Enabling Agricultural Research and Innovation

C2021-0033

New Brunswick Forage 4R Nutrient Stewardship

Interim Report
2020-2021

New Brunswick Soil & Crop Improvement Association
259 Brunswick Street, Suite 302
Fredericton, NB
E3B 1G8

Project Lead:
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New Brunswick Department of Agriculture, Aquaculture and Fisheries
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Note: Due to the restrictions imposed on NBSCIA and DAAF staff because of the Covid-19 pandemic, project C2021-0033 was amended to include a New Brunswick Alfalfa Tissue Study.

***Project Objectives(s)*:** The objectives of the project are to engage producers to use a 4R nutrient stewardship approach to forage production and determine the cost to grow a tonne of high-quality forage on NB livestock farms.

Amended Project Objectives (s): to examine the sulfur status of New Brunswick alfalfa stands through tissue testing.

***Project Deliverable(s)*:** (a) Compare forage *yields* using a farms standard practice to a 4R approach, (b) Compare forage *quality* using a farms standard practice to a 4R approach, (c) Compare the COP of a farms standard practice to a 4R approach and (d) Determine an average COP for a tonne of high quality forage on NB livestock farms.

Amended Project Deliverable (s): (a) Sulfur status of New Brunswick alfalfa stands and (b) identification of other nutrient deficiencies in New Brunswick Alfalfa stands.

***Summary of Progress*:** Due to the restrictions imposed on NBSCIA and DAAF staff because of the covid-19 pandemic, project C2021-0033 was amended to include a New Brunswick Alfalfa Tissue Study.

ABSTRACT/RÉSUMÉ:

This project hopes to engage producers to use a 4R nutrient stewardship approach to forage production and determine the cost to grow a tonne of high-quality forage on NB livestock farms. An amendment was made to the project due to the Covid-19 pandemic with the goal of examining the sulfur status of New Brunswick alfalfa stands through tissue testing. Comparisons of forage yields, quality, and cost of production (COP) using the 4R approach are ongoing for the 2021 growing season, followed by an average COP for a tonne of forage production on NB livestock farms. The project is also monitoring alfalfa stands for sulfur status, as well as checking for other nutrient deficiencies. The section of the project relating to implementing the 4R nutrient stewardship approach is underway with six cooperating producers. Soil samples have been taken prior to the 2021 growing season when Jason Wells and Pat Toner will make 4R fertilizer recommendations to be applied in the spring of 2021. The alfalfa stands section of this project includes 26 participants across the province. Although the 2020 growing season was very dry, the tissue samples of alfalfa stands show that sulfur levels in the province were varied but sufficient. Surveys of producers' management of alfalfa are ongoing in the hopes of explaining the results of these tests. Magnesium and boron are low or deficient in the alfalfa tissue samples. Since these results could derive from the drought conditions of the 2020 growing season, the project team suggests that sampling should continue under different climactic conditions.

Ce projet cherche à inciter les producteurs à adopter une approche de gestion des éléments nutritifs 4R à l'égard de la production de fourrage et à déterminer le coût de production d'une tonne de fourrage de haute qualité dans les fermes d'élevage du N.-B. Le projet a été remanié en raison de la pandémie de COVID-19 dans le but d'examiner l'état du soufre des peuplements de luzerne du Nouveau-Brunswick au moyen d'analyses de tissus. Des comparaisons des rendements et de la qualité du fourrage, ainsi que de la production des cultures (COP) à l'aide de l'approche 4R sont en cours pour la saison de croissance de 2021, après quoi sera établie une COP moyenne pour une tonne de fourrage produite dans les exploitations d'élevage du N.-B. Le projet prévoit aussi la surveillance de la teneur en soufre des peuplements de luzerne, ainsi que la vérification d'autres carences en nutriments. Le volet du projet relatif à la mise en œuvre de

l'approche de gestion des éléments nutritifs 4R est en cours avec six producteurs coopérants. Des échantillons de sol ont été prélevés avant la saison de croissance 2021 et Jason Wells et Pat Toner ont donné leurs recommandations sur les engrais 4R à appliquer au printemps 2021. Le volet sur les peuplements de luzerne de ce projet compte 26 participants à travers la province. Bien que la saison de croissance 2020 ait été très sèche, les échantillons de tissus des peuplements de luzerne révèlent que les niveaux de soufre dans la province étaient variés, mais suffisants. Des enquêtes sur la gestion de la luzerne chez les producteurs sont en cours dans l'espoir d'expliquer les résultats de ces tests. La teneur en magnésium et en bore est faible ou déficiente dans les échantillons de tissus de luzerne. Comme ces résultats pourraient être attribuables aux conditions de sécheresse de la saison de croissance 2020, l'équipe du projet suggère de poursuivre l'échantillonnage dans différentes conditions climatiques.

New Brunswick Forage 4R Nutrient Stewardship – NBSCIA solicited six co-operators and collected background soil samples of the sites to be used in the project. A copy of one of those reports appear in Appendix A as an example. Jason Wells and Pat Toner are working on the 4R fertilizer recommendations that will be applied by producers in the spring of 2021. Sample collection will take place during the 2021 growing season as described previously in the project application.

New Brunswick Alfalfa Tissue Study – NBSCIA solicited 26 co-operators from across the province to participate in this project. NBSCIA and DAAF staff collected corresponding alfalfa tissue and soil samples just prior to producers preforming first cut. An example of an alfalfa tissue report, and its corresponding soil sample report is shown in Appendix B. Due to dry climactic conditions, the project investigators decide to do the second round of samples just prior to third cut in hopes that rainfall would occur. No rainfall occurred, so both samplings were done under similar conditions.

The project team is in the process of surveying farmers as to their alfalfa management practices during the 2020 growing season to better explain the tissue and soil data that was collected. A copy of the survey is attached (Appendix C).

Preliminary results show that New Brunswick alfalfa stands had tissue sulfur levels that were sufficient for proper crop growth and development, even though soil sulfur levels varied. It is the hope of the project team that the survey will help identify trends in fertilizer practices that explain the data collected.

Boron and Magnesium were two nutrients that appeared as low or deficient in a large proportion of the alfalfa tissue samples. Since the availability of these two nutrients is affected greatly by drought conditions, it is the project team's suggestion that the work needs to be continued for at least another year, so sampling can occur under moister growing conditions. This could prove if the levels of these two nutrients are low to deficient or if it was all related to the dry climactic conditions in 2020.

The project team is still examining the data for trends and trying to link it with survey data as seen in Figure 1.

Sample ID	Local	Soil B (ppm)	Tissue B (ppm)	Was there Boron in Spring 2020 fertilizer	
ATS20AB1	Central	0.3	6.99	no	
ATS20GM1	Moncton	0.4	18.89		
ATS20JS1	North Shore	0.4	20.51		
ATS20MB1	Central	0.4	11.78		
ATS20ML1	North West	0.4	13.92		
ATS20OD1	North West	0.4	26.51		
ATS20RC1	North West	0.4	22.51		
ATS20TC1	Kings	0.4	8.62		
ATS20AJ1	Kings	0.5	22.38	no	
ATS20AWL	Central	0.5	33.45	yes	0.8lbs/ac
ATS20CH1	Moncton	0.5	13.88		
ATS20DW1	Moncton	0.5	12.48		
ATS20JL1	North West	0.5	9.98		
ATS20JR1	North Shore	0.5	19.84		
ATS20KB1	North Shore	0.5	15.21	manure (2000gal/ac)	
ATS20EW1	Kings	0.6	24.29		
ATS20KG1	Carleton	0.6	32.65		
ATS20PL1	Central	0.6	33.34		
ATS20CML	Carleton	0.7	28.05	ash fall 2019	
ATS20GL1	Moncton	0.7	26.39		
ATS20LP1	North West	0.7	36.42		
ATS20CD1	North West	0.8	43.59		
ATS20JW1	Kings	0.8	23.9		
ATS20EC1	Kings	0.9	25.65		
ATS20MR1	Kings	1	22.13		
ATS20WD1	Carleton	1	27.42	yes	0.8lbs/ac
ATS20AP1	Moncton	2.3	24		
Nutrient Sufficiency Ratings (color coding)					
Sufficient					
Low					
Deficient					

Figure 1. Soil and Tissue Boron Data and Survey Results Collect To-Date.

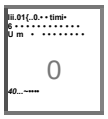
***Adjustments*:** Even though both sampling dates for the New Brunswick Alfalfa Tissue Study were done under extremely dry conditions, valuable information was still garnered. The project team feel that an even better picture of what is happening on New Brunswick farms would be realized from a second year of alfalfa tissue sampling; hopefully under different climactic conditions. The project team asks that the budget for the original New Brunswick Forage 4R Nutrient Stewardship project be amended to include the New Brunswick Alfalfa Tissue Study. A revised budget will be added to the renewal application.

Appendix A

Soil Analysis ReDor(
14-Oct-2020

NB Soil & Crop Imp Assoc
Ray Carmichael
2600 Route 560
Williamstown, NB
E7K 1S6

PEI Analytical Laboratories
PEI Department of Agriculture & Fisheries
23 Innovation Way
PO Box 2000. Charlottetown. PEI. CIA 7N8
Fax: (902) 368-6299
Telephone: (902) 620-3300



Client: Accession: 1607080016
Samples Reported: S201001004
Samples Received: 14-Oct-2020 / 01-Oct-2020

Dean Acton

Samp_o int or motion			Soil Test Values and Ratin95							
Lab Sample P	Field Number	Organic Matter (%)'	pH'	Phosphate P_2O_5 (PPfli)	Potash K_2O (PPfli)·	Calcium Ca (PP m)·	Magnesium Mg (PPm)·	Boron B (PM)*	Copper Cu (PPm)·	Salt mS/cm

Lab Sample p	Field Number	Zinc Zn (PPm)·	Sulfur S (PPm)'	Manganese Mn (PPm)·	Iron Fe (PINTO'	Sodium Na (PPR))·	Aluminum Al (PM)*	Lime Index'	Nitrogen N ('`.,',)	Nitrate-N NO -N (PPm)
	4·...		20	119		37	72,			

L-: Low L: Low M: Medium M.: Above Medium H: High H.: Very High

To convert HECTARES into ACRES multiply by *2.47*				To convert T/HECTARE into TIACRE multiply by 045			To convert Kg/Ha into lbs/ACRE: multiply by 0.9		
Sample Information				**Limestone application IT/Ha) to acheive**			**Required Applications (Kgelim**		
Lab Sample g	Field Number	Field Size (Ha)	Crop to be Grown	pH 5.5	pH 6.0	pH 6.5	Nitrogen N	Phosphate P_2O_5	Potash K_2O
	4 F-.: i = :..		·-·· •,,,, , .				**..l ?**		

Lab $S_{am}pl_e$ #	Field Number	% P/Al	Ratio Ca/Mg	M a n	S o d	C EC (Meqi100g)	Base Saturation K	% Mg	% Ca	% H	% Na	0/0T Baseotal Saturation
1	4R20DA	5 4:··	58:1		0	11				-	' 5	

The Soil Analysis Report result(s) relate only to the actual submitted and tested sample(si Dates of analysis are available in Appendix A of this report. Please take a moment to complete ore client satisfaction survey **at https://ss·ww.survemonkev.com.r PEIAL**

Comments All fertilizer recommendations are based on a pH of 6.0
To convert P205 to P. divide by 2.29 To convert K20 to K. divide by 1.2.

Copies To:
Moncton - Zoshia Fraser - NB Soil & Crop Imp Assoc

Approved By:

V²(6
***Laboratory* wear**

Methods: SFL_22M - pH'
SFL_23M - Organic Matter
SFL24M - Nutrients'
SFL_29M - Nitrate/Ammonia
--',....-- SFL 30M - Nitrogen
SFL:26M - SaWConductivity

&tis**k** **Accredited Methods &**

A & L Canada Laboratories Inc

2136 Jetstream Road, London, Ontario, N5V 3P5
Telephone: (519) 457-2575 Fax: (519) 457-2664

Report Number:C20164-50020
Account Number:01778

Date Received:2020-06-12 **Date Reported:**

Date Printed:2020-06-15

PLANT ANALYSIS REPORT

To: NB SOIL & CROP IMPROVEMENT ASSOCIATION
2-150 WOODSIDE LANE
FREDERICTON, NB E3C 2R9

Attn: LEIGHA SANDWITH

For:

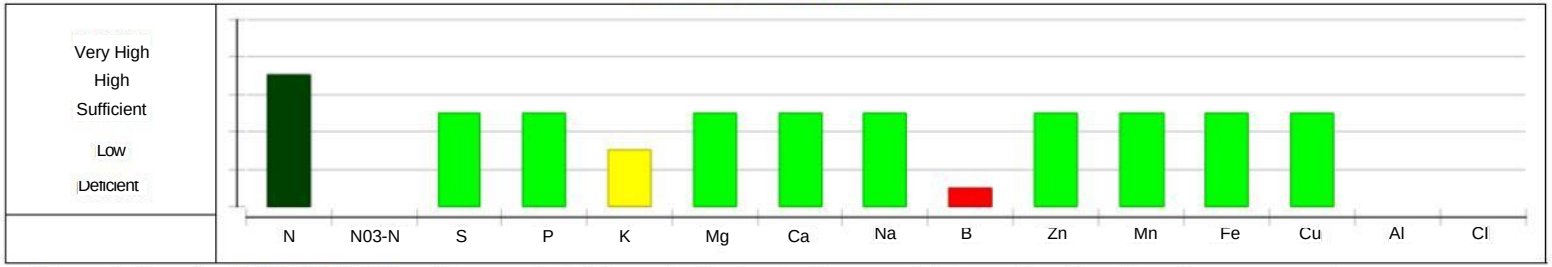
Sample ID: .ATS2CAB1

Plant Type: Alfalfa
Growth Stage: Pncr to flowering
Plant Part: Top 6"

Date Sampled	Lab Number	Nitrogen (%)	Nitrate Nitrogen (%)	Sulfur (%)	Phosphorus (%)	Potassium (%)	Magnesium (%)	Calcium (%)	Sodium (%)	Boron (PPm)	Zinc (PPm)	Manganese (PPm)	Iron (PPm)	Copper (PPm)	Aluminum (PPm)	Chloride (%)
2020-06-08	1640036	5.35		0.38	0.45	2.03	0.36	2.43	0.02	6.99	53	60	183	15.82	98	
Normal Range		3.80 5.00		0.20 0.48	0.30 0.80	2.50 5.00	0.35 0.50	1.00 3.00	0.01 0.03	30 80	20 80	30 150	30 250	5 30		

	N/S	N/K	P/S	P/Zn	***KIM***	K/Mn	Fe/Mn	Ca/B
Actual Ratio	13.9	2.6	1.2	86	5.6	339	3.1	3476
Expected Ratio	12.0	1.1	1.7	100	9.0	460	1.9	400

Nutrient Sufficiency Ratings



– These plants are **low** in POTASSIUM. Possible causes include low soil potassium levels, poor soil drainage, droughty soil conditions or compaction.
– These plants are deficient in BORON. Causes include low soil boron or droughty soil conditions. A&L recommends a foliar application at this time of 1/4 pound boron per acre.
– A&L recommends an application when Mg, B, P, Zn **or** Mn are low or deficient at this plant stage. Follow the recommended product label rates.
– A&L Recommends a followup tissue sample 14 days after foliar treatment to monitor progress.

C20164 50020

Results Authorized By: ,'"4"'--\‹,.. Ian **McLachlin, Vice President** The results of this report relate to the sample submitted and analyzed

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NLt mob. Y.. le ',me.. •••••••.• *ohm* • ••••• *Ca** • nml.1 ovp•••••=4,.• illkb•••••••4. 0•••••••44.1r.

Soil Analysis Report 18-Jun-2020

NB Soil & Crop Imp Assoc
Ray Carmichael
2600 Route 560
Williamstown, NB
E7K 1S6

PEI Analytical Laboratories
PEI Department of Agriculture & Fisheries
23 Innovation Way
PO Box 2000. Charlottetown. PEI. CIA 7N8
Fax: (902) 368-6299
Telephone: (902) 620-3300

Prinmo Edwata

Client: 1607080016 Accession: S200610005 Samples Reported: 18-Jun-2020 Samples Received: 10-Jun-2020

Sample Information			Soil Test Values and Ratings							
Lab Sample #	Field Number	Organic Matter (%)'	pH'	Phosphate P_2O_5 (PPn[1])	Potash K_2O (PPni)	Calcium Ca (PPM)	Magnesium Mg (PPn[1])	Boron B IPPair	Copper Cu (PPrn)	Salt mS/cm
1	ATS20AB1	8.1	6.6							

Lab Sample #	Field Number	Zinc Zn (PPI[71])	Sulfur S (PPm)	Manganese Mn (PPm)	Iron Fe (PPm)	Sodium Na (PPrn)	Aluminum Al (PPm)	Lime Index'	Nitrogen N r")	Nitrate-N NO -N (PPm)

L-: Low L: Low PA: **Medium M+: Above Medium H: High H+: Very High**

To convert **HECTARES** into **ACRES** multiply by 2.17 | To convert **TIHECTARE** into T/ACRE multiply by 0.35 | To convert KgfHa into lbs./ACRE multiply by 0.9

Sample Information				Limestone application IT·Hai to acheive			Required Applications **(Kg/Ha)**		
Lab Sample g	Field Number	Field Size (Ha)	Crop to be Grown	pH 5.5	pH 6.0	pH 6.5	Nitrogen N	Phosphate P_2O_5	Potash K_2O
1	ATS20AB1		- '..1 = •-..-, •						

Lab Sample g	Field Number	% P(Al	Ratio Ca/Mg	IA a n	S ° d	C EC (Meg/100g)	Base Saturation % K	Base Saturation °/.:. Mg	Base Saturation % Ca	Base Saturation % H	Base Saturation % Na	Total % Base Saturation
1	ATS20AB1	6J'=	12:1	0			-	._		20.0	0.6	79.4

The Soil Analysis Report result(s) relate only to th **actual** submitted and tested **sample(** s) Dates of an. lysis ate tradable Appendix A of this report Please take a moment to complete our client satisfaction survey at htuts://www.surves•monkey.contir/PEIAL

Comments: All fertilizer recommendations are based on a pH of 6.0
To convert P2O5 to P. divide by 2.29 To convert K2O to K, divide by 1 2.

Copies To:
Central - Andrew Sytsma - NB Soil & Crop Imp Assoc

Approved By:
Laboratory Manager

Methods :
SFL 22M - pH*
SF—L_23M - Organic Matter
SFL 24M - Nutrients'
SFL[59]M - Nitrate/Ammonia
SFL 30M - Nitrogen
SFL:26M - SaIVConductiinty

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• Accredited Methods & Parameters

Appendix C

Follow-up Questions for the New Brunswick Alfalfa Tissue Survey

How old is the stand? _____

What is the percentage of alfalfa in the stand?

What was applied to the stand in the fall of 2019? (check all that apply and provide applicable details)

_ Lime Type: _ calcitic _ high-Mag Rate: _____

_ dolomitic _ low-Mag

_ Manure Type: Rate: _____

Analysis: please provide a copy of your most recent analysis

_ Fertilizer Analysis: _____ Rate: _____

_ Wood Ash Source: _____ Analysis (if known): _____ Rate: _____

_ Other Specify type, analysis and rate if known: _____

Did you perform any other management practice (s) that you feel may have influenced this crop (ex. herbicide application, grazing, etc.)

_____

What was applied to the stand in the spring of 2020 (before 1st cut)? (check all that apply and provide applicable details)

_ Lime Type: _ calcitic _ high-Mag Rate: _____

_ dolomitic _ low-Mag

_ Manure Type: Rate: _____

Analysis: please provide a copy of your most recent analysis

_ Fertilizer Analysis: _____ Rate: _____

_ Wood Ash Source: _____ Analysis (if known): _____ Rate: _____

_ Other Specify type, analysis and rate if known: _____

Did you perform any other management practice (s) that you feel may have influenced this crop (ex. herbicide application, grazing, etc.)

_____

What was applied to the stand before 2nd cut in 2020? (check all that apply and provide applicable details)

_ Lime Type: _ calcitic _ high-Mag Rate: _____

_ dolomitic _ low-Mag

_ Manure Type: Rate: _____

Analysis: please provide a copy of your most recent analysis

_ Fertilizer Analysis: _____ Rate: _____

_ Wood Ash Source: _____ Analysis (if known): _____ Rate: _____

_ Other Specify type, analysis and rate if known: _____

Did you perform any other management practice (s) that you feel may have influenced this crop (ex. herbicide application, grazing, etc.)

_____

What was applied to the stand before 3rd cut in 2020? (check all that apply and provide applicable details)

_ Lime Type: _ calcitic _ high-Mag Rate: _____

_ dolomitic _ low-Mag

_ Manure Type: Rate: _____

Analysis: please provide a copy of your most recent analysis

_ Fertilizer Analysis: _____ Rate: _____

_ Wood Ash Source: _____ Analysis (if known): _____ Rate: _____

_ Other Specify type, analysis and rate if known: _____

Did you perform any other management practice (s) that you feel may have influenced this crop (ex. herbicide application, grazing, etc.)

_____

Please list what you feel are your major challenges when growing alfalfa in New Brunswick.

1.
2.
3.
4.
5.

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