RAIN research note series:

Sulphur Fertilization on Brassica Vegetables

Since the 1850s, air pollution provided enough sulphur for crop production in Ontario, except in the northwest. As the world has been decreasing industrial pollution, some plants may need sulphur as a fertilizer. Ontario does not have a recommendation for sulphur application. Since brassicas are a group of non-leguminous crop that have a high sulphur demand and grow well in Northern conditions, a trial was developed to see how these brassicas would respond to the sulphur. Three brassica crops were picked to represent Algoma producers accurately; canola for cash croppers, cabbage, broccoli, and cauliflower for market gardeners, and a forage brassica mix that could extend grazing season for livestock producers.

The first part of this trial dealt with brassica vegetables and the effects that sulphur had on them. Cabbage, broccoli, and cauliflower were chosen because they are very common with most market gardeners in Algoma. and are in the brassica family. There were two site locations in Algoma; one location was strictly looking at cabbage, while the second location was looking at all three vegetables. The first location as in the Township of Johnson where one variety of cabbage was monitored. The grower had the cabbage started in a greenhouse, and then after several weeks transplanted the small plants in paper cups into the ground on June 5th-12th. The cabbages were planted into four blocks, with each block receiving rates of 0 kg, 12 kg, 24 kg, 36 kg, and 48 kg of elemental sulphur. This location had serious cut worm and flood problems. The cabbage did not produce well, and therefore sampling was not completed as there was nothing to measure. Before the flood, treatment four (36 kg/SO4) seemed visibly larger; however, the flood and cutworms destroyed most of the plants, so sampling was not completed.

The second location of this trial was on Hwy 17 in Tarbutt Township where all three vegetables (cabbage, broccoli, and cauliflower) were monitored. This location not only looked at the effects of sulphur on vegetables but also at the effects sulphur would have on vegetables when it came to storage longevity. Three plantings occurred, where varieties “Blue Vantage”- Cabbage, “Bishop”- Cauliflower, and “Diplomat”- Broccoli were monitored. Each planting/block received rates of 0 kg, 12 kg, 24 kg, 36 kg, and 48 kg of elemental sulphur. At harvest time (determined by the producer), ten vegetables out of each treatment were measured for height and circumference. This was done for all vegetables in all three plantings. Results were analyzed, and showed that treatment three (24 kg/SO4) and treatment four (36 kg/SO4) produced taller broccoli and cauliflower, and wider cabbage. Plants in treatments three (24 kg/SO4) gained 0.24 kg; treatment four (36 kg/SO4) gained 0.74 kg; whereas treatment five (48 kg/SO4) only gained 0.22 kg when comparing it to treatment one (0 kg/SO4).

After the vegetables had been measured, some of the vegetables were cut and put into cold storage. One cabbage per treatment, one cauliflower per treatment and three broccolis per treatment, at every planting, were harvested, weighed, and put into cold storage for later assessment. The vegetables in cold storage were assessed for saleability. Every two weeks after harvest, the vegetables were visually inspected. If they were considered unsellable (determined by the producer) they were taken out of cold storage. If they could still be sold, they were left in until the next assessment date. This was a way of seeing the effects (if any) the sulphur would have on extending the storage life of these vegetables. Results were analyzed, but they did not show any significant difference between the treatments and the longevity in cold storage.

Even though there was no evidence of the sulphur effecting the storage longevity, producers may want to consider applying sulphur to some brassicas as it did produce taller/wider cauliflower, broccoli and cabbage.

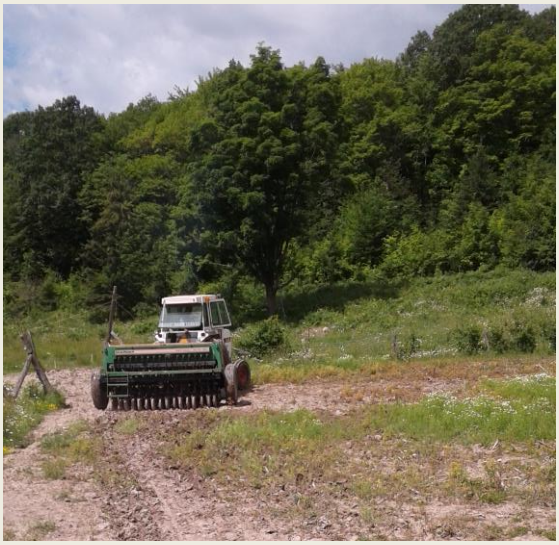
For more information about this project, please contact:

Mikala Parr, Research Technician, 705-942-7927 x3046, mparr@ssmic.com

Growing Forward 2 · RAIN Rural Agri-Innovation Network · AAC agricultural adaptation council · Ontario · Canada

RAIN research note series:
Sulphur Rates on Forage Brassica Mix

Since the 1850s, air pollution provided enough sulphur for crop production in Ontario, except in the northwest. As the world has been decreasing industrial pollution, some plants may need sulphur as a fertilizer. Ontario does not have a recommendation for sulphur application. Since brassicas are a group of non-leguminous crops that have a high sulphur demand and grow well in Northern conditions, a trial was developed to see how these brassicas would respond to the sulphur. Three brassica crops were picked to represent Algoma producers accurately: canola for cash croppers; cabbage, broccoli, and cauliflower for market gardeners; and a forage brassica mix that could extend grazing season for livestock producers.



The second part of this trial was working with a forage brassica mix, that consisted of kale and turnip and the effects sulphur had on it. This mix was designed for hunters to use to bait deer. In this case though, it was used as a forage extension crop for livestock – specifically, a cow herd. The animals would be able to graze the area in the late summer, early fall. The mix was planted on July 11th, 2017 with a no-till drill, with help from our farmer co-operator near Desbarats. Sulphur was added to see if it would influence yield or quality of the kale and turnip. There were 4 blocks, all containing rates of elemental sulphur at 0 kg, 12 kg, 24 kg, 36 kg, and 48 kg. The brassicas were also given background fertilizer on suggestion of the soil samples taken before planting. Algoma received a considerable amount of rain during the season but the brassicas did well. Blocks one and two grew rather well, however blocks three and four grew poorly. This could be due to the different soil types; the end of the field that blocks three and four were on, had more clay. Blocks one and two were on an area that was sandier. Samples from the brassicas were taken October 19, 2017. Within the week (late Oct), the cow herd grazed the remaining brassicas. Treatment four (36 kg/SO4) produced the best overall crop. It produced the highest yield on average within the blocks; however, once the higher rate of sulphur was applied (48 kg/SO4) the yield declined. Forage samples were sent to the lab to be analyzed but did not show anything significant. This part of the project shows that the sulphur did influence the kale and turnip, and that the second highest rate yielded the best.

DM Yield (tonnes/acre)					
Averages	T1	T2	T3	T4	T5
	2.70280	3.34795	3.36261	4.06153	2.57083
DM Yield (kg/ha)					
Averages	T1	T2	T3	T4	T5
	6678.74	8272.95	8309.18	10036.23	6352.66

Overall this whole trail was deemed a success. It was determined that sulphur does influence the yield of brassicas, especially in canola. Considering the wet year of 2017, the project worked out well. Producers should start thinking about adding sulphur to their regular fertilization techniques. A second year of all the trials would be beneficial to see the effects of sulphur on a more typical, dryer season.

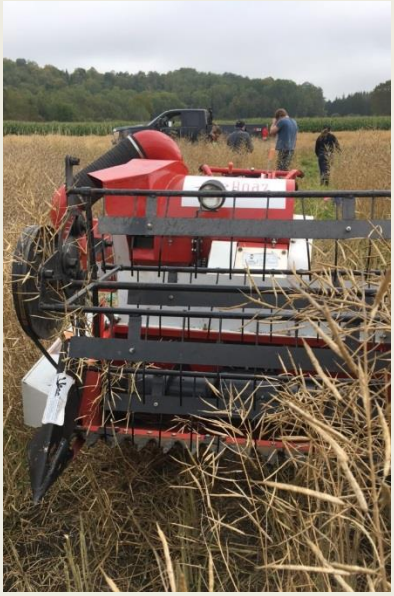
For more information about this project, please contact:

Mikala Parr, Research Technician, 705-942-7927 x3046, mparr@ssmic.com

This project was funded in part through *Growing Forward 2 (GF2)*, a federal-provincial-territorial initiative. The Agricultural Adaptation Council assists in the delivery of *GF2* in Ontario

RAIN research note series:
Sulphur Rates on Canola

Since the 1850s, air pollution provided enough sulphur for crop production in Ontario, except in the northwest. Since the world has been decreasing industrial pollution, some plants may need sulphur as a fertilizer. Ontario does not have a recommendation for sulphur application. Since brassicas are a group of non-leguminous crop that have a high sulphur demand and grow well in Northern conditions a trial was developed to see how these brassicas would respond to the sulphur. Three brassica crops were picked to represent Algoma producers accurately; canola for cash croppers, cabbage, broccoli, and cauliflower for market gardeners and a forage brassica mix that could extend grazing season for livestock producers.



The third part of this trial was looking at the effects of sulphur on a canola crop. This project was in partnership with Thunder Bay Research Station (TBARS); Thunder bay had one location and Algoma had one location. The location in Algoma was near Rydal Bank, where 40 plots of canola were planted and fertilized. The trials panned over half an acre, where four blocks, each block containing 10 plots was planted with canola variety- L252. The canola was planted on May 11, 2017. Background fertilizer of urea, phosphate and potash was applied as recommended from soil sample results. Two different sources of sulphur was applied, gypsum and elemental sulphur were used as the sources. Each fertilizer was applied at 0 kg, 12 kg, 24 kg, 36 kg, or 48 kg in each block. Tissue samples were collected at bolting stage and 25% flowering; but due to data loss of the tissue samples at the 25% flowering stage, samples were taken at the green pod to compensate the loss. The samples were analyzed for general nutrient uptake as well as sulphur uptake. The canola showed a significant uptake of sulphur during the bolting stage compared to the green pod stage.

The canola was harvested on September 12th-15th, 2017 by RAIN's research mini combine. Due to mechanical problems with the combine some of the plots were harvested by hand, using buckets. Samples that were hand harvested were noted, and analyzed separate.

The project was duplicated in Thunder Bay, where yields came back showing, that the higher the level of sulphur (either gypsum or ammonium sulphate) produced a higher yield. Since Algoma received a considerable amount of rain, this may have impacted Algoma's yields. Algoma's yield did increase with the higher levels of sulphur but after analysis, no correlation was shown between the yield and the amount of sulphur. The yield differences between machine harvested, and the hand harvested canola is significant. This can be attributed to machine loss. Using

Algoma- Mini Combine		
Ammonium Sulphate	**kg/ha**	**t/ac**
No sulphur	954	0.39
12 kg S/ha	1294	0.52
24 kg S/ha	999	0.40
36 kg S/ha	957	0.39
48 kg S/ha	1061	0.43
Gypsum	**kg/ha**	**t/ac**
No sulphur	1078	0.44
12 kg S/ha	851	0.34
24 kg S/ha	771	0.31
36 kg S/ha	1102	0.45
48 kg S/ha	890	0.36

Algoma- Hand Harvested		
Ammonium Sulphate	**kg/ha**	**t/ac**
No sulphur	**	**
12 kg S/ha	2328	0.94
24 kg S/ha	2271	0.92
36 kg S/ha	1691	0.68
48 kg S/ha	2230	0.90
Gypsum	**kg/ha**	**t/ac**
No sulphur	1986	0.80
12 kg S/ha	2652	1.07
24 kg S/ha	2180	0.88
36 kg S/ha	2459	1.00
48 kg S/ha	**	**

**Treatment was not hand harvested

Thunder Bay- Hand Harvest

Ammonium Sulphate	kg/ha	t/ac
No sulphur	1411	0.57
12 kg S/ha	5246	2.12
24 kg S/ha	6610	2.67
36 kg S/ha	6495	2.63
48 kg S/ha	6827	2.76
Gypsum	**kg/ha**	**t/ac**
No sulphur	1207	0.42
12 kg S/ha	5916	2.39
24 kg S/ha	6715	2.72
36 kg S/ha	7711	3.12
48 kg S/ha	6831	2.76

a machine to harvest is not as accurate as hand harvest. Soil samples were conducted post-harvest to determine the complete nutrient uptake of the canola. Results did not show any significant difference in the treatment rates when it came to overall nutrient uptake.

This trial showed that the sulphur did influence yield, the higher level of sulphur (either gypsum or the elemental sulphur) increased the yield. Producers should consider adding sulphur to their fertilizer applications on canola. A second year of this trial would be ideal, where more exploration could be done to see what the efficient rate of sulphur is.

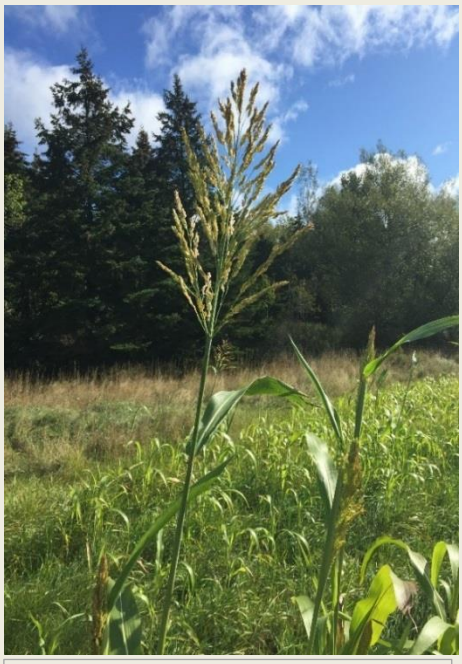
July 4th. 2017

September 12th, 2017

For more information about this project, please contact:
Mikala Parr, Research Technician, 705-942-7927 x3046, mparr@ssmic.com

This project was funded in part through *Growing Forward 2 (GF2)*, a federal-provincial-territorial initiative. The Agricultural Adaptation Council assists in the delivery of *GF2* in Ontario

RAIN research note series:
Nitrogen rates on Forage Sorghum



Block 1- September 29th, 2017

Block 1- September 29th, 2017

Local experience in the Algoma District has indicated that satisfactory yields from forage sorghum can be obtained using less nitrogen fertilizer than recommended, or none at all. This project was to determine experimentally whether it is economical to apply nitrogen fertilizer to forage sorghum at the rate currently recommended. This project was completed at Algoma Community Pastures, where four blocks of forage sorghum were planted on mulched and un-mulched areas. The Community Pasture was recently mulched by a local contractor, an area that was previously small poplars and tamarack and is now usable ground. The area was mulched on June 10th, 2017 then it rained for almost a month it seems. The sorghum was planted on July 10th, 2017 after most of the area had dried up, with help from the Community Pastures. The blocks received nitrogen at the rates of 100 kg N/ha, 50 kg N/ha, or 0 kg N/ha, as well as background fertilizer. Sorghum is a type of forage that needs heat, which is one thing Algoma lacked this season. Therefore, the sorghum did not perform as well as it could have. Block one showed the most progress, and resulted with the highest yield overall. In block two, the sorghum grew in spots but did not produce very well. Blocks three and four only grew about 4 inches and then stopped. No application showed a benefit on either of the mulched areas. A second fertilization and cut was planned but due to weather and timing it was not accomplished. Overall, this year's trial on forage sorghum was unsuccessful. The sorghum did not receive enough heat and received too much rain. Another year of this trial would be beneficial in order to see the effects of the nitrogen on forage sorghum on a more regular season.

Block	Location	Highest yield	Rate of Nitrogen
1	Un-mulched area	17,201.91 kgDM/ha	Full Rate (100 kg/N)
2	Un-mulched area	5,846.72 kgDM/ha	Control (0 kg/N)
3	Mulched Area	3,140.8 kgDM/ha	Half Rate (50 kg/N)
4	Mulched Area	4,832 kgDM/ha	Full Rate (100 kg/N)

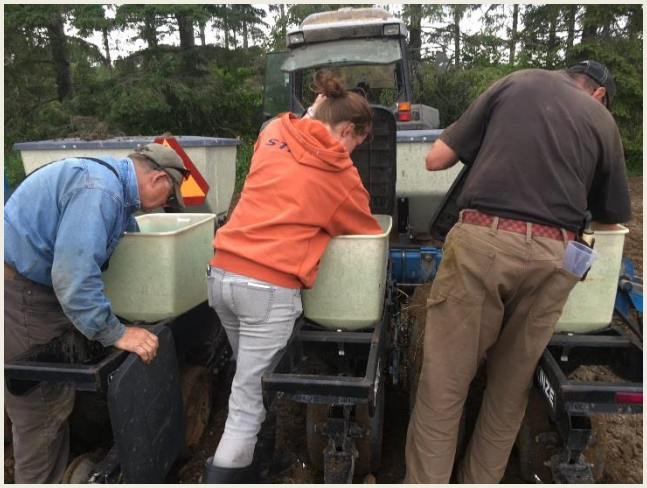
For more information about this project, please contact:
Mikala Parr, Research Technician
705-942-7927 x3046
mparr@ssmic.com

FedNor Canada
SAULT STE MARIE INNOVATION CENTRE
RAIN
RURAL AGRI-INNOVATION NETWORK

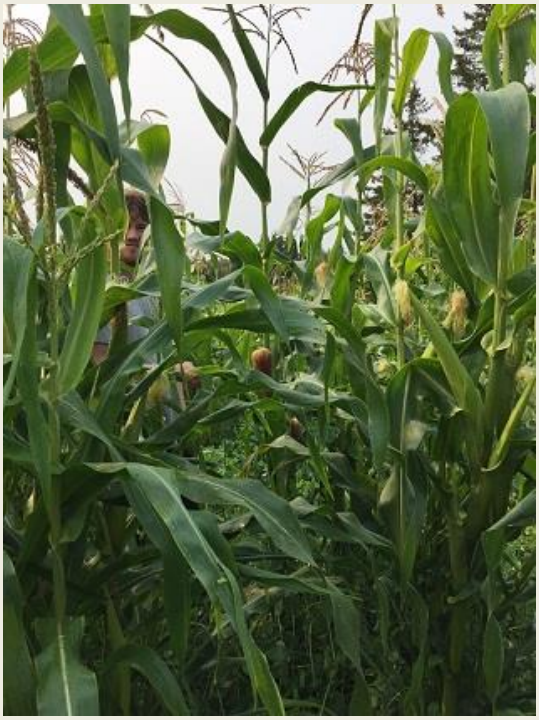
RAIN research note series:

Master Graze Corn Demo

During the 2017 season a small area of a local dairy farm was planted with a corn variety called Master Graze corn in Algoma. This variety is a short season variety but can be grazed or cut and baled. This variety will not produce fully developed cobs, which is why it can be grazed mid-summer. The corn was donated by Dwayne Weber of Choice seeds in Straffordville (email: dgnweber@gmail.com; Tel: 519-878-3728).



The corn was planted on June 14th, 2017 at 41,000 seed/ac. Planted with a no-till drill at 2'' depth and 30'' row spacing. The corn was planted in addition to field peas. The area where the corn was planted was slightly sloped. Since Algoma had such a wet year, the corn on the higher areas performed the best. Most of the lower laying areas did not perform well at all, and therefore were not harvested.



The corn grew over six feet tall in the dry areas, with only spring- applied manure for fertilizer. The Master Graze corn was treated with C250- (Cruiser Maxx Corn 250). The corn did develop some rust spots due to the extreme amount of rain. The corn and peas were cut on Sept 15th, and baled on Sept 16th. The feed results came back with a 10.40% crude protein level, and 61.25% total digestible nutrients (TDN).

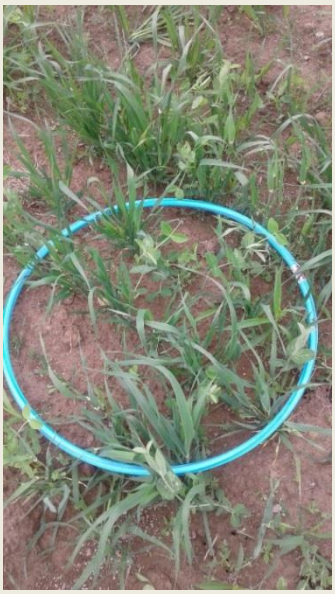
Overall, the Master Graze corn did well considering the lack of heat and extreme amount of rain. It grew well; on the small area that the corn occupied (under half an acre) it produced four 4X4 round bales. The cows that were being fed the baleage enjoyed it, and have been producing well on the Master Graze.

For more information about this project, please contact:
Mikala Parr, Research Technician
705-942-7927 x3046
mparr@ssmic.com

FedNor Canada
SAULT STE. MARIE INNOVATION CENTRE
RAIN RURAL AGRI-INNOVATION NETWORK

RAIN research note series:

Cross-seeding Forages



Conventional seeded- MacLeod
June 22, 2017

Cross-seeded- MacLeod
June 22, 2017

In Algoma, a new technique was demonstrated called cross-seeding (or cross-drilling) this past season. The project aims to determine if cross-seeding is an economically viable practice for establishing pasture and hay crops in Northern Ontario. Researchers from the Rural Agri-Innovation Network (RAIN), the Thunder Bay Agricultural Research Station (TBARS), and the Emo Agricultural Research Station (EARS), worked together and with farmers in their regions to test this planting technique. Cross-seeding is a technique for establishing a crop where half the seed is planted in a conventional drive pattern using a seed drill and the other half of the seed is drilled at a 45-degree angle to the original pass to achieve better ground coverage. The amount of seed and fertilizer does not increase; the inputs are cut in half for each pass. Thus, after completion, the same amount of fertilizer/seed is being used.

There were seven locations in Northern Ontario testing this method. Thunder Bay had two locations, Emo had two locations and Algoma had three locations. In Algoma, all three locations were in co-operation with farmers, where the farmer chose what mix they wanted planted. Both Thunder Bay and Emo had one farmer co-operator and one location at their research station. Depending on the size of the field, half of the field was planted with the cross-seeding technique and the other half was planted conventionally. Some areas in Algoma received twice the amount of fertilizer intended as a result of human error. Monitoring occurred every 1st, 3rd, 6th, and 12th week; % bare ground, % weed species, and % sown species was checked at every location.

Location	Locations	Date Planted	Conventional Yield kg/ha	Cross-seeded yield kg/ha
RAIN- MacLeod	Dunnes Valley	May 12th, 2017	5,992	5,074
RAIN- Stewart	St. Joseph Island	May 15th, 2017	18,265	17,250
RAIN- Prestedge	Huron Shores	May 13-14th, 2017	6,716	4,880
TBARS- Station	Thunder Bay	June 6th, 2017	1,776	3,012
TBARS- Farmer	Thunder Bay	May 27th, 2017	2,972	3,268
EARS- Station	Emo	May 25th,2017	3,154.8	4,004
EARS- Farmer	Fort Frances	June 3rd, 2017	5,364.8	3,128

A considerable amount of data was collected from all over Northern Ontario. Although Algoma did not see a dramatic change in yield between the two techniques, there was a significant difference when it came to establishment time and ground coverage. Thunder Bay showed a higher yield on the cross seeded site at the research station. Emo also noticed an increase in yield on the cross-seeded site at their research station. The cross-seeding sites established quicker and showed much better ground coverage. The cross-seeded sites were also noticeably thicker six weeks after planting. A forage quality analysis was taken and the results did not show any significant differences between the treatments. A second and third year of the trials would prove beneficial as the first year of establishment is not usually cut.

For more information about this project, please contact:
Mikala Parr, Research Technician, 705-942-7927 x3046, mparr@ssmic.com

This project was funded in part through *Growing Forward 2 (GF2)*, a federal-provincial-territorial initiative. The Agricultural Adaptation Council assists in the delivery of *GF2* in Ontario

Growing Forward 2 RAIN RURAL AGRI-INNOVATION NETWORK AAC agricultural adaptation council Ontario Canada