

Enhancing Mushroom cultivation in the region – A potential commercial crop for intensification

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Oyster Mushroom

Introduction

Shiitake (*Lentinus edodes*) and Oyster (*Pleurotus sp.*) are focused mushrooms for production in eastern Bhutan. Rationalized by the increasing loss of arable land to urbanization and industrialization, the threat of climate change is severe on farming. Thus, mushroom farming is the best substitute farming practice. It is climatically suitable in any agro-ecological zones provided with proper cropping shed. Economically, mushroom farming is cost-effective and plays a vital role in the ecosystem.

Mushroom farming in the eastern region is increasing every year covering all the Dzongkhags, yet the production remains at comparatively lower scale to suffice the demands in the domestic markets. Every year, a huge quantity of mushroom is imported: Oyster and Button mushroom from India and Shiitake and Wood ear mushroom from Thailand and China to meet the demand.

Therefore, the mushroom program based at the Agriculture Research and Development Sub-center, Khangma in collaboration with Dzongkhag and gewog agriculture sector is encouraging the early school leavers and interested farmers to take up mushroom farming as a business enterprise. Currently, the mushroom program has established 7 commercial mushroom farms with financial support from Rural Enterprise and Development Corporation Limited (REDCL).

The mushroom program also encourages the youth to take up spawn production unit as a full-time employment. It is a profitable business since the demand for Oyster spawn is high in the region. Thus, mushroom farming is another solution to address the youth unemployment issue and curb down the rate of rural-urban migration.

The focus is also shifted from small-scale farming to commercial mushroom farming. To be qualified as commercial mushroom



farming, minimum of 5000 logs of Shiitake and 3000 bags of Oyster is required in the farm. Besides, mushroom farming is also explored in the six Climate Smart Villages (CSV) under CARLEP.

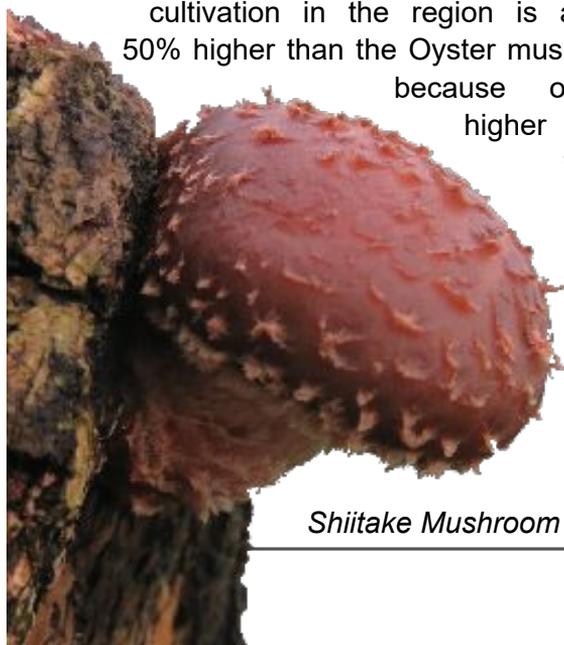
Spawn Production and supply

For commercial purpose, the shiitake mushroom spawn is raised in the sawdust, while the Oyster mushroom spawn is raised in wheat grains. Currently, the mushroom program in Khangma has 8 shiitake strains and 7 Oyster strains. These strains are renewed every after 8 times multiplication from each strain.

In the 2017-2018 FY, 10000 bottles of shiitake spawn and 3701 bottles of oyster spawn were prepared and of this total, 7168 bottles of Shiitake spawn and 4317 bottles of Oyster mushroom spawn were supplied to the individual interested mushroom growers in the region. According to the statistics of the mushroom programme at Khangma, the cultivation of the Shiitake and Oyster in the region is increased by 10% and 60% respectively in 2017-18FY compared to the previous financial year.

Shiitake mushroom inoculation

The preference for Shiitake mushroom cultivation in the region is almost 50% higher than the Oyster mushroom because of its higher price value.



Shiitake Mushroom

Shiitake mushroom is mostly cultivated in Oak logs. It is a season specific. The cultivation starts from mid-December to the first week of April.

1m Oak log is prepared and 7-8-inch depth holes are drilled alternatively on the log. Spawn is injected in each hole with the air compressor and sealed with wax and rosin in a proportion of 4:1 ratio. The Shiitake mycelium takes a minimum of 6 months to fully colonize in the inoculated logs given the optimum temperature of 20-25°C, relative humidity of 60-70% and light intensity 35-40 lux inside cropping shed during the incubation period. It gives fruiting for a maximum of 5 years provided a 1-month rest period after every harvest.

There is a 9.7% increase of Shiitake mushroom inoculation in 2017-2018FY compared to 2016-2017FY in the region. A total of 7168 bottles of Shiitake mushroom spawn were supplied for 51201 logs in 2017-2018FY. Trashigang Dzongkhag has highest Shiitake mushroom farming followed by Mongar Dzongkhag as reflected in Table 1.

Oyster mushroom Inoculation

Wheat and rice straw are the main substrate for oyster mushroom inoculation. It can be grown throughout the year and

Table 1. Shiitake and Oyster mushroom inoculation in 2017-2018 FY

Dz-ongkhag	HHs (no)	Logs inoculated (no)	Bags Inoculated
Mongar	23	6,928	1924
T/gang	36	12431	1024
T/yangtse	14	4514	892
P/gatshel	18	6759	1032
S/Jongkhar	4	1256	88
Lhuntse	3	2330	760
Total	98	34,218	5720

it can grow on all types of straw. Thus, Oyster mushroom cultivation is the best method of utilizing agricultural residues/wastes for additional income generation to farmers.

The Oyster takes a maximum of one month to colonize substrate fully. Parameters requirement in cropping shed is same as Shiitake mushroom. However, relative humidity requirement during the fruiting period is different from incubation for both mushrooms. Relative humidity of 80-90% is required inside the fruiting room. Layer method is followed in spawning. Straw is soaked for 15 minutes and steamed for 1.5 hours. In 2017-18FY, 12619 bags of Oyster mushroom are inoculated benefiting 61 mushroom growers in the region. There is also an increase of 60.2% in oyster mushroom farming compared to last financial year.

a) Mushroom cultivation in the Climate Smart Village (CSV)

In the first year of CARLEP implementation, the implementing agencies have identified six villages (one village each from Six programme Dzongkhags) as a Climate Smart Villages. With the funding from CARLEP, mushroom cultivation was explored and started in these Villages. A total of 7 small-scale mushroom farms were established and 14 Oyster mushroom growers promoted in Threlphu CSV in Trashigang and Pangthang CSV in S/Jongkhar. Total of 2394 logs and 900 bags of Oyster mushroom were inoculated.

b) Mushroom cultivation through School Agriculture Program (SAP)

To further explore the science

of mushrooms, enhance the nutritional diversity in daily diet and provide hands-on mushroom farming in the schools, the SAP in the region has initiated mushroom farming in School from few years ago. Students were provided with the practical knowledge, skills, and insights on mushroom farming. Table 2 shows the detail of mushroom farming undertaken by various schools through the SAP initiation.

c) Credit support farm

Mushroom farming on a commercial scale is a lucrative business. It is economically profitable, socially acceptable and environmentally friendly, wherein, the crop residues and wastes are used as a substrate.

Therefore, the number of people availing of the loan from CSIF (Cottage and Small Scale Industries Fund), BDBL under RF1 (Revolving Fund 1) is increasing every year in the east. A total of nine commercial farms are established under the credit scheme as reflected in Table 4.

Table 2. Shiitake and Oyster mushroom promoted in SAP

SAP	Dzongkhag	Log inoculated (no)	Bags Inoculated (no)
Tsamang PS	Mongar	500	
Serzhong LSS		600	
Kalapang PS			104
Mongar HS		250	
Trashitse HS	Trashigang	200	
Khaling LSS		300	
Jampeling CS		520	
Menji MSS	Lhuntse	562	
Yelchen CS	Pemagathsel	300	
Tseche PS			100
Thongsa PS			400
Bumdeling LSS	T/Yangtse		248
T/yangtse LSS			200



d) Mushroom cultivation in a Group

Owing to the shared labor, less land requirement and to create additional funds in the group, many existing farmers' vegetable group are establishing the mushroom. This transition is not only helping the group earn the additional income but also helping the group to be dynamic and resilient in the case of uncertainties and crop failures. A total of 4050 logs and 1380 bags were inoculated in a group thus far as reflected in Table 5.

Conclusion

Mushroom farming is gradually boosting in the eastern region as it is a lucrative business and the growers don't face the issues in marketing. The preference for Shiitake is relatively higher than Oyster because of its higher price value. Moreover, Oyster

is largely imported from India and the production competition is much higher.

Thus, with the higher demand for Shiitake mushroom, the demand for the Oak trees is also on the rise, which may lead to deforestation. Therefore, the Department of Forests and Park Services (DoFPS) has set a maximum limit of logs per season in every Dzongkhags to prevent mass deforestation by Shiitake mushroom growers. Similarly, the Mushroom unit in collaboration with mushroom growers has started Oak sapling plantation near their farm. The exploration substitutes the log by sawdust to inoculate Shiitake mushroom is also underway.

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Table 4. Shiitake mushroom promoted in credit support farms

Name of farmers	Gewog	Dzongkhag	Log inoculated (no)	Bags Inoculated (no)
Choeda	Bidung	Trashigang	1864	
Chozum	Shongphu			3500
M. Choling	Samkhar		2515	
Sonam	Shermung	Mongar	2378	
Nima Dorji	Tsengkhar	Lhuntse		320
Sonam Lhamo	Phungsothang	S/Jongkhar		1184

Table 5. Shiitake and Oyster mushroom promoted in Group

Name of group	Village	Gewog	Dzongkhag	Log inoculated (no)	Bags Inoculated (no)
Sonam Gongphel Tshogpa	Chiphoong	Chimung	Pemagatshel	1220	
Veg.Group (Dungchen)	M/nangkhar	Phongmey	Trashigang	380	
Veg.Group (Dungchen)	Bargonpa	Phongmey		350	
Dekiling Mushroom group	Dekiling	Radhi		1200	480
Farmers Group	Lichen	Yangtse	T/yangtse	900	900
Veg.Group (Balam)	Balam	Balam	Mongar		800