

From Harvest to Market

DEVELOPING A VIABLE SPECIALTY MUSHROOM ENTERPRISE



For More Information Visit:
www.CornellMushrooms.org

This guidebook is possible because of support from the [USDA Specialty Crop Grant Program](#), [New York Farm Viability Institute](#), and Cornell Cooperative Extension.

Small Farms Mission:

We envision a future where diverse and vibrant urban and rural farms build human capacity, revitalize communities, supply regional food systems, and foster ecological resilience in a changing world.



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Introduction

This publication offers information to support post-harvest handling, sales, business planning, and decision making that is critical to developing a viable specialty mushroom enterprise.

Assuming you have learned, or will learn, the technical aspects of production including substrate acquisition, inoculation, management, forcing, fruiting, and harvest, this guide picks up after harvesting, in the stages of storing, packaging, marketing, sales, and record keeping.

The format of this guide follows the process in the logical order in two sections:

Section 1: The Production Chain: From Harvest to Market

Section 2: Enterprise Planning (Budgeting, Cash Flow, Legal considerations, etc)

In addition to this guide, growers are advised to consult **The Guide to Farming in New York** for more information and resources pertaining to the rules, regulations, and considerations for any farm enterprise in New York State, available at the Cornell Small Farms website: <http://smallfarms.cornell.edu>

GETTING THE MOST FROM THIS GUIDE:

This workbook is meant to serve as a companion to our production manuals: “Best Management Practices for Log-Based Shiitake Cultivation” (2012) and “Growing Specialty Mushrooms in Controlled Environments” (2019), both of which are available as free downloads at:

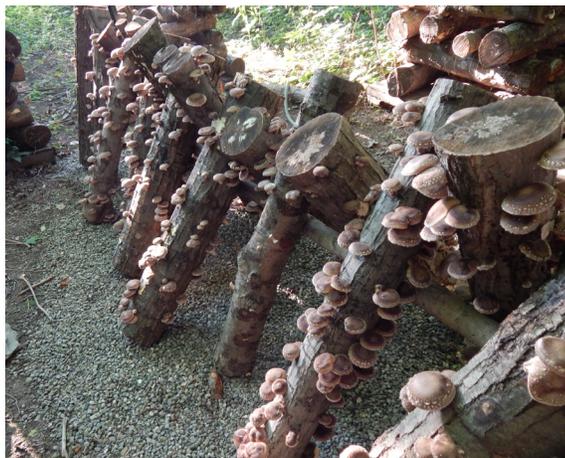
www.CornellMushrooms.org

Growing Specialty Mushrooms: Outdoors vs Indoors

While our materials at www.CornellMushrooms.org explore this topic in greater depth, it is worth briefly reviewing the differences between outdoor cultivation and indoor, controlled environment growing of specialty mushrooms. There is not one method that is right or wrong, but rather each offers distinct differences that are more suitable given your situation.

For outdoor growing, Shiitake (*Lentinus edodes*) alone offers the combination of characteristics needed for reliable and profitable production. Namely, shiitake logs can be soaked and “forced” to fruit on a routine basis, meaning that a grower can get consistent yields from June – October in most parts of New York State.

Other mushroom species that produce reli-



ably outdoors in the forest include oyster, lions mane, stropharia, and nameko. However, each of these mushrooms produces at only specific times of the year, when conditions (temperature and moisture) are just right. Therefore, the timing of fruiting is not controllable nor reliable. A grower with established markets can certainly sell these mushrooms, but he/she won't be able to build a viable business off them alone.

Outdoor production offers the advantages of very low infrastructure and energy costs, since only the forest canopy is needed to provide the proper conditions to fruit. Logs and wood are relatively inexpensive to acquire, and woodland production supports good forest management practices. On the downsides, the species you can grow profitably are limited, and the growing season is also limited to approximately 6 months of the year.

In indoor or controlled environment production, more species can be grown profitably, with the most common being oyster, shiitake, and lions mane. Oyster is the most versatile and adaptable, being successfully grown on straw as well as sawdust. Shiitake, lions mane, and others do best on sawdust. The substrate materials for all types of cultivation must first be treated to "clean" them from contaminants, and during all phases of growing temperature, humidity, light, and air must be carefully controlled. This leads to the pros and cons of this form of production; while a grower can reliably produce a wider range of species, potentially year-round, there is an initial investment of infrastructure and the need to purchase and maintain the equipment to keep environmental conditions optimal.

Learn more about each production system at

www.cornellmushrooms.org.



Regardless of the methodology, the end product behaves the same post-harvest, which is the focus of this publication.

Section 1:

Post-Harvest Handling



*While many growers focus heavily on the technical aspects of production, it is the post-harvest handling and sales that counts in making for a profitable enterprise. Specialty mushrooms are defined as any species other than the *Agaricus bisporus* (button, crimini, portabella), which accounts for over 90% of the current US mushroom consumption. Growers can fetch a premium price for other species including shiitake, oyster, lions mane, and others, provided they can maintain quality throughout the post-harvest process.*

A. Safety & Sanitation

The most important detail in the post-production aspect of specialty mushroom production is to maintain a high quality and safe product for sale.

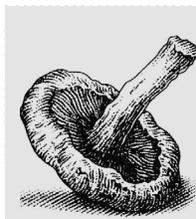
Mushrooms, in particular, are unique in that they are mostly water, and are not best cleaned by washing, since it ruins their texture and shelf life of the product.

“On our farm, we consider how our daily tasks might affect sanitation. For instance, we harvest mushrooms before doing animal chores, or change our clothes first.”

- Steve Gabriel, Wellspring Forest Farm

For this reason, it is CRITICAL to ensure that mushrooms are carefully handled during all phases of harvesting through selling.

Sanitation Checklist



- Be sure to wash hands thoroughly with soap and water anytime prior to handling mushrooms
- Consider wearing latex gloves when handling
- Use stainless steel or food grade plastics to hold and store mushrooms
- Harvest with scissors instead of a knife
- Routinely clean all containers and tools.
- Clean and get mushrooms into the fridge as quickly as possible.

For fresh, uncut produce, no licenses are required to sell specialty mushrooms fresh in New York. Produce must be sold free of debris and in clean containers.

Good Agricultural Practices (GAPS)

The GAPS has been a voluntary food safety monitoring protocol for many years, but some farms may now be required to comply as part of the implementation of the Food Safety Modernization Act (FSMA). Farms grossing over \$250,000 must now comply with produce safety rules and farms between \$25,000 and \$250,000 in sales will need to comply by 1/27/20, unless a farm is “qualified exempt” which is defined as a farm that:

1. Has a three-year running average gross revenue of less than \$500,000 in sales
2. Sells the majority of the food to “qualified end users”. That means either direct consumers of the food, or retail locations within 275 miles of the primary address of the farm.

Regardless of the methodology, the end product behaves the same post-harvest, which is the focus of this publication.



B. Harvesting, Cleaning, & Storing Mushrooms

Mushrooms should be harvested directly into clean stainless or food grade plastic containers, which should be washed and dried thoroughly before use. All harvesters should wash their hands with warm water and soap before heading out to harvest. An alternative option would be for everyone to wear food grade latex or vinyl gloves when harvesting.



Overripe "Pancake" Shiitake

"Depending on the species, time of year, ambient temperature, and other factors, the ripening time from perfect to overripe could be just a few hours.

It's important to plan so you can check your crop frequently in order to capture mushrooms at their peak. You will always miss some, and its often better to harvest a little underripe than wait too long."

- Steve Gabriel, Wellspring Forest Farm



Perfectly ripe, with rounded edge

The proper timing of harvest is critical to achieving a quality crop that will last. While it is tempting to let the mushrooms get as large as possible, what is more important is the integrity of the mushrooms to hold up to storage and transport before being consumed. The difference is considerable; an overripe mushroom (top) may only last a few days in the fridge, whereas mushrooms harvested at the proper time (bottom) can last a week or more.



Lions mane should be harvested when teeth are about 1cm long and drooping downward. When initially fruiting often there are tones of pink or brown, and when ripe the mushroom will be mostly pure white.

Harvest when the cap is mostly unfurled, but not flat. With time and experience, you will notice that the rounded caps are more robust, and will retain their color better. It's important to note that specialty mushrooms at all stages of development are edible, and inevitably a grower will not get all of them harvested at the perfect stage. Overripe mushrooms may be perfectly fine for some outlets, or can be reserved for dehydration or other value-added products, discussed later in this guide.

Since the edge of the mushroom is not always obvious from above, growers often check the edge with their pinky to see if it's ready. Mushrooms that are ready for harvest should be carefully cut at the base with scissors or a knife, or pulled or twisted off. Pulling/twisting can damage bark in log production, so scissors are best.

During the harvesting process, if a harvester comes into contact with a potential contaminant, or cuts themselves, they should immediately stop harvesting and clean and cover their hands prior to resuming harvesting.

Many growers find that it's worth the time to sort mushrooms during harvest. Depending on markets, some sort by size, as some outlets prefer more uniform mushrooms of a specific size. For example, many restaurants

Top Right: The oysters at top of the basket are harvested at the ideal phase, versus the cluster at the bottom which is a bit flattened, making it more brittle.



like smaller mushrooms that can be directly added to dishes without slicing, whereas others want to slice them, and prefer the mushrooms as large as possible. Learning these details are part of the task of good marketing at outreach efforts to your customers.

CLEANING

Mushrooms should always be cleaned prior to storage. Due to the high moisture content (90%+), it is not feasible to wash them in water. Instead, a variety of brushes are used to clean them. You can purchase specific “mushroom brushes,” but many types of paintbrushes, available locally at hardware stores, will suffice. It’s worth having several sizes that differ in the hardness of the bristles, as well as the length, to address different cleaning needs.

Additionally, a damp towel can be used to pat mushrooms and clean them lightly, if necessary. For outdoor cultivation, it is also essential to design your laying yard to reduce dirt splash by putting fruiting racks on gravel, wood-chips, or elevated off the ground.

Thrips, tiny insects that enjoy getting themselves in between the gills, are commonly found on mushrooms grown outdoors. They don’t tend to damage the mushrooms, but should be immediately removed upon harvest. Gently tap the cap once, wait a second, and tap again. Compressed air can also be used after tapping to help blow them away, being careful not to damage the gills.

USING YOUR MOUTH TO BLOW ON THEM IS NOT A SANITARY PRACTICE.



Bottom Right: Examples of mushroom brushes

Storing

Once mushrooms are clean, they should be stored in food grade containers in refrigeration conditions at 36 – 38 degrees F. Storage bins with loose fitting lids are ideal; never seal the lid on your storage container. These are widely available from restaurant supply stores. Refrigerate forest-grown mushrooms as soon as possible after harvesting. Properly harvested and cleaned mushrooms will remain fresh and marketable for several days.

Make sure that your customer also has the appropriate refrigeration equipment, or if you are selling at a farm market or through a small retailer, that they can store your product adequately.

“We harvest mushrooms either directly in the boxes being sold or into black bulb crates commonly used on produce farms. Packing directly into the final packaging helps to limit handling and bruising of the mushrooms while decreasing labor.”

- Willie Crosby, Fungi Ally



Example of a Storage Container

Mushrooms should never be stored in plastic bags OR containers. Paper bags work well for small amounts.

rooms should be stored in bags OR containers.



C. Grading

Though not required, it is recommended for good marketability that mushrooms are graded. There is not an official grading system, but the scale below provides some guidelines based on grower experience:

Grade A:

- Gills white or uniform in color
- Caps curled and rigid
- No damage or defects

Outlets:

- Retail

- Restaurants, CSA
- Wholesale

Grade B:

- Minor damage or defects
- Caps flattened or slightly curled
- Minor coloration of the gills

Outlets:



- Retail
- Restaurants, CSA
- Wholesale

Grade C:

- Extensive damage or defects
- Harvested well past prime

Outlets:

D. Weighing

Basic Rules in NY:

- Food products that are not in containers must be sold by net weight, standard measure or numerical count.
- If selling food items pre-packaged, these need to be accurately marked, with (a) the net weight, standard measure or numerical count, (b) the selling price per pound or unit of standard measure and (c) the total selling price.
- If selling bulk items by weight an approved scale must be used. The vendor is responsible for purchasing an approved device AND having it certified by a local Weights and Measures official. Many scales available at common retail outlets are not appropriate for use; visit <http://www.agriculture.ny.gov/WM/725.pdf> for a list of approved commercial devices. At this time there is no fee in many counties to have equipment certified, but there is a fine for not using approved scales and for every mis-weighed unit available for sale.
- When using open containers, they should be standard sizes, i.e. pints, quarts; and remain open to allow consumer inspection. If closed, they need to be labeled.

BULK (like at a farmers market or grocery store)

Bulk displays are not subject to any required grading, labeling or packaging. If selling bulk items by weight an approved scale must be used. The vendor is responsible for purchasing an approved device AND having it certified by a local Weights and Measures official.

Pre-Packaged

If selling food items pre-packaged, these need to be accurately marked, with (a) the net weight, standard measure, or numerical count; (b) the selling price per pound or unit of standard measure and (c) the total selling price.

Sell by volume?

One option to avoid having to purchase and maintain a certified scale is to sell by volume. For instance, at a farmers market, growers often sell by the pint, which is about 1/4lb. This won't work for any packaged goods for sale.

Selling to restaurants or through a CSA is an agreement between buyer and seller, not requiring a certified scale but relying on the trust between buyer and seller.

E. Packing & Labelling

The type of packaging used depends largely on the outlet. Protecting the product, while making it appealing for purchase, is key. Containers should be breathable, and if at a retail outlet, should enable the product to be seen by potential customers. For wholesale outlets, like restaurants or through a weekly CSA, paper bags with a sticker label are sufficient, and keep mushrooms well. The cost of containers, and their environmental impact should also be considered when deciding what to use for packaging.

- Dried
- Value-Added
- Some chefs will buy at steep discount

The function of a product label is both legally required, and an important marketing tool. Be sure you comply with the law, as well as spend time designing appealing labels before spending money printing them.

For product labels in New York State, the following items are required:

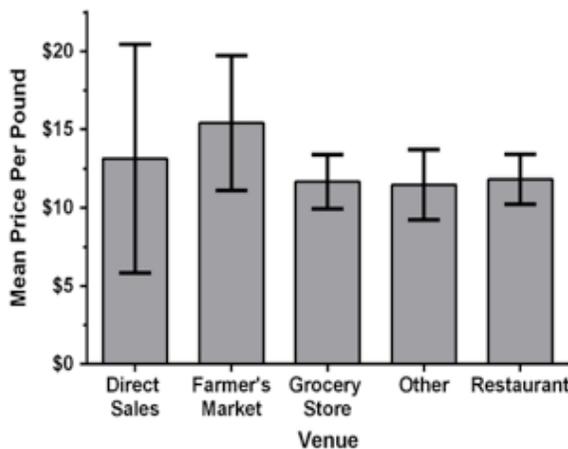
- Identity of Content
- Name of Farm
- Address
- Ingredient Declaration
- Net Quantity of Contents

More detailed information on labeling requirements:

<http://www.agriculture.ny.gov/fs/pdfs/fsi514.pdf>

Your label should be part of your farm “brand” and entice purchases. More of this is discussed in part two if this guide book.

F. Pricing



Grey bars show average price and the lines the range of prices achieved

The pricing one can get for any farm is not fixed, but rather relative to the demand for a product, the value a customer assigns to it, and the effect of other competitors on the market. The price is also different for retail versus wholesale outlets.

Retail sales are in smaller quantities (1/4 to 1 lb), direct to the end-consumer.

Wholesale sales are in bulk (3 - 5+ lbs) and usually to an entity that will then resell them to a consumer, like a grocery store or restaurant.

Data from farmers selling log-grown shiitake around the Northeast from

"I found while selling mushrooms at farmers markets offering the price per pound rather than by the pint increased average sales from \$5 to \$8 per customer."

- Willie Crosby, Fungi Ally

We like to incentivise weekly standing orders from wholesale customers by giving a slightly lower price for this type of commitment.

- Dyami Soloviev, High Falls Farm

Pricing is NOT only a function of what you think someone will pay, but also about ensuring your costs and goals are being met.

This distinction is often overlooked by farmers, and pricing should be determined from thorough enterprise budgeting. (see section two)

The Many Faces of Pricing

There are many ways to articulate your price to your customer, and some will be more enticing. For example, specialty mushrooms could be sold for \$16 per pound in a range of approaches:

A \$4/pint container at a local farmers market (1 pint = about ¼lb)

As \$8/week for ½ lb share in a Community Supported Agricultural model.

As \$5 per package as a local foods co-op (with .35 lbs per package)

Each of these achieves the same end result, but is tailored to interest a buyer at a given market outlet.

G. Dehydrating Mushrooms

Mushrooms that are poor quality, or that a grower is unable to sell, are perfect for any number of value-added products. Shiitake is excellent as a dried product, and is easy to dry.

Additionally, recent research from Penn State and Paul Stamets has also discovered some compelling arguments that exposure of fresh mushrooms to sunlight converts enzymes to enhance both Vitamin D2 and D3 content in mushrooms. This is a boost to the nutritional value of the mushrooms, and also potentially improves their marketability for farmers. See www.cornellmushrooms.org for article.

The current legality of drying and selling mushrooms in New York is a bit confusing, but essentially:

- Mushrooms dried using “natural” methods (sunlight) are not subject to licensing (NY state only). They should be protected from potential contaminants and need go from fresh to dried in under 6-8 hours.
- Mushrooms that are dried in a food dehydrator ARE subject to regulation and currently require a 20C license and thus needs to be done in a certified kitchen.



General Requirements for a Certified Kitchen in New York:

- Three-bay sink with stainless steel drain boards or two-bay sink with a commercial dishwasher
- Separate hand washing/mop sink
- Washable materials on walls and work surfaces
- Restaurant grade, commercial tile floors- painted concrete not allowed
- Commercial coolers/refrigeration
- Water from non-municipal water supply must be tested quarterly.
- Easily cleanable, smooth work surfaces
- Review of processing procedures including hand washing, sanitizing, equipment sinks, water potability and food preparation

For more info:

[#28 Becoming a Small Scale Food Processor](#) – from Guide to Farming in New York

The problem with this is that the sun is not a reliable method of drying at all times of the season in New York. Growers wanting to dry in the sun must be prepared to finish in a dehydrator. This essentially means, unless a grower can develop a reliable solar drying method, they will need the 20C and access to a certified kitchen. Growers in other states should consult with their regulatory authority to learn what requirements are in place.

If a farm doesn't have such a facility, they can often be rented from a local extension office, church, community center, fire hall, or during the off-hours of a local restaurant. The Department of Ag & Markets and your local health Department are involved in the process.

For more information, and the different certifications, read the factsheet [#28 Becoming a Small Scale Food Processor](#) – from Guide to Farming in New York and available at <http://smallfarms.cornell.edu>.

Process for Combined Solar and Mechanical Dehydration:

If you are going to dry mushrooms, it is recommended that for highest value, growers combine solar dehydration with mechanical drying. Again, for personal use, or to share with friends, this can be done on-farm. For sale, currently one is required to follow the a 20C processing procedure.

Steps to dry mushrooms:

1) **Prepare mushrooms:** Trim off any misshapen, irregular, or insect damaged areas of the mushroom. **De-stem mushrooms to be dried.** The stems should be dried separately or can be used as a soup stock. The dried stems can also be sold or powdered and packaged as a seasoning. The best drying occurs within 2-3 days of picking. Not only does this provide less chance of contamination, but a freshly dried shiitake gets a bright yellow color to it. One that has been refrigerated for a week often turns dull brown. It is recommended to dry wet (rain-soaked) mushrooms immediately.

2) **Place whole mushrooms “gills up” on food-grade trays.** The mushrooms should be placed “gills up” to preserve flavor. Some growers prefer to leave the mushrooms whole, and some choose to slice them. Slicing introduces more tools, and more opportunities for contamination, so sanitation becomes more critical.

It's good to use the trays from the dehydrator you own, so that they can be transferred directly from the solar process to the dehydrator, without needing to touch or move the mushrooms another time. Another tip is to sort mushrooms based on size, as smaller mushrooms will dry sooner than larger ones.

3) **Cover trays with screening, and place in sunlight.** The screening protects the mushrooms from insects and critters. Lay them on a table in the sunlight for at least 5 hours, but ideally as long as possible.

Some growers have conceived of solar drying structures that increase temperature and thus speedup drying time. These are ok as long as; 1) **the con-**

tainer protects mushrooms from insects and other contaminants, and 2) the container uses glass or a plastic that doesn't block UV rays (if you want to achieve the increase in Vitamin D).

4) **Move trays to a dehydrator.** This means packing them into a container or directly into the dehydrator, and keeping them protected on the trip to the commercial kitchen. Once there, set up in the dehydrator, and set the temperature to 155 degrees F. The dry time will depend on how dry they became during the solar drying process.



FORMULA:

**Weight of Fresh / Weight of
Dried = .06 to .15**

*A general rule is that 1lb (16 oz) of
fresh should dry to 2 oz of product.*

5) **Remove when fully dehydrated.** The mushrooms are finished when they are “leather hard,” or in other words, are not soft in any place, but also not overly brittle. This is learned over time, and you can verify adequate dryness by weighing the mushrooms fresh and then dry; the finished product should be 6 – 15% the weight of fresh. See formula, left.

6) **Package mushrooms in airtight bags or containers.** A locking plastic bag or glass jar makes good packaging; DO NOT vacuum seal if planning to sell as this requires specific process and another processing license. The mushrooms should retain their quality for at least 6 – 12 months.

7) **To make powder,** simply grind stems/caps in a blender or coffee grinder dedicated SOLELY to this purpose. Package in glass or plastic spice jars. (must be done in 20C facility)

H. Other Value-Added Products



Growers have devised a number of creative products utilizing shiitake mushrooms. Each of these needs to be developed by the grower, based on their perceived markets, the cost of production, and available ingredients. In New York, almost all of these items will be required to be produced in a 20C kitchen, except where noted.

Additionally, many value-added products must be reviewed and approved by a process authority. Cornell hosts the [Northeast Center for Food Entrepreneurship](https://necfe.foodscience.cals.cornell.edu), which can help you navigate a particular recipe you want to develop. <https://necfe.foodscience.cals.cornell.edu>

Some of the more popular products farmers have created include:

- **Shiitake Pate** – shiitake processed with onion, garlic, nuts, and cream cheese/avocado/tofu
- **Rolled Goat cheese** – fresh goat cheve rolled in powdered shiitake seasoning
- **Mushroom Barley Soup** – can process and serve hot or freeze for customers to take home, with local vegetables and grain
- **Duxelles** – traditional French dish, mushrooms, shallots, red wine, spices cooked until a creamy paste is made; can be eaten fresh or frozen
- **Canning** – mushrooms can be canned plain or with spices in a pressure canner.
- **Pickling** – like canning, but in a brine (salt and vinegar) which is acidic
- **Jerky** – mushrooms mixed with other herbs spices, soy sauce, then dried



Photo courtesy of Dyami Soloviev, High Falls Farm

Medicinal Extracts

The world of medicinal extracts is complicated. They offer a potentially lucrative product for growers to consider.

Coupled with selling the product must be the knowledge and understanding of research versus lore. And, sellers need to be sure to avoid making any claims for health benefits, instead highlighting products as only “dietary supplements.” Medicinal products are subject to inspection and jurisdiction of the FDA. Some great resources to further learn about medicinal mushroom properties and making extracts:

- Hobbs, Christopher. Medicinal Mushrooms: An Exploration of Tradition, Healing, and Culture. Book Publishing Company, 2002.
- Powell, Martin. Medicinal Mushrooms - A Clinical Guide. Mycology Press, 2015.
- Rogers, Robert. The Fungal Pharmacy: The Complete Guide to Medicinal Mushrooms and Lichens of North America. North Atlantic Books, 2012.

Natural medicinal products are largely unregulated, which on one hand is good for the producer, as they can more freely offer their product (provided they don’t make claims). On the other hand, it makes for a complex and confusing marketplace, where the contents of one product differ widely from another.

All this being said, those interested in pursuing more knowledge, and willing to develop consistent recipes, can offer a valuable and beneficial product to their market outlets.

The vast majority of scientific literature, along with the customs of traditional Chinese medicine, has focused around **hot water extracts** of the **fruiting bodies (mushrooms)** of a particular species. This is not to say that there are not some medicinal benefits to eating fresh mushrooms (beyond nutrition, which we know about) and the mycelium, but that in essence there has been little exploration into these forms as medicine.



According to the FDA:

The law defines dietary supplements in part as products taken by mouth that contain a “dietary ingredient.” Dietary ingredients include vitamins, minerals, amino acids, and herbs or botanicals, as well as other substances that can be used to supplement the diet. They are labeled as dietary supplements and include, among others:

- vitamin and mineral products
- “botanical” or herbal products — These come in many forms and may include plant materials, algae, macroscopic fungi, or a combination of these materials.
- amino acid products — Amino acids are known as the building blocks of proteins and play a role in metabolism.
- enzyme supplements — Enzymes are complex proteins that speed up biochemical reactions.

Source: “FDA 101: Dietary

Supplements” at <https://www.fda.gov/>

You should know the following if you are considering selling a dietary supplement:

- Federal law requires that every dietary supplement be labeled as such, either with the term “dietary supplement” or with a term that substitutes a description of the product’s dietary ingredient(s) for the word “dietary” (e.g., “herbal supplement” or “calcium supplement”).
- Federal law does not require dietary supplements to be proven safe to FDA’s satisfaction before they are marketed.
- In general, FDA’s role with a dietary supplement product begins after the product enters the marketplace. That is usually the agency’s first opportunity to take action against a product that presents a significant or unreasonable risk of illness or injury, or that is otherwise adulterated or misbranded.
- Once a dietary supplement is on the market, FDA has certain safety monitoring responsibilities. These include monitoring mandatory reporting of serious adverse events by dietary supplement firms and voluntary adverse event reporting by consumers and health care professionals. As its resources permit, FDA also reviews product labels and other product information, such as package inserts, accompanying literature, and Internet promotion.
- Dietary supplement manufacturers do not have to get the agency’s approval before producing or selling these products.
- It is not legal to market a dietary supplement product as a treatment or cure for a specific disease, or to alleviate the symptoms of a disease.

Source: “FDA 101: Dietary Supplements” at <https://www.fda.gov/>

Process for Double Extraction of Shiitake:

Alcohol Extract

1. Fill a quart jar about 3/4 full with dried mushrooms of choice. Fill the jar entirely to the top with high proof (151 or greater) alcohol.
2. Keep mushrooms in the alcohol extract for at least one month, though more will be infused the longer you let it go (up to three months). Try to shake the jar daily.
3. When ready to move on, strain the mushrooms and set the alcohol extract aside.

Hot Water Extract

1. Add the strained mushrooms from above to a pot and add two quarts of water, make sure the mushrooms are covered with water.
2. Bring the mixture to a boil, then gently simmer (NEVER BOIL) for a minimum of two hours, but the longer the better! Be sure to monitor water level and keep it at least above the level of the mushrooms.
3. Once done, allow to cool, and strain the mushrooms, taking care to press the maximum amount of water from the mushrooms. Then, mushrooms go in the compost.
4. Take a clean half gallon jar, and fill first with the alcohol mixture (up to 12oz). Then add an equal amount of the water mixture (up to 12oz). At a 50:50 ratio, with 151 proof alcohol, this results in a mixture around 37.75% alcohol, though it can be diluted further. Under 25% is not considered shelf stable, and over 40% could degrade medicinal compounds in the mix.
5. Store the tincture in a cool place, not in direct sunlight. Lasts about 1 year. For ease of use, distribute into dropper bottles. Take 1 – 2 drop-perfuls daily.

To figure alcohol ratios for different proofs, first determine what volume of the proof alcohol equals 100%. For example, In 16oz of 75.5% alcohol, 12.08 oz would be 100% alcohol ($16 \times .755$). Then, dividing 12.08 with the full content of water extract will provide the exact alcohol content.

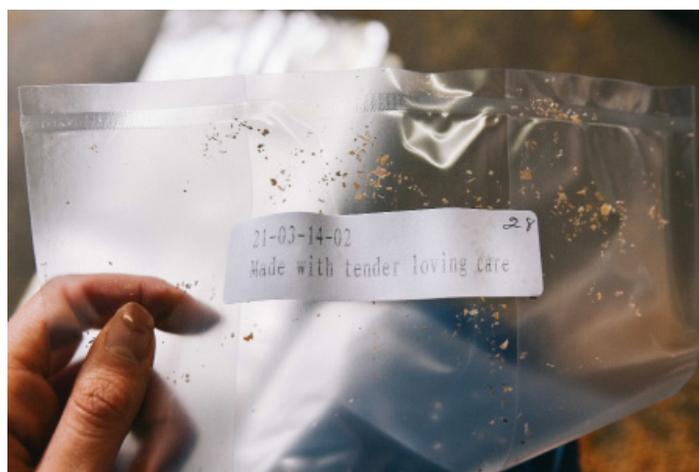


Photo courtesy of Willie Crosby, Fungi Ally

Section 2:

Enterprise Planning



In addition to post harvest handling, it's important for any grower to step back and consider the "big picture" of planning an enterprise, which can be the difference between just selling mushrooms and actually turning a profit. While this section covers some of the starting points, there is much more to planning. Readers in NY are encouraged to review the Guide to Farming in New York at <http://smallfarms.cornell.edu> and those in other states should contact their extension service for more information.

This section offers a number of resources to support farmers in planning their enterprise. These aspects are often left to the last minute, but the more one can get ahead in their planning and enterprise design, the more the farm can benefit. The topics covered in this section include:

- a. Risk Management & Insurance
- b. When am I a farm?
- c. Business Planning
- d. Budgeting & Cash Flow
- e. Record Keeping
- f. Marketing & Channel Assessment
- g. Branding
- h. Certification

A. Risk Management & Insurance

For farmers, risk management is a process of identifying risks inherent to farming and selling crops, so that procedures and measures can be put into place to minimize risks or the consequences of things not going as planned. By identifying risks and taking precautionary action, negative outcomes can be minimized.

Insurance is one way to manage risk. Sometimes policies are required, if a farmer wants to sell to a particular institution, or at a farmers market. But risk management and insurance are not to replace diligence; farmers should always take the precautions necessary to ensure their products are safe for consumption.

This booklet will discuss the issues specific to mushroom production; we invite you to consult factsheets #5 and #6 in the [Guide to Farming in New York](#) to look more in depth at larger concerns for the entire farm business.

Primary Risks for Mushroom Cultivation

There are two main risks for mushroom growers to consider; mis-identification of mushroom species, and the safety of their crop. We have covered safety and sanitation in section one of this guide, so will focus on the issue of proper identification and fears about mushroom poisoning here.

Identification

One of the major concerns of consumers and regulators in America is a fear of consuming poisonous mushrooms. When compared to many other cultures, the US is generally more afraid of mushrooms and the potential ill effects of consuming them.

Part of the job of the mushroom farmer then, must be to assure and educate their customer base about the relative safety of eating mushrooms, and instill confidence they are able to properly identify mushrooms safe for consumption.

In the woods of North America, one could potentially come across around 10,000 different species of fungi, of which, less than 5% are poisonous. Further, a very small percentage would look anything like the mushrooms under cultivation, nor would they grow in the same context (where they grow and what they grow on). Even still, it is critical to take extra precautions and to know how to properly identify mushrooms intended for sale.

For the most common specialty mushrooms, identification is pretty easy, and there are only a few dangerous look-a-likes. The risk of mistaking one for the other is really only heightening outdoors, where a grower could come across any one of a number of fungi growing nearby in the woods and mistake it for another.

There is a very small chance that any material (logs, sawdust, straw, etc) intentionally inoculated with an edible mushroom strain would also fruit a mushroom of a dangerous mushroom, since cultivated mushrooms only grow if they occupy the majority of the material. What is more likely is that another species might show up on an old “spent” substrate, or be simply growing nearby to the area dedicated to cultivation. Careful observation will eliminate most of risk of misidentification. In order to develop good mushroom identification skills, it is recommended shiitake growers take the following steps:

1. Take a class to learn proper identification techniques
2. Familiarize yourself with basic characteristic of mushrooms you are growing
3. Learn potentially dangerous look-a-like mushrooms for the spaces you are cultivating



Proper Identification Procedure

1. Pay careful attention to not just “what” you find, but “where”

Many beginners just excitedly grab mushrooms and don't use their observation skills to capture all the clues needed to properly ID a mushroom. Consider the following when you find a mushroom:

- Was the mushroom growing on the ground, or in wood?
- What tree species was it growing on or around?
- What forest type was it found in?
- Was it growing by itself or in clusters?
- What is the color of the cap? Gills? Stem?
- Does the mushroom have a ring (aka annulus)?

Before harvesting a mushroom, take a picture of it where it is. Note the ecosystem characteristics and habitat it is growing in. Identify the species of trees the mushroom is on or around.

“People are not as familiar with basic morphological characteristics of mushrooms as they are with plants. This creates the illusion that mushrooms are more dangerous but really it is our lack of recognizing basic anatomy of mushrooms that is dangerous.”

- Willie Crosby, Fungi Ally



2. Take a Spore Print

Back at home, select one of the caps and place it facedown on a piece of aluminum foil, allowing it to sit undisturbed for 24 hours. The mushroom will drop its spores onto the foil, like a fingerprint for the mushroom. The resulting “spore print” becomes one of the more helpful ways to ID.

Keep the other mushrooms in the paper bag and store in the fridge, until you are ready to identify.

3. Confirm Identity with Keys & Experts

With your good documentation onsite, as well as your specimens and spore print, you are ready to attempt to identify a mushroom.

As with any identification, it is not one characteristic, but at least three to five, that will help hone in on the species.

Often, the most important aspects that lead to correct ID are:

- Whether the mushroom was growing on wood or from the ground
- If it was found singly or in clusters
- The tree species/forest type found in
- Color of spore print
- Gills “free” or “attached” to stem
- Gills end at stem, or are decurrent, meaning they run down the stem.

To properly identify, use a key, which basically asks a series of questions and leads you through ID in the process. Getting comfortable with keys also gets you versed in the language and characteristics that will help make identification easier in the future as you discover more mushrooms. **DO NOT** Google images or use picture-based guides. This can lead to a lot of incorrect identification!

Finally, as a beginner, try to confirm your mushroom with an experienced mushroom expert so you can be sure. Mushroom foraging is not an activity to do alone. Find others who have been learning the language and learn from them.

Characteristics for Shiitake (*Lentinula edodes*)

Cap: light to dark brown, often with white specs

Gills: white to very light brown

Stem: white to very light brown, tough

Spore print: WHITE

Growing habitat: Shiitake will **ONLY** be found growing from hardwood logs that have been inoculated. There have been no occurrences of other species with a similar form emerging from an inoculated log, though many different types of surface fungus do develop as the log ages (orange, black, white, etc)

Possible Lookalikes

Galerina marginata; These mushrooms go grow from wild logs in the forest. (again, you will only find shiitake on cultivated logs) The fruit bodies of this fungus have brown to yellow-brown cap, with gills are brownish and give a rusty spore print. This is a poisonous mushroom.

To reliably distinguish a *Galerina* from a shiitake, make a spore print. Cut off the stem and place the cap, gills down, on white paper. Cover it with a bowl to keep it moist. *Galerina* always gives a brown spore print; a shiitake spore print is always white. Gill color is not a reliable substitute for a spore print because young *Galerina* gills can look pale –they’ll darken with age.

Additionally, *Galerina* usually has a ring (annulus) around the stem, however, it may degrade as the mushroom ages, and that is why a spore print is a more reliable indicator. The ring is the remnant of a membrane that covers the gills of young *Galerinas* —it runs between the edge of the cap and the stem. As a young mushroom opens, the membrane tears at the cap edge and becomes the ring. In the young *Galerina* at the back of this photo you can see the pale membrane that is breaking to become the ring. Shiitakes never have a ring, no matter what age.



Kuehneromyces mutabilis

Other Possible Lookalikes (Both Edible)



Armillaria mellea



Kuehneromyces mutabilis

(photos courtesy of Wikimedia commons)

Characteristics for Oyster (Pleurotus spp.)

Cap: Oyster or fan shaped, usually 2-10 inches across, often in shelf-like formation, smooth

Gills: Decurrent (gills are attached to and run directly down the stem) Stem: May not have one. If they do, often stubby and off-center. No ring around the stem, or bulge at the base.

Spore print: WHITE to LILAC GREY (make on black sheet of paper)



Growing habitat: Oyster will ONLY be found growing from hardwood logs, often beech and poplar and very occasional conifers. They are found in summer and fall. Often they have a slight anise/licorice scent.

Possible Lookalikes for Oyster:

There are many species of mushrooms that grow from decaying wood and are white or pale in coloration. When cultivating oysters you won't come across these, but you will see them in the woods, and extreme care should be taken to properly identify true oysters.

Stropharia

Cap: dark burgundy that becomes more red as the cap opens

Gills: very dark purple brown (make spore print on white sheet of paper)

Spore print: very dark purple brown (make on white sheet of paper)

Other key characteristics: A distinctive ring (annulus) around the stalk that has a jagged edge (like a kings crown) and a stringy stem

Growing habitat: Stropharia is found growing on wood-chip or duff layer debris in forests, pastures, and lawns.



Possible Lookalikes for Stropharia:

There are many species of mushrooms that grow from the ground, but only a few with a red or burgundy cap that could be mistaken for the Stropharia, yet there are no other mushrooms that have the combination of a burgundy-red cap with purple/black gills.

Several *Agaricus* species could be mistaken for Stropharia, though they typically contain pinkish gills and deposit chocolate-brown spore prints.

Agrocybe is another genus of fungi that may be found in mulch. However, *Agrocybe* species deposit a brown spore print and typically do not contain reddish-purple hues on the caps

Many *Russula* species also have burgundy caps but all have white gills and a chalky stem.

Lions Mane



Description: A single, unbranches clump of soft spines hanging from a tough, hidden “base” (stem) that is firmly attached to tree. Generally white with sometimes a brown or yellow discoloring as it ages.

Spore print: White

Growing habitat: Grows only on hardwoods (Oak, beech common), usually in Fall but sometimes in Spring as well.

Possible Lookalikes

None, generally. All species of *Hericium* are edible and delicious. Only possible to mistake for something else in a very small form. Make sure teeth are present! it is the only North American species that forms a single clump of dangling spines.

MORE GENERAL IDENTIFICATION LINKS:

- **Key:** http://www.mushroomexpert.com/stropharia_rugosoannulata.html
- **About Mushroom ID:** <http://americanmushrooms.com/id.htm>
- **American Poisonous mushrooms:** <http://americanmushrooms.com/toxicms.htm>
- **Common mushrooms of lawn, garden, and home:** <http://americanmushrooms.com/lawnandgarden.htm>
- <http://www.mycology.com/newMycoKeySite/MycoKeyIdentQuick.html>

Insurance

In 2013, new outdoor mushroom growers came across a startling discovery: insurance companies would deny or drop product liability coverage upon learning the farm was planning on mushroom cultivation, mostly over fears of the liability incurred with wrongful identification of a mushroom species or with the sanitary conditions associated with cultivation.

In 2015 Cornell Small Farms began conversations with Lindsay Wickham, who is area field supervisor for New York Farm Bureau. Both organizations then approached Michael Reisinger, with Nationwide Insurance, to discuss the issue.

In conversations it became apparent that the major hurdle was simply that insurance carriers were unfamiliar with the crop, and once informed of the process could see that mushroom cultivation is no riskier than any other vegetable or fruit crop.

Therefore, today growers can get product liability insurance from Nationwide, and several other carriers have since said they were willing to insure outdoor operations. Be sure to check with your local provider before getting started in sales. See the article below to learn more about the importance of product liability.

Small Farm Product Liability: Coverage for Your Farm Products

by Reuben Dourte, Ruhl Insurance

If farming was to be broken down to its most simple definition, one could describe it as the supply side of a complex ‘manufacturing’ assembly line. Agricultural products raised or produced by farmers find their way into an expansive array of goods. As with any type of manufacturing, a products liability exposure inherently exists. Additionally, the alteration of farm produce can create different liability exposures, and in a time where farmers are looking for additional revenue streams, the insurance conversation quickly lends itself to new, and more nuanced, questions.

If you have begun to engage in farming operations, hopefully you have already realized the need and benefit to insuring your operations via a Farmowners policy. A typical, unendorsed Farmowners policy will provide you with liability coverage for your premises and your operations, including the farm products that you produce. The definition of exactly what qualifies as “farm products” may vary greatly between insurance companies. It is important to verify that your operations fall within the definition of farming and the items you are selling are not outside of the scope of farm products.

For example, Insurance Company A may consider the apples you sell at a roadside stand on your premises as farm products and thus covered for product liability on an unendorsed Farmowners policy, while Company B may consider the roadside stand and the gross receipts you make from this enterprise as a commercial exposure. This may mean you will be compelled to purchase an agribusiness policy to receive the Products Liability coverage you need, or endorse your Farmowners policy to provide coverage for “Incidental Business Pursuits”.

In other situations, Farmowners policies may not provide product liability when a product is sold directly to the public vs. being sold to a contractor or wholesaler. For example, if you raise organic chickens and sell directly to a

This article originally appeared in the Small Farm Quarterly, which can be accessed at <http://smallfarms.cornell.edu>

large integrator, a typical Farmowners policy will be able to provide you with coverage. However, if you sell those same eggs directly to the consumer, many agricultural insurers will require that you declare this as a Business Pursuit on your Farmowners policy, and pay additional premium as consideration for the company providing coverage for the heightened liability exposure inherent with sales to the public. Likewise, products you buy for resale, even if they are the same products you raise on your farm, are not considered farm products. This means if you have a bad tomato crop and need to supplement your supply with some of your neighbor's tomatoes, the sale of the products bought for resale will (likely) be considered, by your insurance company, as a commercial business pursuit, and as such the products exposure would need to be covered through a Farmowners policy endorsement or a commercial Agribusiness policy.

Differentiating between farm and commercial products becomes easier as soon as the farmer alters their product in some way. This is because insurance companies will rarely consider altered products as 'farm product', since it has been changed and is, in the case of food, one step further from the field, and one step closer to the fork. If your roadside stand not only sells whole apples, but also pre-slices them, this simple act has likely made the apple no longer a farm product in the eyes of your insurance company. The altering of the apple has now, presumably, opened it up to a higher risk of contamination and foodborne bacteria. If you are turning your apples into pies, your recipe may call for one of your organic eggs in order to make the crust. Should that pie be undercooked by accident, your customers could be potentially inflicted with food poisoning. The heightened risk that is associated with altered farm products requires the company to assign a rate and a liability classification, based on actuarials and prior loss history, to your Farmowners or Agribusiness policy for you to receive the appropriate coverage for the Products Liability exposure present with your operations.

Disclaimer:

Coverage forms vary greatly by insurance company and by state. The information provided below is for discussion purposes only and should not be construed as a formal comprehensive review of individual policies or coverages, nor is it situation specific advice. Readers should personally consult with a licensed insurance agent before making any decisions about their policies or insurance coverages.

Aside from the potential coverage pitfalls that arise from the nuanced definition of farm products, it is important for both large farmers and hobbyists, alike, to know and understand the coverage forms and exclusions on their insurance policy. While Products Liability coverage provides protection for claims arising from the production, manufacturing, distribution, growing or sale of your products, certain companies may exclude coverage for certain types of causes of loss. Policies may have a foodborne pathogen exclusion written into them, or a foodborne contamination sublimit of insurance which reduces the amount of insurance the company will make available to pay a claim brought against you. Other policies may contain wording that appears ambiguous, such as a bacteria exclusion that could possibly be used as justification for a claim denial.

In addition to a comprehensive insurance plan, sanitation best practices,

Liability insurance is nice to have if you have assets you need to protect. If you don't have assets the amount of liability insurance is mostly set by the buyer of the mushrooms. Insurance is not required for selling mushrooms but some buyers and market places require a certain amount of liability insurance to work with them.

- Willie Crosby, Fungi Ally

voluntary USDA checks and consulting with quality control organizations are other ways to affordably mitigate your probability of risk. Having a recall plan in place is an effective way to greatly reduce the cost of a Product Liability loss, should one occur. Insurance can often seem confusing, and the litigious nature that exists within our cultural climate makes it imperative to work with a knowledgeable, licensed insurance agent to ensure that your policy is adequately covering all of your liability exposures.

Reuben is a Account Executive in the Farm and Agribusiness department at Ruhl Insurance in Manheim, PA.



Photo courtesy of Dyami Soloviev, High Falls Farm

B. When am I a farm?

The answer to this question varies, as different programs and agencies each have their own thresholds for what is officially considered a farm. Below are some basic first steps to follow to create a farm business and start generating sales. The table following the checklist provides some information sources for understanding what it means to hit various sales levels. The fact-sheet numbers referenced in this section refer to the [Guide to Farming New York](#).

Checklist for Starting a Farm

Register your farm name as a DBA (“Doing Business As”) or an LLC – Consult Fact Sheet #13 Business Structures in this Guide to learn more about how to do this, and other options for legal structures. Do a thorough search online of any farm name you are considering, to see who else is using it, and whether the website URL and social media handles you want are available.

Open a business bank account – from the very beginning, you should keep your farm income and expenses separate from your household finances. Open a bank account in the name of your farm business, and transfer some seed money into it so you’ll have funds to purchase your start-up supplies. If you use personal savings for this seed money, keep track it as your equity in the farm business. If you use a loan, you’ll need to track that too, which leads to the next step:

Choose a method to track expenses (save receipts) and income – see Fact Sheet #15 Record Keeping in this Guide for some options.

Register your farm with the Farm Service Agency (FSA) and get a farm # - The FSA is the financial arm of the US Dept of Agriculture. They maintain an office in nearly every county; search online to locate the one that serves farms in your area. Why is it important to register with them? Two reasons: you will be counted as part of the Ag Census, and whenever there are programs that could provide funding or conservation assistance to your farm—like farm loans, crop insurance, disaster assistance compensation, or cost-share on fencing or pollinator planting--you will already have a record set up with the FSA. And you’ll be on their contact list so you are more likely to hear about upcoming funding sources!

Get Farm Insurance, including Product Liability – see Fact Sheet #5 Farm Risk Management and Fact Sheet #6 Farm Insurance in this Guide for an overview on types of insurance and considerations as you shop around.

“Having a separate business and personal bank account was critical for me to track expenses and income and helped to make clear decisions about mushroom farming.”

-- Willie Crosby, Fungi Ally

Start selling crops or livestock (Note: Some benefits of being a farm are applied as soon as you start producing a multi-year crop – like perennial woody species or beef cattle – rather than when you start selling.)

Include your farm sales and expenses on your annual tax return – IF you make \$1,000 in sales, you should file a Schedule F with your federal taxes. It's worth finding a tax accountant with farm expertise to help with your taxes, as there are many special considerations for farms with which general tax preparers or accountants are not likely to be familiar. See Fact Sheet #16 Income Taxes for more detail.

“Even though we do our final farm bookkeeping in quickbooks we use google sheets to track the shiitake enterprise expenses and income throughout the year. This way multiple people have access to a quick one-page balance sheet that keeps track of the shiitake enterprise separate from the rest of the farm.”

- Dyami Soloviev, High Falls Farm



Photos courtesy of Willie Crosby, Fungi Ally



Agricultural Assessment

Most states allow eligible farmland located in or outside agricultural districts to be taxed at its agricultural value rather than market value. It can make a difference in the amount you pay in property taxes. Taxes are usually paid based on the agricultural value of land determined each year by the state, not by local market conditions. In most cases the state's values per acre are lower than your property's assessed value. Check with your local extension service for more information. What follows is valid for New York State.

How does the exemption work?

The exemption you receive is the difference between the local assessed value and the state's agricultural values. New York publishes agricultural values annually for 10 soil groups and for woodlands.

To qualify for agricultural assessment:

- Must have 7 acres or more of land in production for sale of crops, livestock or livestock products
- The same farmer must farm the land for at least 2 years
- Farming enterprises must generate \$10,000 in sales (average for the preceding 2 years)
- A combination of enterprises generating \$10,000 in sales will qualify.
- Up to \$2,000 in wood product sales (timber, logs, posts, firewood) can qualify towards the \$10,000 minimum. The only forest products that can be used entirely toward the \$10,000 mark are mushrooms and maple syrup
- Start-up farms are eligible, if they generate \$10,000 in sales in the first year of operation
- Farms less than 7 acres qualify if they generate \$50,000 in sales
- If at least 7 acres of land owned by a rural landowner is rented to a farmer (who meets the income requirements), it is eligible for agricultural assessment provided the landowner has a 5 year written lease with the farmer. The renting farmer must generate at least \$10,000 in sales from their entire operation, of which only a part might be the rented land.



Photo courtesy of Willie Crosby, Fungi Ally

Application Process

1. Go to the county Soil and Water District Conservation office (SWCD) – complete a soils group worksheet. All land qualifying for agricultural assessment is grouped by soil type. SWCD will do this for you – there may be a fee and you will need your tax parcel numbers.
2. Take the completed soils worksheet to your town/county assessor and obtain copies of the Agricultural Assessment Application (form RP-305). Complete one form for each parcel. The assessor will keep the soils worksheet on file. Make copies of the soils worksheet and application for your records.
3. Agricultural assessment applications must be filed every year prior to the taxable status date (March 1). Agricultural assessment is not automatic – you must apply every year by the taxable status date. If you fail to apply, you will not receive the exemption. If no changes have been made in land used for farming, then after the initial application, you will file a short form RP-305-r.
4. If you buy or sell land, make sure you complete a new soils worksheet and file a new Agricultural Assessment form to reflect the changes.

Rented Land– land rented to a farmer for agricultural production is eligible for ag assessment if there are at least 7 acres used in the two preceding years and the land is subject to a rental agreement (written lease) for a term of at least 5 years. A copy of the lease or form RF-305-c must be filed with the assessor. Only the land actually used by the farmer will be eligible for agricultural assessment. Woodland is not eligible unless it involves sugarbush rental or is used for harvesting mushroom logs. Landowners must complete the application process described above to qualify – complete the soils worksheet, go the assessment office and complete form RP-305, and file every year before the taxable status date to receive the exemption.

Renting land to a qualifying farmer is a way for rural landowners, who do not farm, or small farmers who do not use all their land, to receive an agricultural exemption on land that is rented.

Where to Get More Information

- Start with your County Assessment Department
- Visit with your Town Assessor
- NYS Department of Taxation and Finance website: <http://www.tax.ny.gov/pit/property/default.htm>

C. Business Planning

Before diving deeper into aspects of business planning a specialty mushroom enterprise, it's worth taking a few minutes to brainstorm and answer the following questions:

WHY: Your objective.

WHY do you want to take on this venture?

WHY are you passionate or excited about this?

WHAT: Your product or service.

WHAT will your business do?

WHAT will you sell?

WHAT makes it special or interesting?

WHO: Your market.

WHO are your customers?

WHO wants what you are selling?

WHERE: Your location.

WHERE will you operate/sell?

WHERE are your customers?

WHEN: Your timeline.

WHEN will you have this up and running?

WHEN do you have to do things to make that happen?

HOW: Your finances.

HOW will you cover the costs of start-up?

HOW MUCH will it cost to make your product?

HOW MUCH will you need to sell to cover your expenses?

HOW MUCH will you be able to pay yourself?

If the answers to these questions are “I don't know,” then you should answer them before committing to production.

For some loans and assistance, you may need to write a full business plan. Resources to help can be found at: <http://smallfarms.cornell.edu/2017/05/01/12-business-plans/>

D. Budgeting & Cashflow

In any farming enterprise, costs and profitability are highly variable, and depend on seasonal weather conditions and local markets, as well as the decisions of the farmer. Profits could greatly increase or decrease, depending on how the farmer chooses to purchase materials, spend their time, and work to optimize production efficiency.

A budget serves to compare your income with your costs, to summarize and project the overall track your business will take. For speciality mushrooms in particular, budgeting needs to be done over several years because the operation will usually phase into production. The following images and details are taken from excel spreadsheets that are available free for download at www.CornellMushrooms.org, where you can customize the figures to your

Production Figures	
Number of New Logs inoculated	400
Number of logs in production	1,000
TOTAL logs	1,400
Number of logs soaked per week (7 week rotation)	143
Assumed low end production/week (1/4# per log)	36
Assumed high end production/week (1/2# per log)	71
Weeks you will soak	18
Total pounds for season - LOW	643
Total pounds for season - HIGH	1,286
Average	964

situation. We have also printed these in the back of this publication.

Let's first examine an example of a 1,000 shitake log operation that is up and running at full capacity (usually by year 2 or 3). The production and expense figures are based on actual data collected from 2010 - 2012 from farmers producing log-grown shiitake.

First, here are the projections for production. This is based on the number of logs in production, how many soakings occur, and the range of yields, which average $\frac{1}{4}$ - $\frac{1}{2}$

pound of shiitake mushrooms per log, each time it is soaked.

This offers a yield that has a large range, so the further calculations are based on an average of producing 964 lbs.

Sales can be divided up in a number of ways, depending on the goals of the farmer and local market demand.

Here, sales are pretty evenly divided between fresh sales both retail and wholesale, vs dried and value added sales.

Sales	
Pounds of Shiitakes sold Retail	464.0
Avg. price per pound retail (\$12 - 16/lb)	\$12.0
Pounds of Shiitakes sold Wholesale	400.0
Avg. price per ounce wholesale (\$10 - 12/lb)	\$11.00
Lb of Shiitakes sold Dried	100
Oz of Shiitakes sold Dried	50
Avg. price per ounce wholesale (\$6-8/oz)	\$6.00
Pounds of Shiitakes sold Value-Added	0
Avg. price per ounce Value-Added (\$10 -16)	\$12.00
Inoculated Logs Sold	50.00
Price per log	\$15.00

Cash Receipts	
Retail product sales	\$5,568
Wholesale product sales	\$4,400
Dried Product sales	\$300
Value Added Sales	\$0
Inoculated Logs	\$750.00
TOTAL ENTERPRISE RECEIPTS	\$11,018

"The holiday logs are a great way to pay for the expenses of year one of the shiitake enterprise when year one is otherwise a non-income generating year."

- Dyami Soloviev, High Falls Farm

Many growers also make income from selling pre-inoculated logs to customers interested in growing their own shiitake.

Next, we look at **expenses**, the most highly variable element in the budget, largely a result of the decisions a farmer makes. And, while sales can be adjusted to improve the amount coming in, the largest area of improvement for many farming enterprises over time is in reducing expenses:

Direct Expenses	
Materials	
Mushroom Spawn	\$300.00
Wax	\$124.00
Angle Grinder & bits	\$120.00
Inoculation Tools	\$64.00
Fuel	\$50.00
Chainsaw Maintenance	\$72.42
Other Non-Durable	\$71.00
Other Durable	\$65.00
TOTAL	\$866.42
Labor (\$12/hr)	
Log selection & Harvest	\$576.00
Inoculation	\$1,968.00
Laying yard maintainance	\$3,192.00
Harvesting	\$1,560.00
Processing, Packaging	\$360.00
Marketing and sales	\$1,200.00
Other labor	\$336.00
TOTAL LABOR HOURS	766.00
TOTAL LABOR COST	\$9,192.00

For example, the labor cost of inoculation is not often paid “in full” by growers, since they absorb the cost of their labor. Over time, a grower’s efficiency in completing the various tasks should improve.

For example, the rate of inoculation can improve greatly, as can the time spend in marketing and sales. It is likely that both of those categories could be cut by 50% with only modest improvements to the business, resulting in additional profit of almost \$2,000.

In contrast, below are the production figures for indoor mushroom production. The production variables are different, where we look at the amount of dry material inoculated, along with the efficiency converting this material into mushrooms, known as Biological Efficiency. Beginner growers might achieve a lower efficiency around 30%, where as experienced growers can get between 80 – 100%.

Also important to note in this section are the number of weeks in production. Indoor mushroom cultivation allows the potential for year-round production, but for this example, we are assuming a seasonal production of 18 weeks during the warmer months in a Northeast US climate. It should also be noted that this is a relatively small scale operation, inoculating only 80 lbs (two straw bales) worth of material per week.

Production	
Pounds of Dry Substrate Inoculated	80
Pounds of Spawn Needed @ 10:1 rate	8
Pounds of Spawn Needed @ 5:1 rate	16
Assumed Biological Efficiency - HIGH %	0.80
Assumed Biological Efficiency - LOW %	0.30
Weekly Harvest - HIGH	64
Weekly Harvest - LOW	24
Average Weekly Harvest	44
Number of Weeks you will Produce	18
Average Yearly Production	792

Here we see the grower chose to sell their mushrooms through a mix of retail and whole outlets, also drying some for a value-added product. The choices one makes for markets depend a lot on the price per pound that can be fetched. These numbers are conservative, as many specialty growers average \$10 – 12 per pound across all channels, which will have big impact on the gross sales.

Sales	
Pounds of Oyster sold Fresh Retail	500.0
Avg. price per pound retail (\$12 - 16/lb)	\$10.0
Pounds of Oyster sold Fresh Wholesale	292.0
Avg. price per ounce wholesale (\$6 - 10/lb)	\$6.00
Lb of Oyster sold Dried	200.00
Oz of Oyster sold Dried	100
Avg. price per ounce wholesale (\$6-8/oz)	\$6.00
Cash Receipts	
Retail product sales	\$5,000
Wholesale product sales	\$1,752
Dried Product sales	\$600
TOTAL ENTERPRISE RECEIPTS	\$7,352

Taking a look at expenses, this budget accounts for the initial start up costs, many of which are a one-time expense as much of the control equipment and maintenance costs would be reduced or eliminated over time. Initial costs could also be much higher, depending on the space ones needs to develop as an indoor growing facility.

"The annual P and L was one of the most valuable tools I had as a business owner. Looking in review at where the bulk of money was spent and where it came in gives amazing insight into how to plan and grow in the coming years."

- Willie Crosby, Fungi Ally

Direct Expenses	
Materials	
Spawn	\$576.00
Substrate Costs	\$200.00
Containers	\$200.00
Shredder (Straw)	\$750.00
Treatment Costs	\$200.00
Incubation & Grow Room Build & Maintenance	\$1,000.00
Monitoring Equipment	\$500.00
Humidity Control	\$200.00
Temperature Control	\$200.00
Other	\$200.00
TOTAL	\$4,026.00
Labor (\$12/hr)	
Treatment and Inoculation	96.0
Incubation	18.0
Harvesting	192.0
Processing, Packaging	48.0
Marketing and Sales	96.0
Other	48.0
TOTAL LABOR HOURS	498.00
TOTAL LABOR COST	\$5,976.00

The two examples above are merely examples of all the variables that go into budgeting for an enterprise. We encourage growers to play with these variables on the excel spreadsheets, taking the exercise as an activity to help

illuminate the areas where different decisions result in widely varying results. Ultimately, the more a grower is able to track their expenses and keep good records, the more accurate the budget can become.

Download the excel budget templates at www.CornellMushrooms.org

Phasing into production

Perhaps even more important to understand is that mushroom farming has a bit of a different timeframe than some other crops. There is further distinction when considering outdoor log production versus indoor production. Namely, with logs a perennial crop is being maintained, since inoculated logs will remain productive for three seasons. Indoor substrates generally last for only 6 – 8 weeks, so could be considered more like an annual crop.

DATE:	2017	2018	2019	2020
FARM:				
Production Figures				
Number of New Logs inoculated	400	400	400	400
Number of logs in production	0	400	800	1,000
TOTAL logs	400	800	1,000	1,000
Number of logs soaked per week (7 week rotation)	0	57	114	143
Assumed low end production/week (1/4# per log)	0	14	29	36
Assumed high end production/week (1/2# per log)	0	29	57	71
Weeks you will soak	0	18	18	18
Total pounds for season - LOW	0	257	514	643
Total pounds for season - HIGH	0	514	1,029	1,286
Average	0	386	771	964

Regardless of the system, its generally recommended that growers start with a goal of the total number of logs or pounds of substrate he or she plans to maintain at full production. Then, working backward, the grower can make plans to expand production each year. Since outdoor shiitake production is most commonly phased in over multiple seasons, let's look at an example of phasing into a 1000 log operation over for seasons:

The building of a productive system in this way carries other benefits.

Totals				
TOTAL INCOME	\$750	\$4,282	\$8,502	\$11,018
TOTAL EXPENSES	\$3,832	\$5,286	\$5,144	\$5,662
NET PROFIT OR LOSS	\$3,082	\$1,004	\$3,358	\$5,356
<i>without paying labor</i>	\$58.00	\$3,556.00	\$7,726.00	\$10,132.00

For one, labor starts out less intense, and grows as the number of logs does, along with grower experience and confidence.

Sales also start out at a lower volume, giving the farmer time to develop markets. For these reasons, we encourage this phased entry over starting out trying to do 1,000 logs in the first season.

As with any farm business, this results in growers not getting paid (i.e. the enterprise isn't profitable) for the first year. Still, achieving profitability in the third year is possible, and that is a relatively quick turnaround, especially when compared to many other crops.

For indoor systems, since the 6 – 12 month wait for logs from inoculation

to fruiting is drastically reduced to 3 – 4 weeks, it is much easier to scale a system faster, even within just one production cycle.

Cash Flow

Tracking cash flow is important to understand when you will have more or less money available for your enterprise. Often in farming, enterprises have high upfront costs and little money coming in until later in the season. Mushrooms are no exception.

A cash flow example and blank worksheet are included in each of the enterprise budget templates. If the above numbers for a 1,000 log operation are plugged in, this is what it looks like:

	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	TOTAL
TOTAL INCOME	\$100.00	\$100.00	\$400.00	\$350.00	\$150.00	\$2,050.00	\$2,050.00	\$2,050.00	\$2,050.00	\$2,050.00	\$100.00	\$100.00	\$11,550.00
TOTAL EXPENSES	\$593.00	\$1,167.00	\$1,265.00	\$1,203.00	\$386.00	\$659.00	\$669.00	\$680.00	\$669.00	\$669.00	\$155.42	\$35.00	\$8,150.42
DIFFERENCE	\$493.00	\$1,067.00	\$865.00	\$853.00	\$236.00	\$1,391.00	\$1,381.00	\$1,370.00	\$1,381.00	\$1,381.00	\$55.42	\$65.00	\$3,399.58

As is often common with cash flow on farms, there is a clear deficit in the beginning of the season, when costs are high and sales are low. Seeing this helps make for better planning ahead of time.

While a grower can project these numbers and patterns to a reasonable degree, cash flow is most useful when accurate receipts and time records are kept, so the numbers become a true reflection of the reality.

E. Record Keeping

Your budgeting and cash flow documents will only be as good as the data you collect from one year to the next. Establishing a system that makes it easy to jot things down is crucial. Some farmers carry pocket notebooks, while others might take a note in their phone or keep a binder that lives in the barn and is easy for all workers to access.

At a minimum collect the following:

- Date and number of new logs or materials inoculated
- Each Spring record a count of the number of active logs in the yard
- Date of soaking/number of logs soaked
- Date of harvest/number of pounds harvested from logs/bags/beds
- Lbs dried to Oz if dehydrating
- Sales (via invoicing)
- Material purchases (itemize “mushrooms” under Supplies in accounting)

With just the above items, you will be able to track your progress and determine where the money is coming and going. The real challenge is tracking hours. If writing them all down seems overly cumbersome, consider using a timer or stopwatch and getting average hours per week by just collecting a “snapshot” of data for one or two weeks of the season.

It's worth at least estimating and noting time spent on the following tasks. Note the average time spent annually based on our 1,000 log scenario, as well as the typical time of year this is accomplished:

Jan - May

Log Selection & Harvest (48 hours)

Inoculation (164 hours)

Marketing & Sales (50 hours)

TOTAL = 272 hours

June - October

Laying Yard Maintenance (112 hours)

Harvesting (80 hours)

Processing & Packaging (40 hours)

Marketing & Sales (50 hours)

Other (28 hours)

TOTAL = 310

Tracking your hours gives you some time to reflect and compare your expenditure to the sample of farms above. Note that these hours spent are extrapolated from data based on a much smaller number of logs (100), and at a beginner level experience. There are several labor areas that could be significantly improved as growers optimize their systems. (see below)

ABSOLUTE NECESSITY #1: Tracking Expenses

A farm that doesn't track its expenses is not only unable to accurately report these to the IRS for tax purposes each year (a benefit to the farm), but also means that the farmer is running their enterprise on emotions rather than data. How can someone know if they are profitable if they don't take the time to assess their enterprise, at least once a year?

At a bare minimum, farmers should save all receipts from farm-related purchases in a shoebox, and add them all up at the end of the year. Writing "mushrooms" or "feed" or "fuel" on the receipt at the time of purchase will help jog the memory. Ideally, this reconciliation occurs monthly or quarterly, so progress can be tracked, and problems avoided.

It helps to categorize expenses according to the IRS categories on a schedule F, to make the taxes easier at the end of the year:

Admin

Car & Truck

Custom Hire

Feed

"Using a program like quickbooks for invoicing saves so much stress and money. Invoices get lost, unpaid, or forgotten and reminders are critical."

- Willie Crosby, Fungi Ally

Fertilizer & Lime
Fuel
Insurance
Labor Hired
Rent or Lease – Equipment
Repairs and Maintenance
Seeds & Plants (Mushroom spawn goes here)
Supplies
Vet & Medical

For mushroom growing, the bulk of expenses will fall under “Supplies,” and it’s helpful to at least sub-categorize supplies for mushrooms versus other farm enterprises versus overall infrastructure. Set yourself up to at least be able to do this accounting work at the end of the season.

ABSOLUTE NECESSITY #2: Invoicing Sales

Another essential piece of selling mushrooms is a system for tracking sales; usually known as invoicing. The basic system needs to be where you write (or type) the quantity sold, the price, and to whom, where one copy is given to the customer and the second you keep. The simplest way to do this is to create a half sheet invoice that can be torn in two; this way you duplicate the invoice, tear it in half, give one, and keep one for your records.

Receipt books with a carbon copy are perfectly fine for this. Many computer accounting programs, such as Quickbooks, can be set up to generate invoices and save one for you, automatically.

F. Strategic Marketing/ Channel Assessment

If you look at the budgeting numbers above, you might be surprised as how many hours beginning growers are projected to spend on sales and marketing, which accounts for 10% of the total time spent. This section offers some ideas about how to approach marketing and channel assessment for your products.

Definitions:

Wholesale: Selling a product to a buyer that is not the ultimate end user

Examples: Distributors/Grocery/Restaurants/Institutions/Auctions

Retail or Direct: Selling directly to the end user

Examples: Farmers Markets/Farm Stands/CSA

Channel assessment: evaluating which outlets make the most sense for your farm

To read more, consult an excellent resource:

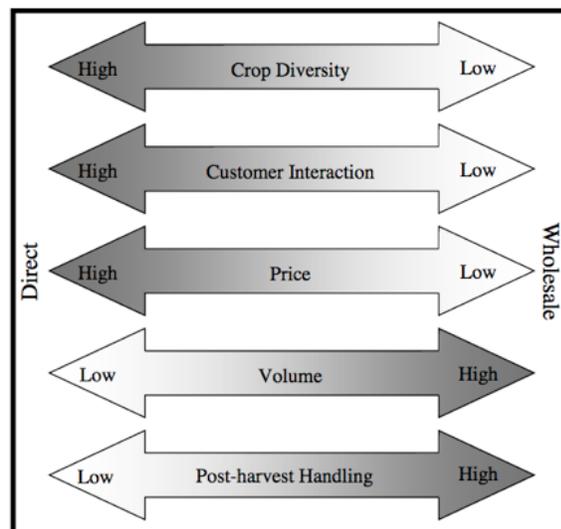
Guide to Marketing Channel Selection from CCE Tompkins:

<http://ccetompkins.org/resources/guide-to-marketing-chan>

From the guide:

“In marketing channel selection, farmers are faced with a dilemma: they can move large volumes of product through wholesalers at relatively lower prices or seek higher prices in direct market channels and run the risk of unsold product.”

Some general trends are shown in the graphic below:



5 Keys to Market Channel Decision Making:

1. Value your time
2. Take time to keep records, even if only for “snapshot” periods
3. Evaluate performance of a channel: Price, Profit, Associated Costs, Sales Volume, Labor Requirements, Risk, Lifestyle Preferences
4. Rank and Compare Channels
5. Combine Channels to Maximize Sales

Considerations Specific to Specialty Mushrooms

- Growers are competing with button mushroom markets and large indoor producers, who sell mushrooms for \$3-4/lb. This may limit ability to compete in certain wholesale outlets and often leaves growers seeking specialty markets and more direct marketing.
- That said, restaurants valuing locally produced, and gourmet quality foods are frequently willing to pay \$10 – 12 for forest grown mushrooms.
- Since mushrooms dry so well, one can take a higher risk selling as much as possible fresh, then dehydrating the leftovers, which will last 6 – 12 months.
- One of the most important aspects of marketing an unusual food like specialty mushrooms is your reputation every one of your customers has to trust you and your product. For this reason, buyers like to buy from an individual or business they know.
- Growers may benefit greatly from mixing market channels to diversify outlets and cash flow. For instance, a CSA often means sign ups in late winter and early spring, which brings in cash before the mushrooms are growing. Then, during the season, restaurant wholesale markets bring in cash without a lot of time (vs farmers market). Any excess production can be dried and sold retail during the fall and winter.

“There is so much opportunity in the field of specialty mushrooms beyond just selling fresh or dried mushrooms. Branding becomes a huge part of this. Creating a business people recognize and trust is crucial in going beyond your local farmers market.”

- Willie Crosby, Fungi Ally



Photo courtesy of Willie Crosby, Fungi Ally

G. Branding

The concept of branding is only recently being applied to farmers and is an important tool for effective marketing and sales. A good brand establishes your farm as a unique identity to help share story of who you are, what your farm story is, and what sets you apart from others. A good brand is conveyed through all materials you put out, including your website, labels, printed materials, and even your personal presence.

While a brand is important, what is more critical is being authentic. Don't force yourself to do something you don't enjoy or feel drawn to just because you think you might sell more mushrooms. Your brand should communicate:

- 1) Your farm's values
- 2) Your farm's personality
- 3) What you do best as a farmer
- 4) The needs you are fulfilling for your customers

A great resource for more ideas: <http://www.standoutinyourfield.org/>

"I always bring a gift of shiitakes to a new customer. I pack them in our retail container with our farm branding. They are presentation worthy. Log-grown shiitakes speak for themselves. They're incredibly beautiful and set themselves apart from straw-grown shiitakes."

- Dyami Soloviev, High Falls Farm

Selling Points for Specialty Mushrooms

- Specialty mushrooms have more fiber than button mushrooms, very few calories (4 - 10 per ounce), little or no fat, no sodium, no cholesterol, and no simple sugars, like sucrose.
- Specialty mushrooms have a wide range of flavors, from mild to robust that allow buyers to create more sophisticated cuisines in their homes.
- Specialty mushrooms have a wide variety of medicinal properties: cholesterol treatment, anti-infection, immune boosting, hypertension treatment, etc
- Specialty mushrooms can be cooked in a variety of ways, including grilling, sautéing, stir-frying, or baking. They can be added to enhance to any vegetable, egg, or meat dish.
- Mushrooms make up an important texture component in meatless meals.
- Mushrooms are a source of B-complex vitamins like riboflavin and niacin, and the mineral selenium.

H. Certification

The choice to certify your production system comes down to two main considerations:

- Does it improve your market standing, and
- Do the standards help you grow better?

We recommend this article on the differences between the programs:

<http://smallfarms.cornell.edu/2015/04/06/certification-programs>

ORGANIC: While some consumers tend to use the word organic in a general way to describe food produced on a farm that they think is sustainable or ecological, the term organic is a very specific label that can only be used by certified operations. Following the organic standards means that the farmer is held accountable by a third party, that is, a certifier that is accredited by the [USDA](#). There are many checks and balances, including tedious compliance and enforcement policies. Several states offer programs to help reimburse farmers for a portion the cost of certification, for those interested in participating in the program. [NOFA-NY](#) is an organization specific to this process in New York. <https://www.nofany.org/>

NEW YORK GROWN AND CERTIFIED: A new program from the state which combines basic GAP certification and Agricultural Environmental Management plans. <https://certified.ny.gov/>



PEER-CERTIFIED: Another relatively popular label is [Certified Naturally Grown](#) (CNG), that requires an application, the signing of a contract, and an inspection performed by a volunteer, usually another CNG farmer. While their standards are based upon organic standards, they have more flexibility to alter requirements. CNG has specific mushroom standards developed. While this program may seem less rigorous than the USDA Certified Organic Certification process, it may be a good option for farms that do a lot of direct sales and have a chance to be transparent to their customers in person.

PLEDGE: A good alternative to certification, whether you don't want to pay for it, or have an aversion to such labels or government or institutions in general, is to take a pledge. In an effort to further assist consumers in identifying where they want to spend their food dollars, this pledge was developed to outline the agroecological management and fair labor practices used by farmers; they sign it annually and can display it for their customers. Pledged farmers who are not certified organic cannot use the term "organic" to define their production, but the transparent principles defined by the Farmer's Pledge are well-aligned with the management practices required by the National Organic Program.



Photo courtesy of Willie Crosby, Fungi Ally

Final Thoughts

Specialty mushroom production can be a highly profitable and enjoyable venture that can be adapted and scaled for a variety of situations and goals of the producer. Equally important to mastering the technical side of production is to develop sound practices for post-harvest handling and to develop a viable and legal business structure and good record keeping practice.

This guidebook serves as a companion to our production guidebooks, videos, and production tools found at www.CornellMushrooms.org. Best of luck in your enterprise and happy mushrooming!



Photo courtesy of Willie Crosby, Fungi Ally

