

## **Integrated Systems Molecular Analysis of Soil Nitrogen Cycling Genes**

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### **Project Brief**

Integrating crop and beef cattle systems provides a unique opportunity to not only study seasonal nitrogen cycling, microbial active carbon, different ratios of organic and inorganic C and N, but to also investigate soil nitrogen cycling communities at the molecular level.

In order to determine how nitrogen is cycling under the different crop rotations and integrated livestock grazing, we are using a molecular approach. This approach allows for the determination of the ability of the soil microorganisms to perform particular functions within the nitrogen cycle. Utilizing the soil samples taken during the growing season, DNA has been extracted from each of the soil samples. The total DNA from each sample is being subjected to Quantitative Real Time Polymerase Chain Reaction (qPCR) analysis to determine the quantity of microbes that possess the ability (the enzyme) to perform nitrogen transformations. The transformations under study include: denitrification, ammonification, and nitrogen fixation. The abundance of these nitrogen transformation genes will be compared to the total number of soil bacteria allowing us to determine the relative capacity of the soils to perform the various nitrogen transformations.

The qPCR analysis is ongoing and will be completed within a few months (delayed due to coronavirus telecommute mandates). Our research team was on track to complete this first round of sampling and analysis by this spring. Social separating mandates have completely stopping laboratory activities. With no end in sight to the coronavirus COVID-19 pandemic, it is impossible to plan activities for qPCR analysis completion. In addition to completing the current soil samples that are on hold, another round of soil sampling for qPCR analysis is scheduled for the 2020 cropping and grazing season.