



ADVANCED AG SYSTEMS'

Crop Soil News

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"It is the crops that feed the cows that make the milk which creates the money."

Advanced Ag Systems
Research, Education, Consulting

Caring For Your Soil's "Skin"

The interface between the soil surface and the atmosphere above it is a critical juncture. Both vital air and water must cross this boundary to supply the root system beneath the soil. Numerous measurements have indicated that 60% of the roots are within 4 inches of this zone. Raindrops strike this interface with the force of little bombs, exploding the soil surface into tiny particles that then plug the porosity of the interface and stop air and water from crossing. If this wasn't bad enough, most tillage systems are designed to pulverize the soil surface to kill emerged weeds and to provide a fine seed/soil contact for rapid germination. This makes the soil skin more susceptible to sealing of the surface pores. Except for semi-aquatic plants, **oxygen at the root surface is critical for roots** to use plant energy to grow and absorb nutrients. Air moves through the pores in the soil unless they are plugged.

The water that can't get in, cannot be used by the crop to produce yield. Adding injury to insult the water that cannot penetrate at the rate it is being dropped from the sky will then follow down slope taking the small, most fertile and productive soil particles loosened by the raindrops, with it, leaving behind the stones and compacted lumps and subsoil. Broadcast fertilizer applied to the surface can be lost if the initial rainfall comes too fast and the surface is sealed before it is absorbed.

Perhaps the most egregious loss is that of surface applied manure. It is easily entrained in water as floating lumps in bedded pack or as fine particles in liquid applied manure. This removes expensive fertilizer that you paid for when you grew the crops and shorts the crop it was applied. The final insult is that the water courses it drains to now become polluted with nutrients, exacerbating algae blooms and deteriorating water quality. Even if you are not directly concerned about this latter factor, you should be for dollars that are leaving your field in the nutrients. Manure management has a critical role on today's farm.

Register for an on line manure seminar March 2, by Dr. Ketterings of Cornell University:

https://cornell.zoom.us/webinar/register/WN_g0B_8_fARtG9M2ztmh9SzA



Pounding "rain bombs" have sealed this unprotected soil surface against air and water infiltration.



In this NRCS demonstration, unprotected tilled soil surface only absorbed water 1 inch. In the picture below, the same soil not tilled with cover, completely absorbed water 4 inches into the profile in the same time.



Worm holes and good surface soil structure allowed the same water to move in 4 inches.

Any step taken to protect the surface also protects one of the most important modifiers of the soil surface- **the earth worms**. Worms drill air/water holes from the surface down into the soil. The “nightcrawlers” are one of the most important as they leave holes ¼ of an inch in diameter. We have measured them to continuously go 3 to 4 feet deep in NY climate zone. Alfalfa roots were following the holes down in the soil. Not only do they leave holes, but their castings (manure) leave a very stable soil structure on the surface, protecting the hole and keeping it open. In one of our trials of corn planted no till on fall killed sod, in a 4 ft x 12 ft area there was a worm hole every six inches (photo at right). In the portion of the field that had one pass of the mole board plow, there were only two worms left in the same total area.



1/4 inch nightcrawler holes that went 4 feet into the soil with surface residue.

Fortunately, there are clear management steps developed over the past 40 years that greatly reduce the losses and **increase the porosity of the soil skin** – the surface interface between the air and soil. The no-till and strip till systems have clearly shown that this surface destruction is not necessary for high yields. A coultter or set of coultters, or a surface clearing coultter, will work a thin zone in which the corn can be planted with good seed soil contact for rapid emergence. The first step is to **keep some type of residue on the surface year-round**. Profitable farmers no longer leave their soil bare over the winter. A cover crop or winter forage will provide surface protection in the off season as long as when it is removed or killed, the stubble residue remains on the surface. Thousands of acres are now protected as farmers learned that they can grow a very **profitable triticale winter forage** that acts like a **cover crop on steroids**; simultaneously protecting and enhancing the porosity of the soil surface. Legume crops such as soybeans, alfalfa, and clover can be planted without any tillage as they are not affected by allelopathy. In fact, in NY, our best seedings have been no tilled into triticale stubble in early June after haylage is finished. The benefit extends for most of the season after the winter forage is harvested if a no-till or narrow zone strip till is used for the next row crop. This narrow strip tillage breaks any allelopathic layer for the next crop. In addition to optimizing corn soil porosity, the critical inter-row is kept in winter forage stubble and massive root system. Anyone who made the mistake of chisel plowing or disking a good winter forage learned to their regret the huge root system under these crops. It took many hours and a lot of diesel fuel to beat the soil smooth again. Both the surface stubble and roots protect the soil surface. The bonus is that each stubble piece is connected to a root system. As the stubble dies, it leaves a hole protected by a surface stem that captures and channels water and air to rapidly move in the soil along the decaying winter forage root.



Even vegetables, a crop notorious for being grown on completely pulverized soil, can grow with the surface protected. These pumpkins were planted into a killed cover after a narrow deep till slit was made in the residue.

For farms without livestock, more farmers are “planting green” where they directly plant into a living cover crop and then kill it after. The resulting residue protects the soil surface. The mass of dead roots in the top couple of inches protects the soil surface. For farms without livestock and just grow grains, it is a viable replacement for the above harvested winter forage system. Care must be taken to avoid “hair pinning” the residue in the slot with the seed. Planting deeper, 2 inches or more, can help alleviate that issue. The second concern with planting green is the potential for slug damage. A win, win option is for the grain farmer to sell the winter forage to a neighboring livestock farmer and then plant into the stubble without the above issues. For farms with livestock, a harvested winter forage gives both a profitable high quality forage crop and a protective surface cover for the soil.

Sincerely,

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Hand
to Better
Agriculture**

