TPSL TPS Lab
AGRONOMY NOTE

Specialists In Soil Fertility, Plant Nutrition and Irrigation Water Quality Management.

ASK THE PLANT®
TO GET THE MOST FROM YOUR PLANTS
DYNAMIC CROP NUTRITION®

WHEAT

NUTRITION NOTES - 1

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Wheat is the premier small grain of American agriculture. The United States harvests 53 million acres annually which yield 13% of the world's wheat supply.

To maintain high yields, wheat requires a plentiful supply of nutrients. To get the crop off to a good start, a comprehensive soil test that measures only plant-available nutrients to determine initial fertilization requirements must be conducted well before planting.

Thereafter, leaf testing at critical development stages is essential to determine nutrient deficiencies so that they may be corrected before they cause permanent reductions in crop yields and quality.

For optimum yields and quality, soils must be capable of delivering amounts of **Nitrogen (N), Phosphorus (P), Potassium (K), Sulfur (S), Calcium (Ca), Magnesium (Mg),** and trace elements including **Iron (Fe), Zinc (Zn), Molybdenum (Mo), Manganese (Mn), Copper (Cu), Boron (B)** and **Chlorine (Cl)** in the needed amounts.

Additionally, **Silicon (Si)** has been shown in recent studies to be extremely beneficial to wheat (in addition to other plants). It strengthens cell walls, thereby decreasing lodging and providing some resistance to disease and insect pressures. Additionally, Silicon can reduce abiotic pressures brought on by drought or excessive soil **Sodium (Na)**. Silicon can also help soubilize plant-unavailable soil nutrient compounds.

All of these nutrients are mined from the soil by wheat roots every year. Rates of removal from the soil also depend on soil properties, whether they're heavy clay or sandy, soil pH, organic matter content, and how much rainfall occurs during the growing season.

Several of these factors are out of growers' control, but they have important effects on how well the soil can deliver the needed amounts of nutrients. To produce optimum yields, growers must initially replenish the nutrients removed from the soil by the last crop and try to predict what will be needed for the next. This part of management has to do with *amounts* of nutrients—how much is presently in the soil and how much the last wheat crop removed from the soil - then followed by an active plant nutrition monitoring [and correction] program throughout the growing season.

Very much has to do with ***timing, mix and rate*** of fertilizer applications. Plants need varying amounts of nutrients during different stages of growth. The best efficiency of nutrient uptake occurs where there is a close match between plant needs and nutrient availability. Topdressing but preferably, foliar feeding, is often needed to ensure adequate amounts of nutrients are available when the plant needs them for Maximum Economic Yields. The expense of supplemental fertilization makes it imperative to "get it right" at planting. The more one knows about the condition of the soil at planting, the better probability there is of meeting the needs of the plants efficiently.

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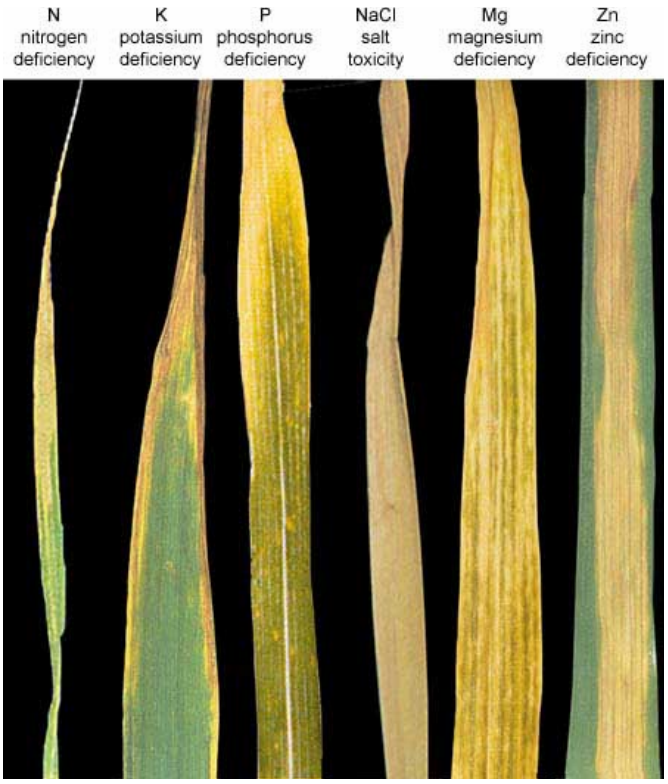
	Pounds of Nutrient per Acre for 80 Bushel Yield										
	N	P_2O_5	K_2O	Ca	Mg	S	B	Cu	Fe	Mn	Zn
Grain	96	44	27	5	12	5	0.06	0.05	0.45	0.14	0.21
Straw	38	10	135	15	12	15	0.02	0.02	1.05	0.24	0.08
Total	**134**	**54**	**162**	**20**	**24**	**20**	**0.08**	**0.07**	**1.50**	**0.38**	**0.28**



Nutrient deficiencies.
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SIGNS OF NUTRITIONAL PROBLEMS

If nutrient deficiencies occur during growth, some loss of yield (and quality) is almost inevitable. How does one know if a deficiency is developing? The onset of visual symptoms can help diagnose nutrient deficiencies. Some symptoms, such as Nitrogen, appear as yellowing of older, lower leaves while upper younger leaves stay green for a while. However, Sulfur deficiency can mimic Nitrogen deficiency, so is more difficult to determine. Other deficiencies (and toxicities due to excessive nutrients) may not display distinctive visual signs. This is particularly true for trace element deficiencies.

By the time nutritional problems appear to the eye, the crop has already lost its ability to deliver best performance.

There is a tendency to diminish the role of trace elements in agriculture because, in comparison to N-P-K, they are needed in such small amounts. But that small amount is vitally important. Many aspects of plant metabolism are controlled by trace elements, from enzyme activity to flowering and seed setting.

While it's important to learn the visual signs of nutrient deficiencies, it's important to recall that by the time visual signs of deficiencies appear, much damage has been done already and the crop will not be able to deliver its potential. Nutrient-deficient plants are also more susceptible to insect damage and losses to disease, contributing to yield losses and making necessary expensive pest treatments.

These factors make plant tissue testing for trace elements particularly necessary. Periodic testing can reveal a coming deficiency before it can reduce growth and development of the crop, giving the grower time to act to maximize yields and quality.

There are three ideal times to test: At **Tillering** (Feekes 2.0 – sample entire plant: 30-50 plants); At **Shoot Elongation** (Feekes 4.0-5.0 – entire plant: 20-30 plants), and at **Boot Stage** (Feekes 10.0 – flag leaf: 20-30 leaves). Never send samples in sealed plastic bags. Wash samples thoroughly to remove any soil, fertilizer or

Other nutrient deficiencies.
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spray residues, remove excess water with a paper towel and allow samples to air-dry. Place in **paper** (NO plastic!) bags for shipment to the lab.

The time between taking a plant sample and receiving results and recommendations needs to be as short as possible (48 hours) to allow the grower time to balance the plants' nutrition before visual symptoms appear.

Because soil organic matter commonly retains higher amounts of trace elements than mineral soil, *building* soil organic matter with crop rotation with cover crops, manure or compost addition, or by reducing tillage, increases the trace element reservoir in the soil.

This takes much pressure off the grower to maintain adequate amounts of these nutrients for the growing crop. Soil organic matter decomposition will release trace elements to satisfy at least part of the crop demand. Several other factors are also benefited by increasing organic matter. These benefits include water holding capacity, æration, structure and in general, soil tilth.

Leaving crop stubble and residues on the ground after harvest is often the only practical way many growers have to build soil. Reducing or eliminating tilling the soil as much as possible will also help retain organic matter in the soil.

While tilling ærates the soil, enhancing microbial decomposition of residues, it also exposes more soil to drying and blowing. In drier climates, crop stubble is especially useful in capturing snow that will melt into the soil in the spring. The more cover on the soil, the more moisture will be retained for the crop.

The straw cover will help prevent drying air from moving across the surface of the soil, carrying moisture away, and will reduce soil temperature. Accordingly, selling off your straw may be an unwise decision. Alternative tillage techniques can also be used to ensure a good seed bed for the next planting. Strip tillage is especially useful in that regard.

Tillering

Optimum Content: 4.5% N 0.49% P

Shoot Elongation

Optimum Content: 3.5% N 0.40% P

Boot

Optimum Content: 2.5% N 0.34% P