

Harvest Edition

Don't add Soil Compaction to 2020 woes



Camron Bullerman says switching to sprayer tires with a higher load rating and lower inflation pressure has made a huge difference in compaction in the fields he sprays on his own farm and in his custom application service. Courtesy photo

Ruts from one bad pass can cut yields by an average of 21% for 2 years

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Soil compaction can cut corn and soybean yields by an average of 21% for the next two harvests, and the effects of field traffic can last far longer, according to extension educators in Minnesota and North Dakota. In fact, University of Minnesota Extension educator Jodi DeJong-Hughes notes that USDA-Agricultural Research Service scientists studied one Waseca, Minnesota, field that was harvested wet and suffered compaction-caused yield losses for 13 years. The big culprit is deep compaction, which occurs below the reach of tillage implements and must recover its structure over time.

Research shows that 16 to 27% of the traffic in a field exerts enough force on the soil to cause deep compaction. Today's massive machinery makes that more likely than ever, and can significantly damage yield potential in a single pass across the field. DeJong-Hughes points out that combines and large 4-wheel-drive (4WD) tractors represent 20 tons of load per axle, and the largest grain carts—which can be loaded with more than 100,000 pounds of grain—can weigh up to 76 tons per axle.

“Almost 80 percent of the compaction happens in the first pass,” DeJong-Hughes warns. “By the third or fourth pass, you’re pretty much at 100 percent.”

In fact, DeJong-Hughes teamed up with North Dakota State University's Aaron Daigh and Umesh Acharya and calculated

that soil compaction from last year's wet harvest could cost Minnesota and North Dakota farmers as much as \$1.76 billion between now and the 2021 harvest. They published their findings this summer in *Agricultural and Environmental Letters*.

As harvest 2020 approaches, DeJong-Hughes points out that farmers can take several steps to minimize compaction, starting with recognizing that there's a strong chance that fields will be wet enough to compact under heavy machinery.

“We usually think fall is dry,” she says, “but it hasn't been. There's always rain.”

Plan Your Route

The first step in minimizing compaction is reducing field traffic. Ironically, that often means eliminating destructive shortcuts on the way to unload.

“One thing I see a lot is farmers driving a full grain cart on a diagonal to the field entrance to get there faster,” DeJong-Hughes points out. “You're putting 80-percent compaction on the diagonals across that field. From the road you can't see it, but from the air you can.”

Cutting across the field to save a few minutes can cause years of pain. The smarter plan is to run as much machinery as possible in your combine tracks, which are already compacted, rather than creating a new problem on fresh ground. Farmers in Australia and Europe have perfected the art of “tramlining,” isolating compaction to narrow lanes rather than damaging more of the field.

“When you load that grain cart, run it in the old combine tracks, then take it to the end of the field and go back along the headlands that are already compacted,” she suggests.

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Improve Soil Health

“Soil structure is your number-one defense against soil compaction,” says DeJong-Hughes. “Little aggregates act like pillars in the soil. They actually hold up your equipment.”

Crop residue, cover crops and roots below the soil also support the weight of equipment, reduce soil compaction, and speed the infiltration of water into the soil so fields are fit for harvest or fieldwork, she adds.

Maintaining soil structure and soil health through reduced tillage or no-till is a powerful long-term solution, DeJong-Hughes notes. For farmers who perform tillage, she recommends reducing the number of tillage passes, reducing the depth and aggressiveness of your tillage, and postponing fall tillage until spring.

Check Your Tires

Your tires are another powerful tool in the fight against soil compaction, noted DeJong-Hughes. Tire inflation pressure directly corresponds to the compaction pressure applied to the soil, so switching from tires that can run at 36 psi to tires that can carry the same load at 24 psi can have a huge impact on compaction.

Switching to a larger tire can often allow you to reduce inflation pressure, she notes. IF or VF tires, with their extra-flexible sidewalls, can carry the same load as a conventional radial tire at 20 to 40 percent less inflation pressure. Even just selecting tires with a higher load rating can allow a reduction in inflation pressure.

Four years ago, Camron Bullerman, who farms near Adrian, Minnesota, replaced the original-equipment 18.4R46 tires on his Miller sprayer with a set of Alliance 356 radials that are the same size. One of the benefits of the new tires is that they have a load rating of 176 rather than the stock tires' load rating of 168. The extra strength of the tires provided

an additional 3,400 pounds of load capacity per tire—helpful with the sprayer's 1,400-gallon tank—and also allowed him to drop his inflation pressure by about 11 psi. The result is that the footprint of each new tire is 40 square inches larger than the one it replaced.

“I don't have the rut problem I did before, or the sprayer track problem I had before,” he said. “In the fall, you used to see the ridges in the crop from compaction, and with Climate and UHarvest [yield monitoring systems], you could see it down to the row.”

Bullerman, who farms with his father Mark and brother Colt, also replaced the tires on the family's 4WD Case STX430 tractor, swapping conventional 710/70R42 radials for a set of IF tires of the same size. The new Alliance 372 IF tires were 1.5 inches wider than the same-sized tires they replaced, but more important, allowed the Bullermans to reduce their inflation pressure by 20 percent.

“Two pounds is a big deal when you're only putting 10 psi in there,” notes Bullerman. “My dad won't even drive the other tractor when he's running the digger in the spring—those new tires just float better over the field. It's still lumpy out there, but you can't feel it as much. They're good on the road, too. They'll go 60 miles a day for weeks hauling Houle wagons.”

Dallas Ransom, the Iowa-based Alliance Tire Americas representative who helped the Bullermans specify their tires, sums it up: “When it comes to compaction, your tires are your first line of defense, they're the most cost-effective thing you can do to soften your footprint.”

DeJong-Hughes agrees, noting that the improvement in yield potential can quickly deliver a return on investment in a better set of tires.

“I would encourage them, if they run a lot of acres, it would be worth it to upgrade right away,” she says.

On-the-Go Inflation

Tires that operate at lower inflation pressure can be an outstanding tool for reducing soil compaction. But to really get the most from those tires, and to help maximize their service life, it's best to run them at the optimum inflation pressure for the load and speed at which they are operating. The problem is that most farmers have to inflate their tires for maximum load and road speeds, which increases compaction when the machinery is running in the field.

Jodi DeJong-Hughes, University of Minnesota Extension educator in Willmar, Minnesota, points out that an on-the-go central tire inflation system (CTIS) allows for a quick adjustment in air pressure when loads or speeds change. In minutes, tractor tires can be deflated automatically for better flotation and less compaction when they reach the field, then reinflated when they are ready to hit the road and run faster.

The systems, which can cost less than \$20,000, are a solid investment in protecting yield potential by minimizing compaction, she says.

“Compared to what they paid for the tractor, the inflation system isn't really that much,” DeJong-Hughes says.

Low Wear, High Return

One of the things Camron Bullerman of Adrian, Minnesota, noticed about his sprayer tires is how little they have worn over the past four years and 20,000 acres. He figures his 1,400-gallon Miller sprayer, which he outfitted with Alliance 356 18.4R46 radials, spends about 40 percent of its time on the road.

“Usually, you'd see extra wear on the right-hand side because you're coming back on pavement and running half on the shoulder,” Bullerman notes. “But you can't even see a cup in that bar yet. And we don't get the squirm like we used to on our old tires.”

Good roading is important to Bullerman, who farms corn, soybeans and wheat and feeds cattle - almost as important as reducing soil compaction by being able to lower his inflation pressure.