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ECONOMIC VIABILITY OF OYSTER MUSHROOM CULTIVATION AS A SOLUTION FOR UNEMPLOYMENT IN NAGALAND

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Abstract

With the unemployment rate of 7.8% placing Nagaland in top 10 states in India with the highest unemployment rate, oyster mushroom cultivation with its low investment, high profit and quick return can help to bring a change in the unemployment status of the state. Mushroom as a vegetable is healthy, nutritious, calorie free and has medicinal properties which have been proven to maintain blood sugar and blood pressure levels, lower cholesterol levels and protection against cancer etc. Nagaland due to its favorable climatic condition, availability of raw materials and labour makes it ideal for mass scale mushroom production. The main objective of this study is to access the foretaste of oyster mushroom cultivation in reducing a small fraction of the current unemployment status of the state, which by evaluating the benefit cost ratio, oyster mushroom cultivation as a business venture was found to be profitable. A total cost of Rs.1,08,600 for 1 shed with a capacity of 500 mushrooms was spent by the mushroom farmers. From the analysis, it was estimated that the farmers gets a gross return of Rs.1,12,500 and a net income of Rs.85,400. A benefit cost ratio of 1.04 was calculated from which we can conclude that oyster mushroom cultivation is a profitable business with its low investment and quick returns with high profit feature. As far as solving the problem of unemployment in the state, oyster mushroom cultivation can go a long way in reducing a certain percentage of unemployment rates in the state.

Key words: Mushroom, Oyster mushroom, Nagaland, Unemployment, Benefit-cost ratio

Introduction

Mushroom is a spore bearing fruiting body, which is the only reproductive part of the organism. They have structures similar to plants but unlike plants they lack chlorophyll and thus cannot produce their own food. They sustain by absorbing the soluble substances that they degrade using the enzymes that they produce. They are mostly found in forests and in the gardens growing on rotten log and decaying organic matter[1]

1 Mushroom Fungi Nutritional Content Biology Essay (2018, November). *UKEssays*. https://www.ukessays.com/essays/biology/mushroom-fungi-nutritional-content-biology-essay.php?vref=1

Mushrooms can be classified into edible and non- edible, or poisonous ones. Most edible mushrooms are both wild and cultivated mushrooms that have been consumed by humans which can be dated back to 4000-6000 years back. The Egyptians, Greeks, Russians, Mexicans, Aztecs, Mayans and many more civilizations have records of mushrooms1. Scientists have described over 14,000 species of mushroom, however, that is likely only a certain fraction of mushroom species in the world2. From 14,000 species of mushroom, there exist over 3000 species of edible species of mushrooms; out which 200 species are commercially or scientifically cultivated and 20 species of the mushrooms have been cultivated on an industrial scale. The most popular mushroom species that are commercially grown all over the world are button mushroom (Agaricus Bisporus), oyster mushroom (Pleurotus Species), paddy straw mushrooms (Volvariella Species), enokitake mushroom, brown clamshell mushroom and white beech mushroom.

The top 10 mushroom producing countries in the world are China, Italy, USA, Netherlands, Poland, Spain, France, Iran, Canada and UK3, while the top 10 mushroom exporting countries in the world are Vietnam, Russia, Turkey, India, Ukraine, Indonesia, Portugal, Pakistan, France and China4. From the data we can see that India may not be the largest mushroom producing country in the world but has placed itself among the top 10 largest exporter of mushrooms in the world.

Table 1: Mushroom production data of India (2018-2022)

Country	**Production (In metric tonnes)**			
	2018	**2019-20**	**2020**	**2021-2022**
India	155.553	201.088	225.924	258.80

Source: ICAR- DMR Annual Report 2021

From the above table it can be evaluated that there is an unprecedented growth of mushroom production in India amounting over 66.37% from 2018-2022. From the data we can observe that the demand and consumption pattern of mushroom in India had a tremendous blowout within 4 years. Thus, we can conclude that mushroom cultivation has a promising future in India and this can be proved from the existing production data and India's placement as one of world's top mushroom exporting countries.

Nutritional and health benefits: Mushrooms contain a wide range of proteins, vitamins, minerals and carbohydrates. Almost all edible mushrooms provide the same nutrients per serving. The table below highlights the amount of nutrients contained in mushrooms per 100 gm of serving.

1 A brief cultural history of the mushrooms (2022, October, 17). *Deutsche welle* https://www.dw.com/en/a-brief-cultural-history-of-the-mushroom/a-63461380

2 Mushroom (2024, October 14). *Wikipedia.*https://en.wikipedia.org/wiki/Mushroom

3 Arora, Akansha (2024, September, 7). Top 10 Mushroom producing countries in the world. *Adda247 current affairs.* https://currentaffairs.adda247.com/top-10-mushroom-producing-countries-in-the-world/

4 Global mushrooms Top 10 Exporters in 2023- Tendata(2024, April 10). *Export News.*https://www.tendata.com/blogs/export/5607.html

Table 2: Nutrition in Mushroom per 100 gm.

Nutrients	**Per 100 gm of serving**
Water	92.4 gm
Energy	22 kcal
Carbohydrates	3.26 g
Calcium (Ca)	3 gm
Phosphorus (P)	86 gm
Iron (Fe)	0.5 mg
Magnesium (Mg)	9 mg
Potassium (K)	0.318 mg
Selenium (Se)	9.3 µg
Sodium (Na)	5 mg
Zinc (Zn)	0.52 mg
Vitamin C	2.1 mg
Vitamin D (D+ D3)	0.2 mg
Folate	17 µg
Chloline	17.3 mg
Niacin	3.16 mg
Fiber	1 g
Protein	3.09 g
Copper	0.318 mg
Riboflavin	0.402 mg
Vitamin B-6	0.104 mg
Vitamin B-12	0.04 µg

Source: USDA

As far as medicinal and health benefits of mushroom is concerned, the health boosting nutrient content as well as the existence of anti-oxidants can go a long way in contributing to human health, lowering the blood pressure because of its rich source of potassium and its anti-inflammatory effect due to the content of selenium, Vitamin D and Vitamin B6[1]. Even though more studies are necessary, the antioxidants found in mushrooms are found to help prevent numerous types of cancer some of which are prostate, colorectal and breast cancer. Providing 1 g of fiber, mushrooms can help manage and lower blood glucose levels. Along with fiber, potassium and Vitamin C in mushrooms may decrease the risk of hypertension and cardiovascular diseases. Folate or folic acid in mushrooms can serve as supplements during pregnancy to boost fetal health[2]. Due to all these nutritional and medicinal properties, mushrooms are a valuable asset for the welfare of humans.

Mushroom cultivation in Nagaland: Nagaland is a biodiversity rich state packed with different species of mushrooms edible and non-edible ones. While some edible wild mushrooms are locally found others are commercially grown. Mushrooms that are commercially grown are oyster mushroom, shiitake mushroom, paddy straw mushroom and button mushroom[3]. Why mushroom cultivation is favourable in Nagaland and its demand is increasing can be proved from the availability of raw materials, labour and favourable climatic conditions in the state making it possible for year round cultivation. The rise of demand in mushrooms is seen because of its nutritional and health benefits. They are often called the 'white vegetable' or the 'boneless vegetarian meat' because of its high content of proteins, vitamins and fibers which is higher than most of the fruits and vegetables[4].Moreover, the climatic conditions in Nagaland make it more favourable for year round mushroom cultivation.

Rationale behind oyster mushroom cultivation: The prevailing weather condition makes Nagaland favourable for commercial cultivation of mushrooms such as oyster mushrooms, shiitake mushroom, paddy straw mushroom and button mushroom. However, oyster mushroom is more favoured than other commercially grown mushrooms as it is easy to grow; it has a faster growth rate, its cost effective nature due to the easy availability of raw materials and initial investment, it has a high content

1 Health benefits of mushrooms (2023, September 08). *WebMD*https://www.webmd.com/diet/health-benefits-mushrooms

2 Ware, Megan (2024, February,14). What to know about the health benefits and nutritional values of mushrooms. *Medical News Today.* Retrieved from https://www.medicalnewstoday.com/articles/278858

3 Rajesga G, Bendangsenla, Mahak Singh, Azaze Seyie (2022)," Scenario of commercial mushroom production in Nagaland", *Mushroom research* 31 (1). DOI:10.36036/MR.31.1.2022.326292

4 Area development scheme- Mushroom Cultivation (2018). NABARD. https://www.nabard.org/auth/writereaddata/careernotices/0910185521AJS%20%20Revised%20MUSHROOM%20ADS%202018-19%20BALOD.pdf

of nutrients like proteins, fiber, vitamins and minerals and also due to its medicinal properties.Wastes such as paddy straws and saw dust are largely burnt by the farmers, which causes air pollution. However, these raw materials can actually be used for the cultivation of mushrooms. This kind of bioconversion exercise can greatly reduce environmental pollution. Mushrooms are widely accepted as delicacy in the menu of the Naga people. Hence there is sizeable local demand for oyster mushroom produce. Besides it has high potential for export. Oyster mushroom cultivation can be a labour intensive activity. Therefore, it will serve as means of generating employment, particularly for rural women and youths in order to raise their social status. It will also provide additional work for the farmers during winter months when the farming schedule is light. Oyster mushroom growing is eco-friendly as it involves re-cycling of plant wastes to produce rich food and the spent mushroom substrate can be used to produce organic manure.

The most important if not the sole reason of oyster mushroom cultivation gaining momentum in Nagaland is because of its economic benefits. It can be a source of income for rural population and can be a promising business venture. It can help in tackling the unemployment problem in Nagaland where the state stands at an unemployment rate of 7.8 percent taking its place in top 10 states in India with the highest unemployment rate.

On the basis of manpower, infrastructure, raw materials and market, a study was conducted selecting by selecting 20 oyster mushroom cultivators in Dimapur and Chumoukedima districts of Nagaland. However it should be kept in mind that the economics of mushroom cultivation differs from seasonal farmers and year round farmers varying across regions which will have a bearing on the benefit cost ratio.

Objectives: The objective of this research is to analyse the cost and returns of oyster mushroom production.

Methodology: Personal interview has been conducted with the mushroom farmers to evaluate the cost and profitability of mushroom cultivation. For estimating the total cost, the following analysis was used:

Total cost= TFC+ TVC

Fixed Cost: Cost of building the shed, depreciation, balance weights and small equipment are all included in fixed costs

Variable cost: Cost of straw, spawn, chemical, labour, electricity, poly bags and miscellaneous items etc are included in Variable cost

To check the profitability of mushroom cultivation, Benefit- cost ratio was estimated

$$BCR = \frac{\text{Gross Return}}{\text{Total Cost}}$$

Result and discussion

Economic analysis of oyster mushroom cultivation

Table 3: Cost incurred on mushroom cultivation

1.	**Fixed cost/ Non- recurring cost**	**Amount (₹)**
	Shed (capacity of 500 mushroom cylinders)	50,000
	Shredder	25,000
	Spray machine	2500
	Balance weight	2000
	Small equipments	2000
Total Fixed Cost (TFC)		**81,500**
2.	**Variable Cost/ Recurring cost**	**Amount (₹)**
	Paddy straw (1 load)	7000
	Spawn (@ ₹150 per kg)	7500
	Labour	5000
	Poly packs (@ ₹210 per kg)	2100
	Lime	3000
	Electricity	500
	Miscellaneous	2000
Total Variable Cost (TVC)		**27,100**
Total Cost (TFC+TVC)		**1,08,600**

Source: Field Survey (2024)

From the table given above it can be estimated that a total cost of ₹.1,08,600 were estimated expenditure for mushroom cultivation. While, ₹. 81,500 were the estimated total fixed cost and ₹. 27,100 were the estimated variable cost, with the highest variable expenditure on straw i.e., 25.64%, the other on spawn i.e., 24.47% and on labour i.e., 18.32% of the total variable. Other expenditure is estimated at less than 10%.

Table 4: Average cost and Return on oyster mushroom cultivation

Average cost and Return	**Amount (₹)**
Total Price of mushroom (₹150per kg)	1,12,500
Gross return (per kg)	1,12,500
TFC	81,500
TVC	27,100
Total Cost (TFC+TVC)	1,08,600
Net income	85,400
B:C Ratio	1.04

Source: Field Survey (2024)

From table 4, we can depict that in a low cost mushroom cultivation of 500 mushroom cylinders the farmers can get a gross return of Rs. 1,12,500 and a net income of Rs. 85,400. From this we can say that a framer can get a benefit cost ratio of 1.04. Thus, we can conclude that oyster mushroom cultivation is a profitable business with low investment and high return.

Risk and challenges: As every business is prone to risks, mushroom cultivation as an agri-business is not shy of risk and challenges. Dimapur and Chumoukedima being a hot region is prone diseases, mould infestation and pests especially flies which contaminates the mushroom spawns. As a result there are more seasonal farmers that prefer to cultivate mushroom during the winter than to cultivate whole year round. Lack of appropriate marketing facilities is another problem. There is huge demand of oyster mushrooms in the state however the mushroom farmers are unable to meet the huge influx of demand in the market. Another major problem is high cost and lack of good quality spawn in the market, there is lack of storage facilities and mushroom processing units to enhance the shelf life and quality of the mushrooms. The price of labourers also constitutes a major section of the total cost. There is lack of high skilled labourers and if available they are expensive while unskilled labourers may cause hindrance in the cultivation process.

Suggestions: Various solutions were suggested by the farmers which were increasing the mushroom cultivation and consumption through campaigns, making available high quality inputs, having a quality control marketing body for ensuring and checking the quality of the mushrooms from different sources and regulation of the mushroom prices in the market. Providing easy access to credit facilities at a lower interest rate that will help in the growth of mushroom production in the state to meet the increasing demand is another suggestion by the farmers.

Conclusion: Even though oyster mushroom cultivation has a huge potential in the state, the mushroom cultivators are facing the huge challenge of fulfilling the increasing demand of mushroom in the market. This is probably due to the lack of adequate financial support because of which the oyster mushroom cultivators are unable to increase the production capacity of their farms. Among the other agro- economic crops, oyster mushrooms have been profitable because of its low investment and high return and the climatic condition of Nagaland makes it all the more a favourable environment to grow mushrooms year round.

With an estimated total population of 41.14 lakhs in 2023 (Census 2011) and an unemployment rate of 7.8%, commercial mushroom cultivation can become a tool of self- employment for the unemployed as well as for rural farmers that will ensure a sufficient family income due to its economic properties of low investment and high profit. Oyster mushrooms in Nagaland can be sold as high as Rs. 150-200 per kg. Nagaland has a good market for mushrooms. Potential buyers are domestic consumers as well as various restaurant and hotel chains. Thus, under the preview of this study, we can conclude that oyster mushroom as a high nutrient vegetable having innumerable health benefit, has high economic advantage which can serve as a medium for income generation for individuals as well as revenue for the state with possible exports.

References

1. Suman, B. C., Sharma, V. P. (2007) Mushroom Cultivation in India. *Daya Books* https://books.google.co.in/ books?hl=en&lr=&id=6AJx99OGTKEC&oi=fnd&pg =PA 1&dq=mushroom+cultivation+in+india&ots=CkjFByrq5e&sig=wEuYyHid jER2V9m kyBLBOyhi13M&redir_esc=y#v=onepage&q=mushroom%20 cultivation%20in% 20 india&f=false
2. Singh, M., Kamal, S., & Wakchaure, G. C. (2011). Earning more through exporting mushrooms. *Indian Horticulture,* 56(3). file:///C:/Users/HP/Downloads/ojsadmin,+IH+May-June+2011-9%20(1).pdf
3. Census (2011) Government of India. https://www.census2011.co.in/census/state/ nagaland.html#:~:text=no%20 correct% 20answer.,The%20last%20census%20of%20Nagaland%20was%20 done%20in%2020 11%20and,population%20is%20approximately%2041.14% 20Lakhs
4. Phillis, Roger (2013). Mushrooms (1st ed.). *Pan Macmillan* https://books.google.co.in/books?hl=en&lr=&id=nRKwAAAAQBAJ&oi=fnd &pg=PA6&dq=mushrooms&ots=91ntTHCxpx&sig=AfL_m5VeN6khGgsThSIS GVocF0k& redir_esc=y#v=onepage&q&f=false
5. Aly Farag El Sheikha and Dian- Ming Hu (2018). How to trace the geographical origin of mushrooms? *Trends in Food Sxience& Technology,* volume 78, 292-303 https://doi.org/10.1016/j.tifs.2018.06.008
6. Area development scheme- Mushroom Cultivation (2018). NABARD. https://www.nabard.org/auth/writereaddata/careernotices/0910185521AJS% 20-% 20Revised%20MUSHROOM%20ADS%202018-19%20BALOD.pdf
7. Mushroom Fungi Nutritional Content Biology Essay(2018,November). *UKEssays.* https://www.ukessays.com/essays/biology/mushroom-fungi-nutritional-content -biology-essay. php?vref=1
8. Jha, Mahabir (2019), "Mushroom Cultivation: A Tool of Self-employment". *Sanshodhan*vol. 8file:///C:/Users/HP/Downloads/admin,+8%20(2).pdf
9. Rajesga G, Bendangsenla, Mahak Singh, AzazeSeyie (2022)," Scenario of commercial mushroom production in Nagaland", *Mushroom research* 31 (1). DOI:10.36036/MR.31.1.2022.326292
10. A brief cultural history of the mushrooms (2022, October, 17).*Deutsche Welle*https://www.dw.com/en/a-brief-cultural-history-of-the-mushroom/ a-63461380
11. Health benefits of mushrooms (2023, September 08). *WebMD* https://www.webmd.com/diet/health-benefits-mushrooms
12. Ware, Megan (2024, February,14). What to know about the health benefits and nutritional values of mushrooms. *Medical News Today.* Retrieved from https://www.medicalnewstoday.com/articles/278858

13. Global mushrooms Top 10 Exporters in 2023- Tendata (2024, April 10). *Export News*.https://www.tendata.com/blogs/export/5607.html

14. Arora, Akansha (2024, September, 7). Top 10 Mushroom producing countries in the world. *Adda247*. https://currentaffairs.adda247.com/top-10-mushroom-producing-countries-in-the-world/

15. Barua, Kriti (2024, September, 29). Top 10 Indian states with highest unemployment rates.
Jagran Josh. https://www.jagranjosh.com/general-knowledge/indian-states-with-highest-unemployment-rates-1727625463-1

16. Mushroom (2024, October 14). *Wikipedia*. https://en.wikipedia.org/wiki/

17. Mushroom ICAR- DMR Annual report.
https://dmrsolan.icar.gov.in/html/annualreports-downloadable-.html

18. Mushrooms and other Fungi, (n.d.). *National Park Service*.
https://www.nps.gov/mora/learn/nature/mushrooms.html