1985 JAPANESE SHIITAKE FARM TOUR

by Bob Harris.

In April 1985 a group of eight interested people toured Japan to see shiitake mushroom cultivation. The tour was a joint effort by Mushroompeople and the Forest Resource Center. What we did not see was a lot of temples and museums, etc., the normal sights seen by tourists. Accompanied by our interpreter and with the complete use of our own buses we were able to see 13 different mushroom facilities. Along the way we ate some incredible foods, explored some of the world’s largest fresh produce markets, rode camels on the beaches, and were invited to the homes of some very well to do farmers. Remember shiitake mushrooms are the number one agricultural export of Japan. We were lucky that the spring rains had not destroyed the beautiful cherry blossoms. We plan to tour shiitake farms in Japan and Taiwan again during the first three weeks of April 1986, which will be cherry blossom time once more. Probably the most impressive facility was the Mori Mushroom Institute with its own hotel and laboratores which we will visit again. Where else could you learn that feeding a mouse 20% of its own body weight in shiitake mushrooms will prevent certain cancers?

On our first day in Tokyo we came upon the Tsukiji fish and produce market, the largest of its kind in the world. Naturally everyone wanted to see all the mushrooms there. Fresh shiitake came packaged in several ways. Sacks made of plastic netting contained 100 grams of high quality mushrooms. An alternative package containing the same weight was also made using a small plastic basket. Larger bulk containers were either wooden flats or cardboard boxes. Most impressive was the fact that all mushrooms were sorted precisely according to size, shape, color, and were packaged in neat rows facing the same direction.

The majority of the fresh mushrooms were medium sized-3” across, with inrolled margins and were a deep brown in color. Less common, but of higher price were the thick fleshed Han Donko type. These occur mainly in the spring and are distinctly rimose, with cracks in the cap caused by cold weather and low humidity. The deep furrows in the flesh are often white, making the mushrooms appear lighter. The thin fleshed flat Koshin type do not appear in the markets until the warm, humid summer months.

Processed mushrooms included dried shiitake and canned mushrooms. The dried mushrooms are sorted and graded into several categories. The Donko type which are thick and have inrolled margins are packaged dry in 100, 500, and 1,000 gram packages. The price depends on the quality and can range from $15-$60 per pound. Lower quality Koshin types are packaged dry as whole mushrooms or pieces of mushrooms. Shiitake and other mushrooms are found canned as a soup mix in a plastic bag container. This product is pasteurized, hermetically sealed and acidified to provide a shelf life of about two months.

Several other cultivated mushrooms were available at the market, including Nameko (Pholiota nameko), Pleurotus sp., Lyophyllum sp., Enokitake (Flammulina velutipes), and Grifola frondosa. Most of these were packaged fresh in plastic bags or in containers with a stiff plastic bottom covered with a special plastic wrap. This wrap was manufactured with microfine holes in the wrap to allow breathing. These mushrooms were also used in the canned soup mix and were rarely found dried.

After meeting with our guide and interpreter we traveled north to the Mori Mushroom Research Institute. We lodged at the Mushroom Hotel site of the 1974 International Mushroom Conference. The hotel was built specifically for the conference and was decorated entirely in a mushroom motif. Silk bed spreads with reishi mushroom, wall paper with shiitake, a wooden goddess sculpture covered with shiitake, and mushroom kimonos were among the hotel decor. At the mushroom book and gift shop, extracts, teas and even a wine made from shiitake were sold. The hot tubs in the spa contained shiitake powder. The hotel is located in a valley that is a center of shiitake cultivation. Shiitake is grown all along the hillsides surrounding the valley.

Dr. Kaniche Mori was our host at a several hour dinner in his family’s two hundred year old hunting lodge. The food was prepared robate style (barbeque) in the manner

(See JAPAN - Page Two)
WORK CONTINUES ON C.E.C.

Reproduced above is the working blueprint for our controlled environment chamber (C.E.C.). The chamber is expected to become operational after the first of the year. It will enable us to demonstrate the possibilities of year around fruiting. Our observations should contribute to efficient operations for other growers and provide recommendations for low cost building construction or conversion. This information will help make the cultivation of shiitake mushrooms a profitable, locally grown forest crop. Contributions to complete the construction of the chamber have been received from: the Laird, Norton Foundation; Tuohy Furniture/Forest Products; Julia and Caroline Marshall; the Governor's Council on Rural Development; Rochester Materials Company (ROMAC); Garn, Inc., Architectural Environments, Reese's Logging; Controlled Environment Growing; and Torben Humle.

In order to provide you with accurate information on climatic conditions at the time of fruiting, ie: temperature, light, air flow, and humidity, several relatively sophisticated and expensive pieces of equipment are needed. For example, a hygrotherograph, which records temperature and humidity carries a $750 price tag. All totaled, we are seeking $2,500 from private individuals to complete the necessary purchases. With the year's end approaching, please consider making a tax-deductible contribution to the Forest Resource Center and join the "Friends of the Forest", a group that offers membership at the $50, $100, $250, $500, and $1,000 levels to support the educational activities and projects that take place at the Forest Resource Center. With your tax-deductible contribution, we can provide you with critical information to successfully establish your shiitake operation.

JAPAN (Continued)

of the fishing villages. Every course contained at least one or more mushroom dishes and was exquisite. There were barbeque shiitake, mushrooms broiled in foil, pickled mushrooms and even a candied dessert fungus considered a prize delicacy.

On the second day with Dr. Mori we toured the facilities at the Institute. The hillsides were covered with shiitake logs in all stages of production and harvesting. Different strains of shiitake were being tested under various conditions. First fruiting is in 6 months, but usually small. First commercial harvest is 15 months from spawning. Harvest occurs about 2 weeks after rainfall. A good yield is 20% of the fresh weight of the log in mushrooms.

Our next stop at the Mori Institute was a pilot facility used for cultivation of edible mushrooms on sawdust medium. The species grown were Grifola, Pleurotus, and Pholiota nameko. A ribbon blender is used to mix sawdust type medium. Both polypropylene bottles and polypropylene bags are used for the sawdust medium. Bottles and bags are supported at a slight angle to horizontal in "A" frame racks for fruiting.

We left the Mori Institute to visit a nearby shiitake farm belonging to Mr. Kanaka which grew year round in greenhouses using whole oak logs. Logs are covered with muslin for 20 days after spawning while under artificial shade.

Mr. Kanaka has his first fruiting (flush) in 6 months. The first commercial harvest is 15 months from spawning. Logs are soaked for 6 hours in winter to initiate fruiting. After soaking the stacks of logs are removed from the tanks and placed on a vibrator for 30
Inexpensive racks made of steel re-rod are used in handling shiitake logs. [Photo by Mitloh Gilbert.]

minutes (further in the article is a discussion with Tehei Fujimoto about the technique of shocking). The logs are then removed to the greenhouse and stacked in position for fruiting where the logs are leaned upright against a central rail about 3' high off the ground. The logs are covered with muslin for 2 days. The flush continues for a period of about a week. Fruiting is induced when natural harvest do not occur and fruiting inhibited during the time of seasonal outdoor fruiting. By inhibiting fruiting during the time of natural harvest, larger harvests are produced during the off season when the market is better. During the dormant period the logs are kept under shade cloth and covered with muslin, etc.

We traveled from the Mori Institute to our next stop on Japan's famous Bullet trains. They live up to all the publicity - every train is on time and trains even stop exactly at the spot marked on the pavement. Our destination was the mushroom research station in Fukushima, a subdivision of a regional forest product utilization agency that is privately funded for public research.

Natural outdoor cultivation is poor in Fukushima because of its colder climate. New strains are being developed that perform in cold weather. Most mushrooms are grown here for the fresh market. Production is 74,680 T (metric) per year of fresh mushrooms and 12,225 T for dried mushrooms for all of Japan. In Fukushima it is 4,300 T fresh and 300 T dried. There are 4,300 growers producing in Fukushima and it is 4% in production for the whole country. Total for Japan is 67,000 growers.

After leaving the Fukushima research center, we toured a private shiitake farm belonging to Mr. Furukawa. His family had been sake manufacturers for several generations and he still lived in his family's 200 year old farmhouse. His family began shiitake growing 15 years ago and was obviously very successful at it.

He spawns the logs in March. Incubation prior to fruiting is 6 months for spring strains and 15 months for summer strains. Incubation is in shaded woods. When incubation (spawn run) is finished, logs are brought to the greenhouse. To induce fruiting, logs are soaked 12-15 hours in summer and 4-8 hours in winter. After soaking the logs are drained and vibrated, brought into the greenhouse and stacked on horizontal metal racks 7-8 tiers high. Logs inoculated with summer strains are flushed 5 times per year, and logs with spring strains are flushed 3 times per year. Turnover in the greenhouse is 6 times per year. The life of a log is 4-5 years from spawning. Yield is 800 grams fresh mushrooms total over the life of the log.

Our tour of Mr. Furukawa's farm included the obligatory tea and sweets at the dinner table, however the sweets were a special, traditional variety and the setting inside a 200 year old traditional farmhouse made this visit a memorable one.

Next we visited a second shiitake farm where the proprietor was also a Mr. Furukawa. Each spring, Mr. Furukawa told us he inoculates 130,000 logs in 10-15 days. Logs are purchased at 140 Yen per log in Fukushima. Spawn costs are 2,500 Yen per 1,000 plugs. ($1 = .02 Yen.)

To finish our tour of mushroom farms in Fukushima we visited a commercial nameko grower who used sawdust medium. For nameko cultivation hardwood sawdust is mixed with nutrients, moistened to 65-70% and bagged. Each polybag weighs 800 grams. The bags are sterilized for 3 hours at 117°C.

After sterilization, bags are cooled and inoculated in a laminar flow hood. Incubation takes 78 days at 16°C and is finished when the spawn grows completely through the sawdust. The top of the bag is removed exposing the surface of the medium. The blocks are then stacked tightly in an "A" frame rack. Mushrooms fruit from the exposed surface. Humidity in the growing room is kept at 95%-100%. Temperature is kept at 13°C. Three flushes are produced with a total yield of 250 grams. Light is provided and CO₂ is exhausted at flushing.

After an additional day of sightseeing in northern Japan we flew across the country to Tottori prefecture on the western coast. Here we visited the Tottori Mycological Institute. This institute is a commercial spawn producer and probably Morii's chief competitor.

At the site of some experimental plots supervised by the institute we were told that log moisture should be at least 50% for fruiting. Research at Tottori is primarily concerned with the isolation of spawn types that resist Trichoderma contamination. Too much humidity encourages Trichoderma contamination. Its growth can be controlled with more air movement. They suggest

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reducing humidity and increasing air movement by cutting the grass beneath the logs.

Production cost in Tottori were: logs - 200 Yen/log; Spawn (20 plugs/log) - 40 Yen/log; spawn labor - 25 logs/hr - 28 Yen/log to 50 logs/hr - 14 Yen/log. The average wage is 700 Yen per hour or 5600 Yen per day, and 80% of labor is female.

Workers can harvest and package 300 kilos per week. Cost per package is 8 Yen. Shipping cost is 10% of final sale price. Prices range from a low of 100 Yen ($1.80/lb) wholesale per 100 grams to about 150 Yen ($2.72/lb) average. Ninety percent of this goes to the grower.

The final region on our tour was Nara, the home of one of the newest and largest wholesale market in Japan and the Yamato Spawn company headed by Tahei Fujimoto. The trading company at the Nara market is one of the two largest in Japan. Yamato spawn accounts for 70% of the spawn used in Nara prefecture. A high percentage of the mushrooms grown here are for fresh consumption. This company sells 1,600,000 metric tons of fresh mushrooms each year. A total of 3 metric tons is sold daily at the market (metric ton = 992 kg). Two thousand metric tons are sold in Nara annually, accounting for 260,000,000 Yen gross.

Prices in Nara are 107-108 Yen per 100 grams of mushrooms. High quality average in winter is 240-250 Yen per 100 grams. Two types of packages are used and all mushrooms are sorted by quality at the farms before shipment to the market. Transportation to the market takes 3-4 hours maximum and the auctions are at 6:30 A.M. The mushrooms are stored at 0- 5°C (usually 4°C), and most commonly are sold within 8 hours of arrival at the market. Fresh mushrooms for sale are a maximum of 80% moisture. Shelf life is 20 days under refrigeration, but could be as short as 1 day if the moisture content is too high. Dried mushrooms are a maximum of 5-6% moisture. Shipping costs 2 Yen per 100 grams. The retailer receives a 20-25% profit margin.

After exploring the market we boarded a bus for a tour of Tahei Fujimoto’s cultivation plots outdoors on the mountainsides, followed by a visit to the greenhouses where he had forced several thousand logs especially for us to see.

When asked about the most common difficulties encountered during the incubation Tahei replied that if a bracket fungus appears on the log this is an indicator that there is too much light and that the bark is too dry, and a new fungus must be introduced that grows through the bark is the perfect mature form of Trichoderma and indicates that there is too much moisture with too little air movement. The contaminant was probably present before spawning. He says monkeys are his biggest problem because they eat shiitake.

To force the fruiting of the mushrooms the logs are soaked in tanks. Tahei does not aerate the water, but does shock the logs by banging each rack of logs against an iron plate one or more times. The logs are kept in a unit with a rack made of rebar. Shocking the logs violently or vibrating them as other growers do has a beneficial effect on the fruiting. It is thought to duplicate the action of a rotten log falling from a tree and landing on the ground. There have been reports of researchers using artificial lightning to shock logs but so far the results have not shown any increase and Tahei believes that the motivation may simply come from the power companies trying to sell electricity.

The logs are moved into a greenhouse and put on special racks on the floor in a dense stacking method. (See drawings by M. Gilbert.) By stacking on the floor higher humidity is maintained. The floor is gravel. The special racks allow harvesting by moving the slope of the logs in the opposite direction. It is a cheap system and more effective than the metal frame shelving racks. A rest period of 20 days is required between soakings. Using the spring strains a log will produce 1 kilogram of mushrooms in 1 year.

We went to his house, after our tours, to have dinner. While waiting for dinner Tahei showed us his paintings and the collection of art that he has gathered over the years. It was as fabulous as the traditional style house that he lives in. But the real high point was the several hour multi-course dinner that his family prepared. Many of the dishes took all day to prepare.

On the following morning we traveled several hours by car with Tahei to a mountain restaurant that specialized in shiitake dishes. Everywhere outside the restaurant were hundreds of thousands of fruiting shiitake logs. While walking around we came upon the small building into which the fresh mushrooms were brought. Inside the entire floor was covered with shiitake. In one corner was an elderly woman slowly drying mushrooms for drying. It looked as if it might take her a week to get to the other side of the room.

During the entire tour we were able to obtain many books about shiitake which will, hopefully, be translated soon. In addition, we purchased quite a few spawn varieties to add to those cultures in the U.S. This and the knowledge gained should help the shiitake industry get a good start in the U.S. in the next few years.

BOB HARRIS and Jennifer Snyder own and operate Mushroompeople in Inverness, California. An itinerary of the upcoming 1986 Japanese Shiitake Farm Tour follows later in the newsletter.

FILLMORE COUNTY JOURNAL
Monday, October 21, 1985

Shiitake growers converge on Forest Resource Center

By Larry Saige
Forty-eight people from seven states and one from France attended the second annual Shiitake Growers Meeting on Saturday, October 12th.

Held at the Forest Resource Center north of Lakesboro, the event included discussions on marketing Shiitake mushrooms, mushroom identification, and a presentation on Shiitake production in Japan.

Tom VanCuster, from the Governor’s Council on Rural Development, spoke about marketing of the mushroom, stressing that local markets must be developed as well as marketing co-ops.

Representatives from Field and Forest, a major supplier of Shiitake spores, presented a guide to identification of mushrooms.

Mitch Gilbert of the Forest Resource Center gave a slide presentation on his trip to Japan. There was a lot of interest in this session since Japan is a major producer of Shiitake mushrooms, and has developed it into a local, small operator industry.

Present at the growers meeting was the largest Shiitake producer in the U.S. who produces 3,000 pounds a week. The largest producer in the Midwest was also present, and has 24,000 logs inoculated that are just coming into production.

Other growers were "mom and pop" operators that have a few cords of logs, and most of these operations will be coming into production in the next year.

Growers toured the facilities at the Forest Resource Center where a controlled environment chamber is under construction. It will be completed by Christmas, and fruiting of logs that have been stored at the center should begin by late winter.

Joe Deden is interested in helping area woodlot owners explore the possibilities of Shiitake mushroom production in southeastern Minnesota. He can be contacted at the Forest Resource Center at 467-2437.

MUSHROOM IDENTIFICATION
Mary Ellen Kozak gives identifying characteristics of mushrooms so that novices can learn more about the mushrooms.
FUJIMOTO'S FRUITING CHAMBER RACKS

These portable racks, designed by Mr. Tahei Fujimoto, allow very efficient use of floor space and are flexible, inexpensive and simple to build. As the crop ripens, each log is picked and tipped away. Cross logs can be rolled away. (Drawing by Mitch Gilbert. Copyright by the Forest Resource Center, 1985.)

FUJIMOTO'S FRUITING CHAMBER RACKS

Fujimoto's dense fruiting chamber stacking arrangement. (Photo by Bob Harris.)

1986 SHIITAKE FARM TOUR ITINERARY

March 29, Saturday: San Fransico Departure


March 31, Monday: TAIPEI. Morning tour of the city includes the National Palace Museum, the Presidential Mansion and a Buddhist Temple. Afternoon visit and inspection is being arranged at a mushroom facility.

April 1, Tuesday: TAIPEI. Morning additional visitation and inspection with your counterparts. Afternoon at leisure for independent shopping.

April 2, Wednesday: TAIPEI - TOKYO. Transfer from Taipei Airport to Tokyo's Narita International Airport. Transfer to hotel located at the Haneda Airport.

April 3, Thursday: TOKYO - OITA. Early morning flight to Oita arriving mid-morning. Transfer to the Tsuchikure Shiitake Farm for inspection and discussion.

April 4, Friday: OITA - BEPPU. Morning departure to Beppu. Visit famous Monkey Mt. and its nearby aquarium.

April 5, Saturday: BEPPU. All day at leisure to independently wander through this famous and colorful hot spring resort town and enjoy the hot sulphur baths.

April 6, Sunday: BEPPU - OITA - OSAKA - NARA. Air and ground connections to Nara. Afternoon visit to Todaji Temple and its great indoor Buddha and Deer Park, Kasuga Shrine with its 1,000 hanging lanterns.

April 7, Monday: NARA. Visit the market to see the activities amid the variety of produce and other delicacies. Inspection of the YAMATO MYCOLOGICAL RESEARCH LABORATORY.

April 8, Tuesday: NARA. All day leisure for inspection and discussions at the Yamato Laboratories.

April 9, Wednesday: NARA - KYOTO. Transfer to the former capital of Japan and cultural city Kyoto. Visit Heian Shrine and its beautiful Inner Garden, walk through Nijo Castle.

April 10, Thursday: KYOTO - TOKYO - KIRYU. Ground transfer by "Bullet" train to Kiryu.

April 11, Friday: KIRYU. Inspection and discussion at the MORI MUSHROOM RESEARCH INSTITUTE.

April 12, Saturday: KIRYU - NIKKO. Visit the TOCHIGI FOREST INSTITUTE for inspection and discussion.

April 13, Sunday: NIKKO - TOKYO. Sightseeing and ground transporation to Tokyo. Morning sightseeing to the world famous Toshogu Shrine, drive up the Irohazaka Turnpike Highway to Kegon Waterfall and Lake Chuzenji.

April 14, Monday: TOKYO. Visit Tsukji Fish Market part of the city's largest and busiest fish market. View Yoyogi Stadium, site of the 1960 Summer Olympics, Meiji Shrine and drive through bustling Akihabara and Ginza shopping and entertainment districts.

April 15, Tuesday: TOKYO - SAN FRANCISCO. Return home.

TOUR COST - $2,980 per person (share basis). Contact: Mushroompeople, PO Box 158, Inverness, CA 94937 for more information.
PROMOTING SHIITAKE IN ONES AREA

by Paul Goland.

I first read about shiitake mushrooms in the October, 1978 issue of Organic Gardening. I bought several spawn kits the next spring, and my original logs, now over six years old, are my best producers. At that same time, several descendants of pioneer families in our remote mountain community also started growing these delicious mushrooms for their own use.

This year, I began a personal campaign to interest landowners in Pendleton County, West Virginia in growing shiitake for themselves and possibly as a cash crop. It's not easy for people here to make a living, but there are plenty of oak trees, good shade, and pure spring water to support this new agricultural activity.

For ten weeks this summer, I ran a classified ad in the local weekly paper: "GROW DELICIOUS MUSHROOMS in oak logs, outdoors in partial shade..." Then I packaged small and broken dried mushrooms (left over from packaging larger, whole mushrooms) in 1- ½ ounce parcels, with the idea of selling these "leftovers" at a lower price only in my home county in West Virginia. After the ad ran for several weeks, I offered the packages to Pendleton County stores on a consignment basis, and most accepted. The people here are rather conservative, but had read about a shiitake seminar I arranged last year. Also, the classified ad raised some interest.

The dried mushrooms sold fairly well, especially in the Franklin IGA Store. When I had my first summer flush of mushrooms this year, I offered five pounds of fresh shiitake on consignment to the IGA store owner. He encouraged me to do a "demo". He supplied the equipment, I sautéed mushrooms in butter, offering tastes on toothpicks to shoppers on a Saturday for several hours. We sold out; now he pays up front for mushrooms, both fresh and dried. I sold him another four pounds when I had a second summer flush - he'd take some every week if I could supply him. Meanwhile, sales of dried mushrooms are picking up in this county, population 7,500.

Encouraged by this, I stopped in a Safeway in Silver Springs, Maryland and planned a demo with the produce manager. I sold eight pounds of fresh and several packages of dried mushrooms in four hours, and the manager was delighted. Although fresh and dried shiitake had been available to him for some time, he had never ordered either for his store. Now, he orders every week.

The key factor in introducing shiitake in both stores was packaging of the fresh product. The mushrooms were clear-wrapped in 5 X 8" meat trays, one layer face down, with one nice mushroom stemmed and gill side down. Packages weighed three or four ounces, with prices in the $2 range. I now include a suggestion sheet, on promoting sales of fresh and dried shiitake and how to do a demo, in each box of dried mushrooms packages going to supermarkets.

I set up my shiitake booth at the Treasure Mountain Festival in Franklin, West Virginia, on September 20-22, and at the Forest Festival in Elkins, West Virginia, on October 3-5. I'd be interested in knowing of other events where I could set up my booth. At these events, I demonstrate inoculating logs (using the Hitachi shiitake drill), offer tastes using dried pieces (Put it in your cheek like a plug of tobacco,) and sell dried Shiitake, inoculated logs, and spawn kits for fall or spring delivery. Festivals are even more fun than supermarket demos!

PAUL GOLAND owns and operates Hardscrabble Enterprises in Cherry Grove, West Virginia. His article was written for use by Dr. Orson Miller, Mycologist, V.P.I. & S.U., Blacksburg, Virginia.
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Because you subscribe to "Shiitake News" you're entitled to one free line classified ad. Subscribers may place one free, 20-word ad anytime during their membership year. Any additional classified placed during that year will be at a special reduced subscriber's rate.
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Deadline: Your typewritten ad and check must be received no later than the 5th of the month preceding the month of next issue. For example, if you want your ad to appear in the March Newsletter, we must receive your ad by February 5th. Classified ad submissions will be accepted in the order they are received. Due to space limitations, your free ad may be held over for publication in the following issue.
The Forest Resource Center reserves the right to accept, reject, or edit, at its sole discretion, any advertisement submitted for publication.

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WHAT IS THE SOUTHEASTERN MINNESOTA 
FOREST RESOURCE CENTER

The Southeastern Minnesota Forest Resource Center's objective is to improve the management of our hardwood resources on private land. The clientele for whom the Forest Resource Center is designed includes landowners, university students, local community education, secondary and elementary education programs, professional foresters and forest scientists. Working in cooperation with Minnesota's Department of Natural Resources, the Forest Resource Center is utilizing an existing facility that is located in the midst of 900 acres of forest land in the Richard J. Dorer Memorial Hardwood Forest near Lanesboro, Minnesota. Educational programs are being developed in conjunction with the University of Minnesota, College of Forestry, the Agricultural Extension Service and the Minnesota Department of Natural Resources. These accelerated educational/demonstration programs will increase awareness, and the level of knowledge and skills of forest landowners and other participants. Forestry specialists are convinced that demonstration sites, when coupled with personal contact, are the best method to encourage forest owners to implement necessary forest management practices. These forest management skills will help woodland owners move to optimum management on their lands. This will result in improved economic development and quality of life in the region.

Shiitake in Eastern Kentucky

Mike Greene, a Tree Farmer from Lanesboro, Kentucky, sent us this first-hand account of raising shiitakes. He told us that "whether it is a money-making undertaking depends mostly on one's willingness to market. Personally, I'll eat as much as I can and let the terrapins have the rest."

Developing species-specific uses for forest thinnings and logging waste is one alternative to firewood. Growing the fungus Shiitake, Lentinus edodes, gives Tree Farmers a crop of quality human food grown from oak. Dead oaks are the "soil" that supports the growth of the meaty-tasting mushroom. Commercially available shiitake-infected oak logs (7/8-inch x 9/8-inch) are used to "plant" the crop and it is harvested over several years with no further care.

In February, 1977, I felled scarlet oak, northern red oak and white oak as a thinning byproduct. The trees were bucked to 4-foot posts of 4 to 8 inches diameter. In March, I used a sharpened 9/8-inch round steel rod 6 inches long to drive a series of holes around and up the log length on a 6-inch x 6-inch spacing. A shiitake-infected log was pounded into each hole. The completed logs were piled close on the forest floor.

In September, 1980, I began to harvest hand-sized mushrooms from 30 logs; five additional infected logs did not bear. Logs were piled loosely on end to allow mushrooms to spring around the whole log.

The accompanying Production Chart summarizes the yearly production by species group. Shiitake logs bear generously after summer and fall rains. During drought, production is nearly zero. No mushrooms are borne in winter or spring.

After five years of production, the logs are deeply decayed and sprout local funguses unfit for consumption. Only insignificant amounts of shiitake are being harvested this year, but logs infected two years ago might begin bearing this season or next.

<table>
<thead>
<tr>
<th>Year</th>
<th>Harvest from 15 white oak “host” logs (in pounds)</th>
<th>Harvest from 15 scarlet oak &amp; northern red oak “host” logs (in pounds)</th>
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<tbody>
<tr>
<td>1980</td>
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<td>1.5</td>
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</tr>
<tr>
<td>1985</td>
<td>0.25**</td>
<td>0.35**</td>
</tr>
</tbody>
</table>

Of the original 20 red oak logs infected, five 4- to 5-inch diameter ones failed to produce mushrooms.

* All sizes produce, all injected logs bear.
** 2 months into 4-month production period.

SOUTHEASTERN MINNESOTA
Forest Resource Center
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Shiitake Production Chart
(all logs 4 feet long x 4 - 8 in. diam.)

CALENDAR:

Shiitake Seminars-
La Crosse, Wisconsin
Jan. 21, 86
Calmar, Iowa
Jan. 28, 86
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