A NEW WINDBREAK NURSERY FACILITY FOR TEXAS

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Introduction

When I was asked to be on this program and present a discussion on the Texas Forest Service's new windbreak nursery facility being built at Lubbock, I must admit I had some reservations. My problem was how do I describe something which hasn't been built.

The only thing that can be seen on the construction site, which is located at the Texas Agricultural Research and Extension Center, is the concrete forms, reinforcing rods, and plumbing for the 24- x 50-foot office building. The tempered glass, aluminum supports and other fixtures for the 30- x 50-foot greenhouse haven't arrived and the materials for the 10,000 square foot lathhouse haven't even been ordered. Furthermore, the only progress we've made in developing the 10 acre bare-root nursery site has been the designing of the trickle irrigation system. However, the greenhouse which has a production capacity of 22,000 containerized conifers and the bare-root nursery with a production potential of 600,000 hardwoods are slated for completion by December 1 of this year.

Since you gentlemen are nurserymen with years of experience in the production of bare-root and greenhouse containerized stock, I am not going to outline our proposed production procedures in detail because it would be very similar to your own operations. Also, our greenhouse system is patterned after the work Dr. Richard Tinus has done at Bottineau, North Dakota, with which all of you are familiar. Therefore, I would like to devote my time this morning describing two features of our facilities that may be new and of interest to you. These are the lava rock cooling system on the greenhouse and the fully automatic trickle irrigation system at the bare-root nursery.

Greenhouse Lava Rock Cooling System

The only unique feature of the greenhouse is the substitution of the traditional aspen pad cooling system with a lava rock system. A similar version of the lava rock system is currently being used successfully on a Texas Forest Service greenhouse at College Station and it has been virtually maintenance free.

The cooling system which is positioned at the south end of the greenhouse includes: (1) 24-inch motorized louvers across the end of the

greenhouse 3-foot above ground; (2) a 6-inch thick bed of 1-inch diameter lava rock spread on a galvanized wire shelf attached to the outside of the greenhouse at eave height (7-foot); (3) a misting system over the lava rock bed; and (4) a concrete sump below the lava rock bed. Two 42-inch exhaust fans are located at the north end of the greenhouse.

The galvanized wire shelf that supports the lava rock is 5-foot wide and extends the full 30-foot width of the greenhouse. The area below the shelf is enclosed with fiberglass down to the concrete sump and sealed so air cannot enter the greenhouse except through the lava rock bed.

The principle of the lava rock system is the same as aspen pads. The rock is porous with a high water retention capacity and large enough for air to be pulled through a 6-inch thick bed with little resistance.

The system works as follows: When the temperature in the greenhouse, which is controlled by a thermostat, rises to 70° F, the exhaust fans turn on and the motorized louvers open. Dry air is pulled down through the lava rock bed and into the greenhouse through the louvers. When the temperature rises to 74° F, the misting system over the lava rock bed comes on wetting the rock and subsequently cooling the air that enters the greenhouse. Excess water that percolates down through the lava rock is recovered in the sump and recirculated.

The advantage of the lava rock bed is that it remains uniform in thickness and its high water retention capacity can easily be maintained by periodically stirring and washing the rock with a high pressure water hose.

Trickle Irrigation System

A 10 acre site for a bare-root nursery has been assigned to us at the Halfway Center, an adjunct of the Texas Agricultural Experiment Station. Halfway is a small community approximately 35 miles north of Lubbock.

The Texas Forest Service was assigned the area with the understanding that a low volume irrigation system be installed which would not interfere with the current research studies being conducted at the center. Therefore, it was necessary to design a fully automatic trickle irrigation system to irrigate all nursery beds during the night. Of the 10 acres, only 5 acres will be equipped with a trickle irrigation system this year.

The 5 acres (360' x 600') is divided into 4 compartments with the main underground 4-inch water line laid lengthwise down the middle. Each compartment has 25- 4- x 160-foot beds on each side of the main water line.

A 21/2-inch water line that distributes water to each compartment is also underground. It is connected to the main water line by a solenoid valve.

The only water line above ground is the 1-inch pipe riser at each bed and the 15 mil irrigation tubing which lays on top of the beds. The tubing is perforated at 18-inch intervals and can apply up to 3/4-inch of water

in a 2 hour period.

An electrical tensiometer is stratigically placed in each compartment at a depth of 6-inches to monitor soil moisture.

The system works as follows:

The solenoid valve and electrical tensiometer for each compartment are wired to a master control panel. The electric water well pump is also wired into the control panel.

2. At 10:00 p.m., the control panel, which has a time clock, scans the electrical tensiometer in the first compartment. If soil moisture is below a set point, the electrical circuit is completed, the solenoid valve opens, and the irrigation well is turned on. The first set of beds are irrigated for 2 hours.

J. At 12 midnight, the water well turns off and the solenoid valve closes.

4. At 12:15 a.m., the control panel scans the tensiometer in the second compartment. If soil moisture is below a set point, the beds are irrigated. If water is not needed, there is a delay of 2 hours and 15 minutes before the next tensiometer is scanned. This procedure is followed until all tensiometers are scanned by the control panel.

5. All beds are irrigated by 6:45 a.m.

6. The 15 minute delay between scans reduces wear on the irrigation pump.

7. The master control panel can be programed to irrigate all compartments each night for a 7 day period.

Considering the location of the bare-root nursery in relation to our other facilities, the automatic trickle irrigation system will save us travel and labor expense. Only one man is required to program the master control panel and flush out the irrigation tubing once each week.

Summary

In summary, I would like to say that the nursery facilities the Texas Forest Service is constructing in West Texas is the first developmental phase of our over-all windbreak program. The greenhouse currently under construction does not have the production capacity to even remotely satisfy the annual demand for containerized windbreak conifers. However, we feel greenhouse experience is needed before we can effectively expand to meet the demand.