



## Welcome to Ground Work

Dear J.P.,

Microbes have big families and need plenty of elbow room. So monitoring, observing, and managing soil pore space is a significant deal because it is in these moist compartments where most beneficial microbes live. A healthy farm soil is approximately 50% pore space, 45% minerals and 5% organic matter. These spaces are of all sizes and shapes from macropores to micropores and, ideally, will be half full of air and half full of water. Examples of macropores are channels left from roots and earthworms. The micropores are tiny.

We want our soil air to be the same composition as atmospheric air. The bacteria and fungi that are doing a job for us need to breathe the same air we do. If we have good tilth and good gas exchange between the soil and the outside air, this will be achieved. But several factors impact our soil gas ratios. Soil texture (sand, silt, clay), organic matter, compaction and crusting all affect soil structure, therefore affecting our soil gas exchange and altering what is in our pore space. If the microbes who we are counting on to feed and protect our roots can't breathe as well as they need to, they won't get as much work done. When they lay down on the job, yields suffer and disease becomes much more likely.

What is commonly the case in our pore spaces? Compared to the atmosphere,

soil air often has half as much oxygen and much higher carbon dioxide levels. Soil microbes use oxygen like we do. Also like us they give off CO<sub>2</sub> that can build up in the soil if the ground can't breathe well. One study found a silt loam soil with oxygen levels nearly the same as the atmosphere but CO<sub>2</sub> levels seven times higher. A finer textured soil in this study, with more clay, more compaction, more micropores, but fewer macropores, was 39% lower in oxygen and 150 times higher in CO<sub>2</sub>! Without free gas exchange of CO<sub>2</sub> and atmospheric oxygen our soils can become anaerobic. When this happens a chain of undesirable events occur that seriously retard crop growth.

This year, many if not most of us are dealing with saturated soils from excess rain. Our pore space is full of water/short of oxygen. Many fields were worked wetter than is desirable therefore causing compaction/a loss of pore space. Many soils have lost their tilth and become crusty and a soil crust seriously impedes gas exchange.

To remedy an oxygen deficiency:

- **Rotary hoe**
- **Harrow**
- **Cultivate**
- **Run a knife.** If sidedressing, consider what kind of knife and how deep to run it. Lower organic matter soils and/or soils with higher clay content seem to respond the best to this practice. But given how many inches of rain have fallen this year, consider ripping darker soils as well.

When mechanically adding oxygen to the soil it is beneficial to add soil conditioners and live microbes. Calcium (Practi-Cal, AgriBoost Ca) and humics will change the charges in the soil and help to hold it open for better gas exchange and root penetration. Adding SP-1 at the same time will take advantage of the newly desirable soil environment to re-establish proper nutrient cycling organisms.

With our customers looking at record commodity prices this spring we need to encourage them through these weather challenges. Opportunities exist for record profits. Let's be sure to share all of the positive practices that we can collectively share to make 2011 as good as it can be.