



## PROGRESS REPORT

**PROJECT TITLE: Climate Change Impacts on Minnesota Corn Production and Environmental Consequences**

**REPORTING PERIOD:** May 1, 2018 to July 31, 2018

**PROJECT NUMBER:** MN CORN RES & PROMO COUNCIL 4118-15SP

**PRINCIPAL INVESTIGATOR:** Tim Griffis

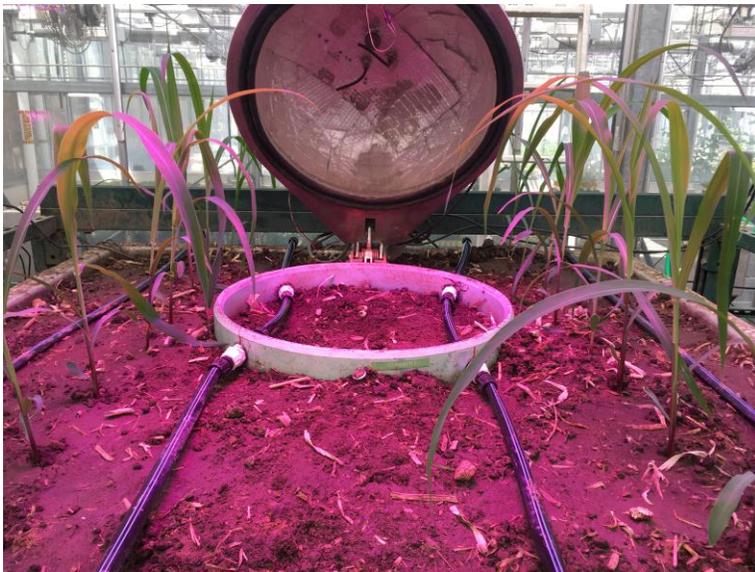
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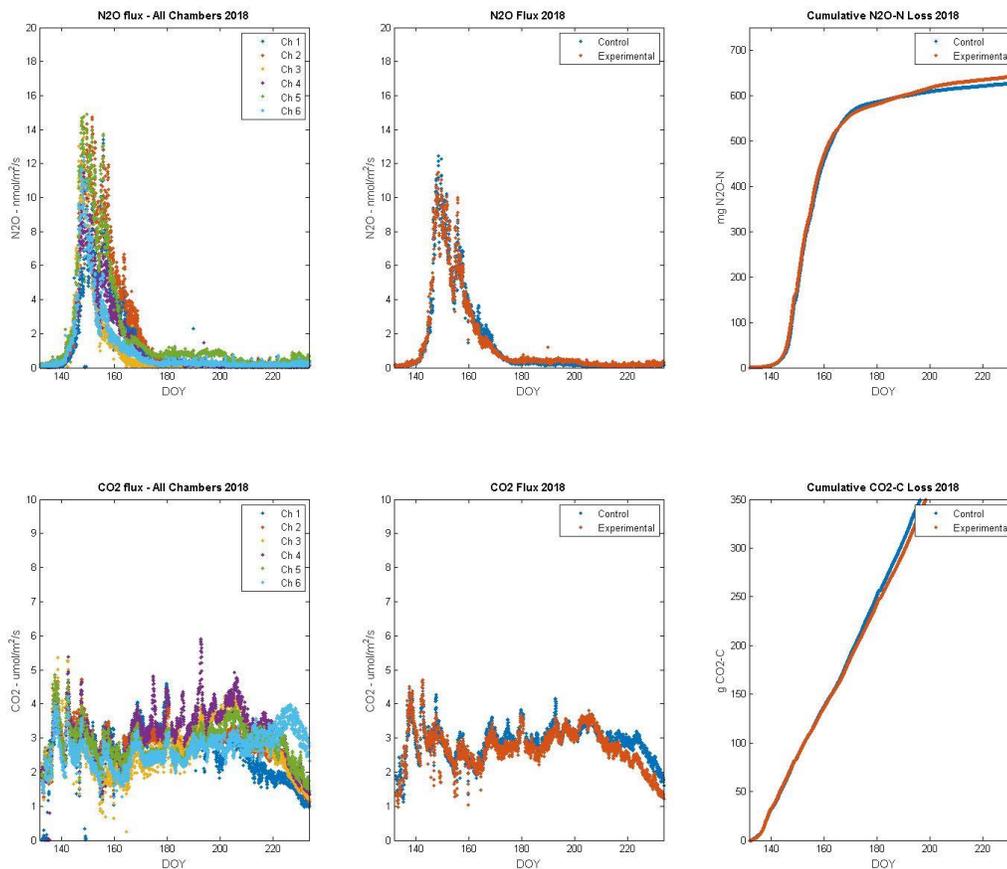
1.) **PROJECT ACTIVITIES COMPLETED DURING THE REPORTING PERIOD.** *(Describe project progress specific to goals, objectives, and deliverables identified in the project workplan.)*

Over the past three months we have been conducting our final growing season climate change experiment using a conventional nitrogen fertilizer management scenario. We have made several improvements to the Mesocosm system including a new drip irrigation system, which applies water more evenly and consistently among the soil chamber treatments. The photo below illustrates the new drip irrigation system developed and deployed by graduate student Lee Miller. Further, we have updated a number of the automated chamber systems for improved estimates of greenhouse gas emissions from the mesocosms.



## 2.) IDENTIFY ANY SIGNIFICANT FINDINGS AND RESULTS OF THE PROJECT TO DATE.

The multi-panel Figure below provides a summary of the 2018 experimental results (to date). It is exciting to note that our experimental treatment and measurement approach has yielded consistent and reproducible results compared to previous years. This is noteworthy given the amount of variability reported for nitrous oxide emission studies based on field measurements. The Figures below illustrate that we can make near-continuous measurements at the mesocosm facility with flux values that are consistent with expected field observations. These 2018 data, and our previous mesocosm experiments, clearly show that increasing precipitation will enhance nitrous oxide emissions to atmosphere and thereby reduce overall nitrogen use efficiency. In a related experiment, we are also seeing similar evidence for enhanced ammonia emissions under warmer and wetter conditions. We are not yet able to comment on how the climate change experiment has impacted yields in 2018. Those data will be acquired and reviewed in October 2018.



Moving forward, we see an excellent opportunity to assess how a non-conventional nitrogen management scenario will impact these nitrogen losses. For instance, because we have a consistent and reproducible result related to this climate change scenario – we can use that benchmark to assess how an alternative nitrogen management scenario will influence emissions. We plan to initiate this final experiment at the mesocosm facility at the end of October 2018.

3.) CHALLENGES ENCOUNTERED. *(Describe any challenges that you encountered related to project progress specific to goals, objectives, and deliverables identified in the project workplan.)*

Nothing to Report

4.) FINANCIAL INFORMATION *(Describe any budget challenges and provide specific reasons for deviations from the projected project spending.)*

Nothing to Report

5.) EDUCATION AND OUTREACH ACTIVITIES. *(Describe any conferences, workshops, field days, etc attended, number of contacts at each event, and/or publications developed to disseminate project results.)*

The experiments are being led by MS student (Lee Miller) and PhD candidate (Zichong Chen) in the Land and Atmospheric Science program. Two undergraduate students from ESPM have been hired to help with these experiments.