %	-	100 %
12	Provision of training /workshop	40%	50%	10%	-	-	100 %

*Strongly Agree (1), Agree (2), Don't Know (3), Disagree (4), Strongly Disagree (5) Source: field survey,2022*

Based on Table-4, the majority of respondents agreed that the provision of soft loans and quality spawn is essential to promote mushroom farming in Nepal. This finding is consistent with a previous review paper that identified access to finance and quality spawn as major constraints for mushroom cultivation in Nepal (Shrestha & Bajracharya, 2011; Shrestha et al., 2022). Additionally, 90% of respondents agreed that it is essential to establish an effective and perfect market, as well as establish storage facilities and provide training for the promotion of mushroom farming. This is also consistent with previous studies that identified the lack of proper storage facilities and inadequate marketing channels as major constraints for mushroom cultivation in Nepal (Shrestha & Bajracharya, 2011; Shrestha et al., 2019). Furthermore, 70% of respondents believed that strengthening technical support is necessary, while 60% of respondents supported the provision of insurance facilities and quality raw materials for the promotion of mushroom farming. These challenges have also been identified in previous studies as major constraints for mushroom cultivation in Nepal (Shrestha & Bajracharya, 2011; Shrestha et al., 2019; Adhikari et al., 2020). The majority of respondents gave their opinion to strengthen the institutional framework, promote mushroom farming in new areas, provide a labor force, and simplify the procedures of capital supply for the promotion of mushroom farming. Overall, the results of Table-4 suggest that farmers in Godavari Municipality face similar challenges to those faced by mushroom farmers in other parts of Nepal (Shrestha & Bajracharya, 2011; Shrestha et al., 2019; Adhikari et al., 2020). The concerned authorities should formulate more extension programs to increase the production, distribution, and consumption of mushrooms, and the national, state, and local level governments of Nepal should formulate effective plans and policies for the promotion of mushroom farming (Shrestha & Bajracharya, 2011; Shrestha et al., 2022). The provision of a wholesale market and effective distribution channels is essential to support the

sustainable development of mushroom farming and profit sharing of the farmers (Shrestha et al., 2019; Adhikari et al., 2020). Skilled development training about the cultivation of mushrooms, awareness programs regarding the importance of mushrooms, provision of subsidies for grassroots level people involved in mushroom farming, and workshops by mushroom experts to farmers and the young generation should be managed to increase healthy mushroom production (Shrestha et al., 2019; Adhikari et al., 2020).

### **Entrepreneurship scope for mushroom farming in virtual farming:**

**Market Research:** Conduct market research to identify the demand for mushrooms and the types of mushrooms that are in demand. This will help you determine the type of mushrooms to grow and the target market for your virtual mushroom farming business.

**Business Plan:** Develop a business plan that outlines the goals, objectives, and strategies for your virtual mushroom farming business. The plan should include details on the production process, marketing strategies, and financial projections.

**Virtual Farming Setup:** Set up a virtual farming system that includes the necessary equipment and software to grow mushrooms. This may include a virtual greenhouse, lighting, temperature and humidity control systems, and software to monitor and manage the growing process.

**Production Process:** Follow the steps of mushroom farming, which include composting, spawning, casing, pinning, and cropping

### **Use high-quality compost to provide the necessary nutrients for the mushrooms to grow**

**Marketing and Sales:** Develop a marketing strategy to promote your virtual mushroom farming business. This may include social media marketing, email marketing, and advertising on relevant websites. You can also sell your mushrooms online through e-commerce platforms or local farmers' markets.

**Legal Compliance:** Obtain the necessary licenses and permits to operate a mushroom farming business. This may include an FSSAI license for food safety compliance to make it internationally demanded product.

**Continuous Improvement:** Continuously improve your virtual mushroom farming business by experimenting with new techniques and technologies to increase production efficiency and quality. Stay up-to-date with the latest trends and developments in the mushroom farming industry

Starting a virtual mushroom farming business requires careful planning, research, and investment in the necessary equipment and software. However, with the growing demand for specialty mushrooms and the potential for high profits, it can be a lucrative entrepreneurial venture.

Recently virtual agriculture may bust mushroom farming also in case of Nepal using virtual agriculture industry 4.0 concept for Nepal (Mishra, A.K., et al., 2022).

## Conclusion

In conclusion, mushroom farming is a viable and economically attractive alternative form of agriculture in Nepal. It follows the principles of sustainable development and helps to materialize the concept of 'waste-to-wealth'. Despite some challenges during production and marketing, the demand for mushrooms is increasing rapidly in Nepal. The majority of farmers in Godavari Municipality face similar challenges to those faced by mushroom farmers in other parts of Nepal. The concerned authorities, including national, state, and local level governments, should formulate effective plans and policies for the promotion of mushroom farming. Local governments should play an active and major role in advocating for various aspects of mushroom cultivation, providing training, and different forms of incentives such as distributing prizes, providing soft loans to farmers for cultivation, producing booklets on mushroom cultivation technology, and providing other essential services

free of cost. To increase the volume of demand and encourage market orientation, it is mandatory to boost the commercial value of products either in a fresh or processed form. Public awareness would intensify consumers' consciousness and the value of mushrooms. Capacity-building programs for farmers, especially in cultivation techniques, access to appropriate varieties of spores, post-harvest care, and marketing could also be beneficial. An appropriate market distorting approach in the longer term could increase the scale of local markets and it could become a competitive and more significant agribusiness.

## Limitations of the Study

The study is just a contextual validity for Prospects and Challenges of Mushroom Cultivation in Godavari Municipality, Nepal. So, it has used limited literature without specific heading of literature and further similar research needed in different parts of Nepal to address the ecological differences across the zones and generate values chain analysis for particular zone.

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