Meeting Corn Nutrient Needs with LysteGro Amendments

Georgian Regional Soil & Crop Project
Interim Report

Purpose:

Declining soil organic matter (SOM) levels combined with fewer livestock operations and reduced access to livestock manure has increased cash crop producer interest in municipal organic amendments such as LysteGro.

What is LysteGro (Lystek)

- Regulated through CFIA - treated as a fertilizer material
- Patented process that combines sewage biosolids + potassium hydroxide + heat (70 °C) + a lysing process
- 12-13% dry matter
- ~ 30 – 27 – 31 lbs/1000 gal of available N-P205-K20 in year of application
- relatively high sulphur (~12 lbs) and high organic matter (~ 500 lbs) content
- regulated through CFIA = product consistency - no need for NASM plan
- Custom applied (to prevent nutrient loss)
- Ideal rate between 3,000 – 4,000 gal/ac for corn
- High pH, high NH4-N = high volatilization risk
- Requires immediate incorporation

LysteGro has a good fit ahead of a corn crop that needs many of the nutrients that the product provides and when applied to a corn crop just ahead of planting or as a side-dress application would reduce environmental risk (volatilization, leaching, runoff) associated with nutrient loss from a nutrient-rich material with high pH and NH4-N.

The project evaluated the nutrient benefit of 2 rates of LysteGro fertilizer injected pre-plant into a corn crop compared to commercial fertilizer in a field scale replicated trial.

Methods:

Site Selection:

- Fields without manure the previous fall or legume plow down
- Starter only fertilizer with maximum of 30 lb. N/ac
- Sites with known field history to account for previous crops, etc
- Sites with uniformity across treatments within a replication.
- Plot size would be between 700 ft. long & field length. Each treatment is 40 ft. (16 rows wide) as LysteGro applicator is 20 ft. (8 rows)

Field length strips would include 2-3 replications of the following treatments as shown in Table 1. Application rates were determined using LysteGro nutrient analysis to meet a 160 bu/ac corn yield goal. The estimated nutrient availability for LysteGro at the rate targets are shown in Table 2.

1. Commercial Fertilizer to meet N requirements according to OMAFRA N Calculator

2. LysteGro @ 4500 gal/ac – i.e. current recommended rate for corn, based on OMAFRA NMAN program and 160 bu./ac corn yield goal
3. LysteGro @ 3,000 gal/ac approximately 2/3rds recommended rate

Table 1. Suggested Plot Layout for Project Sites

LYSETEGRO 3000 GAL/AC	LYSETEGRO 4500 GAL/AC	FERTILIZER – OMAFRAN CALC	LYSETEGRO 3000 GAL/AC	LYSETEGRO 4500 GAL/AC	FERTILIZER – OMAFRAN CALC	LYSETEGRO 3000 GAL/AC	LYSETEGRO 4500 GAL/AC	FERTILIZER – OMAFRAN CALC

Table 2. Approximate Nutrient Availability of LysteGro

	LYSTEGRO LB/1000		160 BU/AC CORN CROP REMOVAL	LYSTEGRO	
	TOTAL	AVAILABLE		4500 G/AC	3000 G/AC
NITROGEN	46	30	132	135	90
P205	69	28*	67	126	84
K20	31	28	46	126	84

*56 lbs P205 available over longer term

Results:

The study was carried out at 5 different locations with the layout shown in Table 1 and with individual site information shown in Table 3. Overall results indicate that the LysteGro provided the nutrients required by the corn crop and at all but one site, out-yielded the commercial fertilizer treatments by an average 16.5 bushels/acre (range -6 to 32). The site details and yield results are shown in the tables and graphs below. Original soil fertility levels were not available when compiling plot results, but the results suggest that micro nutrients, including sulphur, and the addition of organic matter had a positive impact on crop yield. This was especially evident in the site where corn was planted into an old sod field.

The results shown in Table 4 and Figure 1 also indicate that there was no benefit to the additional 1,500 gal/ac applied at the 4,500 gal/ac rate compared to the 3,000 gal/ac rate. A rate of 3,000 gal/ac provided the more economical yield, where the additional 1,500 gal/ac resulted in an average 3.3 bu yield increase (range -3.3 to 14). Soil and weather conditions affect the nutrient availability from organic amendments such as LysteGro, however in 2015, where cool and wetter than normal conditions affected nutrient availability from many manure sources, this did not appear to occur with LysteGro applications.

At harvest, in addition to yield, corn grain protein and stalk nitrate were also measured. Corn grain protein is an indication of late season nitrogen availability and harvest stalk nitrate test, indicates nitrogen left in the corn stalks at harvest and where levels are high provides an indication that applied nitrogen was in excess of crop needs. High stalk nitrate can be an indicator of potential risk for nitrate leaching.

Grain corn protein results, shown in Table 5 and Figure 2, indicate a trend that shows the highest protein for the 4,500 gal/ac rate and the lowest protein for the commercial fertilizer treatments and with very little difference between the 4,500 gallon rate and the 3,000 gallon/acre rate. Again this would suggest that 3,000 gal/ac was the appropriate rate for these sites.

The stalk nitrate test results, shown in Table 5 and Figure 3, also follow the trend of highest level of nitrate remaining in the 4,500 gal/ac rate and significantly lower amounts in the commercial fertilizer treatments. The difference at most sites between the 4,500 and 3,000 gal/ac rate suggests that 4,500 gal rate provided more nitrogen than the crop required. This was especially evident at the Blydorp and Bowman site. The Musselman and Wiley site stalk nitrate results would suggest that the crop may have responded to a higher N application, however, the plot results also suggest that there are other factors beyond nutrients that affect yield.

The trend for yield, grain protein and stalk nitrate was the same for each site, except the Pridham site, where yield, grain protein and stalk nitrate were all highest with the commercial fertilizer treatment, but yield from the fertilizer treatment was only 6 bu/ac higher. Clearly there was something else (compaction, poor drainage?) happening at this site.

Table 3. Site Characteristics by Location

Site	Wiley	Bowman	Pridham	Blydorp	Musselman
Soil type	Loam	Silt Loam	Silt Clay Loam	Loam	Loam
Previous Crop	Wheat	Old sod	Wheat	Soybeans	Wheat
Planting Date	May 2, 2015	May 6, 2015	May 6, 2016	May 6, 2015	May 15, 2015
Variety	DK 36 (3650 CHU)	DKC33-78 (2500 CHU)	DK38-03IB (2675 CHU)	DKC33-78 (2500 CHU)	P9188 (2675 CHU)
Starter	135 lbs 8-32-16	19-34-22-6S–7Z	5-26-15	180 lbs 15-42-42-8S	No starter
Approximate Nutrients Applied (lbs/ac)					
Fertilizer check	11-43-22	154-106-94	~130-70-50	~160-76-76	~160- 0-0
3,000 gal/ac	90-84-84	162-84-84	90-84-84	90-84-84	90-84-84
4,500 gal/ac	135-126-126	207-126-126	135-126-126	135-126-126	135-126-126

Table 4. Corn Yields by Location (2015)

Site	Yield (bu/ac)			Yield Δ (lystegro vs fertilizer)
	Lystek Application		Commercial Fertilizer	
	4,500 gal/ac	3,000 gal/ac	N-P-K equivalent	
Blydorp	175.6	161.6	160.3	8
Bowman	135.3	135.4	103.0	32
Musselman	196.7	193.5	175.2	20
Wiley	220.5	218.1	191.6	28
Pridham	102.6	105.9	110.0	(-6)
Average	166.1	162.9	148.0	16.5

Table 5. Protein and Stalk Nitrate Levels by Location (2015)

Site	Protein (%)			Stalk Nitrate (ppm)		
	Lystek Application		Commercial Fertilizer	Lystek Application		Commercial Fertilizer
	4,500 gal/ac	3,000 gal/ac	N-P-K equivalent	4,500 gal/ac	3,000 gal/ac	N-P-K equivalent
Blydorp	7.7	7.3	4.6	1,750	684	18
Bowman	7.7	7.4	7.3	2,750	2,070	982
Musselman	6.5	6.3	5.8	665	420	2
Wiley	7.8	7.7	6.6	120	109	4
Pridham	5.9	6.1	6.4	14	8	533
Average	7.1	7.0	6.1	1060	658	308

Summary:

In 2015 the 3,000 gallon/acre rate of LysteGro gave the most economic corn yield with grain protein and stalk nitrogen close to the levels with 4,500 gal/ac application. The LysteGro (4,500 and 3,000 gal/ac results combined) gave an average 16.5 bushel/ac yield advantage to commercial fertilizer treatments with nitrogen applied at the N-calculator rate. Grain protein and stalk nitrate result confirm that in this study the 3,000 gal/ac rate was

Next Steps:

This project will continue into 2016. A project looking at application into standing corn and after wheat harvest with cover crops will also look at yield and environmental impact of LysteGro

Figure 1. Corn Yield Results by Treatment (bu/ac)

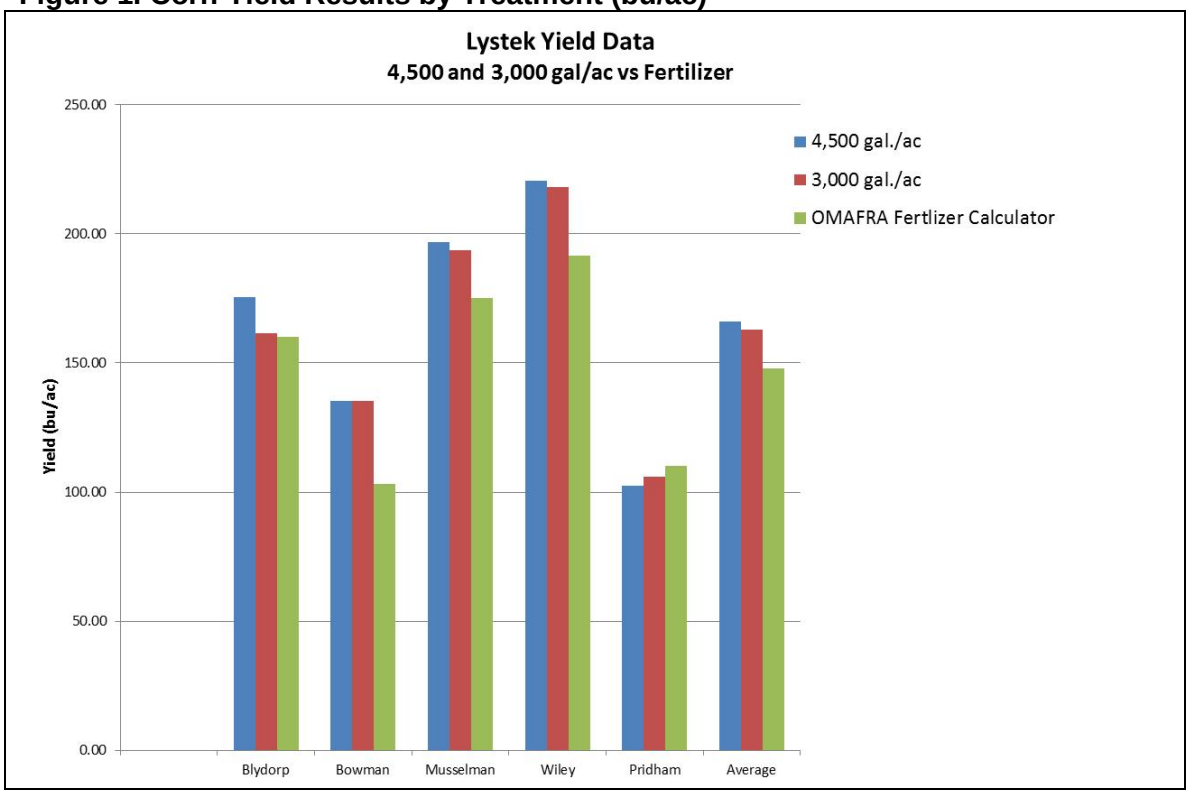


Figure 2. Corn Grain Protein Content By Location

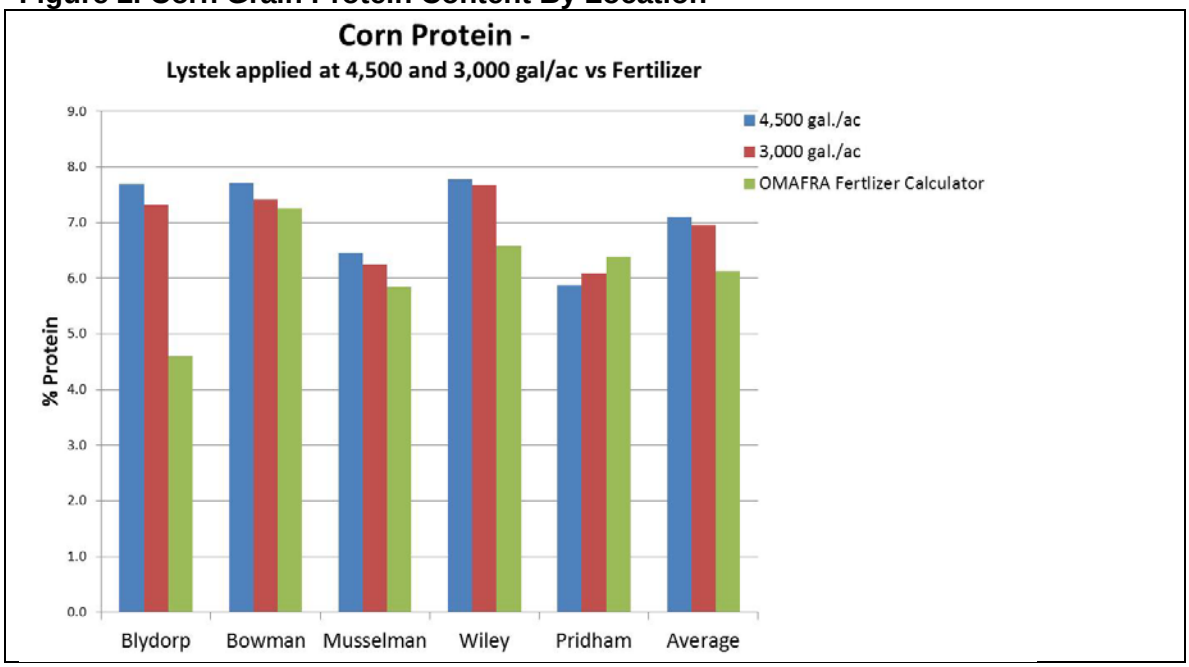
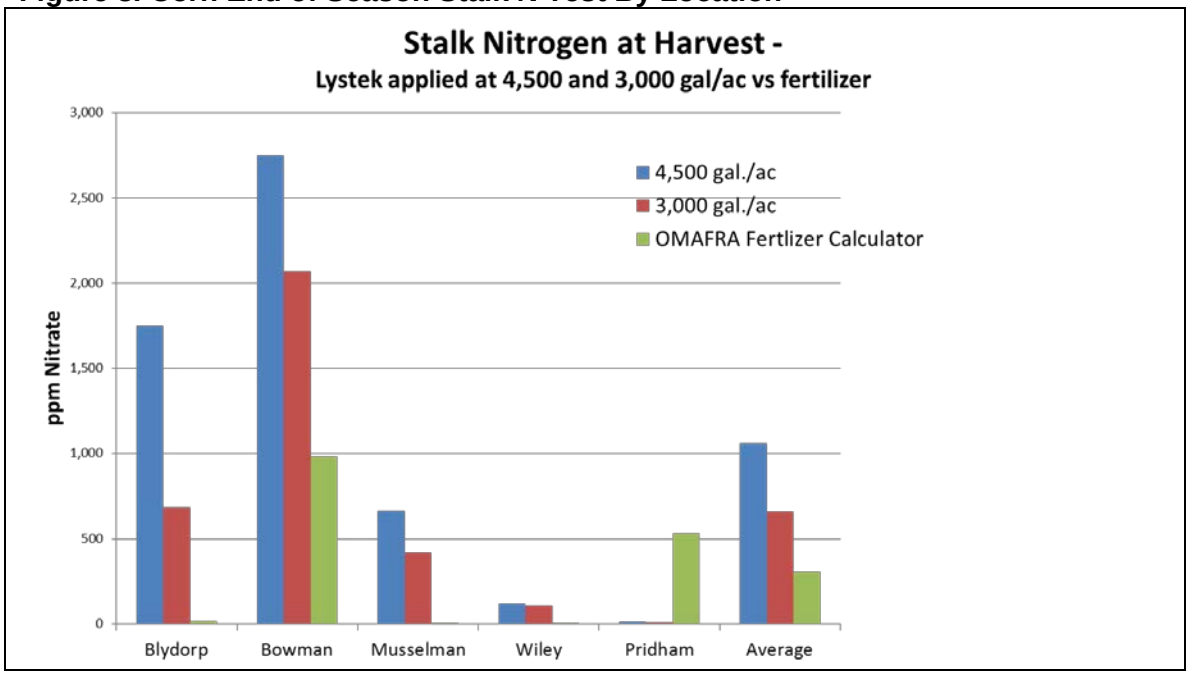


Figure 3. Corn End of Season Stalk N Test By Location



Acknowledgements:

Brian Hall (retired OMAFRA), Derek Hutcheson (OMAFRA summer student)
Andrew Barrie (OMAFRA
Michael Dougherty, Simon Muelendyk (Lystek)
Georgian Central Soil & Crop Improvement Association
Plot Co-operators
Highland Custom Farming, Ed & Jeremy Pridham , Leo and Jon Blydorp, Jon and Brian Wiley, Rob Musselman
Weigh Wagon Contacts
Wayne Foster, BJ's Farm Supply, Rosendale Farms, Todd Woodhouse (Dekalb)

Project Contacts:

Compiled by Christine Brown, OMAFRA, christine.brown1@ontario.ca