

Export potential of Oyster mushroom to Nepal

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Introduction:

Nepal is a small country located in South Asia and is between the Tibet region of China and India with an area of about one hundred forty-seven thousand square kilometers and a population of approximately twenty-eight million people (Chapagain, 2016). Mountain region, Hill region, and Terai region are the three main regions that the geography is divided into in Nepal (Chapagain, 2016). Each region contains a different type of climate such as tropical, temperate and alpine which a wide variety of mushrooms are found widely and grown in the forest. Out of thirty-five types of forest found in Nepal, seven hundred sixty species of mushrooms have been recorded in Nepal as wild which about one hundred seventy of these species has been tested as edible (Poudel & Bajracharya, 2011). The favourable and diverse climate makes Nepal such an advantage in growing many species of mushrooms (Ferchak & Croucher, 1993).

Part 1:

General information on mushrooms in Nepal:

Mushrooms have been consumed and used for medicinal reasons for a long time but cultivation on mushrooms is rather something new to Nepal. Mushroom cultivation in Nepal still maybe small but it is slowly growing as a community. As now, there are about 5000-6000 mushroom farmers in Kathmandu and about 8,000-10,000 kilograms of mushrooms are produced everyday (Poudel & Bajracharya, 2011). Mushrooms are also produced in the city Pokhara and Chitwan but much less produced because of the few farmers they have (Poudel & Bajracharya, 2011). Most mushroom farms are grown in a small scale because they tend to be much more successful than having a large-scale farm which is more labour and harder to maintain a stable condition with the mushrooms. Mushrooms that are in demand from the Nepalese are White button mushroom, Shiitake, Straw mushroom, Ganoderma and Oyster mushroom

(Poudel & Bajracharya, 2011). Research on mushrooms started in 1974 in Nepal under Nepal Agricultural Research council (NARC) (Poudel & Bajracharya, 2011). Now NARC and few other private organizations from Kathmandu provide Nepalese mushroom farmers spawns to grow in their farms (Poudel & Bajracharya, 2011). Mushrooms are not sold at a stable market price in Nepal and which all depends on the demand and supply. During pick productions season, price ranges are from NPR80.00-90.00 (CAD0.98—1.1) per kg and during off season growers earn NPR150-200 (CAD1.83-2.45) per kg (Manandhar, 2004). Roughly mushroom farmers would make about NPR200,000-300,000(CAD2448.6-3672.9) per year (Manandhar, 2004).

Figure 1: The cost of all items needed, total income and the NET profit made

• **Total Production Cost = NPR**5,150.00 (USD69.26)**

Item	Quantity	Cost in NPR
Straw for 100 packets	300kg	1,200.00 (USD16.13)
Plastic bags (18 × 26")	100 pcs	400.00 (USD5.37)
Spawn (250g/bottle)	50 bottles	1,200.00 (24 per bottle)
Rent	2 months	1,000.00 (500/month)
Chemicals		150.00 (USD2.02)
Labor		1,200.00 (USD16.13)

• **Total Income**

= NPR18,000.00-27,000.00 (USD242.09-363.14)

Price	Volume	Value in NPR
90.00 per kg	200-300jg (2-3kg/pack)	18,000.00-27,000.00

* It takes one month growing and another month for harvest.

** NPR (Nepalese Rupee, NPR1 = USD0.0134 in Feb 2004)

• **NET PROFIT = Total Income - Total Production Cost**

▶ Maximum NPR21,850.00 (USD270.00)

▶ Minimum NPR12,850.00 (USD160.00)

(Manandhar, 2004)

Production information:

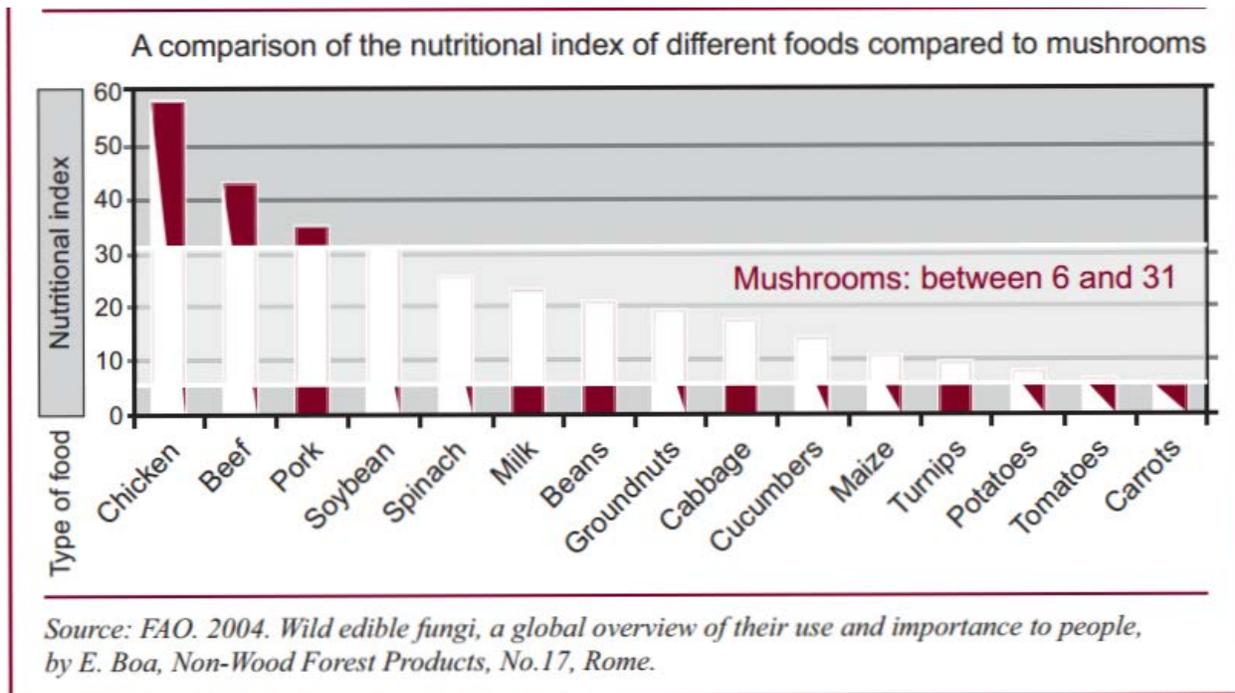
For a potential export idea, Oyster mushroom (*Pleurotus Ostreatus*) spawns will be talked about and investigated throughout this report. Oyster mushroom spawns were chosen out of all the other types of mushroom because it is known to be one of the easier types of mushrooms to grow and even inexperienced farmers or starters can easily grow in their farms or building. (Marshall & Nair, 2009). Another reason why Oyster mushrooms are a good choice of mushroom is because it is one of the popular mushrooms among the Nepalese which can get oyster mushroom farmers to make some potential income. Oyster mushrooms are often grown In the Hilly region and the Terai region which can be rotated around the region depending on the season. (Poudel & Bajracharya, 2011).

Mushroom spawns are like the seed of a vegetable. Spawns are anything that contains the mycelium. Spawns come in many forms but mainly two types are used commercially petri dish and plugs. But mushrooms cannot be grown with just the spawn. To grow mushrooms, farmers will need substrates, spawns, and the right condition. Substrates are anything that a mycelium can grow on. Oyster mushrooms are mainly grown on tree logs, sawdust, wheat, and rice straw as substrates (Marshall & Nair, 2009). Spawns are inoculated into a substrate which the mycelium starts growing by feeding on to the nutrients that the substrates contain and grow, expand and eventually produces the fruit which is the mushroom (Marshall & Nair, 2009). To grow them, they will need a room or a building that is darkened, moisturized, sanitized and a stabilized temperature (Marshall & Nair, 2009). These conditions are very important for mushrooms to constantly keep growing healthy and nutritious. The room must be sanitized due to contamination which can lead to killing the colonization of mycelium by diseases or even grow unwanted species like poisonous mushrooms (Marshall & Nair, 2009). If the farmer can keep these conditions down in their farming, they will be able to contain a sustainable and reproductive mushroom farm and make a

stable income for their farm. Many people in Nepal go through poverty and can not afford technologies and equipment that are advanced and high in price, but there are ways that even people in Nepal can afford. Often farmers will use plastic bags, empty bottles or containers to fill the substrates and inoculate the spawns into them (Marshall & Nair, 2009). They are low cost to run the farm and can be found anywhere which also works very well.

Health benefits:

Figure 2: Comparison of essential amino acids, vitamins, and minerals of different foods compared to mushrooms.



(Marshall & Nair, 2009)

Not only mushrooms can be beneficial economically but they can also help in nutritional needs for the Nepalese. Mushrooms are not only flavourful but they are very nutritious which are often considered to be a equal substitute for meat and many other vegetables (Marshall & Nair, 2009). The consumption of mushroom can provide many vitamins and nutrients that Nepalese do not have in their

body. Mushrooms contain vitamin C, B, and D, niacin, riboflavin, thiamine, folate and minerals including potassium, phosphorus, calcium, magnesium, iron and copper (Marshall & Nair, 2009). They also provide carbohydrates, protein, essential amino acids, fibre and low in fat (Marshall & Nair, 2009). Mushrooms like Oyster mushrooms are known to be very fragile and only last about twenty-two hours after harvesting in an ambient temperature so drying these mushrooms are one of the demanding methods used to sell in the market (Mustayen, Rahman, Mekhilef, & Saidur, 2015). Drying also keeps the nutrients and the flavour of the mushrooms.

In a recent research, Oyster mushrooms has been proven to contain valuable medicinal value. They are known to prevent and treat atherosclerosis (Abidin, Abdullah, & Abidin, 2016). Oyster mushrooms contain anti-atherogenic compounds which can be extracted from fruiting bodies or mycelium to treat people and can be consumed normally like any other food (Abidin et al., 2016).

Company description:

“Mycosource Inc. is a small company that specializes in production of cultivation of Shiitake and Oyster mushrooms on hardwood logs and for substrates in bags.” (“Mycosource Inc.,” n.d.). They are also an owner/operator of Fun Guy Farm, located sixty kilometers from downtown Toronto (“Mycosource Inc.,” n.d.). They are known to be the “supplier of commercial growers and hobby growers and were certified organic by the Organic Crop Improvement Association (OCIA) from 1994 until 2005.” (“Mycosource Inc.,” n.d.). They “research and grow Oyster mushrooms in their laboratory for commercial use and for their strong interest in medicinal properties of mushrooms” (“Mycosource Inc.,” n.d.). They do not just take orders from their customers but they also help teach and assist individually through calls to have them get started in mushroom growing or even commercial growers to give great advice on being successful in mushroom farming.

Mycosource Inc. provides their Oyster mushroom sawdust spawn for \$20/bag (CAD) which contains about 1.5kg of sawdust spawn (“Mycosource Inc.,” n.d.). They also have sawdust spawn for

\$30/bag (CAD) which contains about 2.5kg of sawdust spawn (“Mycosource Inc.,” n.d.). These “sawdust spawns are made to order and prepaid.” (“Mycosource Inc.,” n.d.). Instructions on growing these mushrooms commercially are included on the website or can be found by asking them directly through email or phone.

Figure 3: Sawdust spawn in a bag



(“Mushroom Sawdust Spawn,” n.d.)

Benefits to Canada:

As Nepal mushroom farmers expand and become large producers, more spawns will be needed. This means that there will be more jobs to make spawns for Canadians and will increase profit for Canadian mushroom companies and laboratories. Not only spawns will be needed but also substrates may be needed due to the insufficient number of substrates in Nepal which won't be enough to provide all the mushroom farmers. Also, the transportation company will benefit from this exporting project. Because of the exportation of mushroom spawns, there will be more jobs for companies like A1 Freight Forwarding Inc.

Main Target:

The main targets for this product are for mushroom farmers but the mushrooms that the farmers grow will be bought through the local fresh market in Kathmandu. Most populated city in Nepal and the most mushroom farmers are also in Nepal which delivers to Kathmandu. As for now, Oyster mushrooms are enough for Nepalese because consuming mushrooms as food are relatively still new in the city but as the mushroom popularity grows and the mushroom farming becomes larger as a community, more mushrooms will be needed to be produced. A high percentage of the population are Hindu, which many of them will be vegetarian (Ram Dahal, 1978). Vegetarians will not be able to take in some of the essential nutrients that many animals contain but Oyster mushrooms have the potential of being the substitute of these products from animals which can be a huge enhancement for the Nepalese. Nepal has a huge possibility to expand their mushroom farming and export out to the world.

Part 2:**Transportation:**

Transporting a certain product to another country seems easy and simple but must go through many things to reach the other country. As research has been done, few obstacles were found to export Oyster mushroom spawns to Nepal. The first obstacle is the Phytosanitary Certificate which this certificate will be very likely be needed to export Oyster mushroom spawns. Phytosanitary Certificate is an “official certificate by the plant protection organization of the exporting country to the plant protection organization of the importing country.” (“Phytosanitary Certificates,” n.d.). It “certifies that the plant product has been inspected according to the appropriate procedures and considered to be free from quarantine pests and considered to conform with the current Phytosanitary regulations of the importing country.” (“Phytosanitary Certificates,” n.d.). If the farmers and the exporter do not have the Phytosanitary Certificate with them, the spawns can be held up in the custom which can lead the spawns to damage or death. Another problem with transportation of spawns is that it has a high cost. Because

Oyster mushroom spawns must reach Nepal fast due to its short lifespan, they need to go through Courier which is the express shipping that goes much faster than a standard shipping. As transportation will need to be fast, it will be best to transport through airlines instead of using a ship across the sea. The Canadian company A1 Freight Forwarding Inc. exports numerous products internationally and will be able to meet the stringent transportation requirements (“A1 Freight Forwarding,” n.d.). Using this company, exporting Oyster mushroom spawns is possible. They will go through Courier delivery service using the airlines straight from Toronto to Nepal. After landing in Nepal, they will be delivered to Kathmandu Valley which is very close to the major urban centers and has a high concentration of mushroom farmers. From Kathmandu Valley, all farmers that ordered the Oyster mushroom spawn can easily come down to the city to pick up their supply with their vehicle or any other transportation.

Benefits to Nepal:

Oyster mushroom spawns as a product to produce Oyster mushrooms will greatly benefit Nepal in many ways. Mushrooms consumption has been accepted and known to be consumed by some ethnic groups, but recently it has been bought and consumed by people in the city through fresh markets because people are starting to become aware of health benefits mushrooms can give. As more people understand the health benefits, more people will purchase these Oyster mushrooms and bring mushroom farmers to make a great profit. Additionally, these Oysters mushrooms can be dried and stored up until six months and still contain the nutrients and the flavour (Mustayen et al., 2015). As Oyster mushroom farming grows in Nepal, there will be a greater demand on these mushrooms which more Nepalese will have jobs in this industry. Mushroom growing is very easy to spread and expand because of its fast reproduction on fruit and mycelium. Many Nepalese are very limited in terms of money and resources but once they buy these Oyster mushroom spawns they can keep on reusing and obtain the perfect reproductive cycle. Instead of buying more spawns with a high cost, farmers are able to take parts of the colonized mushroom and use them as new spawns to regrow more mushrooms (Marshall & Nair, 2009). Not only do Oyster mushroom help Nepalese for food but they can also help other crops indirectly. In mushroom farming,

very little things go to waste because the substrates which are used to put spawns into are used in other crops even after use for mushroom growing (Beyer, n.d.). These used substrates, called Spent Mushroom Substrates (SMS) can be used as a soil conditioner for field crops because they still contain nutrients including Potassium, Magnesium, and Phosphorus after use (Maher, 1994). The final benefit for Nepalese mushroom farmers is that it is very easy on labour. Mushroom farming is moderately easy in terms of labour and monitoring and can be done by anyone if they have the knowledge for it. Therefore, people with physical and mental disabilities are capable of working in this environment without struggling.

Challenges:

There are many positive enhancement and benefits to Nepal but there are also many cons and challenges that are needed to be looked over to make this project successful. One of the biggest problems is the transportation network around Kathmandu. Many mushroom farmers can be successful in producing Oyster mushrooms but they are very limited in transportation to bring fresh Oyster mushrooms to the market. Oyster mushrooms do not last a very long time and are very fragile which bumpy roads or no roads can be very dangerous on these Oyster mushrooms and farmers. Another challenge among the Nepalese is the lack of knowledge and training on mushroom growing. To start anything new, people will need knowledge and training on it, but Nepalese do not have the opportunity to take these training which leads them to failure when they start their farm. They are often devastated and hopeless when the problems start rising and have nothing they can do but to watch these mushrooms slowly weaken and die. This is also because of the lack of interest of mushrooms. Nepalese needs more awareness on the health benefits and medical value mushrooms can provide. Because of this, there is much less demand in mushrooms compared to other countries that are educated that mushrooms are very healthy. When there is less demand in mushrooms, there are fewer jobs. When there are fewer jobs for mushroom farming, there will be less education and knowledge on mushrooms.

Competition:

The competition that the Mycosource Inc. faces are the other Oyster mushroom spawns on the market. Surfing through the Online global trade market, Alibaba.com. there has been many companies and people that provide many tons of Oyster mushroom spawns. Because they make spawns in large quantity, the Oyster mushroom spawns are much cheaper than Mycosource Inc. Many of the companies are from China (Mainland) which produces a mass amount of spawns and exports all over the world. One of the companies called Henan Shijixiang Edible Mushroom Co, Ltd locates in Henan, China (Mainland) and make a total annual revenue of about US\$2.5 Million – US\$5 Million with employees from 100-200 people (“High Yield Black Color Oyster Mushroom Spawn,” n.d.). They are “one of the earliest and biggest factory of China and contains cheap Oyster mushroom spawns and many other spawns with a guarantee of high quality and yield.” (“High Yield Black Color Oyster Mushroom Spawn,” n.d.). This company sells a single bag of Oyster mushroom for about US\$6.6-US\$7.2 per bag and only sells a minimum of nine thousand pieces of Oyster mushroom spawn which is about one thousand five hundred bags (“High Yield Black Color Oyster Mushroom Spawn,” n.d.). The scale of Oyster mushroom spawns is on another level compared to Mycosource Inc. Small companies like Mycosource Inc. will have a tough competition against large countries that provide large amounts for a cheap price.

Recommendations:

For healthy and quality mushroom spawns to be delivered to Nepal, Canadians must make their spawns last a longer time. If the spawns can have a longer lifespan, the spawns can take the standard shipping which has a lower cost than the Courier shipping. Also, inventing Oyster mushrooms that last more than twenty-two hours of ambient temperature will save both Nepal and Canada which delivery time from the mushroom farm to the fresh market in Kathmandu won't matter if Oyster mushroom can last long. People in general need to know more about mushrooms. The health benefits, nutritional value, and medicinal value are extremely good and covers many types of vegetables and animal product's

nutrients. This means that Canadians and Nepalese both must educate more people on the importance of mushrooms.

Conclusion:

Overall, exporting Canadian Oyster mushroom spawns to Nepal to grow Oyster mushroom would be very beneficial for Nepalese citizen and Nepalese mushroom farmers as well as Canadian spawn growers. Although there are many problems with growing, transporting and selling, this will become solved eventually and there will be a day where everyone will know the necessity of mushrooms and everyone will be consuming it. Nepal's mushroom farming is growing rapidly and has the potential of being the future leading mushroom growers in the world.

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