

SHITAKE

College of Agricultural Sciences. Penn State University. April 1998.

Specialty Mushrooms. Daniel J. Royse. Penn State University. Department of Plant Pathology. Specialty Mushrooms Homepage. June 1998.

Growing Shiitake Mushrooms in a Continental Climate. Mary Ellen Kozak and Joe Krawczyk. ABC Printers, Marinette, Wisconsin. Second edition 1993.

Mushroom Cultivator: A Practical Guide to Growing Mushrooms at Home. Paul Stamets, J. S. Chilton. Agarikon Pr. Published 1984

Shiitake Growers Handbook: The Art and Science of Mushroom Cultivation. Paul Przybylowicz, & John Donoghue.

Kendall/Hunt Publishing. 1988.

Growing Shiitake Mushrooms. Publication F-5029. Steven Anderson and Dave Marcouiller. Oklahoma Cooperative Extension Service. 1990.

Shiitake Production on Logs: Step-by-Step in Pictures. FOR-77. Deborah B. Hill. University of Kentucky, Cooperative Extension Service, 1999.

Growing Gourmet Mushrooms from A to Z. Bob Beyfuss. Cornell Cooperative Extension. 1999.

Mushroom Cultivation and Marketing Horticulture Production Guide . Alice Beetz & Lane Greer. Appropriate Technology Transfer for Rural Areas (ATTRA). September 1999.

• • •

RI DEPARTMENT OF ENVIRONMENTAL MANAGEMENT & THE RURAL LANDS COALITION SUBCOMMITTEE PARTICIPANTS INCLUDE:

Rhode Island DEM:
Office of Strategic Planning & Policy
Division of Forest Environment
Division of Agriculture

Rhode Island Forest Conservators Organization
Southern New England Forest Consortium
USDA, Natural Resources Conservation Service

FOR MORE INFORMATION CONTACT:

RI DEM, Division of Forest Environment
(401) 637-3367 or visit our website at: www.state.ri.us/dem/programs
USDA, Natural Resources Conservation Service (401) 828-1300

and oyster, can be produced in a woodland setting. This provides opportunities for forest landowners to grow mushrooms to generate revenue to pay property expenses.

A potential mushroom producer would be wise to develop a written marketing plan before committing resources into production. The goal of this analysis is to identify local conditions, such as competition, consumption, and pricing, and to better identify opportunities to sell your product.

Other Sources of Information

Farming Exotic Mushrooms in the Forest.

Deborah B. Hill. Agroforestry Notes. USDA National Agroforestry Center. AF Note 13. July 1999.

Mushrooms - A Small Scale Agriculture Alternative. Diann Hunsinger. PENpages.



Cultivating Mushrooms

EDUCATING THE PUBLIC ABOUT SUSTAINABLE LAND-BASED BUSINESSES

Introduction

Mushrooms are formed by fungi that live on decaying organic matter. The fungus develops in two stages: a vegetative phase when it grows and decomposes organic matter, and a fruiting phase, when mushrooms are produced. The cool, moist environment in the forest is ideal for the growth and development of fungus and some types of mushrooms, including gourmet varieties like shiitake, oyster, and cremini, can be cultivated under these conditions.

The strategy in cultivating mushrooms is to introduce a desirable fungus onto a growing medium and promote its growth, so eventually mushrooms are formed. Although many varieties of mushrooms can be grown under controlled conditions

indoors, or on substrates such as sawdust, this publication focuses on outdoor production using logs.

Production

The production process involves cutting trees, inoculating logs with fungus, stacking the logs in the forest, and forcing the fungus to fruit (produce mushrooms). Material and equipment used includes; a chainsaw to harvest the trees and cut the logs, a high speed drill, mushroom spawn, and wax to seal the holes after inoculation.

Harvesting Trees

Fungus feeds on the cellulose and lignin in wood and once the log is fully occupied by the fungus, it will produce a mushroom.

Management for traditional wood based forest products is difficult in Rhode Island due to the small size of most forestland parcels and the long wait between harvests. However, specialty forest products, such as cultivated edible mushrooms have the potential to become a viable economic activity in Rhode Island as a result of an increased interest in natural foods and ethnic cuisine.

The purpose of this publication is to provide you, as the owner of forest land, with information about starting and maintaining a mushroom-growing business on your woodland.



room. Trees with heavy, dense wood (including most hardwood tree species) encourage the fungus to grow rapidly and allow it to produce mushrooms longer. Oaks (both red and white) are the preferred tree species for producing mushrooms. Red maple can also be used, but requires more careful management. Conifers, such as pine, hemlock, and cedar, should be avoided.

The harvested trees should be five to eight inches in diameter and cut into four foot sections for ease of handling. The trees used must be free of insects and disease and inoculated within one month of being harvested.



Inoculating Logs

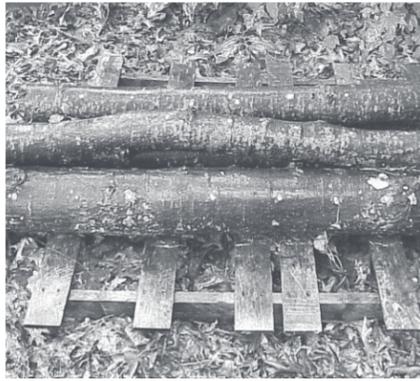
Logs are inoculated with spawn, or mycelium, which is equivalent to the root system of perennial plants. It is readily available in two forms: pieces of wooden dowel that have been colonized by a fungus, or as moistened sawdust held together by mushroom mycelium. Mushroom spawn can be purchased from a variety of suppliers - a list is included at the end of this publication.

Holes are drilled into the log, the spawn inserted, and the holes sealed with wax to prevent moisture loss. The holes should be 5/16 inch in diameter for dowel spawn and 7/16 inch for sawdust spawn, and spaced 6 to 10 inches apart, with 4 to 6 inches between rows. It is best if adjacent rows are offset, so the holes form a diamond pattern.

To ensure the fungus is quickly established, at least 30 to 50 plugs should be used for each four foot log that is five to eight inches in diameter. For commercial production, 300 to 500 logs will be needed to supply a small operation.

Storing Logs

In order for fungus to colonize the log, spread, and produce mushrooms, the inoculated logs should be stored in a cool, moist location. In most cases, the logs can be stored in the understory of the forest provided there is space to stack logs and the location is accessible enough to facili-



tate maintenance and harvesting.

The logs must be stacked in a manner that promotes air circulation and allows for ease of maintenance and harvesting. The moisture content of the logs should be monitored, they need to be kept moist because the fungus will die if the logs dry out.

Depending upon the type of mushroom being produced, the species of logs used, and weather conditions, it will take from six to 18 months for a fungus to colonize the log and produce mushrooms.

Forcing Fruiting

Hormone changes in the fungi stimulate mushrooms to form. Under natural conditions this occurs after a heavy rain or changes in temperature.

Mushroom development can be promoted by soaking the logs. The soaking time needed to stimulate mushroom production varies, depending on air temperature, and may require six to 24 hours in the summer but up to two days in the spring or fall.

Harvesting

Most logs will produce mushrooms for about a week during the fruiting cycle. They should be harvested daily (afternoons are best), by twisting or cutting them off at the base.

During and after harvest, mushrooms must be handled with care to maintain their fresh, healthy appearance. Mushrooms should never be washed with water but can be wiped clean or lightly brushed to remove any soil. Mushrooms must be kept refrigerated and stored in cardboard boxes or paper/cloth bags - never wrapped in plastic.

Mushrooms are best if used within several days of harvest although they can be preserved by drying or freezing.



Resting Logs

After each harvest, the logs must be stored in a shady, moist area for two to three months. During this time, the fungus

grows and replenishes itself. Depending on the type of fungus and species of tree used, a log should continue to produce mushrooms for two to three years.

Markets

Forest grown mushrooms are considered a specialty product. The markets and potential outlets are different than traditional farm products (or even other types of mushrooms). The marketing approach depends on the volume produced and the skills and time available to market them. If a large volume is produced, wholesale to supermarkets, food coops, or health food stores is an option. Wholesale buyers require assurances of consistent supply and quality before they will commit to purchasing.

The best strategy for marketing small quantities is to focus on producing a high quality, specialty food and selling it directly to consumers. Direct marketing at local farmers' markets, to restaurants, or at farm stands may be an opportunity in some locations. DEM, Division of Agriculture (<http://www.state.ri.us/dem/topics/agricult.htm>) maintains a list of farmers

markets and farm stands available to sell locally grown products. Many consumers would be very interested in purchasing locally grown mushrooms knowing the revenue generated by the landowner helps to retain the land as open space.

Another outlet is the Chef's Collaborative, a national partnership with a local chapter, that promotes using locally grown products in restaurants to advocate sustainability. Restaurants interested in promoting local farms subscribe to their newsletter, which lists suppliers of locally grown products. For more info visit their website at <http://www.chefnet.com/>

Another sales strategy is to use the internet to market mushrooms to people in other areas. This requires establishing a website and/or catalog and either drying the mushrooms or making special shipping arrangements to insure the mushrooms arrive fresh.

Other Considerations

Mushrooms are becoming increasingly popular as a specialty food item. Some varieties of mushrooms, including shitake

Sources of Spawn

Southeast Mushroom Inc.
12320 N.W. SR 45
High Springs, FL 32643
1-866-226-7890
<http://www.gourmetloft.com/semushroom/>

Mushroom People
560 Farm Road
PO Box 220
Summertown, TN 38483
(800) 692-6329

Mycosource, Inc
R.R. 1
Goodwood, ON Canada
L0C1A0
(416) 402-9755
<http://www.mycosource.com>

FungiPerfecti, LLC
P.O.Box 7634
Olympia, WA 98507
1-800-780-9126
<http://www.fungi.com>

Beta Spawn Co., Inc.
PO Box 387
Toughkenamon, PA 19374
(610) 268-3087

Champfood
11921 Lofton Avenue
Hastings, MN
(651) 437-2556

•••