

AIM Research Trial Report: **Comparison of Corn versus Sudangrass for Soil Health and Potato Yield**
 Working Group: Soil Improvement
 Crop Year: 2022
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Project Rationale:

The amount of corn grown in rotation with potatoes in Prince Edward Island has been increasing in recent years. Corn is more common in potato rotations in some other parts of North America; however, there have been some concerns relating to possible challenges posed by corn in potato rotation, such as soil erosion, root lesion nematodes, and crop residue. There is a desire from PEI potato producers to get more information about how corn performs in rotations under local conditions compared to other alternative crops.

Project Overview:

Discussions were held with Birch Farms of Bedeque, PEI regarding a potential research field located in Searletown, PEI. This field has a center-pivot irrigation system and was planted to two different crops in 2021: corn harvested for grain and sorghum sudangrass (mulched during the growing season). Both fields were not tilled in the fall of 2021 and were soil sampled in May 2022 ahead of potato planting. Historically, this field was also managed in this way in the previous rotation: in 2018, corn and sudangrass were planted in the same sides of the field as they were in 2021.

Four soil samples were taken from each side of the field. Average fertility from soil tests for this field were:

Crop	OM %	pH	ppm							CEC
			P ₂ O ₅	K ₂ O	Mg	Ca	S	Zn	B	
Corn	2.7	6.4	377	274	126	1079	24.3	5.3	0.6	11.0
Sudangrass	2.9	6.4	394	236	130	1074	18.5	3.2	0.5	10.5

There was very little difference in nutrient concentrations between the two sides of the field, so it is unlikely that nutrient availability would be a confounding factor in this research. In addition, baseline nutrient concentrations were rated Medium or High for most individual nutrients. The only potential difference between the two sides of the field was for organic matter, where there was a 0.2% higher average on the side of the field where sorghum sudangrass in 2021. However, we did not have soil samples from each side of the field prior to rotation crops being planted in 2021, so this difference may have existed in the field prior to 2021. This difference is not statistically significant either, so there may not be much actual difference in organic matter across the field.

We also took soil health samples, taking a composite sample from each of the corn and sudangrass sides of the field. Results are summarized in the table below:

Crop	Sand %	Silt %	Clay %	Active C	Soil Resp.	Agg. Stab.	BNA
Corn	60.2	27.1	12.7	39 (L+)	9 (L)	24 (L)	33 (L+)
SS	59.1	27.8	13.1	34 (L+)	9 (L)	16 (L)	19 (L)

Active C: Active Carbon. Soil Resp.: Soil Respiration. Agg. Stab. : Aggregate Stability. BNA: Biological Nitrogen Availability. Numbers presented here are a score out of 100, based on how test results compare with other PEI fields in a similar crop rotation.

As you can see, there was very little difference observed between the two sides of the field for these soil health metrics. Lower ratings for aggregate stability and biological nitrogen availability on the sudangrass side are unlikely to be statistically significant (random sampling).

The field was planted with Mountain Gem Russets in late May 2022, destined for French fry processing. Fertilizer application and irrigation was consistently applied across the entire field. There was no observed difference in emergence or disease between the two sides of the field.

Potato Yield and Quality:

Treatment	Total Yield cwt/ac	Smalls %	> 10 oz %	Total Defect %	Specific Gravity	M. Yield cwt/ac	Payout \$/acre
Corn	420.0	4.3	14.5	0.4	1.091	400.9	\$5992
Sorghum Sudangrass	422.8	3.5	35.1	2.8	1.089	399.8	\$6204
Difference	-2.8	+0.8	-20.6	-2.4	+0.002	+1.1	-\$212

Four 10 foot yield samples were obtained from each side of the field on October 4th, 2022 at the same locations where soil samples were obtained in the spring. One of the samples from the sorghum sudangrass side was lost before grading due to rot and rodent damage during storage, so the average for that treatment is based on 3 samples rather than 4.

There is no significant difference in total yield, smalls %, total defects, specific gravity, marketable yield and payout between the two treatments. The only significant difference was in the percentage of 10 oz or greater potatoes which was higher on the sudangrass side of the field (~20% higher). This is responsible for the \$212 higher payout for the sudangrass side. However, the loss of one sample from this side of the field makes it harder to draw firm conclusions. There was slightly more rot observed on the sudangrass samples, with no rot observed from the corn samples.

Summary:

Key findings from this trial were:

- There was no difference in total or marketable yield in potatoes following corn compared with following sorghum sudangrass.
- The only quality metric that showed a significant difference was percent 10 oz, which benefited the sudangrass side of the field.
- There was negligible difference in soil nutrient availability or soil health between the two sides of the field.
- It is quite certain that profit from the corn crop in 2021 compared with the net expense of the sudangrass crop in 2021 would more than off set the increased crop value of \$212 in favour of the sudangrass treatment in 2022.

Thank you to Birch Farms for participating in this trial this year. Thanks also to Cavendish Farms for providing access to Central Grading for grading of yield samples.