Perforated drain tile with a sock inserted into lower holes of manifolds.

High Tunnel Uses "Climate Battery"

Jim Schultz built an HVAC system into his new high tunnel at Red Shirt Farm. Known as a climate battery, the system of underground pipes and fans helps heat plants in the winter and cool them in the summer.

"We've maintained temperatures around 40 F from October through February, sufficient for growing greens," says Schultz. "We start the winter season with the soil temperatures around 79 F, and over the winter, it goes down. During the day, when the high tunnel temperatures get into the 60s, we run the fan to recharge the battery. At night, the fans pull the heat back out to warm the high tunnel."

In western Massachusetts, the temperatures can reach -10 to -15 F. At that point, Schultz will supplement the battery with propane heaters. Fans are shut down. Supplemental heat is also used when tomatoes are transplanted into the high tunnel.

"We need 65 to 70 F for the tomatoes, so we shut down the fans and use propane heaters," says Schultz.

In the summer, the fans are turned back on to pull hot, humid air through the series of pipes. Moisture is absorbed by the soil, and the temperature is lowered to the soil's natural 45 F temperature.

"You can feel the reduction in humidity in the air exiting the climate battery," says Schultz. "With lower humidity in the high tunnel, we have fewer problems with disease, and we don't see the moisture condensing on the plastic as we do in our other high tunnels."

Schultz installed the climate battery with the aid of a grant when putting up a 30 by 72-ft. high tunnel. The first step was to remove topsoil in the footprint of the high tunnel, setting it aside. He then removed subsoil to a depth of 4 ft.

Following the design of a Colorado-based engineering firm, Schultz laid out three 30-ft., 12-in. poly culverts as manifolds. One was at either end of the excavation and one in the center. Three rows of 4-in. holes spaced at 4-ft. intervals were cut in the sides of the end manifolds, facing into the excavation. Three matching rows of holes were cut into each side of the center manifold. The manifolds were set at 30 ft. intervals.

The 4-ft. spacing was selected specifically for Schultz's soil type. He notes that spacing in sandy/lighter soil could be closer, while heavier soil could have wider intervals as heat will transfer better in heavier soils.

Precut 30-ft. sections of 4-in. perforated drain tile with a sock were inserted in the lower row of holes in the three manifolds. Space between the pipes was then backfilled and compacted.

Once the process had been repeated twice, Schultz returned the topsoil in a 14-in. layer, sufficient for his preferred use of a broadfork to loosen the soil for transplants in his high tunnels.

The last step was to install 2-in. thick rigid foam boards around the perimeter of the excavation. He used two 2-ft. wide boards with one laid horizontal and a second set vertical facing the excavation.

"The combination of the two offers the same insulation against frost as a single vertical board going down 5 ft.," explains Schultz.

Thermal curtains on the high tunnel add another layer of insulation. The curtains close automatically to help retain heat at night.

While the climate battery has been beneficial to Red Shirt Farm's winter production, Schultz is unsure if he'll repeat it in his next high tunnel. Planned use of a high tunnel is key to getting the full value out of the investment, suggests Schultz.

"The up-front cost is in the order of $10,000," he says. "It's best suited for winter growing. If you plan to use it only for peppers and tomatoes, it may not be the best decision. It's great if you need cooling and dehumidifying in the summer, especially if you couple that with winter growing."

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Photo courtesy of Chris Lockwood

Denhill Twin-Pull made with two David Brown 995 skid units repurposed from David Brown-based Sands forward control sprayers.

Power Units Boost Tractor Power

Sam Hill and Justin Dennis designed the Denhill Twin-Pull for seasonal high horsepower needs. The auxiliary power pack consists of tandem 64-hp. engines and rear ends. It hooks up to a conventional tractor drawbar, increasing the horsepower available to pull implements by 128 hp. Hill, a Norfolk (U.K.) farmer, and Dennis, a Norfolk civil engineer, developed their prototype as an alternative to ever larger and more expensive tractors. Freelance writer Chris Lockwood detailed their efforts in an extensive article in the December 2023 issue of *Classic Tractor*.

"Our goal was to make better use of available tractors without investing in expensive horsepower only needed for limited periods," says Hill.

It's a challenge the two have been working on for several years. Their first attempt involved joining two crawler tractors together with a tow chain. The operator sat on the one in the rear and controlled the steering, clutch, and throttle of both.

Their next attempt involved a tractor that sat on the front linkage of a second tractor. The idea was to pick the first tractor up when turning, but it proved too heavy.

The Denhill Twin-Pull was their most successful attempt yet. They invested 200 hrs. of time to harness the two David Brown 995 skid units repurposed from David Brown-based Sands forward control sprayers.

The skid units mount side-by-side in a heavy-duty frame that measures 23 1/2 ft. from the lead tractor drawbar to the implement drawbar. The 5 by 12-in. I-beam at the center of the frame has an 88-in. rear cross member and a 108-in. front cross member. The Twin-Pull weighs in at about 8,000 lbs. with about 2,000 lbs. resting on the lead tractor's drawbar. It measures 12 ft. side to side.

The Twin-Pull's wheels are set to straddle the lead tractor's tracks. This ensures each of the drive wheels gets undisturbed ground to bite into and spreads the weight out, notes Hill.

Preparing for field work involves manually selecting gears in the Twin-Pull transmissions. Stops on the throttles are set for idle and working speeds. When the operator is ready to start tillage, clutches and throttles are engaged remotely with spool valves. At headlands, clutches are disengaged as the implement is lifted out of the soil.

A key safety component of the frame is the sliding drawbar that connects the Twin-Pull to its lead tractor. If the power pack starts to move up on the tractor, tension on cables that control the throttles is reduced, and the power pack backs off.

This past summer, it was demonstrated at several field days. In September, Hill used it behind his 154-hp. 1988 Ford TW-25 (the lead tractor) at a local plowing day. It was the first time it had been put to the test.

"We didn't use the full power of either the Twin-Pull or the lead tractor as the discs we were pulling didn't require it," says Hill. "We wanted to use the Twin-Pull as much as possible to prove the contribution it could make. Had the load been greater, the combination of units would have met the challenge, and driving would actually have been easier."

Hill acknowledges that the prototype is very much proof of concept and was done at a low cost. He recognizes it could be significantly improved. To date, no one has stepped forward to do so.

"We used what we had," says Hill. "If I built another version, it would be much larger, at least 200 hp. Engine throttles would be paired and controlled electronically from the cab. I would replace the sliding drawbar with a kill switch in the cab and the I-beam with a box beam. This would shorten the overall length, which would help on headland turns."

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Customer-Focused Drive Feed Scrapers

Feed alley scrapers from Mensch Manufacturing are in a constant state of change as customers provide feedback and suggest improvements. According to Noah Mensch, the company has been making the scrapers for many years and has made many changes over that period.

"We've made big changes to the frames and how they're welded to extend their use life," says Mensch. "The biggest change was to offer either plastic or rubber wear blades."

Mensch scrapers have a universal bucket attachment and come in stationary, rotating, and V-blade designs. Stationary blades are available in 6 ft., 6 in. and 7 ft., 11 in. widths. The 7-ft., 5-in. rotating blade moves feed to the left or right and is available in hydraulic or manual models. The V-blade has a 7 ft., 11 in. width. They range in price from $3,735 for the stationary blade to $4,350 for the V-blade.

Mensch notes that the plastic and rubber blades take the vibration out of scraping and are gentler on the concrete. They're also rust-free in the highly corrosive environment.

"Some clients prefer the plastic for its slippery nature, but it doesn't have the wear characteristics of rubber," says Mensch. "The rubber holds onto the feed more than the plastic, but that's not a problem at higher speeds. Some like the simplicity of the stationary blade, while others like the hydraulically controlled rotating blade or the V-blade."

Mensch encourages customer feedback, especially any changes they make to the company's products. "We're constantly looking for ways to improve our products and help customers solve problems," he says.

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Mensch feed scraper V-blade.