

Cobb Hill Mushrooms



Long a symbol of longevity in Asia because of their health-promoting properties, shiitake mushrooms have been used medicinally by the Chinese for more than 6,000 years. Here at Cobb Hill, we started growing shiitakes a bit more recently, in 2006. Our hope was to supplement our garden produce and to use a waste product (small logs) from non-commercial forest thinning operations.

We set these early logs in shaded areas of our woods. During these early years, fruiting was erratic and dependent on rainfall to stimulate fruiting. We often missed peak fruiting because we did not visit logs every day to check.

Even when or timing was good our mushrooms sometimes got very soggy from rain storms just prior to picking. We learned many things about mushroom cultivation in these early years.

In 2010 we had about 250 logs and began soaking logs in a stock tank (forced fruiting). Force fruiting produced mushrooms in a more predictable way (i.e., we knew when they were going to fruit verses our previous method of letting the weather control fruiting). We also made some other modifications, such as creating a covered and dry space during fruiting to reduce rain and slug damage to the shiitakes. Last year (2011) we were successful in cultivating shiitake mushrooms in a predictable way- we produced ~320 lbs! In 2012, our total logs increased to approximately 500, which is our capacity for this enterprise.

Fungi are fascinating! They are neither plant nor animal but something in between. There are many mysterious about cultivating them still to be discovered. We love growing, experimenting, and eating shiitakes and also the exercise of moving logs around (we use our backs and carts). We look forward to providing a healthy food source to our local area and helping others cultivate mushrooms well. A description of our cultivation process and brief summary of nutritional benefits are listed below.

We hope you enjoy them!

Jesse Hills, Phil Rice & Bill Stack

Annual cycle of mushroom cultivation (See photos in Appendix)

Once a tree has been cut and logs transported to the site, there are six general phases for cultivating shiitake mushrooms:

- (1) **Inoculation** – Drilling holes in logs and plugging these holes with the mushroom spawn (spring and/or fall);
- (2) **Spawn Run** – Letting logs sit in shaded area for a year so that the shiitake mycelium (vegetative growth of mushroom -"roots") can colonize the log;
- (3) **Log Soaking** – Logs are put into a stock tank for about 12-24 hrs to stimulate fruiting. About 100-125 gallons of water used for each soaking. Water is often used for multiple soakings. Water is drained via house back into well overflow channel.;
- (4) **Fruiting** –putting logs under shade structure for 7-10 days in vertical position to accommodate fruiting and harvesting;
- (5) **Harvesting** – picking the crop and putting into immediate cold storage; and
- (6) **Resting**- logs are moved to a shaded area to rest for 6-8 weeks before soaking/fruiting sequence.



More Cultivation Details: Hardwood logs used are typically 3 to 8 inches in diameter and are 3-4 ft long. Logs are inoculated with certified spawn during the spring and fall. Logs typically are generated during forest stand improvement work (non commercial thinning or crop tree releases). Only green logs are used to grow shiitakes. This is because they have the high moist content and low percentage of competitive fungi that are crucial to growing shiitakes. Once logs are inoculated they rest in a shaded area for one year before fruiting.

Logs used for growing our shiitakes are selected and cut by our licensed forester, Bill Stack, using sustainable forest practices. Logs come from both our forest and other forests in the Upper Valley.

Our total mushroom log operation is approximately 500 logs. Each log goes through 2-3 fruiting cycles each year. Mushroom yields are approximately 0.5 lbs/log/fruiting. Logs last about 4 years before needing to be replaced; each year we add ~120 logs. During the winter and cooler months the logs are dormant; they are placed in a shaded area that is out of the wind.

Nutritional and Health Benefits:

The shiitake mushroom is prized around the world for its medicinal properties. It is one of the most popular sources of protein in China, Japan, and the rest of Asia. Its popularity is not due to its ample protein but its delicious flavor and other medicinal attributes.

The nutritious shiitake mushroom is comparable to green beans and peas. Shiitakes have four to ten times the flavor of common white button mushrooms. In addition to their robust/pungent, woody flavor and meaty texture, shiitakes provide high levels of protein (18%), potassium, niacin and B vitamins, calcium, magnesium and phosphorus. They have natural antiviral and immunity-boosting properties and are used nutritionally to fight viruses, lower cholesterol and regulate blood pressure. Lentinan, an immunostimulant derived from shiitakes, has been used to treat cancer, AIDS, diabetes, chronic fatigue syndrome, fibrocystic breast disease, and other conditions with impressive results.

Shiitake Mushroom Nutritional Highlights

Shiitake Mushrooms(cooked)
Serving size: 4 mushrooms
Calories: 40
Protein: 1.12g
Carbohydrate: 10.3g
Total Fat: 0.16g
Fiber: 1.5g



The shiitake flavor is intensified by drying. Dried mushrooms can be stored indefinitely and reconstituted by soaking. The texture is different from fresh log-grown shiitake, and they don't sauté well, but dried shiitakes are perfect for soups, stews, gravies and baked dishes.

Log grown vs sawdust grown shiitakes: Shiitakes are typically grown on two substrates: hardwood logs or sawdust blocks. The highest quality shiitakes are grown on oak logs. No supplements are needed. All of the mushroom's nutrients are within the log. Logs are kept outside under shade as the shiitakes require indirect sunlight, day and night cycles, and ventilation. Log-grown shiitakes take approximately 10-12 months to fruit.

Sawdust blocks are fabricated by combining hardwood sawdust and cooked grains that are sterilized with pressurized steam. They are inoculated with spawn, incubated for 1-4 months and then soaked in water to stimulate the fruiting process. Urea, minerals, and other substances may be added to increase protein and boost nutritional content. The mushrooms are grown indoors with controlled humidity, temperature, electric light, and

air flow. The sawdust block is highly susceptible to disease and competing fungi. Some producers use pesticides to control mites or add species-specific fungicides or other chemicals to control disease.

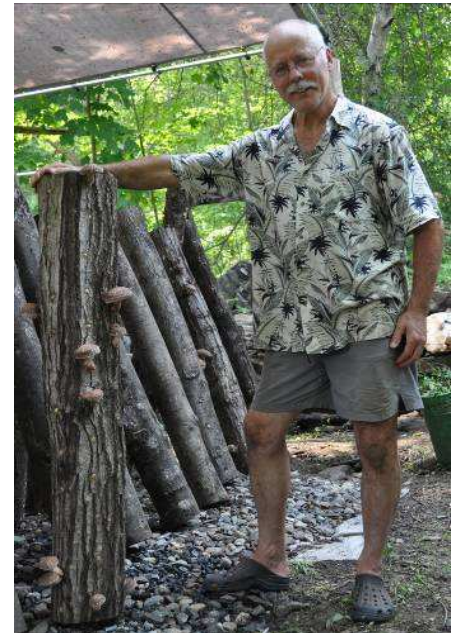
Most shiitakes available in the supermarket are grown on sawdust. The log-grown shiitakes go primarily to chefs and pharmaceutical companies. Consumers, who are not aware of the difference, are currently paying the same amount for both types, even though the wholesale price of sawdust-grown shiitakes is about half that of log-grown shiitakes. In Japan, sawdust-grown shiitakes cost consumers less than \$4.00 a pound while log-grown shiitakes sell for \$40 a pound or more.



Some sawdust-grown shiitakes are very good and many people can't recognize the difference until they have seen both types and cooked with them. Log-grown shiitakes have more of a meatier texture. The gills on log-grown shiitakes and on high-quality sawdust-grown mushrooms will be pure white and unbroken. A package of log-grown shiitakes will usually contain mushrooms of different colors, shapes, and sizes, and the mushrooms will have short stems. The mushrooms from sawdust blocks may all have the same conical shape, pale color and markings (or no markings). Low-quality sawdust-grown mushrooms having bulbous stems, yellow or broken gills and an ammonia-like smell should be avoided.

Our Goals:

- Growing mushrooms to supplement our garden produce and to explore selling mushrooms at our farm stand.
- Utilizing a waste product (small hardwood logs and chips from forest management work) to cultivate shiitake mushrooms in a way that (1) provides predictable and dependable yields and (2) minimizes resource use (water, land, and energy) and labor (don't pull our backs out).
- Participating in University of Vermont (UVM) shiitake mushroom cultivation study. UVM has grant to investigate ways to supplement farm incomes by growing and selling shiitakes. We are one of twenty growers participating (see <http://www.uvm.edu/sustainableagriculture/?Page=shiitakeoverview.html>)
- Providing mushroom inoculation workshops for those in the Upper Valley who are interested in cultivating mushrooms in their gardens (once/year, about 10-15 people).
- Exploring value added mushroom products (e.g., dried mushrooms)



Appendix: Photos of Shiitake Log cultivation



Logs are inoculated with spawn



“Assembly line” inoculation process



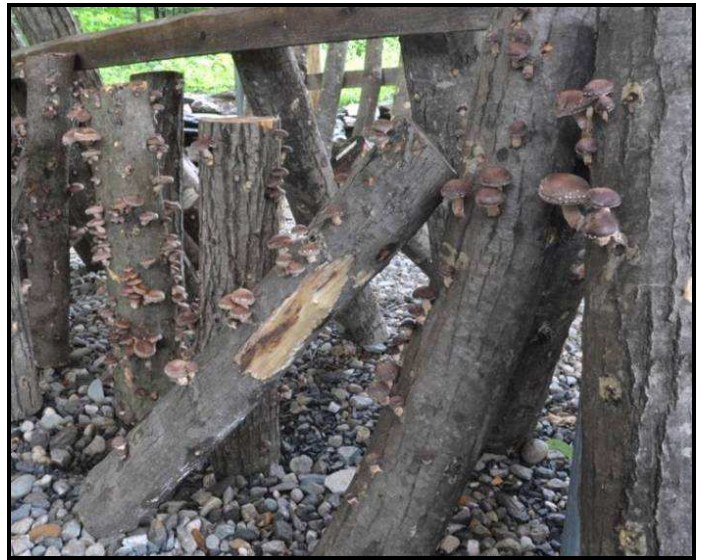
Logs rest for 1 year (colonization period)



Log Soaking Tank to stimulate fruiting



Covered Fruiting Area



Logs Fruiting



Shaded Mushroom Resting Area



Sun Dried (Shiitakes Vitamin D increases by 100X)