



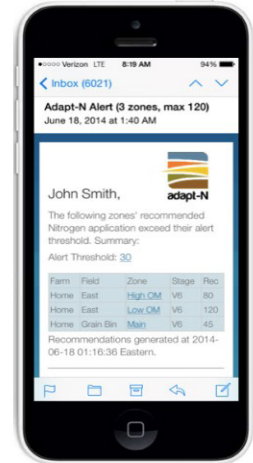
Adapt-N and N-Insight tools for precision nitrogen management

What is Adapt-N?

Adapt-N (<http://adapt-n.com>) is a nitrogen technology solution that offers benefits for farmers, consultants and fertilizer retailers, while effectively addressing multiple environmental concerns. The tool is innovative because it was the first of its kind to generate location-specific, in season, optimum nitrogen rate recommendations, while integrating real-time weather information and local soil and crop management factors. The tool is currently calibrated for use on about 95% of the US corn production area spanning 35 states.

Scientifically proven technology

Adapt-N has proven benefits, because its precision management approach increases efficiencies in nitrogen use and results in “win-win” outcomes: reduced environmental impacts with higher producer profits. Based on 152 multi-year on-farm strip trials in the Midwest and Northeast, we have demonstrated **average reductions in N inputs by 29 lbs/ac and higher farmer profits (\$29/ac)**. We have also demonstrated that the use of Adapt-N can result in **35-40% reductions in leaching and gaseous losses of nitrogen**, thus significantly reducing N loss to waterways and minimizing greenhouse gas emissions. Adapt-N offers an estimated 5-20x return on investment for growers, depending on the production environment.

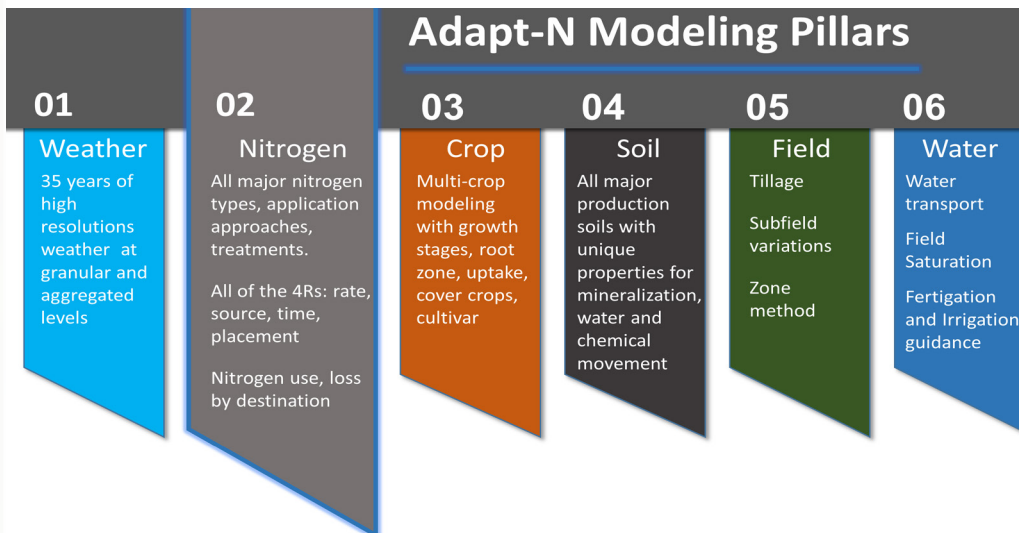


Adapt-N is a cloud based tool that can be accessed anywhere from the field to the office.

Credentials

Adapt-N was developed at Cornell University and has been extensively documented in the scientific literature based on pioneering research starting in 2002. The tool was initially rolled out in beta form in 2008, but was

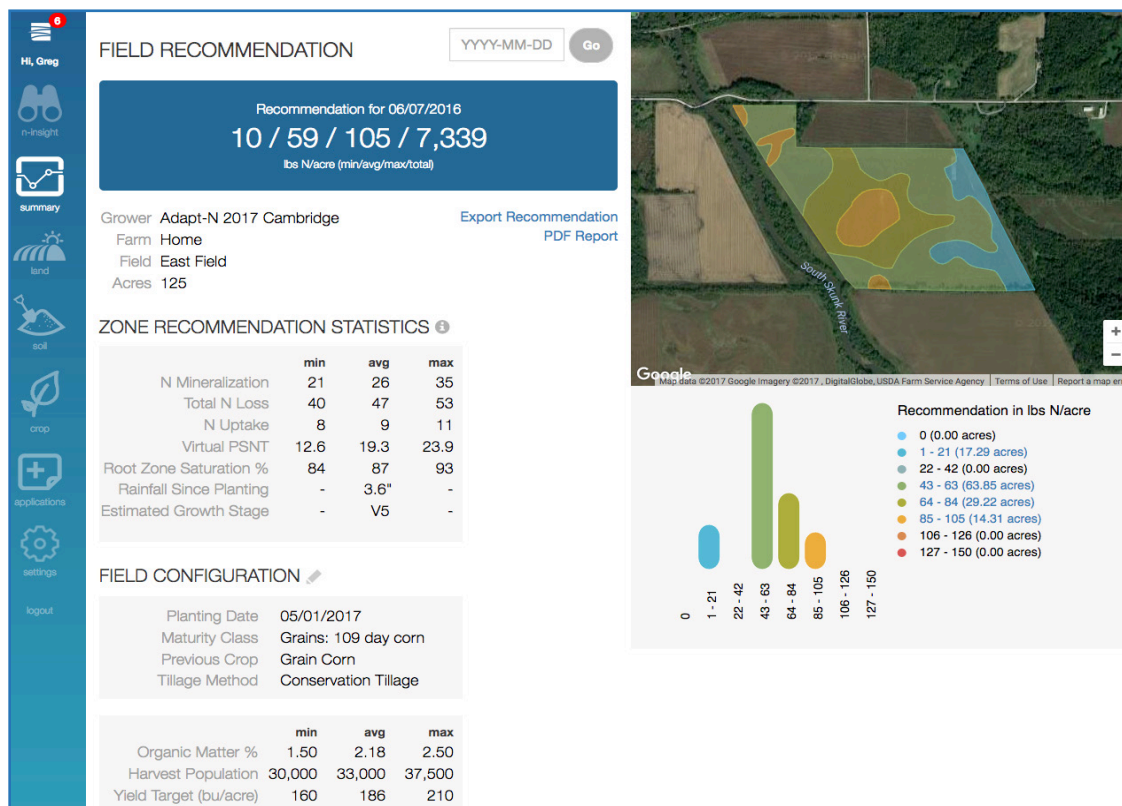
licensed in 2013 to a start-up company, Agronomic Technology Corporation. A video summary of the Adapt-N development process as part of lead inventor Harold van Es' presentation at the 2016 World Economic Forum can be viewed at <https://www.youtube.com/watch?v=LfpWpZtv3Kk>.



Adapt-N is a dynamic simulation model which uses near real time climate data and field-specific management, soils and crop information supplied by users.

Approach

Adapt-N focuses on an important component of the solution: getting farmers to apply the right N fertilizer rate for a particular production environment. When crop nitrogen uptake is optimized, environmental losses are minimized. The tool also facilitates the use of other beneficial technologies like better N application timing, cover cropping, and use of enhanced efficiency products. Adapt-N is Cloud-based and accessible through any internet-connected device that supports a web browser. In addition, it is compatible with several farm data platforms (agX, Agrian and FieldAnalytics) to increase availability and ease of use.



Adapt-N's interface provides in-season N sidedress recommendations as well as graphs and other information highlighting seasonal dynamics of soil N, crop growth, temperature, and precipitation for each management unit.

Flexibility within the tool allows for point based, zone based (left) or grid-based options.

Adapt-N integrates layers of yield, agronomic and other data to make the N sidedress recommendation.

Marketability and scalability

Adapt-N's user base is rapidly expanding and currently has subscriptions of farmers, consultants and fertilizer retailers across 20 US states, primarily in the Midwest and East. The tool is mostly sold through wholesalers (consultants and retailers), a marketing strategy that allows for rapid scaling. Furthermore, the tool can be co-branded with these groups and thereby effectively engages the fertilizer trade sector, breaking down traditional barriers between commercial and environmental interests.

Adapt-N has also gained attention – including awards -- from several environmental and sustainability-oriented initiatives that regard the tool as an important component of nutrient reduction strategies. Therefore, marketing is significantly focused around integration with environmental and corporate sustainability initiatives.

Integration with soil health testing

There are tie-ins between Adapt-N and soil health through the model's representation of C and N mineralization. Biological indicators such as respiration and protein content are included in the Cornell Comprehensive Assessment of Soil Health analysis. We are currently working to include soil health information into Adapt-N, which will allow for further N fertilizer reductions when soil health has been enhanced. We postulate that this approach will be attractive to farmers and have greater benefits.