Growing Gourmet Mushrooms on Woodland Waste

Project Number: fne02-428

Senior Investigator: Tina McMurray, Weeping Birch Farm, Greenwich, NY

Summary: This study was undertaken to determine if gourmet mushrooms could be grown on the woodland waste left from a selective timber harvest. In addition to that basic question, the investigators were looking at understanding what the most desirable combination of tree species, mushroom cultivar and production method is to accomplish the production of gourmet mushrooms in natural forest conditions.

Seven different species of mushrooms were chosen because of their harvest times and because they are all popular with gourmet cooks. These mushrooms are:

- Oyster Mushrooms
  - *Pleurotus ostreatus* or White Oyster (7 strains)
  - *Pleurotus pulmonarius* or Italian Oyster (2 strains)
  - *Pleurotus eryngii* or Umbel or King oyster
  - *Pleurotus columbinus* or Blue Oyster
  - *Hypsizygus tessalatus* or Warm Weather
  - *Hypsizygus ulmarius* or Elm Oyster
- Lion's Mane or Pom-Pom [*Hericium erinaceus*]
- Winter Mushroom [*Flammulina velutipes*].
- Hen-of-the-Woods or Maitake [2 strains of *Grifola frondosa*]
- Wine Cap [*Stropharia rugoso-annulata*]
- Blewit [*Clitocybe nuda*]
- Reishi [*Ganoderma lucidum*]

All of these were then "planted" into 4 different types of primarily hard wood timber waste: tree tops, tree stumps, brush and leaf piles and wood chip piles. Records were made of dates of fruiting, weight of harvest, type of mushrooms and the type of waste on which they fruited.

Production was best for the oyster type mushrooms that were inoculated into the wedge cut by chainsaw into the stump.

Introduction: Weeping Birch Dairy Farm is owned and operated by William McMurray and three of his children: Robin, Tina and Bonnie. The 100 cow dairy plus the custom hauling business are full time jobs, but as the number of families dependent on farm income increases, all members agreed that they needed to diversify income and labor.

The first step was to begin more aggressive forest management. The large hardwood forest on the farm hadn't been logged in many decades and with the help of a forester the McMurray's were able to capitalize on good timber prices. It was the encouragement of Jon Raymond, the forester, that spurred the McMurray's on to use the woods as a base for an alternative crop.

The existence of several upscale Farmers Markets' in Saratoga Springs and Glens Falls and the emergence of a flourishing local market in Cambridge, provided some promise

Photo 1—Fall following selective harvest.

that these select mushrooms would find a market. Several food writers from local communities were immediately interested in the product and helped raise awareness by featuring them in food columns.

Objectives: The primary concern for the McMurray's, having no background in growing mushrooms or marketing a gourmet food item, was will it work and will it make us money?

The advice offered by mushroom consultant John Boyle was important. John supplied the cultural information about inoculation, expected harvest times, use and quality of mushrooms etc. The marketing guidance came through Cornell Cooperative Extension, friends and neighbors and trial and error.

Photo 2—Arrow points to drilled hole sealed with wax. Note also metal tag for ID

Methods: The timber harvest was guided by a certified consultant forester. The logger took most of the tree but left stumps and also branches with a diameter of less than 8". From these remains the following planting areas were constructed. (see photo 1, above)

Stumps were prepared by drilling 7/16" diameter holes 1-2" deep around the perimeter (see photo 2, right). These holes were filled with sawdust or plug spawn and sealed with hot wax to prevent loss of moisture. Stumps were tagged for record keeping. Stumps were primarily used to grow Oyster mushrooms although Lion's Mane, Winter Mushroom and Maitake were also used on stumps.

Photo 3—Drilled bolts lying in woods.

Bolts were made from small logs 40-48" long with a diameter of 3-8" (see photo 3, above). There were inoculated with sawdust spawn and plug spawn through 1-1.5" deep drilled holes. The holes were drilled in rows and patterns favored by Shiitake growers. The holes were sealed with hot wax. Bolts were used for Oysters,

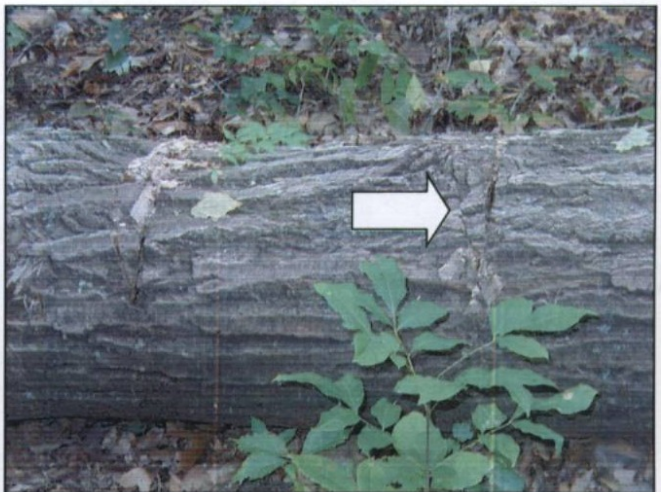

Photo 4—Arrow points to wedge cut by chainsaw. This method proved to be productive and less labor intensive.

Photo 5—Stacked stump blocks

Hericium and Flammulina.

Blocks or Wedges of wood (larger diameter pieces of various lengths) were inoculated as bolts or through slashes cut with a chainsaw. (see photo 4, previous page) Some of the shorter ones will be stacked one on another with a layer of sawdust spawn between each block (see photo 5, left). This method, which we called the stacked stump, is much less labor intensive than drilling holes. Oyster, Hericum, Flammulina and Grifola were planted into these wood wedges and stacked stumps.

Piles of wood chips were moved to suitable shady locations in the woods and were well watered before planting. The piles were randomly shaped and approximately 100 square feet in size with a minimum depth of 12 inches. Woodchip piles were inoculated with Oysters and Stropharia.

The leaf piles were used to grow Blewits. We inoculated directly into an area of partially decomposed leaves. (see photo 6, below)

All mushroom spawn was inoculated between March and June of 2002. The first recorded harvest was in late August of that same year, but most of the harvest was the following spring.

Photo 6—Roped off leaf pile.

Outcomes and Impacts: Harvest for a few mushroom types began in late summer after inoculation. (see Table 1, below) Harvest totals were 47 lbs 15.75 oz for all varieties picked. Eight different varieties were harvested with the most productive being the White Oyster. 29 Pounds and 13.75 ounces were harvested from that variety.

The spring was less productive, with only 13 lb and 10.25 ounces being harvested until July 3rd. At this point, due to significant labor shortage caused by heath of principal investigator, the study was terminated. Little data on wood types was gathered. Most fruiting was done on wedge type inoculations. For complete list of production data, see Table 2 on page 4.

Table 1. Production Totals

	Fall 2002	Spring 2003	Variety Totals
Elm Oyster	1lb 15.75oz	13 lb 8.5 oz	**15 lb 8.25oz**
Gray Dove	2lb 12.5 oz		**2lb 12.5 oz**
Warm Weather	2lb 14.25 oz		**2lb 14.25 oz**
PLP oyster	8.5 oz	1.75oz	**10.25 oz**
Italian	2lb 8oz		**2lb 8oz**
Blue Oyster	5lb 10.75 oz		**5lb 10.75 oz**
Blue Dolphin	1lb 12.25oz		**1lb 12.25oz**
White Oyster	29lb 13.75 oz		**29lb 13.75 oz**
Harvest Total	47lb 15.75 oz	13lb 10.25oz	**61 lb 10 oz**

Date	Mushroom Type	amount harvested	Cultural Method	wood species
25-Aug-02	Elm Oyster	gone by	wedge	
1-Sep-02	Gray Dove	2 oz.	wedge	
	Warm Weather	1 oz.	wedge	
5-Sep-02	PLP Oyster	6.5 oz	stacked stump	
	Italian Oyster	40 oz	wedge	
	warm weather	3.25 oz	wedge	
7-Sep-02	warm weather	6.5 oz	wedge	
	PLP oyster	2 oz.	wedge	
17-Sep-02	Elm Oyster	gone by	wedge	White Birch
	White Oyster	gone by	stacked stump	
	Italian Oyster	gone by	stacked stump	
22-Sep-02	warm weather	1 oz.	wedge	
	Elm Oyster	1 lb. 10 oz	wedge	
	blue oyster	2 oz.	drilled stump	
23-Sep-02	Elm oyster	2 oz.	drilled stump	
10-Oct-02	Warm weather	1.25 oz	wedge	
14-Oct-02	Elm Oyster	2 oz.	wedge	
18-Oct-02	Blue Oyster	1.5 oz	drilled stump	
20-Oct-02	Elm Oyster	1.75 oz	wedge	
	Warm weather	3.75 oz	wedge	
	white oyster	21 lb 12 oz	wedge	
	Blue Dolphin	1.25 oz	stacked stump	
	white oyster	6 lb 5 oz	wedge	
25-Oct-02	warm weather	frozen	wedge	
	gray dove	frozen	drilled stump	
	gray dove	frozen	stacked stump	
	blue dolphin	frozen	stacked stump	
9-Nov-02	Blue Dolphin	gone by	wedge	
	Blue oyster	5 lb 7.25 oz	stacked stump	
	Gray Dove	1 lb 12.25 oz	stacked stump	
	Blue Dolphin	11.25 oz	stacked stump	
13-Nov-02	warm weather	1 lb 10.25 oz	wedge	
	white oyster	1 lb 12.75 oz	wedge	white birch
22-Nov-02	Blue Dolphin	8.25 oz	wedge	
	blue dolphin	3.75 oz	stacked stump	
	gray dove	14.25 oz	stacked stump	
	gray dove	2 oz.	drilled stump	
	cold oyster	1.8 oz	wedge	white birch
	warm weather	1.75 oz		
	warm weather	2.5 oz		
30-May-03	Elm Oyster	9.5 oz	wedge	white birch
	PLP oyster	1.75 oz	wedge	maple
	Elm oyster	6.25 oz	wedge	
	elm oyster	15 oz	wedge	
31-May-03	elm oyster	14 oz	wedge	
6-Jun-03	Elm oyster	11 oz	wedge	
8-Jun-03	Elm oyster	1.75 oz	wedge	
	Elm oyster	2 oz.	wedge	
10-Jun-03	Elm oyster	7 oz	wedge	
	Elm oyster	4.5 oz	wedge	
14-Jun-03	Elm oyser	4.5 oz	wedge	
26-Jun-03	elm Oyster	5 lbs	wedge	
	Elm oyster	9 oz	wedge	
1-Jul-03	Elm Oyster	2 lbs 15 oz	wedge	

Potential Contributions: There is very little published data on the production of gourmet mushrooms on woodland waste. We hope that this study will provide some background for other entrepreneurs that consider utilizing their forest land for growing mushrooms.

Publications/Outreach: An Open House and woods walk were held on October 3rd, 2003. Nearly 40 people from the greater Capital District area were in attendance. This was followed by an article in the Jan/Feb 2004 issue of Ag Digest, a Washington County Cornell Cooperative Extension newsletter. Results of this project were also presented at a Forestry workshop in April 2004 held in South Glens Falls and sponsored by Cornell Cooperative Extension and the Adirondack District RC&D (Resource Conservation & Development).

This project attracted a good deal of interest from the local media. The Saratogian, The Post Star and The Chronicle all had articles about the McMurray's and the SARE project.

John Boyle, the mushroom consultant on the project, does a good deal of teaching and lecturing about growing mushrooms throughout the upper and lower Hudson Valley. Mr. Boyle has also referred to this project during these educational sessions.

Future Recommendations: A smaller scale investigation of growing these same types of mushrooms on wedges would probably be the most valuable follow-up on this project. This project was a large and difficult project. Too few roads were made initially to provide easy access throughout the inoculated area. Roads are important to make it easy to move with the help of a gator. (see photos 7 & 8)

Photo 7—Forest Road

More market research would also be helpful as we still do not know which mushroom is the most desirable from a market standpoint. Realistically this information will vary from region to region. Demand for high end food items tends to be somewhat elastic as well.

Additionally, a long-term project to investigate the productive life of these various wood waste methods would help answer questions that affect a business plan.

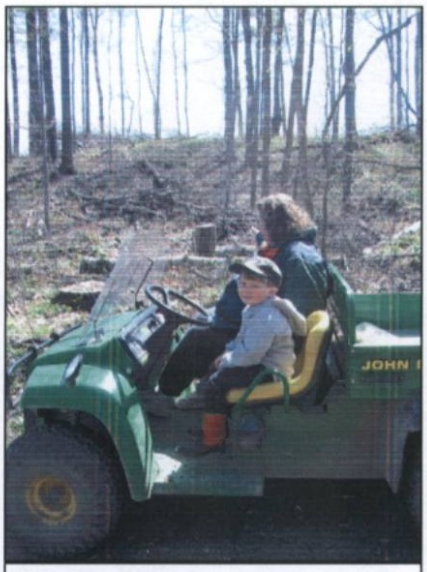

Photo 8—Tina and Liam checking mushrooms.

GROWING GOURMET MUSHROOMS ON WOODLAND WASTE

WEEPING BIRCH FARM LLC
12 OLD CAMBRIDGE RD
GREENWICH, N.Y 12834
(518) 692-2507

TYPES OF OYSTER

1.Blue Dolphin
2.Cold Blue
3.Warm Blue
4.Grey Dove
5.White
6.Italian
7.From G.V.
8.Eryginii
9.Tessalatus
10.Ulmarius

Types of Shiitake

1.Moondance
2.Northern Lights
3.Southern Belle
4.WR 46
5.Night Velvet
6.Snow Cap

Others

1.Lion's Mane
2.Reishi
3.Maitake
4.Blewits
5.Flammulina G.V.
6.Strophoria
7.Eryngii
8.Pulmonacivs

Due to relying on nature supply is limited please call ahead.

WEEPING BIRCH FARM IS LOCATED IN SOUTHERN WASHINGTON COUNTY JUST OUTSIDE GREENWICH, NEW YORK. OUR GRANDPARENTS PURCHASED IT IN 1943. MOM AND DAD BOUGHT THE FARM FROM THEM IN 1954. THE FARM WAS ABOUT 224 ACRES, SINCE THEN WE BOUGHT 70 ADDITIONAL ACRES. 100 ACRES OF THIS IS FOREST WITH THE REST BEING PASTURE AND CROPLAND. WE ALSO RENT 150 ACRES OF CROPLAND FROM NEIGHBORS. WE PLANT CORN FOR SILAGE AND ALFALFA FOR HAYLAGE, WITH GRASSIER FIELDS USED FOR DRY HAY. WE MILK ABOUT 100 COWS AND RAISE ALL OUR OWN YOUNG STOCK. WE (ROBIN, BON, TINA) ARE NOW THE 3RD GENERATION TO WORK THE FARM. WE NEEDED TO DIVERSIFY TO GENERATE ENOUGH INCOME FOR THE THREE OF US TO KEEP OUR FARM FOR THE FUTURE GENERATIONS. FOR THIS REASON WE HIRED A FORESTER AND SELECTIVELY HARVESTED. THIS HARVESTING WILL PROVIDE US WITH AN OPPORTUNITY TO PLANT AND HARVEST MUSHROOMS. WE HAVE HIRED JOHN BOYLE TO HELP US SET UP A SMALL SEASONAL MUSHROOM OPERATION.