



17A

SOIL TECH NOTES

Soil Respiration

CONCERN: “I heard from a couple guys over coffee the other day that they claim the soil actually breathes!! What are they talking about?”

SITUATION:

- Soil respiration is a common and very much needed property of the soil. Respiration comes from the microbes involved in soil organic matter decomposition, respiration from the plant roots, and respiration from other soil fauna.
- Soil respiration is dependent on quality and quantity of SOM present, soil temperature, soil moisture, pH, microbes present in the soil, aeration, etc. These must be in balance to be most effective.
- These properties vary seasonally, of course, but also daily and sometimes even hourly. Soil respiration is very sensitive to moisture content in the soil. Activity of microbes increases up until about 50-60 percent of the pores are filled with water. (“Field Capacity”) Likewise, very dry and often hot soils will have much lower microbial activity and soil respiration.
- If moisture content approaches saturation, respiration decreases dramatically and the normally aerobic microbes begin to use NO₃, nitrate, for oxygen, instead of O₂. This can lead to denitrification and loss of N₂ in the gaseous form.
- Medium textured soils, silt loams and loams, are generally the most efficient when it comes to soil respiration and decomposition of SOM. Sandy soils, with low amounts of clay and OM and light-colored timber soils with low amounts of OM, have lower and less efficient respiration rates.

POSSIBLE SOLUTIONS:

- Reduced tillage will leave more residue on the soil surface for the microbes to decompose and release more nutrients. Compacted areas in a field have lower respiration rates because of reduced pore space containing air. No-till is a good practice to increase soil respiration and encourage SOM decomposition.
- Cover crops and other practices that physically add more OM to the soil, either with residue or root systems, will increase respiration in the soil.
- Cropping systems with residue that has a high C:N ratio, such as wheat straw, will take longer to decompose in the soil than those with lower C:N ratios such as soybean residue or cover crop residue.
- Drainage in soils that DO NOT have Program Wetland considerations, will help to keep the soils aerated and in a better physical condition for microbial respiration and decomposition of SOM.
- Maintaining proper pH in the surface is also important. Microbes tend to like slightly acid to neutral conditions to be more productive. Sometimes excessive amounts of inorganic fertilizers or pesticides can also reduce microbial action for short time periods.

