Site-Specific Nutrient Application
Extension Education in North Dakota

The Situation
In the early 1990’s, site-specific management of crop nutrients was considered impractical for North Dakota farmers to implement. However, Ag-supply retailers began to provide site-specific services that were not supported by any local research or education.

Extension Response
Beginning in 1994, the NDSU Extension soil specialist initiated a site-specific nutrient application research and Extension education program. In 1995, the specialist advanced the concept of soil sampling by zone. Further development of the zone concept continued through 2001. Since then, most of the Extension education effort has been to modernize fertilizer nutrient recommendations to be most useful with modern site-specific technologies. Since 2007, research into the use of ground-based active-optical sensors and the use of imagery from satellites and aerial vehicles has led to published algorithms for site-specific nutrient application recommendations in corn and preliminary algorithms for their use in sunflower, spring wheat and sugar beet.

Impacts
A survey of sugar beet grower practices and profitability by American Crystal Sugar Cooperative reported that 54% of 425,000 sugar beet acres operated by their growers utilized site-specific nutrient sampling and application. Profitability of growers using this technology was $47 per acre greater averaged over the past 10 years than their neighbors that did not take advantage of the technology. This amounts to $10.8M per year greater profit in the region per year for 10 years, or a total of $108M greater profit over the 10-year period. Site-specific technologies, once thought only practical for high-value crop production, such as sugar beet or potato, are now used by growers of all crops in North Dakota, thanks in great part to the relative cost savings and time efficiency of zone soil sampling compared to greater density soil sampling required to provide similar soil information using a grid soil sampling approach.

A USDA survey published in 2016 reported that North Dakota producers using precision ag technologies of all kinds, including variable-rate nutrient application, realized $88 per acre benefit from precision ag technologies compared to their neighbors who did not take advantage of the technology. This compares to $65 per acre benefit for the rest of the USA compared to those who did not use precision ag technology.

Zone soil sampling is now the default procedure for soil samplers in the state, particularly for nitrate-N determination, and it will soon be the default sampling procedure in Minnesota for farmer compliance with new nitrogen management regulations. A concept once thought impossibly impractical for North Dakota agricultural has now become mainstream.

Feedback
The development of the zone soil-sampling concept was recognized through an award from a prominent national Precision Ag magazine publisher. Over the past 23 years, the site-specific nutrient application Extension education program has provided over 300 presentations to a total state audience of 24,000 growers, ag-industry representatives and crop consultants on aspects of site-specific nutrient measurement and application. The dissemination of this information has resulted in the development of new businesses that offer site-specific farming services to their farmer-customers.

Public Value Statement
North Dakota’s greatest natural resource is its land and soil. By managing this natural resource through the use of site-specific nutrient analysis and recommendations, productive soil will be available for future generations.

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