From the Ground Up

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Irrigation Water Analyses

In our last newsletter we discussed the importance of getting your irrigation water analyzed. We also explained the value of knowing the sodium level and the sodium adsorption ratio and how to interpret these tests. In this newsletter we will discuss other parts of the water test that affect water quality, Electrical Conductivity, Bicarbonate, Chlorides, Boron and Iron.

Electrical Conductivity (EC)

The electrical conductivity measures the salt content of the water. The salts are both positively charged ions such as calcium, magnesium, potassium and sodium and the negatively charged ions such as bicarbonate, carbonate, chloride, sulfate and nitrate. As the electrical conductivity increases so does the salt content of the water. Crops vary to the degree of sensitivity to salts, but most crops will tolerate levels of 1.1 or less with no effect on yield. Excess salinity may cause moisture stress within the plant. Water with too few salts can lead to surface soil crusting. Irrigation water should have at least 20 ppm calcium and an EC of at least .5 to prevent surface soil dispersion.

Bicarbonates

The bicarbonate level of water is often overlooked in irrigation water analysis. As soils dry, the bicarbonates will precipitate with calcium, reducing calcium availability and increasing the level of sodium relative to calcium. This will lead to the development of a thin surface layer that can impede water infiltration and increases water runoff. Bicarbonate has also been shown to be toxic to roots and reduces root growth and the uptake of phosphorus and many of the micronutrients. Bicarbonate levels above 100 ppm are sufficient enough to cause concern. Concentrations greater than 200 ppm may pose a potential hazard. Levels in the Missouri River valley wells are usually high.

Since bicarbonates react with calcium to form calcium carbonate and render the calcium unavailable in high pH soils. Amendments that are acid forming will neutralize the bicarbonate and are recommended to offset the ill effects. Gypsum, although not acid forming, is effective in supplying soluble calcium to react with the bicarbonate or to replace calcium that has been removed from soil solution by the bicarbonate.

Chlorides
High concentrations of chlorides can inhibit plant growth, however, most crops will tolerate levels of up to 200 ppm. Overhead irrigation can cause some leaf burn especially when the rate of evaporation is high. Gravity irrigation poses little concern.

Boron
Excess boron can be toxic to plants. Wheat, soybeans and sunflowers are affected if levels exceed .75 ppm. Corn is usually not affected until the level exceeds 2 or 3 ppm. Alfalfa and sorghum are very tolerant and can tolerate levels greater than 4 ppm. Calcium is effective in tying up boron. Lime can be used if the pH of the soil is low. On neutral or high pH soils, gypsum is a good source of calcium to react with the boron.

Iron
Seldom is any plant problems caused by high levels of iron in irrigation water. It will cause brown staining on leaves and fruit. Iron oxides will block sprinkler heads and pump components. Brownish slime can also be produced by iron bacteria which may also plug irrigation equipment. Ozone treatment and filtration can be used to treat the water if desired.

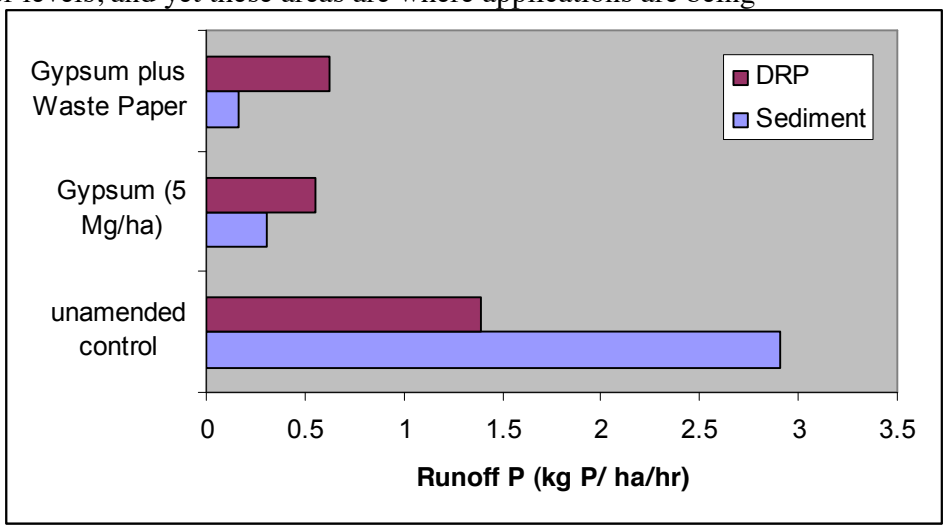
Identify What Caused the Poor Areas
Most producers have noticed this year that the poor areas of their fields really showed up this year when harvesting. While these areas are fresh in your mind take time to try to identify why these areas yield less. It could be caused by a number of things, but it is probably soil related. Is it because the soil is sandier in that area? Is it because the soil is eroded in that part of the field? Is it due to a high pH in that soil in that part of the field? If so it may also relate to a nematode issue? Could it be a drainage issue? Is it a low pH soil and aluminum toxicity issues? Could it be that in that area the soil is compacted or just has poor soil structure because it has more clay and/or high magnesium levels? Is the problem caused by high sodium levels in that area. Grid sampling fields have identified areas that have variable pH or fertility levels, but probably have not helped you in identifying soil structural problems. Often times the poorest yielding areas have the highest fertility levels because crop removal has been less over the years.

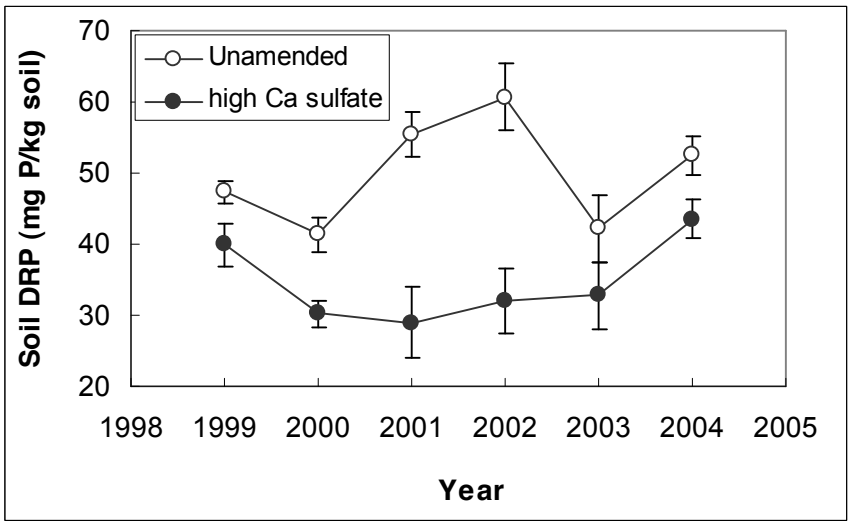
The next question is……can I do anything to correct the problem? Soil testing these areas separate from the rest of the field can be useful in helping identify causes and finding solutions. If the problem is caused because the soil texture is sandy, there probably isn't much you can do unless you have a way to apply more water to that part of the field. If the problem is due to soil structure, then concentrate on ways to improve it. This could be a subsoiling operation that breaks up the compacted layer or loosens the soil. Remember that calcium sulfate is an effective tool in improving soil structure and keeping the slots from the subsoiler open. It is also effective in lowering magnesium levels. Fall is the best time for these operations. If the area has a low pH, then schedule a lime application. Again, the fall is the best time for this. If the soil has a high pH (greater than 8.0) also determine if sodium is an issue in this soil. If so, calcium sulfate will be effective in reducing the negative effects of the sodium and the high pH condition.

With grain prices increasing, these poorer areas become even more costly. You can no longer let these soil conditions rob you of profits. Soil Solutions have helped many producers make their soils more productive. If you need help in identifying possible causes to lower yields give us a call and we will be more than willing to meet with you to discuss this and possible solutions.

A Catch 22

We are told that to reduce runoff from fields we should reduce our tillage or preferably go no-till. Next we are told that if we want to reduce the amount of phosphorus runoff from fields we should incorporate the manure. It is difficult to do both.....a catch 22. Hillsides are the areas where manure is most often most beneficial due to past erosion lowering organic matter levels, and yet these areas are where applications are being limited due to slope….again a catch 22. However, a management tool that research has shown to be helpful in these matters is to apply gypsum when you apply the manure. As the data to the right shows gypsum at a 2 ton/acre rate reduced the amount of sediment (whether no-till or not) leaving the field by more than six-fold and the "dissolved reactive phosphorus" was cut in half. This same research from Arkansas (USDA) supported what numerous other researchers have also shown….that this treatment will give this effect for multiple years. In this study (table to the left) the results were realized for four years. The research also shows that if you have soils that are high in phosphorus from previous heavy manure applications, gypsum is also a good management plan to reduce the amount of phosphorus that will leave the field. This means you retain your





fertility so you benefit plus there is less risk of our streams and lakes being contaminated. Other studies have also shown less pesticides and less hormones were in the runoff where gypsum was used. You not only will practice good stewardship, but you will also improve your crop production….a win-win for everyone.

Don't put it off

Each spring we have fields that we can't get spread because we run out of time. The retail dealers we work with tell us the same thing. This costs you lost yield for each year you delay. Instead give us a call today and get your fields put on the list so we can get them spread or your local dealer can get them spread while in your area.