



High Value Cropping – A Small Scale Agro-Business Case from Mushroom Cultivation

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Abstract

The strategic positioning of mushroom cultivation as a high value crop (HVC) is a genuine proposition for the economic development of any state or country. It has the ability to provide health and wealth to the bottom of pyramid in a society. It has the ability to encounter the abuse of urbanization. Unlike other industry, it has no threat to environment or climate change rather it suffers due to such factors. It has proved the social, economic and environmental dimensions of sustainability by virtue of its low-investment plans, use of low-end technologies, small-farmers and high utility of space and women entrepreneurship. A small-scale agro-business case ventured by a woman entrepreneur is presented in this paper.

Objectives – The paper aims primarily at encouraging small farmers and small households, including women, in urban localities to cultivate mushroom. The secondary objective is to create awareness of mushroom farming as a HVC activity in the society.

Methodology – A general review based descriptive methodology is followed in the paper for the readers and participants of the conference. Further, the objectives are established more effectively through an experiential case study approach.

Key Findings – The study reveals that mushroom cultivation is very attractive and easy for all. Even it has the ease of marketing. However, it has some inherent challenges of maintaining proper temperature and humidity; and risk of managing the health of the crop and hygiene of the grower to bacterial and fungal infection.

Conclusion - The little preparedness and preventive measures can overcome the risks and challenges to tap the benefits. Though the discussion was limited to small-scale business, it has the scope of extending it to a large-scale business with proper provision and maintenance of a cold chain. Food processing can take the application to another level by dehydrating the mushrooms and prove it genuinely as an HCV even through exports to different parts of the sub-continent, continent and even the globe.

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Introduction

Standard staple food crops are generally produced in mass and consumed in mass. These crops are always tried for a high-yield. Whereas, other crops are developed in a particular season or a region due to preferred consumers and climates. This demands the special interest of consumers dominated by the high value attached to it. Mostly, the high value crops (HVC) are developed in small test-beds, subsequently extending to larger beds due to the taste of commercial success. The advantage is often taken both by the small rural farmers to enhance their income and urban people to improve the space utility while meeting their tastes and preferences. Looking at the diminishing land-sizes, growing urbanization and population, HVC turned up to be the best practice of farming. HVC, thus, sets the journey of farmers from basic agriculture to the use of advanced processes of agro-business from kitchen gardens or farms. Mushroom, one of the HVCs, can be grown in a small room, even under thatched roof.

Literature Review

Maximum Yield Reader Survey (Bond, 2017) even claims three types of HVC, mushrooms, strawberries, and basil that can be grown hydroponically. HVC like – Bamboo (potted bamboo plants); Flowers; Ginseng; lavender; Willows; Saffron; Ground Covers; Herbs; Landscaping Trees and Shrubs; Mushrooms; and Ornamental Grasses yield more revenues than a conventional crop, and further characterized by lower crop cycle times and high market demands. A genetically developed or modified high-value crop can yield high profit and can operate in small scale (Panda and Das, 2009) from an urban environment where it can provide a friendly environment too.

Mushrooms are eaten and appreciated for their flavor, economic and ecological values, and medicinal properties for many years (Genders, 1946). They have an attractive composition from the nutritional point of view. In general, mushrooms contain 90% water and 10% dry matter. The protein content varies between 27% and 48%, carbohydrates are less than 60%, and lipids 2– 8%. The total energetic value of mushroom caps is 1.05–1.50 J/kg of fresh mushroom. There are at least 12,000 species of fungi considered as mushrooms, with at least 2,000 species showing various degrees of edibility (Chang 1999). Over 200 species are from wild sources, used for various medical purposes in the eastern countries. About 35 mushroom

species are commercially cultivated of which around 20 are cultivated on industrial scale. The most cultivated mushroom worldwide is *Agaricus bisporus* (button mushroom) followed by *Lentinus edodes* (shiitake), *Pleurotus* spp (oyster mushrooms), *Auricula auricula* (wood ear mushroom), *Flamulina velutipes* (winter mushroom), and *Volvariella volvacea* (straw mushroom) (Chang, 1999). Mushrooms have the ability to degrade lignin cellulosic substrates and can be produced on natural materials from agriculture, woodland, animal husbandry, and manufacturing industries (Rinker, 2002), which are often landfilled or burned in the field at great cost to the environment (Anoliefo et al. 1999; Philippoussis and Diamantopoulou, 2011). However, mushroom production generates an enormous amount of used “spent” substrate, which might also be a source of environmental contamination.

According to the Synthesis Report (2005), the challenges for high-value cropping are:

- Marketing of the HVC products
- Estimating the market demand of the HVC products
- Enabling the production and marketing environment for the HVC products

Scope for business research in high-value cropping:

- Developing the right partnerships between production and marketing
- Demonstrating right practices and methods
- Formulating right strategies for growers (poor/housewives, and commercial firms)
- Managing information, innovation and technology for sustainability

Following considerations are important for promoting high value agricultural products as a strategy for reducing poverty and enhancing food security and overall social sustainability:

- HVC is not a core, but a complementary strategy.
- HVC need to customer focused to hedge with the commercial risk.
- HVC products can compete and substitute imported goods
- Poor farmers would be able to form long-term links to HVAP markets.

Cultivation of Mushrooms

Mushroom culture involves several different operations, each of which must be carefully performed. The success of mushroom production depends in great part on the quality of the spawn, which must be prepared under sterile conditions to diminish contamination of the

substrate. Several studies have been done to improve and develop new techniques for the production of spawn.

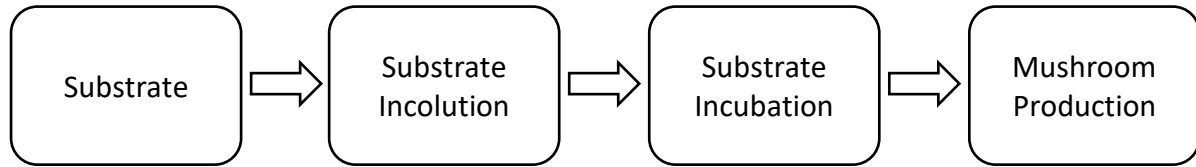


Figure 1: General Procedure of Mushroom Production

The current paper deals with mushroom cultivation as a small-scale agro-business case following this section of this paper. Mushrooms grow in a non-soil bed that require moisture level of 70 – 90 % and a temperature range of 15 - 35 °C (Furlan et al. 1997). Therefore, it is grown domestically in a conducive atmosphere and commercially with artificially controlled atmosphere. Technology enabled atmosphere controlling is one of the requirement for perishable products like mushrooms (Arora and Panda, 2018). This is more prone to urban living environment. Cold chain infrastructure is essential for mushroom culture to scale up to handle both the volume and variety for distant and dispersed market, while retaining the high-values of the crop leading to a sustainable business (Saxena and Panda, 2016). The detailed atmospheric requirement for three popular mushrooms are given in table 1.

Table 1: Temperature and Humidity Requirement for Mushrooms Production

Type	Stages	Time required (in days)	Room Temperature required (in °C)	Bags' Temp (in °C)	Relative Humidity in %
Button	Mycelium run	14-15 days	20-25	20-25	Monitoring not required
	Case run	14-15 days	20-25	20-26	70
	Fruiting	30 th day	16-18	16-20	70
Milky	Mycelium run	15-20 days	25-30	25-32	Monitoring not required
	Case run	15-20 day	30-35	30-38	90
	Fruiting	46 th day	30-35	30-38	90
Oyster	Mycelium run	14-15 days	20-25	20-28	Monitoring not required
	Fruiting	20-21th day	20-22	20-25	80

CASE STUDY:



***A Small Scale
Agro-Business Case
on
Mushroom Cultivation***

[A Case from Dehradun, Uttarakhand]

When an average Indian farmer earns Rs. 8 to 10 by selling 1kg of potato, mushroom cultivation appears to him as an HVC to earn Rs. 80 to 100 by selling 1kg of mushroom. The price difference can change lives of farmers. Even, a person from low-income group in sub-urban or urban location can do mushroom cultivation. Any person who has a small garden, courtyard, or disposable space of 10' x 10' room can do it with a very small investment. Someone who is not a farmer, not a poor fellow, but has a hobby of gardening can grow mushroom to add a new taste to his lifestyle. The ease and economy can trigger anyone to start this as a small scale business. It has inspired many women to become entrepreneurs. This paper presents a case from Dehradun, the capital city of Uttarakhand in north India. The case describes how a housewife, Savitha Ben (pseudo name), started mushroom cultivation in the backyard of the house as a hobby, subsequently found its viability as an HVC and turned to an entrepreneur. Though three varieties of mushrooms, namely – Button, Oyster and Milky are suitable for Uttarakhand climate; she started with one variety and did others subsequently. Slowly Savitha Ben got recognized as another *Mushroom Lady* of the city.

Why mushroom farming?

Savitha Ben says, mushroom farming is attractive to her, even though she is a city dweller, and is left with a very little disposable space at her home. The reasons she cited are:

- It is a healthy and nutritious food.
- It requires relatively less time to grow and harvest mushroom. White Button mushroom takes 3 months, whereas Oyster mushroom takes 1 to 2 months. Hence, it is possible to see the result and benefit within a short time.
- It needs less investment, appearing feasible for new and small-scale grower like her. NABARD provides loans for establishment of mushroom units, spawn production unit and compost making unit.
- It is more of an urban farming due to ease of sale in a city like Dehradun where the risk of perishability is minimum.
- It fetches good returns, if consumed domestically in terms of nutritional value; good earning in addition, if done commercially. So, she started for own, later for society.

Facility Required for Mushroom Cultivation

Savitha Ben says, her mushroom farm started from a backyard space of 10'x10' area. She encourages all to check if they can meet their own requirements. She says, it can start if –

- There is a minimum space of 10'x10' room. (insulated from outside temperature);
- There are bamboo racks and/or ropes for hanging plastic bags;
- The farm space has cross ventilation, or exhaust fans (no. of fans depends on the size of room);
- There is water connection to maintain humidity of the room.

Costing Structure of Mushroom Business

Savitha Ben says, it started with her hobby of gardening to try with mushrooms without any record of expense. The trial became successful. Immediately the inspiration came for a small-scale business for *Milky Mushroom*. The cost structure of the business operation may be laid down as follows:

Fixed cost:

1. Construction of shed	: ₹ 1,00,000
2. Bamboo racks and rope hanging	: ₹ 10,000
3. Instruments to monitor temperature and humidity:	₹ 500
Total	: ₹ 1,10,500

Recurring cost:

1. Wheat straw (200 kg)	: ₹ 1,350
2. Formalin and Bavestin	: ₹ 300
3. Spawn (30 kg)	: ₹ 3,000
4. Cocopit	: ₹ 600
5. Manure for casing	: ₹ 1,000
6. Labour	: ₹ 1,500
Total	: ₹ 7,750

Yield & Earning:

Expected yield @ ₹ 100 / kg	 140 kg	 ₹ 14,000
Actual yield	40 kg	₹ 4,000
Remark : LOSS		

Business Result

In above case, spawning was done in the end of April 2018. Temperature and weather was suitable. Mycelium run was perfect, and fruiting was good in the start. This year, it started raining early and temperature dropped in the month of June. Temperature of room dropped below 30 in the month of July. Therefore, the expected yield was not achieved. The business cycle went through losses.

Savitha Ben being a courageous lady, did not give hopes. She realized that the lack of experience and preparedness led to such a fate when climate change was the major reason of crop failure. Learning from the mistakes and more preparedness provided the determination of growing Oyster mushrooms in the changed climate to take advantage. Now the business with this humidity and temperature expects a good yield in next cycle.

Challenges and Opportunities

As said by *Savitha Ben*, there is no major problem in mushroom cultivation. But, there are many challenges, which when handled successfully, brings the profitable opportunities.

Challenges:

- Getting raw materials of good quality (i.e. suitable wheat or rice straw);
- Process cycle finds difficulty in strictly following the literature/guide/manual, especially in mycelium run and fruiting;
- Disposing the waste safely, especially in an urban environment;
- Regular monitoring for not skipping anything from the knowledge/control;
- Labor intensive;
- Insects and diseases may breakout into the house, if mushroom is cultivated in adjacent. Indoor growers need to seal off their grow rooms to prevent from the flies and insects.
- Possibility of several serious diseases. Sanitation is critical in mushroom cultivation as is very careful control of humidity, temperature, CO₂, compost development and other growth factors.

Opportunities:

Mushroom being a type of HVC, its farming is profitable. But, it needs to maintain the temperature and humidity and choose the right place. There is a greater need to maintain the hygiene of the crop as well as the people from getting infections.

Svitha Ben being a small-scale entrepreneur could not use the infrastructure for controlled atmosphere for growing mushroom. She was dependent on the favorable weather. Her talent helped in maintaining a balance between the challenges and opportunities.

Scope and Support for Marketing

Svitha Ben says, mushroom being a HVC, gets easily sold in the open market and major Mandis. Often the suppliers of spawn buy the products. Therefore, there is nothing to worry about selling or creating a market for sales. Certain minimum training will be very helpful to the mushroom cultivators. Indian Council of Agricultural Research (ICAR) provides the training for basic mushroom cultivation. In Dehradun Ms Divya Rawat, known as the Mushroom Lady, provides hands on training of basic mushroom cultivation. She also supports and help women entrepreneurship.

Learning

Mushroom farming can create very good opportunity for everyone to earn decent income. With more research and training, it is possible to produce economically and benefit. There is need for training for the growers and sellers in the post harvest periods, like packaging, preserving and food processing. Packaging and preservations add value to mushrooms by saving the farmers from losses due to not getting sold. Food processing industry, however, can reduce the perishability and enhance the profitability by entering into agreed terms of contract in mitigating the risk in the market.

Conclusion

The genuine positioning of mushroom cultivation as a high value crop (HVC) is truly a support to the economic development through many strata of the society by providing good health through a nutritional food and wealth to the grower in terms of its low investment, low production cycle, little business risk and high return. It can be done in the kitchen gardens of urban society without having threat to environment or climate change like other industries. It does not require any high-end technologies. Small farmers and housewives can grow this from their small land or space for a high utility value by entrepreneurship. The concept is well accepted by the market, hence there is an ease of doing business. The business being mostly done in small-scale there is a limited risk of competition. The case study in the paper, shows how a woman entrepreneur takes it as a venture and prepares for the next venture towards another variety, because of a low financial risk and possibility of quick recovery or make-up in the business. As alarmed in literature and admitted in the case, a little preparedness and prevention can avert all smaller issues and challenges in this business to achieve success. In case of success and expansion, it may require investment of cold chain infrastructure. But, again the government schemes and parent industries come forward to the development of this industry.

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