DO MY CROPPING PRACTICES IMPACT SOIL MICROBIOLOGY?

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There is a considerable amount of excitement surrounding the idea of "soil biology" and its role in agriculture today. Maintaining healthy soil is important, and certainly involves paying attention to the living organisms in the soil. However, studying soil microbiology is complex, there are limitations to the current methods of research, and there is a lot of information and claims out there that can be hard to sift through. This session will cover how a microbiome study is typically conducted, outline some limitations of this type of study, and present results regarding crop rotation and soil bacterial communities.

A few terms to know:

- **Microbiome**: *the microorganisms in a particular environment, like the gut, or soil.*
- **Next generation sequencing**: *newer DNA sequencing technology that allows a lot of DNA sequences to be read simultaneously.*
- **16S rRNA Gene**: *a barcode-like gene that all bacteria have, that can be used to identify them. "ITS" is a similar gene in fungi.*
- **Alpha diversity**: *the total number of different types of species, also called richness.*
- **Beta diversity**: *variation in the types of species present in two different environments.*
- **Functional redundancy**: *when multiple organisms in the soil are able to carry out the same functions.*

---- Abstract for the research project ----

Crop rotation, but not cover crops, influenced soil bacterial community composition in a corn-soybean system in southern Wisconsin.

Crop rotation, the successive cultivation of different crops on the same field, has been practiced for centuries, and it is often associated with increased crop yields. Cover cropping is a less ubiquitous farming practice that also increases plant biodiversity over time. Cover crops are a soil conservation tool; they are grown between harvest and planting of the main crop to protect and enrich the soil. Increasing crop diversity with crop rotation and cover cropping may contribute to shifts in soil bacterial communities. Our first objective was to investigate the soil bacterial communities associated with growing corn (*Zea mays* L.) or soybean (*Glycine max* L.) continuously versus annually rotating these crops. Our second objective was to determine if the first season of cover cropping had an impact on soil bacteria in a corn-soybean system. Soil was collected from a long-term crop rotational study with continuous corn, continuous soybean, and annually rotated corn-soybean treatments. These rotation treatments had various cover crops established within each plot, which were sampled individually. Bacterial populations were estimated in each sample by extracting DNA and sequencing the V3-V4 region of the 16S rRNA gene. We found that soil pH, organic matter, and certain macronutrients were essential drivers in

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determining the composition of bulk soil bacterial communities. Continuously cropped corn and soybean had distinct bacterial communities, while annually rotated communities were similar in both crop phases. The incorporation of cover crops into the rotation system did not result in significant changes to the bulk soil bacterial community. This result was probably due to limited cover crop growth in the first year of establishment, and a limited amount of time for soil communities to respond to this change.