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PRODUCTION PERFORMANCE OF MUSHROOM IN INDIA

Dr. Shilpa Sree. R [1], Dr. R. Govindasamy [2], Kaleeswari. G [3]

[1]*Assistant Professor, Department of Economics, Central University of Andhra Pradesh, Janthalur, Andhra Pradesh*

[2]*Assistant Professor, Department of Economics, Bharathiar University, Coimbatore – 46.*

[3]*Ph.D. Research Scholar, Department of Economics, Bharathiar University, Coimbatore –46.*

ABSTRACT----------

Agriculture is the backbone of India, underpinning the country's economy and sustaining the livelihoods of a significant portion of its population by contributing 18 percent gross domestic product in agriculture sector directly and indirectly. Within this vital sector, allied agricultural activities play a crucial role in enhancing agricultural economics by contributing to rural development, income diversification, employment generation, and sustainability. Among these activities, mushroom cultivation has emerged as a significant area of focus. This study aims to analyse the production in mushroom cultivation and examine the schemes available to support its growth. The compound annual growth rate for mushroom production has been calculated, revealing that states like Bihar, Jharkhand, and Rajasthan have exhibited sharp increases in production, while others like Madhya Pradesh and Nagaland have shown mild yet steady growth. The production data indicates that the mushroom industry in the northern region is expanding comparing to southern region.

KEY WORDS: *Mushroom, cultivation, production, countries, Northern India, Southern India, compound annual growth rate, trend line*----------

I. INTRODUCTION

The Indian economy heavily relies on agriculture, which provides the majority of food for its vast population and serves as a primary source of income. It supports the livelihoods of farmers and agricultural workers and encompasses transportation, processing, and selling of agricultural products. As of 2023-24, the agricultural sector contributes **18.2 per cent** to GDP and significantly impacts rural development by fostering income generation, eradicating poverty, and improving living standards. Specialized agricultural activities, such as sericulture, mushroom farming, aquaculture, poultry, and dairy farming, are in high demand and command high market value. This study focuses on mushroom production in India, with **Bihar** being the highest producer. Mushrooms are considered high-value crops, leading to a significant market demand, and mushroom farming has evolved into a specialized agricultural activity to meet this growing need.

Mushroom farming involves growing fungi for commercial or personal use. Common varieties include white button, oyster, shiitake, and Portobello mushrooms were cultivated indoors or outdoors. Commercial farms can produce large quantities to supply supermarkets and restaurants, while small-scale cultivation meets individual needs. Mushrooms are also used in traditional medicine. For farmers and entrepreneurs, mushroom farming can be a profitable venture, requiring specialized knowledge and management.

II. BACKGROUND OF THE STUDY

The history of mushroom farming is lengthy and fascinating, going all the way back to prehistoric times. Shiitake mushroom farming was first documented in China in the 12th century, where farmers were already growing them. Around the year 1700, shiitake mushroom cultivation on oak logs was first introduced to Japan.

Champignon mushrooms (Agaricus bisporus) were first grown in caverns in France in the late 17th century, marking the start of mushroom farming in Europe. The champignon mushroom gained popularity quickly and was soon grown in both Europe and the US. Commercial mushroom growing started in the United States around the beginning of the 20th century. Since Pennsylvania's establishment as the nation's first commercially successful mushroom farm in 1896, the state has grown significantly as the nation's primary mushroom production region. Today, mushroom farming is a multibillion-dollar industry that annually yields millions of pounds of the edible plant.

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III. WORLD SCENARIO

China's mushroom cultivation has grown rapidly over the past 30 years, with an annual growth rate of over 10 percent, contributing about 75 percent of global production. In 2022, it became the largest exporter of processed mushrooms, with $1.01 billion in exports to Hong Kong, Russia, and Vietnam. The industry supports over 25 million farmers and contributes to food security and rural development. Globally, mushroom farming is evolving, driven by demand for organic, locally grown, and exotic varieties.

Table 1: Top Ten Mushroom Producing Countries in World

Year	China	Japan	Poland	USA	Netherlands	India	Spain	Canada	Russia	France
2017	37.130	0.459	0.291	0.423	0.300	0.102	0.159	0.120	0.016	0.086
2018	37.901	0.467	0.200	0.416	0.300	0.134	0.166	0.126	0.031	0.083
2019	38.981	0.470	0.235	0.384	0.270	0.182	0.170	0.132	0.048	0.088
2020	40.008	0.471	0.320	0.370	0.260	0.211	0.166	0.133	0.086	0.080
2021	41.127	0.469	0.379	0.344	0.260	0.243	0.164	0.138	0.111	0.099
CAGR	**2.59**	**0.54**	**6.83**	**-5.04**	**-3.51**	**24.24**	**0.78**	**3.56**	**62.29**	**3.58**

Source: Food and Agriculture Organization

Table 1 highlights global mushroom production from 2017 to 2021. China remains the largest producer with steady growth (2.59 per cent), while India (24.24 per cent) and Russia (62.29 per cent) show the fastest growth, signalling emerging industries. Poland (6.83 per cent) strengthens its position in Europe. Japan (0.54 per cent), Spain (0.78 per cent), and France (3.58 per cent) show stable but mature markets with minimal growth. The USA (-5.04 per cent) and Netherlands (-3.51 per cent) face declines, likely due to market saturation or competition. Canada (3.56 per cent) shows moderate, steady growth.

IV. INDIAN SCENARIO

Mushroom cultivation in India began in the late 19th century, with N.W. Newton identifying species in 1886 and Dr. E.C. Boy conducting chemical analyses. Systematic paddy straw mushroom farming started in Coimbatore in 1943. By the 1960s, it spread to northern regions like Himachal Pradesh and Jammu & Kashmir, with key developments at Solan under ICAR. In 1964, Agaricus bisporus (white button mushrooms) was experimentally grown in Srinagar. During the 1980s, modern techniques, such as controlled environments, helped mushroom farming expand to states like Punjab, Haryana, Tamil Nadu, Karnataka, and Andhra Pradesh. The National Centre for Mushroom Research and Training (NCMRT) was established in 1983, boosting standardized production methods. Production rose from 100 tonnes in 1970 to 25,000 tonnes by 1993, with white button mushrooms dominating 90per cent of the output. Other varieties like paddy straw, oyster, shiitake, and milky mushrooms gained importance, especially in Karnataka and Kerala. Small-scale cultivation is common among small farmers or groups across India.

V. OBJECTIVES OF THE STUDY

This present study has two main objectives. They are as follows:

- To examine the production of mushroom in India.
- To analyze the schemes and subsidies of mushroom production in India.

VI. METHODOLOGY

In this study, the data of mushroom production has been collected from the period 2017 to 2024. The data has been collected from various secondary sources such as National Horticulture Board, NABARD, FAO, etc. CAGR and trend analyses were the major tools used in this study.

VII. REVIEW OF LITERATURE

Arunachalam et. al., (2023) analysed the production, export and import trends of mushroom production in India. The article collects the production, import and export data from 1997 to 2021. The study analysed the growth trend and reveal a favourable upswing in mushroom production for India and Tamil Nadu, but unfavourable downward trend was found in both the export and import of mushrooms in India, as indicated by the Compounded Annual Growth Rate analysis. **Surya Sidhant Rath and Sarba Narayan Mishra (2023)** focused on the production trends in mushroom growth in Odisha, India and world. It has been found out that from 2013-2022, the compound annual growth rate (CAGR) of mushroom production was 3 percent globally, 36 in India, and 16 percent in Odisha, with notable growth in states like Rajasthan, Bihar, and Chhattisgarh. Although some regions, particularly in north-eastern India, lag in production, there is significant potential for expansion due to the availability of agricultural residues and technological advancements, positioning mushrooms as a sustainable food source.

VIII. RESULTS AND DISCUSSIONS

Production in India

India primarily produces **button mushrooms**, followed by **oyster** and **milky mushrooms**, with states like **Haryana**, **Punjab**, **Uttar Pradesh**, and **Himachal Pradesh** being major producers.

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Table 2: Production of Mushroom in India

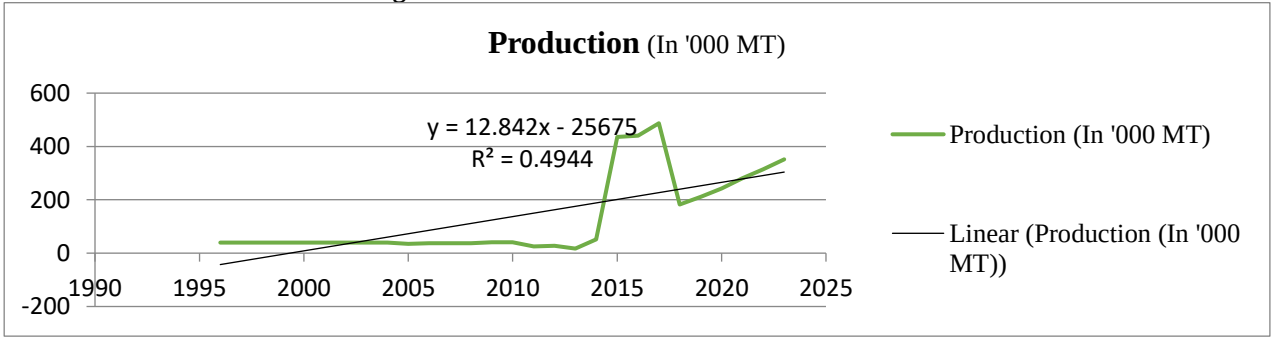
(in "000 MT)

Year	Production	Year	Production	Year	Production
1996-1997	40	2005-2006	35	2014-2015	51.1
1997-1998	40	2006-2007	37	2015-2016	436
1998-1999	40	2007-2008	36.9	2016-2017	441
1999-2000	40	2008-2009	37.3	2017-2018	487
2000-2001	40	2009-2010	40.7	2018-2019	182
2001-2002	40	2010-2011	40.7	2019-2020	211
2002-2003	40	2011-2012	25.7	2020-2021	242.9
2003-2004	40	2012-2013	28.2	2021-2022	280.4
2004-2005	40	2013-2014	17.1	2022-2023	314.8
		2023-2024 (3rd Advance Estimates)			351.1

Source: Indiastat

Table. 2 indicates the mushroom cultivation in India. The data has been collected from 1996- 1997 to 2023 - 2024 showing different phases. From 1996 -1997 to 2005 - 2006, production remained stable at 40,000 metric tonnes, followed by a slight decrease to 35,000 metric tonnes in 2005-2006. A significant decline occurred in 2011-2012, dropping to 25,700 metric tonnes, and further to 17,100 metric tonnes by 2013-2014. However, production began to increase from 2014 - 2015, peaking at 487,000 metric tonnes in 2017-2018. After a fall to 182,000 metric tonnes in 2018-2019, production steadily increased, reaching 351,100 metric tonnes by 2023-2024, indicating consistent growth in recent years.

Figure 1: Production of Mushroom in India



Source: Indiastat

The graph shows mushroom production trends over time, with stable production around **40,000 metric tonnes** until 2010. After a sharp drop, production spikes dramatically, peaking near **500,000 metric tonnes**, followed by a decline. Recently, production has been recovering, reaching close to **300,000 metric tonnes**. The linear trend line, represented by the equation y=12.842x−25675y, indicates long-term growth, with a moderate correlation to the data. The R^2 was 49 percent.

Mushroom Production in Northern Zone of India

Table 3: Production of Mushroom in Northern India

(In "000 tonne)

States/UTs	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	CAGR
Arunachal Pradesh	0.06	0.06	0.06	0.08	0.08	0.01	0.01	-25.82
Assam	0.22	0.22	1.2	1.4	1.4	1.65	1.83	42.34
Bihar	5.6	5.6	20.28	21.33	28	35.6	41.31	39.52
Chhattisgarh	0.54	7.6	1.05	13.9	13.9	16.79	18.92	80.89
Delhi	3.16	3.16	3.16	3.25	-	4.49	4.71	6.88
Goa	4.47	4.47	6.4	6.5	-	8.86	9.39	13.17
Gujarat	12	12	14	14.5	14.5	14.1	14.6	3.32
Haryana	20.05	20.05	20.05	19.6	21.2	21.5	24.1	3.11
Himachal Pradesh	14.51	14.51	15.6	14.8	14.8	18.61	20.88	6.25
Jammu & Kashmir	0.77	1.5	1.5	3.5	2.65	3.4	3.8	30.48
Jharkhand	1	1	3	7.5	5.02	6.63	7.65	40.37
Madhya Pradesh	0.5	0.5	0.5	1.5	1.5	2.12	2.44	30.24

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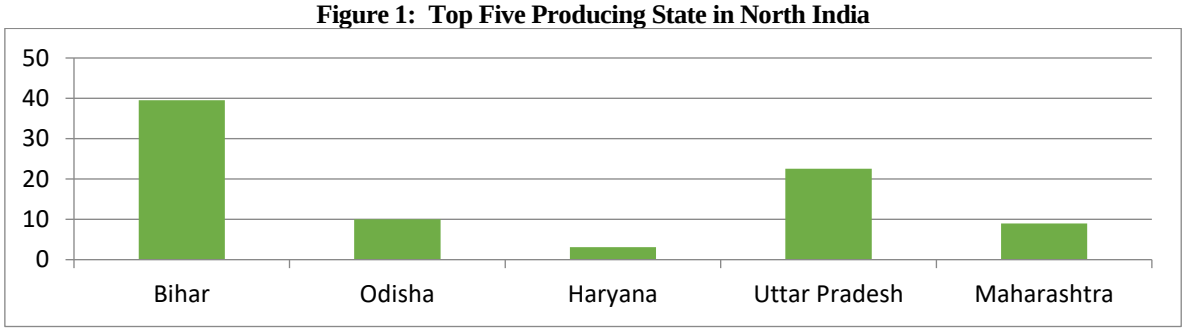
Maharashtra	18.38	18.54	19	22	25.6	32.55	30.77	8.97
Manipur	0.07	0.07	0.07	0.1	0.03	0.04	0.04	-8.91
Meghalaya	0.04	0.04	0.04	0.05	0.03	0.07	0.08	12.25
Mizoram	0.07	0.07	0.07	0.07	0.07	0.08	0.09	4.28
Nagaland	0.41	0.41	0.41	0.5	1.64	0.16	0.17	-13.65
Odisha	19.53	19.53	21.53	22.5	25	34.5	34.6	10.00
Punjab	12.75	18	18	18.5	19.15	19.75	19.8	7.61
Rajasthan	1.4	11.8	15.4	14.6	18.4	19.96	21.44	57.59
Sikkim	0.01	0.01	0.01	0.02	0.02	0.02	0.02	12.25
Tripura	0.12	0.12	0.12	0.15	0.12	0.16	0.16	4.91
Uttar Pradesh	7.6	9.7	9.7	14	12.4	23.41	25.7	22.51
Uttarakhand	11.67	12.4	14.2	16.02	19.8	22.35	25.6	13.99
West Bengal	3	3	7.5	7	9.5	11.3	9.85	21.99

Source: National Horticulture Board

Figure 1: Top Five Producing State in North India



Source: National Horticulture Board

Table 3 and Figure 1 highlights the steady increase in mushroom production in Northern India over the years. In 2023-24, Bihar emerged as the top producer, followed by Odisha, Maharashtra, Uttar Pradesh, and Haryana, all of which made significant contributions. In contrast, the lowest-producing states in the northern region were Arunachal Pradesh, Manipur, Meghalaya, Mizoram, and Sikkim. From 2017 to 2023, Bihar led with an impressive Compound Annual Growth Rate (CAGR) of 39.52 percent, showcasing its rapid production expansion. Odisha and Maharashtra also reported positive CAGRs of 10 percent and 8.97 percent, respectively, while Uttar Pradesh experienced strong growth with a 22.51 percent CAGR. However, Nagaland and Mizoram recorded negative CAGRs during this period.

Production of mushroom cultivation in South of India

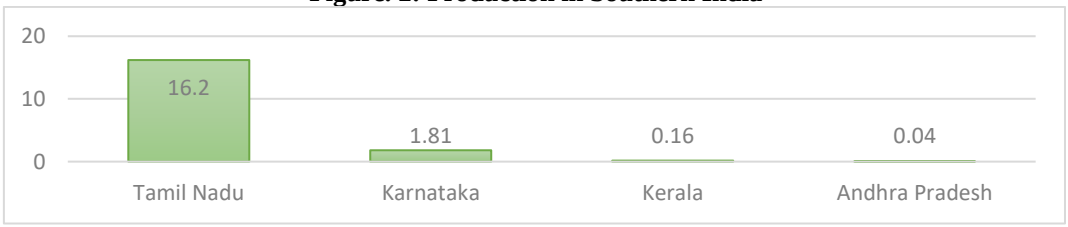
Table 4: Production of Mushroom in Southern India

(In "000 tonnes)

States/UTs	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	CAGR
Tamil Nadu	11.48	11.48	11.48	11	12.66	14.9	16.2	5.90
Karnataka	1.22	1.22	1.22	4.5	1.5	1.64	1.81	6.79
Kerala	0.91	0.91	0.91	1	0.04	0.13	0.16	-52.85
Andhra Pradesh	3.65	3.65	3.65	3	0.05	0.06	0.04	-25.14

Source: National Horticulture Board

Figure. 2: Production in Southern India



Source: National Horticulture Board

Table 4 and Figure 2 illustrate mushroom production in Southern India, highlighting **Tamil Nadu** as the leading producer, with output steadily increasing from **11.48 thousand tonnes in 2017-18** to **16.2 thousand tonnes in 2023-24**, achieving a **CAGR of 5.90per cent**. **Karnataka** exhibits fluctuating trends, recovering to **1.81 thousand tonnes in 2023-24** with a higher **CAGR of 6.79per cent**. In contrast, **Kerala** and **Andhra Pradesh** have experienced significant declines, with production falling to **0.16** and **0.04 thousand tonnes**, respectively, resulting

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in negative CAGRs of **-52.85per cent** and **-25.14per cent**. The graph clearly emphasizes Tamil Nadu's dominance in mushroom production, while the other states contribute minimally to the overall output.

IX. SCHEMES AND SUBSIDIES OF MUSHROOM PRODUCTION IN INDIA

1. Agricultural and Processed Food Products Export Development Authority (APEDA)

This scheme was established in **1986** under the **APEDA Act** passed by the Parliament. The primary objective of APEDA is **to promote the export of agricultural and processed food products from India** by providing financial assistance, information, and guidelines for product development and export promotion. It offers various assistance in processing, quality certification, and packaging to meet export standards, often covering up to 50 per cent of the costs incurred. It helps farmers and cooperatives navigate the export process for mushroom-based products. It conducts training on best practices in mushroom cultivation and processing for export, generally offering financial support maximum up to ₹50,000 per program.

2. Small Farmer's Agribusiness Consortium (SFAC)

It was established in **1994**, the **Small Farmer's Agribusiness Consortium (SFAC)** operates schemes to promote agribusiness development, particularly in the North East and hilly states of India. Under the **Agribusiness Development scheme** by the **Department of Agriculture and Cooperation**, SFAC provides **venture capital assistance** and project development support. The **Venture Capital Scheme** encourages investments in agribusiness projects in collaboration with nationalized banks, offering up to **10 per cent of the total project cost**, **26 per cent of the total project equity**, or a maximum of **₹75 lakh** for projects in these regions. In special cases, higher venture capital can be considered, and funded projects must ensure assured markets for farmers or producer groups.

3. Ministry of Food Processing Industries (MOFPI)

The **Mega Food Parks Scheme (MFPS)**, launched by the **Ministry of Food Processing Industries (MOFPI)** in 2008, aims to develop modern food processing infrastructure and enhance the value chain from production to market. In hilly states, including the North-East, the scheme offers a **grant-in-aid of up to 33.33 per cent** for plant, machinery, and technical civil work. The Ministry also runs a scheme for developing **cold chain infrastructure**, value addition, and preservation, supporting agriculture, horticulture, and food processing through **technology upgradation and modernization**.

4. Subsidy on Mushroom Cultivation

The Mushroom Cultivation Subsidy, introduced in **2011** under the National Horticulture Board, aims to promote mushroom production and support farmers. The scheme falls under the Mission for Integrated Development of Horticulture (MIDH). It provides financial assistance of up to ₹10 lakhs, covering 50 percent of the total cost for setting up mushroom plants, composting units, and spawn production. Individual farmers are eligible, with additional benefits like a 50 percent discount on compost. Applications can be made through the NHB website, and state-specific helplines are available.

5. Horticulture Mission for North East and Himalayan States (HMNH)

The **Horticulture Mission for North East and Himalayan States (HMNH)**, launched in 2014 as a sub-scheme of the **Mission for Integrated Development of Horticulture (MIDH)**, aims to promote horticulture, including mushroom cultivation, in these regions. The scheme offers **100 per cent financial assistance** for public sector projects and a **40 per cent subsidy** for private sector projects. The cost norms provide **₹20 lakh** for mushroom production and compost making units, and **₹15 lakh** for spawn making units. Additionally, the scheme supports **post-harvest management**, offering assistance for infrastructure like cold storage, collection, and marketing facilities.

6. Directorate of Marketing & Intelligence (DMI)

This scheme was initiated by the **Ministry of Agriculture and Farmers' Welfare** in **2014**. This scheme aims to enhance the marketing infrastructure for agricultural and allied produce in India, focusing on post-harvest requirements and improving the overall efficiency of agricultural marketing. This scheme includes support for functional infrastructure such as collection, drying, cleaning, grading, standardization, sanitary measures, quality certification, labelling, packaging, and value addition facilities. Additionally, mobile post-harvest infrastructure, like refrigerated vans for transporting agricultural produce, is also eligible for assistance under the scheme to ensure efficient cold supply chains.

7. National Horticulture Board (NHB)

It was launched in **2014** as part of the **Mission for Integrated Development of Horticulture (MIDH),** the Horticulture Mission for North East and Himalayan States (HMNH) promotes commercial horticultural crops, particularly mushrooms. It supports post-harvest management, primary processing, and infrastructure development to boost productivity and farmer income in hilly areas. The scheme offers 50 percent credit-linked subsidies: up to ₹37.50 lakh for integrated mushroom production units and up to ₹72.50 lakh for post-harvest management projects in these regions.

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8. Area Development Scheme – Mushroom Cultivation

The **Area Development Scheme (2018-23)** for mushroom cultivation in Bhojpur District promotes the commercial farming of mushrooms like Oyster and Button varieties, especially among small and marginal farmers. The scheme highlights the high productivity and eco-friendly nature of mushroom farming, which requires less land and can generate income while managing agricultural waste. Training programs are provided to farmers through local institutions. The initiative aims to improve income, support diversification, and provide market access, backed by subsidies, credit support, and infrastructure development for post-harvest management (scheme of mushroom).

Schemes provided by the State Government:

Mushroom development initiatives under the state sector aim to enhance mushroom cultivation through various objectives. The Department of Horticulture, GoHP, implements several schemes:

1. ***Training on Mushroom Cultivation***
2. ***Registration of Mushroom Growers***
3. ***Supply of Compost***
4. ***Availability of Spawn***
5. ***Loan Facilities***
6. ***Extension Services***
7. ***Subsidy for Mushroom Development***

Additionally, the **Rastriya Krishi Vikas Yojna** provides **₹80,000** for constructing mushroom houses and related equipment. The **National Bank for Agriculture and Rural Development (NABARD)** supports mushroom cultivation by developing area schemes, creating bankable models, updating unit costs, and promoting initiatives under watershed development projects, facilitating off-farm employment.

X. CONCLUSION

The mushroom sector plays a vital role in rural development, contributing to income generation and poverty reduction. Government initiatives such as ISAM, MIDH, and NABARD provide crucial support by fostering technological advancements and improving market access. Mushroom farming in India has evolved into a specialized agricultural industry, although there are significant regional disparities. Northern states like Bihar, Maharashtra, and Odisha have shown impressive growth, while southern states lag behind with lower growth rates. Despite increased production, there remains a shortage of mushrooms. To address this, the government should offer more subsidies by way of providing machineries, spawn, straws and financial assistance to the mushroom producers.

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