

National Centre for Livestock and the Environment (NCLE) Long Term Field Trial 2008 Year End Update

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Manure, Soil and Crop Management Practices

This was the establishment year for all treatments, so all plots were seeded to barley and harvested for silage; blocks dedicated to perennial crops were subsequently underseeded to a mixture of perennial grasses. Liquid and solid pig manure, as well as solid dairy manure were applied to plots in late fall 2007. Plots were seeded directly with a commercial-scale airseeder, without preseeded tillage, to Legacy Malting Barley on May 6, 2008. All of the synthetically fertilized plots received broadcast urea one day prior to seeding and monoammonium phosphate was placed with the seed. Urea was also broadcast on manured plots that required additional N to balance total amounts of N across all manure treatments in accordance with the N analyses for manure samples collected during application in fall 2007. Perennial forage plots were underseeded to a blend of 40% HPS Meadow Brome, 25% HPS Tall Fescue, 25% HPS LM Orchard Grass and 10% Colt Timothy on May 21, 2008 using a Brillion seeder at rate of 10-12 lbs/ac; the same blend and rate of forage seed was also planted on September 11, 2008 to improve the uniformity of establishment. All plots were sprayed with Refine M herbicide on June 24, 2008.

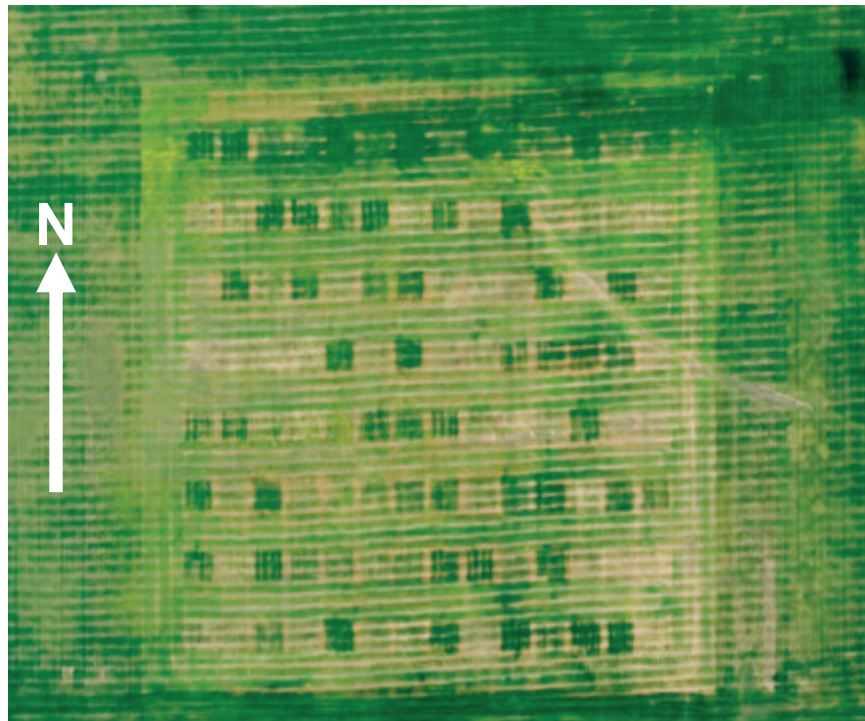


Figure 1. Aerial photo of the long term trial at Glenlea taken July 15, 2008, two days prior to harvesting the barley silage. Twelve treatments are arranged in 8 blocks, including 4 blocks of treatments for the annual cropping system and 4 for the perennial forage cropping system. Horizontal lines indicate the barley crop's response to chaff rows from previous year's crop; vertical lines within plots indicate crop response to manure and urea fertilizer application.

Silage was harvested on July 17, 2008. Annual crop plots were tilled in mid August, received manure in October and were cultivated twice afterwards. To encourage proper crop establishment, plots underseeded to perennial forage did not receive tillage or manure in fall 2008.

Sampling and Measurements

Biomass

Biomass samples were collected on July 17 immediately prior to the field scale silage harvest to measure yields, nutrient concentrations and nutrient uptake. Samples were taken using 5-0.25 m² quadrats per plot; wet and oven dry (70C) weights were measured. Samples were then ground for nutrient analysis and subsamples of the dried and ground samples placed in Ziploc bags for long term archival storage. Based on preliminary results (Table 1), the yield responses to synthetic fertilizer and liquid pig manure were greater than the response to solid pig manure and solid cattle manure, even when the various forms of nutrients were applied according to recommended methods of estimating "available N."

Soil

Soil samples were taken over a 10 day period after harvest using the Giddings (30-120 cm) soil sampler in three locations within each plot and with a Dutch Auger (0-30 cm) in five locations following the same "W" pattern as the biomass samples. These samples were air dried and ground for nutrient analysis. Residual N concentrations in these samples were similar and very low for all treatments (Table 1) and were used to determine rates of manure application for fall 2008.

A second set of shallow soil samples (0-15 cm) for microbial analyses was collected from the plots immediately after the crop was harvested, along with another set of samples one week after manure was applied to the plots. These samples were collected for Mario Tenuta and Denis Krause's research into microbial dynamics and pathogen persistence in the soil. Manure samples for microbial analyses were also collected at time of spreading. All soil and manure samples for microbial analyses were frozen fresh and stored at -80C.

Table 1: Biomass yields (kg ha⁻¹) and residual N (kg ha⁻¹) (0-60 cm) for NCLE long term field plots.

Treatment	Biomass Yield (Oven Dried, kg ha ⁻¹)		Residual NO ₃ ⁻ -N in Soil (0-60 cm, kg ha ⁻¹)		
	Annual	Perennial	Annual	Perennial	Mean
Control (no manure or fertilizer)	4263	2354	15	12	14
Synthetic fertilizer (N & P based rates)	10451	8674	21	17	19
Composted Solid Pig Manure (N based)	4795	3579	17	11	14
Stockpiled Solid Pig Manure (N based)	3950	2499	16	12	14
Liquid Pig Manure (N based)	7802	7834	22	15	18
Solid Dairy Manure (N based)	4676	4498	11	12	12
Stockpiled Solid Pig Manure (P based)*	4102	2822	15	15	15
Liquid Pig Manure (P based)*	8685	6304	15	13	14
Solid Dairy Manure (P based)*	5240	3138	17	14	15

*For P based manure treatments, synthetic N was added to meet crop N requirements where necessary.

Rob Gulden's research group conducted two weed surveys on the long term plots. The first was in late June and the second was mid August after harvest to see what weeds persisted. The data from the first survey was used to determine herbicide to use on the plots this year.