



## Research Re-Evaluates Corn Yield Potential in Northern NY through Collaborative Partnership

By Lisa Fields

The corn yield potential of soils across New York was last updated in the mid-1990's. The trends in yield since World War II show a steady increase over time for both silage and grain in New York State. This has raised questions about the need for additional fertility, especially nitrogen (N) fertilizer, to sustain or meet possibly increasing yield potential.

National data show that while yield increases have occurred, N applied to corn has remained the same. This would suggest that newer and higher yielding varieties require less N per bushel of grain or per ton of silage produced. Are current varieties simply better at taking up N already in the soil? When might external N be needed and when not? And is there a link to N needs, uptake, and yield levels for fields over time? Are there differences between long-term manured fields and field with little or no manure history?

Farms that are regulated by CAFO rules are required to follow land grant nutrient management guidelines. Realizing that on-farm results vary, since 2000 farms have had the opportunity to adjust yield potentials to levels higher than listed in the database if they have three years of yield documentation.

In 2013, Cornell guidelines provided two additional opportunities for farms, recognizing the need to evaluate when extra N was needed and when not. As part of the NRCS guidelines for adaptive management, farms can prospectively use higher N rates if they track yields as noted above, take a corn stalk nitrate test (CSNT) sample at the end of the growing season, and manage CSNT-N over time to be below 3000 ppm. And those with an interest in doing on-farm research can implement N rate studies to determine optimum N rates over time.

Not all farmers are able to easily collect yield information. Recognizing this reality, as well as the need for a credible, scientific approach to reset yield potentials and retest the basic corn N equation, the Nutrient Management Spear

Program (NMSP) at Cornell started a collaborative project in 2013 funded by Northern NY Agricultural Development Program (NNYADP): "Re-Evaluating Yield Potential of Corn Grain and Silage in Northern NY."

Professor Quirine Ketterings, who leads the NMSP, said, "Northern NY producers, crop advisors, and we at Cornell wanted to evaluate current crop yields and the need for updates."

"Because of year to year variability in some fields we knew we had to examine yields over several years for this project to give us meaningful information," Ketterings explained. "The first step was to obtain accurate yield data from enough fields to represent the predominant soil types where corn is grown in the region. As a multi-year project, we're looking at crop seasons from the full gamut of weather conditions that farmers face."

Project collaborators include Northern NY Cornell Cooperative Extension Regional Field Crop Specialists Mike Hunter and Kitty O'Neil, and Mike Contessa of Champlain Valley Agronomics.

Contessa remarked, "Broad participation by the farm community in sharing yield data will undoubtedly expedite the state-wide goal of updating the Cornell yield potential database."

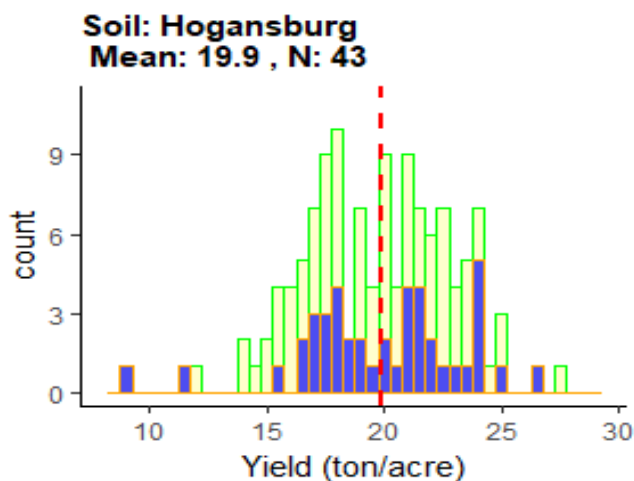


Figure 1: Example of a yield frequency histogram derived from farm yield data.

Initial results from 2013-2015 showed that of 46 fields in the study, 19 (41%) were within 10% of the listed yield potential for their soil types, 15 fields (33%) yielded less than 90% while 12 fields (26%) exceeded the listed yield potential by 110% or more.

Ketterings commented, "In the initial dataset from northern NY, the highest yielding fields had the lowest ratio of N applied to N removed, showing that the soil supply of N for high yielding fields is substantially higher than in the low yielding fields. These results in part reflected manure histories and made it clear that we needed to expand and do whole farm yield potential assessments."

The increase in use of yield monitors with corn harvesting equipment and their enhanced reliability over recent years is making expansion of the project possible. Contessa explained, "Harvester generated spatial yield records help propel us down a path of accelerated learning. Data driven decision making is essential to advancing farm production and environmental protection goals. Questions, such as the validity of the current Cornell Yield Potential database, that historically could have taken many years of research to solve, can now be answered much faster with accurate yield data."

However, when yield data from monitors is used without removal of obvious errors, the reported yield data can differ from reality by tons or many bushels per acre. Thus, a first step in use of yield monitor data for assessment of actual yields and yield potentials for each soil type, was to remove errors from yield monitor information. Yield Editor software was used to "clean" the data. The software's developer, Scott Drummond with USDA Agricultural Research Service (ARS), provided consultation on applying the program.

"The information is only as good as we make it. Consistent cleaning of the unavoidable errors introduced in harvester generated data is critical," Contessa noted. "The effectiveness of the data driven approach hinges on the ability of users to effectively analyze and interpret the data".

Ketterings explained, "With the data evaluation protocol that was developed as part of this study, analyses can now be done much more quickly. This assessment also allows for quicker documentation of whole field yields and within field yields, such as yield per soil type, yield excluding headland areas, and yield per soil management zone."

Our progress to date with this project is exciting," she added. "In recent months we have analyzed multiple-year monitor data records for a handful of Northern New York farms. We've also received datasets from other farms that we will be analyzing in the next few months. Farms that participate typically have a subset of soil types that predominate on the farm. We can now create frequency histograms that show ranges in yield for fields with the same soil type. The histograms for those soil types [see Figure 1] allow us to calculate average yields (single year and multiple years if the data exist), yields achieved on the top 15-25% of the fields, highest and lowest yields, etc. And CAFO farms that have summaries like this can plug their own yields into the Land Grant guideline N system."

With the development of an efficient method to process large amounts of information, the team will soon be calling for additional farm fields to add to the existing dataset. The more information they receive, the better the yield potential analysis will be. More information on the project can be found at: <http://nmsp.cals.cornell.edu/NYOnFarmResearchPartnership/YieldDatabase.html>. To submit corn silage or corn grain yield data, see: <http://nmsp.cals.cornell.edu/NYOnFarmResearchPartnership/Protocols/YieldMonitorDataSharingInstructions.pdf>.

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The **Nutrient Management Spear Program (NMSP)** is an applied research, teaching and extension program for field crop fertilizer and manure management on dairy and livestock farms. It is a collaboration among faculty, staff and students in the Department of Animal Science, Cornell Cooperative Extension, and PRO-DAIRY. Our vision is to assess current knowledge, identify research and educational needs, facilitate new research, technology and knowledge transfer, and aid in the on-farm implementation of strategies for field crop nutrient management including timely application of organic and inorganic nutrient sources to improve farm profitability while protecting the environment. An integrated network approach is used to address research, extension and teaching priorities in nutrient management in New York State. For more information on NMSP projects and extension/teaching activities, visit the program website (<http://nmsp.cals.cornell.edu>) or contact Quirine Ketterings at [qmk2@cornell.edu](mailto:qmk2@cornell.edu) or (607) 255-3061.