Passive Solar Greenhouses Store Sun's Heat in Barrels of Water

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Inexpensive passive solar greenhouses heated only by sunlight falling on 55-gallon barrels of water are effective for growing plants year-round, said a University of Missouri Extension specialist.

Heat from sunlight is stored in water-filled barrels during the day and radiates at night, replacing use of fossil fuel, said Eric Lawman, an agronomy research specialist at the Bradford Research and Extension Center (BREC) near Columbia.

"Passive solar greenhouses extend the growing season and allow plant production year-round," Lawman said.

Temperatures inside an experimental passive solar greenhouse at BREC did not fall below freezing during the past two winters, Lawman said, while daytime temperatures have reached into the 80s. There is a similar greenhouse at the MU Southwest Center in Mt. Vernon.

The greenhouses measure 24 feet long, 12 feet wide and 12 feet high. The 2-1-1 ratio is important for such greenhouses to be effective.

"It allows adequate surface area for sunlight and minimal inside area to lessen heat dissipation during dark hours," Lawman said.

To capture as much sunlight as possible, the greenhouse has an east-west orientation, with a sloped south-facing wall. Geographic latitude determines the ideal slope angle; for central Missouri, the south-wall glazing should be about 45 degrees. The sloped wall consists of two layers of clear plastic spaced 6 inches apart. A small inflator fan pushes air between the sheets, creating a zone of dead air that serves as additional insulation.

The other walls contain fiberglass insulation sandwiched between metal siding on the outside and particleboard on the inside. The white, waterproof particleboard reflects heat into the barrels.

To extend the growing season, the greenhouse needs 2.5 gallons of water per square foot of glazing, Lawman said. For all-season growing, the requirement is 5 gallons per square foot. Thermostat-controlled shutters and exhaust fans remove excess heat as needed.

The greenhouse at BREC cost about $3,000 to build. "If you can build a shed, you can build one of these greenhouses," Lawman said.

Throughout winter, growers can produce cold-season crops such as lettuce, carrots and strawberries. Some plants can be started from seedlings, he said. Construction details and photographs are online at http://aes.missouri.edu/bradford/education/solar-greenhouse/solar-greenhouse.php.

(Source: Eric Lawman, 573-884-7945)