

# What will it take to restore organic matter to Iowa's soils?



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**Amount requested for renewal year: \$15,905**



## Scope of Work

Work plans for coming year, where I am in original timeline, what objectives and strategies will be employed, and who will do the work

This project has two major activities 1) Field experiment measuring decomposition rates in materials with different carbon and nitrogen contents and 2) Organic matter decomposition simulations and models inter-comparison.

In the coming year, I will measure remaining mass of prairie, fertilized prairie, and maize roots at two points to determine the rate at which mass is being lost (decomposed). The decomposition rate will be linked to both soil depth and carbon and nitrogen content of the original root material. Additional measurements will be made in 2018.

I am using the Agricultural Production Systems Simulator (APSIM) for the model intercomparison and have a version of the model that is very well-calibrated for my study site for maize root decomposition. However, there have been several improvements made in the prairie version of APSIM and I am currently recalibrating the model for use in the model intercomparison. This should be done by the end of February, at which point I will move on to incorporating APSIM's structure with other widely-used soil carbon models to perform a model intercomparison using soilR, an R-based modeling platform.

## Brief project summary

The priority for the first year of the project was to terminate areas of prairie, fertilized prairie, and maize to create a pool of dead organic matter in the soil. After these plant systems reached peak root biomass, I cut 6 ft x 6 ft areas of vegetation and then allowed for some regrowth. When the areas became green again (except the maize), I applied glyphosate to permanently kill the vegetation in the area. I took soil cores to a depth of 1 meter (6 ft) and over the last few months have removed the soil and leaf residue from these samples, leaving only the roots. This serves as my initial measurement of root biomass in the three different treatments (Fig. 1).



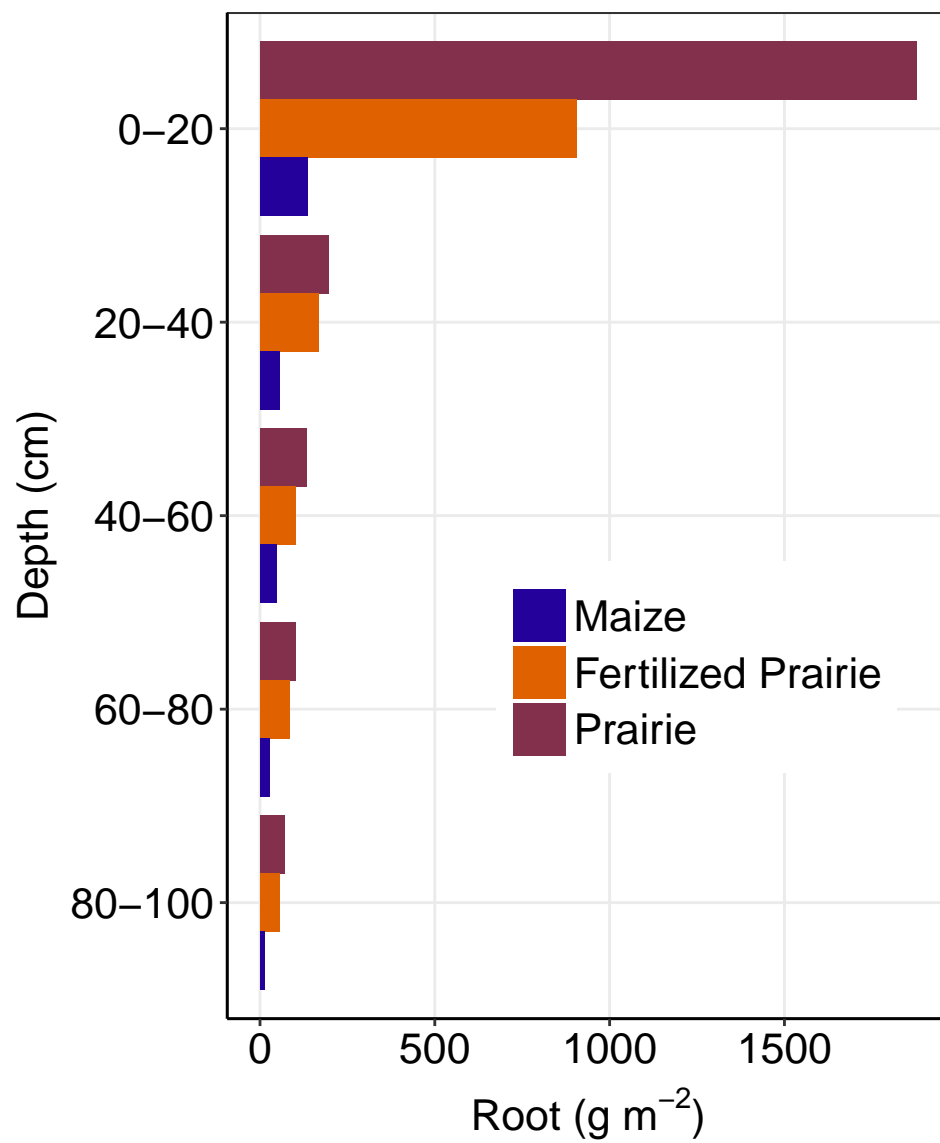


Figure 1. Root mass at initiation of experiment.

The prairie experiments in which I am working have recently undergone a thorough analysis related to species community composition over the first six years of the experiment, performed by a colleague on the experiment. This new analysis, combined with improvements to the APSIM prairie model will allow me to make a very complete calibration of the model that will simulate changes in prairie functional groups over time, key to simulating both the proper organic matter inputs and soil environmental conditions needed to model long-term soil carbon dynamics. This, along with running a suite of other models, will help us determine how much organic matter needs to be added to Iowa soils in order to bring soils to a “restored” level.

The only changes made for the reporting year is the addition of materials to build partitions to place in the soil around the terminated areas to prevent new roots from growing into the dead-root areas.

## Budget Narrative

I have funds carried over due to the fact that the undergrad assisting me had the wrong account number on her timecard. I will start paying her on the LCSA account for the time she has already spent processing roots. This time was according to budget ~ 225 hours at \$10.50 (\$2,363). According to Deborah Hop, I will have some 2016 funds remaining after accounting for these costs. If possible, I would like to use any other carry-over funds towards carbon and nitrogen content analysis of the root material collected in 2016.

*Salary/Hourly:* We are requesting 20% salary per year for PI Dietzel, who will run the decomposition model simulations, take field samples, build the interactive online visualizations, and write the press and scientific articles (\$10,100/year).

We are also requesting pay for 225 hours per year at \$10.50/hr for an hourly worker to process field samples in the lab by separating roots from soil (\$2,363/year).

*Payroll Benefits:* We are also requesting funds for benefits for PI Dietzel at 33%, resulting in the need for \$3,333.00/year.

The benefit rate for hourlies is 4.7%, resulting in a need of \$109.00 for each year.

## Budget

Salary and Wages: \$12,463

Fringe Benefits: \$ 3,442