**Soil pH and Major Nutrients Explained**

As a forage or row crop producer, you understand the importance of maintaining adequate pH and soil nutrient levels in your fields. You probably test your soils tested on a somewhat regular basis and apply the recommended rates of lime and various nutrients. But it is also important to understand just exactly what pH is and how various nutrients in your soil affect plant growth. A better understanding of these principles may enable you to make better management decisions.

**pH** – pH is the measure of acidity in the soil. A soil with a pH of 7.0 is neutral. pH values lower than 7.0 are considered acidic while values greater than 7.0 are considered basic. Most forages and grain crops prefer a soil with a pH that is slightly acidic, somewhere in the range of 5.5-7.0. Soils with a pH above or below this range may result in a number of conditions that negatively affect plant growth. Probably the most important condition to consider is the availability of nutrients. Soils that are too acidic or too basic will limit the availability of nutrients to the crop being grown. Soils in Missouri naturally have low to moderate levels of liming materials resulting in soils that are slightly acidic, or in the optimum range for most plant growth. However, years of rainfall (which has a pH of 5.7) and application of fertilizer (which tends to be acidic) often result in a soil with a pH that is too acidic for optimum plant growth. When soils reach this point, it is necessary to apply a liming material to neutralize some of the acidity.

**Nitrogen** – Nitrogen is the most frequently deficient nutrient in crop production and most non-legume systems require nitrogen inputs. The primary use of nitrogen in plants is for the formation of proteins. Nitrogen is also an integral part of chlorophyll. Therefore, a plant with sufficient nitrogen will exhibit vigorous vegetative growth and a dark green color while a plant that is nitrogen deficient will be stunted and yellow. Plants normally contain 1 to 5% nitrogen by weight and absorb nitrogen in the forms of nitrate of ammonium. Nitrate and ammonium, if not used by the plant, are readily lost from the soil, resulting in the need for yearly application of a nitrogen fertilizer to meet crop needs.

**Phosphorus** – The most essential function of phosphorus in plants is in energy storage and transfer. A plant produces energy when it goes through photosynthesis. Much of this energy is stored by phosphorus in the plant to be used later on. Without phosphorus, this energy would be lost. Adequate phosphorus is important early in the life of a plant when roots and reproductive parts of plants are being developed. Ample phosphorus also increases root growth, reduces grain ripening time, and increases straw strength in cereal grains. A large amount of phosphorus exists naturally in the soil but it is often not in the plant-available form, highlighting the need for occasional application of phosphorus fertilizers.

**Potassium** – Potassium is absorbed by plants in larger amounts than any other nutrient except nitrogen. The total potassium content of a soil is many times greater than what a crop needs, but only a small fraction of this soil potassium is available to the plant, resulting in the need for potassium fertilizer application. Potassium plays a number of roles in the plant including: enzyme activation, water uptake, energy production, sugar transport, nitrogen uptake, and protein synthesis. One of the most important of these is water uptake. Potassium gives plants the “pull” that draws water into their roots. Potassium deficient plants will often exhibit signs of drought stress, even in years when rainfall is adequate.

For more information about these or other nutrients, contact Travis Harper at the Henry County Extension Center by phone (660)885-5556 or email harpertw@missouri.edu.