

Field Conditions

Flooding Affects The Soil, Causing Compaction, Microbial Changes

BETTY VALLE GEGG-NAEGER
MidAmerica Farmer Grower

WHITTINGTON, ILL.

Soil damage, including compaction, changes in microbial activity and erosion is one of the issues farmers face in fields that were flooded last year, according to Mike Plumer, University of Illinois Extension natural resources educator.

"Since we had a lot of flooding last year, a lot of ground went under water, not just in the river bottoms but a lot of different areas had saturated soil," he said. "Some fields were deep under water so we are looking at situations where they went under water quickly with four or five foot of water over the top. When water stacks up it gets to be a lot of weight. If the soil isn't saturated it can actually cause some compaction. The other thing it does is it causes a change in the microbial population which is killed if it stays under water very long. One of

them planted as early as possible if we want root development," Plumer said. "When it gets below freezing tillage radishes die, so we need at least 60 days of growing season before it freezes. That means those crops need to go in very early which is a problem because we normally don't have the crop harvested that early."

Those cover crops will help loosen the soil by putting down roots over winter time or late into the fall like a radish would. They poke holes down through that compacted area and as those roots decay water will start going down through those holes again.

"If we can do a couple of years of the cover crops we can alleviate a lot of the compaction," Plumer added.

Cover crops may be a lot of work and a bit of money, but in the end a farmer can expect a better stand and better yields. Compaction causes loss of soil structure, and it can take several years to re-



Issues of soil compaction, changes in microbial activity and erosion are being looked at by Mike Plumer, University of Illinois Extension Natural Resources Educator.

Photo by John LaRose Jr.

the biggest things we normally see is a loss in the mycorrhiza so we see some problems with phosphorus uptake."

Another aspect of the flooding problem occurred in the fall when harvest equipment on very wet soils caused further compaction. An average combine is in the 50,000 pound range, so axle loads can be very high on these pieces of equipment.

"So not only did we have the flooding, but we turned around and had high axle loads in the fall trying to get the crop out," Plumer said. "So that could have added to the compaction if the soil wasn't completely saturated. One way to tell is if the tire tracks displaced the soil."

There also was a reduction in yield of the crop the past year where flooding occurred. A lot of nitrogen loss occurred because of the excessive water and periodic flooding by denitrification.

Crops from the flooded areas did show a reduction in yield this year.

"We did lose quite a bit of yield on those particular fields," he said. "Some fields actually drowned out. I know of a number of fields that were completely inundated and the corn and soybeans died."

Though final figures have not yet been released, reports are that thousands of acres were lost. In the fields that lost nitrogen, yield was much reduced.

As to the percentage of loss, Plumer said it depends on the location of the farm.

"Not only did we lose some crop but there were prevented planted acres in the state where the farmers actually couldn't get back in the field to get any crop planted," he reported. "We worked with a lot of those folks looking at putting in some cover crops to try to mitigate the damage as well as improve the soil for this coming year. But there was a lot of prevented planted acres in some areas."

The rainfall event in 2009 was the eighth wettest year on record since the 1800s when they began keeping records. It was an extremely wet year and it continued extremely wet during the growing season. Many producers didn't get into the field until late May or even June, and then there were very few days at any one time when they could actually plant a field.

"In May, I think there was one or two days that was suitable to plant and in June I think there was only five or six days," Plumer noted. "A lot of the crops were planted in very muddy wet soils. We had compaction at planting time, and we had compaction at harvest time as well. This coming spring we're going to start to see some issues with that, as well as farmers working wet soil to fill ruts can increase compaction."

There are huge differences in soil types in Illinois. Soils range from Wisconsin glaciated soils that are black prairie soils, all the way to southern Illinois where soils are unglaciated. These soils have different makeup and different subsoil. Even across southern Illinois there are many differences in the soil types and subsoils.

"As we get into southern Illinois soils, we have a lot of problems with internal drainage on the fields where water won't move through the profile very well," he said. "We have clay pans and fragipan soils, and both of those will tend to perch water in the upper part of the soil profile which makes it difficult to get into the field. Since it doesn't move through the profile very fast, most of the soils allow water through at less than six hundredths of an inch per hour so it takes a long, long time for that water to move out of that soil. That delays the planting even further on those soil types and that's the very predominant soil type across the uplands."

This spring, Plumer doesn't expect dry enough conditions to relieve the compaction.

"That's going to be a problem because in order to correct compaction we need very dry soils so we can fracture it," he said. "Also, if we're going to do tillage to fracture it, from what we're seeing the tillage needed would be deeper than most of the tillage tools that we have. We're seeing compaction down to three feet in a lot of areas, so to make an estimate the farmer needs to dig out in the field and find out where and how deep the compaction is. Then he needs to find a tool that will get below the compaction by at least two to four inches to lift it up."

"We need to look at modifying our planting methods a little bit, use banded fertilizer applications," he suggested. "Starter fertilizer applications will help that plant feed better, quicker. Then this fall we hope we have dry weather so we can do some deeper tillage on it."

The other opportunity is to put in some different cover crops and allow the deep rooted cover to penetrate through that compacted zone over winter time. Cereal rye or annual ryegrass are some of the deeper rooted winter cover crops. Some people may consider tillage radish to put some of the root system down.

"The big thing on cover crops is we need to get

build that structure and alleviate emergence and rooting problems.

"Setting the planter properly is going to be an issue, putting fertility, like a pop up fertilizer or starter fertilizer on the seedling will help overcome some of that to get it off to a healthy start," Plumer suggested. "If we suspect compaction, we want to look at early planting to make use of the higher moisture conditions so the crop roots can go through that compacted area before it dries out in July and August."

Farmers also may want to look at reducing the axle load on equipment. Otherwise, they need to look at controlled traffic.

"When we start matching tire patterns and then all the equipment runs in a compacted track, leaving the rest of the field uncompacted, we can't correct the deep compaction because we don't have the tillage equipment that will go deep enough," he said. "So we reduce the risk of more compaction if we just run the same tracks every time. You can use GPS mapping, or run an auto steer where you can actually run the equipment down the same tracks every year. You'll have yield loss in those tracks, but through the width of the equipment out to the edges, you're not going to see that yield loss as it will be uncompacted; whereas if you're in a tillage system and you don't watch wheel tracks, most of the research is showing that you recompact about 70 percent of the field by doing tillage passes. So it's important if you're using heavy equipment and run it loaded, that you start looking at controlled traffic patterns."

Another option is to keep the grain carts partially full, get one hopper on and dump it off so you're not compacting. The same on a combine, dump more frequently so you don't have such a high axle load.

Studies in several states have been done on yield loss because of grain cart compaction. Typically they show a 7.5 percent to 10 percent yield loss in the tracks.

"Ohio has some recent work out on grain carts," Plumer said. "They started working on the study when the first grain carts came out 16 years ago; they're showing that the grain cart tracks now, 16 years later, are running about an 18 percent yield loss. That's pretty significant just from grain cart tracks."

Plumer explained that when soil is very moist it'll compress and squeeze the air space out. This fall some of our fields had so much water that all the soil pores were full of water. When they drove across it the water didn't compact.

"So, instead of tracks across the field, you'll actually see huge mounds of soil squished up out of the ground laying on top of the ground," he said. "When we get that displacement of soil, that shows that we had water in the soil pore space and actually we didn't get near as much compaction than if we would have run tracks across the field and didn't see any displaced soil. So actually the big ruts with the big mounds of dirt are an indication that there's less compaction. But it sure makes it rough to fix in the spring."

One practical solution is a tile drainage system. They help pull the soil moisture off, they dry the soil, allowing for earlier planting.

"Also, in the fall it will be drier so you'll have less trouble with tracking, making harvest easier and causing a lot less damage to the soil," he added. "We see significant yield increases where fields have been tiled in southern Illinois. Those who have done that, they typically tell me that even though it's expensive, (\$400 to \$600 an acre), in about 5 years the increase in yields will pay for the tile work. The tile are actually either trenched in or plowed in and they're typically laid right down to the lower subsoil. Tile placement is normally around 30 to 34 inches. When we put them that shallow then we have to put them closer together. So any tile that is put in is normally at 30- to 40-foot spacings. In northern Illinois where they have good soils and they can put the tile in five to six foot deep they can space them 100 feet apart. In southern Illinois we can't do that because at that depth the tiles won't drain."

Plumer predicts it will be interesting this year. There may be a lot of different crop symptoms, such as stunted corn, seedling death and other diseases in soybeans because of the compacted zones in the field. Yet he doesn't expect to see any difference in weeds.

"The only way we might see differences in weeds is if there is inhibited our crop growth so we don't get any canopy and shading which is very possible," he added. "Where we have extensive tracking, you're going to see uneven fields, and those uneven patches will allow more light in making it a little harder to get weed control in those areas." Δ

BETTY VALLE GEGG-NAEGER: Senior Staff Writer, MidAmerica Farmer Grower