



Field Nitrogen Balances as a Tool to Prioritize Corn Silage Fields for Management Interventions

Introduction

The adaptive N management process for field crops in New York allows farms implementing a comprehensive nutrient management plan (CNMP) to override foundational land grant university guidelines when defining N application rates. However, this process requires farmers to measure and report crop yield and to conduct an end-of-season assessment to see if the higher N rates were warranted. End-of-season evaluation tools include conducting corn stalk nitrate test (CSNT), N rate studies, or implementing N rich or control N strips in fields. In 2025, estimation of N balances was added as an extra end-of-season evaluation tool for corn silage. This factsheet describes the added value of estimating N balances not just for fields under adaptive N management, but for all corn silage fields in the farm using readily available data, as a strategy to diagnose field N use efficiency and prioritize management interventions.

Calculating a Field N Balance

A field nutrient balance is the difference between nutrients supplied to the crop and nutrients removed with harvest. The ratio of N

removal to N supply is another valuable indicator of N use efficiency that can be estimated with the same data. Available N supply is the sum of the plant-available N contributions from soil, previous crop N credits, fertilizer, and manure. Available manure N derives from both organic and inorganic N, which varies according to manure type, application method, and timing. The various inputs can be estimated based on farm records, manure analysis, and book values for soil N and rotation N credits. Nitrogen removal can be derived by multiplying yield and average silage N content. For details on how to estimate these values, see [Agronomy Factsheet #125](#).

Interpreting Available N Balance Results

Field available N balances can be compared with feasible targets shown in Figure 1, defined based on a 2024 study with farmers and farm consultants analyzing 994 New York fields. Fields performing in the red area have an N removal/N supply lower than 50% (minimum N removal/N supply), and/or a field available N balance larger than 142 lbs N/acre (maximum available N balance). Fields in the red area show the largest opportunities for N management

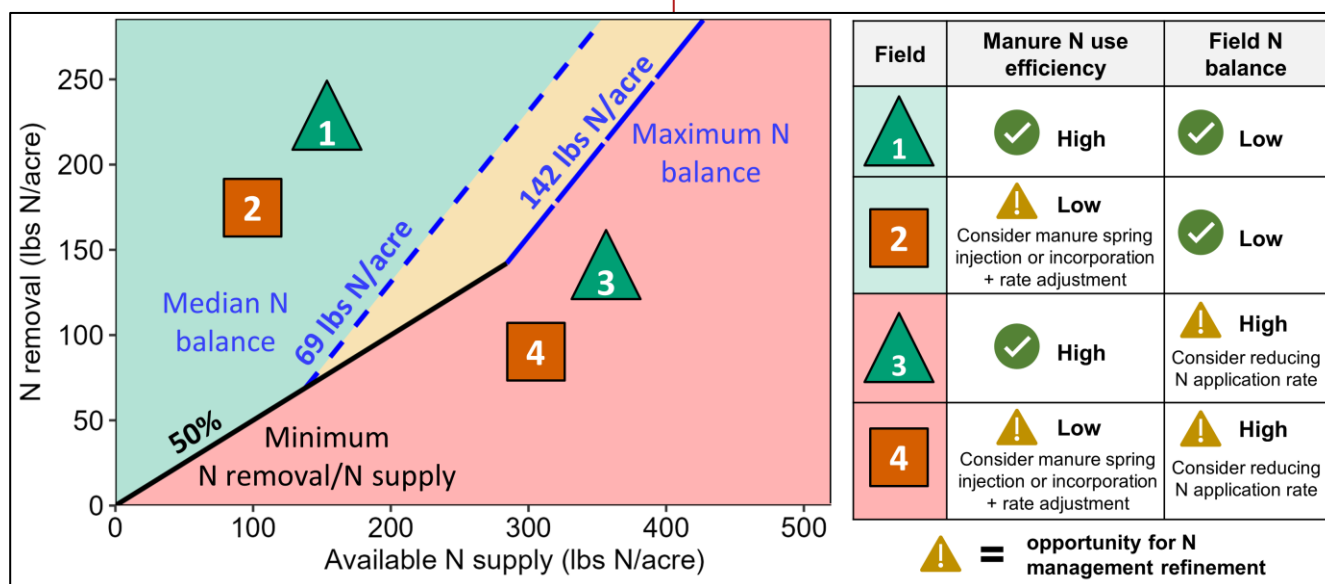


Figure 1. Feasible outcomes or target values defined for the N balance assessment framework and example of end-of-season available N supply and N removal for four corn silage fields.

refinement. Fields in the orange area, have balances lower than the maximum N balance but higher than the value that was achievable by 50% of fields in the study dataset (69 lbs N/acre). These fields may also show some opportunity for N management refinement. Fields in the green area display most efficient N use. For more details on how to use the results of an available N balance for a specific field under the adaptive N management process of New York, see [Agronomy Factsheet #129](#).

Considering Manure N Use Efficiency

As manure is a significant source of N on livestock farms, the field balance framework also considers how effectively manure-N is used. Fields with spring manure injection or timely incorporation have the most efficient use of N and are represented with green triangles (Figure 1, Fields 1 & 3). Fields with manure applications in the fall/winter, or surface application without incorporation in the spring (least efficient manure N use) are represented with red squares (Figure 1, Fields 2 & 4). Varied insights on N management refinement opportunities can then emerge (▲ in right table, Figure 1).

Prioritizing Management Interventions

Further insights can surface when available N balances are derived for all corn silage fields on a farm in a specific year. Fields with high N balances and yields lower than the farm average have the greatest opportunities for N management change (red corner, Figure 2). Using the flow chart in Figure 3, producers can analyze what factors may be limiting yield for a field with low N use efficiency, as their low yield was unlikely to be due to a lack of N.

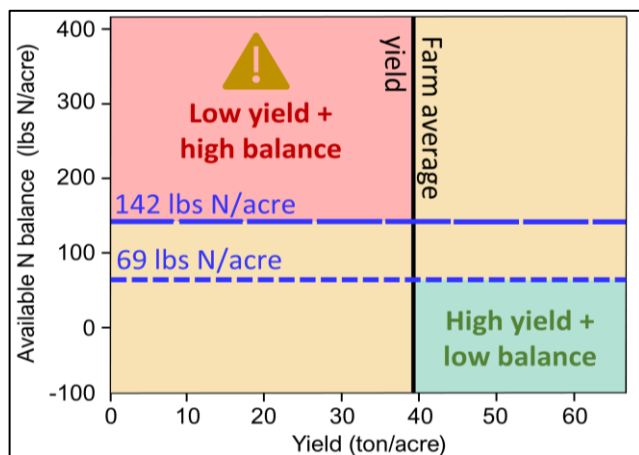


Figure 2. Field N balance vs crop yield across multiple corn silage fields of an individual farm.

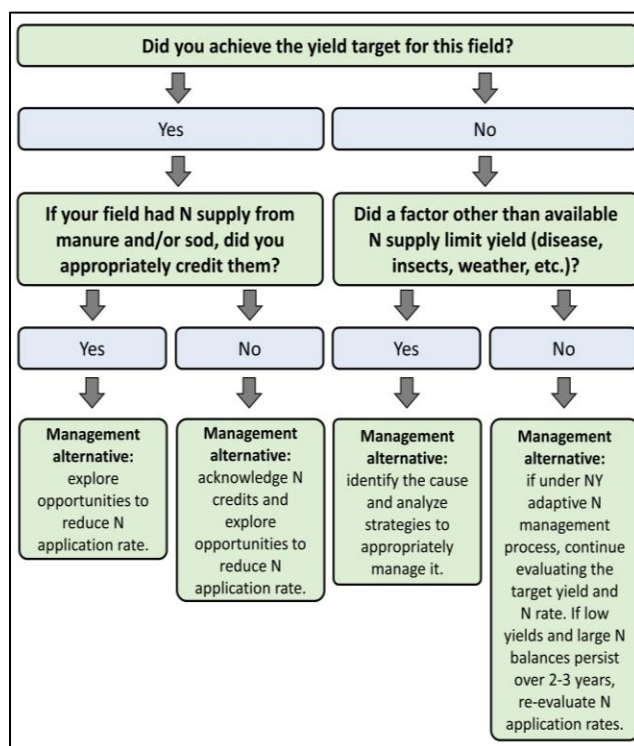


Figure 3. Dichotomous key to diagnose factors affecting NY corn silage fields with large N balance and low yields.

In Summary

Conducting an available N balance for all corn silage fields on a farm each year enables identification of field whose low yield is not due to lack of N, and prioritization of interventions for both crop and N management over time.

Additional Resources

- Cornell NMSP Agronomy Fact Sheet Series. <http://nmsp.cals.cornell.edu/guidelines/factsheets.html>

Disclaimer

This fact sheet reflects the current (and past) authors' best effort to interpret a complex body of scientific research, and to translate this into practical management options. Following the guidance provided in this fact sheet does not assure compliance with any applicable law, rule, regulation or standard, or the achievement of discharge levels from agricultural land.

For more information

 **Cornell University**
Cooperative Extension

Nutrient Management Spear Program
<http://nmsp.cals.cornell.edu>

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