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Plant Nutrition TODAY
Better Crops, Better Environment...through Science

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WHAT IS THE BEST NITROGEN RATE FOR YOUR FIELD?

Most farmers strive to implement a cropping system and nutrient management strategy that will allow them to capture favorable growing conditions which at least meet historic average crop yield potential. The fertilizer N rate chosen has traditionally depended on results from land grant university research and extension replicated studies, which may span several years and environmental conditions. In the past, many such public studies were nearby, but in recent times, because of declining budgets and program cuts, farmers have had fewer such studies to rely on in guiding their N rate selections.

Ideally, one could match the applied N rate in perfect synchronization with crop uptake demand, with a perfect knowledge of soil N release. However, we recognize that a sizeable portion of the N that plants take up comes from the soil, as microbes breakdown organic matter and organic N is converted to ammonium and then nitrate forms; the forms essential for plant nutrition. Unfortunately, we still can't predict the amount of N that will become available, and when it will become available, from the full soil profile or rooting volume; especially across an entire growing season. Yes, there are some soil N tests which have met with moderate success, but their use and success in the field under differing conditions and geographies have been limited.

If recent local research results on similar soils and cropping system conditions are not available, then a plan should be developed to evaluate existing N rates against alternative N rates: both above and below the current practices. As crop yield potential is raised with improved genetics, questions are being asked about the potential need for higher N rates (or changes in timing and placement). To help answer these questions, some leading farmers are partnering with their crop advisers and fertilizer dealers to establish N rate tests on their own farms. Such N rate comparisons can provide valuable information, but they should be repeated over several years, and they should be randomized and not just simple side-by-side contrasts. Treatment randomization is important because unseen gradients in soil fertility, moisture holding capacity, and internal drainage in many fields can skew the results in side-by-side comparisons and mislead interpretations.

Sensor technologies are also available, which detect the greenness of the crop (e.g. corn, wheat) during the growing season, and which reflect the N nutritional status. Such monitoring can allow one to adjust to conditions of improved yield potential (e.g. favorable weather) or to adapt to conditions that may have caused unmeasured volatile, leaching, runoff, and drainage losses of N. The calibration for these "N sensing" applications should be locally or regionally based. Several university and USDA research programs have made progress with such calibrations. Farmers, crop advisers, Extension agents, and fertilizer dealers are increasingly employing the technologies where they have been proven economically feasible.

Field-average hind-sight or "post-mortem" evaluations of N sufficiency are important, but replicated tests to evaluate the crop response under different N rates and different management systems are considered more valuable, especially when coupled with monitoring of plant N status during the growing season. Use of yield potential alone is no longer considered the best approach in determining the N rate for a given field. Consider ways to evaluate the performance of your N management program by partnering with others who are skilled in on-farm evaluations. Such tests can help instill confidence in the fertilizer N management program, and help ensure that both economic and environmental protection goals are achieved.

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Abbreviations: N = nitrogen.