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**Progress Report**

PROJECT TITLE: Farmable Vegetative Buffers

PROJECT NUMBER:

REPORTING PERIOD: Aug 1 – Sept 30, 2019

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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.*)

Root and soil sampling was conducted on

Grain and stover samples were collected on October 28.

Our new 40 acre living mulch field is now established.

The following manuscript describing our findings on N requirements was published:

Alexander, J.R., J.M. Baker, R.T Venterea, and J.A. Coulter. 2019. Kura Clover living mulch reduces fertilizer N requirements and increases profitability of maize. Agronomy. 9(432): doi: 10.3390/agronomy9080432.

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

In the 2017 growing season, we found that in 1st year corn following kura clover (corn planted into established kura clover using zone tillage), there was no response to added N, i.e. – no significant differences in yield across the range of applied N from 0 to 223 lb acre-1, with yields averaging approximately 200 bu acre-1. For second year corn in kura living mulch, yields were optimized at an N rate of 107 lb acre-1, well below U of M recommendations. Stover yields followed the same trends as grain yields. Residual soil N at the end of the season was consistent with these results, i.e. – at optimum N rates (0 for 1st year, 107 for 2nd year) there was very little residual N susceptible to off-season leaching.

In the 2018 growing season, we found no yield response to added N in either the first or second year corn in the kura living mulch system. Average yield across all plots was 213 bu/ac, slightly exceeding the station average of 210 bu/ac.

Findings from spring management study:

There were no significant differences in soil N enrichment from retaining or harvesting clover residue pre- row establishment, therefore, we conclude that a pre-plant forage harvest will not reduce N-credits from the living mulch.

Strip-tillage increased soil N enrichment by 144% over band herbicide kill row establishment.

Nitrous oxide emissions from managed KCLM were significantly higher than unmanaged clover at p<0.1, with >2 kg/ha from 3 of the 4 treatments over a 6 week sampling period.

Findings from spring 2019

Our study investigating the effects on kura clover living mulch management on clover root and above-ground biomass dynamics found that living clover roots are present at roughly 8 tonnes per hectare prior to mowing and tillage management. Above-ground biomass was roughly 1/10th of the root biomass in the early spring, but clover shoots accumulated 400 kg/ha between 16 May and 21 May, even after strip-tillage management.

We are continuing to sample root and shoot biomass pools along with corn development with goals to determine kura clovers physiological response to stress under prolonged shading. These data will aid in our understanding of clover resilience under intensive management to facilitate the design of crop rotations that maintain clover health and realize observed agronomic and environmental benefits.

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

No specific challenges.

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

Project remains on budget.

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

**Outreach Publications**

None this quarter

**Outreach Activities**

August 5-7: A poster detailing kura clover systems and their flexibility within row-cropping systems was presented by Jon Alexander at the Nitrogen Use Efficiency Workshop at the University of Missouri in Columbia, MO, and received the third-place prize in the graduate student poster competition. This event was attended by 300 students, scientists, and industry professionals.

September 30: A talk that discussed nutrient and agronomic management was presented to a class of Minnetonka high school students that are participating in the VANTAGE Global Food Sustainability program on.

October 23: Uur work was featured in the college level Science in Seconds competition, where students are asked to describe their work and its broader impacts in three minutes. This was attended by 40 students, faculty, staff, and administrators in CFANS.

**Other**

We have successfully established a new 40 acre kura clover field on DNR land near the Rosemount Research and Outreach Center to replace the kura research field at Rosemount that has been lost due to a University effort to sell the land to a developer. The new field is now ready to have corn planted into it next spring.