

KENTUCKY SHIITAKE PRODUCTION WORKBOOK

Harvesting

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If you started with live spawn from a reputable supplier and freshly cut logs from living hardwood trees, your logs should be ready to produce shiitake mushrooms after 6 to 18 months of incubation. How soon the logs complete their “spawn run” depends on:

- the species, diameter, and length of logs;
- the variety of spawn;
- the density of spawn inoculation;
- the month of inoculation; and
- weather conditions (especially rainfall) since inoculation.

For a list of suppliers of live spawn, see *Shiitake Production on Logs: Step-by-Step in Pictures* (FOR-77) or *Kentucky Shiitake Production Workbook: Resources* (FOR-89).

It is important to keep the logs moist during the incubation period. That means if it has not rained for more than seven days, especially when temperatures are greater than 75°F, you need to wet down the logs. Water them using either a regular or soaker hose or with some type of efficient sprinkler system. White spots or rectangles around the rims of the log ends indicate that the spawn run is complete and that your logs are ready for production.

When it is warm and wet in the spring or fall, the logs may produce some mushrooms without your assistance, but do not force them into the production cycle described below until they have incubated a full year.

When you begin production, remember that each log will be on a nine-week cycle. It is better to plan on a total number of logs divisible by nine so you will have an

even number of logs in production each week. For example, if you want to work with 100 logs, plan on 108. At the beginning of Week 1, immerse overnight (8 to 12 hours) one-ninth of the logs you have ready for production (12 logs in this case).

Remove the logs from the soak tank and stack them in a log-cabin (open center) crib. Place the stack on nonproducing base logs, scrap lumber, or wooden pallets. Leave a square, open space in the middle of the stack. Stack the logs not more than five layers high so that you end up with 20 logs in the stack (see Figure 1). These stacks should remain in a shaded area that provides 85% to 90% shade cover. Place a bag rack on the top logs (see Figure 2a for rack design and Figure 2b for bag rack foot design). Cover the logs with a 55-peck plastic bin liner (48 inches by 48 inches by 60 inches). See FOR-89 for a list of suppliers for the bin liners.

Figure 1.



Bag Rack: Materials Needed

- 1-inch schedule 20 PVC piping (usually available in 10-foot lengths). (Note: 1 length of pipe should make 2 bag racks.)
 - 1 piece, 24 inches long (top rail).
 - 4 pieces, each 8 inches long (legs).
 - 4 pieces, each 1 inch long (nipples—connecting pieces for piping and fittings).
- 1-inch schedule 20 PVC fittings.
 - Four 45-degree ells.
 - Two 90-degree tees.
- Adhesive for PVC pipe or duct tape.
- 1 piece of $\frac{5}{8}$ -inch plywood for feet of bag rack—cut 4 with jigsaw or band saw (see template, Figure 2b).

Bag Rack: Assembly

1. Attach a tee to each end of the 24-inch piece.
2. Attach the four 1-inch pieces to the open ends of the two tees.
3. Attach the four ells to the other ends of the 1-inch pieces.
4. To make legs of bag rack, attach the four 8-inch pieces to the open ends of the ells.
5. Glue or tape all sections together.
6. Insert the short section of a bracket foot into the open end of each leg of the bag rack.

Figure 2a. Bag rack design

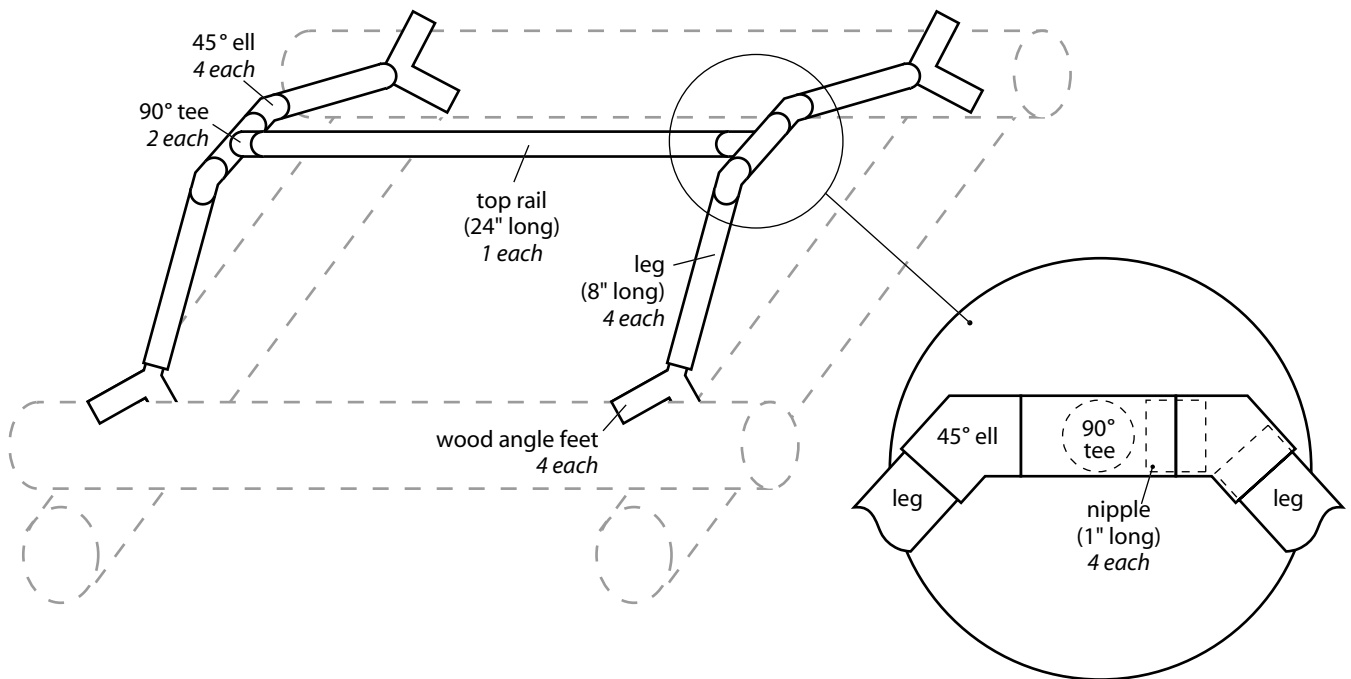
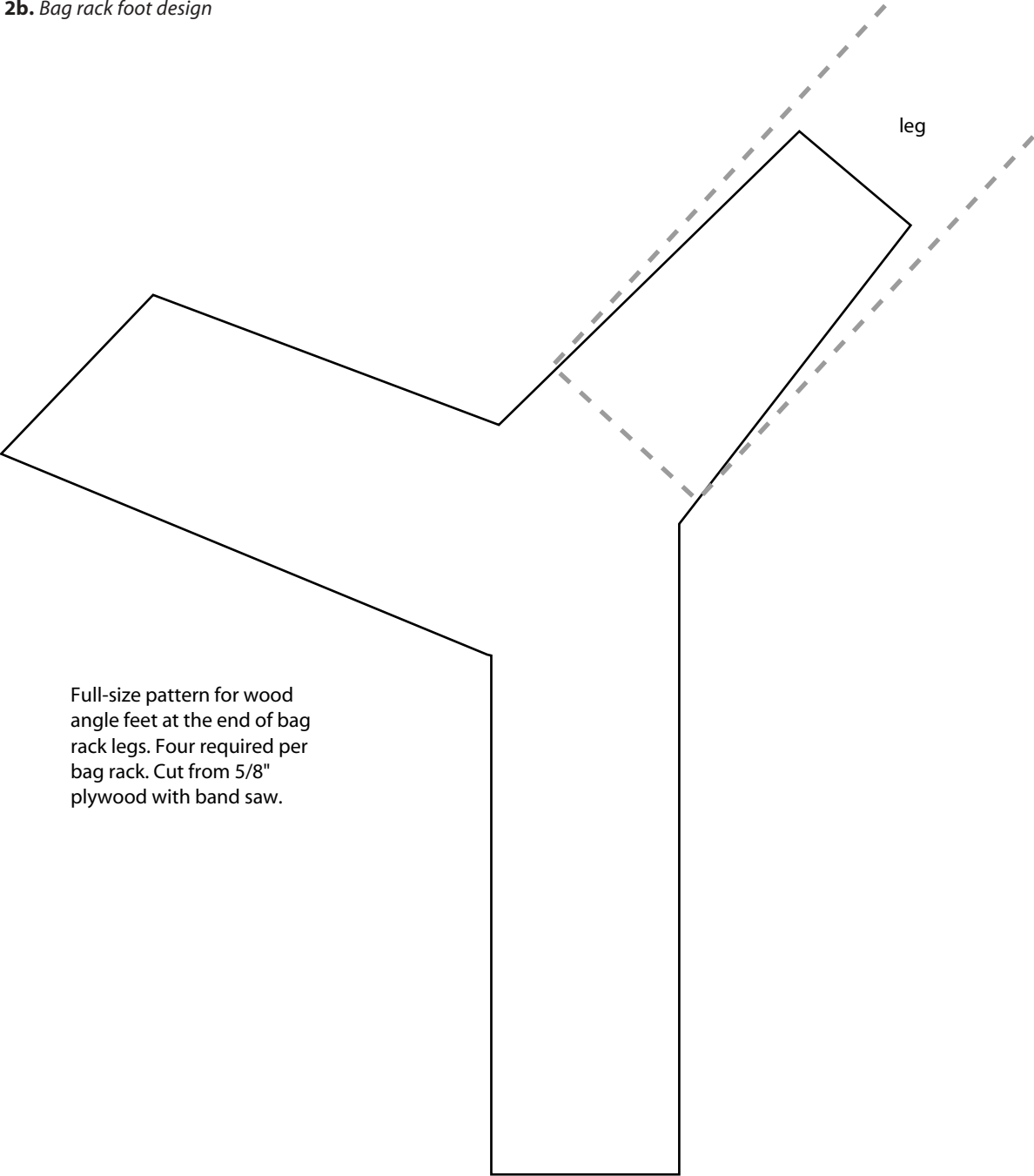


Figure 2b. Bag rack foot design



Full-size pattern for wood angle feet at the end of bag rack legs. Four required per bag rack. Cut from 5/8" plywood with band saw.

Cut a small vent hole in the very top of the bag (the bottom seam) so air can circulate within the stack (see Figure 3). Also, to increase air circulation, if the bottom (open) edge of the plastic hangs to the ground, roll the plastic up around the bottom of the log stack to the top edge of the base logs, scrap lumber base, or pallet. Covering the wet stack like this has several benefits. It:

- Creates a mini-greenhouse effect and makes the inside microclimate more favorable for uniform fruiting of logs (Figure 4).
- Prevents rainfall from getting onto the fresh mushrooms, which makes them soggy and less marketable.
- Greatly reduces damage from insects or animals.

When the mushrooms grow to harvestable size with 2- to 3-inch caps, roll the plastic up to the rack and pick or cut mushrooms off the logs. Then roll the plastic back down over the stack. Repeat this process over the next day or two until most of the flush is harvested.

When the logs stop flushing, remove the plastic and bag rack and leave the stacks to rest for eight weeks as they are. After the eight-week resting period, they can be soaked and fruited again. If there is little or no rainfall during those eight weeks, the logs need to be wetted down periodically. If there is some kind of regular rainfall (1/2 to 1 inch per week), the logs should not require more watering during this production phase.

Figure 3.

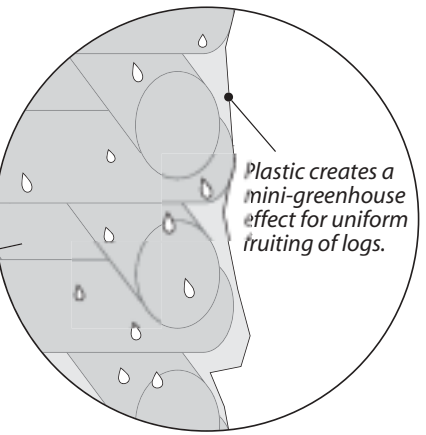
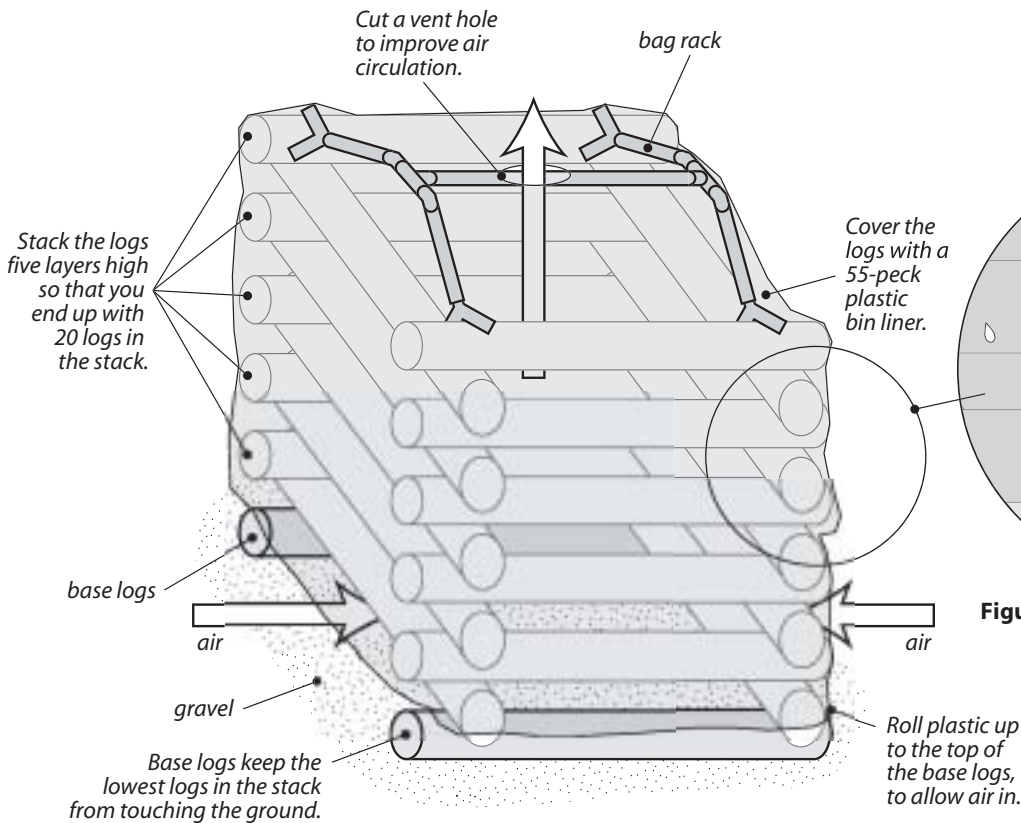


Figure 4.

Mushrooms appear in a few days, usually two to three days after stacking and covering. They should be harvested into some kind of container, preferably a basket so they have air circulation as they are picked (Figure 5). Select mushrooms that are at least 2 to 3 inches across the caps, as mentioned previously. The caps should still be rolled under on the edges or still attached to the stipes (stems), as shown in Figure 6.

For a high-quality mushroom, it is important to get the harvested mushrooms into refrigerated storage as soon as possible, certainly within one hour of picking. This time limit is important to consider when you are designing your mushroom operation. You will need refrigerated facilities near the production yard, including an appropriate power supply.

Figure 5.

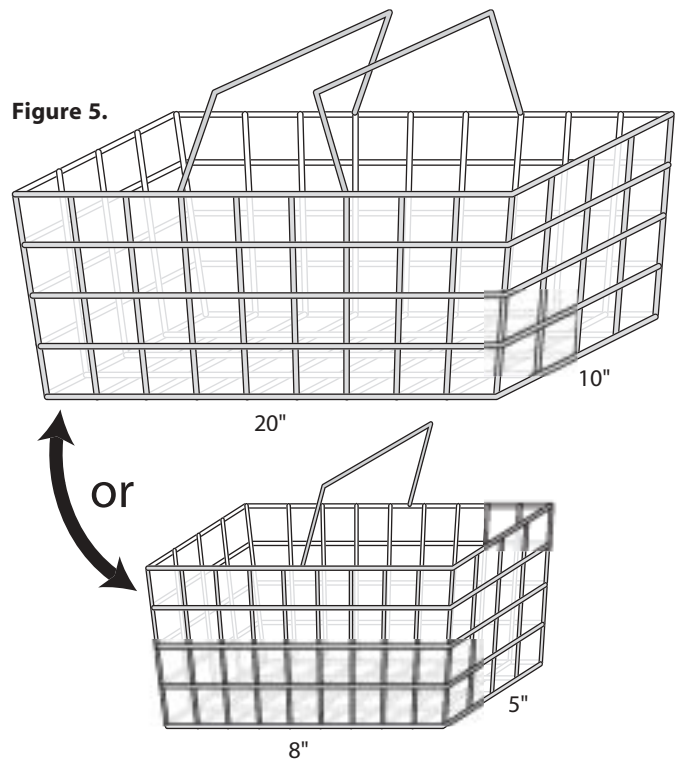
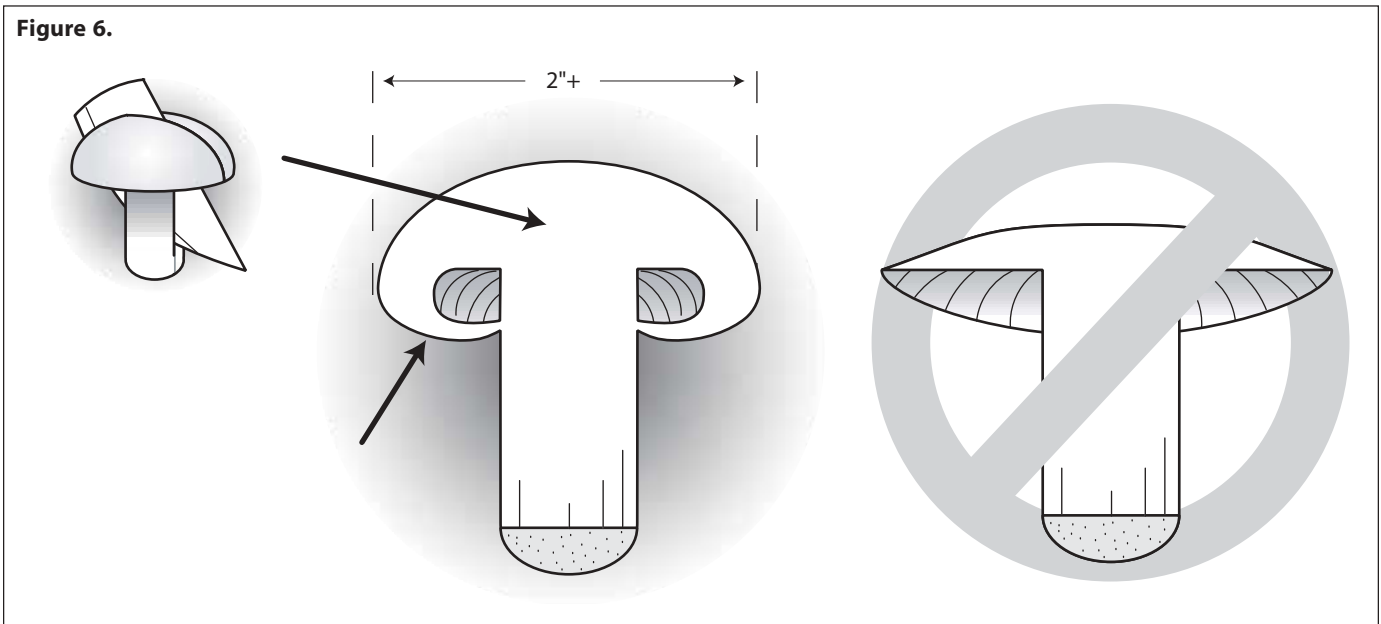


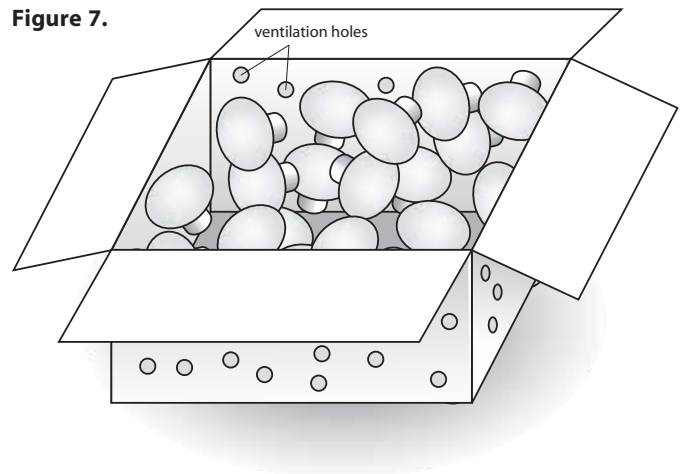
Figure 6.



Mushrooms should be at least roughly graded—minimally to first and second quality—and packed in boxes for market either the same day that they are harvested or the following day. See FOR-89 for suppliers of shiitake boxes, or contact local produce wholesalers for standard-size boxes such as 3-pound, 5-pound, and 10-pound tomato boxes (Figure 7).

By using this production cycle, you should have your mushrooms available for market weekly. Check with your regular buyers to see which day of the week they would like to buy your mushrooms. Then, work backward to have production in line so the mushrooms will be ready for delivery to market on that day. Chefs and produce man-

Figure 7.



agers appreciate a fresh, high-quality product and may be more willing to pay a higher price for it.

Labor on the production cycle varies: On the afternoon of the first day and the morning of the second day, the logs need to be loaded into the soaking tanks and then unloaded. The amount of time needed depends on how many logs you are working with, what equipment you have for moving the logs around, and the size of your tank(s). For a smaller operation—500 logs or fewer—one or two tanks of galvanized metal or heavy-duty plastic may be big enough to soak your logs; one-ninth of a 500-log operation is about 55 logs.

Logs are stacked in even numbers, usually in groups of 20. You may want to adjust your total number of productive logs so that it can be divided into stacks with even numbers of logs and roughly 20 logs per stack per group. For example, if you were considering something like a 500-log operation, you might want to adjust that figure to 540 logs so that each weekly charge would be 60 logs and three stacks (Table 1). If you have a larger operation, you may need to construct appropriate-size concrete tanks for the number of logs being soaked at any one time.

Table 1. Number of logs in production each week and number of 20-log stacks based on total (and actual) logs in production.

Total Number of Logs	Weekly Number in Production	Number of 20-Log Stacks
100 (108)	12	N/A
200 (198)	22	1+
300 (306)	34	1.5
400 (396)	44	2+
500 (504)	56	2.5
540	60	3
600 (594)	66	3+
700 (702)	78	~4
800 (792)	88	4+
900 (900)	100	5
1,000 (1,008)	112	5+

Note: The number in parentheses in the first column is the number of logs you will need in order to have an equal number of logs in production during each week of a 9-week cycle.

Once the logs are soaked, stacked, and covered, there is no labor until the mushrooms begin to appear, so you could use this time to make sure your gathering baskets, shipping boxes, etc., are ready and that your buyers are ready to purchase your mushrooms.

The time needed for harvesting also depends on the number of logs that you have in production. If you have managed properly, you can expect possibly as much as one to two pounds of mushrooms per log per flush. At the 100-log level, this might take you a half-hour to an

hour to harvest. Larger numbers will require more harvesting time.

Smaller diameter logs and some varieties of hardwood tree species such as sweetgum will produce and exhaust more quickly. Larger diameter logs and species such as white oak will start up a bit more slowly but will produce for a longer period of time. Logs forced to produce in this manner should produce mushrooms for at least three growing seasons (April to October). Some may produce for an additional year. Logs that are totally spent can be used for the production of oyster mushrooms (*Pleurotus* spp.), as base logs, for firewood, or, if ground up, for a very nutrient-rich mulch for your garden and landscape.

Post-Production Management

At the end of the annual production cycle, which normally occurs in October, the logs should be restacked for the dormant season. Continue to use base logs to keep the lowest logs from sitting directly on the soil. Stack the logs crisscross like firewood, several logs to the layer (Figure 8). The logs should be closely stacked, but not touching—leave about an inch between logs. These logs can be stacked six to eight layers high and should be covered with shade cloth for the winter if there is no winter shade. If you do not already have shade from evergreen trees in your shiitake yard, shade cloth will allow air to circulate and rainfall to penetrate into the stack while protecting the stacks from direct sunlight.

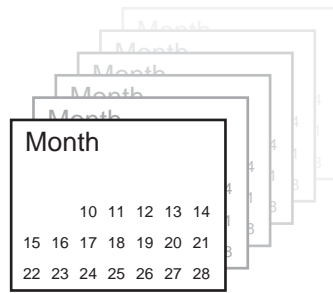
Unless it gets extremely dry during the winter months, these stacks should not require watering. When the weather warms up midspring (mid-April), you can unstack these logs and begin the production cycle with the first group of logs to be fruited that season.

Figure 8.

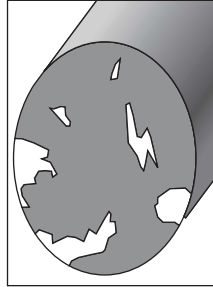


In Summary

1. Make sure your logs have incubated for a full year before being forced into production.

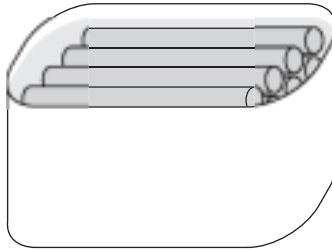


2. Look for the white spots on the log ends to be certain that the spawn run is complete.



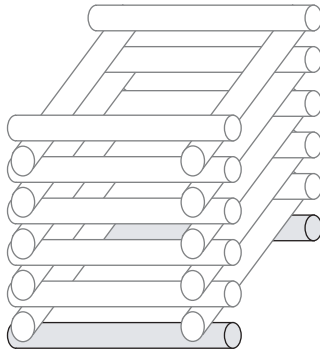
3. Select one-ninth of your fully incubated logs for production.

4. Immerse these logs in water for 8 to 12 hours (most easily overnight).

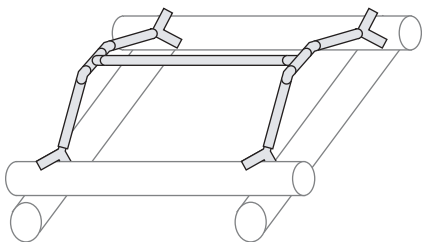


5. Remove the logs from water after soaking.

6. Stack immediately in log-cabin cribs, no more than 20 logs per stack.

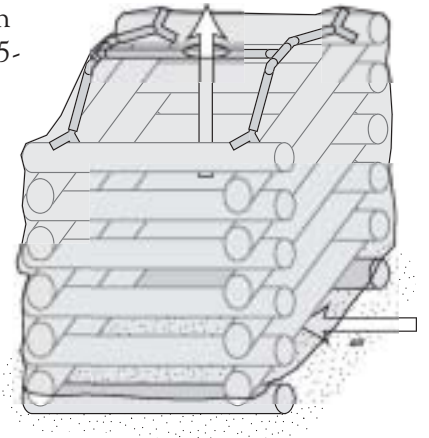


7. Brace bag rack on the top two logs.



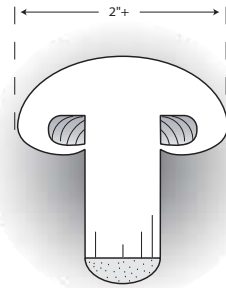
8. Cut a vent hole in bottom seam of 55-peck clear plastic bin liner.

9. Cover the stack with a bin liner, leaving air space at bottom.

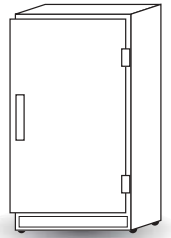


10. Wait two to three days for mushrooms to begin emerging.

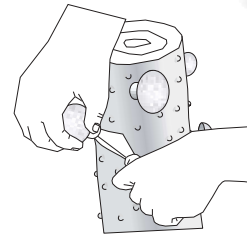
11. Begin harvesting for the first day when some caps are 2 to 3 inches in diameter.



12. Refrigerate mushrooms within one hour of picking.

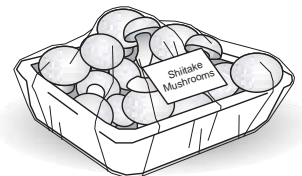


13. Harvest for two to three days.

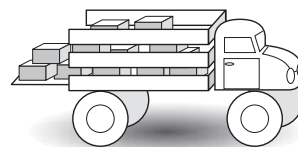


14. Grade for marketing.

15. Package for marketing.



16. Distribute to market.



Shiitake Spread

3 to 4 ounces fresh shiitake mushrooms
1 onion, 3-inch diameter
1 tablespoon butter
1 tablespoon olive oil
Parsley flakes
1 teaspoon Spike seasoning
Salt and pepper
12 ounces light cream cheese

1. Chop mushrooms and onions up very fine in food processor or blender.
2. Melt butter and olive oil in skillet over medium heat.
3. Saute mushroom-onion mixture over medium heat for about 5 minutes, stirring frequently.
4. Add seasonings to saute mixture while cooking.
5. Remove mixture from heat and stir into cream cheese. If mixture is very stiff, add 1 tablespoon of water or milk to make it a spreadable consistency.
6. Chill.
7. Serve with crackers or raw vegetables.

—Deborah B. Hill

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