PROJECT REPORT TO
VIRGINIA CORN BOARD

Project Title: Improving Nitrogen Rate Recommendations for Virginia Corn

Terms of Project: April 1, 2022 - June 30, 2023

Project Leader: Dr. Wade E. Thomason, Former Extension Grains Specialist, School of Plant and Environmental Sciences, Virginia Tech, Blacksburg, Virginia

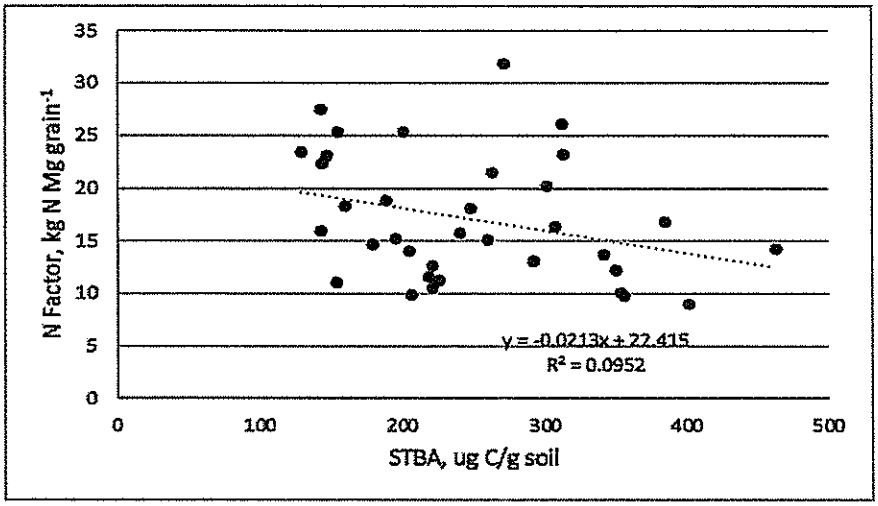
Locations:
13 Virginia locations, respectively, including Coastal Plain, Piedmont and Ridge and Valley sites.

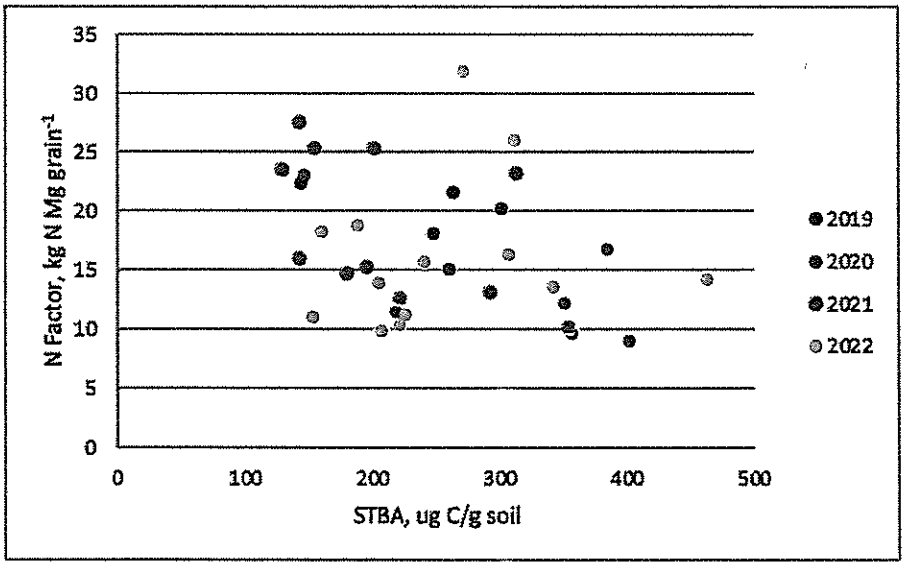
Project Objectives:
1) Evaluate the soil test for biological activity (STBA) from various soils as a predictor of corn N need on a field-specific basis.

Objective #1 **– Soil test for biological activity (STBA)**

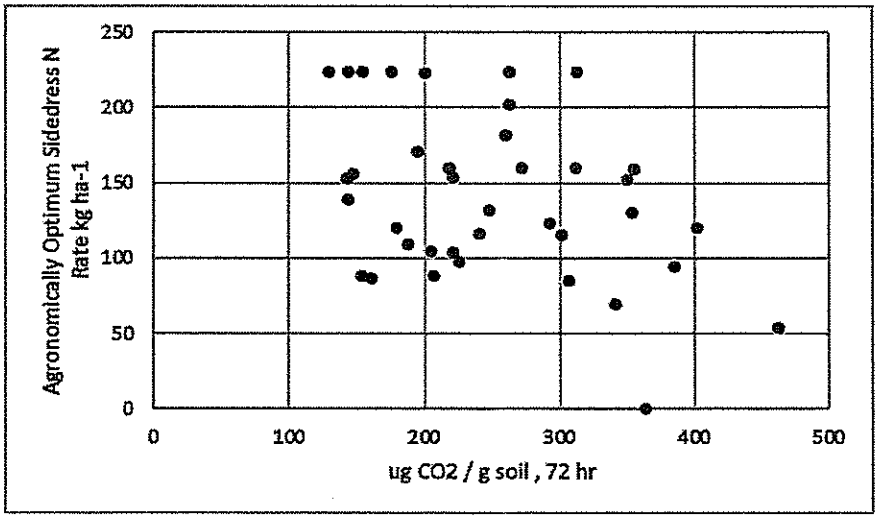
Nitrogen rate recommendations are traditionally based on yield goal in Virginia and most other states. Recent evidence suggests CO_2 evolution (or soil test biological activity) has a strong relationship with N efficiency per unit of yield goal (kg N Mg grain^{-1}). When considering different management practices and cover crop histories, our results from 4 years of trials suggest that the overall relationship was reduced to a level that is likely not biologically useful.

The graduate student involved tested at 13 fields with high to moderately-high yield potential throughout Virginia including the major soil types and corn growing regions. He collected soil samples (0-4") collected preplant and post-harvest and applied 6 N rates, 0, 40, 80, 120, 160 and 200 lb N/ac at sidedress in a randomized complete block design with four replications at each site. He also collected PSNT samples (0-12") at the time of sidedress. collected ear leaf samples from all plots at R1 and recorded yield, moisture and N content at harvest.

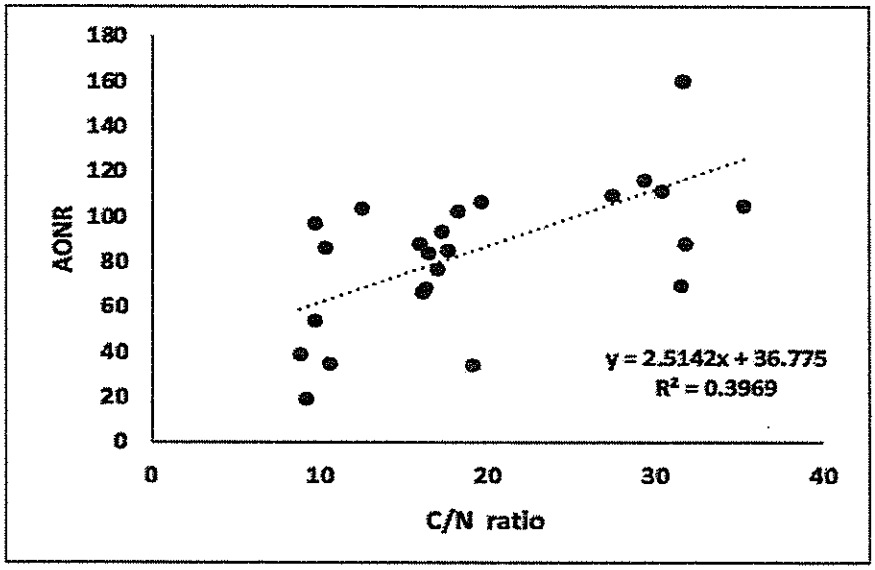




There was little relationship between STBA and agronomically optimum sidedress N rate as shown below.



All sites in 2021 and 2022 and some in 2020 had winter annual cover crops in place prior to corn. It is likely that the contribution of these cover crops to N cycling (mineralization or immobilization) affected our results as the STBA analysis was not sensitive to cover crop. We did find a moderate relationship between cover crop CN ratio and AONR, suggesting that cover crop N level had a major influence on N dynamics (Figure below). It is likely that factors in addition to the STBA value will need to be considered when making decisions about corn N management.



Conclusion:

Based on this set of samples from a representative set of fields, it appears that the STBA test alone is not sufficient to quantify adjustments in corn N need. In this case the majority of fields had a winter annual cover crop present with approximately ⅓ of fields in grasses, ⅓ in legumes, and ⅓ in mixtures. Future work should measure/define the contribution of winter cover crop to the corn N pool.

Because of the timing of the test, it does not account for cover crop N contribution (or immobilization) and that cover crop N cycling piece seemed to be a major influence on these outcomes. See the regression with CN ratio vs ANOR. We do believe it is one more piece to add to the N management puzzle and a reasonably reliable of soil N supplying POTENTIAL (note that potential is under ideal conditions).

This work highlights the need for sound agronomic interpretation of any data of this type. It's a lot better in context and with other insights than in a vacuum. We would encourage farmers to conduct their own N rate response trials on farm. Combined information from soil C/OM, weather, management and experience from multiple years of response trials will provide farmers with powerful tools to make the best decisions for their business.