



Moisture... Too Much and Too Little:

Impacts on Future Fertility Management

Whether soil moisture is excessive or in short supply, it will impact nutrient supply to the growing crop.

Farmers, land managers, crop advisers, and fertilizer dealers need to be aware of factors that will require specific nutrient management considerations for the next crop.

Nutrient Management

Many growers may be contemplating cutting back on fertilizer applications on fields that were affected by drought or flooding, because they believe that significant residual amounts of nitrogen (N), phosphorus (P) or potassium (K) remain in the soil due to lower crop removal associated with a below average harvest. However, several nutrient-specific factors should be considered before rates are adjusted.

Nitrogen

Normal or excessive rainfall will restore soil moisture levels in many areas. In areas where moisture is excessive, soil conditions are ideal for denitrification and leaching losses of available nitrate-N. Here are some factors to remember that may affect N management decisions moving forward:

- Warm temperatures during much of a growing season will likely result in better than normal organic matter mineralization...making more N potentially available for crop uptake...but also leaching or denitrification in wet soils.
- Where soils have been cool, N release from legume residues and manure has been slowed.
- Wet soil conditions in fall/early winter will keep N mineralization at a minimum.
- Low soil N levels mean little flexibility for N rates.
- Confirm soil N availability by residual nitrate soil tests.
- Nitrogen use efficiency will be affected by adequate availability of P and K.
- Low soil N will make preplant and starter N especially important for the next crop.
- Surface soils reworked by floodwaters may be especially low in available N.

Phosphorus

Soil microbial activity is important in P nutrition as well as that of N. When something interferes with microbial activity, crop nutrition suffers. This is frequently the case for crops grown in fields that were either fallowed or flooded the preceding year. Most crops have a beneficial association with a fungus...which forms mycorrhizae (root fungus)...colonizing their root system. This fungus aids P absorption by crop roots. Mycorrhizae activity is often depressed after fallowing or moisture-saturation, producing severe P deficiency conditions. A reduction in the amount of P supplied by breakdown of organic matter also contributes to the problem. Zinc (Zn) availability will also be lowered by the same processes.

Corn is probably the most sensitive crop to fallow or flooded soil syndrome. Soybeans are affected, but less severely. Wheat is also significantly affected by lowered P availability.

Prolonged flooding of soils produces several physical, chemical, and biological changes, some of which are not reversible. Phosphorus doesn't undergo direct chemical changes under these conditions, but its availability to plants is affected by reactions with iron (Fe) and manganese (Mn), both of which are made more reactive by water-logged soil conditions. As soils dry out, the forms of Fe and Mn phosphates change, but the availability of the P remains low.

If wet conditions persist into the spring, growers may want to increase P rates to offset low soil P availability. Cool, wet soils (especially in no-till) can limit root growth and may interfere with P uptake. Phosphorus fertilization will help overcome these problems. Here are some points to remember as you plan ahead:

- Starters containing P should be considered for corn, grain sorghum, and cotton ... even when soil tests indicate high P levels.

- Use of high P starter at rates of 40 to 70 lb P₂O₅/A normally corrects P deficiency on fallowed soils.
- High soil test P levels can help avoid fallow or flooded soil plant growth problems, but the minimum level has not been clearly defined.
- Arkansas research shows that wheat following a single rice crop (flooded soil) responds well to preplant, banded, or topdressed P applications.
- Flooded, reworked soils may be low in organic matter, affecting P availability.
- Research on flooded soils indicates that lower P availability may or may not be detectable by soil tests for P.

Potassium

Substantial compaction from traffic and tillage on wet soils frequently occurs. Research has demonstrated that K management becomes increasingly important under compacted, wet, and cold soil conditions. High soil test K levels and band application of K can reduce the negative effects this new compaction may have on crop yields. Consider the following:

- Potassium availability isn't affected as much by flooding-induced soil chemistry changes as is P.
- Leaching on sandier soils (cation exchange capacity less than 5 to 7) may have removed much of the available K.
- Leaching on clay soils is not likely to have so much effect on K availability.
- Soil testing can be an important indicator of K availability on soils which have been subjected to flooding.
- Besides rebuilding soil test levels on leached soils, remember that starter K is particularly important when soils are compacted, wet, and/or cold.

- Adequate K should be applied for spring-planted crops, and also for forage crops (fescue, bermuda, alfalfa, etc.).
- Split applications of K may benefit crops, especially on the sandier soils. Part of the K may be applied with the pre-plant fertilization and the remainder may be applied as an early-sidedressing or topdressing before plants begin reproductive growth.
- For summer grass pastures and hay meadows like bermudagrass and bahiagrass, K should be applied at or slightly before spring green up. Additional K should be applied to meet subsequent grazing and hay needs. Potassium can be applied after each hay harvest or every other harvest, to replace harvested K and to provide uptake demands of the next growth cycle.

Other Nutrients

- Sulfate-sulfur (S) may have also leached on the sandier soils. For wheat and cool season forages, growers should consider applying 10 to 20 lb S/A in the sulfate form with the first N application. For spring planted crops, growers should also consider providing similar S rates (as sulfate-S).
- Elemental S is slow to convert to sulfate in cool, wet conditions. Rapid crop growth can increase nutrient demands and sulfate uptake demand may not be met unless a sulfate-S source is applied.
- Growers should pay attention to magnesium (Mg) balance with K, especially on sandier soils receiving high rates of K. Providing a water-soluble source of Mg this spring with the K application may help lower the risk of grass tetany in cool season annual and perennial grass pastures and hay meadows.

Summary

There's no doubt the next year will produce many challenges for nutrient management on soils recovering from climatic conditions. Operating dollars could be short, and spending decisions will need to be made carefully. However, past experience tells us that fertilizer inputs will likely give favorable returns. Start planning now for next year to make the best crop conditions will allow. Remember, good plant nutrition is an important part of production recovery on fallow and saturated soils. ■

More information is available at the PPI website:
www.ppi-ppic.org

Reference # 05101



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