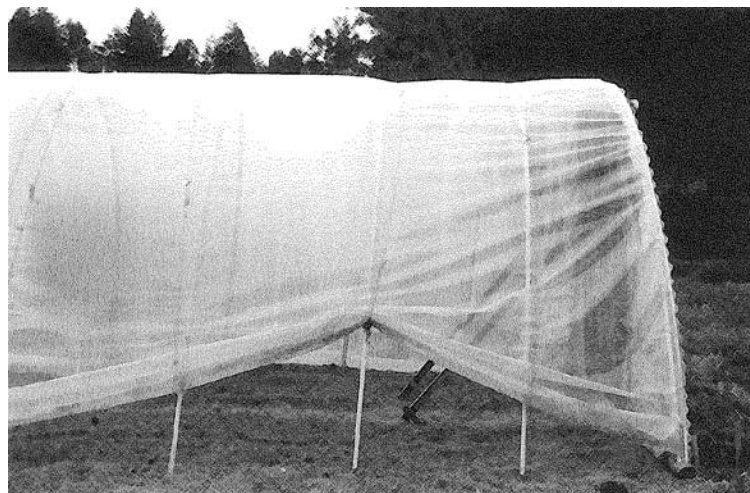


Portable Field Hoophouse

WSU EXTENSION MANUAL EM015



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By

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When constructing a greenhouse would be unwieldy and too expensive, a plastic-enclosed house—the hoophouse—fulfills most of a small farmer’s or home gardener’s needs. So named because of the arched or “hoop” structure that supports the plastic “skin,” hoophouses are available in many lengths.

If you have a small farm business and are looking for ways to increase crop diversity or earliness, this portable field hoophouse may help. Some crops that are well suited to this type of hoophouse include tomatoes, peppers, eggplants, and melons—crops that need to be planted after danger of frost and that generally mature late in the season west of the Cascade Mountains. The hoophouse effectively allows a grower to produce early yields of crops that require more heat units than the environment may otherwise provide.

The hoophouse rests directly over the soil in the field, using no benches or special growing media. Two people can easily dismantle and reassemble the lightweight structure in a different section of the field each year or within a growing season. An advantage to moving the hoophouse around the field is crop rotation, which avoids pest buildup. Another is the low cost, approximately \$350 for a 10’ X 42’ hoophouse.

The following hoophouse design will result in a structure approximately 10’ wide at the base, 6 1/2’ high at the center, and 42’ long (Figure 1). Growers can easily adjust the length by adding or taking away support hoops and altering the length of the polyethylene plastic appropriately. The maximum length of polyethylene plastic available on the market is 100’, which governs the maximum length for constructing a

hoophouse. While initial construction of the hoophouse will take a day, two people can later put it up and take it down in only 2 hours. Storing the hoophouse out of the field during the winter months spares it from some of the worst weather and makes it last many years. Using wood treated with water-based preservatives also increases the longevity of the structure.

Selecting Materials

Polyethylene plastic is available in many grades. A 6 mil weight is recommended for greenhouses. Selecting a lighter weight (4 mil) is not recommended. Untreated polyethylene will cost less initially; however, the lifespan of the material is significantly less, and the material will likely degrade after one year of use. When treated with a UV inhibitor, 6 mil plastic generally is guaranteed for 3 years.



Figure 1. Portable field hoophouse, 10’ wide by 42’ long, resting directly on soil surface in the field.

Gases that escape from the PVC (polyvinyl chloride) pipes contribute to the deterioration of the polyethylene plastic. To prevent “off-gassing,” paint the PVC pipes with white latex paint. Use wood treated with water-based preservatives for the base of the door frame, where the wood comes into contact with the soil. Untreated wood used for the remainder of the frame will not severely affect its longevity. Choose a mid-weight (4 oz to 5 oz) corrugated plastic for the ends. A clear plastic generally will darken over the years, whereas a colored plastic will lighten with time. The color of the plastic will not affect the usability of the hoophouse. Most light will enter through the polyethylene sides.

The choice of nylon twine for tying the hoops in place is broad. Twisted twine is susceptible to unraveling, while braided twine is more durable. Natural fiber twine (jute or cotton) is not recommended due to the stretching these materials experience. Baling twine is inexpensive and durable.

MATERIALS

- 9 ea. 2”x 4”x 12’ boards, treated with water-based preservatives
- 4 ea. 2’x 8’ sheets of 4 oz greenhouse-grade corrugated plastic
- 30 ea. 1/2”x 18” lengths of reinforcing rod (rebar)
- 17 ea. 18’ lengths of 3/4” rigid white schedule 40 PVC (20’ lengths cut down)
- 430’ good quality nylon twine (minimum tensile strength 210 lbs.)
- 1 piece of 6mil polyethylene plastic sheeting, 50’ long x 20’ wide
- 38 ea. 3” galvanized self-tapping screws with rubber washers
- 30 ea. 1” galvanized self-tapping screws with rubber washers
- 10 ea. 1/4”x 4” bolts and matching wing nuts
- battery powered drill

Building the Ends

Two of the two-by-four boards will become the bottoms of the door frames. Construct both door ends in the same fashion. For each door frame, place an 11-foot length of two-by-four down with a 4-inch side facing up. Mark the center of the 11-foot board, then mark 14 1/2”

on each side of the center. These marks frame a 29” length in the middle of the board, which will become the bottom of the doorway. At each end of the framing board, measure 6” and drill two 1-inch holes next to each other into the bottom piece, placing the holes as close together as possible (Figure 2).

Turn the bottom piece on its side and insert a PVC length into holes at opposite ends, to form a hoop. This will be the outermost hoop. The corrugated plastic and door frame will attach to it. Cut two 6-foot lengths of two-by-four for the door uprights, along with one 32-inch piece for the top (header) of the door. Screw the header into the uprights, using the 3-inch self-tapping screws, so that the door frame is 2” wide and 4” deep. The door frame is then screwed to the bottom piece at the marked position using 3-inch self-tapping screws. Brace each side of the doorway with a two-by-four cut 60” long with the ends cut at a 45° angle. Screw braces in place with 3-inch self-tapping screws.

Cut the corrugated plastic, lining up the ridges horizontally, to fit the ends of the hoophouse. Fitting the corrugated plastic horizontally gives added strength to the ends. Overlap the top piece of corrugated plastic a few inches over the bottom piece to keep the ends weatherproof. Use 1-inch self-tapping screws with rubber washers to attach the corrugated plastic to the door frame and the hoop. The rubber washer is helpful to keep the corrugated plastic from cracking.

Attaching the ends to the hoop structure with bolts makes the hoophouse quite easy to take apart and reassemble.

Forming the Hoop Structure

In the field, mark an area 10’ wide by 42’ long for the hoophouse site. At each of the four corners, hammer an 18-inch piece of reinforcing bar (rebar) 12” into the ground, leaving 6” above the surface. The aboveground portion of the rebar will hold the PVC hoops of the hoophouse in place. Place a door frame upright at one end, inserting the PVC hoop onto the rebar. In what will be the inside of the hoophouse, attach a support leg to each door upright (Figure 3).

Using 3-inch self-tapping screws, attach the support legs to the side of each door frame

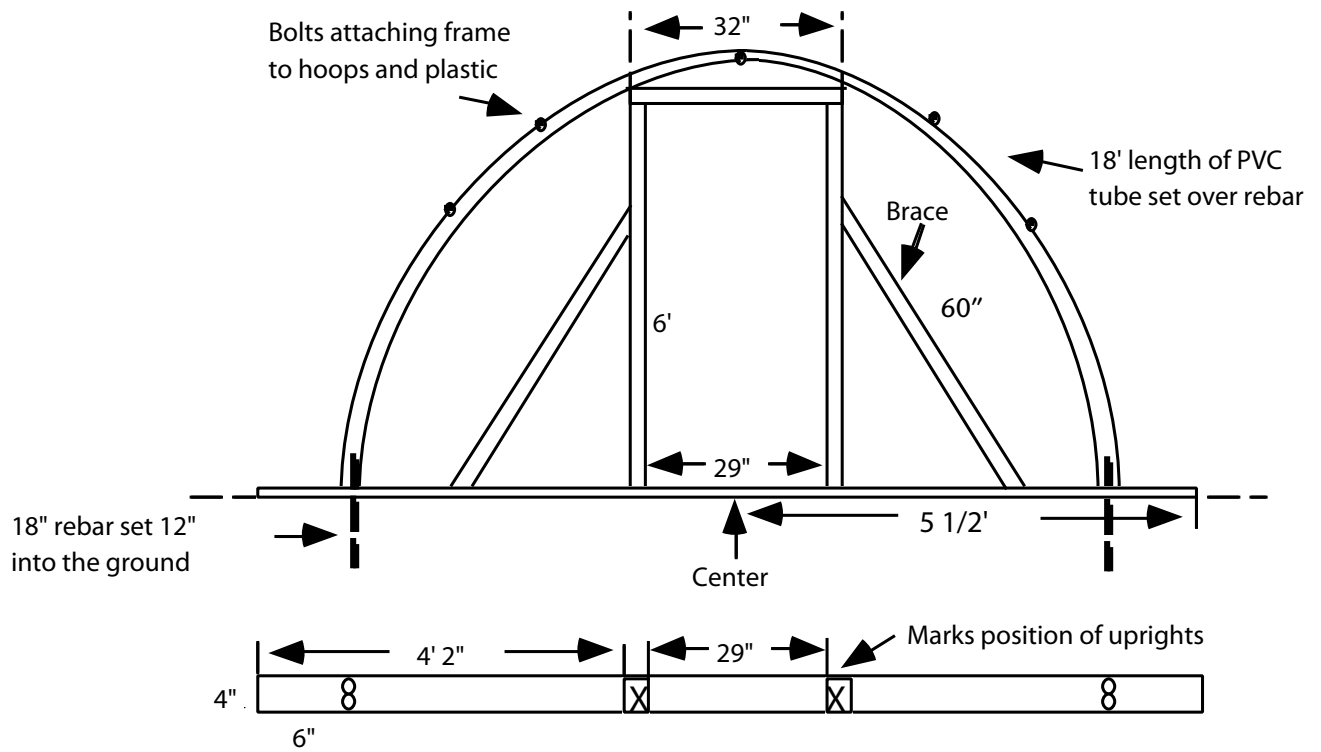


Figure 2. Top view of bottom piece with two holes drilled 6" from each end and door uprights marked, and front view of the hoophouse end frame.

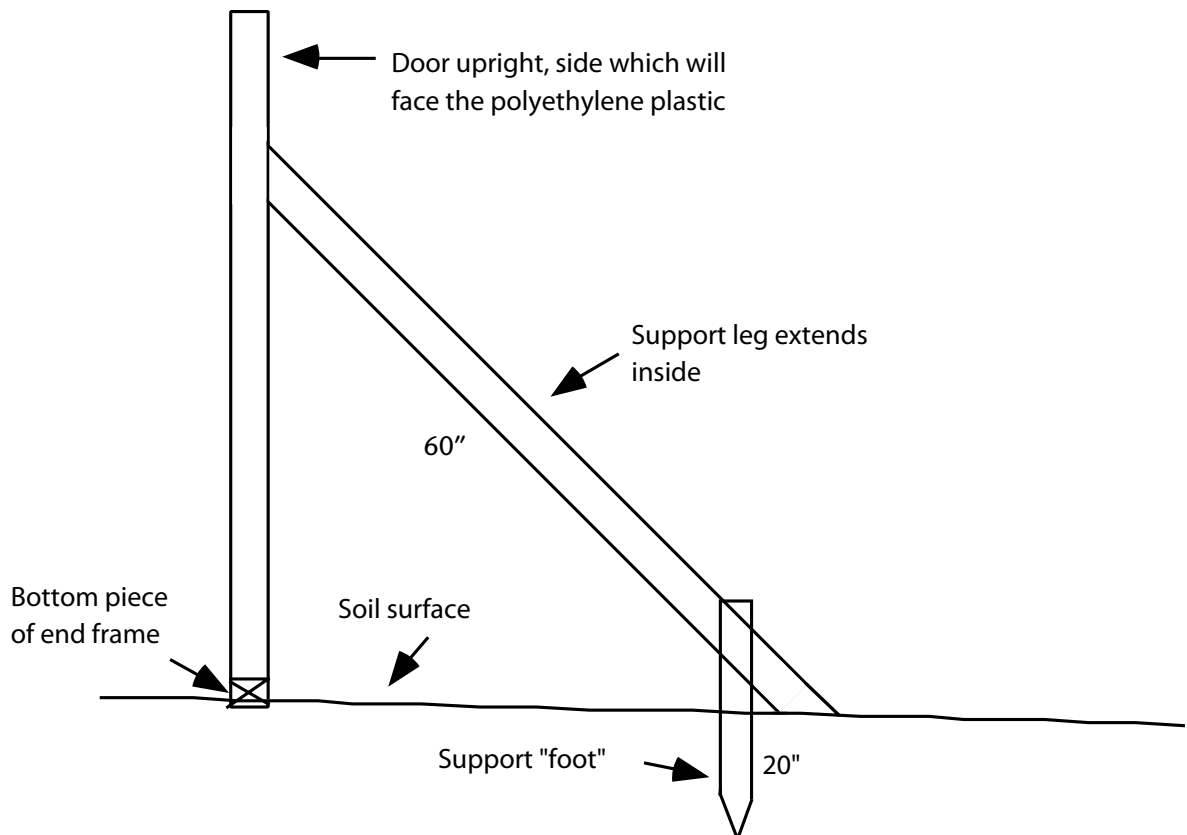


Figure 3. Support leg and "foot," attached to the side of door upright which will face the polyethylene plastic, on what will be the inside of the hoophouse.

that will face the polyethylene plastic. Attach a support “foot” to the end of each leg and pound them into the ground. The support legs will keep the hoophouse frame from shifting, losing its shape, or straining the plastic. Place the second door frame at the opposite end of the area marked for the hoophouse. Insert the PVC hoop over the rebar and secure with support legs in the same fashion.

At 3-foot intervals along each of the 42-foot sides, hammer rebar into the ground, always leaving 6” above the surface. Gently bend an 18-foot length of PVC, positioning each end directly above the rebar, and carefully slide the PVC ends onto the rebar to form an arch (Figure 4). Repeat this procedure until you have formed 13 PVC hoops. It is not necessary to insert rebar into the two remaining holes in the bottom of each of the door frames. Simply insert the PVC into the holes, forming a double hoop at each end. When the polyethylene plastic is in place, bolt the double hoops together.

Starting at one end of the hoophouse, attach one end of the twine to the top center of the second hoop—the hoop immediately next to the door frame end. Pass the twine over to the next hoop, pulling it tight and looping it around the hoop. Continue on to each successive hoop until all hoops are attached together. When you reach the last hoop, reverse the process until

you are back where you started. Connecting the hoops with twine helps to stabilize the hoop frame and will support the polyethylene plastic that will lie on top of it. It is important to keep the twine tight to prevent the plastic from sagging and collecting water when it rains. This would cause stress on the plastic and on the PVC framework.

Measure and cut a 5-foot strip off the 50-foot length of polyethylene plastic. This will leave a piece 45’ long by 20’ wide to be used for the hoophouse body. Use the piece 5’ long by 20’ wide for the doors. Spread the 45-foot length of polyethylene plastic across the hoop structure, pulling it tight, and insert the ends of the plastic between the double-hoops at each end. Bolt the corrugated plastic to the double-hoop ends, keeping the polyethylene plastic sandwiched between. To bolt the ends together, drill five holes through the corrugated plastic, the double-hoop ends, and the polyethylene plastic. Space the bolts so that one is at the top center, and two are on each side spaced 2’ apart (Figure 2). Place a rubber washer over the hole on the corrugated plastic side, insert the bolt, and secure the wing nut on the inside of the hoophouse.

Secure the polyethylene plastic in place with twine tied over every hoop except the double hoop ends. To attach the twine to the hoops, lift

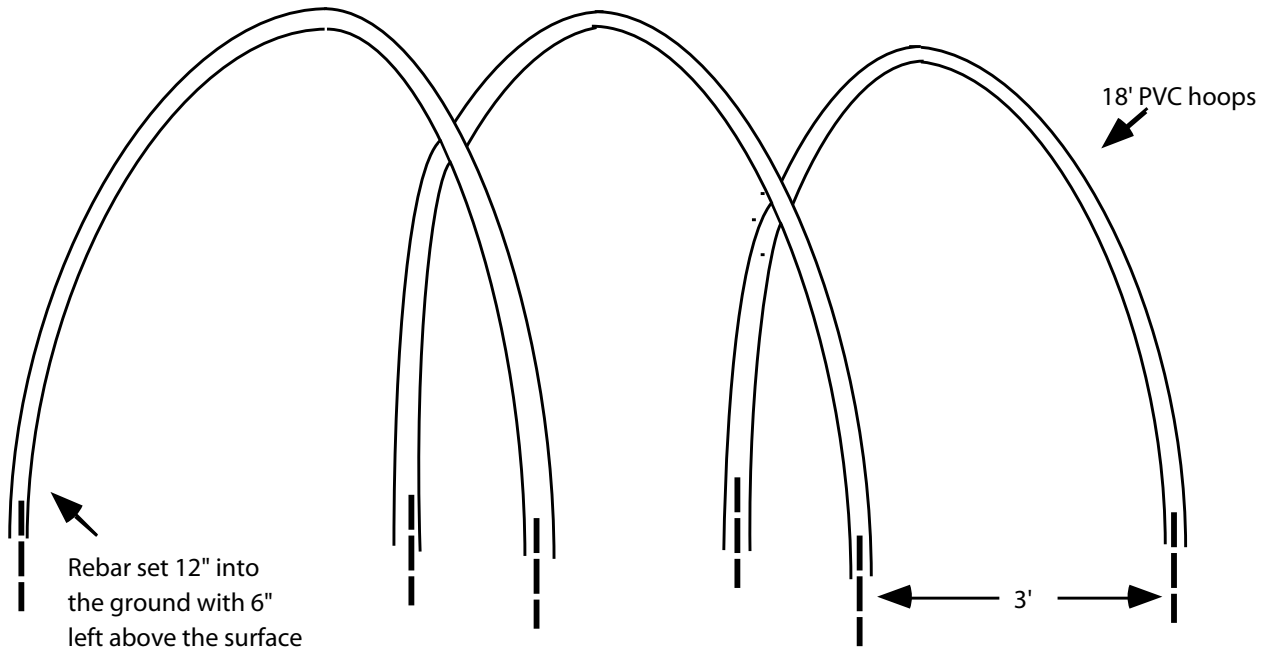


Figure 4. View of the PVC hoops outlining the sides of the hoophouse.

the PVC hoop up slightly, tie a 20-foot length of twine to the rebar, and slip the PVC hoop back in place. Throw the twine over the hoophouse to the other side and tie it in the same fashion to the rebar supporting the other end of the PVC hoop. The twine should be just loose enough to allow slipping the polyethylene plastic up when raising the sides of the hoophouse for ventilation. Tying the plastic down at each hoop prevents the plastic from blowing out due to wind pressure.

Finishing Touches

The doors are simply polyethylene plastic sheeting, weighted on the bottom and hung on hooks at the top of the doorways. Cut the remaining piece of 5' X 20' polyethylene plastic to form two pieces 5' wide and 6' long. Attach a narrow piece of scrap wood at each end of the 6-foot length of polyethylene plastic. You can roll the plastic doors up on warm days to allow a breeze through the hoophouse, lowering the temperature. The polyethylene plastic along the 42-foot sides of the hoophouse also can be rolled up and attached with twine to the hoops (Figure 5). This additional ventilation is necessary during the hot summer months in most climates. To use the hoophouse, form two soil beds, one running down each side of the hoophouse, and install drip tape in each bed for easy watering (Figure 6). Transplant or direct seed crops into the soil.

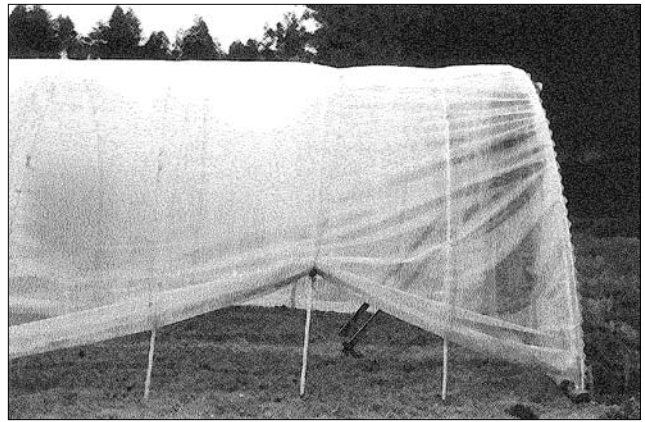


Figure 5. View of the side of the hoophouse, showing polyethylene plastic secured by twine. A side of the hoophouse has been raised for ventilation and tied in place with twine.

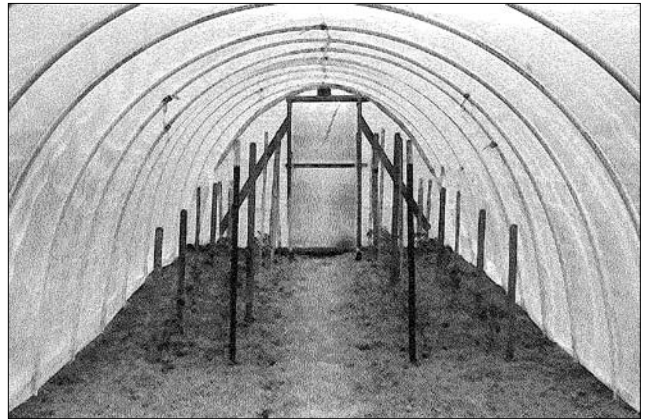


Figure 6. Transplant crops into the soil inside the hoophouse. Lay drip tape down the center of each bed.



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