

RURAL ENTERPRISE SERIES

RES-11

Shiitake Mushrooms Enterprise

Shiitake mushrooms are specialty mushrooms with a distinctive flavor that are grown on oak logs. Specialty mushrooms have been enjoyed locally and in small quantities by Native American and ethnic populations and have been widely used for centuries by Asian cultures. Behind the common button and oyster mushrooms, the shiitake mushroom is the third most widely produced mushroom in the world, and American production of shiitake has increased faster than any other specialty mushroom.

The shiitake is a large, umbrella-shaped mushroom that is dark brown and is prized both for its culinary and its medicinal properties. Proven medicinal benefits include antiviral, antifungal, and anti-tumor effects. For example, the consumption of shiitake mushrooms significantly lowers blood cholesterol levels and is reported to lower high blood pressure in laboratory animals. Shiitake contain all eight essential amino acids in better proportions than in soybeans, meat, milk, or eggs, as well as a good blend of vitamins and minerals, including vitamins A, B, B12, C, D, and niacin. Shiitake mushrooms are a popular source of protein in Japan and a diet staple in China and other parts of the Pacific Rim.



Shiitake mushrooms have been commercially grown in the United States for over 20 years and are now well accepted by American gourmet markets. Shiitake may be used as a meat substitute in vegetarian dishes and are valued for their full-bodied flavor, dark color and meaty texture. In 1999, wholesale market prices for shiitake ranged from \$4 to \$8 per pound, and growers generally received between \$4 and \$6 per pound for fresh, well-formed mushrooms.

Methods

To grow shiitakes, green oak logs are cut (5" x 48") in the spring and inoculated with spores (also called spawn), which are purchased from commercial suppliers. Different strains are better suited for different environmental conditions. Using the most appropriate strain for your area will be a large factor in the success or failure of your operation.

Inoculation is perhaps the most time-consuming operation in shiitake production. The process of inoculation begins with taking harvested, cut-to-length logs and drilling rows of holes about 6 inches apart along the length of the log. Logs average 35-40 holes each. Hole depth and diameter will vary depending on the type of spawn used. To prevent bacterial or fungal competitors from entering the log, each inoculation hole should be sealed with a thin coat of hot wax using a sponge.

After inoculation, logs should be stacked in a shaded forest location or covered with 60 percent shade cloth. Proper moisture content is critical for optimal incubation and should be monitored regularly. Logs should never dry out, but should not be so wet as to produce mold. It is important to allow the bark to dry out between waterings. Good air circulation will help to prevent molding. Fruiting can be initiated by soaking the logs in a creek or water tank. This is usually done every few months to time the fruiting of the logs.

Logs will begin to fruit between 6 to 18 months after inoculation and will continue to produce mushrooms for about three to five years, depending on log diameter. Growers report the second and third years after inoculation as the most productive, with double the production of that during the first and fourth years.

Mushrooms should be harvested when their caps are about two-thirds open, cutting the stem flush with the bark with a sharp knife. Mushrooms may be stored in a cardboard box for up to a month at 36-41°F. Mushrooms may also be dried whole or sliced before marketing, but they will bring substantially lower prices than for fresh whole mushrooms. Ideally, mushrooms are sold immediately to restaurants, retail outlets, and other places.

Each log may be used for 4 to 5 years. Mushroom production will only occur from spring through fall unless the logs are put in a heated location through the winter.

Time and Skills Needed

Of course, the more experience you've had growing mushrooms, and especially shiitakes, the better off you'll be. You or a member of your production team will need to be able to regularly lift substantial logs and be comfortable hammering and drilling and working in damp areas. Inoculation, which is the most labor-intensive part of the proposition, takes place in the spring. If you are otherwise occupied in the spring, you might consider another enterprise. If you have the resources to cut your own logs, that will save money. Be prepared to harvest, pack, and transport your mushrooms in the fall.

Equipment and Resources Needed

To grow wild-simulated shiitake mushrooms, you'll need a shady forest location. You'll need a chainsaw and safety gear if you're going to cut your own logs. You'll need a dependable water source, sprinklers and hoses, or watering troughs. Mushroom spawn, poly-foam plugs, wax, a drill, drill bits, a hammer, and a sharp knife are also essential. You'll need packing boxes and you may need one or more refrigerators to store your crop until it's all ready to go. Lastly, you'll

need a way to transport your finished product to market.

Marketing

The shiitake enterprise provides opportunities for local producers, but experience has shown that if many producers get into the market in one area, the supply can quickly outstrip the demand. The result is falling prices. Large-scale producers may also act to suppress the price that smaller producers receive for their mushrooms in local markets. Therefore, growers need to carefully assess the demand and supply in their area before diving in.

Local buyers and outlets for the small-scale producer include restaurants, bed and breakfasts, vacation resorts, organic retailers and markets, supermarkets, and farmers' markets. If small producers are unable to find local buyers, wholesale buyers will buy dry product but offer only about half the price per unit of fresh mushrooms. Value-added products, such as gourmet shiitake dinners, mushroom samplers, gift tins, sauces, and soups, as well as fresh and dehydrated shiitake products, bring on average about three times the wholesale price of unprocessed mushrooms, so this is something to consider.

Financial Picture

Cost and revenue calculations in the following budget cover the useful life of the logs (4 years). In our example, overhead or establishment costs (3), which are incurred only in the first year of operation, are estimated at \$2,406. Because of differences in mushroom production and estimated sales, income and annual costs will vary by year;

as a result, net revenue over costs is estimated for each of 4 years.

In our example, the \$2,406 in establishment costs is charged completely against the first-year income.



Lost Creek Mushroom Farm



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These costs could have been split four ways, with a quarter of the expenses charged to each year. This alternative would have changed the profitability for each of the 4 years.

In our sample budget, net revenue over total costs (5), commonly known as *profit*, is negative for the first year, with a loss of \$2,374. The operation makes money during years 2 and 3, \$3,433 and \$1,759, respectively. However, in year 4, the operation loses money again.

Profitability for this operation will change depending on labor and material cost savings and the price received for the mushrooms. For example, harvesting logs from the property as part of a forest thinning would reduce the establishment cost (3) by \$750. Producing on more logs can lower overhead costs. The water tank and refrigerator are not essential until the second year. Targeting niche markets may increase the price received per pound, but it will also increase marketing costs. Higher prices received for fresh mushrooms and value-added products will significantly increase the grower's margin. Careful attention to inoculation and incubation as well as thorough marketing will greatly aid in the success of a shiitake enterprise. To get a true picture of potential sales revenues, prospective growers must do some spe-

cific marketing research for their areas.

The budget also provides a break-even price (6). This is calculated by adding up the production costs for each of the 4 years (\$9,817) and dividing that sum by the total pounds of mushrooms produced (1) over the 4 years (4,400), which equals a break-even price of \$2.23. The break-even yield (7) for the price over the 4-year period is also provided. This is calculated by totaling the production costs over the 4 years (\$9,817) and dividing that number by the average price per pound (\$3.50) that can be expected. This means that 2,805 pounds of mushrooms must be produced to break even, give the costs provided. Total labor costs (8) over the 4 years are calculated at \$4,317.

The use of break-even prices and yields provides prospective entrepreneurs with another tool to help them gauge how much crop they will have to market to meet their monetary goals. For this enterprise, the entrepreneur will now have to decide if the work involved is worth the potential returns. He or she may decide to run with it, change the structure of the enterprise to make it more profitable, or drop the idea.

Information Sources

American Mushroom Institute, One Massachusetts Ave, NW, Ste. 800, Washington, DC 20001, 202-842-4344. www.americanmushroom.org

Appalachian Mushroom Growers Association, Rt. 1, Box 30BYY, Haywood, VA 22722

Jenkins, D.H., J.S. Kays, and A.L. Hammett. Shiitake mushroom production and marketing. SPF-2, Natural Resource Income Opportunities Series. Special Forest Product Enterprises: An Edible Product Example. www.natural.resources.umd.edu/Pages/Shiitake.htm>

Hill, Deborah B. 2001. Shiitake production on logs--Step by step in pictures. University of Kentucky Cooperative Extension. <http://www.ca.uky.edu/agc/pubs/for/for77/for77.pdf>

Missouri Alternatives Center, links to several publications on shiitakes, www.agebb.missouri.edu/mac/links/index.htm

Royse, D. 2001. Cultivation of shiitake on natural and synthetic logs. Penn State University, University Park, PA. <http://pubs.cas.psu.edu/FreePubs/pdfs/ui203.pdf>

Lost Creek Mushroom Farm, Perkins, OK. <http://www.cowboy.net/~lcmf/farm2.html>

Fox Valley Farms, Lyons, OR. www.shiitake.net

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SHIITAKE MUSHROOM ENTERPRISE BUDGET

1000-log operation

INCOME	year 1	year 2	year 3	year 4
Number of logs	1000	1,000.00	1000	800
(1) lbs mushrooms produced	100	2,200.00	1500	600
lbs sold (fresh) 20% cull rate	80	1,760.00	1500	480
Price per pound	\$3.50	\$3.50	\$3.50	\$3.50
Total revenue	\$280	\$6,160	\$4,200	\$1,680

ESTABLISHMENT COSTS	UNIT	QUANTITY	PRICE/UNIT	TOTAL COST
(2) 5" X 48" green oak logs	log	1000	\$0.75	\$750
Mushroom spawn	gal	25	16	400
Polyfoam plugs	box	3	12	36
High speed drill	drill	1	250	250
Drill bits	bit	10	6	60
Water tank	tank	1	100	100
Used refrigerators	unit	2	100	200
Misc. (sprinklers/hose)			100	100
Labor-drill, plant, cut plugs, plug, rack	hr	70	6	420
Labor-inspect & water	hr	15	6	1
(3) Total establishment costs				\$2,406

FIXED COSTS	year 1	year 2	year 3	year 4
Hauling, \$0.26/mi., 200 mi.-yr. 1; 3,000 mi ea., yrs. 2-4	52	780	780	780
Boxes (\$0.50/3 lb mushrooms)	13	293	200	80
Utilities (\$0.07/Kwh)	25	200	200	200
Labor (\$6/hr)				
Soak/rack-yr 1: once x 1 min/log	100			
Yrs 2-4: 4 times/yr x 1 min/log		400	400	320
Harvest (17.5 lbs/hr)	27	603	411	165
Hauling (wage x distance/40 mph)	30	450	450	450
(4) Total fixed costs	247	2726	2441	1995

Establishment costs	\$2,406.00			
Total costs	\$2,653.00	\$2,726.00	\$2,441.00	\$1,995.00
(5) Net revenue over total costs	(\$2,373)	\$3,434	\$1,759	(\$315)
(6) Break-even price @ this yield	\$2.23			
(7) Break-even yield @ \$3.50/lb.	2805			
(8) Total labor costs	\$4,317			
Total labor hours	719			

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