

Introduction of mushroom mycelium to Nepal

Name: Yixuan Wan

Section: 0102 Friday 2.30pm

AGR1110

Date: Dec. 1st. 2015

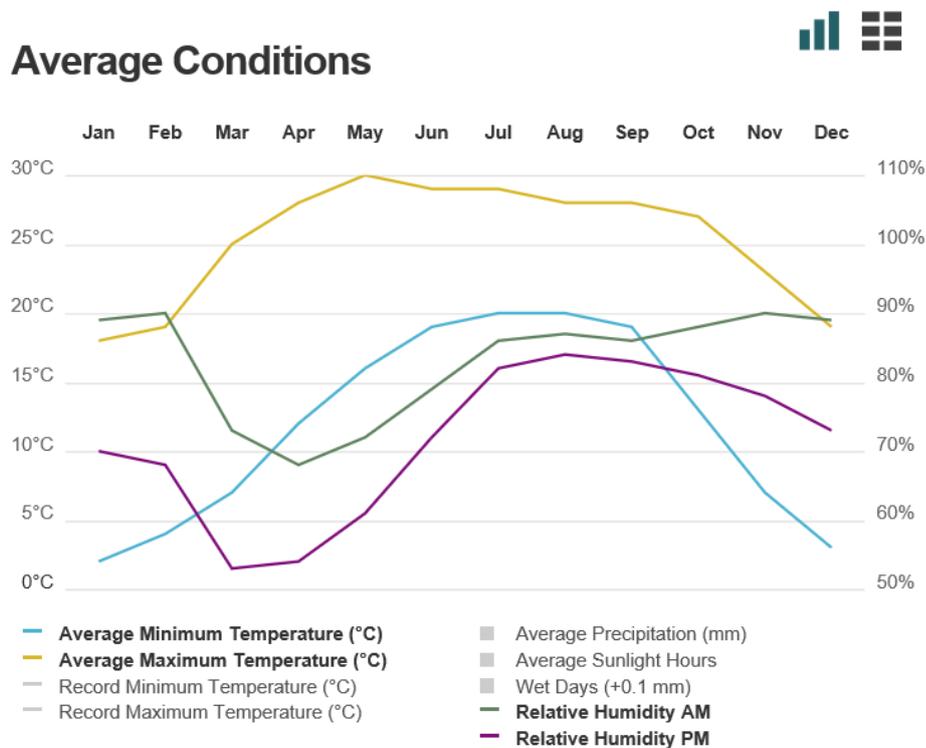
Background information of Nepal:

Till 2013, including Nepal, 49 countries are still grouped as the least developed countries by the United Nations Conference on Trade and Development (UNCTAD, 2013). All the evaluation criteria are on the basis of the individual and national economic condition. One criterion, the Per capita Gross National Income of Nepal is \$659 which is only half of the graduation threshold \$1242 (United Nation Department of Economic & Social Affairs and Committee for Development Policy, 2015), which represents the average low income level of the Nepalese and the serious national poverty situation, which also reflecting the economics and productivity of the Nepal still remains at the very primary level. In addition, agriculture sector accounts for around 33% of the Gross Domestic Product and supports around 86% of the total population (Local Initiatives for Biodiversity, Research and Development, 2009). Therefore, the way to enable the majority of Nepalese people to be lifted out of poverty is to increase the farming income. However, within the 147180 km² country, 78% of the land is composed by the mountainous morphology (Pariyar & Shelton, 1998), but the fragmented topography is not favorable for the large-scale crop cultivation, so raising income could hardly be solved by the quantification of the crop production. Instead, the income could be risen by the means of enhancing the crop value. Thus, growing crops with higher economic value becomes the feasible resolution to help Nepalese to get rid of poverty.

Product information:

By the Agricultural development Economics Division, Food and Agriculture Organization of the United Nations, cash crops are defined as the “crops which are grown primarily for marketing rather than for household consumption.” (Hill & Vigneri, 2011) Therefore, for Nepal the cash crop with higher economics value and adaption to the local environment would be ideal to cultivate. Nevertheless, Nepal climate enjoys its own particularities, since it has both summer and winter raining season due to the arrival of monsoon and the impediment of the Himalaya Mountains (Pariyar & Shelton, 1998) which conducts to the high year-round humidity ranging from 68% to 90% at day and 53% to 84% at night(BBC, 2015) in the graph 1.

Graph 1: Kathmandu annual humidity graph according to day time and night time.



Average Conditions data © Copyright RM, 2011. All rights reserved. [Helicon Publishing](#) is a division of RM.

The humidity provides the crop, the mushroom, the important factor, moisture (Marshall & Nair, 2009) for it to be grown. As the most initial and essential stage of the mushroom cycle, mycelium grows into hyphae which is the main mode of the further growth of the mushroom (Marshall & Nair, 2009) could be purchased from the Canadian supplier for the Nepalese farmer. Therefore, in light of the monsoon climate of Nepal and the small-scale farming mode, the most suitable agriculture product export to Nepal is the mushroom mycelium.

Different from the traditional crop cultivation, Marshall and Nair in the FAO booklet *Make Money by Growing Mushrooms* stated that mushroom cultivation requires both pasteurized mycelium, the spores, and the substrate and different strains requires different substrate. Since the agriculture waste could be reused and processed into substrates shown in groups in the table 1 like sawdust and cotton waste, the growers' production cost will be minimized. Yet, the farmer could chose to use log as the substrate.

Table 1: the table of the category of the substrate based on the strains of mycelium.

BOX 1 Key mushroom species and their corresponding cultivation medium

Growing Medium	Mushroom Species
Rice straw	Straw (<i>Volvariella</i>), Oyster (<i>Pleurotus</i>), Common (<i>Agaricus</i>)
Wheat straw	Oyster (<i>Pleurotus</i>), Common (<i>Agaricus</i>), Straw (<i>Volvariella</i>), Roundhead (<i>Stropharia</i>)
Coffee pulp	Oyster (<i>Pleurotus</i>), Shiitake (<i>Lentinus</i>)
Sawdust	Shiitake (<i>Lentinus</i>), Oyster (<i>Pleurotus</i>), Lion's Head or Pom Pom (<i>Hericium</i>), Ear (<i>Auricularis</i>), Ganoderma (<i>Reishi</i>), Maitake (<i>Grifola frondosa</i>), Winter (<i>Flammulina</i>)
Sawdust-straw	Oyster (<i>Pleurotus</i>), Roundhead (<i>Stropharia</i>)
Cotton waste from textile industry	Oyster (<i>Pleurotus</i>), Straw (<i>Volvariella</i>)
Cotton seed hulls	Oyster (<i>Pleurotus</i>), Shiitake (<i>Lentinus</i>)
Logs	Nameko (<i>Pholiota</i>), Shiitake (<i>Lentinus</i>), White jelly (<i>Tremella</i>)
Sawdust-rice bran	Nameko (<i>Pholiota</i>), Ear (<i>Auricularis</i>), Shaggy Mane (<i>Coprinus</i>), Winter (<i>Flammulina</i>), Shiitake (<i>Lentinus</i>)
Corncobs	Oyster (<i>Pleurotus</i>), Lion's Head or Pom Pom (<i>Hericium</i>), Shiitake (<i>Lentinus</i>)
Paper	Oyster (<i>Pleurotus</i>), Roundhead (<i>Stropharia</i>)
Horse manure (fresh or composted)	Common (<i>Agaricus</i>)
Molasses waste from sugar industry	Oyster (<i>Pleurotus</i>)
Water hyacinth/Water lily	Oyster (<i>Pleurotus</i>), Straw (<i>Volvariella</i>)
Oil palm waste	Straw (<i>Volvariella</i>)
Bean straw	Oyster (<i>Pleurotus</i>)
Cotton straw	Oyster (<i>Pleurotus</i>)
Cocoa shell waste	Oyster (<i>Pleurotus</i>)
Coir	Oyster (<i>Pleurotus</i>)
Banana leaves	Straw (<i>Volvariella</i>)
Distillers grain waste	Lion's Head or Pom Pom (<i>Hericium</i>)

Source: Beetz, A. & Kustudia, M. 2004. *Mushroom cultivation and marketing. Horticulture Production Guide. ATTRA Publication IP 087.*

There are 2 companies in Canada which can supply the mushroom spawn. One company is the “Wylie Mycologicals”, contact number is 519-534-1570. Its address is 166 South Bass Lake Road, RR 1, Georgian Bluffs, Ontario, N0H 2T0. The other company is the “Mycosource Incorporation”, the contact number is 416-402-9755, at 21 Maple Avenue, Toronto, M4W 2T5.

According to the information provided by both companies on their websites. Differences exist in the product of both companies as well. The company “Wylie Mycologicals” mainly sells the mushroom growing kit in bags, which has included the sterilized substrate. All the kits are ensured to be organic and fruit (Wylie Mycologicals LTD., 2012), but the yield is not ensured. The price for all the product is unitedly 28\$ per bag, and each bag weighted around 7 pounds. In addition, it provides 16 mushroom strains more than the company “Mycosource Incorporation” which only specializes in 2 strains of shiitake and oyster. The company “Mycosource Incorporation” provides both the growing kit and the mushroom mycelium with cultivating instructions posted on the websites. The price of sawdust spawn for wholesale is \$18 per bag. Each bag weighed 2.5 kg, which can inoculate over 25 logs (Mycosource Incorporation, 2012).

Considering wholesale, the most economic transportation from Canada to Nepal is the ocean freight. However, since Nepal is the land-locked country, (United Nations Conference on Trade and Development, 2003), the ocean freight could not directly deliver to Nepal, so Calcutta, India becomes the closest permitted sea-port to Nepal by Indian government (Foreign Investment Promotion Division HMG, 1996), and the cargo could be either driven or railed to Nepal. Comparing to the other companies, the A1 freight offers the least transportation fee. Since both companies are located in Ontario, the cargo will be shipped from Toronto to Calcutta. Assuming the whole village is going to cultivate the mushroom and there are 20 families in total. Each family is going to cultivate 150 logs of mushroom. Then, each family needs $150/25=6$

bags of mycelium, the net weight of the spawn of the whole village is $6 \times 2.5 \text{ kg/bag} \times 20 = 300 \text{ kg}$. If the items are placed in the 1 m^3 crate, based on the quote data from the A1 freight website, the ocean freight fee is 286.89 USD (2015).

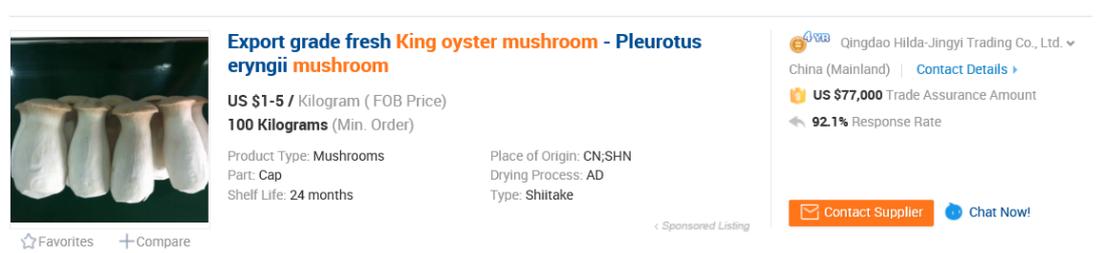
Product Perspective Analysis:

Because the purpose of the project is to help enhance the income level of the Nepalese, the possible profit of the Nepalese farmer could be expressed in a mathematical model. The yield of the mushroom is calculated from the average yield of the experiment “Yield and Nutritional Composition of Oyster Mushroom Strains Newly Introduced to Bangladesh” (Ahmed et al, 2013), and the average mushroom retail price is 245 Rupee (Ministry of Agricultural Development, 2015). In the light of the 80.17 exchange rate of Nepalese Rupee to Canadian Dollar (Nepal Rastra Bank, 2015), even without adding the transportation fee, the mathematical model of the profit could be built as $y = (0.6x) - 0.542794x = -0.0573x$, which means if mushroom is sold in Nepal with Nepalese Prices and without any processing or value addition, the farmer is not going to earn any profit since the coefficient is negative. The reason comes from the high exchange rate between the currencies and the difference in the economic strength of Nepal and Canada (UNCTAD, 2013).

Then, in order to enhance the income level of Nepalese, the proper strategies should be adopted. Because of the high currency exchange rate, the investment of the product should be minimized. For Nepal is also accounted as the service exporter (UNCTAD, 2013) due to the large number of population. In addition, two thirds of the

labor force is enrolled in the agriculture production (UNDP & Government of Nepal National Planning Commission, 2014), so there is the great chance that Canadian supplier can transfer the production department of mycelium to Nepal which not only decreases the cost but also offers more professional experience to Nepalese. However, Nepal is still the undeveloped country, the low GNI (United Nation Department of Economic & Social Affairs and Committee for Development Policy, 2015) enables the people have relative low affordability to the product. Hence, if the production is redundant, the solution is to seek for exportation to the other countries. In the meantime, mushroom has high water content, which is hard to reserve (Marshall & Nair, 2009), so drying not only prolongs its shelf-life for exportation, but also enhance its flavor. Moreover, it adds value addition to the raw material. For instance, from Alibaba.com, the price of fresh king oyster mushroom is 1 to 5 USD per kg, but the price of king oyster mushroom increases to 7 to 12 USD per kg shown in picture 1 and 2.

Picture 1: the picture of price of the king oyster mushroom on Alibaba.com



Picture 2: the picture of the price of dried oyster mushroom on Alibaba.com



High Quality Dry Oyster Mushroom

US \$7-12 / Kilogram (FOB Price)
1 Metric Ton (Min. Order)

Product Type: Mushrooms
 Part: Whole
 Brand Name: CHUANYE

Place of Origin: CN:SIC
 Drying Process: AD
 Shelf Life: 3 years

Sichuan Chuanye Food Co., Ltd.
 China (Mainland) | [Contact Details](#) ▶
 5.9% Response Rate

[Contact Supplier](#) [Leave Messages](#)

☆ Favorites + Compare

Besides, Nepal is the land-locked country with the Himalayan Mountain impeding in the north, which means it is remote and hard to communicate or connect with other market (United Nations Conference on Trade and Development, 2003). Thus, the visitors from the other places or countries becomes the good marketing sources. From 2002 to 2013, the Chinese tourists visiting increases from 8715 to 113173 which is 10 times more (Durbar, 2014). It shows the great potential of tourists increase, so the farmers can make the connection with the merchants and sell fungi through the channel of tourism which offers the direct path to the market.

For Canada, the exportation will enhance the trade volume and the profit of the company, since its large population foundation of around 27.8million (DESA & CDP, 2015). Exportation to Nepal is also the process of putting the product into the new niche market, although it is still risky to compete with the Nepalese local producers, but it is valuable to contrast the Canadian domestic product to the others and make modification or improvement to the current product and explore new market.

The cultivation of fungi does not require large land area, the farmer could either choose to cultivate mushroom indoor or outdoor. In addition, fungi culture does not demand high labor input but requires on the meticulous skills (Marshall & Nair, 2009), so the work is not restricted to age or gender. Hence, it is the work that women or old

people both could handle, which enable more population to participate in agriculture production without interfere the planting of rice or barley, the major crop which provide energy. Also it is the work can also effectively enhance the involvement and empowerment of women in the agriculture and provides them another skills of supporting the family.

Reference:

1. DESA & CPI. (2015). *The Least Developed Country Category 2015 Country Snapshot*

United Nation.

2. LI-BRID. (2009). *Climate Change and Agrobiodiversity in Nepal: Opportunities to include agrobiodiversity maintenance to support Nepal's National Adaptation Programme of Action (NAPA)*

FAO.

3. UNCTAD. (2013). *THE LEAST DEVELOPED COUNTRIES REPORT 2013.*

Geneva, Switzerland: United Nation

4. <http://www.fao.org/ag/agp/agpc/doc/counprof/nepal.htm>

<http://www.fao.org/docrep/013/am313e/am313e00.pdf>

<http://www.bbc.com/weather/1283240>

<http://www.fao.org/3/a-i0522e.pdf>

<http://www.wyliemycologicals.ca/#!contact/rn373>

<http://mycosource.com/>

http://unctad.org/en/Docs/tdbldcac1d19_en.pdf

<http://www.catmando.com/gov/industry/fipd/fipd7.htm>

<http://www.a1freightforwarding.com/quote/booking.php?quoteID=155429&CargoType=Commercial%20cargo>

http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0100-204X2013000200010&lng=en&nrm=iso&tlng=en

<http://www.nrb.org.np/fxmexchangerate.php>

<http://un.org.np/sites/default/files/Nepal-HDR-2014.pdf>

<http://www.tourismdepartment.gov.np/tourism-statistics>