

2016 GLBRC Baseline Sampling Report

Biofuel Cropping System Experiment (BCSE)

Soil

Soil was sampled three times in the BCSE plots in 2016. Samples were taken on May 9, June 27 and October 24 in all replicates (R) 1-5 of all treatments (G) 1-10. Soil was sampled using ¾" diameter push corers. Three cores (0-25cm) were taken from each of the three sampling stations and all 9 cores composited for each plot. Inorganic nitrogen extractions and soil moisture determinations were done on subsamples from all soil sampled. Analysis of the extracts for nitrate and ammonium will be completed by Cathy McMinn during winter 2016-2017.

Also on October 18, soil was sampled from the microplots in G1-10 R1-5. Nine cores (0-25cm) were composited from each microplot. These samples along with the October 24 main plot samples were air-dried and archived. Also, a subsample from each was sent to the MSU Soil and Plant Nutrient Lab for standard analysis which includes pH, lime requirement, P, K, Ca, and Mg.

Gas

Gas was sampled eighteen times on the BCSE using static chambers (round) between March 31 and December 2, 2016. Main site plots that were sampled include G1-5, and 10 in R1-4, as well as the microplots in G2, 3, and 4 in R1-4 - where the cover crop was removed. For all gas sampling, frequency was twice each month, except for a seven-week period following fertilization when sampling was done weekly. Samples were taken between 8am and 12noon. Winter gas sampling began on December 21 and should continue monthly through March 2017. BCSE plots sampled during the winter are G1, 4, 5 and 10 in R1-4, but none of the microplots. All gas samples were analyzed for nitrous oxide, carbon dioxide and methane by Kevin Kahmark using the Agilent/Gerstel automated GC in Academic 330.

Soil temperature and soil samples to determine moisture content were taken near each chamber when gas was sampled during the field season. Air temperature was logged both inside and outside, while light was measured outside, of some chambers using HOBO dataloggers.

An automated gas sampling system was used to analyze gas from all treatments in block 1 daily. Automated chambers were sampled four times each day. Samples were analyzed immediately for nitrous oxide, methane and carbon dioxide.

Water

Soil water samplers were used to collect water from the soil in G1-10 R1-4. Samplers were evacuated and leachate collected about twice each month. Fourteen collections were made between March 28 and November 14. The leachate collected was delivered to David Weed in the Hamilton Lab for analysis.

Plants

Above-ground biomass: Plant biomass samples were taken from the BCSE plots at their peak and/or just prior to harvest. Species separations were completed on the majority of samples taken. The plant sampling season began with cover crop samples taken from G2, 3, and 4 on May 16. Live leaf samples were taken from the G8 main and microplot trees on July 11. In the main part of G8, understory samples were taken July 22. Leaves were collected in ground traps as they fell from the trees in G8 between July 22 and November 17. Traps were typically checked bi-weekly and leaf litter collected. At peak biomass, mid-August through mid-September, plant samples were taken from G5, 7, 9 and 10, as well as the G5 unfertilized microplots. Soybeans were sampled near their peak in G4 on September 26. Peak corn samples were taken from G1, 2 and 3 on September 27. On October 6 and 10, miscanthus ANPP was sampled from G6. On October 12, the residue remaining following machine corn stover collection was collected from the ground in G2 and 3 to evaluate collection efficiency. Corn stover residue from G1 was collected on October 25. Continuing the sampling that began in 2014, plant samples were taken to evaluate harvest efficiency just prior to machine harvest in G1 on October 24 and in G5, 7, 9, and 10 on October 31 and November 1. Harvest efficiency samples were taken from G6 on November 15. Poplar tree diameters from both the main and microplot portions of G8 were measured December 7. One tree from each of the five replicates of G8 was harvested on December 13. Height, diameter and weight measurements were recorded for each tree. All plant material from all samplings was dried at 60°C for at least 48 hours. The dried biomass will be weighed, ground and archived. Subsamples will be analyzed for carbon and nitrogen by Stacey VanderWulp.

Below-ground biomass: No sampling for roots was done on the BCSE in 2016.

Phenology: Weekly checks for emergence began in mid-March, 2016. Following emergence, phenology data was collected twice each month from May 6 – November 4 in all plots of block 1. Average plant height measurements were taken three times, including once near or at peak. Phenology data was collected by Matt Arndt and Jack Gibson.

Leaf Area Index (LAI): Measurements of light for LAI calculation were taken twice each month between May 23 and November 4 in all plots of block 1. Sampling was done beginning just after sunrise and typically took 60-75 minutes. Readings were taken by Ian Turner and Jack Gibson using an AccuPAR LP-80 Ceptometer.

Scale-up Fields

Soil

Soil was sampled on November 28 in all the GLBRC scale-up fields at Lux Arbor and Marshall Farms. Soil was sampled using ¾" diameter push corers. Ten cores were taken to a depth of 25 cm at each of the 10 stations in each plot and combined. Inorganic nitrogen extractions and soil moisture determinations were done on subsamples from all soil sampled. Analysis of the extracts for nitrate and ammonium will be completed by Cathy McMinn during winter 2016-2017.

These soil samples will be air-dried and archived. Also, a subsample from each will be sent to the MSU Soil and Plant Nutrient Lab for standard analysis which includes pH, lime requirement, P, K, Ca, and Mg.

Gas

Gas was sampled eighteen times in the GLBRC scale-up fields using static chambers (round) between March 31 and December 2, 2016. All seven plots were sampled, L1-3 and M1-4, with four chambers in each plot. Sampling frequency was about twice each month, except for a seven-week period around fertilization when sampling was done weekly. Samples were taken between 12:45pm and 4:30pm, on the same day as the BCSE. All gas samples were analyzed for nitrous oxide, carbon dioxide and methane by Kevin Kahmark using the Agilent/Gerstel automated GC in Academic 330.

Soil temperature and soil samples to determine moisture content were taken near each chamber when gas was sampled. Air temperature was logged both inside and outside, while light was measured outside, of some chambers using HOBO dataloggers.

Plants

Plant biomass samples were taken from all plots when they were at or near their peak. Species separations were completed on all ANPP samples taken. The prairie plots, L3 and M2, were sampled August 22. The switchgrass samples were taken from L2 and M3, and the control field M4 sampled, September 15-20. Lastly, L1 and M1 corn fields were sampled September 27, 28. A residue sample was collected from the ground near each station following machine harvest in L1 and M1 on November 16. All plant material from all samplings was dried at 60°C for at least 48 hours. All dried biomass will be weighed, ground and archived. Subsamples will be analyzed for carbon and nitrogen by Stacey VanderWulp.

Switchgrass Nitrogen/Harvest Experiment

Soil

Soil samples were taken on November 8. Four cores (0-25cm) were composited from each plot. H1 and H2 were each sampled and kept separate. The field-moist soil was analyzed for pH by Gracie Curtis in the Robertson lab.

Water

Soil water samplers were used to collect water from the soil in blocks 2-4. Samplers were evacuated and leachate collected about twice each month. Fourteen collections were made between March 28 and November 14. The leachate collected was delivered to David Weed in the Hamilton Lab for analysis.

Plant

Samples were taken by hand at peak biomass in all plots, H1 and H2, on September 23. This was done to look more closely at biomass differences across the gradient that shows up in the machine harvest yields. A sub-sample from the machine harvest of these plots was saved. This biomass is dried and will be ground, archived, and analyzed for CN.

On July 14, GreenSeeker readings were taken in all the plots in the gradient. On the same day, three plant samples were taken from each plot as well. The dried samples will be ground and analyzed for nitrogen to relate to the readings from the GreenSeeker.

Written by Stacey VanderWulp