High yielding silage field sections had higher soil microbial biomass across 3 fields on a New York dairy.

Within-Field Variability of Soil Characteristics and Corn Yield Stability

INTRODUCTION

- Yield stability: ability of a field section to produce consistent yields despite variable weather.
- Is this related to within-field soil differences?

MATERIALS AND METHODS

1. Collected multi-year silage yield monitor data records.
2. Created "Yield Stability Zones", categorizing each 2 x 2 m field section by yield and year-to-year yield consistency above or below the farm averages.
3. Used R code to determine sampling locations within zones.
4. Soil samples (0-20 cm) were taken within 48 hours of substantial rain in June 2020.
5. Samples analyzed for microbial biomass by Prolific Earth Sciences (microBIOMETER test kit) and for KCl extractable NO_3^- and NH_4^+ by NMSP laboratory.

PRELIMINARY RESULTS

Microbial biomass was variable but highest in Zones 1 and 2 (Figure 1).

- Zone 1: High Yield, Low Variability
- Zone 2: High Yield, High Variability
- Zone 3: Low Yield, High Variability
- Zone 4: Low Yield, Low Variability

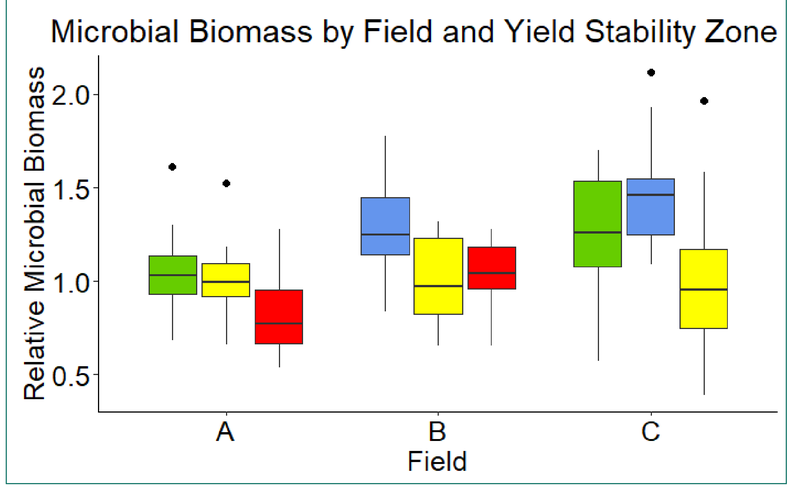

Figure 1: Three Yield Stability Zones were sampled in each field.

DISCUSSION

- These results are consistent with Zone 2 yielding the highest in low-stress cropping seasons.
- Timing of sampling related to crop growth and rainfall is critical for comparing microbial biomass.
- Future trials (more farms/fields) may offer management insights.

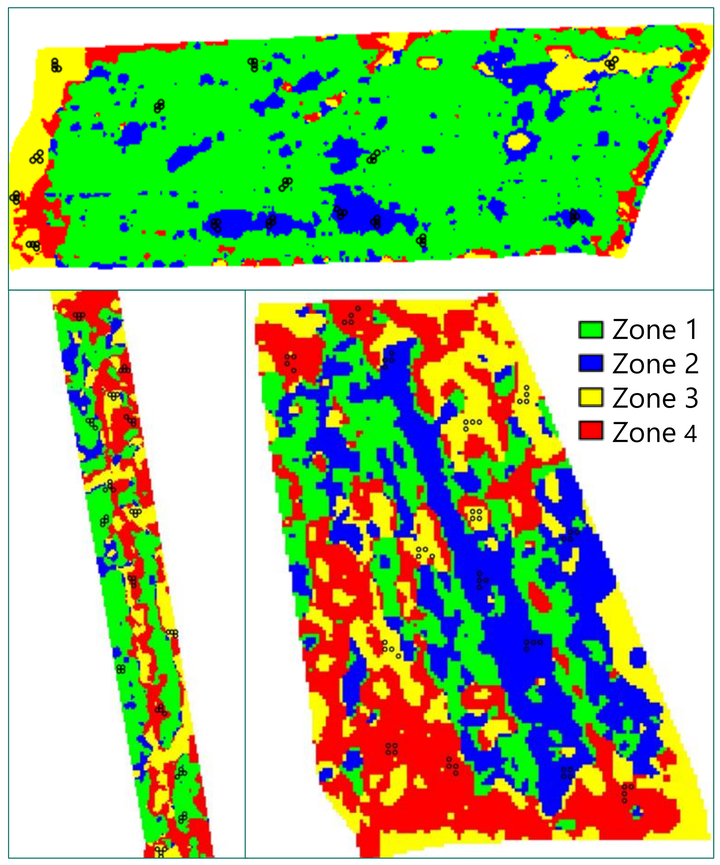

Figure 2: Yield Stability maps and sample sites. 60 composite soil samples per field (180 total) were collected using Trimble Juno 3B GPS units.

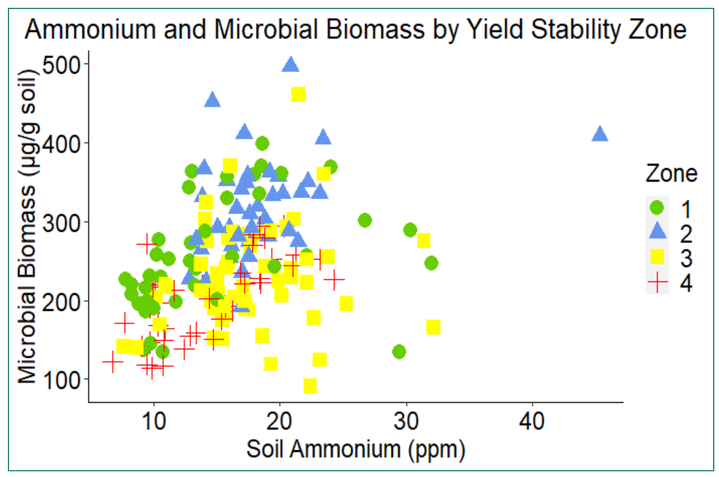

Figure 3: Microbial biomass tended to increase with soil NH_4^+ within and across zones although results showed large variability within zones.

Methodology for comparing microbial biomass across zones and fields:

- Microbial carbon (MC) determined in µg per g soil using the microBIOMETER® test kit.
- To determine relative microbial biomass, each sample's MC was divided by the average MC of Zone 3 for the specific field.
- Unadjusted MC correlated better with NH_4^+.

Ben Lehman [a], Jason Cho [a], Bea Mace [a], Celia Walden [a], Karl J. Czymmek [a,b], and Quirine Ketterings [a]

[a] Nutrient Management Spear Program, [b] PRO-DAIRY Program at Cornell University

Funded by Prolific Earth Sciences, Inc., JumpStart Program, Rawlings Scholars, Federal Capacity Funds

Questions? Ben Lehman (bhl46@cornell.edu) or Quirine Ketterings (qmk2@cornell.edu)