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## FANTASY FERTILITY - NOT SUSTAINABLE

**Higher crop yields place increased nutrient-supplying pressures on the soil.** It is well known that crop roots absorb nutrients from the soil solution through **root interception** (*as roots explore new soil volumes*), **mass flow** (*as water moves through soil pores*), and **diffusion** (*as nutrients move in the soil solution from a zone of higher concentration to a lower concentration*) processes. Soils with higher fertility levels are better able to supply plant nutrients during times of environmental stress and also during peak crop uptake demands.

**Wise, economic additions of fertilizer and/or manure help replace the available nutrients removed from the soil by crop harvests, erosion, leaching, and other losses.** Neglecting such nutrient replenishment leads to declines in: 1) soil fertility, 2) crop productivity, 3) cropping system resilience, and 4) indices of soil health; which threaten sustainability. Soil testing is a very important tool in assessing current levels of soil fertility, and in monitoring changes over time; an essential sustainability practice. However, soil testing is not a perfect tool .... and experienced agronomists know that they should also use complementary plant tissue analyses, as well as estimates of crop harvest nutrient removal, to assess and manage optimum plant nutrition in each field and sub-field area.

Many farmers and their crop advisers currently face difficult economic decisions because of undesirable crop prices and lower-than-expected crop yields; due in part to unfavorable weather in 2015. **As management plans are developed for the 2016 cropping season, it may be helpful to be reminded of some fundamental facts:**

- Soils do contain significant amounts of total nutrients, but those amounts are not necessarily reflective of *available plant nutrient levels*.
- Release of plant available nutrients from soil clay minerals and soil organic matter can often be slower than plant uptake demand; especially during rapid crop growth.
- Cover crops can help capture residual soil nitrate, but they do not magically produce new nutrients from the soil, and they may not cycle nutrients to successive field crops at rates that match those crop needs.
- Manure nutrients are often not a balanced crop nutrient supply:
  - o manure *"book values"* for plant available nutrients may not represent actual variable contents,
  - o release of nutrients in plant available inorganic forms is less predictable than from fertilizers, and
  - o based on 2012 data, use of all the recoverable manure resources, that are capable of collection and application to fields in the U.S., could provide less than 10% of crop nitrogen needs, less than 35% of crop phosphorus needs, and less than 25% of crop potassium needs in the U.S.
- Shallow soil sampling, especially in no-till or reduced till systems, can lead to a false sense of true root-zone fertility levels (i.e., an over-estimate of root zone soil test levels).
- Neglect of nutrient replacement does impact soil fertility and does show up on soil test results; provided that soil samples are representative, have consistent sampling quality (e.g., right depth, consider fertilizer bands, etc.) and are collected from the same field location from year to year to enable head-to-head soil fertility comparisons and trend evaluations.
- "Miracle" products that provide a few ounces of plant available nutrients can not, and do not, replace typical levels of nutrients removed from fields in crop harvests:
  - o if a product claim seems too good to be true, then it probably is just that,
  - o rely on advice from an experienced agronomist or crop adviser on new products and technologies,
  - o consider your own appropriately-designed on-farm evaluations.

**We all aspire to a better and more productive future, and we admire optimistic dreamers and those with a clear vision of that future.** But as we tell our children and grand-children, dreaming does not make it so. A practical, implemented plan of action is necessary to achieve one's goals and dreams. Consider the facts above in your 2016 plans. Base your nutrient management and input decisions on solid agronomic advice and research-based evidence. Avoid being fooled by the fantasy of adequate soil fertility, that may rob your productivity and economic sustainability.

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