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ECOLOGICAL SCIENCE TECHNICAL NOTES - FOR IN SERVICE USE

## TECHNICAL NOTES

U.S.D.A., NATURAL RESOURCES CONSERVATION SERVICE - St. Paul, Minnesota

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**Purpose:** To transmit information from the University of Minnesota about fall tillage management in wet soil conditions.

**Filing Instructions:** This note is available on line in section I of the eFOTG under Technical Notes & References by Discipline, Agronomy.

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## **Agronomy Tech Note #MN-24 Fall Tillage Management in Wet Soil Conditions**

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This article will address options for tillage in wet soils.

Soil compaction and smearing is a distinct concern when pulling implements through or driving on wet soil. Residue management is another concern. We want the fields to dry out quickly next spring for quick planting. To limit soil damage and to help with soil warm-up in the spring, keep these strategies in mind:

- Fill in ruts
- Keep tillage shallow
- Properly prepare equipment
- Plan ahead for spring

### **FILL IN RUTS**

If you have ruts in the field from fall harvest, the first instinct is to aggressively fill them in. Soil structure is your soil's number one defense against future soil compaction, and tillage destroys structure. To maintain the structure your soil has, just fill in the ruts with light tillage by running equipment at an angle. You may need 2-3 passes to accomplish this. These areas will not yield as well as the non-rutted area, but there is not much you can do to change this.

### **KEEP TILLAGE SHALLOW**



Photo 1: Example of a vertical tillage machine.  
Photo by Jodi DeJong-Hughes

A light tillage pass like disking is useful for incorporating residue and introduce air into the soil. If the soil is wet, try to operate this shallow tillage equipment no deeper than 3 inches. Another option for wet soils is vertical tillage. Vertical tillage runs 1 to 3 inches deep and uses straight or wavy coulters, a harrow, and rolling baskets. Vertical tillage fluffs-up the remaining residue with shallow penetration and minimal inversion of the soil.

Lifting wet soils can create clods. If using a chisel plow or disk ripper, shallow up the shanks, and use narrow points. The wings have a higher potential for smearing the soil. Twisted or parabolic shanks will create the most soil movement and can create soil clods. Clods in themselves are not bad going into winter. Next spring they will leave more surface area for water infiltration. However, a field with clods will likely need an extra tillage pass in the spring to create an adequate seedbed for good seed-to-soil contact.

Another consideration is “frost tillage”. This phrase was coined by van Es and Schindelbeck in 1993. They conducted research in New York to look at tillage on a slightly frozen soil. The premise was that as the surface of the soil freezes, it pulls or wicks moisture from the lower layers of soil, making them drier. When compared to no frost, they found that when the frost layer was 0.5 to 1 inches, the soil better supported the weight of the equipment when chisel plowing to a depth of 8 inches, that the soil below the frost layer was drier and tilled easily, and that corn yields were not affected. Due to the frozen plates of soil created with frost tillage, they observed that rain infiltrated quicker in the tilled soil versus a soil without tillage. These plates quickly diminished as they thawed.

While Minnesota usually does not have the shallow frost cycles throughout the winter like New York, we generally have at least one to two freeze-thaw cycles each fall. In the fall of 2007, we ran a strip tiller through 1.5 inches of frost and the machine worked very well. However, due to horsepower limitations, tillage may not be practical when the depth of frost is much deeper. This provided an opportunity for extending our fall tillage window.

## **PROPERLY PREPARE EQUIPMENT**

Wet soils have a high potential for soil compaction. To limit soil compaction, keep axle loads under 10 tons and properly maintain air pressure in the tires. Not only does this help the soil, but it will help your tractor run more efficiently and with less slippage. On wet soils, use the lightest tractor that can still get the job done.

There isn't much you can do to reduce the weight of combines. If possible, unload before the grain hopper is full to limit axle loads. Large grain carts have very high axle loads (up to 43 tons per axle). Control the wheel traffic from grain carts by running in the previous combine tracks and don't cross the field at a diagonal. Eighty percent of the compaction happens on the first pass; use it to your advantage.

Check over equipment and replace worn parts, sharpen blades, and adjust down pressure for each field's soil conditions. These small details are more important in extreme moisture conditions.

## PLAN AHEAD FOR SPRING



Photo 2. Field saturated during fall harvest.  
Photo by Jodi DeJong-Hughes

Planting soybeans may be the best option in fields with heavy residue. They are very adaptive to higher residue levels, are not as soil temperature sensitive as corn, and grow well in no-till situations. If trying no-till beans, set the corn header of the combine as high as possible to reduce the amount of residue matted onto the soil surface.

Corn on corn has more residue to manage and needs additional nitrogen fertilizer than corn following soybean. Row cleaners are a must for corn following corn in order to obtain uniform seeding depth and facilitate warming of the soil over the seed. For corn following corn where high quantities of surface residue are present, consider a starter fertilizer.

Wheat is another option for heavy residue fields. However, if you are planting wheat after corn, make sure to choose a variety that minimizes the potential for diseases.