Nutrient Management Considerations

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Note: Information contained herein has been derived from several USDA and KSU Extension publications. Any nutrient management program should be based on current soil test results, natural resource concerns and producer objectives. Because of local or regional differences consult with your local USDA Natural Resources Conservation Service Office, KSU Extension Office or other local qualified service provider before acting upon any information found in the attached material.

For comprehensive information on soil testing and nutrient rates, obtain a copy of "Soil Test Interpretations and Fertilizer Recommendations" publication MF-2586, from KSU Extension.

Minimum Recommended Soil Test Levels Of Some Nutrients

- Nitrogen (N) – Depends on yield goal
- Phosphorus (P) – 20 ppm
- Potassium (K) – 130 ppm
- Zinc (Zn) – 0.5 to 1.0 ppm
- Sulfur (S), Chloride (Cl), Boron (B) – Varies by crop
- pH – 6.8 - Below 6.5 nutrient availability and other concerns begin to exist. Below 6.0 problems become more severe.

N- P-K
Fertilizer analysis: 7-21-7 percent of nutrient by weight of material.

Nutrient management manages the amount, source, form, placement and timing of the application of nutrients and soil amendments.

Improper placement and timing can nullify all other good planning efforts.

Proper soil pH is very important to nutrient interaction in the soil and plants.

Minimum soil test levels become even more important during times of weather extremes. Cold damp soils in April. Hot dry soils in July.

If soils test levels are low banding nutrients become more important.

If the natural soil stores of nutrients are allowed to be depleted significant inputs will be required to build it back up. In general it requires 18# P_2O_5 to raise phosphorus levels 1 ppm or 9# K_2O to raise potassium levels 1 ppm. Crop removal rates need to be considered in any fertilizer program.

Site index ratings may limit the amount, timing and placement of nutrients that can be applied.

Banding nutrients near the seed row is much like a campfire. Like a person is drawn to a campfire when it is cool, roots grow to that concentrated band of nutrients when the soil is cool.
Reserve surface applied and incorporation of fertilizer to soil building programs. Fall apply to have less chance of runoff.

A corn crop needs a higher level of available P because of cooler soils in early part of growing season. Banding nutrients is very important.

Eroded sites are lower in nutrients and organic matter. Much of the excess nutrients found in water bodies are from eroding fields.

Nitrogen
Nitrogen credits should be accounted for from all sources such as from previous legume crops like soybeans and alfalfa, soil organic matter as well as applied animal wastes.

20# of nitrogen / % OM / year is released into the soil.

It takes 4-8 weeks, under proper soil temperature and moisture conditions for residue to breakdown for nitrogen to be released.

Do not take the nitrogen credit from a soybean crop for the wheat crop. Due to cooler soil temperatures it will not be released in time.

When a corn plant reaches 12" to 18" tall the plant has determined the nutrients available to it. Ear size is set. Additional nitrogen added after this time will have little affect on yield.

Nitrogen Credits For Legumes

Legume	#N/Ac.
Alfalfa - > 80% stand	100-140
- 60-80% stand	60-100
- < 60% stand	0-60
Red Clover	40-80
Sweet Clover	100-120
Soybeans (1# of N per bushel of yield)	30-60

Why Soil Test?

- To Detect
  - Nutrient deficiencies
  - Trends
  - Diagnose problem areas
- To Prioritize
  - What nutrient is the limiting factor
  - Rate of application
  - Which field first
- Monitoring
- Regulatory

General soil tests for P, K and pH and should be taken every 3 years. Organic matter, micro-nutrients and possibly a nitrogen profile test should be taken if it has never been done. This may be most helpful in high yield environments and for problem solving.

A soil test is as much an index or a value as it is an actual amount. Due to calibration and other variables of how tests are run, analysis is only relevant to a particular lab. This is why that sending seemingly the same sample to two labs may return different test results as well different recommendations. Further, approaches to nutrient management may differ from lab to lab. Get to know the people doing the testing and ask questions.

Soil Sampling and Other Considerations

- When sampling a field consider
  - Slope changes
  - Soil type (soil survey information)
  - Cropping history
  - Special or unusual areas (keep separate samples)
    - Areas where manure has been applied
    - Problem or odd area
    - Wet spots
    - Areas adjacent limestone roads that could influence pH
    - Areas spot application of nutrients or lime has been done

- Sampling
  - Soil test at the end of the growing season before tilling the field.
  - A submitted soil sample should be made from up of 15 to 20 plugs of just soil (6” depth) and no residue from over a maximum of 20 acres. These plugs should be well mixed and a sample placed in a soil sample bag. A 160 acre field should have at least 8 separate samples submitted. Be sure to mark and keep good records of where each submitted sample was taken from.
  - GPS grid sampling of no more than 2.5 acres per sample will allow for more actual fertilization of a field. Soil test results and GPS yield data is used to vary nutrient application to best fix each acre in the field.
    - The goal of GPS grid sampling and yielding monitoring is not to obtain a uniform yield across a field but rather manage each acre for it’s expected yield. Resources are allocated based on that needed to produce the expected yield, reducing the over and under application of critical nutrients.

- Realistic yield goal
  - Five year or more average X 1.1 = expected yield

Organic Matter (OM)

It is important to know OM levels in a soil to determine proper herbicide rates.

Want to really build OM levels in the soil? Then no-till.

Organic nutrients are not available until they are mineralized (released, broken down by microbes) for plant use.