

Research And Demonstration Plots Balance Runoff And Erosion Reduction

COLUMBIA, MO.

Collaboration between University of Missouri Extension and the USDA Agricultural Research Service has shown that using a rotary harrow to incorporate atrazine in the soil balances the amount of runoff and erosion compared to other tillage systems.

The harrow decreases the runoff compared to no-till and decreases erosion compared to minimum till use of a field cultivator, said Bob Lerch, a USDA ARS soil scientist and adjunct assistant professor at MU.

In Missouri's claypan soils, the two biggest water-quality issues are soil erosion and atrazine contamination, Lerch said. About a decade ago, he and some ARS colleagues discussed the idea of using a tillage implement and/or sprayer combo to incorporate atrazine into the soil while keeping enough crop residue to control erosion.

"So that was kind of the dream," he said. "Ideally, we would be using some implement that is already out there. We didn't want to come up with a new implement. We thought there could be something out there on the market that could help solve this problem."

Due to lack of funding, the idea wasn't pursued for several years. Then Bob Broz, extension assistant professor at MU, asked Lerch if he had any ideas for a capstone project for agricultural systems management.

"We thought these students might be able to do some quick assessments of how practical it would be, what kind of residue cover, what kind of working capacity it would have to meet the needs of farmers," Lerch said. "So we kind of laid the groundwork and gave the students a framework of what we were interested in. If they could assess existing implements and look at the feasibility to see if this was an idea worth pursuing, it would be a huge help for us to decide if this was a research project worth doing."

Lerch says a group of students did excellent work showing that the rotary harrow was probably the best combination of incorporating atrazine and leaving quite a bit of crop residue. It also has a very high working capacity – a farmer can cover 40 acres an hour – and doesn't require a huge tractor.

Lerch and Broz took the idea to Syngenta, which Broz says had been under pressure from the Environmental Protection Agency to come up with best-management practices to control atrazine. A proposal was put together based on the students' findings and Syngenta agreed to fund the research and demonstration project.

The plots, set up at the MU Bradford Research and Extension Center, were large enough for each tillage treatment to be put in with farm-scale equipment. Plots were set up using no-till, the rotary harrow and minimum till with a field cultivator. Researchers used a rainfall simulator to create the runoff, which was captured during a 90-minute rain event. The concentration and total load of sediment and atrazine in runoff were measured.

Lerch says the harrow did not significantly increase erosion compared to no-till, whereas under minimum till with a field cultivator, erosion was four to five times higher than no-till. No-till had the highest atrazine concentrations and lost the most total atrazine – 22 percent of what was applied. The minimum till, because it incorporates deeply, had the lowest atrazine loss and concentration, and the rotary harrow was in-between.

"The bottom line was the harrow really balanced these two concerns," Lerch said. "We didn't increase erosion a lot and we significantly decreased atrazine loss. I can say it is the first time I've ever done a study where the outcome was what I hoped it would be. It almost never works that way."

Adoption of these results is the next step. Lerch says the real impact of this is not putting it in a publication somewhere; it is a matter of whether farmers are going to pick this up as a practice that could deal with both the erosion and atrazine issue. He sees the 30 years of promoting no-till as an obstacle to that.

"What I'm saying is don't till more. I'm saying till differently and till with a purpose," Lerch said. "Till with the idea that you are going to minimize erosion but you will mix that chemical in just a little bit to keep it out of the waterways. That's good for the producer because of better weed control and better yields." Δ