BC Grain Producers Association

2023

Field Research

Table Of Contents

2023 BCGPA Board of Directors

Malcolm Odermatt
President
Baldonnel, BC

Ed Hadland
Vice– President
Baldonnel, BC

Hannah Willms
Director
Rose Prairie, BC

Ernest Wiebe
Director
Rose Prairie, BC

Ty Cusack
Director
Pineview, BC

Amias Dirks
Director
Cecil Lake, BC

Miles Wuthrich
Director
Cecil Lake, BC

Kevin Thiessen
Director
Buick, BC

Robert Vander Linden
Outgoing Director
Clayhurst, BC

2023 Staff

Sarah Prebushewski
Office Administer
admin@bcgrain.com
250-782-2557

Dr. Sahel Miladi Lari
Chief Scientific Officer
research@bcgrain.com
250-219-3295

Jennifer Critcher
Outreach & Advocacy
hello@bcgrain.com
250-219-3284

Presidents Report

Well my grandpa used to say that no two years are ever the same and I don't think we will ever quite have the environmental conditions of 2023. We started off dry, then some scattered clouds brought rain to some fields and not others. The smoke rolled in from forest fires in the area and took up residence. It failed to pay rent but did make breathing difficult and blocked the sun on some hot July days for our crops. Fall rolled around quickly due to the lack of rain and we all stayed up late getting off as many acres before fall set in. Well we all could have worked banker hours this past fall. I heard of someone discing some ground late in December. Winter finally came in January and hopefully we will receive some more snow because we are still currently sitting at a level 5 drought (the highest classification in BC). The grain markets have softened as if they are in a downy dryer sheets commercial but let's hope that global demand for our canola picks up and we can see a rebound in the price soon. For the first time in years the BC grain producers have a full board of directors who are well rounded and we all try our best to represent the grain sector in BC at meetings across Canada throughout the year. I greatly appreciate all the producers that have taken the time to attend our functions or partner with us on your farmland to carry out local, unbiased crop research. I also have to thank the BC Grain Producers staff who made this book happen. Let's all hope for a few less fires and a bit more rain for 2024's crop as we quickly approach spring!

Malcolm Odermatt

Cell:250-793-5213

Email:Malcolm@bcgrain.com

2023 Rewind

The BC Grain Producers Association (BCGPA) would like to thank the producers who made this year's Peace Region Field Research possible. We would also like to thank The BC Hydro Peace Agriculture Compensation Fund for funding this project for a second year.

The 2023 season was the second year of the Peace Region Field Research Project for the BCGPA. This project's goal is to support producers in taking risks to try new best management practices on their farms; collecting information on those practices; and then distributing the knowledge to other Peace Region growers. The data collected from these sites will then be used to progress the adoption of these best management practices on Peace Region farms. The long-term goal of the project is to improve the sustainability and profitability of farms in the BC Peace Region.

Grain producers in the area have always been willing to try new practices to help adapt to our sometimes harsh environment in the north. BC Grain in proud to showcase 15 projects over 13 different sites with 8 different farms. Sites varied in scope from fertility, variety, seed treatment, & equipment . BCGPA monitored all sites for growth and yield variations between the different treatments. The information collected in this book is true representation of what happened in the field, information supplied in this book is from individual producers and may vary from farm to farm. BC Grain does not sell or distribute any of the products shown in this book and unless noted there was very minimal sponsorship. In just the second year of the project we are already starting to see the benefits of collecting multiple years data and knowledge transfer successes through on-farm field tours and ability for producers to easily access unbiased, regionally relevant research results. This research aligns and supports the continued growth of the organization to continue to work towards our mission**.**

"BC Grain Producers Association supports and connects grain producers in BC by providing a collective voice, information, and regionally relevant research"

Thank you to our Funders!

Peace Region Field Research Project

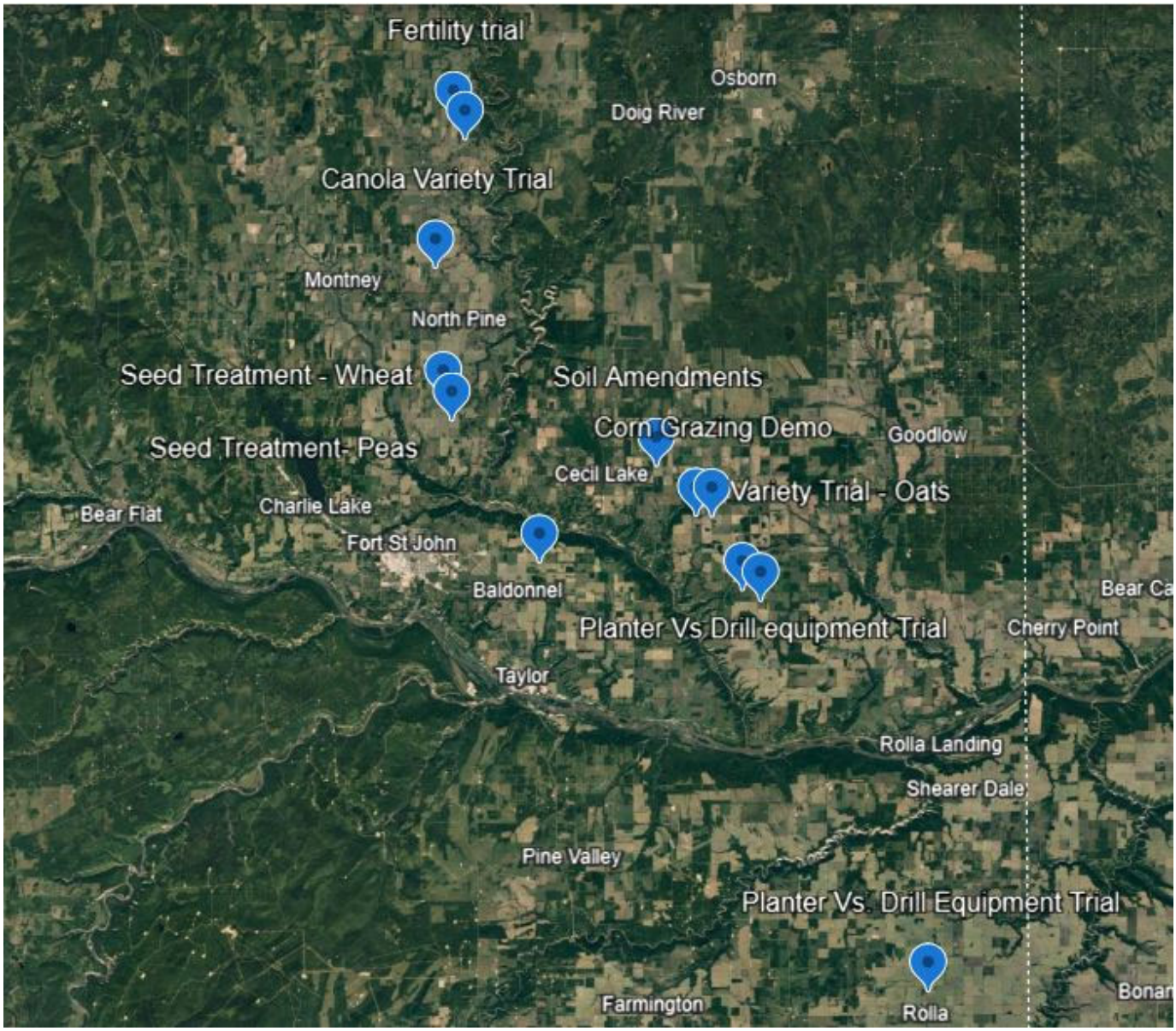
Advocacy, Outreach & Operation Project

NORTHERN DEVELOPMENT

BC Hydro Power smart

B.C. PEACE RIVER GRAIN INDUSTRY DEVELOPMENT COUNCIL

2023 Field Location Map



Special thank you to all of our Partner Producers who dedicated, their time and farm resources to collaborate with The BC Grain Producers in completing these trials

PW FARMS– Miles, Karen & Dave Wuthrich

Rivercrest Farms– Tobin and Amias Dirks Family

Summit Acre Farms– Cusack Family

LH Willms Inc– Les & Hannah Willms

Brandon Funk, Edmund & Willy Rath

Malcolm & Martin Odermatt

Wide Spread Farms– Ernest & Margret Wiebe

Transpine Farms– Fred & Madeleine Lehmann

Trial One

Plowing Vs Minimum Tillage

Wide Spread Farms

Plow Minimum Tillage

Seeding Date: May 5, 2023

Harvest Date: September 11, 2023

Variety: Metcalfe Barley

Trial Area: Buick, BC

PEACE REGION
LIVING LAB

Effects of Plowing on Long-Term Minimum Tillage

Soil Management System

Wide Spread Farms – Buick, BC

Project Goal: To compare the effect of plowing in a long-term minimal tillage field on infiltration, compaction and yield. .

Project Description: A tillage trial contrasting the effects of: an annual fall plowing tillage pass (BMP) to long term one pass minimal tillage (CHECK), in the same field.

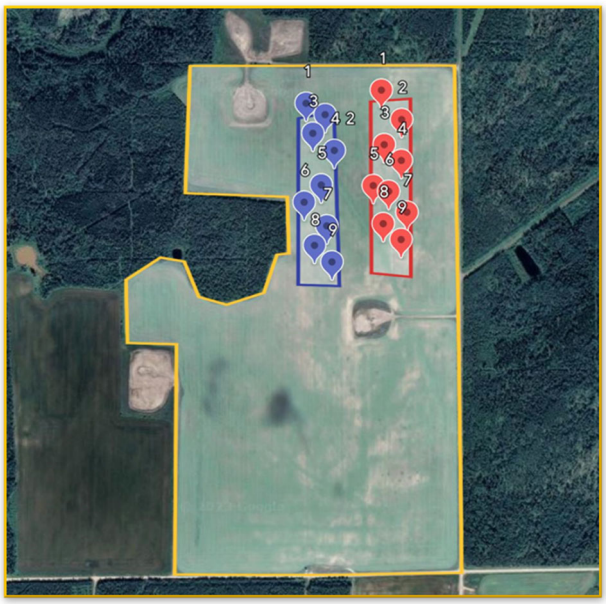
After the fall harvest of 2022, in a 212 acre long-term minimal tillage field, the producer plowed a 45 acre area (BMP) to compare with the remaining 167 acres of long-term minimum tillage (check). In 2023, both the plowed and minimal tillage areas were planted using direct seeding by hoe type opener in an annual cropping situation (barley). Both the BMP and check areas were managed with the same practices throughout the 2023 growing season. This project site is part of the 5 year living lab project (2022-2026) Plowing will continue each fall in the BMP area for the duration of the 5 year project.

Project Background: Minimum tillage / zero tillage systems have been widely adopted in grain and oilseed production across the BC Peace Region.

Zero tillage, while offering several benefits such as: reduced soil erosion, improved moisture retention, and reduced fuel usage; can also have some negative effects on the soil. These may include: increased soil compaction, reduced organic matter decomposition, and potential for increased weed pressure. Additionally, in some cases zero tillage can lead to the accumulation of crop residues at the soil surface, which may affect soil warming and seedling emergence.

Along with the above challenges, in recent years grain & oil seed producers in the region have been noticing a decline in yield, and water infiltration leading to increased runoff causing erosion. Compaction of the soil can significantly hinder root penetration, reduce pore space, limit air and water movement, and make it difficult for roots to grow and spread. This can lead to stunted root development, decreased nutrient uptake, and contribute to overall reduced plant growth. Producers have begun to add more high disturbance tillage into their operations to determine if a one-time tillage pass can counteract the side effects of long-term minimum tillage. This involves using a plow to turn over the top layer of the soil, which is typically rich in organic matter and nutrients. Doing so helps aerate the soil, control weeds, break compaction layers and prepare the ground for planting crops.

Monitoring & Data Collection: This project is part of the 5-year long term monitoring project, but there were visual and data differences recorded already during the 2023 monitoring season. Ten acre polygons were laid out on both the plowed (BMP) and minimum tillage (check) areas, and 9 data points (following a "W" pattern) were marked to ensure data collection was collected from same spot each time. This is shown in the aerial photo below, with the BMP in red and check in blue .

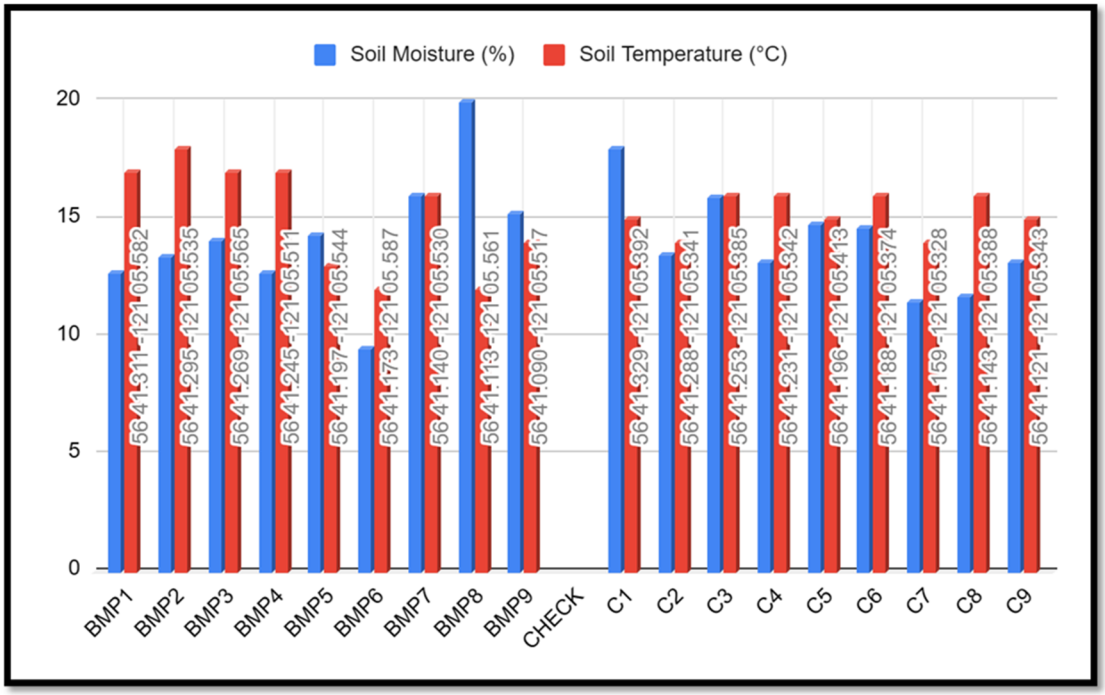


Data that was collected from each of these points, for both the BMP and check areas, included:

- Soil temperature & moisture
- Soil compaction
- Crop residue
- Infiltration
- Visual observations
- Yield

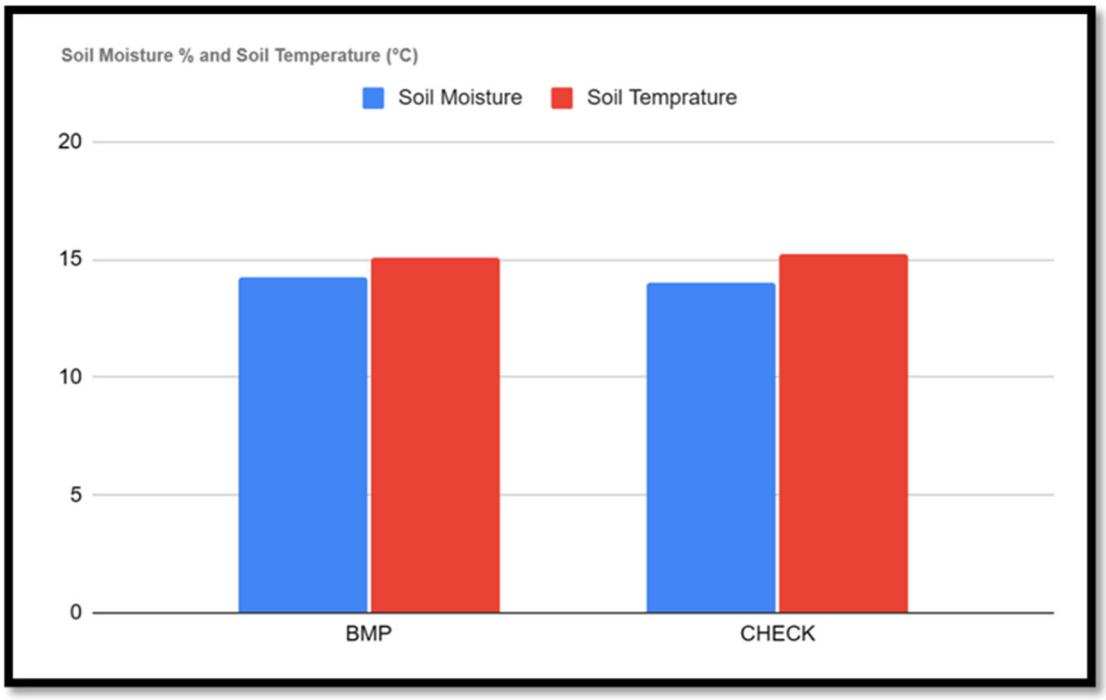
BC Grains Chief Scientific Officer Dr. Sahel Miladi Lari provided the following summary of the information collected from the 9 data points within a 10 acres polygon of each treatment:

Soil Temperature & Moisture: This was measured using a digital thermometer on the surface soil (0-15 cm or 0-6"), while soil moisture was measured using a soil moisture probe. The chart reveals that the highest temperature and moisture levels in BMP were recorded at point 2 and point 8, respectively. The lowest temperature and moisture levels in BMP were both observed at point 6. In check, the highest moisture level was found at point 1, while the highest temperature levels were shared by points 3, 4, 6, and 8. The lowest temperature level in check was recorded at point 7.



The chart above shows the soil temperature and moisture levels at the nine different points within the 10 acre polygons for both the plowing (BMP) and minimum tillage (check).

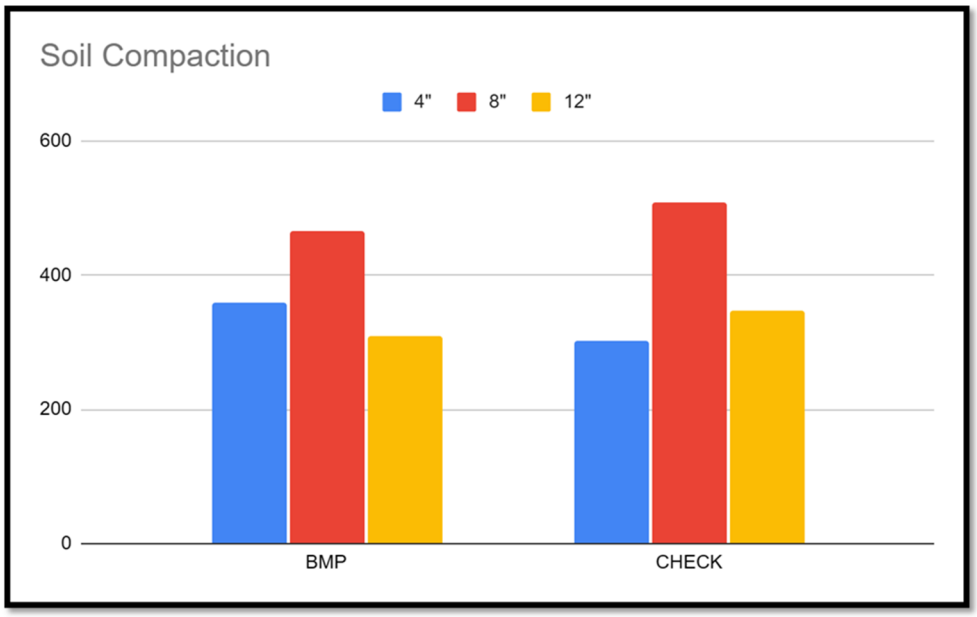
The chart below compares the average soil moisture and temperature in BMP and check. The percentage moisture in BMP was higher than check, and the temperature was lower than check.



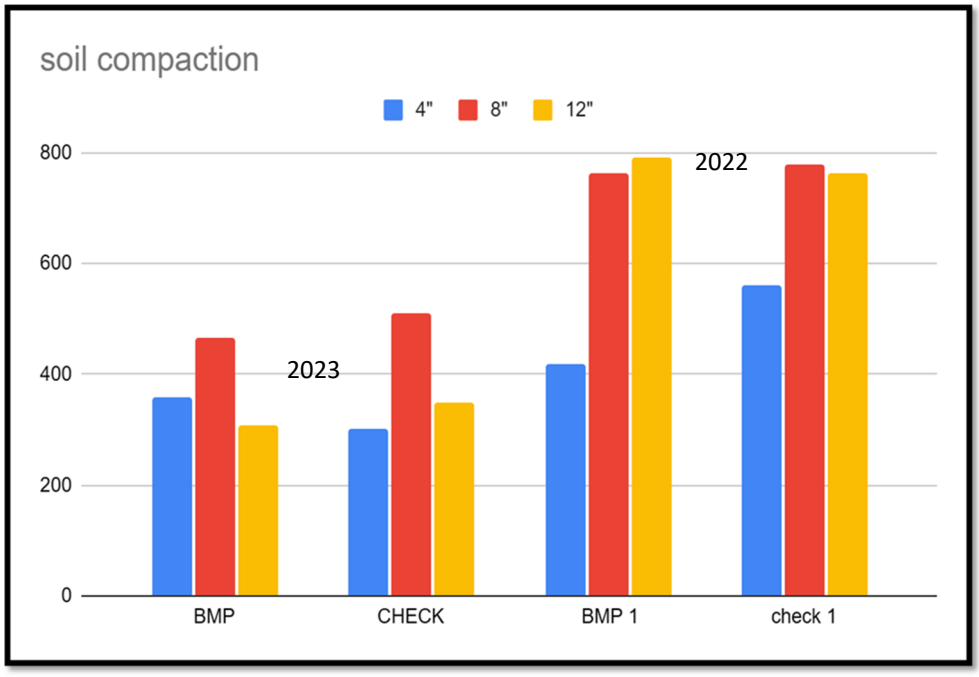
Soil moisture and temperature are two important factors that affect the carbon sequestration potential of different cropping systems. Carbon sequestration is the process of storing carbon in the soil and preventing it from entering the atmosphere as greenhouse gases. This can help mitigate climate change and improve soil quality. Soil moisture and temperature influence the decomposition and stabilization of soil organic matter, the activity and diversity of soil microorganisms, the rates of photosynthesis and respiration, and the growth and yield of crops. Plowing enhances soil moisture relative to minimum tillage due to several factors. First, plowing generates a finer soil texture that retains more water than the coarser texture of minimum tillage. Second, plowing conceals the crop residues or mulch that otherwise diminish water loss from the soil surface by evaporation and transpiration. Third, plowing facilitates water infiltration and storage in the soil by eliminating the compacted or crusted layers that obstruct water movement.

Soil Compaction:

Soil compaction is the reduction of soil pore space due to external pressure, such as from machinery, animals, or human activities. It can reduce **water infiltration**, **aeration**, **drainage**, and **root growth**, leading to lower crop yields and higher susceptibility to drought and erosion. The SpotOn Digital Soil Compaction Meter was used to measure the soil compaction.



The chart below shows the change in soil compaction from 2022 to 2023. Soil compaction is the process of increasing the density of soil by reducing the air spaces between the soil particles. Soil compaction can have negative effects on plant growth, water infiltration, and soil biodiversity. According to the chart, soil compaction decreased in 2023, indicating an improvement in soil quality. The data for 2022 were obtained from BMP-1 and check 1 methods.



Single Ring Infiltration:

The infiltration rate depends on the soil type, moisture content, and compaction. Nine sample points were tested using this method at the site A6 on June 16th, 2023.
The infiltration rate was calculated for each sample point in both BMP and CHECK methods. Here are the results:

BMP – Plow Infiltration Rates

Sample Point #	GPS Coordinates	Time (min)	Infiltration Rate (cm/min)
1	56 41.311 -121 05.582	0.5	0.6283
2	56 41.295 -121 05.535	0.4333333333	0.7264
3	56 41.269 -121 05.565	0.6833333333	0.4608
4	56 41.245 -121 05.511	0.7333333333	0.4296
5	56 41.197 -121 05.544	4.15	0.0759
6	56 41.173 -121 05.587	0.9666666667	0.3256
7	56 41.140 -121 05.530	12.3	0.0256
8	56 41.113 -121 05.561	0.5	0.6283
9	56 41.090 -121 05.517	3.766666667	0.0836

Check – Minimum Tillage Infiltration Rates

Sample Point #	GPS Coordinates	Time (min)	Infiltration Rate (cm/min)
C1	56 41.329 -121 05.392	0.08333333333	3.7699
C2	56 41.288 -121 05.341	0.1	3.14
C3	56 41.253 -121 05.385	0.1666666667	1.8849
C4	56 41.231 -121 05.342	0.1833333333	1.7136
C5	56 41.196 -121 05.413	0.15	2.0933
C6	56 41.188 -121 05.374	0.06666666667	4.7100
C7	56 41.159 -121 05.328	0.3833333333	0.6519
C8	56 41.143 -121 05.388	0.5166666667	0.4833
C9	56 41.121 -121 05.343	0.2833333333	0.8816

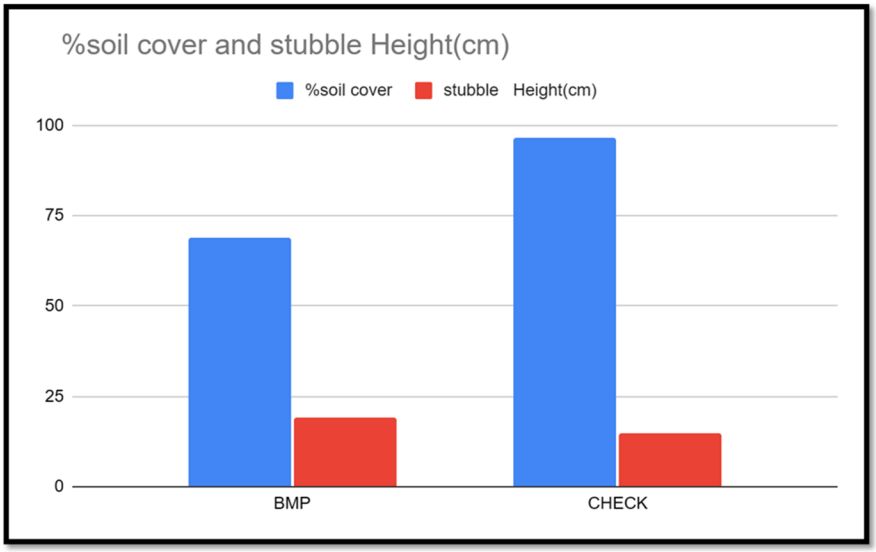
To compare the two methods, we can calculate the average infiltration rate for each method and see which one is higher. The average infiltration rate is the sum of the infiltration rates divided by the number of sample points. Here are the results:
BMP (Plow): Average infiltration rate = 0.3651 cm/min
CHECK (Minimum Tillage): Average infiltration rate = 1.9186 cm/min
Therefore, we can conclude that the minimum tillage method has a higher average infiltration rate than the plow method, which means that the soil in the Minimum tillage area is more permeable and allows more water to infiltrate. This could also be due to different soil types, compaction, vegetation, or other factors that affect the soil structure and porosity.

Crop Residue:

Crop residues are the plant materials that remain in the field after harvesting the crop. They have various roles in agriculture and the environment, such as:

- Improving soil health by adding organic matter, nutrients, and biological activity.
- Reducing soil erosion by protecting the soil surface from wind and water.
- Enhancing water conservation by increasing infiltration and reducing evaporation.
- Mitigating climate change by sequestering carbon and reducing greenhouse gas emissions.

Measurement of crop residue was taken by using a meter stick marked into 25 equal segments and counting crop residue coverage in the 25 segments.



Crop Residue Visual Assessment

Minimum Tillage—CHECK

Plow—BMP

In Crop Observations: Field inspections were completed at three different time periods throughout the growing season.

June 16, 2023: Soil moisture, temperature, compaction, and infiltration measurements were taken.

August 4, 2023: Soil compaction measurements taken, and visual root observations were made.

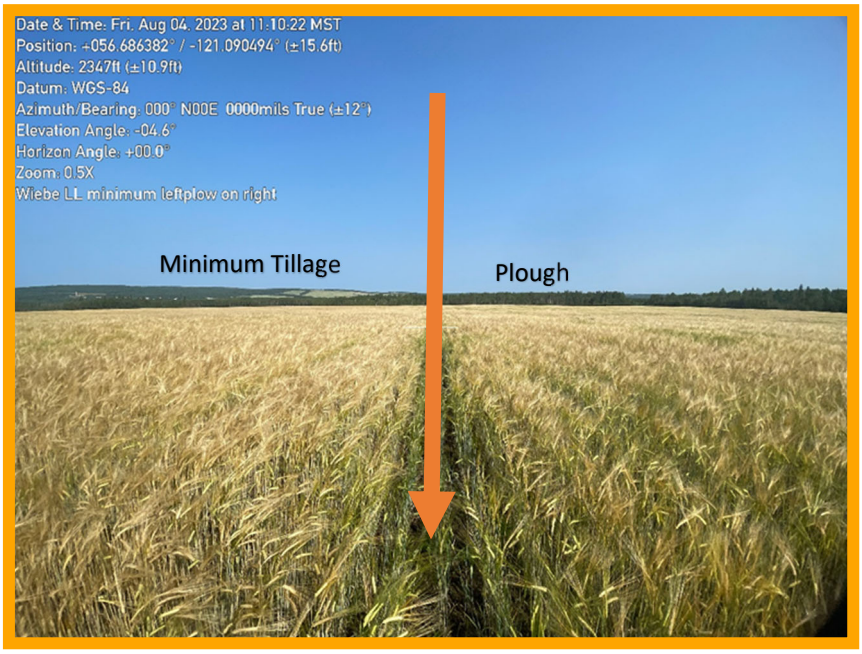
September 26, 2023: Crop residue assessments were made.

Visual Observations—June 16, 2023

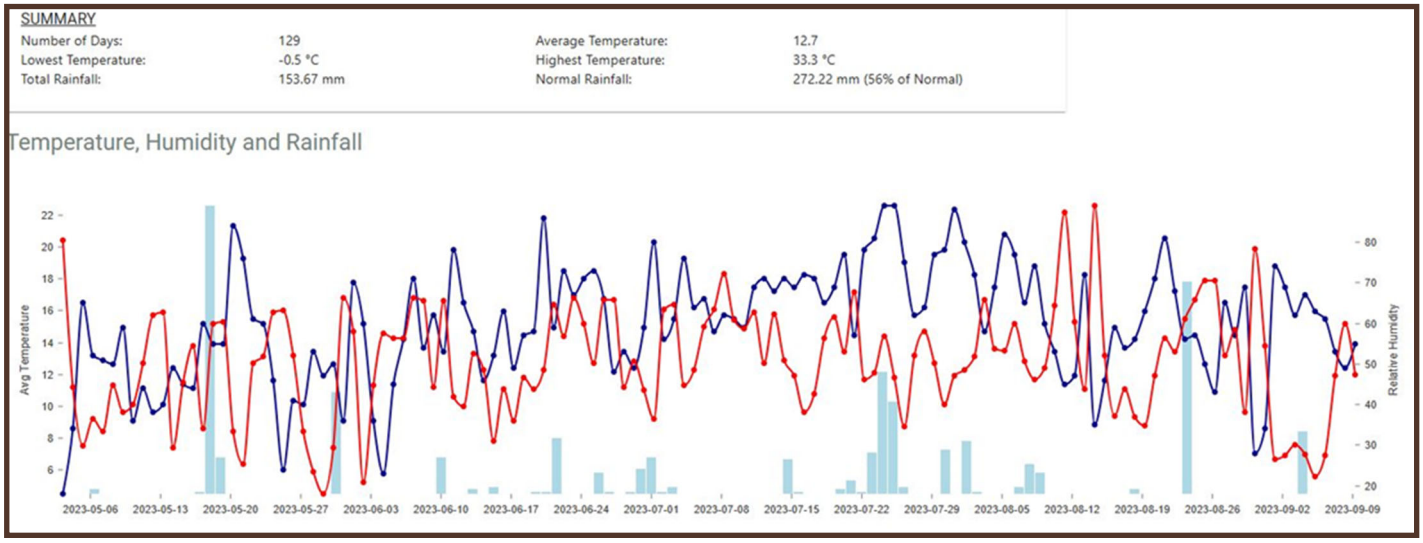
Minimum Tillage (Check)

Plow- (BMP)

Visual Observations Aug 3, 2023



Weather Summary

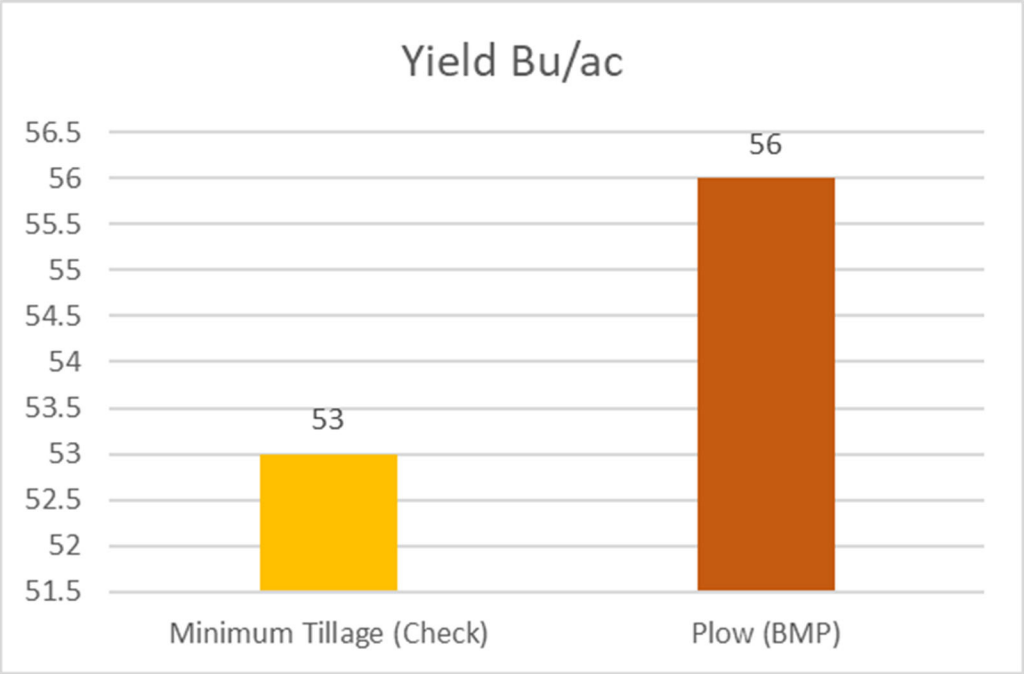


Crop Yield:

Yield Measurements were taken from both the BMP (Plowing) and Check (Minimum tillage) using producers combine GPS for area measurement and weigh scales on grain cart BMP (east side of field) Plow 27.5 acres @ 33,900 kgs =33.90mt = 1.233 mt/ac **56bu/ac** Minimum till (west side) 36.5 ac @ 42,000 kg = 42.00mt =1.17mt/ac **53bu/ac**. Giving the plowing side a **3 bushel/ ac yield advantage**. Grain samples from each the BMP and Check were sent away to the grain commission. Protein for both samples was comparable BMP= 12.7% and Check = 12.5% and Moisture was 12.2% moisture for Check and 13.5% moisture for BMP. Both samples graded a 1CW.

Cost Comparison:

The producers cost of plowing per acre is $48/ac including equipment, fuel and operator. (Cost may vary depending on farm and area) with the yield increase of 3bu/ac @ $6.00 = $18.00/ac which is 37.5% of the plowing costs the producer did not see a return on investment in the first year. This project will be monitored for 3 more years.



Trial Two (A)

Wheat Variety Comparison

PW Farms

Intrepid Wheat

CDC Go

Seeding Date: May 5, 2023

Harvest Date: Aug 23, 2023

Trial Area: Cecil Lake, BC

Wheat Variety Comparison Trial

PW Farms —Cecil Lake BC

Project Goal: To compare yields of two common grown wheat varieties grown in the Peace Region.

Background: In a side by side comparison trial, two or more varieties are tested simultaneously under the same growing conditions to directly compare their effectiveness, performance, and characteristics. This type of trial allows for a direct comparison of the varieties being tested, often to determine which is superior or more suitable for a particular purpose. Both trials were treated the same throughout the growing season, the only variations would be natural variability in the field.

Fertility: 90-43-0-16 blend put down in a mid row band.

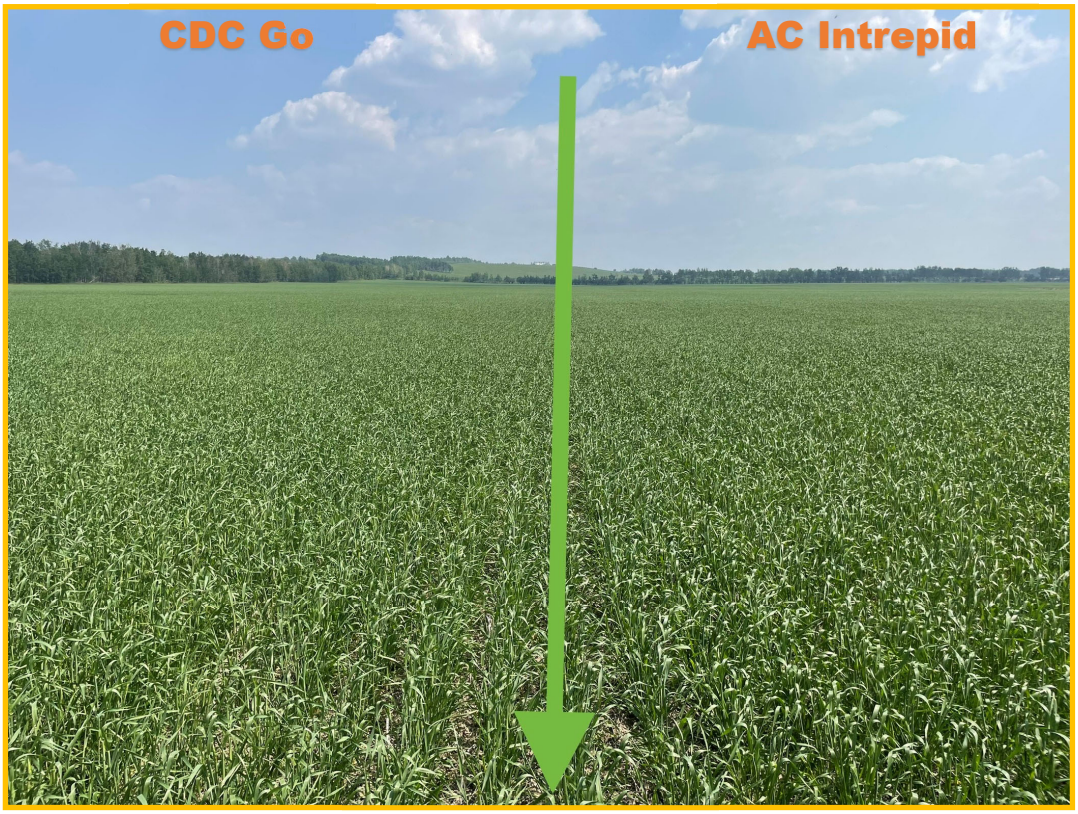
Seeding Equipment: Bourgault precision drill with 10 inch row spacing .

Seeding Rate: 2 bushels per acre.

Herbicide: Everest and MCPA. **Please see seed distribution company for more information*

AC Intrepid: This variety is a hard red spring wheat that has been adapted to the Canadian prairies. The variety was registered in 1997 for it's high grain yield, early maturity, awn less short strong straw, increased protein, and bushel weight. It has a R rating for cereal diseases: leaf rust, stem rust, and common bunt. This variety is suited for western Black and Grey wooded soil (BC Peace Region) and is known for its good quality and high protein.

CDC Go: This variety is a high yielding semi-dwarf HRSW variety, and was registered in 2004. known for its strong straw (semi dwarf) . Resistant to bunt, moderate resistance to leaf rust, and R to MR for stem rust. MR to MS for loose smut.



June 23, 2023

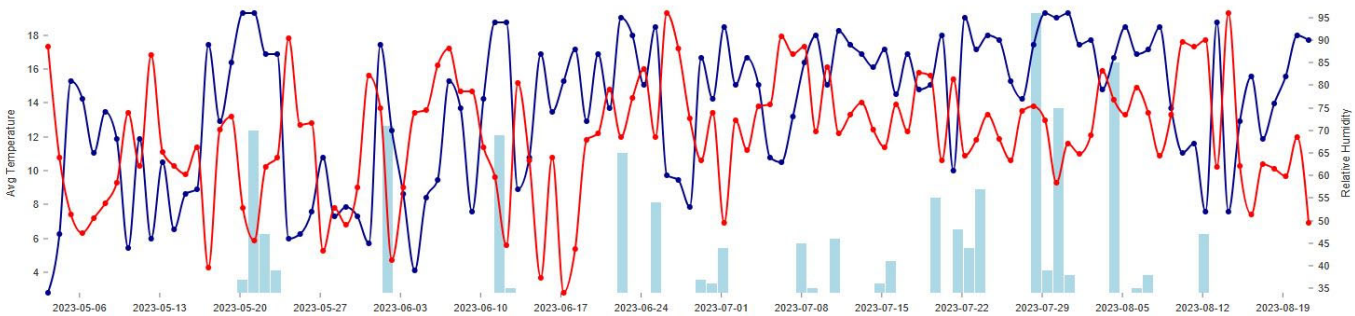
Weather May 5th - August 23, 2023

Weather data was pulled from the BC Peace Agri Weather Network (Flatrock station)

SUMMARY

Number of Days:	110	Average Temperature:	12.0
Lowest Temperature:	1.9 °C	Highest Temperature:	32.7 °C
Total Rainfall:	121.41 mm	Normal Rainfall:	206.78 mm (59% of Normal)

Temperature, Humidity and Rainfall



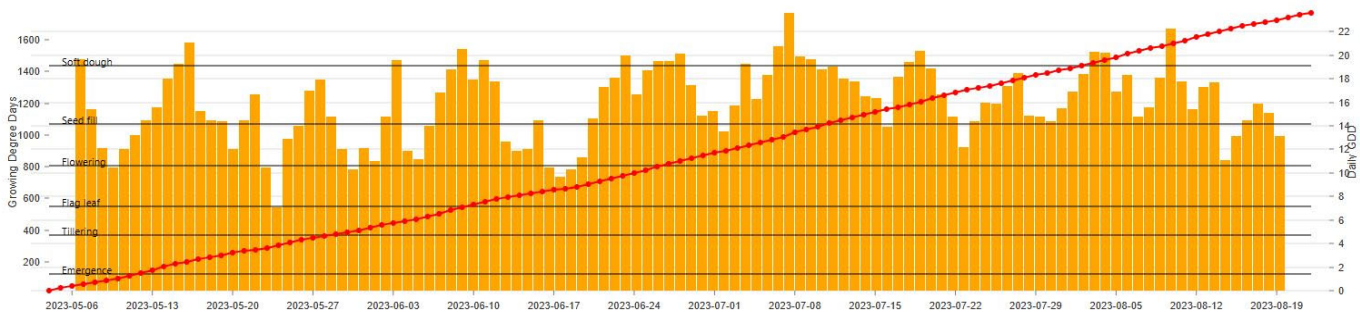
Growing Degree Day Summary

SUMMARY

Number of Days: 111

	Actual	Normal	% of Normal
GDD Base 0C	1767	1458	121%
GDD Base 5C	1212	910	133%
GDD Base 10C	660	408	162%

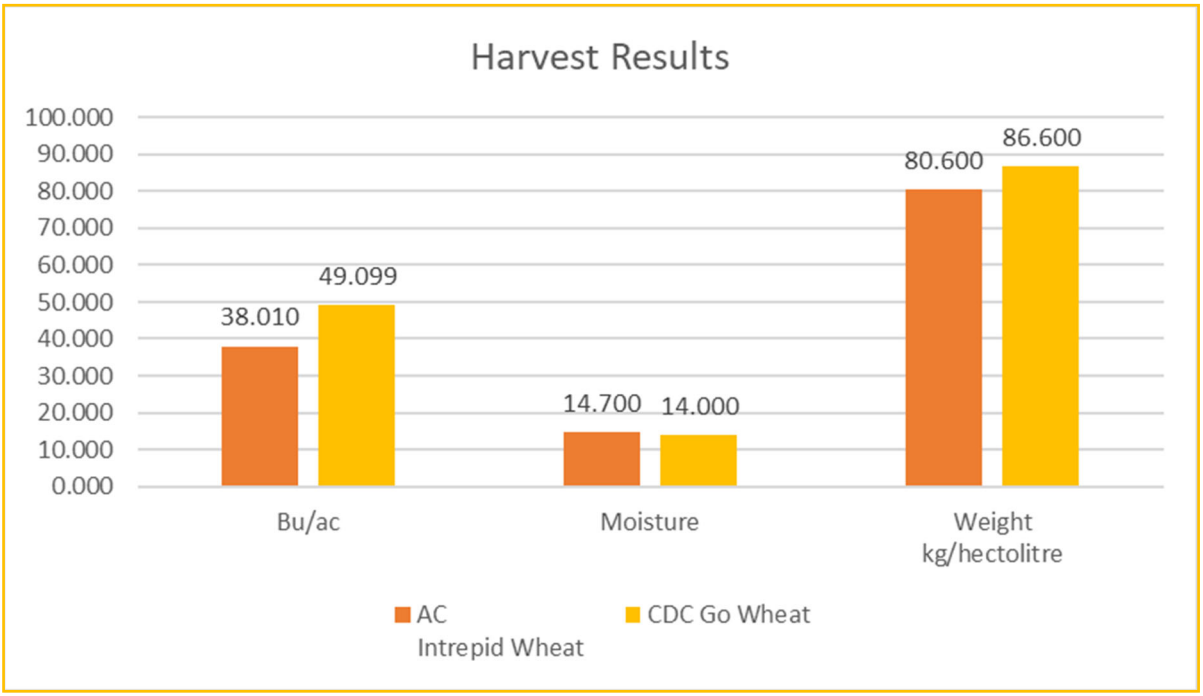
GDD Chart



Wheat Yield Data

Yield Results

	Acres	Lbs	Tonne	Bushels	Bu/ac	Moisture	Weight kg/hectolitre
AC Intrepid Wheat	**3.270**	**7456.000**	**3.383**	**124.303**	**38.010**	**14.700**	**80.600**
CDC Go Wheat	**3.280**	**9660.000**	**4.383**	**161.040**	**49.099**	**14.000**	**86.600**



Grain Sample Results

Variety	Grade	TWT	DON (Raptor)	Falling Number	Moisture %	Protein
AC INTREPID	1CW RS	388	< 0.3	408	14.4	13.5
CDC GO	1CW RS	402	< 0.3	362	14	13.5

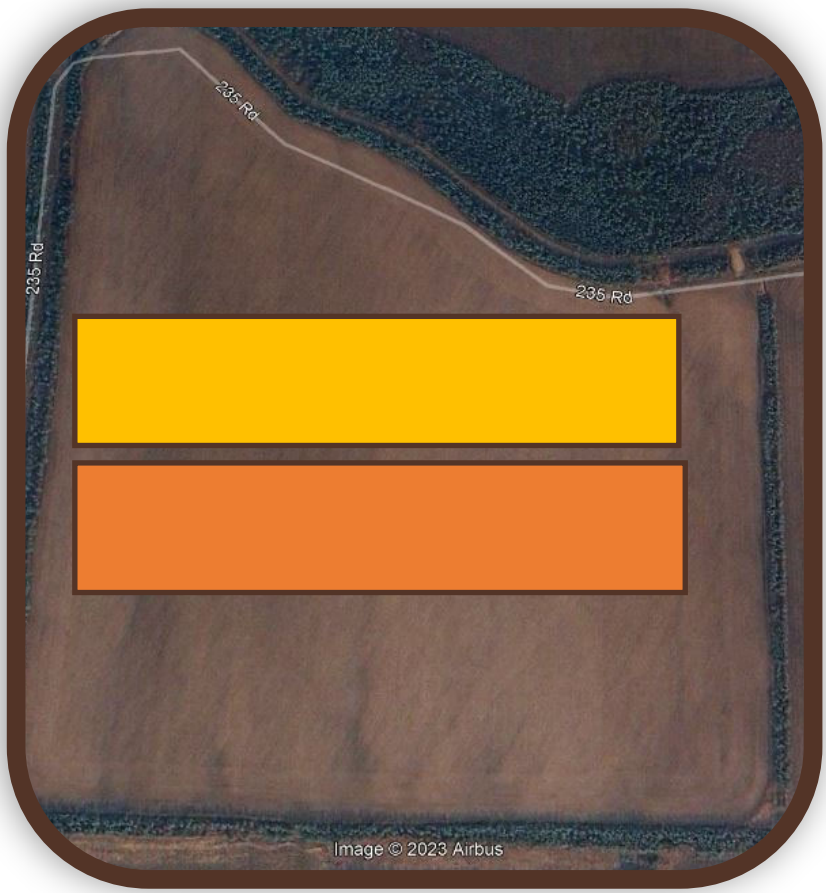
* Grain samples sent to the Canadian Grain Commission

The only difference noted at harvest was harvesting the intrepid was more difficult as it was unawned and harder to thresh.

Trial Two (B)

Oat Variety Comparison Trial

PW Farms



Camden

Kyron

Seeding Date: May 5, 2023

Harvest Date: September 14, 2023

Trial Area: Cecil Lake, BC

Oat Variety Comparison Trial

PW Farms—Cecil Lake, BC

Project Goal: To compare yield of two oats varieties grown in the BC Peace Region.

Background: In a side by side comparison trial, two or more varieties are tested simultaneously under the same growing conditions to directly compare their effectiveness, performance, and characteristics. This type of trial allows for a direct comparison of the varieties being tested, often to determine which is superior or more suitable for a particular purpose. Both trials were treated the same throughout the growing season, only variations would be natural variability in the field.

Fertility: 70-35-10-0 blend put down in a mid row band

Seeding Equipment: Bourgault precision drill with 10 inch row spacing **Seeding Rate**: 3 Bu per

Herbicide: Refine SG

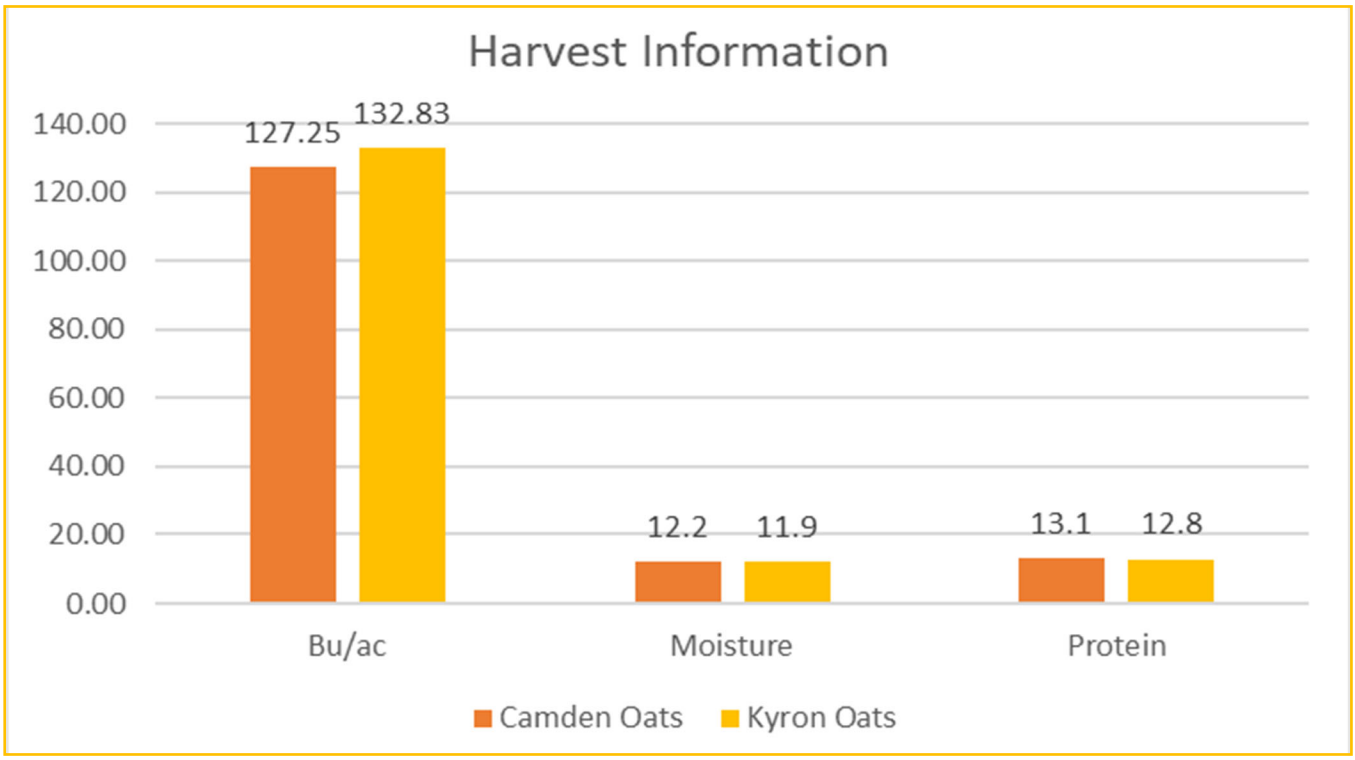
Camden Oats: *(Description from seed company)* A very high yielding oat with excellent lodging resistance. Grower and miller approved with high yields and improved quality. Shorter stature, with better lodging resistance, high leaf biomass, better grain quality than Triactor - higher % plump, less thins, higher beta glucan, approved milling variety.

Kyron Oats: (*Description from seed company*) White Milling Oat: a new milling oat with high yield potential (similar to CS Camden), similar heigh with CS Camden with good standability, earlier maturity compared with current varieties (-3d vs. CDC Ruffian, -2d vs. CDC Endure, -1d vs. CDC Arborg).

Scan QR Code to visit seed company website—CAMDEN

Scan QR Code to visit seed company website—Kyron

Yield Results					
	Acres	Lbs	Ton	Bushels	Bu/ac
Camden Oats	1.210	5238.00	2.38	153.97	127.25
Kyron Oats	1.210	5468.00	2.48	160.73	132.83



Grain Samples Results				
Variety	Grade	TWT	Moisture	Protein
CS Camden	1CW	260	12.2	13.1
Kyron	1CW	260	11.9	12.8

Trial Three

Seed Treatment Comparison

Summit Acre Farms

Trial Area: Pineview, BC

Pea Seed Treatment Comparison

Summit Acre Farms—Pineview, BC

Project Goal: The goal of this trial was to see the benefit of seed treatment against Aphanomyces root rot.

Background: In recent years, pea growers in the BC Peace Region have noticed a decline in pea yield due to seedling disease. Aphanomyces pea disease, also known as Aphanomyces root rot, is a destructive fungal disease that affects pea plants. It is caused by the pathogen Aphanomyces euteiches. The disease primarily attacks the roots and lower stems of pea plants, leading to wilting, stunting, and yellowing of leaves. The infection occurs when the spores of Aphanomyces euteiches come into contact with the plant roots in wet, poorly drained soil conditions. The pathogen penetrates the roots, causing rotting and decay. As a result, the plant's ability to absorb water and nutrients is compromised, leading to various symptoms and reduced yield.

Early symptoms of Aphanomyces pea disease include water-soaked lesions on the roots and lower stem. As the disease progresses, the affected areas become brown and can develop a characteristic "black root" appearance. Above-ground symptoms may include yellowing, wilting, and overall poor plant vigor. Managing Aphanomyces pea disease involves implementing cultural practices such as crop rotation, avoiding planting peas in poorly drained fields, and choosing resistant or tolerant pea varieties. Fungicide seed treatments and soil fumigation with appropriate chemicals may also be employed in severe cases. Early detection, proper sanitation, and preventive measures are crucial in minimizing the impact of Aphanomyces pea disease and maintaining healthy pea crops. For more information see recent AAFC Peace Region project.

Seeding Date: May 11, 2023

Seeding Conditions: Due to the early spring and above seasonal temperature averages, the soil temperature was warm at time of seeing. The producer noted there were no diseases noted from any previous crops, however Aphanomyces had been detected on farm in recent years. Peas wee seeded at 212lbs/ac with Agtive Thrive granular inoculant @4.5lbs/ac.

Seed Treat #1: **Nufarm: Zeltera Pulse** *(Description as per manufacturer website)*

Product Description: *Zeltera® Pulse seed treatment delivers broad-spectrum control of seed and soil-borne diseases in pulse crops. It has four modes of action, and two of them target every labeled class of pulse disease to manage resistance along with built-in aphanomyces and fusarium root rot protection.*

Active ingredients: *Group 4 fungicide (metalaxyl), Group 7 fungicide (inpyrfluxam), Group 11 fungicide (mandestrobin), Group 22 fungicide (ethaboxam).*

Diseases controlled: Seed rot, seedling blight and seedling root rot caused by Rhizoctonia solani Seed decay/pre-emergence damping-off, post-emergence damping-off, and seedling blight caused by Rhizoctonia solani, Seed rot/pre-emergence damping-off caused by Pythium spp. including control of metalaxyl-resistant Pythium spp. Seed rots, seedling blight and seedling root rot caused by Fusarium spp. (including but not limited to F. avenaceum, F. solani and F. oxysporum).

Diseases suppressed: *Early season root rot caused by Aphanomyces euteiches and Phytophthora sojae. Seed rots, seedling blight and seedling root rot caused by Phomopsis longicolla. Seedling blight caused by seed-borne Ascochyta spp. and Sclerotinia sclerotiorum. Seed rot and seedling blight caused by seed-borne Anthracnose (Colletotrichum lindemuthianum and C. truncatum). Seed rot and seedling blight caused by seed-borne Botrytis cinerea.*

Producer Comments: Application was good, resulting in good coverage.

Cost: $22/Acre

Seed Treat #2: **Annelida Organics AnneMaxx Seed Treat *(Description as per manufacturer website)***

Annelida AnneMaxx Line is designed to restore the soil balance and increase the natural biology of the cultivated land. AnneMaxx may optimize the oxygen levels and enhance the nutrient uptake and be used in conjunction with our other products.

The advantages of Vermicastings - worm castings and extracts are nature's best plant food. As soil conditioners, Annelida's worm castings, extracts and seed inoculants may: enrich your soil with microorganisms, humus and other soil biology to improve your soil's physical structure; increase your soil's water holding capacity and reduce soil erosion; reduce salinization and acidification and restore your soil to an optimum pH range; increase cation exchange and enable your soil to retain nutrients longer; enhance germination, root growth and structure, plant growth, and yield in both soil and hydroponic operations; make more nutrients available for plant uptake and utilization and reduce nutrient leaching; and increase your plant's resistance to disease and pests.

Producer Comments: Added water for better coverage.

Cost: $2/Acre

Treatment # 3: **No seed treatment (check)**

Trial Layout:

In Crop Observations:

On June 13, 2023, a site visit was completed to collect visual observations. Local weather station data for the month prior to visit (May 13-June 13th) calculated an average temp of 12.5C with 57.15mm of rainfall, which is 98% of normal rainfall for the area. Plants were taken from each area of the field and compared visually. Observations at this site visit noted that AnneMaxx trial appeared to have a visually healthier plant stand, increased fibrous roots, and soil was more mellow and easier to dig plants from seed row.

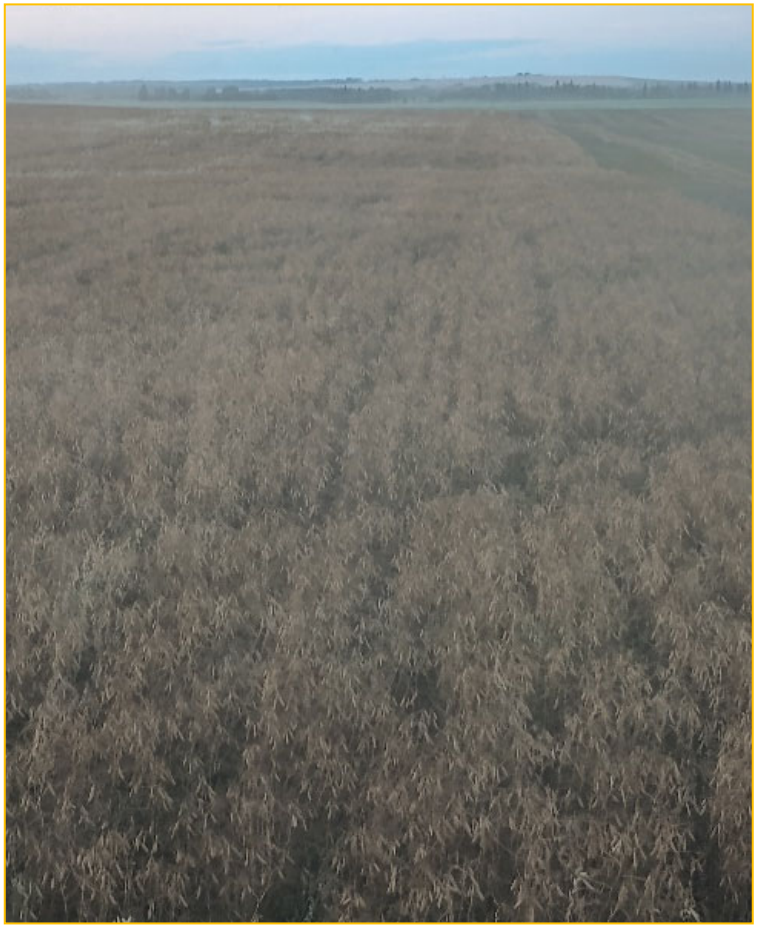
Harvest Data: All treatments were harvested August 19. Yield data was collected from the location: The check and treatment #1 yielded the same; treatment #2 yielded 0.3/bu/ac higher than the other two areas. The producer noted that at harvest, treatment #2 (Annemaxx) appeared visually to have disease. (*have or not have?)*

Harvest Samples: Grain samples were collected from treatments #1 and #2.

They were both sent to SGS labs to complete a germination test and fungal scan to determine if the seed had any fungal spores.

Both treatments had germination of 99 %. The fungal scan revealed Ascochyta Blight/Spot (Ascochyta spp.) in both treatments, with treatment #1 (Zeltera) having 0.5% and treatment #2 (AnneMaxx) having 1 %.

Producer Comments: Given the poor moisture conditions, the producer does feel that continued testing is required to determine the effectiveness of both treatments.



Wheat Seed Treatment Comparison

Summit Acre Farms—Pineview, BC

Project Goal: To determine if there is yield advantage by using different seed treatments on CWRS Wheat.

Background: Historically, because of our northern climate the BC Peace Region, often seeding occurs into colder wet soils. These soil conditions can be less than ideal for seedling establishment. Seed treatments have been used to protect from seedling diseases. Cereal seed treatments offer several benefits for crop production. Here are some key advantages:

Disease and pest protection: Seed treatments can safeguard cereal crops against various diseases caused by pathogens and pests. They create a protective barrier around the seed, reducing the risk of seedling diseases and early-season pest damage.

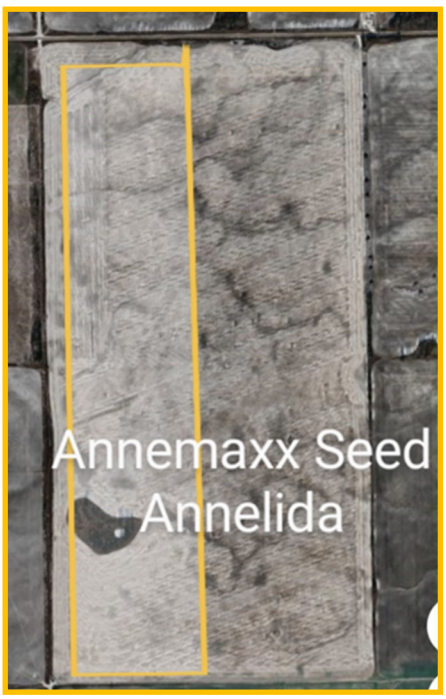
Improved seedling emergence: Seed treatments can enhance seedling vigor and promote uniform emergence. They help seeds overcome environmental stressors and provide essential nutrients for early growth, resulting in healthier and more robust plants.

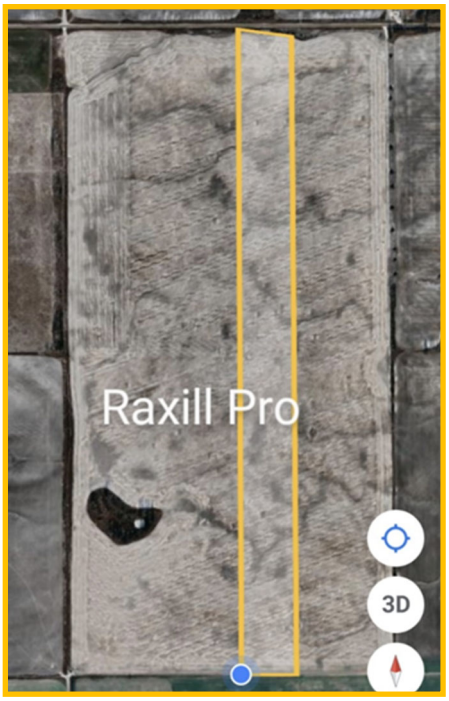
Enhanced crop establishment: By protecting seeds from pathogens and pests, seed treatments contribute to better crop establishment. This leads to higher plant populations, uniformity, and ultimately improved yield potential.

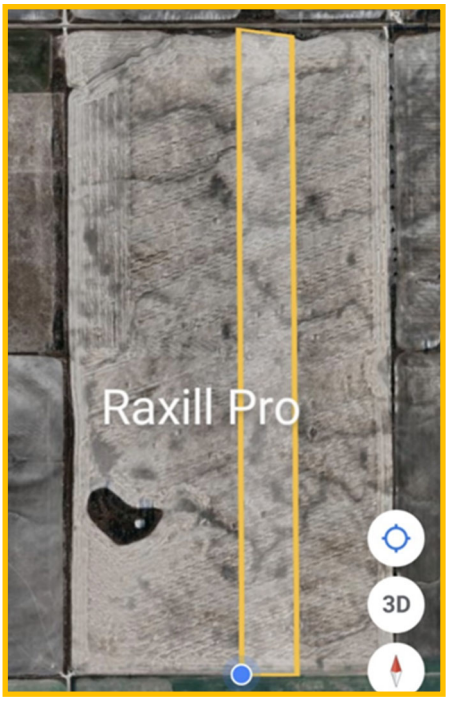
Increased yield potential: With improved disease and pest management, enhanced seedling emergence, and better crop establishment, cereal seed treatments can help maximize yield potential. By protecting the crop during critical early growth stages, they contribute to higher yields and overall profitability.

Seeding Date: May 3,2023

Trial Layout:







Seed Treatment #1: **Bayer Raxil Pro** *(product information as per manufacturer website)*

With three different fungicide actives, Raxil® PRO provides everything you need to maximize your cereal crop's potential. In addition to superior disease protection from the most dangerous seed- and soil-borne diseases like true loose smut and Fusarium graminearum, you also get a stronger, faster emergence to help your field get the head start it needs to reach its maximum yield potential and superior quality. Unmatched seed- and soil-borne disease control, including best-in-class yield robbing diseases like Fusarium graminearum and true loose smut. One simple rate, regardless of disease pressure, with no need to add additional products. Three fungicidal actives for complete contact and systemic disease protection. Micro-dispersion formulation ideal for more thorough, even seed coverage. Easy to apply formulation ideal for both on-farm and commercial application. Applies safely in cooler pre-season temperatures, with a freezing point of -16°C.

Producer Comments: Application was good with good coverage

Cost: $3.23/Acre **Yield:** 59.47 Bu/Acre **Total Acres of Trial:** 25.87 Acres

---

Seed Treatment #2: **Annelida Organics AnneMaxx Seed Treat** *(description as per manufacturer website)*

Annelida AnneMaxx Line is designed to restore the soil balance and increase the natural biology of the cultivated land. AnneMaxx may optimize the oxygen levels and enhance the nutrient uptake and be used in conjunction with our other products. The advantages of Vermicastings, worm castings and extracts are nature's best plant food. As soil conditioners, Annelida's worm castings, extracts and seed inoculants may: enrich your soil with microorganisms, humus and other soil biology to improve your soil's physical structure; increase your soil's water holding capacity and reduce soil erosion; reduce salinization and acidification and restore your soil to an optimum pH range; increase cation exchange and enable your soil to retain nutrients longer; enhance germination, root growth and structure, plant growth, and yield in both soil and hydroponic operations; make more nutrients available for plant uptake and utilization and reduce nutrient leaching; and increase your plant's resistance to disease and pests.

Producer Comments: Added water for better coverage.

Cost: $2/acre **Yield:** 61.20 bu/acre **Total Acres of Trial:** 31.31 acres

---

Treatment # 3: **Check** *(no seed treatment)*

Cost: N/A **Yield:** 57.72 bu/acre **Total Acres of Trial:** 31.2 acres

Previous Disease Information: No information.

In Crop Observations: On June 13, 2023 a site visit was completed to collect visual observations. Local weather station data since seeding date (May 3-June 13th) calculated an average temp of 12°C with 57.15mm of rainfall, which is 84% of normal rainfall for the area and timeframe. Plants were taken from each area of the field and compared visually. Observations at this site visit noted that AnneMaxx trial appeared to have a visually healthier plant stand, increased root depth, soil was more mellow and easier to dig plants from seed row. Raxil Pro seed treatment visually had more fibrous roots but a shallower depth.

Yield and Cost Comparison:

Wheat Seed Treatment Comparison

	Yield bu/ac	Trial Size (acres)	$ per acre	Difference From Check Bushels	Wheat $/bu $8
Treatment #1 Raxil Pro	59.47	25.47	$3.23	1.75	$14.00
Treatment # 2 AnneMaxx Seed Treat	61.2	31.31	$2.00	3.48	$27.84
Treatment # 3: Check (no seed treatment)	57.72	31.2	$0.00		

Trial Four

Cover Cropping Demonstration

Summit Acre Farms

Seeding Date: June 20, 2023

Previous Crop: LL Canola

Cover Crop Mixture: Field Peas with Red Clover, Turnip, Radish and Hairy Vetch

Trial Area: Pineview, BC

PEACE REGION
LIVING LAB

Cover Cropping Demonstration

Summit Acre Farms – Pineview, BC

Project Goal: To utilize cover crops in an annual cropping system to help break up soil compaction and improve soil health.

Background: This field is part of the 5 year living lab project that will compare this field (BMP) with and adjacent field (Check) where a continues cropping system will be done over the same time period. The producer wanted to compare these two fields and determine if by planting a cover crop there will be an improvement to reduce compaction, increase water infiltration and increase yield.

Previous Crop: LL Canola

Seeding Date: June 20, 2023

Cover Crop Mixture: Field Peas, Red Clover, Turnip, Radish, and Hairy Vetch.

Fertility: No additional fertility was added.

Soil Moisture: Within 4 days of finishing seeding the cover crop there was 26.15mm (1.028 inches) of rain, which created optimum moisture conditions for germination and establishment. It should be noted that prior to this rainfall, soil moisture conditions had been depleted due to lack of precipitation. The producer did note that as the field had no disturbance since fall 2022, the previous crop trash layer assisted with moisture retention.

Soil Temperature: Although no temperature was taken at the time of seeding, there has been two months of warm dry conditions, making the soil temp warm.

Seeding Rate: Peas: 1.5 bu/ac (seeded at deeper depth); and

Custom Blend: Red Clover 10lbs/ac, Radish 2lbs/ac, Turnip 1lb/ac, and Hairy Vetch 1lb/ac. (custom blended together, and seeded out the same shoot).

Seed Cost: $44.38/ac (Custom blend $3.17/lb * 14lbs/ac) Peas seed $20/ac = $65/ac

Equipment costs: Custom seeding rate $30/ac (includes Seeding equipment + operator + support equipment)

TOTAL Cost: **$95/ac**

Weed Control: Pre seed glyphosate application at a rate of .67l/ac of 540gm prior to seeding was completed.

2024 Cropping Plan: Allowing of Red clover regrowth creating an additional cover crop year.

Spring Conditions at time of baseline measurements

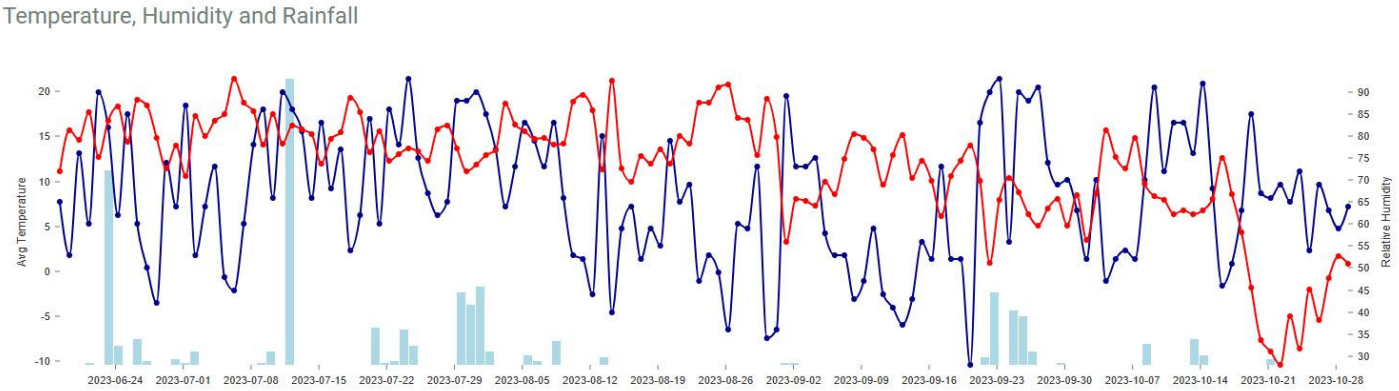
Weather Data: Nearest Weather Station located (@ Bickford Farms) approximately 5 miles north west across the Montney Creek. According to producer weather pattern in 2023 were quite unpredictable with intermittent rainfall events that rainfall information to be slightly more than weather station data indicated.

Using the data collected from the local BC Peace weather monitoring station, the Growing Degree Days can be determined for this trial location. Growing Degree Days (GDD) are determined by calculating the accumulated heat units above a base temperature threshold, typically 10 degrees Celsius, during the growing season. The formula is: GDD = (Max Temperature + Min Temperature) / 2 - Base Temperature.

Weather Data — Bickford Station		
	May 1- Sept 30	June 20- Oct 28
Total Rainfall	205.99mm	156.46mm
Average Temperature	13.2C	11.8C
Highest Temperature	31.8C	31.8C
Normal Rainfall	270.61mm	215.09mm
% Normal Rainfall	70%	73%

Growing Degree Days	**June 20, 2023**	**To**	**October 28, 2023**
# Days of Growth	131		
	Actual	**Normal**	**% of Normal**
GDD Base 0C	1836	1496	123%
GDD Base 5C	1221	897	136%
GDD Base 10C	649	400	163%

Weather Chart June 20th (Seeding) to Oct 28th



.

Baseline Sampling Summary

Dr. Sahel Miladi Lari

BC Grain Chief Scientific Officer Dr. Sahel Miladi Lari provided a summary of the sampling that was completed comparing this field (BMP) and Adjacent field (Check) these samples were taken as a baseline to be utilized over the duration of the Living Labs project. These measurements were taken May 12, 2023 prior to the seeding of the cover crop on June 20, 2023.

Soil Compaction

One of the main goals of this Cover cropping BMP is to utilize a non mechanical control to mange compaction. Soil compaction is a process that reduces the pore space between soil particles, making it harder for water, air, and plant roots to move through the soil. Soil compaction can be caused by various factors, such as heavy machinery, tillage, animal traffic, and rainfall. Soil compaction can have negative impacts on crop growth, soil health, and environmental quality. The producer has noted that compaction on this field appears to be higher than on the adjacent check field.

Effects of Soil Compaction

Some of the effects of soil compaction are:

- Decreased water infiltration and drainage, leading to more runoff and erosion.
- Reduced soil aeration and oxygen availability, affecting soil microbial activity and nutrient cycling.
- Increased soil strength and bulk density, limiting root penetration and exploration.

Altered soil temperature and moisture regimes, affecting seed germination and plant development.

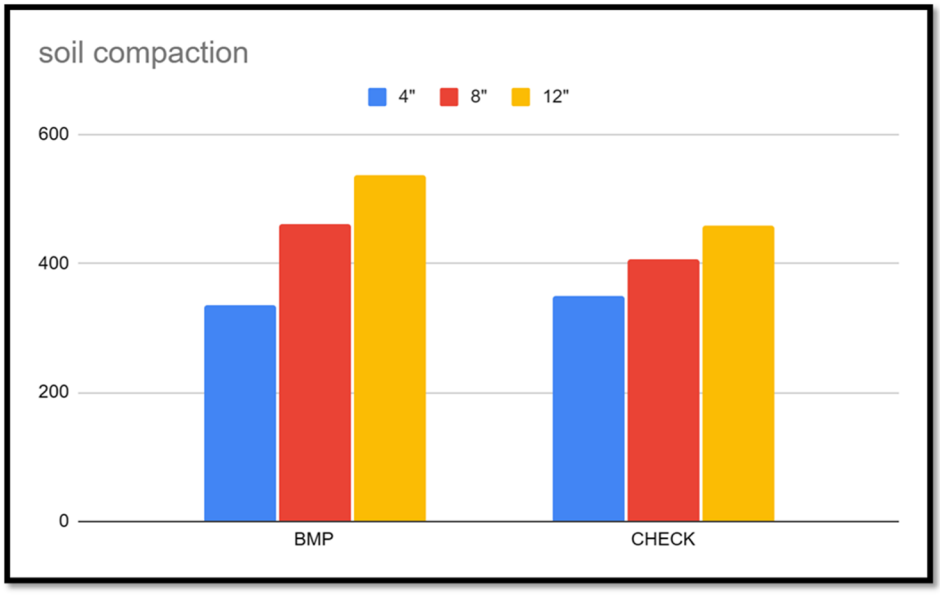
Management Practices to Prevent or Reduce Soil Compaction

To prevent or reduce soil compaction, some of the management practices are:

- Avoiding field operations when the soil is wet or moist.
- Reducing the weight and frequency of machinery and equipment on the soil surface.
- Using controlled traffic or tramline systems to confine wheel traffic to specific paths.
- Increasing soil organic matter and biological activity to improve soil structure and aggregation.
- Applying cover crops, crop rotations, and reduced tillage to enhance soil diversity and resilience.

Soil Compaction Measurement

For this project, the SpotOn Digital Soil Compaction Meter was used to measure the soil compaction. The chart below shows the average soil compaction of BMP and check at different depths (4”, 8”, and 12”). The data indicate that the soil compaction in check was lower than in BMP at all depths except at 4” depth, where BMP was lower than check.



Increased Water Infiltration: Compacted soil can hinder water infiltration, leading to runoff and erosion. Cover crops with deep-rooting systems can break up compaction, allowing water to penetrate the soil more effectively. This helps improve soil moisture retention and reduces the risk of waterlogging. In recent years, the BC Peace Region has experienced many instances of significant rainfall in a short time frame followed by prolonged dry periods. Ability for water to infiltrate rather than drain off can improve moisture availability to plants throughout the growing season while decreasing erosion damage. Dr. Sahel Miladi Lari was able to provide the following summary detailing the baseline water filtration results from sample that was completed prior to seeding of cover crop.

Single Ring Infiltration Results[1].

To calculate the infiltration rate, used the following formula.

$$I = \frac{V}{A \times t}$$

where I is the infiltration rate (cm/min), V is the volume of water is the cross-sectional area of the pipe and t is the time (min). Using this formula, we can calculate the infiltration rate for each sample point in both BMP and CHECK methods. (See charts below)

To compare the two methods, we can calculate the average infiltration rate for each method and see which one is higher. The average infiltration rate is the sum of the infiltration rates divided by the number of sample points. Here are the results:

BMP: Average infiltration rate = 0.3651 cm/min
CHECK: Average infiltration rate = 1.9186 cm/min

Therefore, we can conclude that the CHECK method has a higher average infiltration rate than the BMP method, which means that the soil in the CHECK area is more permeable and allows more water to infiltrate. This could be due to different soil types, compaction, vegetation, or other factors that affect the soil structure and porosity.

Infiltration Rates for BMP

Sample Point #	GPS Coordinates	Time (min)	Infiltration Rate (cm/min)
1	56 41.311 -121 05.582	0.5	0.6283
2	56 41.295 -121 05.535	0.4333333333	0.7264
3	56 41.269 -121 05.565	0.6833333333	0.4608
4	56 41.245 -121 05.511	0.7333333333	0.4296
5	56 41.197 -121 05.544	4.15	0.0759
6	56 41.173 -121 05.587	0.9666666667	0.3256
7	56 41.140 -121 05.530	12.3	0.0256
8	56 41.113 -121 05.561	0.5	0.6283
9	56 41.090 -121 05.517	3.766666667	0.0836

Infiltration Rates for Check

Sample Point #	GPS Coordinates	Time (min)	Infiltration Rate (cm/min)
C1	56 41.329 - 121 05.392	0.08333333333	3.7699
C2	56 41.288 - 121 05.341	0.1	3.14
C3	56 41.253 - 121 05.385	0.1666666667	1.8849
C4	56 41.231 - 121 05.342	0.1833333333	1.7136
C5	56 41.196 - 121 05.413	0.15	2.0933
C6	56 41.188 - 121 05.374	0.06666666667	4.7100
C7	56 41.159 - 121 05.328	0.3833333333	0.6519
C8	56 41.143 - 121 05.388	0.5166666667	0.4833
C9	56 41.121 - 121 05.343	0.2833333333	0.8816

Benefits & Challenges of Introducing Cover Crops

Benefits

Nutrient Cycling and Retention: Cover crops take up excess nutrients from the soil, preventing leaching and nutrient runoff. When cover crops decompose, they release these nutrients back into the soil, improving nutrient availability for subsequent crops. This cycling of nutrients reduces the need for synthetic fertilizers. The addition of nitrogen fixating species such as peas and clovers utilizes natural processes to build nitrogen within soils. Continued monitoring will be done to access the nutrient benefits of this cover crop in the future.

Weed Suppression: Cover crops can act as a natural weed suppressant by competing for resources such as light, water, and nutrients. By reducing weed pressure therefore also reducing herbicide usage, promoting an integrated weed management approach.

Soil Erosion Control: Compacted soil is more prone to erosion, especially during heavy rainfall events. Cover crops help protect the soil surface from erosion by intercepting raindrops, reducing runoff, and improving soil structure. Infiltration & compaction testing will be completed on this field for the duration of the project to access how these changes over time.

Biodiversity and Habitat: Cover crops provide habitat and food sources for beneficial insects and microorganisms. This promotes biodiversity in agricultural landscapes and supports natural pest control, reducing the reliance on pesticides.

Challenges

Timing and logistics: Choosing the right time to plant was challenging especially given the drought conditions prior to seeding, and the need to fit within the existing crop rotation and management practices. As the seeding of this cover crop is also at the same time that spraying operations are taking place there were additional labour allocation challenges.

Competition with cash crops: As cover cropping essentially take a year out of revenue generating crops there is a revenue loss that is created, for smaller farms or farms with reduced ability to withstand reduction in cash flow there are significant financial risks. Unless farm has ability to take additional yield & soils information following cover crop implementation there can be challenges in determining the direct cost & soil health benefits.

Challenges Continued ...

Species Selection: Selecting the appropriate cover crop species and varieties that are well adapted for the unique Peace Region climate can be difficult, as the growing season is generally shorter. Factors such as climate, soil type, and desired outcomes need to be considered. Different cover crops have varying growth habits, nutrient requirements, and disease susceptibility which can impact their effectiveness.

Seed Availability and Cost: Local availability and affordability of cover crop seeds can be a challenge, especially for less common or region-specific species. Seed supply for many cover crops may be limited in the Peace Region and producers may have to source seeds from other regions, which can increase the risk of importing invasive weeds or diseases that can have long-term impacts to farming operation. Seed costs are also high for custom mixtures and with no cash revenue generation from expense.

Weed Management: While cover crops can help suppress weeds, they can also introduce weed species if not managed properly. Timing of cover crop termination and ensuring effective weed control during the transition from cover crop to cash crop is important. In this cover cropping project volunteer canola from the previous year became a particular challenge as pre seed glyphosate herbicide application was unable to control LL volunteer canola and in some areas of the field the volunteer canola outcompeted the cover crop.

Integration with Existing Equipment and Practices: Modifying or adapting machinery and equipment to accommodate cover crops can be a hurdle. For example, planting or terminating cover crops may require adjustments to seeding or tillage equipment. The producer was able to utilize a double shoot seeding implement to seed the peas deeper (fertilizer band) and the cover crop seed mixture in a shallower seeding depth improving the seed to soil contact for germination and establishment. The producer also identified that challenges with surface plant growth may be difficult to manage with their current equipment.

Wildlife Damage: As cover crops are late season, they are at peak vegetative growth after most annual crops have been harvested making cover crops very attractive to wildlife species such as deer, moose, water fowl, and bears. Producer noted significant wild life during later fall period: at one point 20 moose and approx. 100 deer were grazing on this cover crop area.

Knowledge and expertise: Implementing cover crops effectively requires knowledge of their benefits, management techniques, and potential challenges.

Changes to Scope of Project

Livestock Integration: Although the original intention of this cover cropping project was to grow the cover crop and have it terminated by environmental conditions (frost) or through herbicide. Drought conditions in the Peace Region during the 2023 growing season made this cover crop a valuable feed source. The producer made the decision to install temporary fencing and graze this cover crop. Although not intentional, this operation created an additional scope to this project.

Grazing Information: 80 cow calf pairs (born May 2023) grazed for 22 days starting October 28, on the north 96 acres. Additional grazing may be added. The producer did not graze the remaining portion of field as he wanted to compare grazing vs no grazing. It should be noted the part of the field that was left as check, was the worst part for soil health and drainage.

Benefits of Livestock Integration into Annual Cropping System:

Enhanced soil health: Cattle grazing can help improve soil structure and fertility by trampling plant residues, incorporating organic matter into the soil, and stimulating nutrient cycling through their manure.

Weed and pest control: Grazing animals can help control weeds by consuming and trampling them. Additionally, they can reduce pest pressure by breaking up pest life cycles and disturbing habitats.

Nutrient cycling: Cattle grazing on cover crops or crop residues can recycle nutrients by consuming plant material and returning it to the soil through their manure. This can reduce the need for synthetic fertilizers and improve nutrient availability for subsequent crops.

Diversification and risk management: Integrating livestock into cropping systems provides an additional income stream. It can help spread financial risks by reducing dependence on a single commodity.

Improved forage utilization: Grazing cattle on cover crops or crop residues can help utilize plant material that would otherwise go to waste. This maximizes the use of available resources and reduces feed costs

Challenges of Livestock Integration into Annual Cropping System:

Compaction: Cattle integration can cause soil compaction especially as livestock tend to follow same pathways and concentrate in areas or increased feed, water, or shelter. This soil compaction can negatively affect soil health and water infiltration.

Inc*reased labour:* To effectively graze a cover crop and ensure even distribution of manure additional labour and infrastructure many need to be put in place. For example: installing of fencing, more labour to move temporary fencing, creating water sources, and hauling of water.

Future Challenges

2024 Identified Challenges / Benefits:

Vegetative growth management: In traditional annual cropping systems, straw management is done via combines through a straw chopper. The producer has identified that the surface growth of this cover crop is significant, and although this will be a great long-term addition of soil organic matter there will management strategies to be considered in the interim. The hoe type openers on their existing drill may not be able to seed effectively into the increased debris levels of trash that may be on the surface. This increased vegetative debris may cause hair pinning, plugging, and poor seed placement for future crops. Producer is seeking out options such as: mowing or different tillage equipment; aim to not continue to graze any livestock past June 2024; and remove any growth by aggressive tillage that could impede the root pathway water infiltration created by the decaying turnip/ radish root structure.

Reduced Revenue: An additional year of lost cash revenue may be a challenge especially with increased cost of production. Integration of livestock may an additional cash value.

Timing and Logistic: As an additional seeding pass is required for 2024 because the red clover is already seeded there is a decrease in spring /harvest work load.

Weed Control: As there are limited herbicides that can control weeds in a red clover stand additional weed control practices may need to be implemented, should a challenging weed species emerge.

Trial Five

Optimum Gly Canola Variety Comparison

Odermatt

Seeding Date: May 9, 2023

Harvest Date: September 13, 2023

Variety: Multiple

Trial Area: Baldonnel, BC

Optimum Gly Canola Variety Comparison Trial

Odermatt - Baldonnel, BC

Project Goal: Compare 5 different canola varieties in a side-by-side comparison.

Trial Description: Side by side comparison field research conducting a systematic evaluation of 5 canola varieties in a real Peace Region setting. Throughout the growing season there were observations and data collection on side by to compare their characteristics, performance, and outcomes. This type of research allows for direct comparisons and helps identify similarities, differences, advantages, disadvantages, and other relevant insights. In this instance, the performance outcome is a yield comparison between the similar Round Up tolerant canola varieties.

Seeding Date: May 9, 2023

Previous Crop: Barley

Seeding Conditions:

Moisture: Okay (on the dryer side, definitely not wet) .

Temperature: 6" down was 5 degrees and 2" down was 10 degrees. Field was harrowed in fall 2022 and has been zero/minimum till for past 30 years. Seed depth was between ½'' to ¾'' and a seeding speed of 4.3 mph.

Thousand Kernal Weight Seeding Information: Seeding to thousand kernel weight (TKW) is important in agriculture because it provides valuable information about seed quality and helps optimize crop production. TKW is a measure of the weight of a specified number of seeds, usually 1,000, and it can indicate seed size, vigor, and potential yield. Seeding to TKW allows a more consistent and uniform plant stand, by using seeds with a known weight, farmers can ensure that they are sowing a consistent number of seeds per unit area, which promotes even germination and reduces competition among plants. This ultimately leads to better crop establishment and more uniform plant growth.

Seeding Equipment: Seed-master (side band, dual shoot) Ultra Pro Metering.

Plot Size: 720mx39m or 6.93acres per plot.

Seed Treatment: Lubi GEN/ Helix Vibrance and Lubriderm on all Pioneer Varieties. Dekalb Treated with Prosper EverGol and BUTEO Start.

Herbicide Application: All varieties registered to be treated with glyphosate; however, Pioneer is done through Optimum® GLY trait. 2 passes of glyphosate at .33/acre.

Varieties Seeded: Dekalb TF 98CR

Pioneer 44H44

Pioneer 515G

Pioneer P510G

Pioneer P511G

*For more product information, scan the QR codes to visit manufacturer websites

Yield Information: See below table:

Yield Information

Variety	Thousand Kernal Weight (TKW)	Seeding rate lbs/ac	Yield Bu/ac
DkTF98CR	5.6	5.45	54.91
44H44	6.1	4.86	55.59
P515G	5.2	5.8	52.23
P510G	5.3	5.4	46.38
P511G	3.7	6.7	46.43

*Yields were calculated at 10% moisture not 6.1% so yields would be slightly higher if using adjusted weight

**Yield Measurements taken using weigh wagon*

**Seed Moisture 6.1%*

**There is no weather station near this field therefore no weather information for this location*

Green- 0.5%

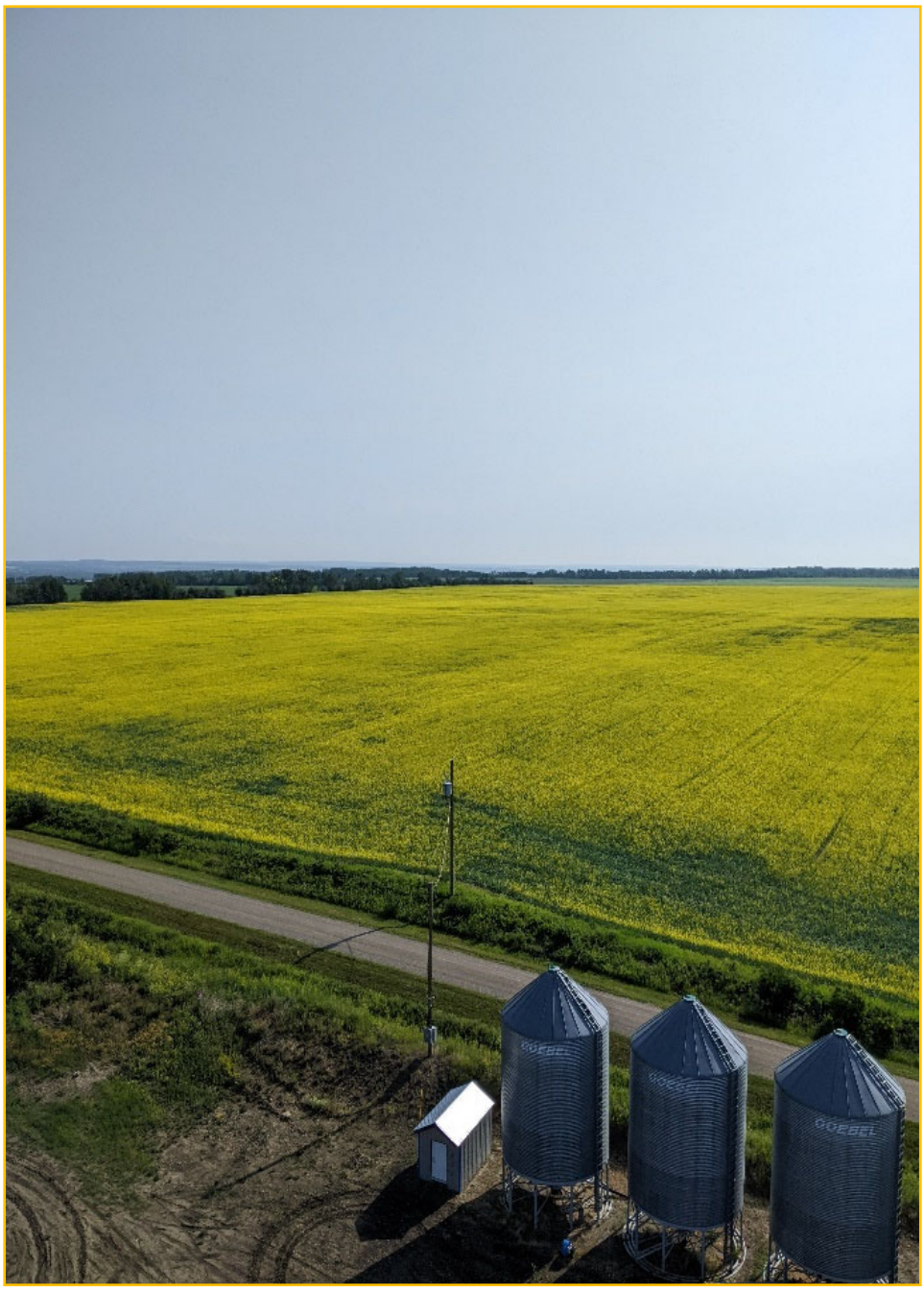
Growing Season Comments from Producer:

Growing season was less than ideal but not terrible. The seeds all germinated quickly and got off to a good start and outgrew any flea beetles. They did get drought stressed but timely showers kept them growing without too much difficulty. We had a tremendous amount of smoke during the growing season due to wildfires. No noticeable insect or disease losses. We ended up with around 8 plants per square foot for most of the plots.

Harvest Information:

Swathing date: August 27, 2023

Combined date: September 13, 2023



Trial Six

Liberty Canola Variety Comparison

LH Willms Inc.

Seeding Date: May 9, 2023

Harvest Date: September 15, 2023

Trial Area: Rose Prairie, BC

Liberty Canola Variety Comparison

LH Willms—Rose Prairie, BC

Project Goal: Comparing 6 different canola varieties in side-by-side comparison.

Trial Description: Side by side comparison field research conducting a systematic evaluation of 6 canola varieties in a real Peace Region setting. Throughout the growing season there were observations and data collection on side by to compare their characteristics, performance, and outcomes. This type of research allows for direct comparisons and helps identify similarities, differences, advantages, disadvantages, and other relevant insights. In this instance is performance outcome is yield comparison between the similar Round Up tolerant canola varieties

Seeding Date: May 9, 2023

Seeding Conditions: In the two weeks prior to seeding the average daily temperature was 10.3C with a low of -2.9C and high of 29.4C. Total rainfall for this period was 6.86mm which is 51% of normal for this same time period. Although the weather conditions were warmer than average there was good soil moisture at seeding.

Previous Crop: Wheat.

Plot Size: Plot size varied from 2.36 ac to 2.91 acres.

Varieties Seeded:

Pioneer P509L:

Pioneer P505MSL:

Pioneer P516L:

Pioneer Exp226:

Pioneer Exp4404:

Pioneer P612L:

L340:

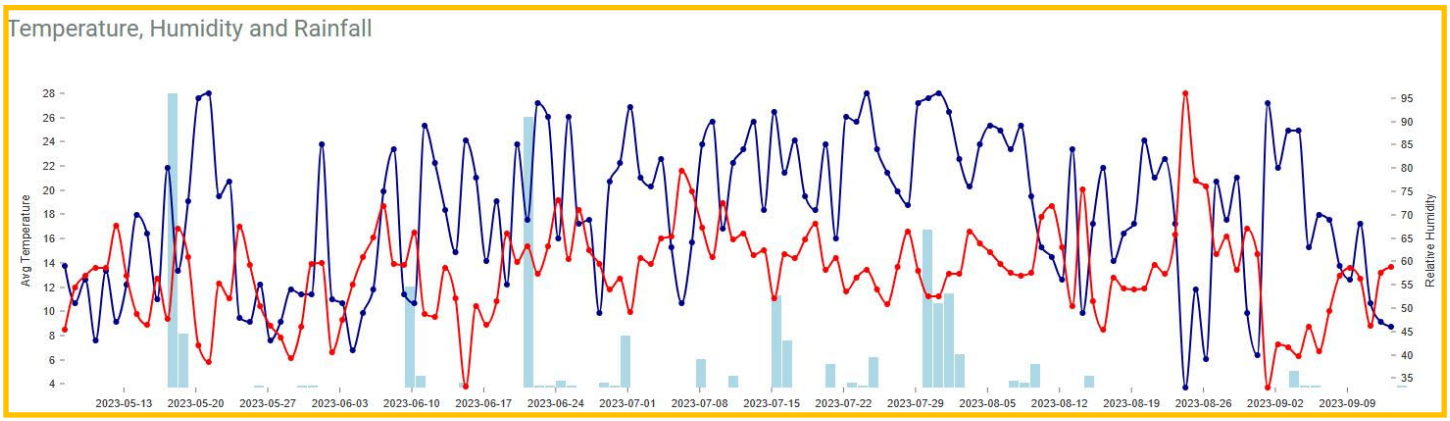
Bayer

Pioneer

Scan QR code to visit manufacturers website for variety information

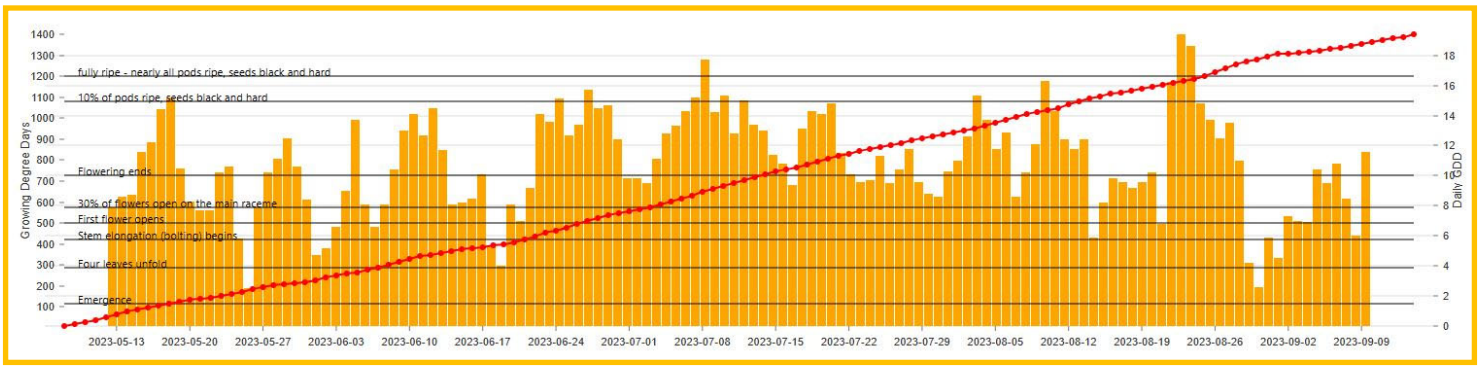
Weather Information:

Weather Data: Rose Prairie	
	May 9- Sept 15th
Total Rainfall	161.54 mm
Average Temperature	13.2C
Highest Temperature	31.1C
Normal Rainfall	249.11mm
% Normal Rainfall	65%
*BC PeaceAGRI Weather Network	



Growing Degree Days
Rose Parire

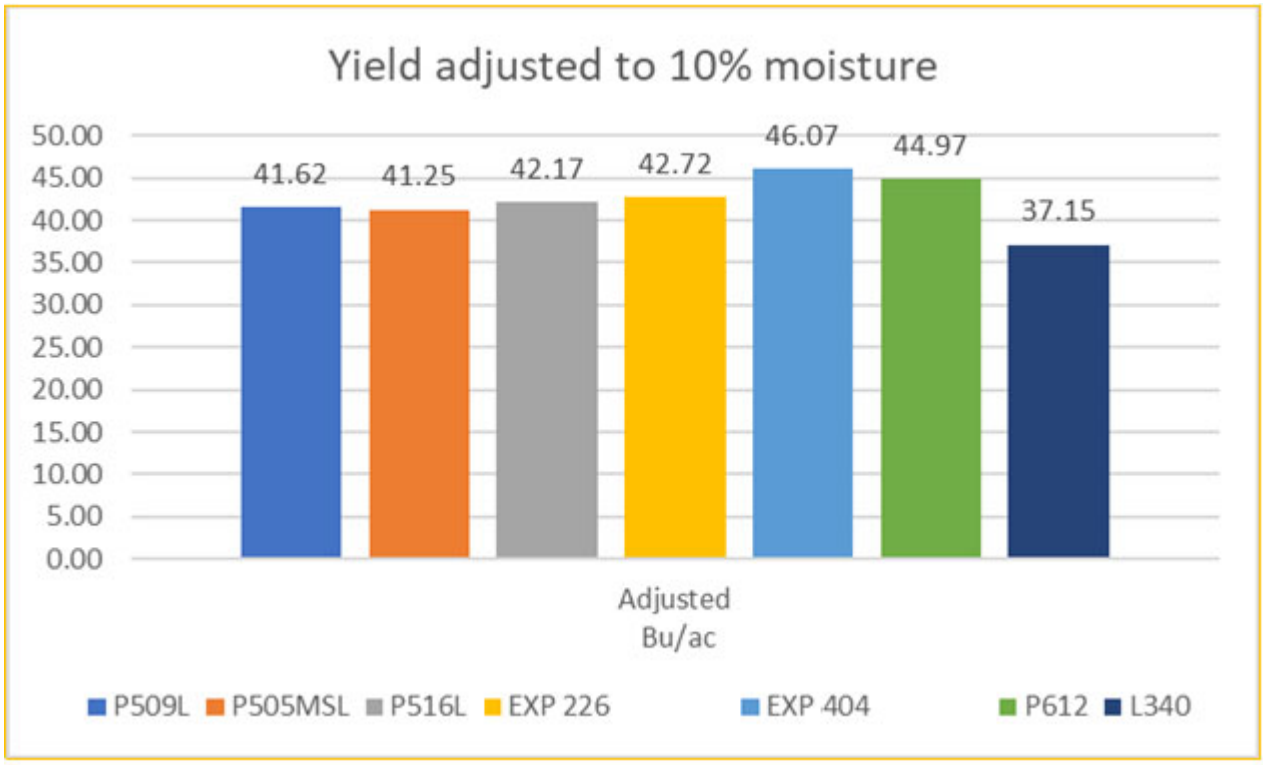
	May 9, 2023	To	September 15, 2023
# Growth Days	129		
	Actual	Normal	% of Normal
GDD Base 0C	2049	1930	121%
GDD Base 5C	1399	1045	134%
GDD Base 10C	757	452	167%



Weather data was pulled from the BC Peace Agri Weather Network (Rose Prairie Station)

Harvest Yield Data:

Harvest Data Liberty Canola Trial Sept 15, 2023				
Description	**Acres**	**Bu/ac**	**Moisture**	**Adjusted Bu/ac**
P509L	2.94	**39.78**	5.39%	**41.62**
P505MSL	2.91	**39.45**	5.45%	**41.25**
P516L	2.89	**40.33**	5.46%	**42.17**
Experimental 226	2.89	**40.71**	5.07%	**42.72**
Experimental 404	2.88	**44.11**	5.58%	**46.07**
P612	2.60	**42.89**	5.18%	**44.97**
L340	2.36	**35.56**	5.55%	**37.15**



Harvest Samples:

Harvest Grain Sample Results												
Variety	Grade	ADFRmeal (Acid Digestible Fiber)	Chlorophyll	Iodine Value	Linoleic Acid	Linolenic Acid	Moisture	Oil	Oleic Acid	Protein	Saturated Acids	Total Glucosinolates
P509L	1 CAN	25.4	2.1	113.4	17.9	10.3	4.8	48.6	63.4	17.5	6.5	6.5
P505MSL	1 CAN	25.7	2.8	112.5	17.6	10.0	4.9	47.6	63.9	17.9	6.5	7.9
P516L	1 CAN	24.1	2.2	111.6	16.6	9.6	4.7	48.3	65.1	17.5	6.5	4.1
Experimental 226	1 CAN	22.1	2.5	113.3	17.2	10.3	4.3	52.3	64.4	16.9	6.1	3.0
Experimental 404	1 CAN	25.5	5.5	112.0	17.5	9.7	4.7	48.9	64.1	17.7	6.6	4.7
P612L	1 CAN	22.7	3.5	114.2	18.3	10.5	4.6	48.6	62.8	18.3	6.4	4.3
L340PC	1 CAN	26.0	2.4	111.8	16.2	10.1	4.9	45.8	64.9	18.4	6.5	7.4

Thank you for your sponsoring this trial:

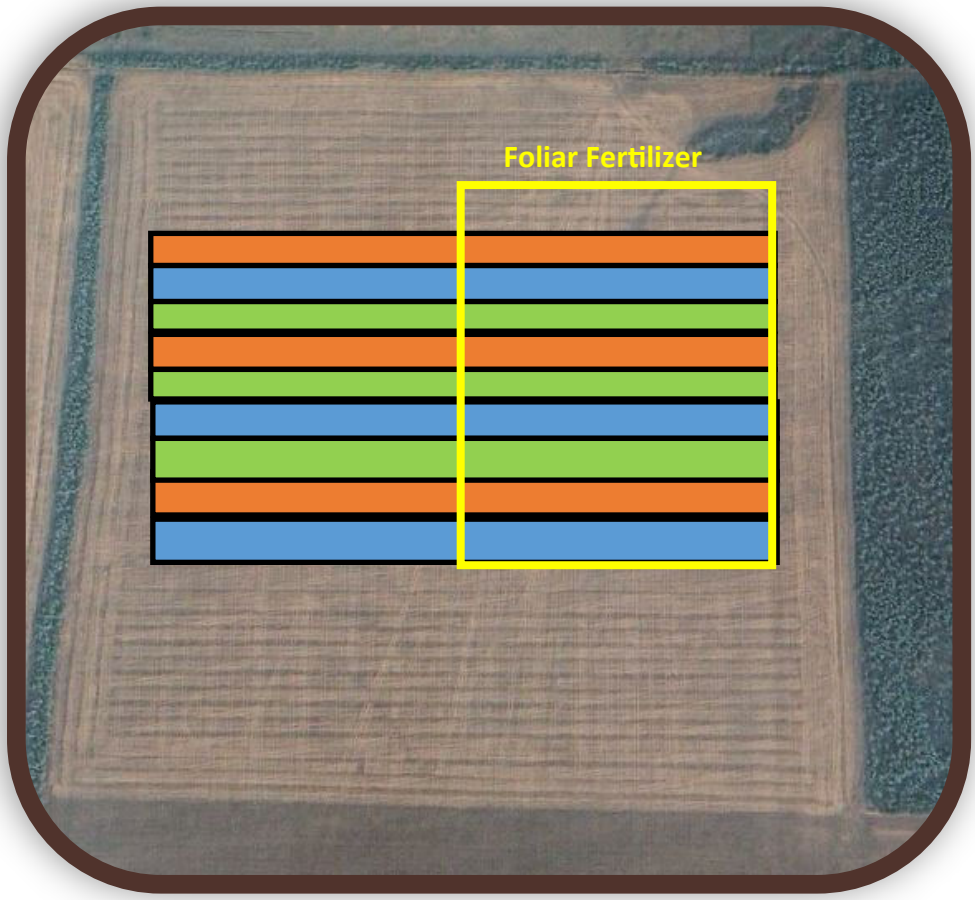
PIONEER®

LH WILLMS INC
ROSE PRAIRIE, BC

Trial Seven

Equipment & Fertility Trial Summary

River Crest Farms



Planter: 10-34-0 Liquid Fert | Drill: 11-52-0 | Planter: Omex

Seeding Date: May 15, 2023

Harvest Date: Sept 19, 2023

Variety: Dekalb 82SC

Trial Area: Flat Rock, BC

Planter vs. Air Drill Trial Summary

River Crest Farms

Project Goal: To complete a second year of comparison between the two different types seeding equipment planter vs. drill, each replicated three times. The trial did evolve into two different fertility comparisons as well. The first comparing the planter drill using two different types of in seed row liquid starter fertilizers: 10-34-0 & OMEX TNT. The second additional trial was comparing two passes of foliar applied fertility which included macro and micro nutrient application. Each was replicated 3 times a total of 18 different trial ranging in size from .63 - .75 acres in size, as this location was split up into 3 different projects:

Project #1: Planter Vs. Drill— Year Two;

Project #2: Planter seed row starter fertility (OMEX TNT vs. 10-34-0); and

Project #3: Foliar applied fertility vs none.

Seeding Date: May 15, 2023

Variety: Dekalb 82SC thousand kernel weight 3.75grams. 1.9lbs of seed per acre at a the population of 230,000seeds/ac.

Seeding Rate: Planter 1.9lbs/ac (230,000 seeds/ac) Drill 4.3 lbs/ac

Previous Crop information: 2022 crop was Wheat which yielded 60bu/ac average

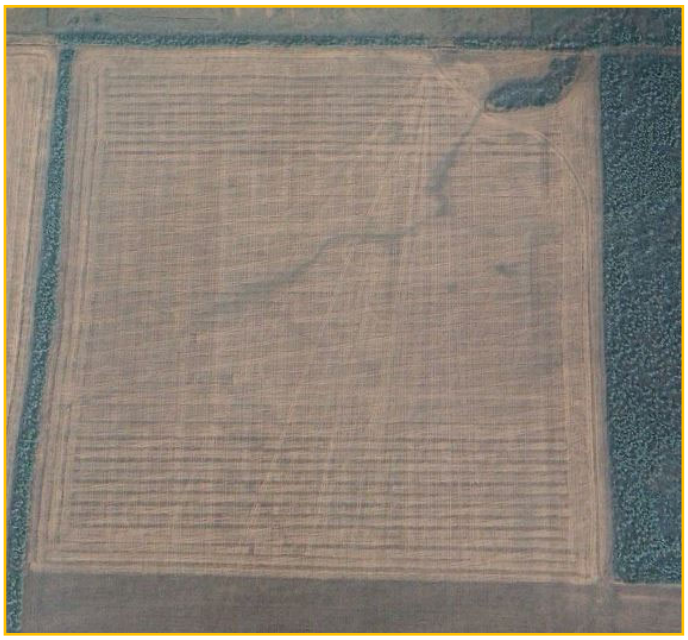
*Field was also under seeded to perennial ryegrass in 2023 for a 2024 crop.

Seeding Conditions: Although moisture conditions at the time of seeding were beginning to get dry, there was fair seed bed moisture and soil conditions were warm as 2023 spring temperatures were unprecedentedly high. According to the closest weather station data (Peace Agri weather Network-Flatrock) in the 30 days prior to seeding, the average daily temperature was 7C with a low of -4.7C and a high of 31.3C. Rainfall was 14.73mm, or 50% of normal rainfall for this time period.

The following table is a description of the trail layout and what fertility and herbicide applications were done across the whole field area:

Herbicide: Liberty + Centurion Foliar Fert: 10-10-10- Liquid Blend @ 1l		**Herbicide: Liberty + Centurion No Foliar fertility**	
1A	Planter 1.9lbs/ac 10-34-0- Liquid Fert	1B	Planter 1.9lbs/ac 10-34-0- Liquid Fert No in crop foliar
2A	Drill 4.3 lbs/ac 11-52-0 dry Fert (18 lbs actual)	2B	Drill 4.3 lbs/ac 11-52-0 dry fert No in crop foliar
3A	Planter 1.9lbs/ac TNT Omex Liquid Fert	3B	Planter 1.9lbs/ac TNT Omex Liquid Fert No in crop foliar
4A	Planter 1.9lbs/ac 10-34-0- Liquid Fert	4B	Planter 1.9 lbs/ac 10-34-0- Liquid Fert No in crop foliar
5A	Planter 1.9lbs/ac TNT Omex Liquid Fert	5B	Planter 1.9lbs/ac TNT Omex Liquid Fert No in crop foliar
6A	Drill 4.3 lbs/ac 11-52-0 dry Fert (18 lbs actual)	6B	Drill 4.3 lbs/ac 11-52-0 dry fert No in crop foliar
7A	Planter 1.9lbs/ac TNT Omex Liquid Fert	7B	Planter 1.9lbs/ac TNT Omex Liquid Fert No in crop foliar
8A	Planter 1.9lbs/ac count 10-34-0- Liquid Fert	8B	Planter1.9lbs/ac 10-34-0- Liquid Fert No in crop foliar
9A	Drill 4.3 lbs/ac 11-52-0 dry Fert (18 lbs actual)	9B	Drill 4.3 lbs/ac 11-52-0 dry fert No in crop foliar

Variability in Field & Topography: Field is approximately 90 acres of bush surrounded by bush buffer on three sides and open to the south. There is a slight water draw across middle of field but over all fairly flat uniform topography.



Growing Season Weather Conditions: Using the data collected from the local BC Peace weather monitoring station, the Growing Degree Days (GDDs) can be determined for this trial location. GDDs are determined by calculating the accumulated heat units above a base temperature threshold, typically 10 degrees Celsius, during the growing season. The formula for calculating GDD is:

GDD = (Max Temp. + Min Temp.) / 2 - Base Temp.

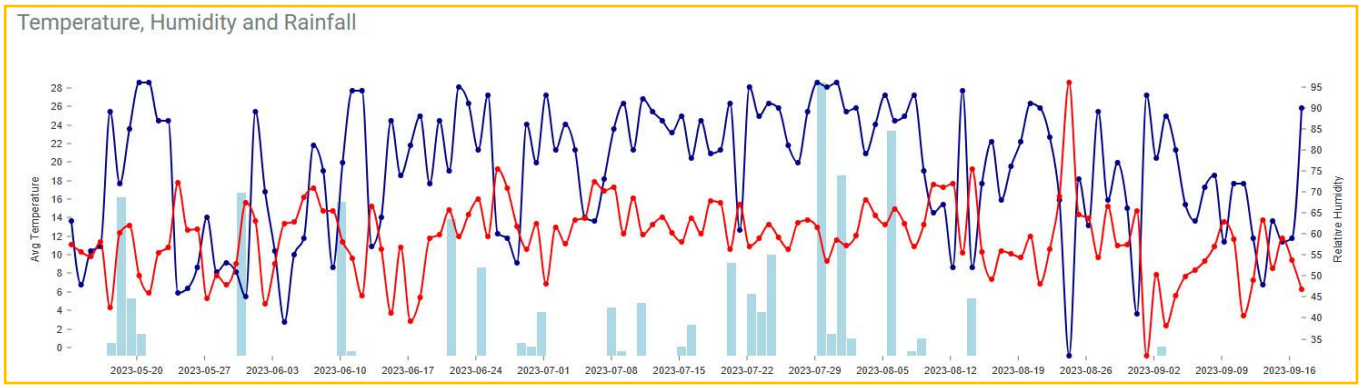
Each day, the average of the maximum and minimum temperatures is calculated, and if it exceeds the base temperature, the difference is added to the cumulative GDD. This process is repeated throughout the growing season to track the accumulated heat units, which can help estimate the growth and development of plants.

Weather for Dirks Trial 2023 May 15 - September 20	
Average Temperature:	11.8 °C
Lowest Temperature:	-2.6 °C
Highest Temperature:	32.7 °C
Total Rainfall:	122.17 mm
Normal Rainfall:	241.19 mm (51% of Normal)

Growing Degree Days for Dirks 2023 Trial May 15 - Sept 20, 2023			
Number of Days: 128			
	Actual	Normal	% of Normal
GDD Base 0C	1984	1672	119%
GDD Base 5C	1344	1038	129%
GDD Base 10C	718	451	159%

Information generated using http://www.bcpeaceweather.com/

Flatrock Weather Station: May 15 – September 19



Fertility

Manure Application: There is not a usual fertility operation on this field, but Rivercrest Farms had some composted manure that was applied to this field in fall of 2022. Although not within the scope of this project, the estimated nutrient value of 2 metric tonnes of manure per acre can vary depending on the type of manure and its nutrient composition. However, some general nutrient content ranges for cow manure are:

⇒Nitrogen (N): 10-30 kg/tonne;
⇒Phosphorus (P): 5-20 kg/tonne; and
⇒Potassium (K): 10-30 kg/tonne.

Applying 2 metric tonnes of composted manure per acre can provide several benefits to the soil. Potential benefits include:

Nutrient enrichment: Composted manure is rich in essential nutrients like nitrogen, phosphorus, and potassium. Applying it to the soil can help replenish these nutrients, promoting healthier plant growth.

Organic matter addition: Composted manure is an excellent source of organic matter. It improves soil structure, enhances water retention, and promotes beneficial microbial activity, leading to improved soil health.

Increased soil fertility: The nutrients present in composted manure can enhance soil fertility, making it more conducive for plant growth. This can result in increased crop yields and improved overall productivity.

Enhanced water-holding capacity: Composted manure can improve the soil's water-holding capacity, reducing water runoff and increasing moisture retention. This is particularly beneficial in arid or drought-prone regions.

Soil structure improvement: The organic matter in composted manure helps improve soil structure by enhancing aggregation and reducing compaction. This allows for better root penetration, nutrient uptake, and drainage.

It's important to note that the specific benefits may vary depending on the composition of the composted manure, the existing soil conditions, and the specific crop or plants being grown. Conducting soil tests would have provided more accurate information regarding the benefits of applying composted manure. With the lack of rainfall in 2023 growing season there are limitations as to how much nutrients were available.

Fertility (continued)

Anhydrous Ammonia (NH3): During the fall 2022 application of Nh3 fertility, there was an equipment failure which caused areas of the equipment to not apply at the correct rate. One of the three sections of the application equipment was not working correctly, which effected even application rate.

Although this application error did affect the available fertility, the producers feel because the NH3 application was applied at an angle to the seeding of this trial and there were three replications of each seeding and drill plot, this variability would have been present throughout the entirety of the trial.

Rivercrest Farms applied NH3 at a rate of 70 lbs/ac of actual. Although NH3 is not a product used on every farm in the Peace Region, Rivercrest Farms has been using it for a number of year since it fits within their farming operation. Ammonia (NH3) fertilizer has both benefits and challenges, as listed below:

Benefits of NH3 Fertilizer:

Nutrient Availability: NH3 contains high levels of nitrogen, an essential nutrient for plant growth. It provides an efficient and readily available source of nitrogen, promoting healthy plant development.

Cost-Effective: NH3 is often more cost-effective than other nitrogen fertilizers, and this is particularly important in the BC Peace Region as our northern geography increases transportation cost and availability of fertility. It has a high nutrient content, so less volume needs to be transported to remote farms to achieve the same nitrogen application rates compared to other fertilizers.

Longevity: NH3 fertilizer is relatively long-lasting in the soil. It releases nitrogen slowly, providing a sustained nutrient supply for plants over an extended period. This is also a reason why Peace Region producers are also able to apply in fall and minimize nutrient losses through leaching or volatilization in comparison to other nitrogen sources.

Challenges of NH3 Fertilizer:

Volatility and Safety: NH3 is a highly volatile gas, which can pose safety risks during handling, storage, and application. It requires specialized training, equipment and careful handling to prevent accidents and exposure.

Environmental Impact: Improper application or losses during handling can lead to the release of NH3 into the atmosphere, contributing to air pollution and potential negative impacts on air quality and climate change.

Fertility (continued)

Granular Fertilizer vs. Liquid Fertilizer: Rivercrest Farms has implemented liquid fertilizer into their fertility program, with two different seeding implements (Planter Vs. Drill). This has increased the fertility options available. Liquid fertilizer and granular starter are two common types of fertilizers used in the seed row for canola crops. Here's a comparison of the two:

Application: Liquid fertilizer is applied directly as a liquid solution, while granular starter is applied in solid form. Liquid fertilizer is typically applied with specialized equipment, in this case a planter equipped with liquid fertilizer attachments. The granular starter is usually applied using a seed drill with a designated granular fertilizer hopper.

Nutrient availability: Liquid fertilizer is quickly absorbed by the plant roots due to its immediate availability in a dissolved form. This can provide a rapid nutrient uptake for the emerging seedlings. On the other hand, granular starter fertilizer needs to break down and release nutrients over time, which may result in a delayed nutrient availability to the plants. Granular fertilizers also contain additional salts which may, in overapplication situations, become toxic to emerging seedlings.

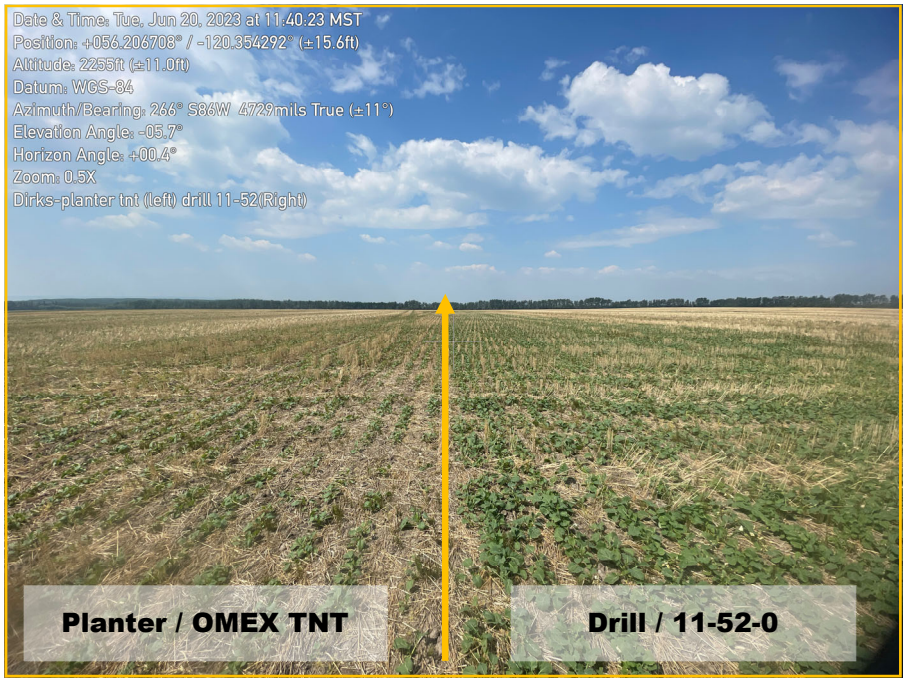
Nutrient concentration: Liquid fertilizers can be formulated to have high nutrient concentrations, allowing for precise control of nutrient ratios and application rates. There are limitations to the amount of fertilizer liquid or granular that can be put in direct seed row so it is important to follow both equipment manufacturer guidelines as well as product placement guides.

Uniformity: Liquid fertilizers tend to provide more uniform nutrient distribution within the seed row, as they can be easily mixed and applied evenly. Granular starters may have variations in distribution due to uneven spreading or inconsistent seed placement.

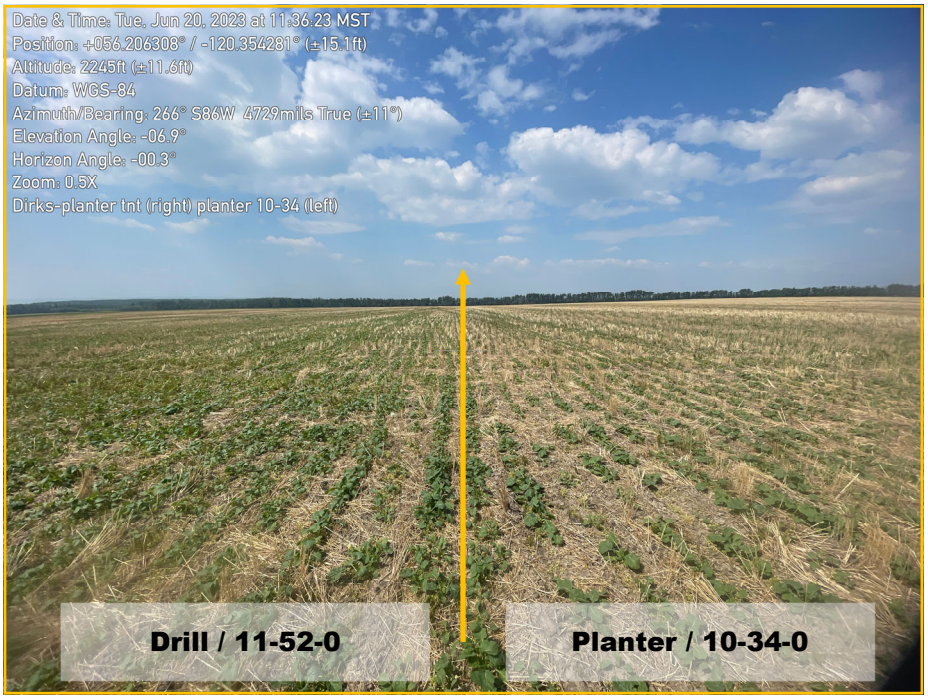
Handling and storage: Liquid fertilizers require specialized storage and handling facilities to ensure safe storage and prevent spills. Granular starters are generally easier to handle and store, as they are less prone to leakage or evaporation. The choice between liquid fertilizer and granular starter depends on various factors including equipment availability, nutrient requirements, application method preferences, and other agronomic considerations.

Seeding Rates

Seeding Rates: Planter seeding rate for this trial was 1.9lbs/ac (230,000 seeds/acre) and Drill was 4.3 lbs/ac. Both seeding rates were based on the seed weight and size the of canola variety that was seeded. This information can be found on the back of the canola bag or available from your seed sales rep.



Canola seeding rates refer to the amount of canola seeds seeded per unit area during the planting process. Appropriate seeding rate is crucial for optimizing crop establishment, yield potential, and managing weed competition. Seeding rates for canola can vary depending on factors such as seed size, seed quality, soil conditions, and the desired plant population. Generally, canola seeding rates in the BC Peace region range from 4 to 6 pounds per acre. Higher than typical seeding rates are often used in our region as our northern climate can have increased factors of seedling mortality due to cold wet spring soils and risk of early season frost. Recent years have also saw increased flea beetle insect damage all of which can impact seedling losses.



The goal of selecting an appropriate seeding rate is to achieve an optimal plant stand that allows for vigorous growth, efficient resource utilization, and effective weed suppression. A sufficient plant population helps reduce inter-plant competition, promotes uniformity, and minimizes the risk of yield loss due to factors like pests, diseases, and environmental stresses.

Farmers typically consider factors such as soil fertility, moisture availability, seed quality, and the presence of weeds when determining the ideal seeding rate for canola. It's advisable to consult local agricultural experts, seed suppliers, or extension services for specific seeding rate recommendations tailored to your region and conditions. .

Plant Stand Counts

Plant Count Information: Plant stand counts were taken on the Planter vs Drill trial to determine the plant stand to compare which equipment was able to provide the best plant establishment. The plant stand counts were taken June 20th, 5 weeks after seeding. Crop stage was 4 leaf stage to rosette. To account for the difference in row spacing, the plant stand counts were taken by foot of row. Although this could be variable because of the independence of the induvial openers and trash/ seedbed conditions. Post harvest plant stand counts were also taken to confirm populations. Canola plant stand counts are important because they provide valuable information about the establishment and health of the canola crop. Here are a few reasons why plant stand counts matter:

Estimating Yield Potential: Plant stand counts help in estimating the potential yield of the canola crop. A higher plant stand count usually indicates better crop establishment and, potentially, a higher yield potential.

Identifying Gaps or Thin Stands: By assessing plant stand counts, farmers can identify areas with gaps or thin stands in the field. Identifying these areas early allows farmers to take corrective measures such as reseeding or adjusting management practices to ensure uniform plant populations.

Assessing Pest Pressure: Plant stand counts can help diagnose potential pest issues. If there are significant gaps or missing plants in certain areas, it could indicate pest damage from insects, diseases, or weeds. Timely detection of pest pressure allows farmers to implement appropriate pest management strategies.

Determining Crop Health: Plant stand counts also provide insights into the overall health of the canola crop. Sparse or uneven plant populations may be indicative of unfavorable growing conditions, nutrient deficiencies, or other stress factors that could impact crop growth and development.

Overall, monitoring canola plant stand counts enables farmers to make informed decisions regarding crop management practices, optimize yield potential, and proactively address any issues that may affect the health and productivity of the canola crop.

The plant stand counts indicated that overall across the trial the plant stands were lower than targeted, this could be associated with poor moisture conditions. The Canola Council of Canada recommends a target plant stand count of 7 to 10 plants per square foot for canola. However, please note that specific recommendations may vary based on factors such as region, soil conditions, and farming practices.

In this situation the producer goal was 5-6 plants per sq/ft. The relationship between plant stand populations and maturity in canola can vary based on various factors. Generally, a higher plant stand population in canola can lead to more competition for resources, such as light, water, and nutrients. This competition can cause individual plants to allocate more energy towards vegetative growth rather than reproductive development, potentially delaying maturity.

On the other hand, lower plant stand populations may result in reduced competition and better resource availability for each plant.

Foliar Fertility

Application Information: *(For additional information see Trial 7B)*

First Pass Foliar Applied Fertility: This was tank mixed with Liberty herbicide at an application rate was 1.35l/ac and centurion (clethodim). Foliar application of micro nutrients was applied according to the regular fertility plan of Rivercrest Farms.

Second Pass Foliar: The goal of this second pass was to determine the remaining nutrition needs to be able to give the plants the best yield advantage. Plant samples were taken on plot 1B & 3A. Young leaves and old leaves were taken and plant sap testing was completed at Future Analytics Inc. in Red Deer. Plant sap nutrient analysis is a technique used to determine the nutrient composition of plant sap. It involves collecting sap from the plant and analyzing its nutrient content, which can provide valuable information about the plant's nutritional status and any deficiencies or imbalances in its nutrient uptake. This analysis typically includes measuring macronutrients such as nitrogen, phosphorus, and potassium, as well as micronutrients like iron, zinc, and manganese. The results of sap nutrient analysis can help guide plant nutrition management strategies and optimize fertilizer applications to ensure healthy plant growth. The results obtained from this testing indicated that there were deficiencies in micro nutrients such as Molybdenum.

Harvest Date: September 19, 2023.

Harvest Data Collection

Harvest data collection was taken using the producer's existing equipment. Plot measurements were taken by utilizing GPS systems on the combine and weight scales of grain cart.

According to weather data in the two weeks prior to harvest, the average daily temperature had been 8.7C with a low of 0.2C and high of 26.8C. No rainfall had been noted, so overall very favorable harvest conditions.

As this trial was taken by straight cutting, the combine operator was able to take harvest weights from the middle of each trial to prevent any overlap that could impair accurate data collection.

Individual weights were taken from each of the 18 different trials, grain sample were collected, and moisture & oil content were done at BCGPA lab before being sent away to Canadian Grain Commission for complete analysis.

Trial Seven (A) Equipment Trial: Drill vs. Planter—Year 2 (Project 1)

River Crest Farms

Project Goal: To compare a Planter vs. Drill in a side by side replicated comparison, seeding canola for a second year. *For additional information, see "Trial 7 Equipment & Fertility Trial Summary".*

Equipment Description:

Planter: CASE 1245 Early Riser Planter - 38.6 ft Width on 15-inch Row Spacing (31 Rows)

Cost Per Acre: $30

The Case 1245 Early Riser Planter is an advanced agricultural machine designed for efficient and precise planting of crops. It is specifically engineered to optimize the planting process, ensuring accurate seed placement and uniform seed spacing for optimal crop growth.

The Early Riser Planter utilizes technology features to enhance productivity and performance. It incorporates a high-speed planting system that allows for rapid seed delivery while maintaining accuracy. The planter includes advanced seed meters that ensure consistent seed singulation and spacing, minimizing the risk of skips or doubles during planting.

This planter is equipped with adjustable row units that enable farmers to customize the row spacing according to their specific crop requirements. It offers flexibility in planting various crops and accommodates different field conditions. Additionally, the Early Riser Planter incorporates advanced depth control mechanisms, allowing farmers to precisely set the planting depth for each seed.

The Case Early Riser Planter only offers liquid starter fertility placed on top of the seed row. This is very seed available which limits the rate of fertility that can be put down with the seed.

Case 1245 Early Riser Planter is a reliable and efficient planting solution, designed to help farmers achieve higher yields through precise and consistent seed placement.

Drill: Bourgault 3720 Seed Drill 60 ft Width on 10-inch Row Spacing

Cost Per Acre: $18

The Bourgault 3720 seed drill is a highly efficient and versatile agricultural implement designed for precision seeding. It is commonly used for large-scale farming operations. The drill consists of a frame that supports multiple rows of seeding units, typically ranging from 30 to 60 feet in width.

The Bourgault 3720 incorporates advanced technology and features to ensure accurate seed placement and optimal seed-to-soil contact. To ensure proper seed depth, the drill features depth control wheels or discs that create furrows in the soil. These furrows guide the seeds into the ground at the desired depth. Additionally, the drill may have press wheels or packer wheels that follow behind the seeding units, providing firm soil contact to optimize germination. The Bourgault 3720 seed drill is often used for seeding a wide range of crops, including cereals, oilseeds, and pulses. This drill's high capacity gives the ability to cover large areas in a timely manner.

The Advantages and Disadvantages

Equipment upgrades on any farm are difficult and even after decision has been made, on-farm comparisons of the two implements are valuable. Growers Tobin and Amias Dirks said it was valuable to compare over multiple years to continue evaluating the two implements. As this farm not only grows grain but also fine seeds such as perennial ryegrass & fescue, the ability for seeding equipment to accommodate for sod is important. The Dirks said when comparing an air drill and a planter for seeding canola, there are several key factors to be considered:

Seeding Mechanism: An air drill typically uses an air delivery system to distribute seeds uniformly across the field. It uses a series of narrow tubes and air pressure to release seeds into the soil. On the other hand, a planter employs a mechanical mechanism, such as a vacuum metering system, to precisely place seeds at a predetermined spacing.

Seed Placement Accuracy: A planter generally offers more precise seed placement compared to an air drill. With a planter, you can typically control the spacing between seeds and the depth at which they are planted, resulting in more consistent germination and potential yield. However, air drills have improved over the years and can also achieve relatively accurate seed placement.

Field Conditions: As Rivercrest Farms includes fine seed growing in their production system, the ability for seeding equipment to handle sod soil conditions is top of mind. Air drills are often favored in no-till or minimum-till farming systems, as they can handle residue and provide good seed-to-soil contact. Their design allows for better penetration in challenging soil conditions, which can be beneficial when seeding canola. Planters, on the other hand, may struggle in heavy residue or tough soil conditions and are more commonly used in conventional tillage systems. Dirks did specify that both pieces of seeding equipment (due to the design of the openers) do preform well in sod soils post grass production which was a big consideration in the equipment selection process.

Seed Capacity & Flexibility: Air drills generally have larger seed hoppers compared to planters, allowing for greater seed capacity. At 60ft, the Dirks drill is also significantly wider than the 38ft planter which is advantageous when: seeding large areas, planting multiple crops simultaneously, or if there is difficulty finding multiple skilled equipment operators. Planters, however, offer more flexibility in terms of seed type and spacing adjustments, making them suitable for various crops and planting configurations. Being a mixed grain/cattle operation, the ability to utilize the planter to seed corn for grazing adds additional uses for the planter but also a more cost-effective feed source for the cattle operation (*See Grazing corn information).*

Seeding Rate & Cost: When using a planter for canola, it is possible to cut back on seeding rates due to the improved precision and accuracy of seed placement. Planters are designed to distribute seeds evenly and at optimal depths, ensuring better seed-to-soil contact and reducing competition among plants for resources. By using a planter, you can achieve more consistent seed spacing and reduce the risk of overcrowding. Canola plants that are spaced appropriately have access to sufficient nutrients, sunlight, and water, which promotes healthier growth and higher yields.

Lowering the seeding rates with a planter can also help manage input costs by reducing the amount of seed required per acre.

The Dirks estimated that on average (depending on seed characteristics) they can use *50% less seed @ a 2.5lb/ac seeding rate and a cost of $12/lb for a seed cost savings of $30/ac.*

The Advantages and Disadvantages Continued ...

It's important to note that the optimal seeding rate can vary depending on various factors such as environmental conditions, soil fertility, hybrid characteristics, and management practices.

When cutting back on seeding rate when seeding canola, there are several risks to consider:

***Reduced Plant Population*:** Lower seeding rates can lead to reduced plant populations, which may result in lower overall yield potential. Canola plants need sufficient spacing to develop a healthy root system, access nutrients, and compete with weeds effectively.

***Increased Weed Competition*:** Lower plant populations can result in increased weed competition. Weeds can outcompete canola plants for nutrients, water, and sunlight - leading to decreased yields. Adequate seeding rates help establish a dense crop canopy that suppresses weed growth.

***Vulnerability to Environmental Stress*:** Insufficient plant populations make canola crops more susceptible to environmental stresses such as drought, heat, and disease. Higher seeding rates provide a buffer against these stresses by ensuring a more robust stand and better overall crop health.

Maturity: Decreased plant stands can causes plants to branch out which can prolong maturity.

Cost & Maintenance: Air drills tend to be more cost-effective compared to planters, making them the most popular choice for many BC Peace Region farmers. They are typically easier to maintain and require less frequent calibration. Planters, with their more complex mechanisms and precision systems, can be more expensive to purchase and maintain. There is also an increased level of mechanical knowledge that is also need with the planter. Amias stated *"With the planter you get precision, but with that you need the to maintain the equipment to ensure accuracy".* When asked about how the planter equipment purchase decision was made, Tobin and Amias said their farm was at a point where they need to upgrade their drill/ tractor (at an estimated cost of $700,000 +) or multipurpose utilize a tractor they already had (for running their grain cart at harvest) to also be used on a planter for spring seeding.

Ultimately, the choice between an air drill and a planter for seeding canola depends on factors such as farm size, tillage practices, desired seed placement accuracy, and budget. Tobin and Amias both agreed that it was important to evaluate what their specific needs were and consult with agricultural experts or local farmers to make an informed decision.

Drill Roots

Planter Roots

2023 Comparison Data

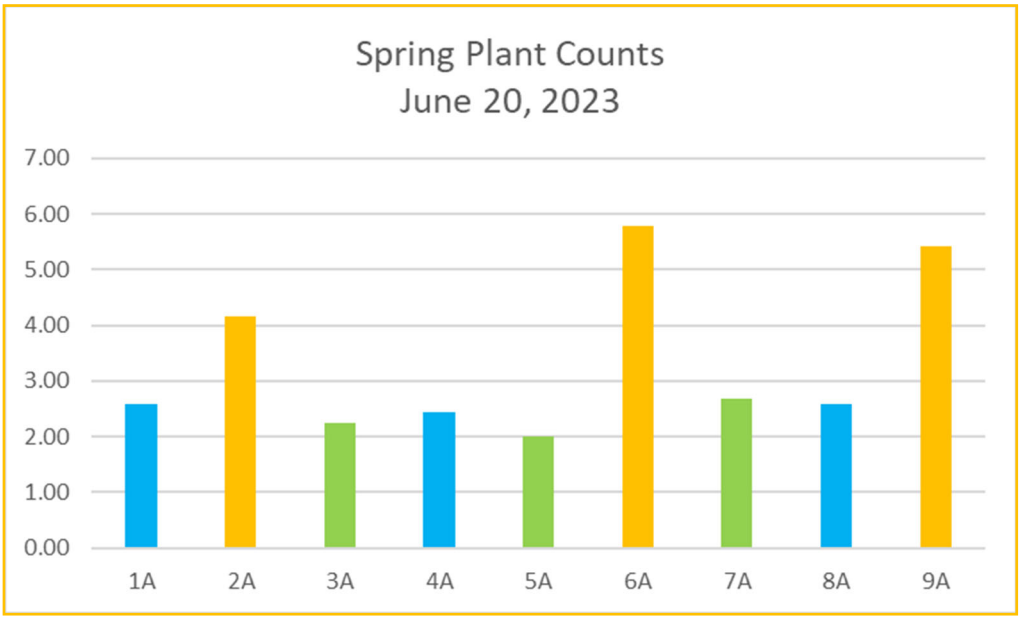
Spring Plant Counts

Plant Stand Counts Planter Vs. Drill Comparison

Taken: June 20, 2023

Trial #	Description	Row Spacing cm	plants per sq/M	Plants per sq/ft
			plants per sq/M	Plants per sq/ft
1A	Planter 10-34-0 Liquid Fert	38.1	27.82	2.59
2A	Drill 11-52-0 dry phos	25.4	44.88	4.17
3A	Planter TNT OMEX fert	38.1	24.15	2.24
4A	Planter 10-34-0 Liquid Fert	38.1	26.25	2.44
5A	Planter TNT OMEX fert	38.1	21.52	2.00
6A	Drill 11-52-0 dry phos	25.4	62.20	5.78
7A	Planter TNT OMEX fert	38.1	28.87	2.68
8A	Planter 10-34-0 Liquid Fert	38.1	27.82	2.59
9A	Drill 11-52-0 dry phos	25.4	58.27	5.42

*Each plot plant counts taken 5 samples in a W sample pattern
Spring plant stand counts only taken in foliar applied fertility
counts taken by meter of row and converted target plant stand 5 plant sq/ft

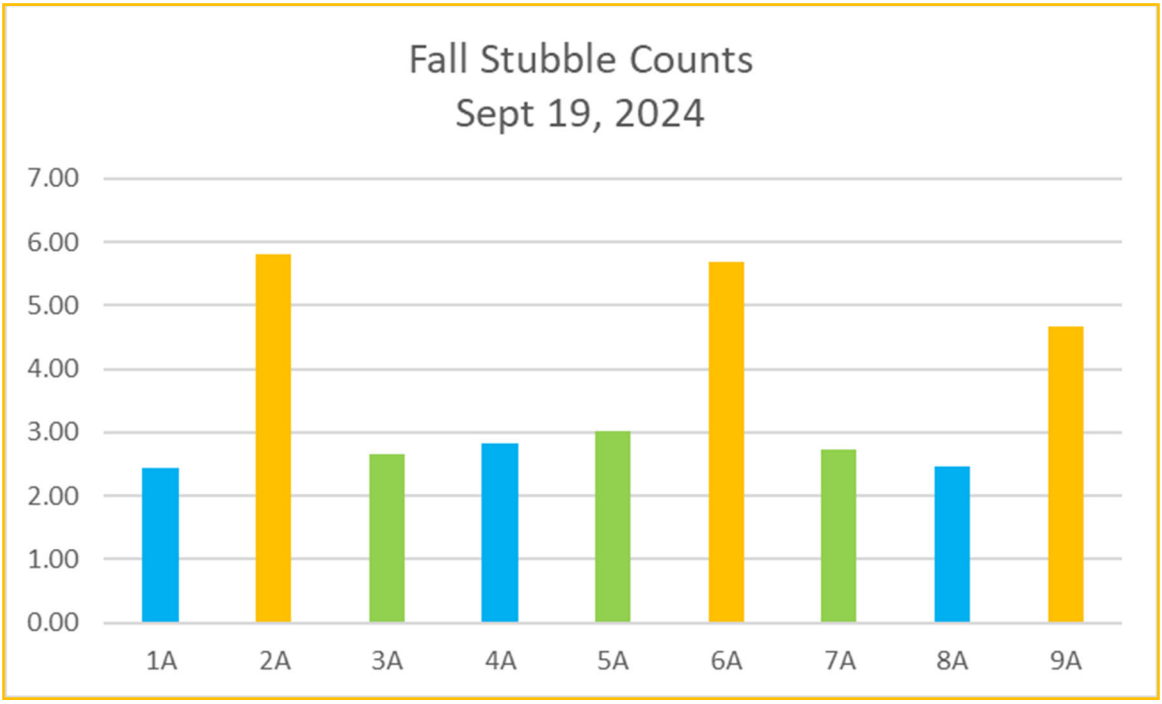


Post Harvest Stubble Counts

Plant Stand Counts
Planter Vs. Drill Comparison
Taken: September 19, 2023

Plot #	Description	Row Spacing	Plant Count Average	plants per sq/M	plants per sq/ft
		CM	per meter of row	plants per sq/M	plants per sq/ft
1A	Planter 10-34-0 Liquid Fert	38.1	10.00	26.25	2.44
2A	Drill 11-52-0 dry phos	25.4	15.89	62.55	5.81
3A	Planter TNT OMEX fert	38.1	10.89	28.58	2.66
4A	Planter 10-34-0 Liquid Fert	38.1	11.56	30.33	2.82
5A	Planter TNT OMEX fert	38.1	12.33	32.37	3.01
6A	Drill 11-52-0 dry phos	25.4	15.56	61.24	5.69
7A	Planter TNT OMEX fert	38.1	11.22	29.45	2.74
8A	Planter 10-34-0 Liquid Fert	38.1	10.11	26.54	2.47
9A	Drill 11-52-0 dry phos	25.4	12.78	50.31	4.68

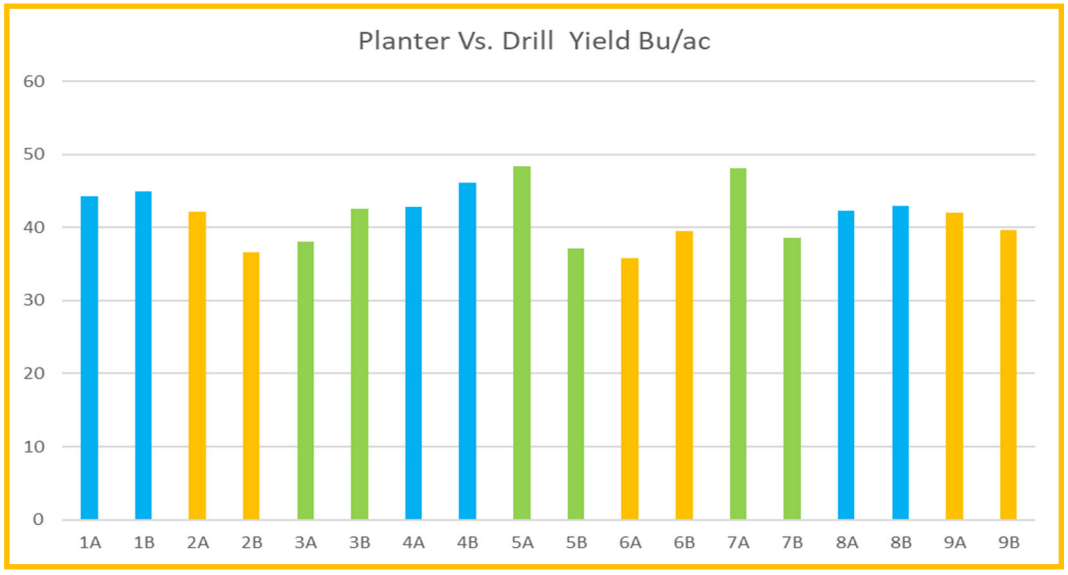
*Each plot plant counts taken 9 samples in a W sample pattern
counts taken by meter of row and converted target plant stand 4-5 plant sq/ft



Harvest Data Collection

Plot #	Description	bu/ac	Moisture	Oil Content
1A	Planter 1.9lbs/ac 10-34-0- Liquid Fert	**42.50**	5.98%	46.20%
1B	Planter 1.9lbs/ac 10-34-0- Liquid Fert No in crop foliar	**43.29**	6.24%	44.50%
2A	Drill 4.3 lbs/ac 11-52-0 dry fert	**40.63**	6.11%	45.80%
2B	Drill 4.3 lbs/ac 11-52-0 dry fert No in crop foliar	**35.14**	5.99%	45.10%
3A	Planter 1.9lbs/act TNT Omex Liquid Fert	**36.88**	6.80%	45.30%
3B	Planter 1.9lbs/ac TNT Omex Liquid Fert No in crop foliar	**41.08**	6.43%	45.90%
4A	Planter 1.9lbs/ac 10-34-0- Liquid Fert	**41.25**	6.32%	46.00%
4B	Planter 1.9lbs/ac 10-34-0- Liquid Fert No in crop foliar	**44.32**	6.05%	46.10%
5A	Planter 1.9lbs/ac TNT Omex Liquid Fert	**46.88**	6.71%	44.80%
5B	Planter 1.9lbs/ac TNT Omex Liquid Fert No in crop foliar	**35.68**	6.06%	44.70%
6A	Drill 4.3 lbs/ac 11-52-0 dry fert	**34.38**	5.98%	45.30%
6B	Drill 4.3 lbs/ac 11-52-0 dry fert No in crop foliar	**37.84**	5.56%	44.70%
7A	Planter 1.9lbs/ac TNT Omex Liquid Fert	**46.88**	7.38%	43.40%
7B	Planter 1.9lbs/ac TNT Omex Liquid Fert No in crop foliar	**37.84**	7.88%	43.80%
8A	Planter 1.9lbs/ac 10-34-0- Liquid Fert	**41.25**	7.46%	44.20%
8B	Planter 1.9lbs/ac 10-34-0- Liquid Fert No in crop foliar	**41.62**	6.71%	44.50%
9A	Drill 4.3 lbs/ac 11-52-0 dry fert	**40.63**	6.61%	44.00%
9B	Drill 4.3 lbs/ac 11-52-0 dry fert No in crop foliar	**38.38**	6.57%	44.20%

Yield was adjusted for moisture content to 10%



Grain Sample Results

Plot #	Description	ADFRmeal (Acid Digestible	Chlorophyll	Iodine Value	Linoleic Acid	Linolenic Acid	Moisture	Oil	Oleic Acid	Protein	Saturated Acids	Total Glucosinolates
1A	Planter 1.9 lbs/ac count 10-34-0- Liquid Fert Foliar Fert: 10-10-10- Liquid Blend @ 1l	20.9	7.2	114.5	18.2	10.8	6.1	48.4	62.8	18.1	6.5	16.6
1B	Planter 1.9 lbs/ac 10-34-0- Liquid Fert No in crop foliar	19.7	7.5	115.4	18.3	11.2	6.6	46.1	62.1	20.4	6.5	20.0
2A	Drill 4.3 lbs/ac 11-52-0 dry fert Foliar Fert: 10-10-10- Liquid Blend @ 1l	20.2	6.1	115.1	18.4	11.0	6.0	47.0	62.3	19.6	6.5	18.5
2B	Drill 4.3 lbs/ac 11-52-0 dry fert No in crop foliar	19.9	6.4	115.7	18.6	11.4	6.0	46.6	61.7	19.8	6.5	20.4
3A	Planter 1.9 lbs/ac TNT Omex Liquid Fert Foliar Fert: 10-10-10- Liquid Blend @ 1l	20.1	6.1	115.3	18.4	11.1	6.7	47.4	62.4	19.2	6.5	17.6
3B	Planter 1.9 lbs/ac TNT Omex Liquid Fert No in crop foliar	20.3	6.3	115.3	18.8	11.0	6.4	47.6	62.1	18.9	6.6	18.5
4A	Planter 1.9 lbs/ac 10-34-0- Liquid Fert Foliar Fert: 10-10-10- Liquid Blend @ 1l	20.7	6.5	115.1	18.2	11.1	6.5	48.2	62.6	18.5	6.4	17.0
4B	Planter 1.9 lbs/ac 10-34-0- Liquid Fert No in crop foliar	20.0	7.4	114.6	18.6	10.8	5.8	48.0	62.8	19.0	6.5	19.0
5A	Planter 1.9 lbs/ac TNT Omex Liquid Fert Foliar Fert: 10-10-10- Liquid Blend @ 1l	20.0	7.2	115.4	18.6	11.1	7.0	47.1	62.2	19.8	6.5	17.4
5B	Planter 1.9 lbs/ac TNT Omex Liquid Fert No in crop foliar	19.7	7.1	114.9	18.9	10.9	5.9	47.6	62.3	19.3	6.5	19.3
6A	Drill 4.3 lbs/ac 11-52-0 dry fert Foliar Fert: 10-10-10- Liquid Blend @ 1l	20.1	7.4	114.9	18.8	10.9	5.9	47.4	62.4	19.1	6.5	17.6
6B	Drill 4.3 lbs/ac 11-52-0 dry fert No in crop foliar	19.5	6.4	115.7	18.9	11.2	5.8	46.1	61.6	20.4	6.5	20.8
7A	Planter 1.9 lbs/ac TNT Omex Liquid Fert Foliar Fert: 10-10-10- Liquid Blend @ 1l	19.2	10.5	115.6	19.2	11.1	7.4	46.4	61.9	20.6	6.5	18.7
7B	Planter 1.9 lbs/ac TNT Omex Liquid Fert No in crop foliar	19.1	8.4	115.2	19.2	11.0	7.0	46.6	62.1	20.7	6.5	20.0
8A	Planter 1.9 lbs/ac10-34-0- Liquid Fert Foliar Fert: 10-10-10- Liquid Blend @ 1l	20.1	8.5	114.1	18.7	10.5	6.7	47.2	62.8	19.3	6.6	17.7
8B	Planter 1.9 lbs/ac 10-34-0- Liquid Fert No in crop foliar	19.5	8.5	114.7	18.8	10.7	6.2	46.6	62.5	20.2	6.5	18.8
9A	Drill 4.3 lbs/ac 11-52-0 dry fert Foliar Fert: 10-10-10- Liquid Blend @ 1l	19.5	8.0	115.3	19.1	11.0	6.4	46.8	62.2	20.0	6.5	19.3
9B	Drill 4.3 lbs/ac 11-52-0 dry fert No in crop foliar	18.6	8.5	115.5	19.1	11.1	6.1	45.3	61.7	21.6	6.6	22.0

Cost Analysis
Planter Vs. Drill

	Yield bu/ac	Seeding Rate lbs/ac	Difference from Check	Starter Fert Cost Per Acre	Seed Cost Per lb	Seed Cost per acre	Seed Cost Savings $/ac	Equipment $/ac	Fall 2022 Fertility	Total $/ac (Seed+ Fert +Equipment)
Planter TNT OMEX	44.87	2.4	4.87	$42.50	$12.00	$28.80	$22.80	$30.00	$81.00	$182.30
Planter 10-34-0	43.1	2.4	3.1	$24.51	$12.00	$28.80	$22.80	$30.00	$81.00	$164.31
Drill 11-52-0	40	4.3	0	$19.47	$12.00	$51.60	-	$18.00	$81.00	$170.07

* Costs are based off producers information, All Trials received $25/ac fall applied P-K-S Blend & $56/ac of NH3
Yield Average Over whole trial and all replications and Adjusted to 10% moisture

Trial Seven (B) Fertility Trial: Liquid vs. Granular (Project 2)

River Crest Farms

Project Goal: To compare liquid started fertilizer types when using a planter seeding implement. *For additional information, see "Trial 7 Equipment & Fertility Trial Summary".*

Equipment Description: Planter: CASE 1245 Early Riser Planter - 38.6 ft Width on 15-inch Row Spacing (31 Rows)

Omex TnT Starter Fertilizer:

Description: OMEX TNT is a liquid starter fertilizer that is designed to provide essential nutrients to plants during the early stages of growth. It typically contains a combination of nitrogen, phosphorus, and potassium, which are crucial for promoting strong root development and early plant vigor. As per manufacturer information: *With the combination of Poly/Ortho Phos, TPA and Carboxylates, your crop will have access to the all-important phosphorus; faster and longer during its key growth stage. TPA protects the phosphorus and reduces its tie-up with calcium (alkaline soils) or with iron/aluminum (acidic soils). TPA improves phosphorus efficiency. It provides newly germinated seedlings with enough energy early, to find and make use of side placed fertilizer sooner and more efficiently. it works to free up key nutrients and provides superior phosphorus and nutrient uptake when your crop needs it most."* ***TnT Starter contains:*** OMEX Starter P (9-32-2) with TPA + Carboxylate; OMEX Humic 12%; And micronutrients (B, Zn, Mn, Cu, Fe)

The specific formulation of OMEX TNT may vary, but the goal is to deliver a balanced nutrient mix that supports healthy plant establishment. For detailed information on OMEX TNT, including specific formulations and application guidelines, it's best to refer to the manufacturer's product specifications or contact their customer service for the most up-to-date information.

Application Rate: 3-5 US gal/ac in seed row

Cost Per acre: $42.50

Advantages:
1. Rapid Absorption: Liquid fertilizers are quickly absorbed by plants, providing a fast nutrient boost.
2. Application Flexibility: They can be applied through irrigation systems, foliar spray, or directly to the soil, offering flexibility in application methods.

3. Nutrient Precision: Liquid fertilizers allow for precise nutrient application, which can be beneficial for addressing specific nutrient deficiencies.

4. Low salt index for safer seed placement in seed row.

Disadvantages:
1.Storage and Handling: They require careful storage and handling to prevent spills and ensure proper dilution and application.

2. Cost: Liquid fertilizers can be more expensive on a per-nutrient basis compared to granular fertilizers, due to transportation , manufacturing and packaging costs.

3. Equipment: Increased investment in handling and application equipment, and transportation

10-34-0 Liquid Fertilizer:

Description: 10-34-0 liquid fertilizer is a high-phosphorus fertilizer commonly used in agriculture. The numbers 10-34-0 represent the ratio of nitrogen (N), phosphorus (P), and potassium (K) in the fertilizer. In this case, it contains 10% nitrogen, 34% phosphorus, and no potassium.

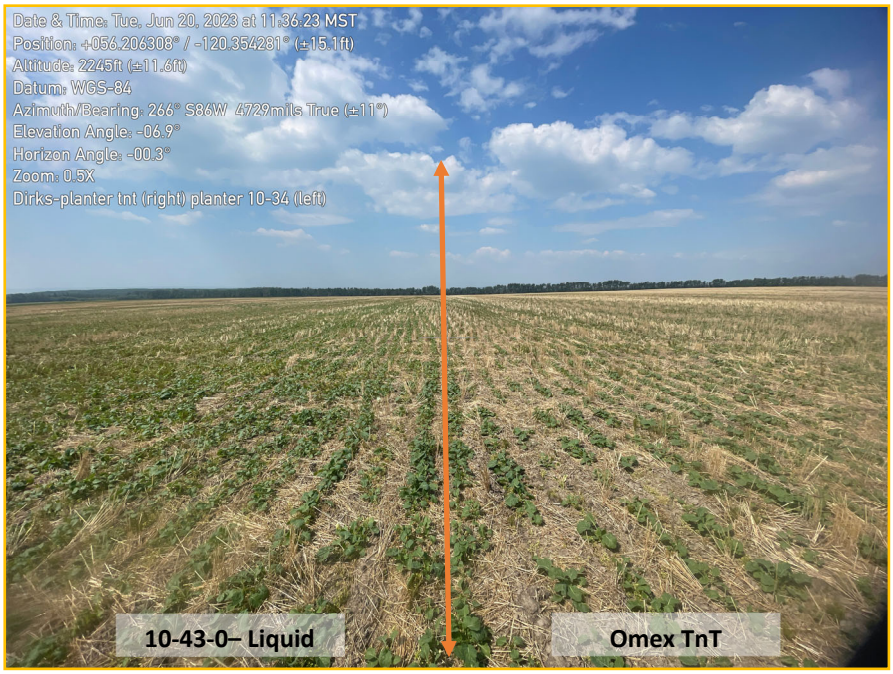
This particular formulation is especially useful for promoting root growth and early plant establishment due to its high phosphorus content. It is often used when a crop requires a significant amount of phosphorus during its early growth stages. The liquid form allows for easier application and absorption by plants.

Application rate: 4.5 us gallons/ac.

Cost Per acre: 24.51/ac.

Advantages: Many of the advantages of the liquid 10-34-0 are the same as the Omex TNT, although it is high salt index and has no micronutrients.

Disadvantages: Same as other liquid fertilizers.



Yield Comparison

Starter Fertilizer Comparison Yield

Plot #	Description	Acres	Mt per acre	lbs/ac	bu/ac bushel	Adjusted for moisture bu/ac
5B	OMEX TnT Rep 1	0.74	0.809	1783.784	**35.68**	**37.09**
7B	OMEX TnT Rep 2	0.74	0.858	1891.892	**37.84**	**38.65**
3B	OMEX TnT Rep 3	0.74	0.932	2054.054	**41.08**	**42.56**
	Average	0.74	0.87	1909.91	38.20	**39.43**
1B	10-34-0 Rep 1	0.73	0.982	2164.384	**43.29**	**44.92**
4B	10-34-0 Rep 2	0.74	1.005	2216.216	**44.32**	**46.08**
8B	10-34-0 Rep 3	0.74	0.944	2081.081	**41.62**	**43**
	Average	**0.74**	**0.98**	**2153.89**	**43.08**	**44.67**

No foliar fertility was applied to these replications

Moisture & Oil Content		
Description	**Moisture**	**Oil Content**
10-34-0	6.24%	44.50%
OMEX TnT	6.43%	45.90%
10-34-0	6.05%	46.10%
OMEX TnT	6.06%	44.70%
OMEX TnT	7.88%	43.80%
10-34-0	6.71%	44.50%

Cost Analysis
10-34-0 Vs OMEX TNT No Foliar Fertility

	Actual Bu/ac	Difference in Bu/ ac	Product Cost	Bushels required to cover product cost	Bushels required to cover product cost	$ gain / loss @	$ gain / loss @
	Adjusted to 10% moisture	from Check	Per Acre	Grain Price @ $17/bu	Grain Price @ $14.50/bu	Grain Price @ $17/bu	Grain Price @ $14.50/bu
Planter TNT OMEX fert	39.43	-0.57	$42.50	2.50	2.93	-$9.69	-$8.27
Planter 10-34-0 Liquid Fert	44.67	4.67	$24.51	1.44	1.69	$79.39	$67.72
Drill 11-52-0 dry phos (CHECK)	40	0	$19.47				

*Check Yield Based on average of all plots

Trial Seven (B) Fertility Trial: Foliar Fertility (Project 3)

River Crest Farms

Project Goal: To compare the effects on yield of foliar fertilizer application in canola to no foliar fertility. *For additional information, see "Trial 7 Equipment & Fertility Trial Summary".*

Foliar applied fertilizer has several advantages, including rapid nutrient absorption by plants, the ability to address nutrient deficiencies quickly, and reduced nutrient leaching into the soil. Additionally, foliar feeding can be a way to provide nutrients to plants that have difficulty absorbing them from the soil. In addition foliar application can provide stress relief from plants during poor environmental conditions (drought, in this case).

On the downside, foliar applied fertilizers may not provide long-term soil benefits, and they can be more labor-intensive than soil applications. There can also be limitations to the amount of nutrients that can be absorbed through the leaves, and overapplication can lead to leaf burn or toxicity.

Foliar Fertility Application:

Manufacturer Description: **"***Triple Ten™ (10-10-10) is a liquid fertiliser combining a hot mix N-P-K blend, chelated trace elements and natural growth promotants. These natural growth promotants include fulvic acid, seaweed fertiliser and vitamins. Veg-Tech Triple Ten™ represents state-of-the-art, crop-specific fusion fertilising*." For additional information visit manufacturer website www.nutri-tech.com

Foliar Fertility Pass #1:

Date: June 12, 2023.

The first pass foliar was done with the herbicide Triple Ten from Agsol at 1l/ac and 3gal 18-0-0. Triple Ten is a comprehensive blend of micronutrients and plant stimulants.

Cost Per Acre: 10-10-10 = $12.00/ac, Urea = $9.25/ac.

Foliar Fertility Pass #2:

Date: July 3, 2023.

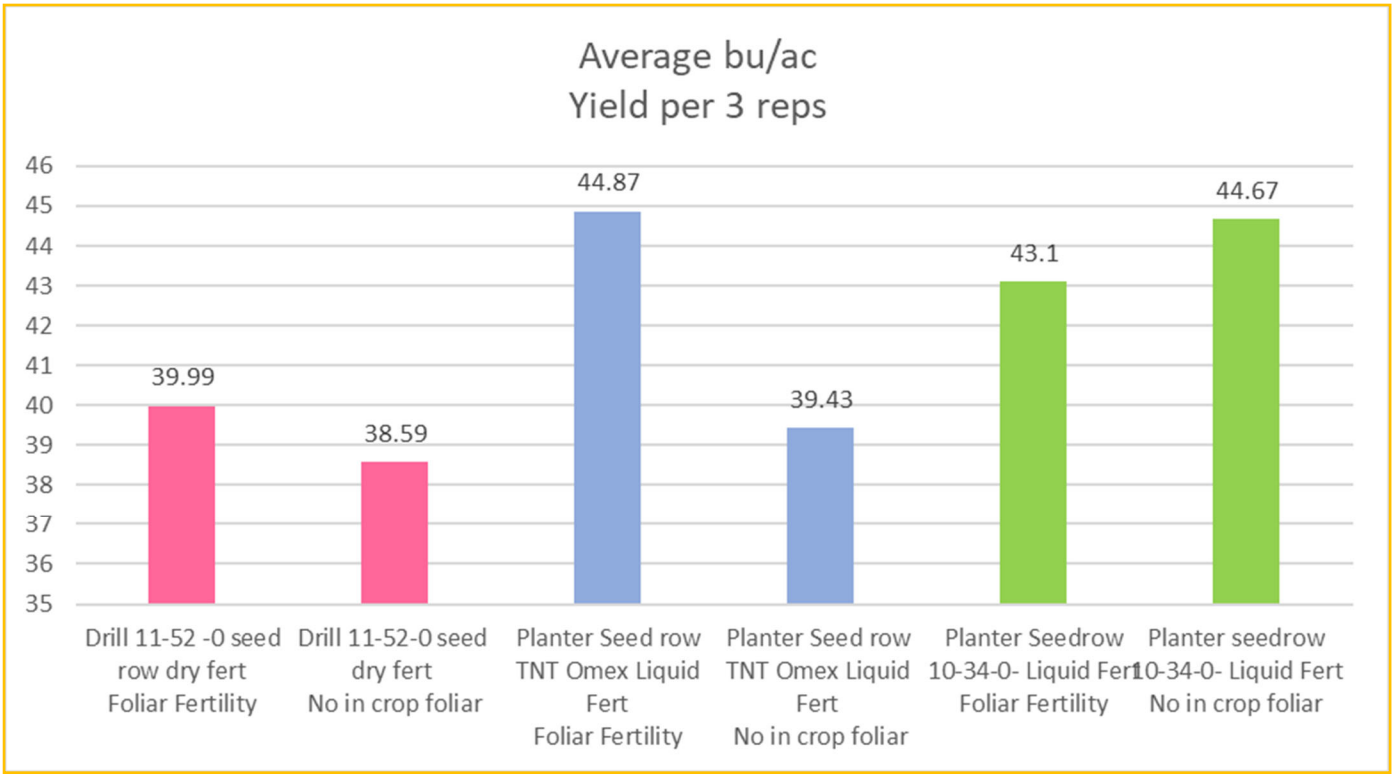
Second pass was a custom blend of different products that included: phi42 from ATP as phos source; boron; Mo; fulvic acid; and 3 gal 18-0-0. This custom blend was based on sap plant tissue analysis samples that were sent to Future Analytics (an independent lab in Red Deer, Alberta). A sap (Stem-Immersion Sampling) plant tissue test involves taking a sample of plant tissue, typically the stem, and immersing it in a solution to extract the plant sap. This sap is then analyzed to assess the plant's nutrient levels and overall health. The test helps in determining nutrient deficiencies or excesses, allowing for tailored fertilization and adjustment of nutrient management practices to optimize plant growth and yield.

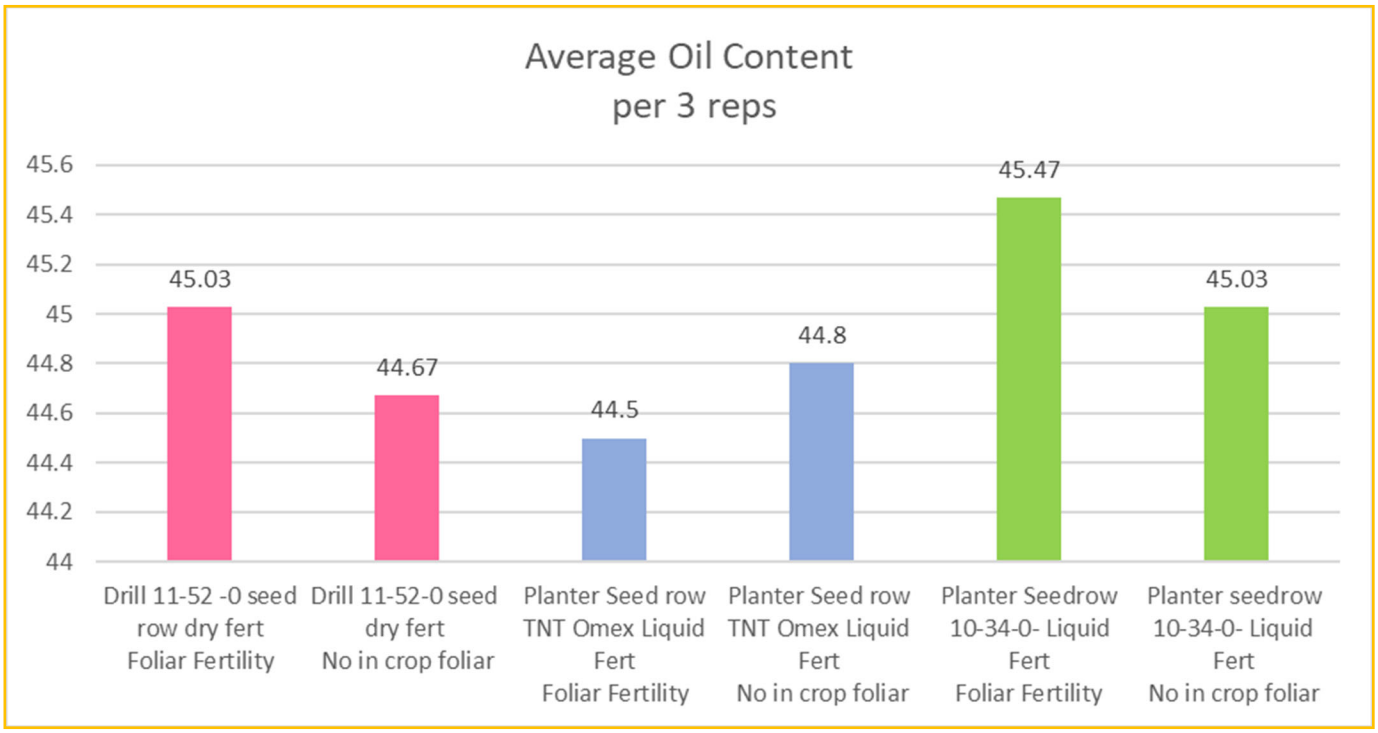
Cost Per Acre: $24.50

Scan QR code to for more information on Future Analytics Lab

Yield Comparison

Description	Average bu/ac Yield per 3 reps	
Drill 11-52 -0 seed row dry Fert **Foliar Fertility**	39.99	**Increase 1.4 bu/ac**
Drill 11-52-0 seed dry Fert **No in crop foliar**	38.59	
Planter Seed row TNT Omex Liquid Fert **Foliar Fertility**	44.87	**Increase 5.44bu/ac**
Planter Seed row TNT Omex Liquid Fert **No in crop foliar**	39.43	
Planter Seed row 10-34-0- Liquid Fert **Foliar Fertility**	43.1	**Decrease 1.57bu/ac**
Planter Seed row 10-34-0- Liquid Fert **No in crop foliar**	44.67	




Average Oil Content
per 3 reps
45.6
45.4
45.2
45
44.8
44.6
44.4
44.2
44
45.03
44.67
44.5
44.8
45.47
45.03
Drill 11-52 -0 seed row dry fert Foliar Fertility
Drill 11-52-0 seed dry fert No in crop foliar
Planter Seed row TNT Omex Liquid Fert Foliar Fertility
Planter Seed row TNT Omex Liquid Fert No in crop foliar
Planter Seedrow 10-34-0- Liquid Fert Foliar Fertility
Planter seedrow 10-34-0- Liquid Fert No in crop foliar

Trial Eight

Fertility After Alfalfa Production

In Annual Cropping System

LH Willms Inc.

Seeding Date: May 5, 2023

Harvest Date: September 9, 2023

Crop: Wheat

Trial Area: Rose Prairie

Field Location: Trials were located 6.5km north of Rose Prairie

Fields were ½ mile apart

Fertility After Alfalfa Production In Annual Cropping System

LH Willms Inc.—Rose Prairie, BC

Project Goal: To compare soil health characteristics Nutrient levels, organic matter etc. after previous alfalfa production with a field that has never had Alfalfa in rotation.

Back ground: For generations Peace Region farmer have integrated perennial legumes such as alfalfa, alsike & Red clover into there rotations with the goal to improve soil health through increased organic matter, reduced compaction and nitrogen fixation. LH Willms Inc, a farm in Rose Prairie BC in recent years has integrated alfalfa into their annual cropping rotation. This project compares two adjacent fields one with alfalfa in previous years and the other that has been continuously cropped.

Previous Crop: Alfalfa

Previous Cropping Information: Alfalfa was seeded with Clearfield Canola by blending canola and alfalfa seed, according to producer this is an easy process.

The crop was sprayed with Solo + Post to control weeds. Controls was good on everything except Thistle.

2019 was a tough harvest and Canola swathes were left in the field over winter and spring thrashed. Although not a "normal" situation the alfalfa under the swathes was set back and took an extra year to establish. Spring 2022 field was sprayed with Assure II to control Foxtail Barley and was very effective.

The pure alfalfa hay stand only yielded 1-2 bales/ acre (1500 lb. bales) The goal is to increase the alfalfa yield to make it a more profitable crop. In 2023 producer had a different field yielding 3 bales / acre producer feels that improvements are being made in this cropping system. One challenge is that crop Insurance will not insure the establishment of the Alfalfa because it's seeded in row with the Canola. An additional note is that Clearfield Canola can be sold into the Non GMO market for a premium.

Management to remove Alfalfa: No tillage done to remove alfalfa, Sept 2022 field was sprayed with Glyphosate 360gm @ 1 l/ac tank mixed with 2-4D & Dicamba. Then Harrowed late Oct 2022 to knock leaves off alfalfa stubble, although producer not sure if this harrow pass was necessary. Spring 2023 field was zero tilled directly into stand leaving the alfalfa roots in place. Seeding implement used was New Holland sd440 with 4" atom jet paired row opener.

Seeding Date: May 5, 2023

Crop: Wheat

Seeding Conditions: According to local weather station located within two miles of trial locations; in the two weeks prior to seeding the average temperature was 8.5C with a recorded low of -1.8C and high of 28.9C,

Fertility Information: Both fields had the same spring fertility, The full fertility rate was 170lbs of urea equaling 78lbs of Actual N was applied. Micro Phos blend of 11-39-0-65 applied at 30lbs/ac was put down with the seed as starter fertilizer. All treatments received the same starter blend.

Advantages of Adding Alfalfa Production into Annual Cropping Rotation

Soil improvement: Alfalfa has deep roots that can penetrate the soil, helping to break up compacted soil and improve its structure.

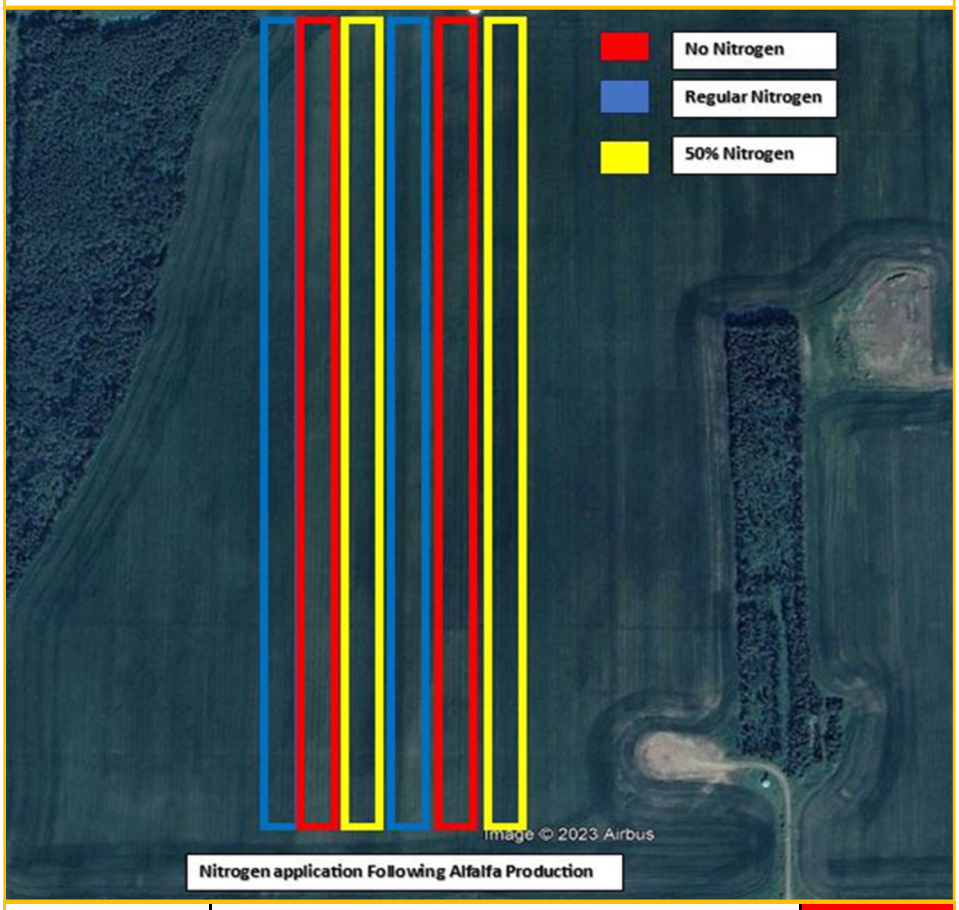
Nitrogen fixation: According to Alberta agriculture a 5 mt/ac alfalfa crop will fixate up to 250lbs/ac of nitrogen per year. his nitrogen fixation occurs through the symbiotic relationship between alfalfa plants and nitrogen-fixing bacteria called rhizobia, which reside in nodules on the plant's roots. Actual nitrogen contribution from alfalfa can be influenced by factors such as the age of the stand, the health of the plants, and the availability of other nitrogen sources in the soil. Additionally, the nitrogen fixation capacity tends to be higher during the early stages of alfalfa growth and decreases as the plants mature. Alfalfa's ability to fix nitrogen is one of its significant advantages, as it reduces the reliance on synthetic nitrogen fertilizers and provides a natural source of nitrogen for subsequent crops in a rotation system.

Weed suppression: Alfalfa is a competitive crop that can suppress the growth of weeds, reducing the need for herbicides and manual weed control.

Water conservation: Alfalfa has a deep root system that allows it to access water from deeper soil layers, making it more resilient to drought conditions.

Crop rotation benefits: Including alfalfa in an annual cropping system can provide rotational benefits by disrupting pest and disease cycles, reducing pest pressure on subsequent crops.

Trial Layout For Field With Alfalfa As Previous Crop



Treatment #1	Zero Additional Nitrogen Applied After Alfalfa	
Treatment #2	50% of regular Nitrogen Applied After Alfalfa	
Treatment # 3	100% of regular Nitrogen Applied After Alfalfa	

Challenges of Adding Alfalfa Production into Annual Cropping Rotation

Longer establishment period: Alfalfa takes time to establish and reach its full productivity, typically requiring 1-2 years. This can delay the production and economic benefits compared to annual crops. Reduced flexibility: Once established, alfalfa requires a longer growing season and is less flexible in terms of crop rotation compared to annual crops. This can limit the options for crop diversification.

Disease and pest management: Alfalfa is susceptible to certain diseases and pests, such as alfalfa weevils and leaf spot diseases. Effective management strategies, including scouting and appropriate pesticide use, are necessary to mitigate these risks.

Difficulty getting stablished: Peace Region's grey wooded soils tend to have lower pH's being more on the acidic side, some as low as 4.8. Alfalfa will not establish well if pH is below 6.

Harvest and storage challenges: Alfalfa requires proper harvesting and storage techniques to maintain its nutritional quality. Improper handling can lead to spoilage and loss of forage quality. Additional equipment that is not traditionally found on grain farms may need to be purchased, rented of borrowed to harvest crop. Market demand and price volatility: The market demand for alfalfa can fluctuate, affecting the profitability of its cultivation. Price volatility and dependence on specific markets can pose challenges, additional long-term marketing considerations may need to be determined prior to planting.

It's important to note that the advantages and disadvantages of growing alfalfa in an annual cropping system can vary depending on factors such as climate, soil conditions, management practices, farm size and market dynamics.

Trial Layout for Continuous Annual Cropping Field

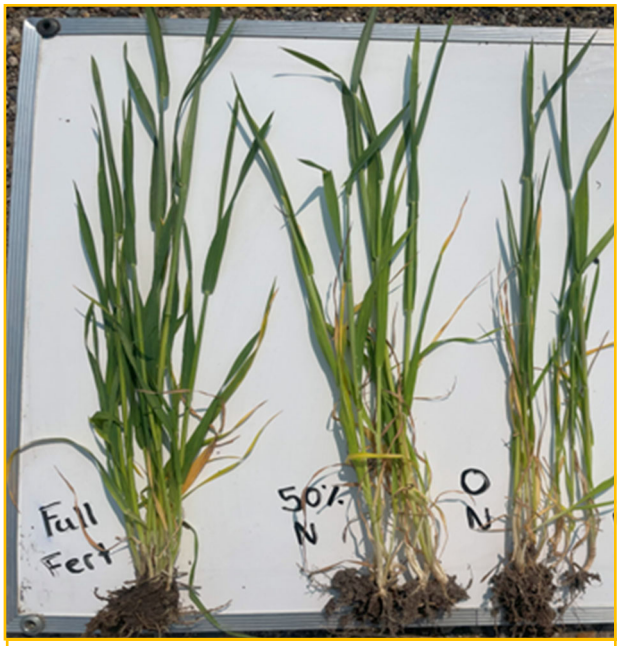
Treatment #4	Zero Additional Nitrogen Applied No Alfalfa	
Treatment # 5	50% of regular Nitrogen Applied No Alfalfa	
Treatment # 6	100% of regular Nitrogen Applied No Alfalfa	

June 22, 2023 Observations

Observations: This site visit was completed 48 days after seeding, recorded average for this timeframe was 11.8C with a recorded low of 2.3C and high of 30.5C. Growing degree days since seeding was 461 GDD, with 295GDD as the calculated normal for this area this was 156% of normal growing conditions. Using these GDD as a guide the crop growth stage was calculated mid range between flag and flowering. It was observed that the actual growth stage of this crop was flag leaf, difference in growth stage could be contributed to the heavy smoke coverage from local forest fires during this timeframe, although there is no weather data to support this assessment. Rainfall for May5-June 22 was 52.58mm, 61% of normal average rainfall for this time period.

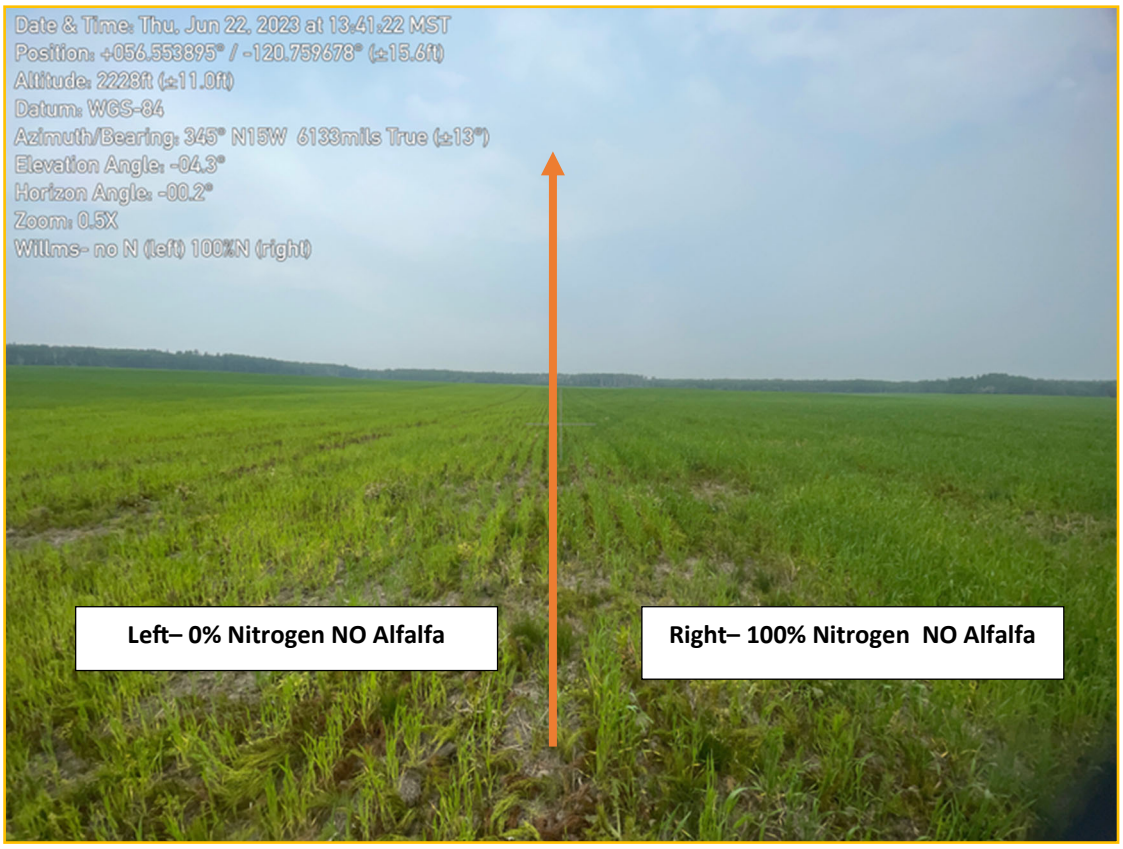
Field observations indicated that the 0% Nitrogen applications were exhibiting signs of nitrogen deficiency in both fields. Nitrogen deficiency in wheat can exhibit several symptoms. Initially, the lower leaves of the plant turn yellow, starting from the tip and progressing towards the base. The yellowing is more pronounced in older leaves. As the deficiency worsens, the yellowing spreads to the upper leaves, and the entire plant appears pale green or yellowish. The plants may also exhibit stunted growth, reduced tillering, and thinner stems. In severe cases, the leaves may become chlorotic and develop necrotic spots. Plant tissue samples were sent away to A&L laborites, the results confirmed the deficiency of nitrogen in the No alfalfa 50% Nitrogen and the No alfalfa 0% Nitrogen treatments. Although the 0% nitrogen After Alfalfa was visually yellowing in comparison to other treatment the plant tissue results indicated that Nitrogen levels were within sufficient range. Boron deficiency was identified in plant tissue tests, although this was not within the scope of project it is an important to note given the poor soil moisture conditions in the region that boron deficiency symptoms may have been mis-identified as drought stress as boron deficiency primarily affects the overall growth and development of the plant, drought stress directly impacts the plant's water status, leading to visible wilting and water-related symptom

Fertility After ALFALFA



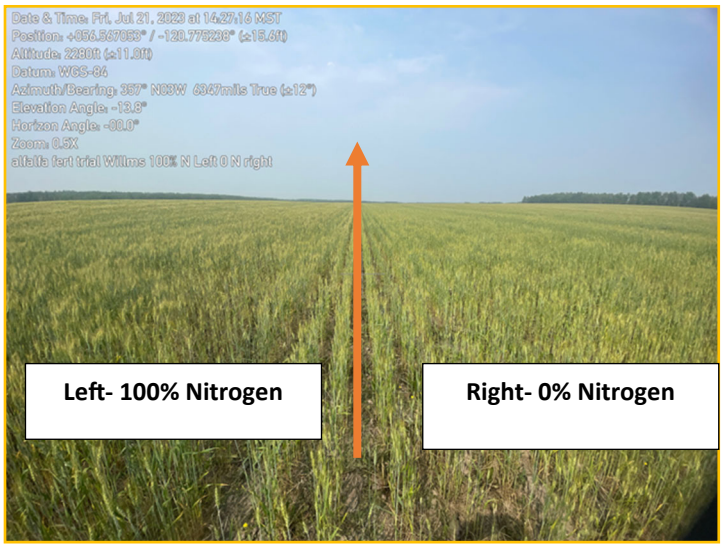
Fertility No ALFALFA

June 22, 2023 Growing Season Observations continued..



July 21, 2023 Observations

Observations: This site visit was completed 78 days after seeding Growing degree days since seeding was 843GDD, with 576GDD as the calculated normal for this area this was 146% of normal growing conditions. Using these GDD as a guide the crop growth stage was 2 (seed fill) It was observed that actual growth stage of this was seed fill. 0% and 50% Nitrogen visually had thinner plant stand, less tillering, shorter heads and fewer seeds. Rainfall for June 22- July 22 = 56.39mm or 73% of normal rainfall for this time period.



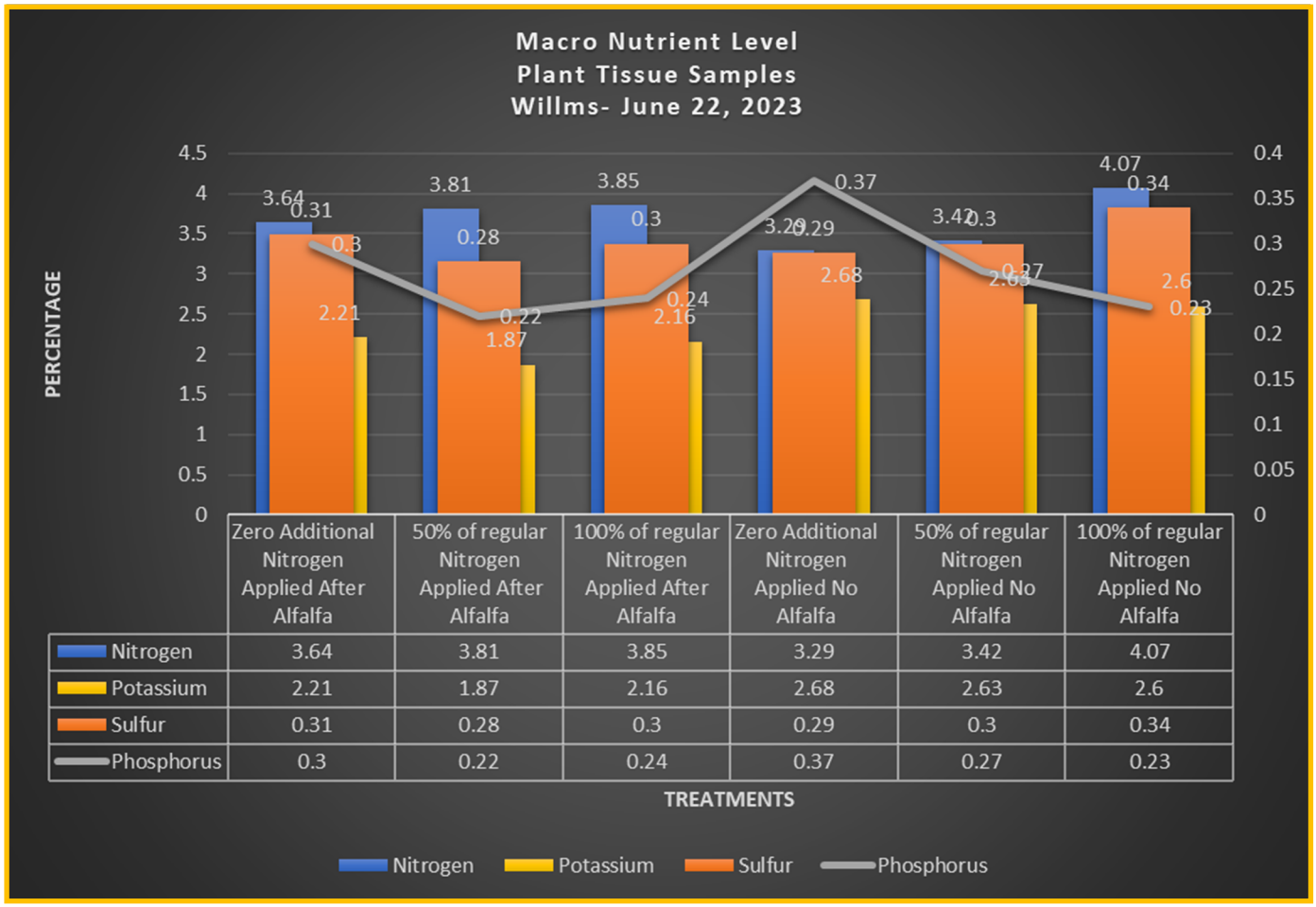
Plant Tissue Sample Results

Summary Completed by Dr. Sahel Miladi Lari

Plant Tissue samples were taken during the June 22nd site inspection. Samples were taken on each treatment collecting the newest leaves from 9 different samples points in a “W” pattern down the length of each treatment. Samples were dried for three days then shipped to A&L Labs for analysis. BC Grains Chief Scientific officer Dr. Sahel Miladi Lari reviewed results and provided the below summary.

Macronutrients level: The bar graph (1) compares the percentage of macronutrients in plant tissue from 6 different treatments. The treatments are T1(zero Additional Nitrogen Applied After Alfalfa), T2(50% of regular Nitrogen Applied After Alfalfa), T3(100%of regular Nitrogen Applied After Alfalfa), T4(Zero Additional Nitrogen Applied no Alfalfa), T5(50%of regular Nitrogen Applied no Alfalfa) and T6(100% of regular Nitrogen Applied no Alfalfa). It is clearly shown in the graph, that T6 had the highest percentage of nitrogen (N) in all treatments, whereas T4 had the lowest percentage of N. T4 also had the highest amount of potassium (K) in all treatments, whereas T2 had the lowest amount of K. The minimum phosphorus and sulfur were in T2 with 22%, and 28% respectively.

Bar graph 1: The percentage of macronutrients in plant tissue from 6 different treatments



	Zero Additional Nitrogen Applied After Alfalfa	50% of regular Nitrogen Applied After Alfalfa	100% of regular Nitrogen Applied After Alfalfa	Zero Additional Nitrogen Applied No Alfalfa	50% of regular Nitrogen Applied No Alfalfa	100% of regular Nitrogen Applied No Alfalfa
Nitrogen	3.64	3.81	3.85	3.29	3.42	4.07
Potassium	2.21	1.87	2.16	2.68	2.63	2.6
Sulfur	0.31	0.28	0.3	0.29	0.3	0.34
Phosphorus	0.3	0.22	0.24	0.37	0.27	0.23

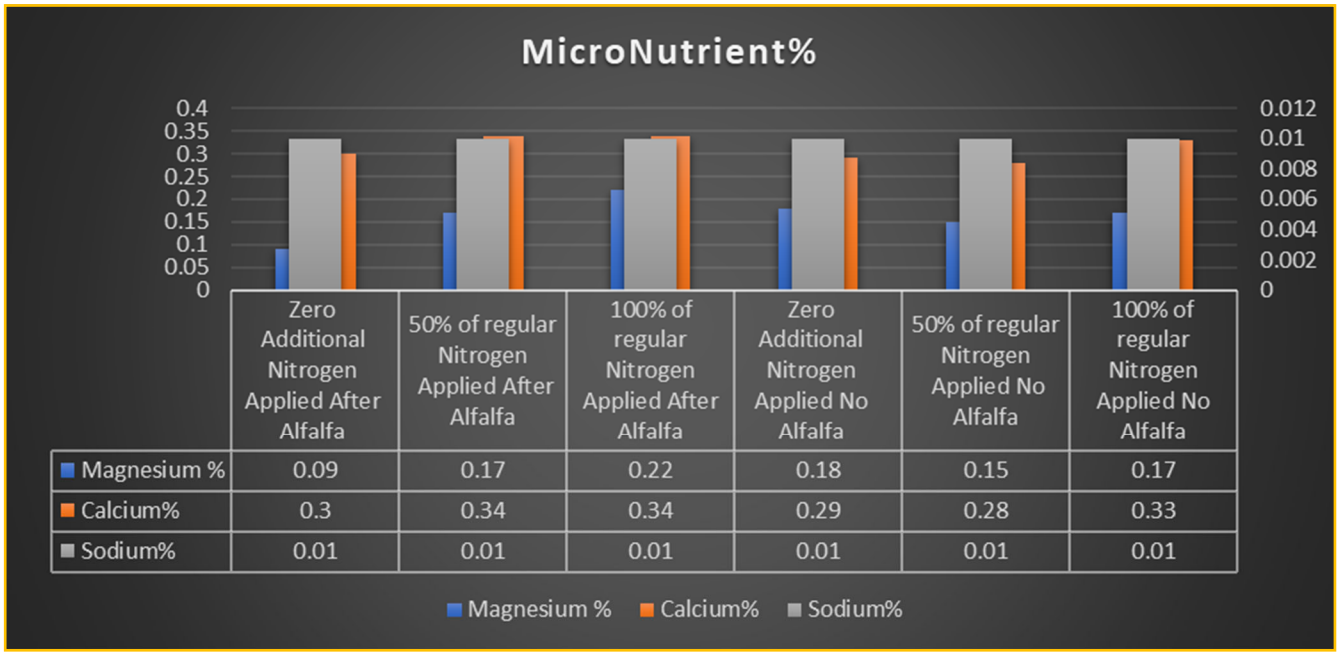
Micronutrients Level: The bar graph (2) compares the percentage of micronutrients in plant tissue from 6 different treatments. The bar graph shows that the highest percentage of magnesium (Mg) was in treatment T3, which had 22% of Mg in its plant tissue. The lowest percentage of Mg was in treatment T1, which had only 0.09% of Mg. Treatment T2 and T6 had the same percentage of Mg with 17%.The amount of calcium (Ca) and sodium (Na) was sufficient.

The amount of **manganese (Mn)** in **T4** was the highest among all treatments, while **T5** was the lowest. **T5** had the highest **iron (Fe)** level and **T1** had the lowest. **T3** had the highest **copper (Cu)** level with **9.55 parts per million (ppm)**, and **T6** had the lowest with **6.27 ppm**. **T6** also had the highest **boron (B)** level with **8.17 ppm**, and **T1** had the lowest. **T6** had the highest **zinc (Zn)** level and **T1** had the lowest. **T5** had the highest **aluminium (Al)** level and **T3** had the lowest. According to a report by A&L Canada Laboratories, a leading company in agricultural and environmental testing, all treatments had a boron (B) low except T4 and T6.Treatment 1 (T1) had a magnesium (Mg) deficiency and amount of Iron was high in all treatments.

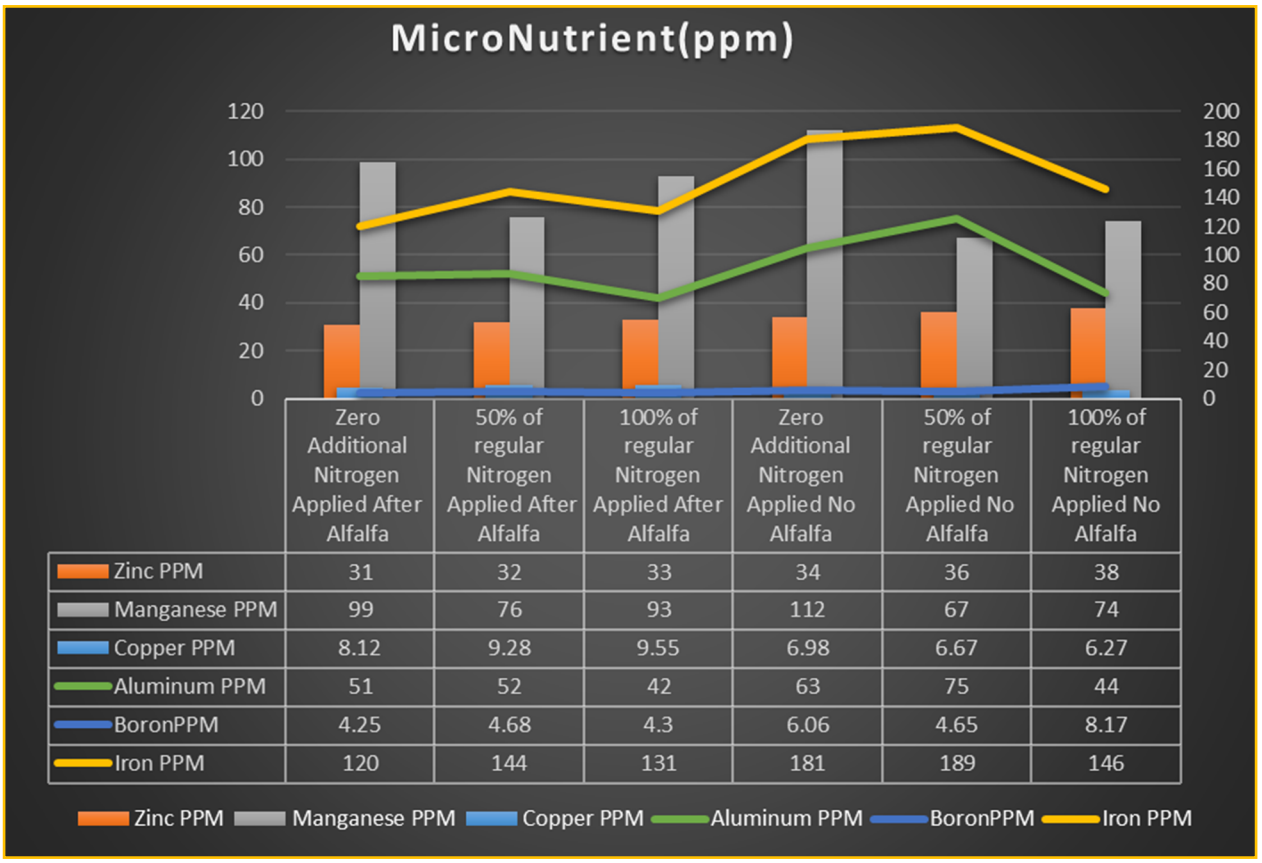
Boron and magnesium are essential for plant growth and development. Boron facilitates cell wall formation, sugar transport, and flower development. Magnesium is the central atom in chlorophyll, which enables photosynthesis, and also assists with carbohydrate metabolism and phosphorus transport.

Various factors, such as incorrect soil pH, nutrient imbalance, poor soil conditions, or improper watering, can cause boron and magnesium deficiency in plants. Boron deficiency can result in stunted growth, distorted leaves, and reduced yield . Magnesium deficiency can cause chlorosis (yellowing) of lower leaves, reduced photosynthesis, and poor crop quality.

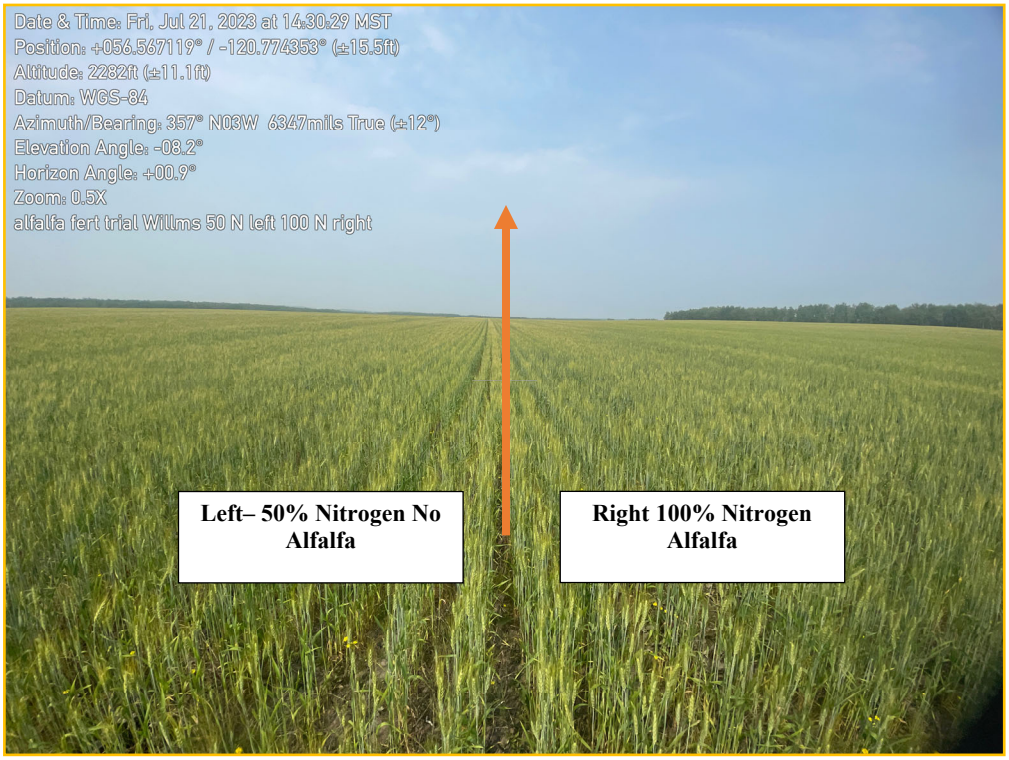
Bar Graph 2—The percentage of macronutrients in plant tissue from 6 different treatments



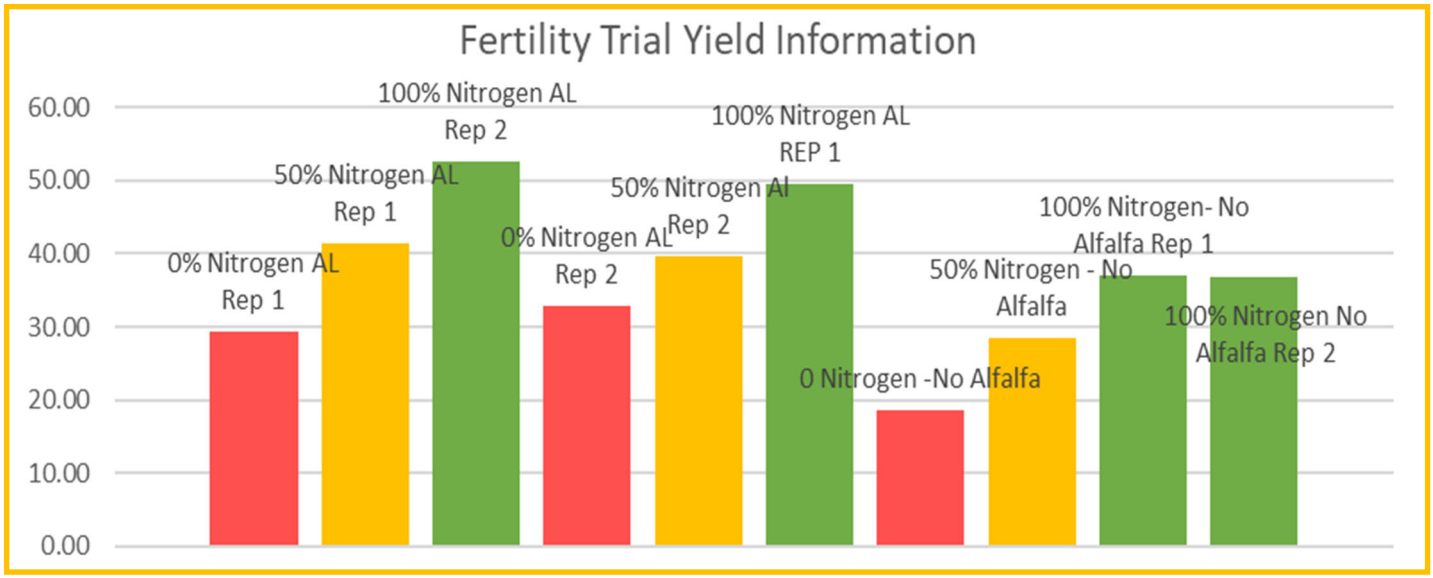
The bar graph 3- The percentage of Micronutrients in plant tissue from 6 different treatments



	Zero Additional Nitrogen Applied After Alfalfa	50% of regular Nitrogen Applied After Alfalfa	100% of regular Nitrogen Applied After Alfalfa	Zero Additional Nitrogen Applied No Alfalfa	50% of regular Nitrogen Applied No Alfalfa	100% of regular Nitrogen Applied No Alfalfa
Zinc PPM	31	32	33	34	36	38
Manganese PPM	99	76	93	112	67	74
Copper PPM	8.12	9.28	9.55	6.98	6.67	6.27
Aluminum PPM	51	52	42	63	75	44
BoronPPM	4.25	4.68	4.3	6.06	4.65	8.17
Iron PPM	120	144	131	181	189	146



Willms Fertility Trial Harvest Data				
Description	**Acres**	**Mt per acre**	**Bu/ac**	**Moisture Adjusted Bu/ac**
0% Nitrogen AL Rep 1	3.02	0.803	**29.49**	**29.40**
50% Nitrogen AL Rep 1	3.02	1.127	**41.40**	**41.40**
100% Nitrogen AL Rep 2	3.02	1.428	**52.48**	**52.58**
0% Nitrogen AL Rep 2	3.01	0.892	**32.78**	**32.84**
50% Nitrogen Al Rep 2	3.01	1.072	**39.38**	**39.61**
100% Nitrogen AL REP 1	3.03	1.346	49.45	49.45
0 Nitrogen -No Alfalfa	2.62	0.506	**18.60**	**18.56**
50% Nitrogen - No Alfalfa	2.78	0.774	**28.43**	**28.48**
100% Nitrogen- No Alfalfa Rep 1	2.52	1.005	**36.93**	**37.00**
100% Nitrogen No Alfalfa Rep 2	2.43	1.002	**36.82**	**36.89**



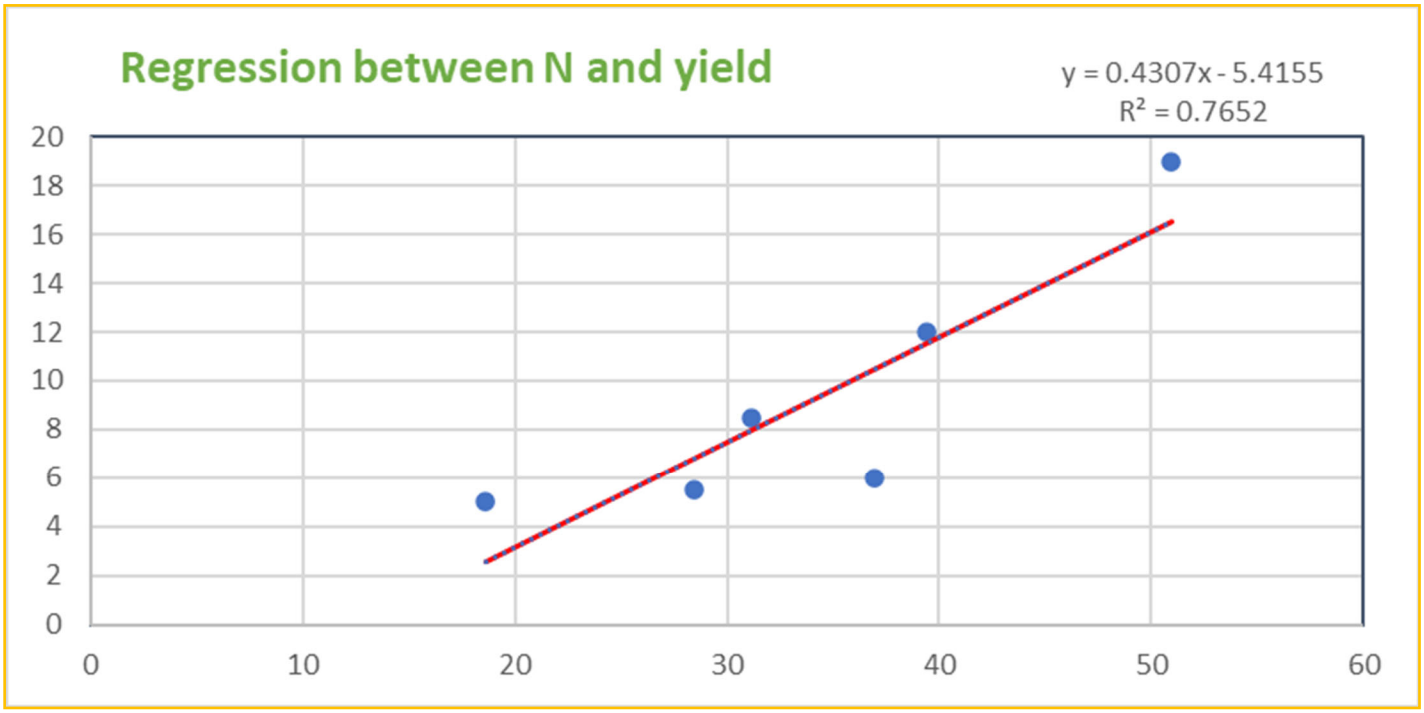
Yield:

The amount of yield in the treatment of 100% regular Nitrogen applied after Alfalfa was the highest with 52.58 Bu/Acre and the treatment of Zero additional Nitrogen no Alfalfa had the lowest amount of yield with 18.56Bu/Acre.

Regression analysis is a statistical method used to investigate the relationship between a dependent variable and one or more independent variables. It aims to understand how the dependent variable changes as the independent variables change. This method is commonly used for forecasting, understanding causal relationships, and making predictions. Below is a regression analysis between yield and Nitrogen application.

Regression between N and Yield:

A regression analysis was conducted to examine the relationship between the nitrogen level in the soil test (N) and the yield of the crop in different treatments. The results indicated that there was a significant positive linear relationship between N and yield, as shown by the F-test ($F = 50$, $p = 0.02$) and the coefficient of determination ($R^2 = 0.76$). The slope of the regression line was 0.35, implying that for every unit increase in N, the yield increased by 0.35 units on average. The p-value for the slope was 0.02, suggesting that the slope was significantly different from zero. Hence, it was concluded that N was a significant predictor of yield in this study.



Grain Quality Data

Grain Samples Results
Canadian Grain Commission
Willms- 2023

Sample Description	Variety	Grade	TWT	DON (Raptor)	Falling Number	Moisture	Protein
100% Nitrogen-No Alfalfa	STETTLER	1CW RS	413	< 0.3	388	14.0	10.9
0%Nitrogen - No Alfalfa	STETTLER	1CW RS	413	< 0.3	386	14.5	11.4
50% Nitrogen - No Alfalfa	STETTLER	1CW RS	413	< 0.3	402	14.2	10.9
100% Nitrogen Alfalfa Rep 3	STETTLER	1CW RS	414	0.3	380	13.7	14.5
50% Nitrogen Alfalfa Rep 2	STETTLER	1CW RS	417	0.3	399	13.6	13.6
0% Nitrogen Alfalfa Rep 2	STETTLER	1CW RS	417	< 0.3	403	14.0	13.8
100% Nitrogen Alfalfa Rep 2	STETTLER	1CW RS	415	< 0.3	397	13.9	13.6
50% Nitrogen Alfalfa Rep 1	STETTLER	1CW RS	415	< 0.3	380	14.2	13.4
0% Nitrogen Alfalfa Rep 1	STETTLER	1CW RS	414	< 0.3	390	14.5	13.4
100% Nitrogen Alfalfa REP 1	STETTLER	1CW RS	414	< 0.3	408	14.3	13.2

After Harvest Soil Sample Results

Summary Completed by Dr. Sahel Miladi Lari

Soil samples were collected from two different depths (0-6 & 6-12 inches) of the experimental area on November 10, 2023. The following table summarizes the results of the soil analysis for different treatments and parameters. then shipped to A&L Labs for analysis. BC Grains chief Scientific officer Dr. Sahel Miladi Lari reviewed results and provided the below summary

The treatments are T1(zero Additional Nitrogen Applied After Alfalfa), T2 (50% of regular Nitrogen Applied After Alfalfa), T3(100%of Regular Nitrogen Applied After Alfalfa), T4(Zero Additional Nitrogen Applied, no Alfalfa), T5 (50%of Regular Nitrogen Applied, no Alfalfa) and T6 (100% of regular Nitrogen Applied, no Alfalfa).

The table shows that the pH values for all treatments ranged from 5.3 to 5.6, indicating acidic soil conditions. The organic matter content was highest in T3 (14.5%) and lowest in T1, T4, and T5 at the depth of 12" The phosphorus (P) levels were medium in T1, T2, T3, and T4 and good in T5 and T6. The nitrate (NO3) levels were highest in T3 (25 ppm) at the depth of 6" and lowest in T4 (1 ppm) at the depth of 12". The potassium (K) levels were very high in T6 (311 ppm) at the depth of 6" and low in T3 (89 ppm) at the depth of 12". The calcium (Ca), sulfur (S), magnesium (Mg), zinc (Zn), manganese (Mn), iron (Fe), copper (Cu), and boron (B) levels varied among the treatments and depths, as shown in the table (1).

The treatment 100% of regular Nitrogen applied after Alfalfa(T3) had the highest amount of organic matter and N03 in all treatments. Amount sulphur (S), boron (B), and manganese (Mn) were low or very low in all treatments.

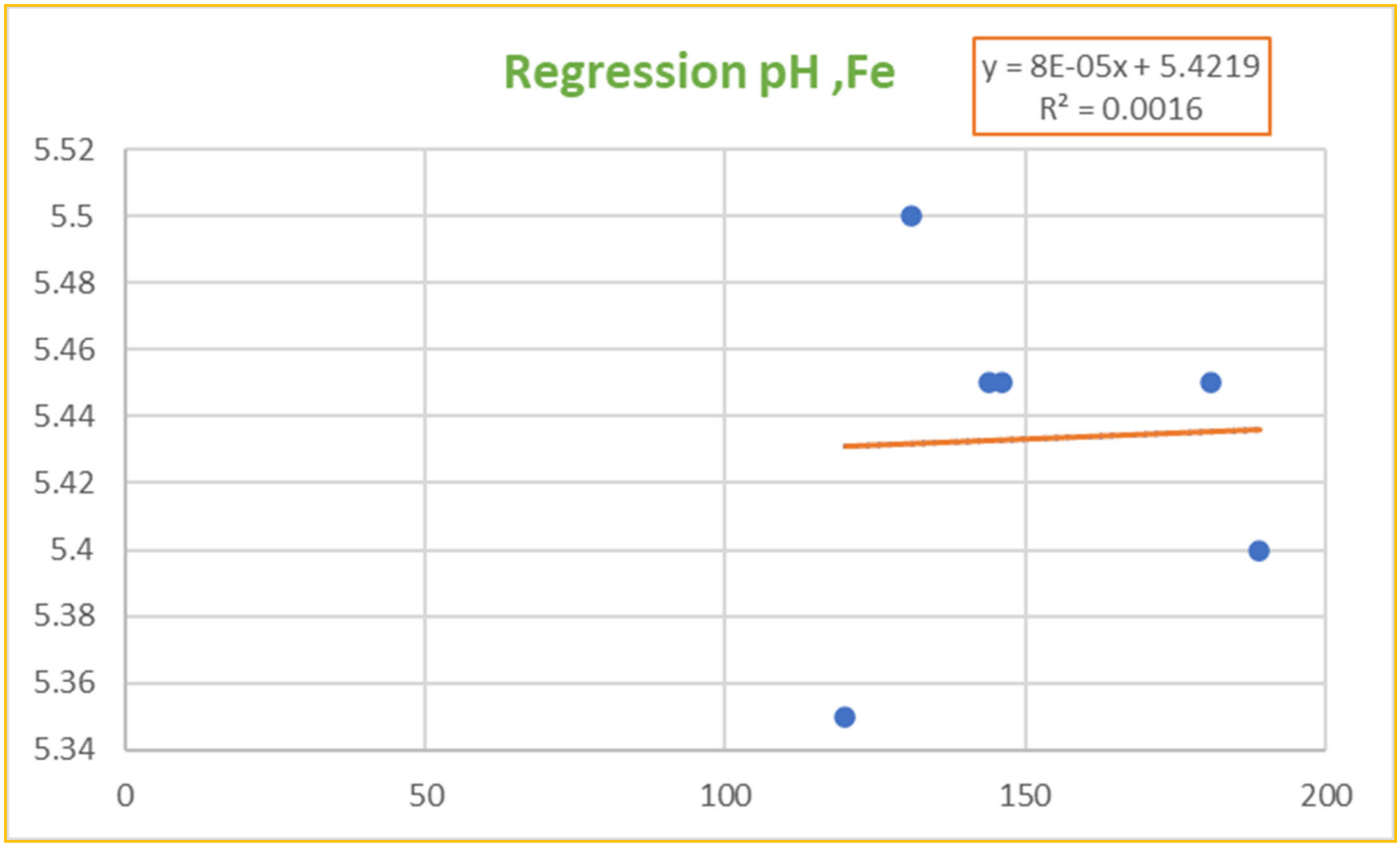
Table 1-The results of the soil analysis for different treatments and parameters

Treatment #	Depth	Organic Matter	pH	CEC meq/100gm	Nitrate Nitrogen N03-N PPM	Nitrate Nitrogen N03-N lbs/ac	Phosphorus PPM Bicarb	Phosphorus PPM Bray-P1	Potassium K PPM	Sulfur S PPM	Sulphur lbs/ac	Sodium	Magnesium PPM	Calcium PPM	Boron PPM	Zinc PPM	Manganese PPM	Iron PPM	Copper PPM
#1	6	5.8	5.3	23.8	12	22	14	19	232	14	25	35	488	1650	0.2	4.1	10	106	0.9
	12	3.8	5.4	30.6	5	9			148	29	52	85	755	2090					
# 2	6	6.2	5.5	21.1	16	29	14	19	137	9	16	29	383	1330	0.2	4	8	80	0.9
	12	4.5	5.4	24	8	14			102	10	18	54	570	1610					
# 3	6	14.5	5.6	18.4	25	45	17	28	124	13	23	18	277	1710	0.4	5.4	9	99	2.7
	12	7.7	5.4	20.6	13	23			89	11	20	30	371	1510					
# 4	6	5.9	5.5	22.5	9	16	16	23	212	14	25	30	460	1680	0.2	6.1	8	95	0.6
	12	3.9	5.4	23.9	1	2			90	8	14	38	514	1450					
#5	6	6.9	5.5	24.4	10	18	22	33	236	16	29	30	443	1600	0.1	6.6	9	107	0.6
	12	3.8	5.3	29.5	1	2			103	10	18	46	549	1550					
# 6	6	6.9	5.5	24.2	10	18	21	43	311	23	41	38	451	1750	0.2	8.5	10	132	0.7
	12	4.1	5.4	30.8	2	4			168	14	25	62	698	1750					

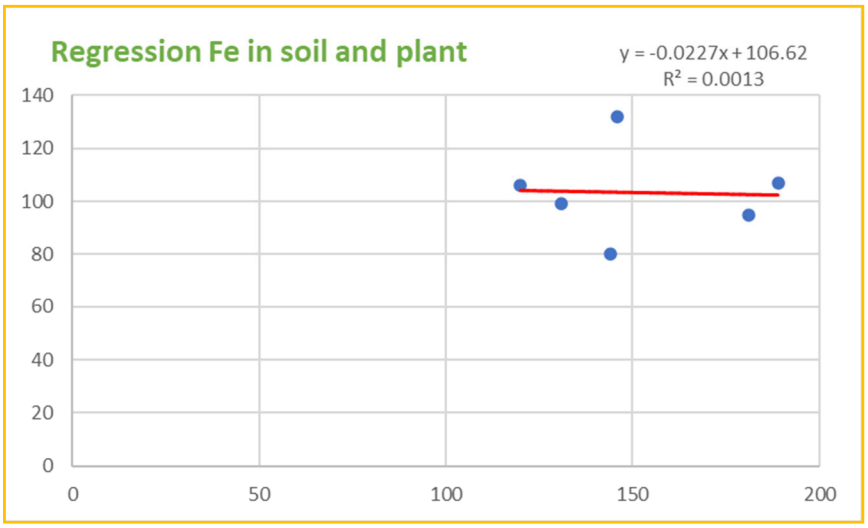
Regression analysis is a statistical method used to investigate the relationship between a dependent variable and one or more independent variables. It aims to understand how the dependent variable changes as the independent variables change. This method is commonly used for forecasting, understanding causal relationships, and making predictions. In this project the plant tissues samples taken in season were compared to the fall soil sample results

Regression between Iron Plant tissue and Soil PH :

The relationship between soil pH and iron concentration in plant tissue was investigated using linear regression analyse. The results showed that the regression equation was y = 0.98 - 0.12x, where y is the iron concentration in mg/kg and x is the soil pH. The coefficient of determination (R^2) was 0.00159, indicating that only 0.16% of the variation in iron concentration was explained by soil pH. The F-test for the overall significance of the regression model was not significant (F = 0.94, p = 0.94), suggesting that soil pH was not a good predictor of iron concentration in plant tissue. Therefore, the hypothesis that soil pH affects iron availability and uptake by plants was not supported by the data.

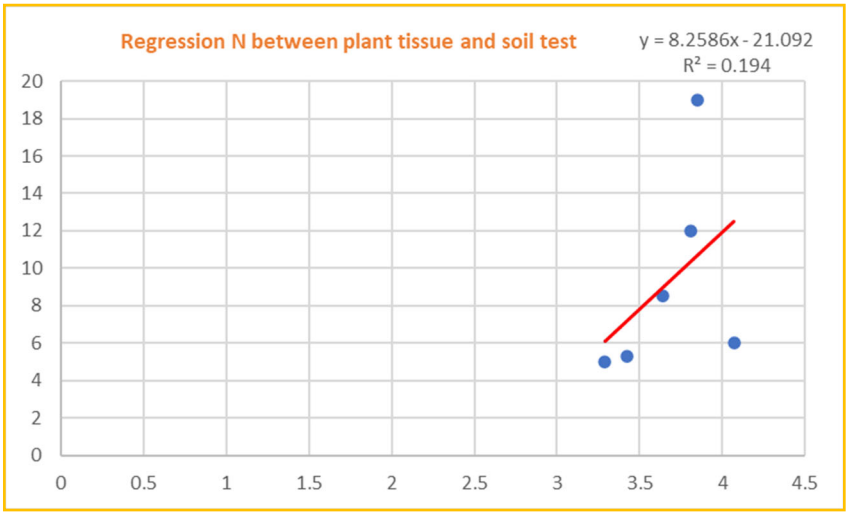


Regression between Iron in Plant Tissue and Soil:



The relationship between iron (Fe) concentration in soil and plant tissue was investigated using linear regression analysis. The results showed that the regression model was not significant, as the F-value was 0.94, which was higher than the critical value of 0.05. The coefficient of determination (R2) was 0.00132, indicating that only 0.13% of the variation in plant tissue Fe concentration could be explained by soil Fe concentration. The intercept value was 0.13, which means that the expected plant tissue Fe concentration would be 0.13 mg/kg when soil Fe concentration was zero. The slope value was 0.94, which means that for every unit increase in soil Fe concentration, the plant tissue Fe concentration would increase by 0.94 mg/kg. However, both the intercept and the slope were not statistically significant, as their p-values were 0.13 and 0.94, respectively, which were higher than the significance level of 0.05. Therefore, the regression analysis suggested that there was no linear relationship between soil Fe concentration and plant tissue Fe concentration.

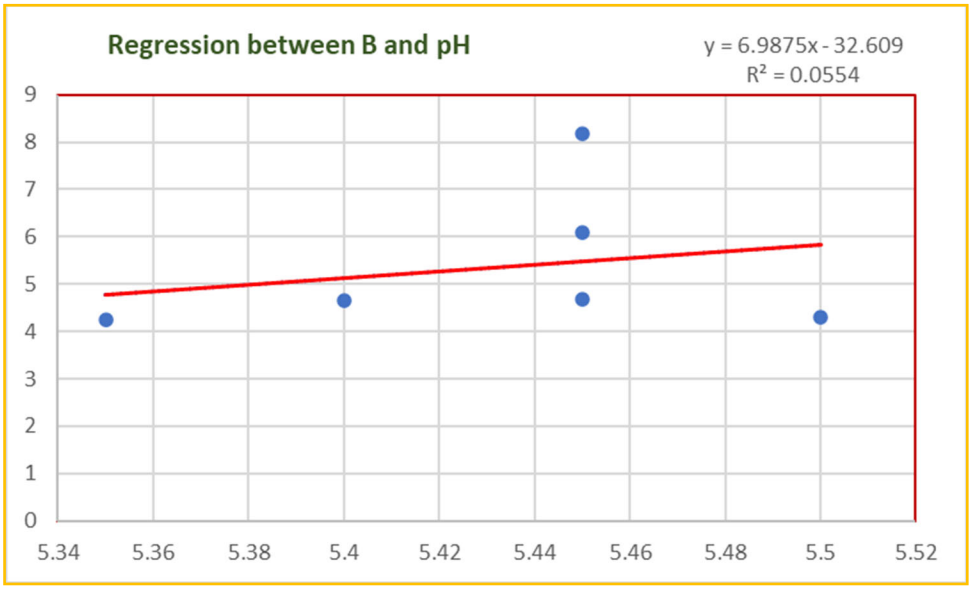
Regression between Nitrogen (N) in Plant Tissue and Soil test in all treatments:



The regression analysis showed that the nitrogen (N) content in plant tissue was weakly correlated with the N content in soil (R^2=0.194). This indicates that the variation in plant N content was not well explained by the variation in soil N content. The regression model was not statistically significant at the 0.05 level (p=0.382), meaning that there was no evidence of a linear relationship between plant N content and soil N content across the treatments. However, the intercept of the regression model was statistically significant at the 0.001 level (p=0.000163), meaning that there was a non-zero baseline of plant N content regardless of soil N content. The slope of the regression model, which represents the change in plant N content per unit change in soil N content, was not statistically significant at the 0.05 level (p=0.382), meaning that there was no clear effect of soil N content on plant N content. Therefore, the hypothesis that plant N content depends on soil N content was rejected. Other factors, such as plant species, growth stage, environmental conditions, and soil properties, may have influenced the plant N content more than the soil N content.

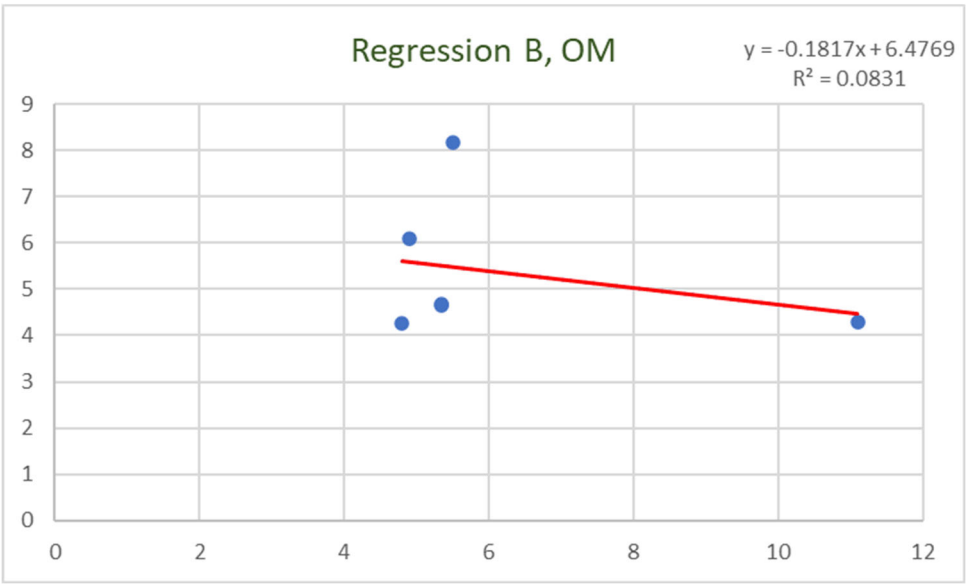
Regression analysis between Boron and pH soil:

The regression analysis showed that the boron (B) content in plant tissue was not correlated with the pH of the soil (R^2=0.0054). This indicates that the variation in plant B content was almost independent of the variation in soil pH. The regression model was not statistically significant at the 0.05 level (p=0.901), meaning that there was no evidence of a linear relationship between plant B content and soil pH across the treatments. Therefore, the hypothesis that plant B content depends on soil pH was rejected. Other factors, such as soil texture, and crop type, may have influenced the plant B content more than the soil pH.



Regression analysis between B in Plant tissue and OM in Soil test:

The regression analysis showed that the boron (B) content in plant tissue was weakly correlated with the organic matter (OM) content in soil (R^2=0.083). This indicates that the variation in plant B content was not well explained by the variation in soil OM content. The regression model was statistically significant at the 0.01 level (p=0.010), meaning that there was some evidence of a linear relationship between plant B content and soil OM content across the treatments. However, the slope of the regression model, which represents the change in plant B content per unit change in soil OM content, was not statistically significant at the 0.05 level (p=0.5795), meaning that there was no clear effect of soil OM content on plant B content. Therefore, the hypothesis that plant B content depends on soil OM content was not strongly supported.



Summary: Soil testing is an important method, but it does not always correspond with plant tissue analysis. This is because the nutrient concentration of plant tissues is influenced by many factors besides the soil nutrient availability.

Weather May 5th – September 9th

Weather: Weather data from the Peace Agri-weather Network www.bcpeaceweather.com using the Rose Prairie Weather Station.

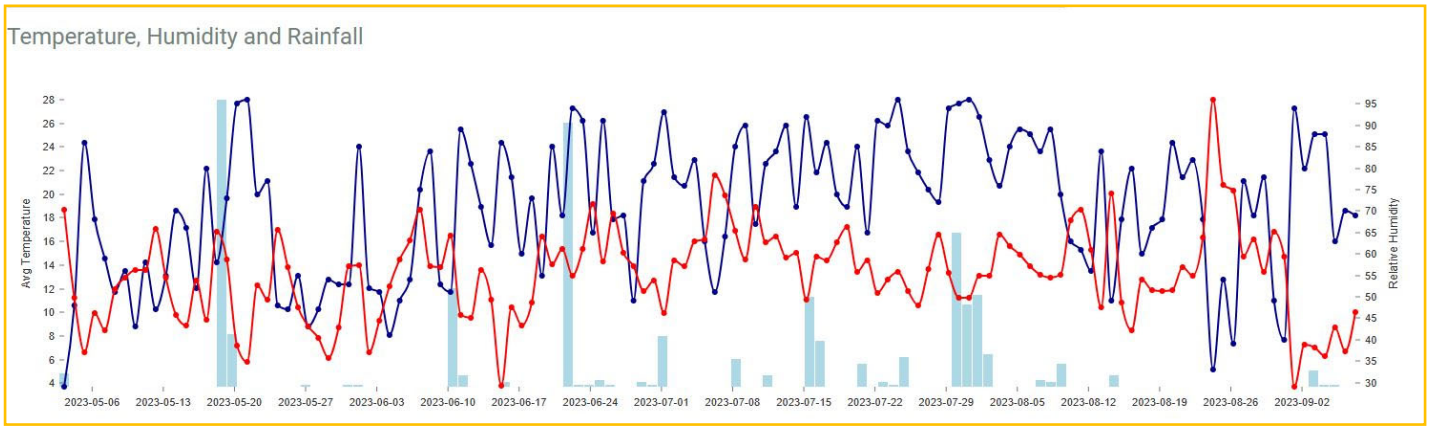
Weather Summary Willms Trial 2023 May 5th - Sept 9th	
Average Temperature:	13.2C
Lowest Temperature:	minus -.6
Highest Temperature:	31.1C
Total Rainfall:	162.81mm
Normal Rainfall:	245.88mm (66% normal)

Growing Degree Days
Willms 2023 Trial

SUMMARY May 5 - Sept 9, 2023

Number of Days: 127

	Actual	Normal	% of Normal
GDD Base 0C	2122	1772	120%
GDD Base 5C	1423	1083	131%
GDD Base 10C	750	461	163%



Economics

Cost of Production Information								
Rate Description	Starter Fert Micro Phos 11-39-0-6 @ 30lbs/ac $/ac	Actual lbs/ac N Applied	$ per LB of N	$ per acre	Ad-justed Bu/ac	$per bu wheat	Gross $/ac	Gross less Fertility Costs
100% Nitrogen Alfalfa Rep 2	$ 25.00	78	$ 0.86	$ 67.08	52.58	$ 10.00	$ 525.80	$ 433.72
100% Nitrogen Alfalfa REP 1	$ 25.00	78	$ 0.86	$ 67.08	49.5	$ 10.00	$ 495.00	$ 402.92
50% Nitrogen Alfalfa Rep 1	$ 25.00	39	$ 0.86	$ 33.54	41.4	$ 10.00	$ 414.00	$ 355.46
50% Nitrogen Alfalfa Rep 2	$ 25.00	39	$ 0.86	$ 33.54	39.61	$ 10.00	$ 396.10	$ 337.56
0% Nitrogen Alfalfa Rep 2	$ 25.00	0	$ 0.86	$ -	32.84	$ 10.00	$ 328.40	$ 303.40
100% Nitrogen- No Alfalfa	$ 25.00	78	$ 0.86	$ 67.08	37	$ 10.00	$ 370.00	$ 277.92
0% Nitrogen Alfalfa Rep 1	$ 25.00	0	$ 0.86	$ -	29.4	$ 10.00	$ 294.00	$ 269.00
50% Nitrogen - No Alfalfa	$ 25.00	39	$ 0.86	$ 33.54	28.48	$ 10.00	$ 284.80	$ 226.26
0 Nitrogen -No Alfalfa	$ 25.00	0	$ 0.86	$ -	18.56	$ 10.00	$ 185.60	$ 160.60

Producer Perspective: Although we were disappointed in most of our yields in 2023 however with an increase of 13bu/ac of Wheat on this field that had been in alfalfa over other fields in the same part of the farm. This is the increase we are targeting and feel it was a success. The big question is how many years is it effective for. Our target is to increase Wheat yields by 10-15bu/ac and Canola by 7-10bu/ac for 3 subsequent years.

The soil samples taken in the fall 2023 show higher organic matter in both 0-6 and 6-12 depths. One is super high at 14% that may be an anomaly but most 0-6 show 1% and 6-12 show .5% higher than other fields this would be a benefit in subsequent years. The results from this alfalfa trial show the need for N fertilizer in growing our crops, the intent in growing Alfalfa is not to replace N fertilizer but to make our soils and crops more resilient. The goal is to increase yields in our grey wooded soils to be equivalent to other areas on the prairies. The intent of the fertility trials is to quantify the benefits of growing a legume in the rotation.

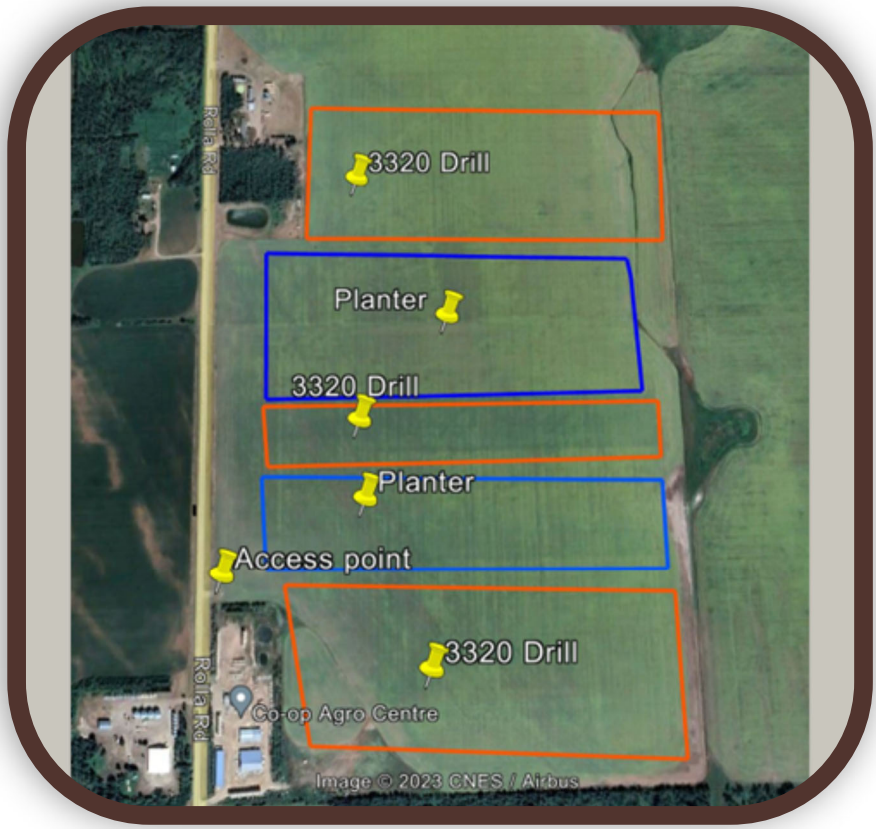
We feel that a pure alfalfa stand is fairly easy to grow and then take out of production with a benefit to the soil. Adding a grass to the hay mix would add some volume to the hay but uses up the benefits that the alfalfa is created and adds to the challenge of removing or seeding into.

By zero tilling into this terminated alfalfa stand the goal is to leave the alfalfa roots in place thus increasing organic matter and increasing water infiltration in our clay soils. More testing needs to be done to see if we are achieving this but it does appear to be benefiting.

Trial Nine

Planter vs. Drill Comparison

Funk & Rath



Planter

Drill

Partner Producers: Brandon Funk (Drill) Willy & Edmund Rath (Planter)

Seeding Date: April 29, 2023

Harvest Date: September 2, 2023

Field Side by Side Comparison Trial

Vaderstad Planter vs. 3320 Bourgault Paralink Drill

Project Goal: Compare two neighbouring farms seeding implements under the same environmental conditions.

Producer Prediction: That the planter with the cost savings of a lower seeding rate will be the most economical, even when factoring cost of purchasing equipment

*Both trials were treated with the same agronomic practices throughout the growing season, comparison was using different seeding equipment at the recommended seeding rate.

Equipment Description: 34Ft Vaderstad tempo L 24 (row) Planter 17.5 inch (45cm) row spacing @ 2.8 lbs/ac canola seeding rate

Equipment Cost per Acre: $20/ac (Seeding implement only no labour, tractor or fuel)

The Vaderstad planter is a popular agricultural implement used for precision planting. Here are some key advantages & disadvantages.

Advantages:

1. Precision seeding: The Vaderstad planter ensures accurate seed placement, resulting in consistent plant spacing and optimal seed-to-soil contact.
2. Increased yield potential: The precise planting achieved by the planter promotes even emergence, reduces competition between plants, and maximizes yield potential.
3. Time and labor savings: The planter's efficient design allows for faster planting speeds.
4. Versatility: Vaderstad planters are available in various configurations and can handle different types of seeds and crops, providing versatility for farmers with diverse planting needs.
5. Advanced technology: Many Vaderstad planters incorporate advanced features such as GPS guidance, variable rate seeding, and automatic row shut-off, enhancing planting accuracy and efficiency.
6. Fertility Application: This Vanderstad planter has the ability to apply granular fertilizer in side band as opposed to liquid or no fertility application option in other planter models.

Disadvantages:

1. Initial cost: Vaderstad planters can be relatively expensive to purchase, which may pose a financial challenge for some farmers, especially small-scale operations.
2. Maintenance and setup: Like any complex agricultural machinery, the planter requires regular maintenance and proper setup to ensure optimal performance, which may require additional time and expertise.
3. Limited suitability for certain conditions: The Vaderstad planter may not be suitable for all soil types or field conditions, particularly in challenging terrains or regions with specific cropping practices. 4. Learning curve: Operating the planter effectively may require a learning curve, especially for farmers who are new to precision planting technology. Training and familiarity with the equipment are important for achieving desired results.

Field Side by Side Comparison Trial

Vaderstad Planter vs. 3320 Bourgault Paralink Drill

Drill: 60Ft 3320 Bourgault paralink Drill 10 ' (25.4 cm) row spacing @ 5lbs /ac seeding rate

Equipment Cost Per Acre: $20/ac (Seeding implement only no labour, tractor or fuel)

The 3320 Paralink Bourgault Drill is a popular agricultural equipment. Here are some advantages & disadvantages.

Advantages:

1. Versatility: Wider range of seed and fertilizer placement options, allowing for flexibility in different crop types and field conditions. Ability to seed and fertilize in one pass reducing fuel & labour costs.

2. Efficiency: Its large working width and high-capacity tank enable faster planting, reducing the time required for seeding operations.

3. Precision: The drill's accurate metering system ensures precise seed and fertilizer placement, promoting uniform crop emergence and optimizing resource utilization.

4. Easy Maintenance: The drill is designed for easy maintenance and features durable components, reducing downtime and repair costs.

Disadvantages:

1. Cost: The 3320 Paralink Bourgault Drill can be expensive to purchase, making it a significant investment for farmers and agricultural businesses.

2. Learning Curve: Operating this drill may require some training and familiarity, particularly for those who are new to this specific model or advanced agricultural equipment in general.

3. Maintenance and Repairs: Although the drill is designed for easy maintenance, any necessary repairs or replacements could still incur costs and time delays.

5. Fertilizer Placement: Unable to place fertilizer in a side band, only seed row or mid row is an option.

Seeding

Fertility: 100lbs of actual Nitrogen (NH3) was applied fall of 2022

75 lbs (product) of Ammonium Sulphate floated on spring 2023 prior to seeding

50lbs of 11-52-0 Phos will be applied with seed through each drill at time of seeding. Foliar Fertility was applied in crop to both treatments.

Pesticide: Two passes on insecticide were applied to the each treatment, first pass to manage flea beetles (May) and Lygus bug (Aug 1)

Herbicide: Split application of Grassy weed control herbicide for control of wild oats first pass and Liberty herbicide was applied in a separate pass.

Seeding Date: April 29, 2023

Seeding Conditions: In the previous two weeks prior to seeding the average daily temperature was 6.4C, Low -3.6C, high 24.5C, rainfall for time period was 9.14mm or 79% of normal rainfall for that time period. Weather data collected from the nearest Peace Agri Weather Network station. Outside air temperature on the day of seeding was 24.5C. Although surface soil conditions were beginning to get dry, the soil moisture conditions were good at time of seeding.

Planter seeding Rate: *6 seeds per sq/ft* **Drill Seeding Rate**: *9.75 seeds per sq/ft*

Plant Counts: Taking plant counts in canola is important for several reasons. Firstly, it helps farmers to assess the stand establishment and determine if the crop is growing as expected. This information enables them to make informed decisions about potential replanting or adjusting seeding rates. Additionally, plant counts can provide valuable insights into the overall health of the crop and yield potential, allowing farmers to implement appropriate management practices to maximize production.

Plant counts were taken at 10, 18, 30 & 47 days post seeding. The target plants per sq/ft plant counts the each producer was hoping to get was 5-6 plants per sq/ft. It was recommended that to compare the planted vs drill with the difference in row that per meter of Row counts be taken and converted to plants per sq/ft. Low plant counts in canola can lead to delayed maturity. This occurs because with fewer plants, there is less competition for resources, which can cause individual plants to grow larger and produce more branches. As a result, the plants take longer to reach maturity, potentially leading to a later harvest. High plant counts in canola can lead to increased competition for resources such as water, nutrients, and sunlight, which can result in smaller individual plant size, decreased yield, and increased susceptibility to diseases and pests. Overcrowding can lead to lodging, making harvesting difficult. It's important to maintain optimal plant density to ensure healthy growth and maximum yield.

Between seeding and first inspection May 9 there was no rainfall, average temperature of15C with a recorded low of 4.1C and high of 28.9C. Second inspection May 17th there continued to be no rainfall, average temperature of 18.1C with high of 31.4C and low of 5.7C.

Between the May 17 & June 14th there was cumulative rainfall of 71.37mm (2.8inches) with an average temperature of 15.7C low of 4.4C and High of 27.3. Visual observations at the time of the first plant count were that the planter had a more uniform , evenly placed plant stand. This is a attributed to the planters metering system that places each seed individually.

Plant Counts

May 9th — Planter

May 9th — Drill

Plant Stand Counts
Planter Vs. Drill Comparison

Description	Row Spacing cm	Seeding Rate	Count Date	Stage	Plant Count 1	Plant Count 2	Plant Count 3	Plant Count 4	Plant Count 5	Plant Count 6	Plant Count average	plants per sq/M	Average Count	% seed survival
		seeds per sq/ft			**	per	meter	of	row	**		plants per sq/M	Plants per sq/ft	-
Drill	25.4	9.75	09-May	Cot-1st	7	11	8	4	17		9.40	37.01	3.44	35.28%
Planter	45	5.97	09-May	Cot	17	2	10	25	15		13.80	30.67	2.85	47.74%
Drill	25.4	9.75	17-May	2 leaf	12	18	9	7	17	12	10.50	41.34	3.84	39.40%
Planter	45	5.97	17-May	2 leaf	17	19	22	15	14	24	14.50	32.22	2.99	50.16%
Drill	25.4	9.75	30-May	5 Leaf	32	11	22	19	27	17	18.50	72.83	6.77	69.43%
Planter	45	5.97	30-May	6 leaf	35	21	29	32	30	35	24.50	54.44	5.06	84.76%
Drill	25.4	9.75	14-Jun	Rosette	9	17	28	10	10	10	12.33	48.56	4.51	46.28%
Planter	45	5.97	14-Jun	Rosette	17	19	22	15	14	24	14.50	32.22	2.99	50.16%

*Each plot plant counts taken 5 -6 samples in a W sample pattern, counts taken by meter of row and converted target plant stand 5-6 plant sq/ft

Drill Planter

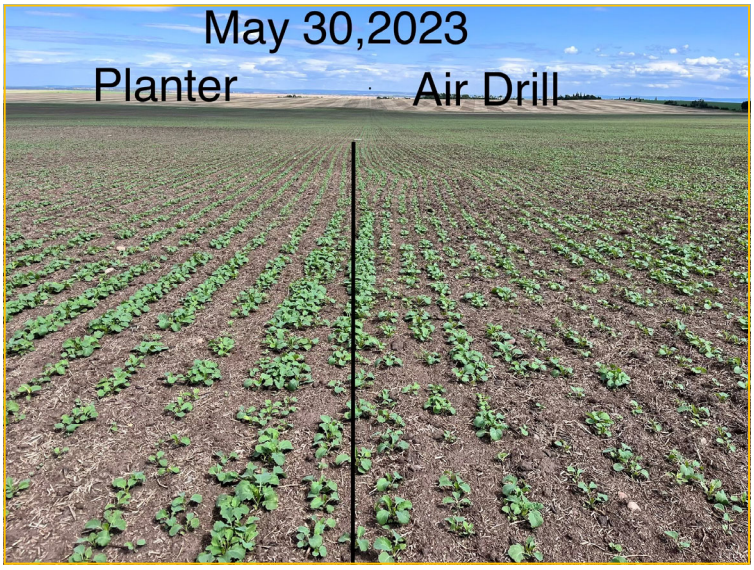
May 30th Observations

Growing Season Observations

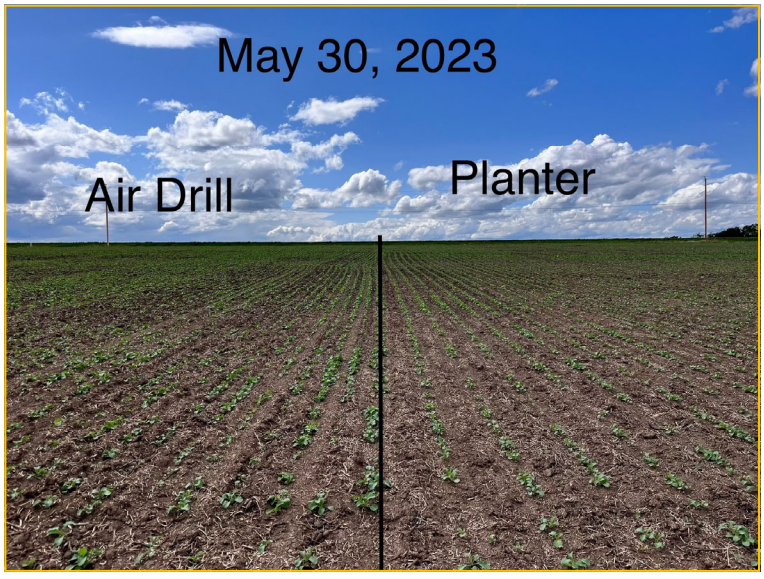
May 30th Observations: Local Agronomist Jennifer Frederickson completed a field visit May 30th she noted that seed placement on the planter was much more uniform than the air drill (in regards to depth) At the time of this visit the plants were anywhere from 2 leaf to 6 leaf (most in the 5 leaf) at least 1-2 in 2 leaf per square count. She felt that the planter was so even but moisture wasn't even so some seeds were sitting in dry soil until it rained (May 20th). With this uneven moisture and the uniform seed placement of the planter actually may have contributed to planter seeds not germinating at same time. In the picture below note the smaller cotyledon growth stage plants that germinated after the ran. There was minimal moisture between in June and July which may have contributed to the seedling mortality difference from May 30th and June 14th visit.

May 30th Plant Counts—Planter

Comparison pictures were taken a each site visit to determine if there were any visual differences, planter on left and drill on right.



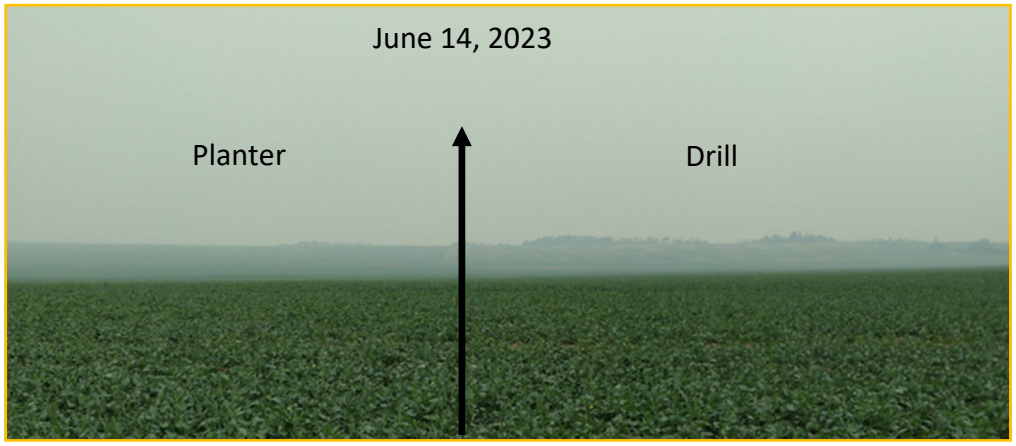
Facing West

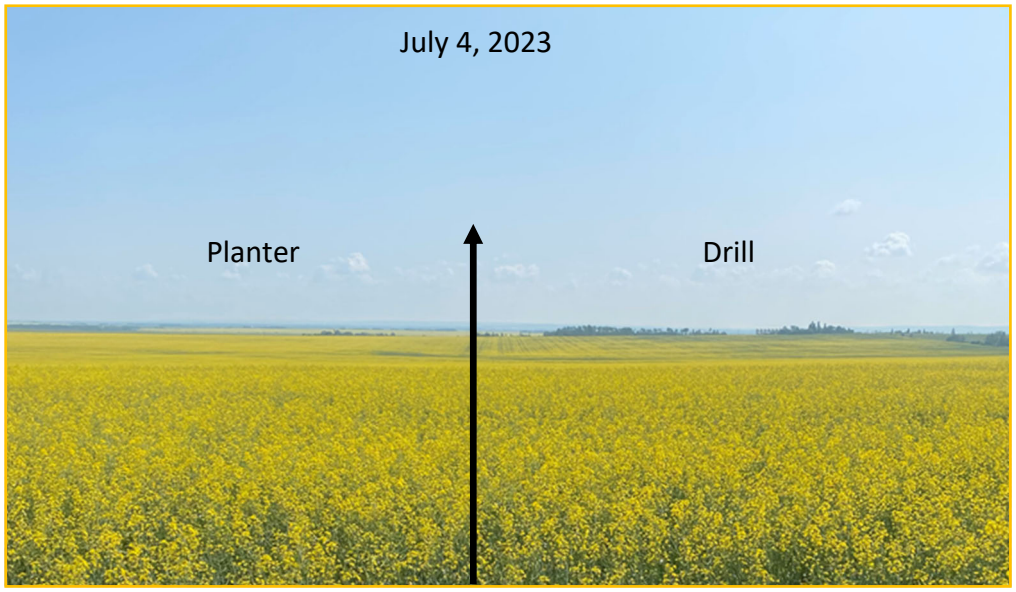


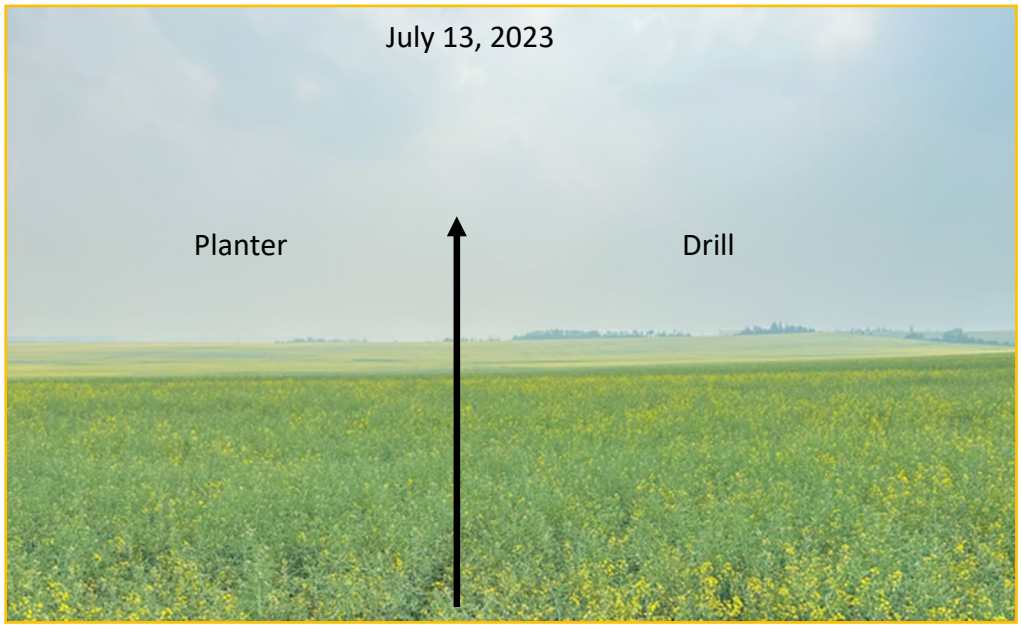
Facing East

Growing Season Observations

Comparison pictures were taken a each site visit to determine is there were any visual differences, planter on left and drill on right.







Growing Season Observations

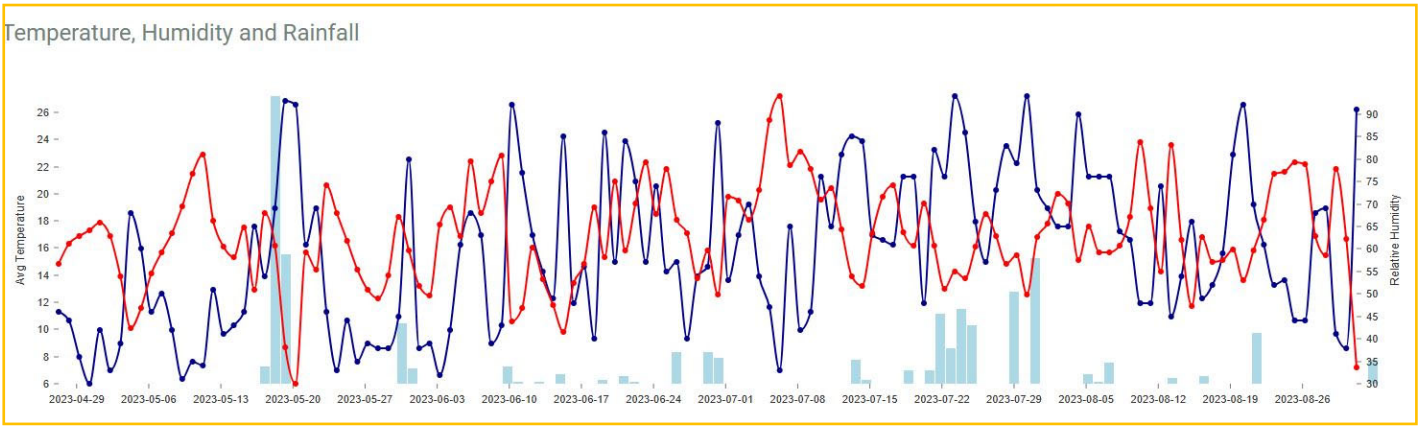
Comparison pictures were taken a each site visit to determine is there were any visual differences, planter on left and drill on right.

Weather April 29– September 2nd

Growing Season Weather Summary: All weather information generated from local weather station data collected through the BC Peace Agri Weather Network using the Rolla weather station. **http://www.bcpeaceweather.com/**

Weather Summary: April 29 - Sept 2	
Average Temperature:	16.9 °C
Lowest Temperature:	4.1 °C
Highest Temperature:	33.2 °C
Total Rainfall:	172.21mm (6.78 inches)
Normal Rainfall:	267.15mm (64% of normal)
*Weather information collected from	Peace Agri weather network

Growing Degree Days Summary: April 29 -Sept 2			
Number of Days: 127			
	Actual	Normal	% of Normal
GDD Base 0C	2173	1643	132
GDD Base 5C	1538	1018	151
GDD Base 10C	906	453	200



Harvest Data

Yield data was collected by taking area calculated by GPS distance and header width. Weights were taken using producers grain cart scales. Crop was harvested using straight cut header utilizing full header down center of trial. Planter trial straw was visually greener at time of harvest, (See picture Below Drill Crop residue on left Planter Crop residue on the right) Grain sample moisture tests confirm that Planter samples were significantly higher moisture. See harvest yield and grain sample information chart on next page.

↑ Drill Crop Residue ↑

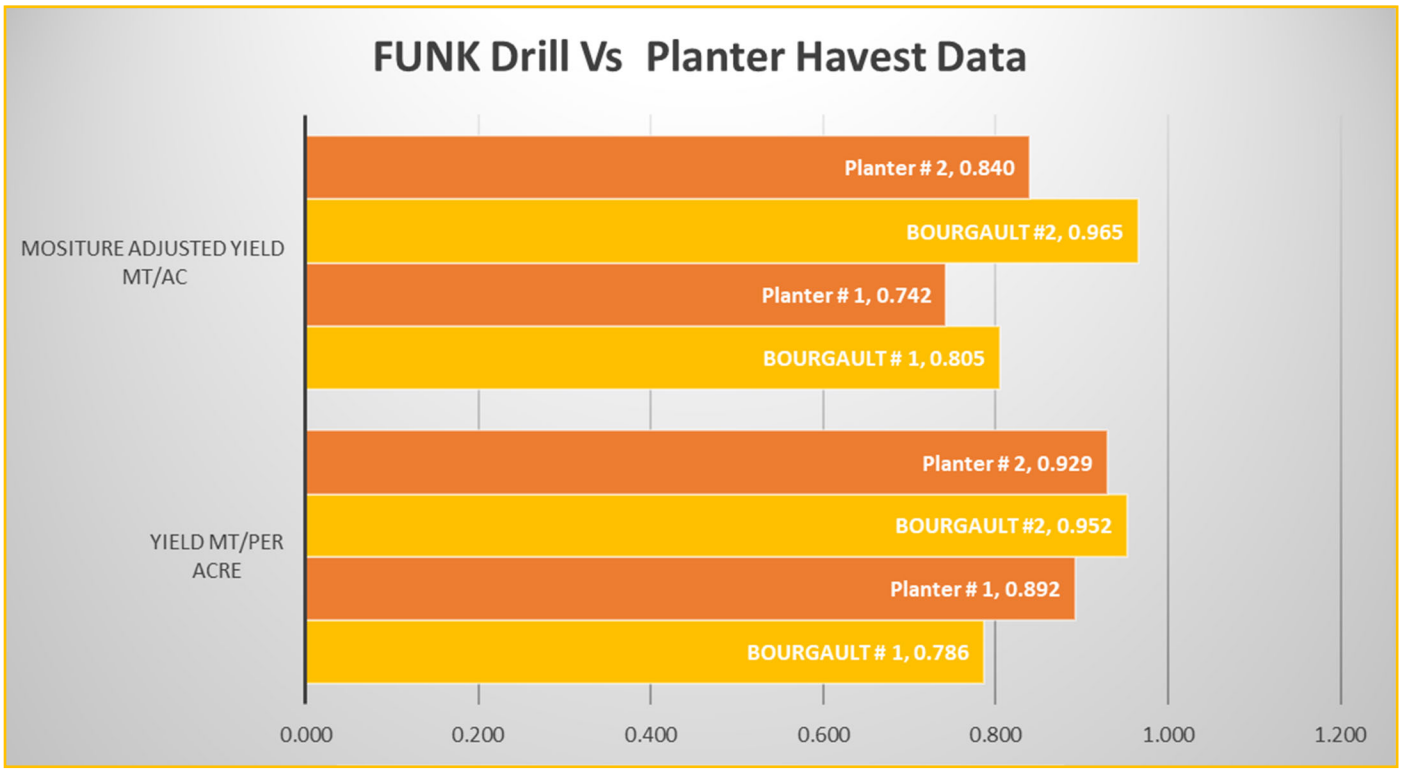
↑ Planter Crop Residue ↑

Harvest Data

Drill Vs. Planter Harvest Data — Sept 2, 2023

Description	width Ft	Weight KG	Metric Tonne	Mt per acre	Bu/ac	Moisture	Oil Content	Target Moisture	Shrinkage /expansion %	Adjusted Bu/ac
Drill # 1	40	1700	1.700	0.786	**34.65**	7.62%	42.60%	10%	0.024	**35.48**
Planter # 1	40	1930	1.930	0.892	**40.98**	26.80%	error due to high mois-ture content **	10%	-0.168	**32.73**
Drill # 2	40	2060	2.060	0.952	**43.74**	8.68%	41.20%	10%	0.013	**42.54**
Planter # 2	40	2010	2.010	0.929	**42.68**	19.65%	error due to high mois-ture content **	10%	-0.097	**37.02**

*** Canola grain samples were sent away to Canadian Grain commission confirm grade and quality ***
** BCGPA oil content tester could not test at high moisture see Grain commission data *Yield Adjusted to 10% moisture



Harvest Grain Samples

Harvest Sample Results — Canadian Grain Commission

Sample	Grade	ADFRmeal (Acid Digestible Fiber)	Chlorophyll	Iodine Value	Linoleic Acid	Linolenic Acid	Moisture	Oil	Oleic Acid	Protein	Saturated Acids	Total Glucosinolates	DGR
Drill # 1	1 CAN	20.7	12.1	115.1	18.0	11.3	6.4	41.9	62.5	24.3	6.5	14.4	0.20 P
Planter # 1	1 CAN	20.4	13.6	115.1	18.1	11.2	8.1	42.1	62.5	24.2	6.5	13.3	0.20 P
Drill # 2	1 CAN	20.6	14.2	115.5	18.1	11.4	7.2	41.9	62.3	24.3	6.5	14.4	0.20 P
Planter#2	1 CAN	20.7	15.2	114.4	18.3	10.8	9.1	43.0	62.9	23.4	6.4	12.0	0.20 P

Cost Analysis					
	Yield Bu/ac	$/bu	Gross per acre	Seed Costs	Gross Less Seed Costs
Drill # 1	35.48	15	$ 532.20	$ 65.00	$ 467.20
Planter # 1	32.73	15	$ 490.95	$ 35.14	$ 455.81
Drill #2	42.54	15	$ 638.10	$ 65.00	$ 573.10
Planter # 2	37.02	15	$ 555.30	$ 35.14	$ 520.16

Producer Perspective: Although seeding date was early the seeding conditions were perfect and depth looked good at seeding. Plant counts were inadequate for both drill and planter, and the plant count told the story in this trial. The reduced plant counts on the planter caused the plants to branch out lengthening maturity. As maturity in the Peace Region is crucial because of our short growing season. In a normal year this would have given significant harvesting challenges and would probably had to have been swathed. Producer noted that these plant counts were by far the lowest on the rest of his planted acres in the same area although the remaining acres were seeded a week later.

Producers agree that seeding conditions were optimal at time of seeding so even given the results no changes would have been made to the depth on either implement. Producer hypothesis made in the spring still stands and if the trail was to continue to a second year the hypothesis would still be "That the planter with the cost savings of a lower seeding rate will be the most economical, even when factoring cost of purchasing equipment"

Trial Ten

Cover Cropping Living Labs Project

Trans Pine Farms

CHECK Cover Crop Cocktail

Crop: Wheat & Cover Cropping Cocktail

Trial Area: Cecil Lake, BC

PEACE REGION
LIVING LAB

Trans Pine Farms Living Lab Project

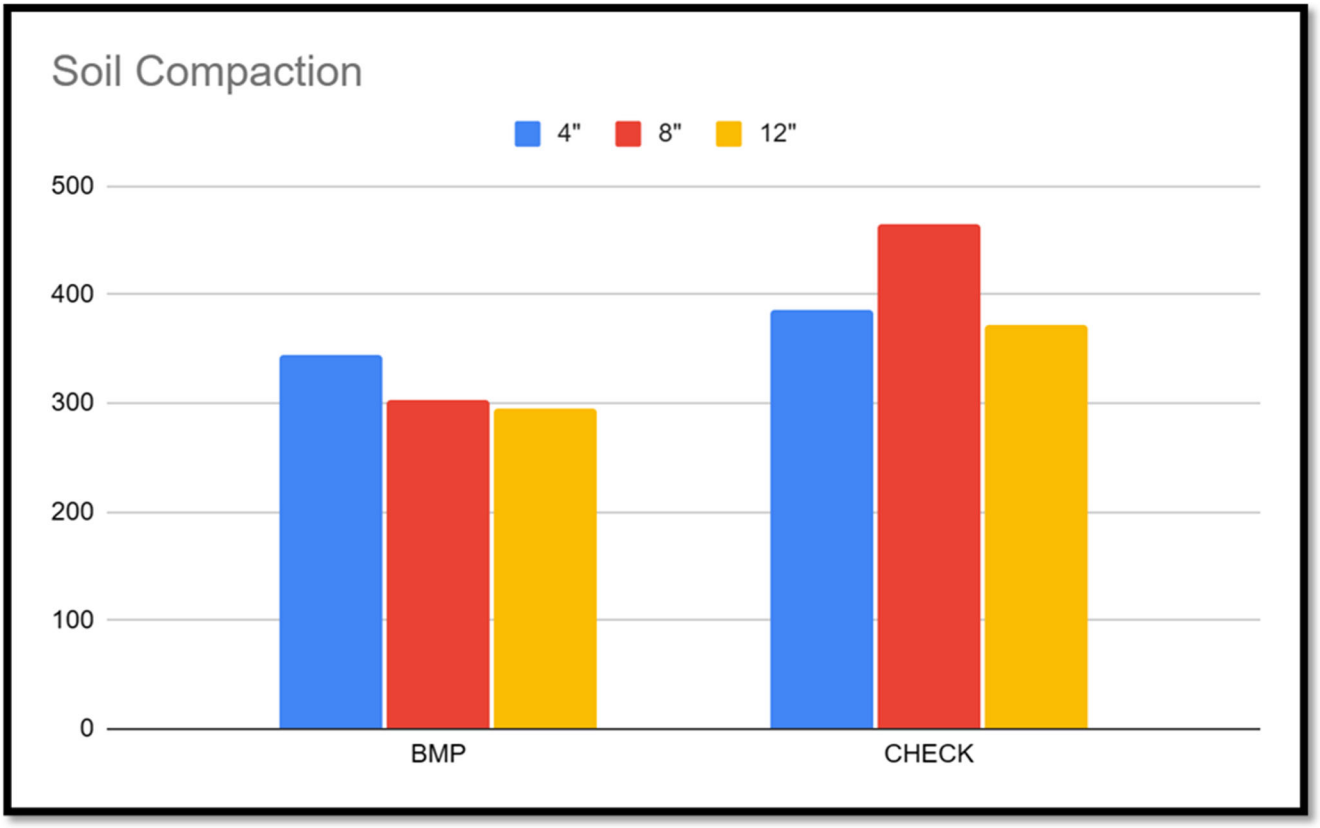
Summary completed by Dr. Sahel Miladi Lari

Main Project: The aim of this project is to compare the yield performance of two different fields: the check field (marked by a yellow polygon on the left side of the road) and the BMP field (marked by a blue polygon on the right side of the road). The dots within the polygons show the locations where co-benefits data were collected in fall 2022 and spring 2023. This data set comprises measurements of moisture, temperature, compaction, crop residue, and water infiltration.

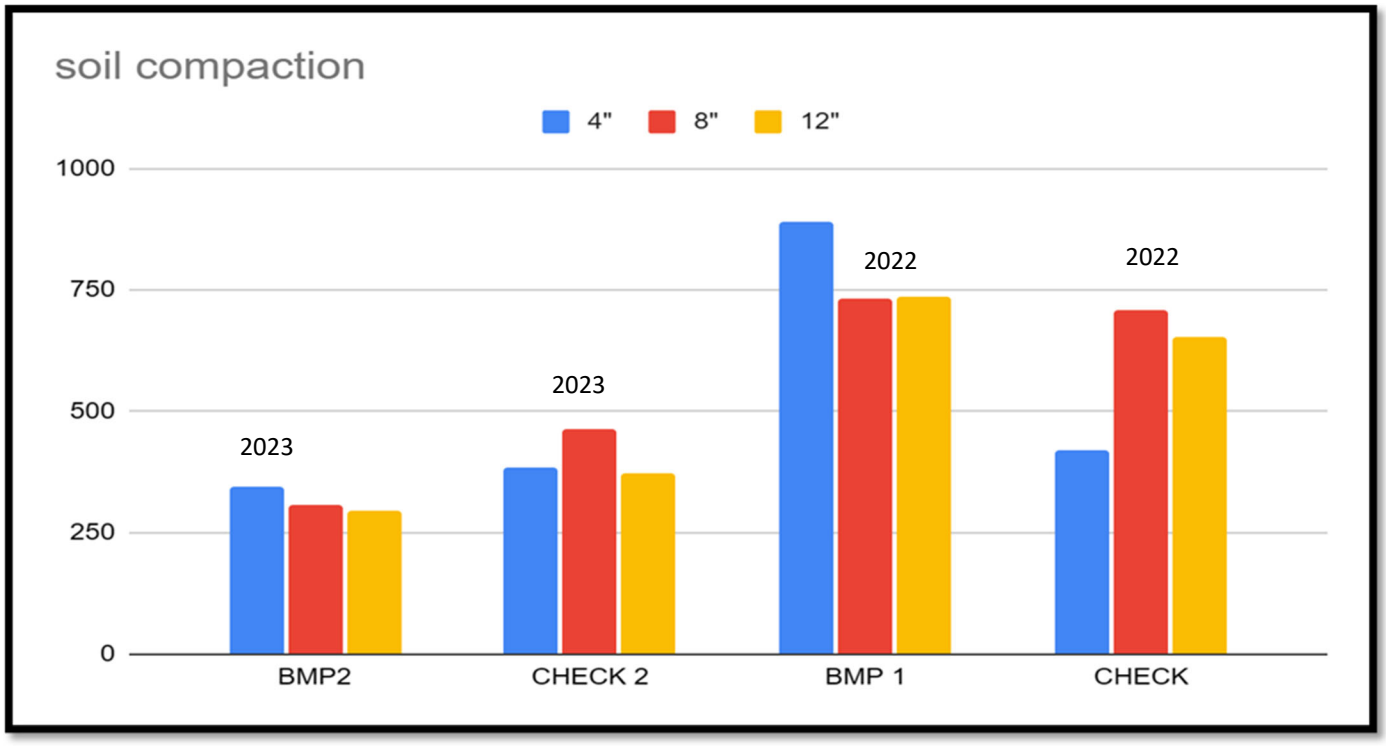
2023 Cropping Information: Flax was planted in the check field (yellow polygon), while a cover crop mixture of crimson clover, red clover, oats, and Cicer milk vetch was sown in the BMP field (blue polygon). The cover crop was harvested for feed twice during the growing season, in late July and September. Samples of the cover crop were analyzed, and clippings were used to estimate the yield.

Soil Compaction: The SpotOn Digital Soil Compaction Meter was used to measure the soil compaction.

The chart below indicates the average soil compaction of BMP and check at different depths (4”, 8”, and 12”). The data show that the average soil compaction in BMP was lower than in check.



The chart below compares the soil compaction in 2022 and 2023. BMP 1 and check 1 represent the soil conditions in 2022, while BMP 2 and check 2 represent the soil conditions in 2023. The chart shows that soil compaction has improved over time.



Soil Aggregation on in Tilled area of Field

Cover Cropping BMP

Single Ring Infiltration: Single ring infiltration is a method to measure the rate of water infiltration into soil or other porous media. It involves driving a ring into the soil and supplying water in the ring under either constant head or falling head condition. The amount of water that enters the soil over a given time period is related to the soil's hydraulic conductivity.

Using the same formula as before, we can calculate the infiltration rate for each sample point in both BMP and CHECK methods. Here are the results:

BMP Cover Crops:

Sample Point #	GPS Coordinates	Time (min)	Infiltration Rate (cm/ min)
BMP1	56 18.374 -120 30.149	10.68333333	0.0234
BMP2	56 18.338 -120 30.085	8.633333333	0.0289
BMP3	56 18.370 -120 30.047	1.433333333	0.1745
BMP4	56 18.332 -120 29.987	6.9	0.0362
BMP5	56 18.368 -120 29.943	0.5833333333	0.4280
BMP6	56 18.341 -120 29.898	1.75	0.1429
BMP7	56 18.381 -120 29.820	0.1833333333	1.3600
BMP8	56 18.333 -120 29.768	1.683333333	0.1483
BMP9	56 18.368 -120 29.726	0.7333333333	0.3400

Check:

Sample Point #	GPS Coordinates	Time (min)	Infiltration Rate (cm/min)
C1	56 18.337 -120 30.409	1.066666667	0.2341
C2	56 18.358 -120 30.443	2.6	0.0962
C3	56 18.383 -120 30.482	1.083333333	0.2304
C4	56 18.365 -120 30.516	7.483333333	0.0333
C5	56 18.340 -120 30.536	7.866666667	0.0317
C6	56 18.359 -120 30.577	1.183333333	0.2109
C7	56 18.375 -120 30.634	0.6166666667	0.4050
C8	56 18.362 -120 30.686	1.233333333	0.2025
C9	56 18.337 -120 30.672	0.5666666667	0.4404

Infiltration Results: To compare the two methods, we can calculate the average infiltration rate for each method and see which one is higher. The average infiltration rate is the sum of the infiltration rates divided by the number of sample points. Here are the results:

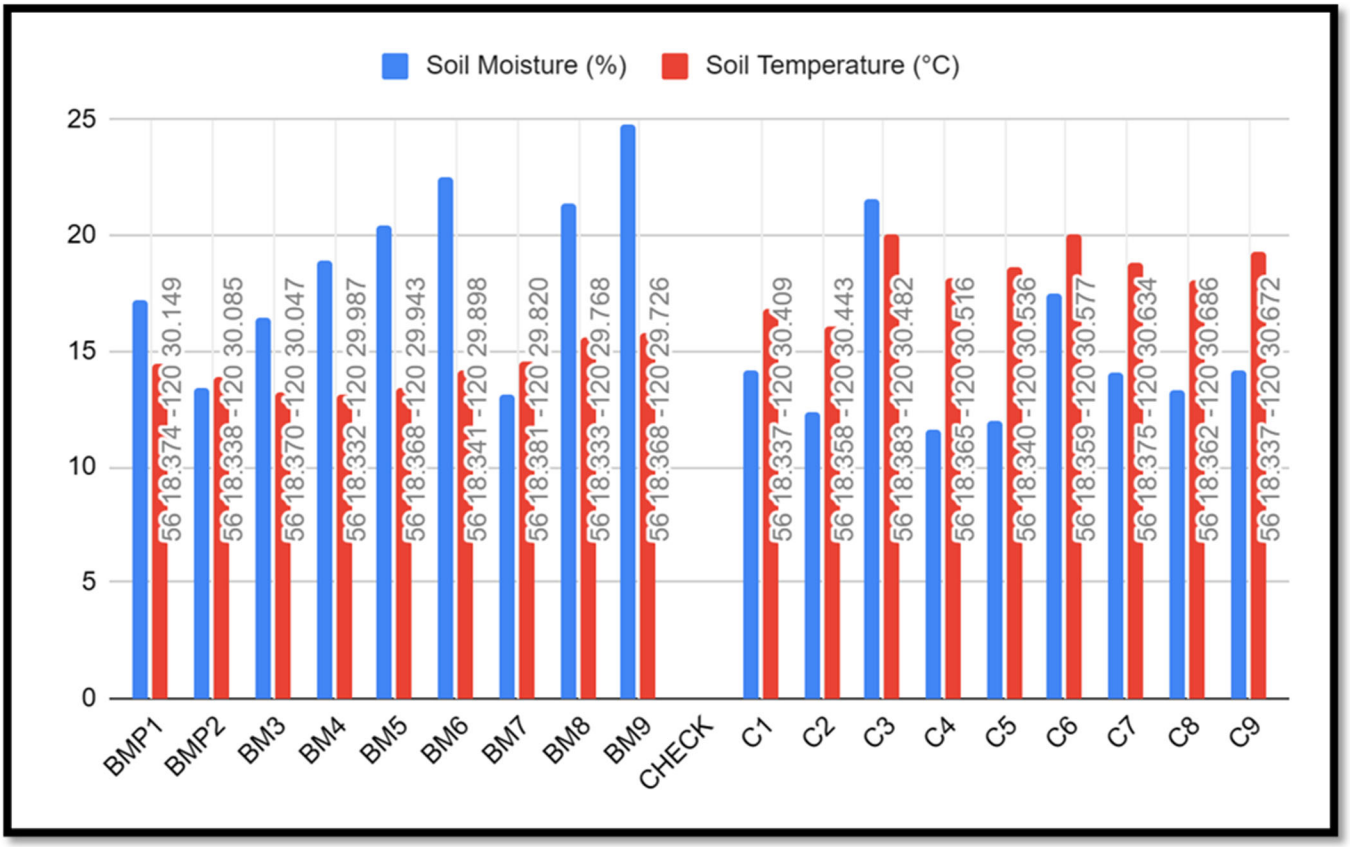
BMP 1 Cover crops: Average infiltration rate = 0.1985 cm/min

CHECK: Average infiltration rate = 0.2161 cm/min

Therefore, we can conclude that the CHECK method has a slightly higher average infiltration rate than the BMP 1 Cover crops method, which means that the soil in the CHECK area is more permeable and allows more water to infiltrate. This could be due to different soil types, compaction, vegetation, or other factors that affect the soil structure and porosity.

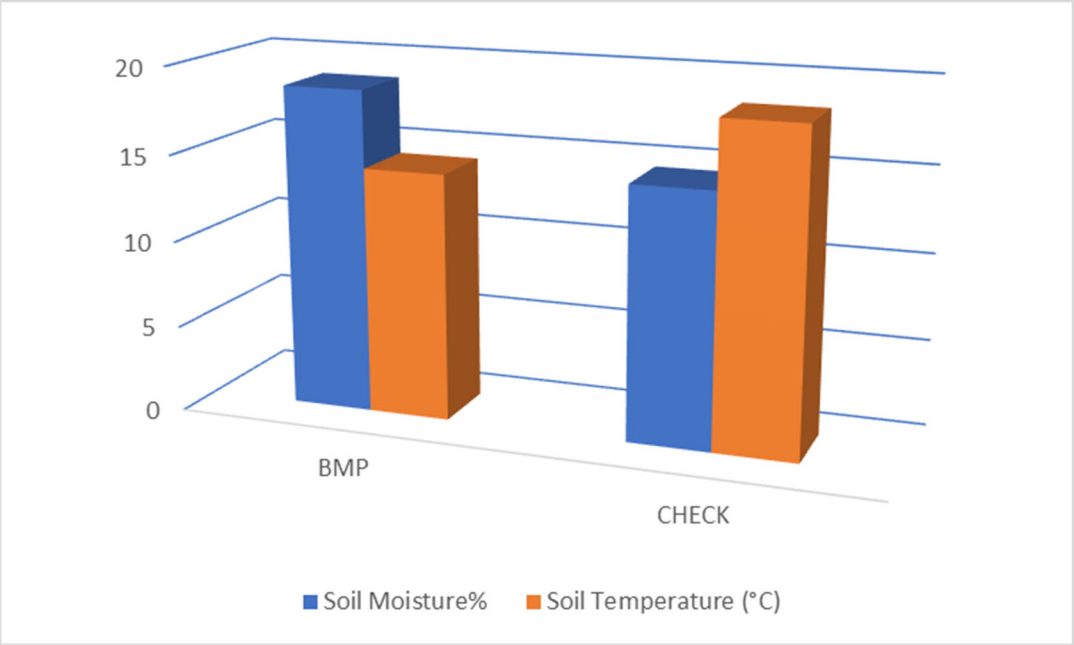
Soil Temperature and Moisture: The digital thermometer to measure soil temperature was used to measure soil moisture and soil temperature.

The chart below shows the soil temperature and moisture levels at nine different points of A3 in BMP and check. Soil temperature was measured using a digital thermometer on the surface soil (0-15 cm or 0-6”), while soil moisture was measured using a soil moisture probe. The chart indicates that the highest temperature and moisture levels in BMP were recorded at point 9. The lowest temperature and moisture levels in BMP were observed at point 3 and point 7, respectively. In check, the highest moisture level was found at point 3, while the highest temperature levels were shared by points 6 and 3. The lowest temperature level in check was recorded at point 2.



Soil Temperature and Moisture Comparison:

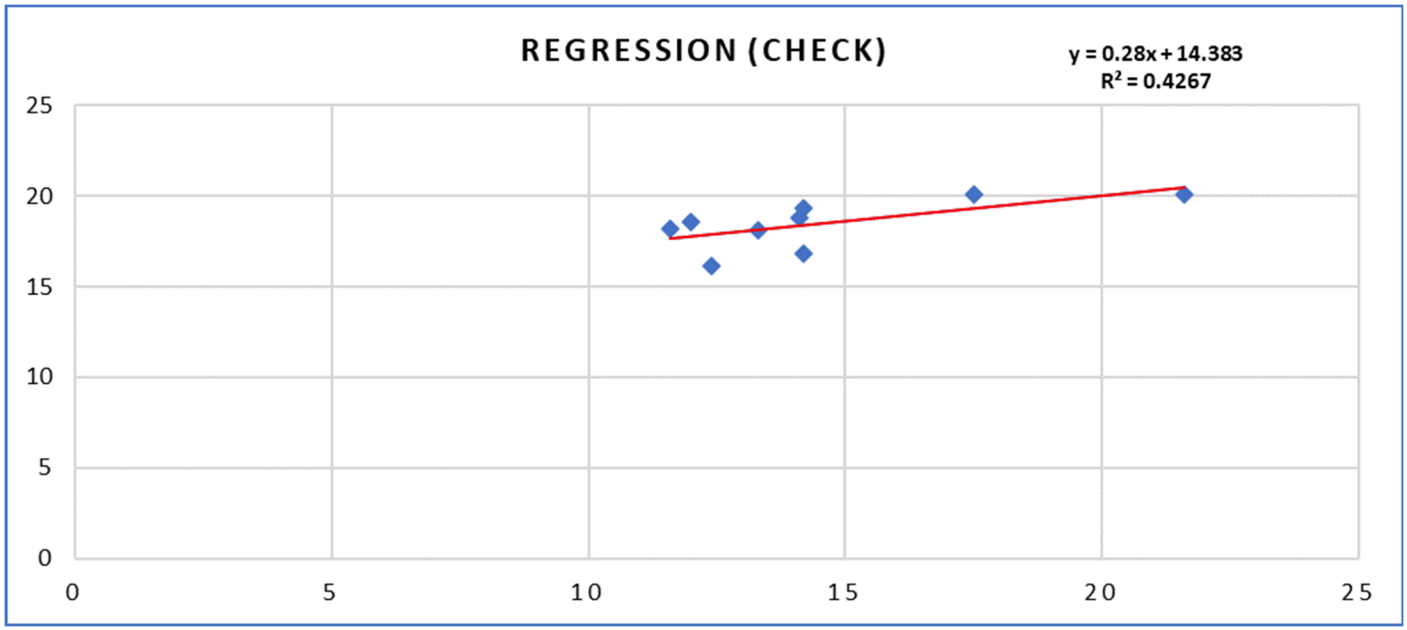
The chart below shows that the average percentage of soil moisture in BMP is higher than in the check, and the soil temperature is lower than in the check.



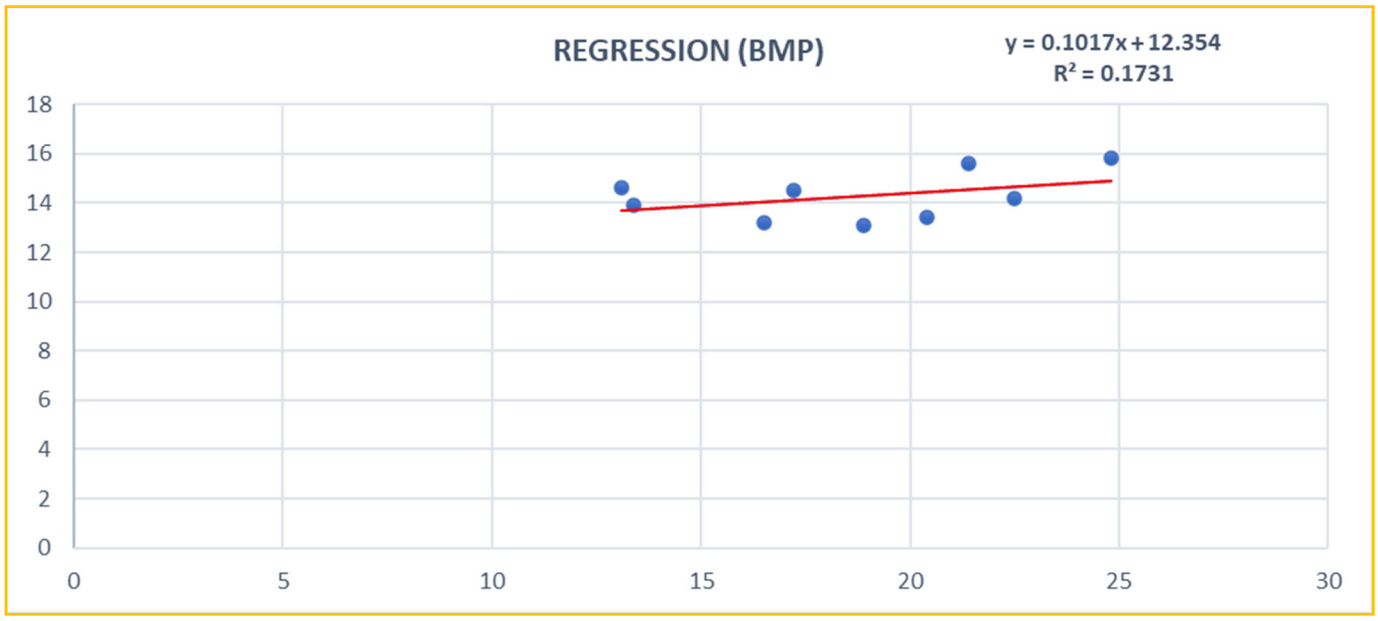
Regression Between Soil Moisture and Temperature:

CHECK: A simple linear regression was performed to examine the effect of soil moisture on soil temperature.

Where y is the soil moisture and x is the soil temperature. The model accounted for 42.7% of the variation in soil moisture (R-squared = 0.42). Both the intercept and the slope were statistically significant at the 0.05 level. A positive and significant influence on soil moisture was exerted by soil temperature, such that a one-degree increase in soil temperature was associated with a 1.524 percentage point increase in soil moisture. Soil temperature was concluded to be a relevant predictor of soil moisture .



BMP: A linear regression analysis was performed to examine the relationship between soil moisture and soil temperature. Soil moisture was not a significant predictor of soil temperature ($F(1, 87) = 0.51$, $p = 0.265$). Only 17.3% of the variation in soil temperature was explained by soil moisture, as indicated by the R-squared value. Therefore, no linear relationship was found between soil moisture and soil temperature.



The relationship between soil moisture and temperature was discussed, considering different factors, such as soil type and climate, that could affect it. Previous studies that reported similar or different findings were compared and contrasted with the results. The possible mechanisms behind the observed relationships were explained, such as how evaporation and heat transfer affected soil temperature by soil moisture, and how microbial activity and decomposition affected soil moisture by soil temperature. Some implications of the results for soil erosion and management were suggested, such as how soil erodibility and crop growth could be affected by changes in soil moisture and temperature.

ADDTIONAL FIELD TRIALS ADDED IN SPRING 2023:

In addition to the original project there have been additional treatments performed on the BMP that are outside of polygons. Grain samples and the yield have collected from the producer. The date of planting was on May 11, 2023.

The treatments included:

1) Soil amendment trial: wheat with gypsum and copper (20 Acre)

WHEAT CWRS Perata	120 lbs/Acre
Copper gypsum	5 lbs 5%Cu
Total nutrients:	
N-P-K-S (lbs).	91-23-0-10
Ca-Cu	68lbs-0.25lbs

2) Soil amendment check (60 Acre).

Total nutrients:	
N-P-K-S (lbs).	93-26-0-12

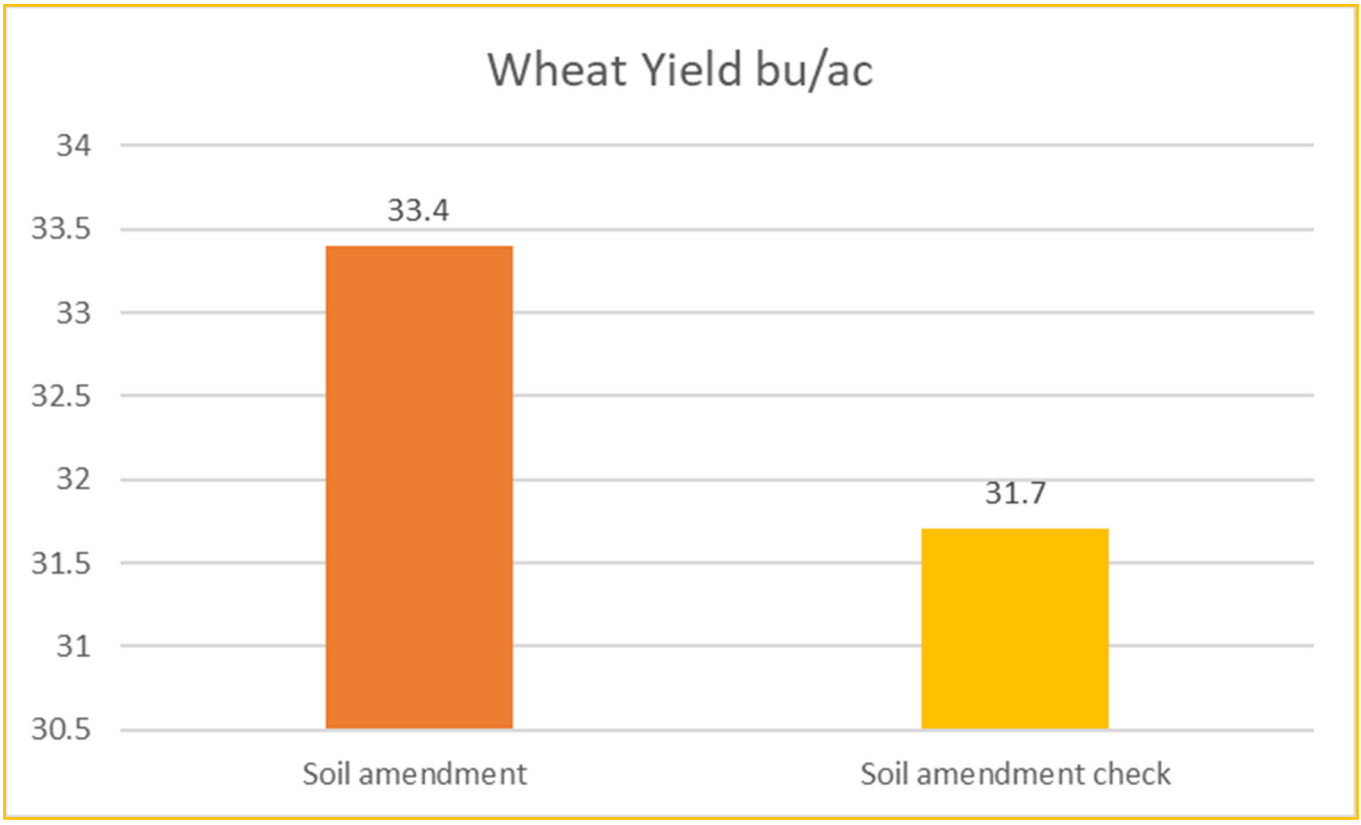
Yield Information

2023 Yield Information:

The table below shows the amount of yield in all treatments. The effects of the different treatments on crop yield were compared in two different field experiments. .

Site A3 Yield

Treatments	Description	Yield
Soil amendment	Wheat With additional Ca soil amendments	33.4 (Bu/Acre)
Soil amendment check	Wheat no Ca Soil Amendments	31.7 (Bu/Acre)
Living lab check (flax)	Flax	21.25 (Bu/Acre)
Living lab BMP first cut	1st cut Cover Crop harvested for livestock feed	0.56 (Mt/Acre)
Living lab second cut	2nd cut Cover Crop harvested for livestock feed	1.39 (Mt/Acre)



Trial Eleven

Cover Cropping (Year 2)

LH Willms Inc

Seeding Date: May 17, 2023

Harvest Date: August 21, 2023

Crop: Barley, AC Albright

Trial Area: Rose Prairie

PEACE REGION
LIVING LAB

LH Willms Cover Cropping (Year 2)

Summary by: Dr. Sahel Miladi Lari

Project Summary: This project was conducted on a land that had participated in a cover crop trial in 2022. The trial assessed the suitability and performance of different cover crop blends for the region and the farm. The aim was to design a cover crop blend that could be incorporated into an annual crop rotation and that could improve soil quality by reducing compaction and enhancing nitrogen fixation. This was done by grain producers who did not have livestock in their operation. The ultimate goal was to develop a cover crop that could be compatible with a grain and oilseed rotation. The project also sought to improve the soil's water infiltration by using zero tillage practices. Since the trial was carried out in the first year of the project, one of the plots might have repeated the cover crop in the fourth year. These plots were large, ranging from 100 to 150 acres in size. The image below depicts the location of the Living Lab projects and the table provides the names of the treatments.

Name of Treat-ments	**Cover Crop blend for 2022**
LHN1 **BMP # 1**	Fosters Custom Blend seeded at 8 lbs/ acre 50% radish 50% red clover
LHNM1 **BMP # 2**	Fosters Custom Blend seeded at 14 lbs/ acre 40% radish 20% Crimson clover 20% annual ryegrass 20% turnip
LHSM1 **BMP# 3**	Imperial Seed Pollinator Blend seeded at 10 lbs/ acre 21% Crimson clover 15.5% Siberian millet 15.5% black oil sunflower 10.5% Phacelia 10.5% Persian clover 10.5% Berseem clover 10.5 % radish 3% teff grass 3% purple top turnip
LHS1 **BMP # 4**	Imperial Seed TG Soil Enhancer Blend seeded at 9 lbs/acre 70% Daikon radish 15% Crimson clover 15% Berseem clover
Check (BMP5)	Barley 2022

To review:

Year 1 "Cover Cropping at Farm Scale"

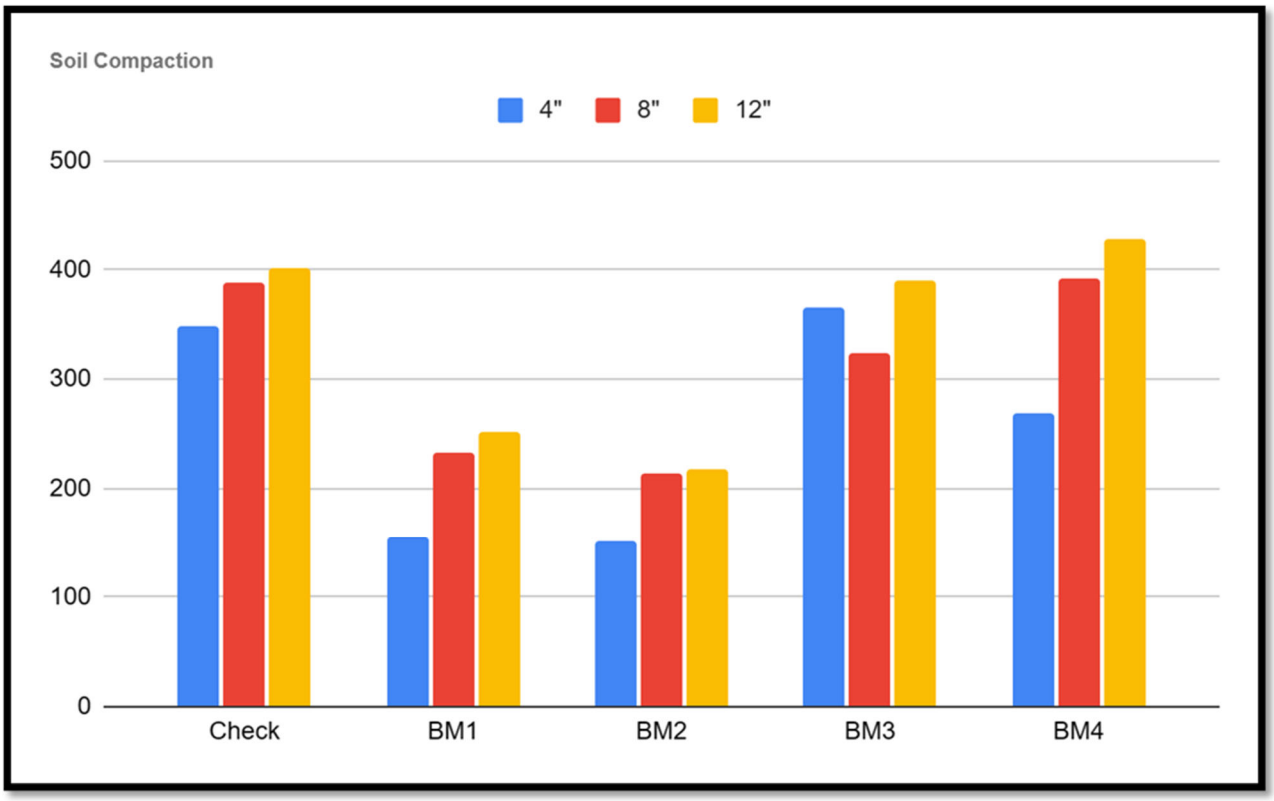
Scan this QR Code

Soil Compaction:

Soil compaction is a problem that affects the quality and productivity of soil. It occurs when soil particles are pressed together, reducing the space between them and the ability of water, air, and nutrients to move through the soil. Soil compaction can have negative impacts on plant growth, soil structure, erosion, and carbon sequestration. Therefore, it is important to prevent or reduce soil compaction by using appropriate management practices.

One of the management practices that can help improve soil health and reduce compaction is cover cropping. Cover crops are plants that are grown between cash crops to provide various benefits for the soil and the environment. It is important to choose a cover crop species or mix that meets the goals and needs of each farm. There are many types of cover crops available for different purposes such as weed suppression, nutrient fixation, green manure production, or erosion control. In this project report, the SpotOn Digital Soil Compaction Meter was used to measure the soil compaction.

The chart below shows the average soil compaction of the BMP and the check treatments at three different depths: 4”, 8”, and 12”. **Among all the treatments, BM2 had the lowest compaction at each depth.**



Single Ring infiltration:

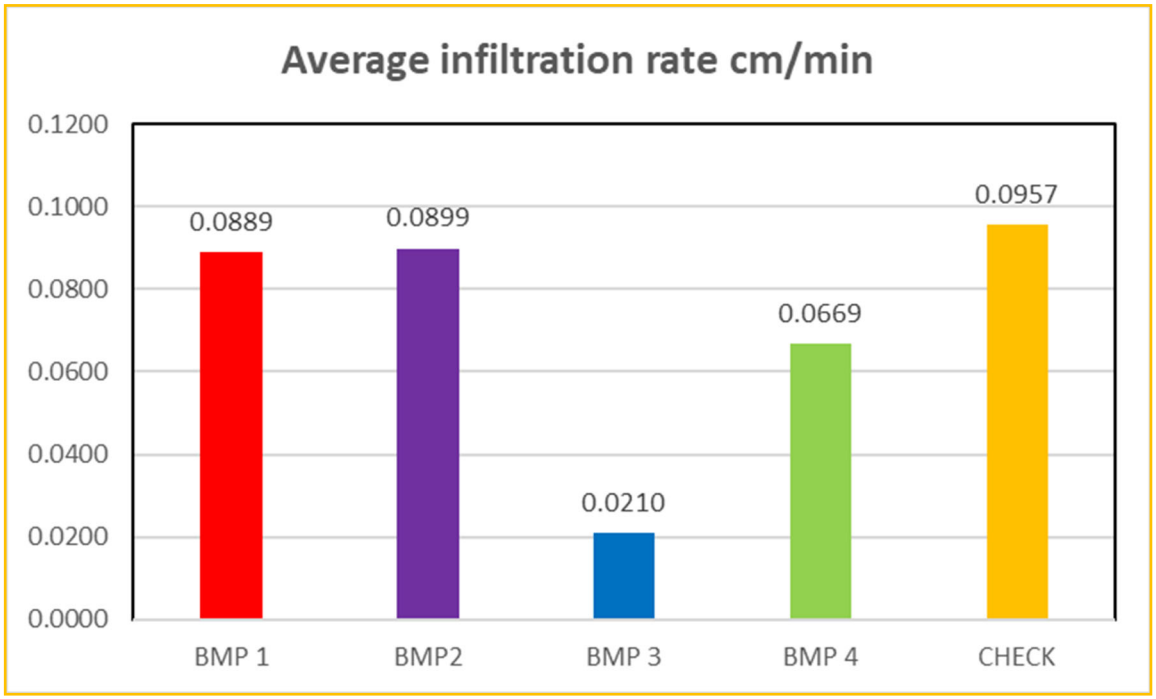
Single ring infiltration is a method of measuring the rate of water entry into the soil through the air-soil interface. It involves driving a metal ring into the soil and measuring the water flow through it over time. Single ring infiltration can provide information about soil structure, texture, organic matter, and water holding capacity.

One of the benefits of cover crops is that they can increase infiltration by creating a physical barrier on the soil surface that prevents water from ponding or running off. Cover crops can also increase infiltration by improving soil structure and aggregation, which reduces pore space and increases porosity.

Infiltration measurements were taken from the nine samples points in each of the BMP's and the check.

The average infiltration rate is the sum of the infiltration rates divided by the number of sample points. The results were as follows:

Average infiltration rate	
#	cm/min
BMP 1	0.0889
BMP2	0.0899
BMP 3	0.0210
BMP 4	0.0669
CHECK	0.0957



Therefore, it can be concluded that the CHECK has the highest average infiltration rate, followed by BMP2, BMP1, BMP4, and BMP3. This means that the soil in the CHECK area is the most permeable and allows the most water to infiltrate, while the soil in the BMP3 area is the least permeable and allows the least water to infiltrate. This could be due to different soil types, compaction, vegetation, or other factors that affect the soil structure and porosity.

Soil Sample Analysis (Year 2)

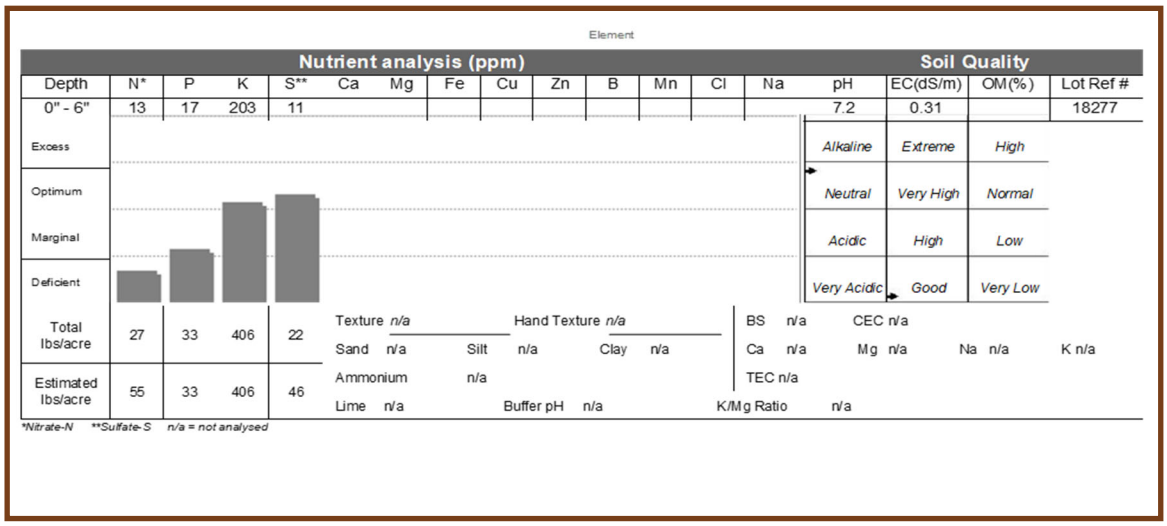
Soil Analysis:

Soil samples were obtained from the experimental site on November 10, 2023, and transported to the laboratory for analysis. The tables below present the soil characteristics for various treatments and indicators.

BMP #1 Soil Sample Results

BMP 1:

Seeded at 8 lbs/ acre
50% radish
50% red clover



Element

Nutrient analysis (ppm)														Soil Quality			
Depth	N*	P	K	S**	Ca	Mg	Fe	Cu	Zn	B	Mn	Cl	Na	pH	EC(dS/m)	OM(%)	Lot Ref #
0" - 6"	13	17	203	11										7.2	0.31		18277

Excess	Alkaline	Extreme	High
Optimum	Neutral	Very High	Normal
Marginal	Acidic	High	Low
Deficient	Very Acidic	Good	Very Low

Total lbs/acre	27	33	406	22
Estimated lbs/acre	55	33	406	46

Texture n/a — Hand Texture n/a
Sand n/a — Silt n/a — Clay n/a
Ammonium n/a
Lime n/a — Buffer pH n/a — K/Mg Ratio n/a

BS n/a — CEC n/a
Ca n/a — Mg n/a — Na n/a — K n/a
TEC n/a

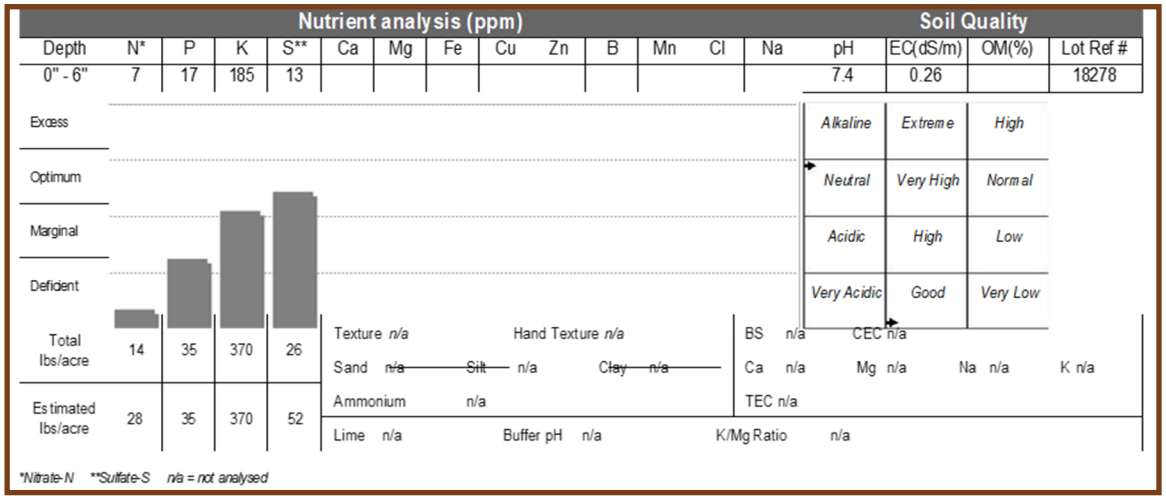
*Nitrate-N **Sulfate-S n/a = not analysed

According to the report from Element lab regarding soil analysis in BMP 1, the pH of the soil was **7.2**, which indicates a **neutral** condition. The EC was **0.31 dS/m**, which is considered a **good** condition. According to the bar graph, the amount of N was **deficient** at **13 ppm**, while P was **marginal** at **17 ppm**. K and S were optimal at **203 ppm** and **11 ppm**, respectively.

BMP # 2 Soil Sample Results

BMP 2:

Seeded at 14 lbs/ acre
40% radish
20% Crimson clover
20% annual ryegrass
20% turnip



Nutrient analysis (ppm)														Soil Quality			
Depth	N*	P	K	S**	Ca	Mg	Fe	Cu	Zn	B	Mn	Cl	Na	pH	EC(dS/m)	OM(%)	Lot Ref #
0" - 6"	7	17	185	13										7.4	0.26		18278

Excess	Alkaline	Extreme	High
Optimum	Neutral	Very High	Normal
Marginal	Acidic	High	Low
Deficient	Very Acidic	Good	Very Low

Total lbs/acre	14	35	370	26
Estimated lbs/acre	28	35	370	52

Texture n/a — Hand Texture n/a
Sand n/a — Silt n/a — Clay n/a
Ammonium n/a
Lime n/a — Buffer pH n/a — K/Mg Ratio n/a

BS n/a — CEC n/a
Ca n/a — Mg n/a — Na n/a — K n/a
TEC n/a

*Nitrate-N **Sulfate-S n/a = not analysed

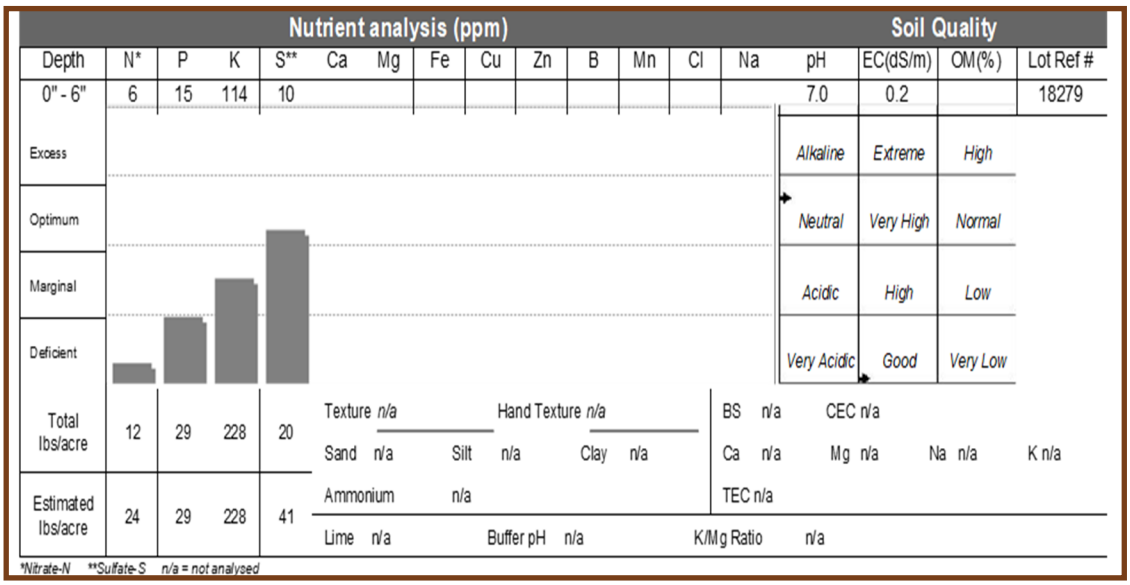
According to the report from Element lab regarding soil analysis in BMP 2, the pH of the soil was **7.4** which indicates a **neutral** condition. The EC was **0.26 dS/m**, which is considered a **good** condition. According to the bar graph, the amount of N was **deficient** at **7 ppm**, while P was **marginal** at **17 ppm**. K and S were **optimal** at **185ppm** and **13ppm**.

Soil Sample Analysis (Year 2) Continued

BMP 3:

Seeded at 10 lbs/ acre
21% Crimson clover
15.5% Siberian millet
15.5% black oil sun-flower
10.5% Phacelia
10.5% Persian clover
10.5% Berseem clover
10.5 % radish
3% teff grass
3% purple top turnip

BMP #3 Soil Sample Results

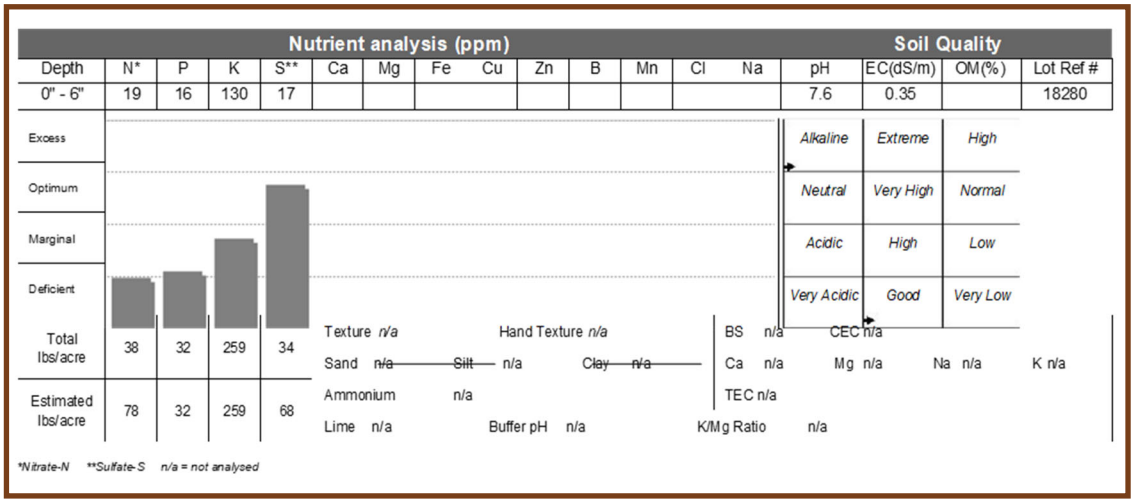


According to the report from Element lab regarding soil analysis in BMP 3, the pH of the soil was **7.0**, which indicates a **neutral** condition. The EC was **0.2 dS/m**, which is considered a **good** condition. According to the bar graph, the amount of N was **deficient** at 6 **ppm**, while P was **deficient** at **15 ppm**. K was **marginal** at **114 ppm** and S was optimal at **10 ppm**.

BMP 4:

Seeded at 9 lbs/acre
70% Daikon radish
15% Crimson clover
15% Berseem clover

BMP # 4 Soil Sample Results



According to the report from Element lab regarding soil analysis in BMP 4, the pH of the soil was **7.6**, which indicates a **alkaline** condition. The EC was **0.35 dS/m**, which is considered a **good** condition. According to the bar graph, the amount of N was **deficient** at **19ppm**, while P was **marginal** at **16 ppm**. K was al-so **marginal** at **130ppm** and S was optimal at **17 ppm**.

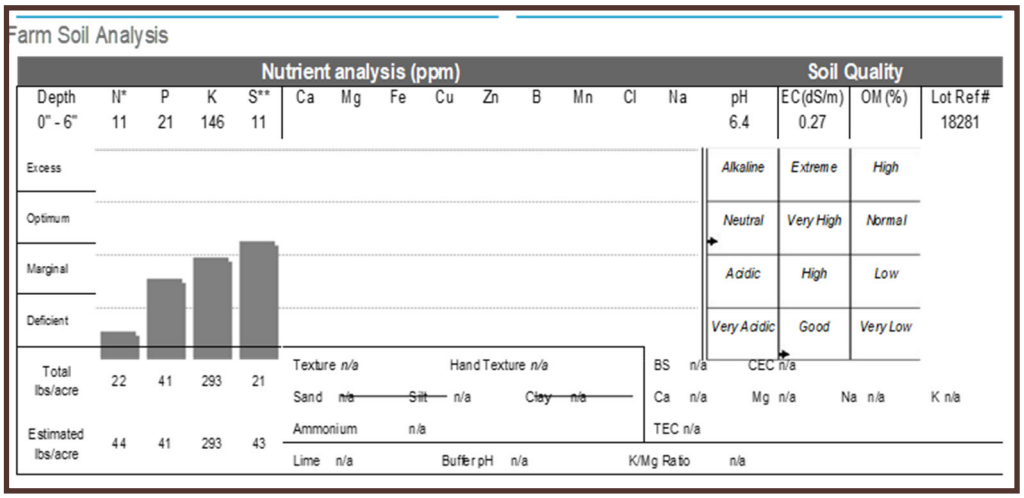
Soil Sample Analysis (Year 2) Continued

BMP # 5 CHECK:

NO cover crop in 2022

According to the report of the element lab regarding soil analysis in BMP 5 (CHECK), the pH of the soil was **6.6**, which indicates a **neutral** condition. The EC was **0.27 dS/m**, which is considered a **good** condition. According to the bar graph, the amount of N was **deficient** at **11 ppm**, while P was **marginal** at **21 ppm**. K was also **marginal** at **146 ppm** and S was optimal at**11ppm**.

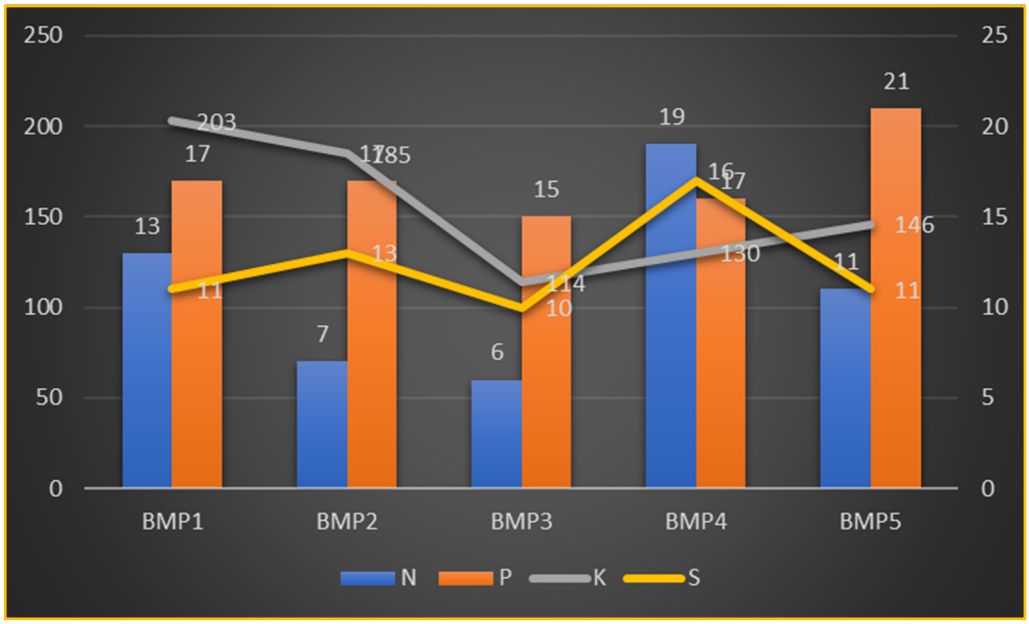
BMP #5 CHECK Soil Sample Results



Comparison of nutrient analysis (ppm) in different treatments:

The bar graph to the right compares the amount of nutrient analysis (ppm) in all treatments. The amount of N was deficient in all treatments. The amount P was marginal condition while for BMP 3 was in deficient condition. BMP 4 had the highest S with 13 ppm and the amount of K was highest for BMP1.

Comparison the amount of nutrient analysis (ppm) in all treatments



Harvest Summary (Year 2)

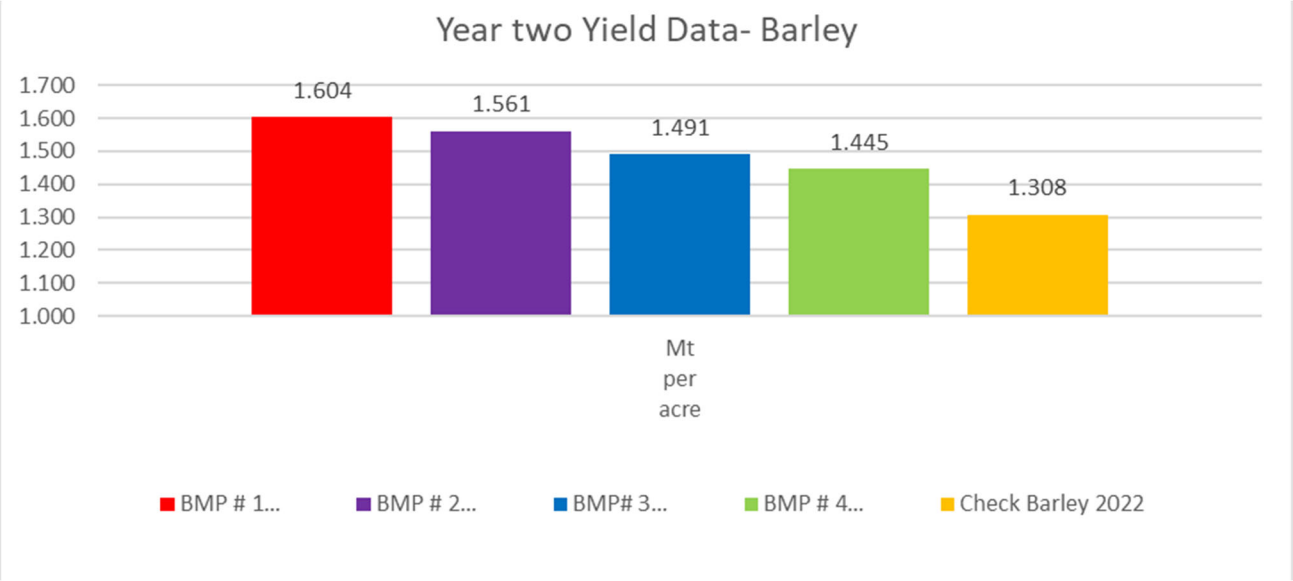
Yield: The bar graph (2) below compares the yield amounts for different treatments. BMP1 had the highest yield, while check had the lowest yield among all treatments.

Based on the results, it seems that cover crops can have different effects on crop yields depending on the type of cover crop, the soil conditions, and other factors

However, some possible reasons are:

- BMP 1 used a custom blend of radish and red clover as a cover crop, which might have enhanced soil quality and nitrogen fixation compared to other treatments.
- BMP 1 used zero tillage practices to improve soil infiltration and water retention, which might have reduced erosion and runoff compared to other treatments.

Yield Comparison In All Treatments



Grain Sample Results

Harvest Grain Samples:

Grain samples were collected from each treatment at the time of harvest and sent away to the Canadian Grain Commission for analysis

Sample Description	Crop	Moisture	Protein	Final Grade CGC
CHECK	Barley	11.20%	11.34%	2 CW
BMP#1	Barley	11.70%	10.10%	1 CW
BMP#2	Barley	11.40%	9.53%	1 CW
BMP#3	Barley	11.50%	9.43%	1 CW
BMP#4	Barley	11.30%	9.36%	1 CW

Trial Twelve

Corn Grazing Demo

Rivercrest Farms

Grazing Corn

Rivercrest Farms

If you were on the BC Grain Summer field tour or drove by Rivercrest Farms this summer you would see a unique crop for our Region - CORN! BC Grain was watching this field throughout the season and we wanted to hear how it went.

Producers looking at Corn during a stop on the summer tour

Diversification on any farm can come with successes and challenges. Rivercrest Farms in Cecil lake has added grazing corn into their cattle feeding strategy. One reason for this is that corn is able to producer more tonnes per/ac yield than traditional hay, Dirks estimated 60 aces of grazing corn can = 160 acres of hay. Which allows 1oo acres that can then be used in the grain and fine seed growing business. Listed are some advantages and disadvantages to adding corn.

Advantages:

Nutritious Feed: Corn can provide high-energy forage for grazing livestock during the winter months.

Cost-Effective: Utilizing corn for winter grazing can reduce the need for trucking, storage or purchasing additional feed, potentially lowering feeding costs.

Soil Erosion Control: Grazing corn can help to reduce soil erosion during the winter months by providing ground cover.

Nutrient Management: By grazing corn evenly there is even manure distribution which eliminated the need for expensive corral cleaning or transportation costs. This also reduces some of the need for synthetic fertilizer use.

Disadvantages:

Weather Dependency: Growing corn in the BC Peace Region can be challenging because of or short some times wet/cold growing season which can effect the availability and quality of the corn for grazing.

Soil Compaction: Overgrazing of winter corn can lead to soil compaction, which can negatively affect future crop yields.

Nutrient Management: Effective management is required to prevent nutrient depletion of the soil due to grazing and to ensure the sustainability of the practice.

Equipment: Additional equipment may need to be purchased for seeding, and management of grazing.

Seeding Date: May 19, 2023

Seeding Rate: 30,000 seeds per acre

Variety: P6909R (Pioneer) 39F44 (Pioneer) Two different varieties for different pollination windows

Fertility: Nh3 was applied fall 2022 120lbs/ac of actual N, blend potash, phos and sulphur and 5 gallons of liquid starter

Cost: Seed & Fertility $200/ac

Growing Season Weather conditions: Using the data collected from the local BC Peace weather monitoring station it can be determined that Growing Degree days for this trial location. Growing Degree Days (GDD) are determined by calculating the accumulated heat units above a base temperature threshold, typically 10 degrees Celsius, during the growing season. The formula for calculating GDD is: GDD = (Max Temperature + Min Temperature) / 2 - Base Temperature.
Each day, the average of the maximum and minimum temperatures is calculated, and if it exceeds the base temperature, the difference is added to the cumulative GDD. This process is repeated throughout the growing season to track the accumulated heat units, which can help estimate the growth and development of plants.

The number of growing degree days required for grazing corn can vary based on the specific variety of corn, local climate conditions, and the intended grazing period. Typically, corn for grazing requires between 1,800 and 2,500 growing degree days (GDD) from planting to reach maturity.

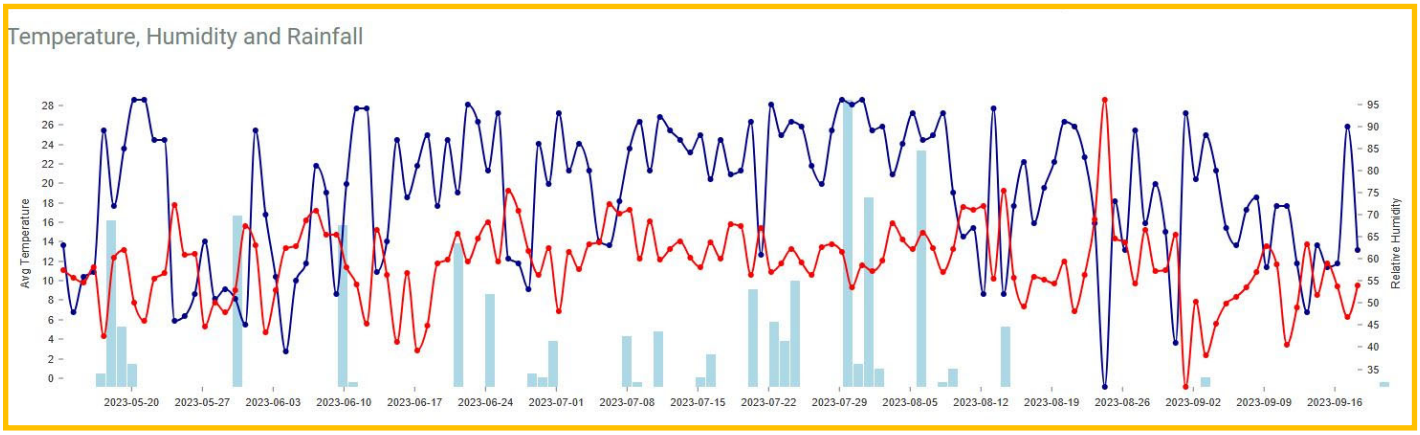
Growing Degree Days
Dirks 2023 Trial

SUMMARY May 15, 2023 - Sept 20, 2023

Number of Days: 128

	Actual	Normal	% of Normal
GDD Base 0C			
	1984	1672	119%
GDD Base 5C			
	1344	1038	129%
GDD Base 10C			
	718	451	159%

Weather Summary Dirks Trial 2023 May 15th - Sept 20th	
Average Temperature:	11.8 °C
Lowest Temperature:	-2.6 °C
Highest Temperature:	32.7 °C
Total Rainfall:	122.17 mm
Normal Rainfall:	241.19 mm (51% of Normal)



Winter Grazing Summary: The producer divided the total field area of 60 acres into 1.65 ac pieces by mowing strips and installation of temporary electric fencing. By isolating the area of which the cattle are grazing they are able in ensure even consumption of the corn and more evenly distribute the Manure.

Total Area 60 acres = 1.65ac plots estimated 2 days per plot 80 head of cows, 60 heifers, 40 calves

Producers were hoping to get 76 days of winter grazing**.** Cattle were moved into corn in early November and were pulled January 22, 2024.

PEACE REGION
LIVING LAB

Enhancing Agroecosystem Services in the Peace River Region:

A Progress Report for 2023

Hello to everyone in the Peace Region Living Lab (PRLL)- our core producer collaborators and partner groups (PGs)!

It's my honour to let you know that we have made significant progress with the PRLL, which wouldn't have been possible without the support, commitment, and collaboration of everyone involved, particularly the PRLL PGs (their staff and boards of directors), Agriculture and Agri-Food Canada partners, core producers, Food Water Wellness Foundation, Cargill and some other agricultural companies.

As a reminder, the PRLL, an innovation project supported by research, started in 2022 and stretches across the Peace Region of Alberta and British Columbia. Some very important highlights include

Science Coordination Activities

1. As expected, our PRLL brings together farmers and ranchers with scientists of diverse backgrounds and agricultural commodity groups.

2. The PRLL has 57 core sites with 14 categories of best management practices (BMPs) aimed at solving climate change challenges.

3. A few of these sites have multiple BMPs, while others mostly have one BMP.

4. Soil carbon sequestration to a soil depth of 1m, greenhouse grass mitigation and co-environmental benefits are some of the key deliverables of the project.

5. 2023 marked the second year of co-environmental benefit measurement data including soil water infiltration (through saturated and unsaturated methods, soil compaction, soil moisture and temperature, and insect/disease monitoring.

An indication that we can now start investigating the impacts of the BMPs being implemented by the core producers across the Peace Region of AB and BC.

Socioeconomic Activities

1. We have also continued with our yearly farm management data (FMD) collection, adding to the previous 5-year cropping history.

2. The FMD includes crop rotations and how they affect input use in cash production, forage seed and forage crops, and horticultural crop production.

Various aspects of crop/livestock integration are also captured in the FMD collection.

Knowledge Translation and Transfer (KTT) Activities

1. We greatly recognize that extension services offer an important line of communication between the PRLL and core producers. As part of our knowledge translation and transfer, we continue to produce our quarterly PRLL Newsletter and organize extension events.
2. The last edition of the PRLL Newsletter featured the support of a financial contribution from the food and agriculture company, Cargill. PRLL and Cargill believe that farmers are at the heart of the food supply chain, and their experiences and learnings are critical.
3. Early this year, we started the Peace Living Lab - Producer partner virtual coffee, which is geared toward a core producer-to-core producer extension and PRLL updates where core producers meet, exchange information and educate their peers themselves about their BMPS- what, why and how?
4. Our first 'Below Ground' event was held in February this year at Rycroft, AB. This brought together PGs, AAFC scientists, core producers and other partners. Topics covered included soil health concepts, how soil carbon is measured, managing soil microbes, how to increase nitrogen efficiency, as well as, and farm financial management for a healthy bottom line and deep economics for soil health.

The 2024 'Below Ground' event is planned for February 21 and 22 at Pomeroy Hotel & Conference Centre Fort St John

Importantly,

- Funding for this project has in part been provided by Agriculture and Agri-Food Canada through the Agricultural Climate Solutions – Living Labs program.
- The PRLL partners have continued to support and actively contribute to the project on an ongoing basis. I say a big thank you to the Peace Region Forage Seed Association, Peace River Forage Association of BC, The Peace Region Food Action Hub & Agricultural Extension Institute, BC Grain Producers Association, Fourth Sister Farm, North Peace Applied Research Association, Mackenzie Applied Research Association, SARDA Ag Research and the Peace Country Beef & Forage Association.
- Some preliminary data from the first 2 years will be available to core producers in February 2024, particularly on soil quality (pH, electrical conductivity, soil organic carbon, organic matter) and co-environmental benefits (soil temperature, moisture, compaction and infiltration).
- Representatives from AAFC visited some core producer sites and attended a few extension events in September 2023
- Remember, a living lab is a unique approach to problem-solving and focuses on producers' needs and expertise with numerous on-farm assessments with producers making the decisions and driving the process over the project duration.

As this is a living lab, your continuous feedback is important to us.

We encourage you to visit the PRLL website from time to time to keep you abreast of activities, events and updates.

https://peacelivinglab.ca/project-sites/

We are also on Twitter @Peace_LivingLab,

Or Facebook https://www.facebook.com/peacelivinglab.ca

You can also subscribe to our YouTube Channel @peaceregionlivinglab

The PRLL Management Team looks forward to everyone's continued support in 2024.

Regards, Akim Omokanye, PhD, PAg

PRLL Program Director

January 2024

2023—Pest Monitoring Summary

By: Keith Uloth

Seeding started this season in late April and carried on until mid-May. The 2023 monitoring season started with traps for Diamondback Moth and Flea Beetle being deployed in canola the first week in May, with presence of both pests being detected at that time.

Other Pests Monitored in Canola: Bertha Armyworm, and Swede Midge.

In Wheat: Wheat Midge

In Field Peas: Pea Leaf Weevil

Weekly sweep-netting in canola, wheat, and peas were collected to count Lygus Bug populations, other potential pest populations, and beneficial insect populations.

Lygus Bug in Canola

In Forage/Forage Seed:

- Red Clover Casebearer in Red Clover and Yellow Sweet Clover
- European Skipper in Timothy.
- Cutworms and Sod Webworms in Creeping Red Fescue
  Weevil activity in Yellow Sweet Clover

Highlights from the season started in May with Glassy Cutworms in Creeping Red Fescue and other grass crops causing some damage to fields. Damages from other cutworm species included Redback Cutworm in Canola and vegetable gardens, Black Army Cutworms in Alfalfa. Grass crops in the region seemed more affected by this outbreak with Glassy Cutworm being found throughout the region. Cutworms that affected Canola and Alfalfa were localized to some fields throughout the region. Striped Flea Beetle damage was seen in early May among newly seeded Canola, damage was also noted in the South Peace area in August. Lygus bug populations stayed constant through the season with some areas being near the lower count of economic threshold.

Glassy Cutworm

Sod Webworm moths were reported by many local producers in late July during hay and grass seed harvest, fall scouting in Creeping Red Fescue throughout the region indicated high numbers in some areas, mainly areas in the South Peace.

Glassy Cutworm

Beneficial insects this season noted in high numbers were Tachinid Flies, Carabid Beetles, Lady Bugs and Lacewings. These predatory insects are known to help regulate many pest populations of caterpillars and aphids. Also, there were parasitized Cutworms found in in both Canola and Grass seed crops.

Disease Summary:

Diseases this season were not commonly found as dry field conditions and relatively low amounts of precipitation helped keep populations low. For the second season in a row, Stripe Rust was not found this season at any surveyed wheat field. Tan spot was found in Wheat fields around the region but in low occurrence.

Powdery Mildew on Slender Wheatgrass

As the season progressed, soil sampling for Clubroot was conducted in Late August and Early September. This year's survey involved 70 canola fields from around the region with processing of samples to been done over the winter. Results from the survey continue to show no fields testing positive for Clubroot.

Aphanomyces and other pulse diseases were in low occurrence this season. The project continues to aid in research that continues to better understand Aphanomyces and how producers can better manage this disease.

Among forages monitored this season, Stem eyespot and Anthracnose continue to be commonly found in Creeping Red Fescue. For a second season counts of diseased plants were overall quite low among fields, but the diseases were still found to be quite high in both plant counts and concentration of more established fields. In Slender Wheatgrass, powdery mildew was found in mid-June and Loose Smut in mid-July. Both diseases were quite prevalent in the field but was not found in any other species of Wheatgrass.

Loose Smut in Slender Wheatgrass

Parasitized Redback Cutworm

Parasitic Wasp Eggs in Creeping Red Fescue

2023– Weather Update

By: Keith Uloth

To access all the tools and data available from the Peace Agri-weather network go to www.bcpeaceweather.com.

Tools and updates are continuingly being added to the website to help growers better plan and access information in a timely manner. Tools currently available are Growing Degree Days calculator, with growth stage lines, Fusarium Head Blight risk calculation tool, and a Wheat Midge risk calculation tool. When using the Growing Degree Day calculations, software should show expected stages for Canola, Wheat, and Barley.

Scan To go to the BC Agri Weather Network

Also available to users is access to historical data going back to 2016. Historical data includes temperature, precipitation and barometric pressure, wind speed and direction recordings. Weather updates are updated to the website between 5-15 minutes depending on the station. There is an option on the website to make station of preference be available at the top of the page by selecting the desired station.

This season the BC Peace Agri-weather network installed two new weather stations on the network in Clayhurst and Bison Creek areas. The project also updated some station hardware around the region by replacing 4 rain gauges, 4 wind anometers and 3 temperature sensors which were beyond re-calibration or repair.

The spring seeding season began in late April this past season with field conditions being on the drier side due to a lack of winter snow and early spring precipitation. For some areas within the region a lack of moisture would continue through the growing season. Wildfire smoke would also play a factor this season with early season weather conditions being quite smoky.

Temperatures in general this past season started quite warm prior to seeding time. For the months of the growing season as seen in Table 1., most areas around the region saw quite stable temperatures on average when comparing months from May to August. The average highs recorded in May and June varied significantly between areas within the region having average highs ranging from 21-24°C. For July and August highs ranged from 23-26°C. Average daily temperatures throughout the season remained constant around 15-18°C for each month as shown in the provided table. Seasonal lows were also quite constant starting in May with a range from 6-8°C, then rising for June, July and August with a range of 8-12°C.

Table 1. Monthly Temperatures (°C) from May- August 2022

North Peace (H/A/L)		May	June	July	August
Buick		21/15/8	22/16/10	23/18/12	24/17/11
Rose Prairie		22/15/7	22/16/9	23/17/11	24/17/10
Bear Flats		24/15/7	24/17/10	25/18/12	26/18/10
Cecil Lake		23/15/7	24/17/10	25/17/10	25/17/9
South Peace (H/A/L)					
Dawson Creek		23/15/6	23/16/8	24/17/10	25/17/9
Rolla		22/16/8	23/17/11	24/18/12	24/18/12
Farmington		22/15/6	23/16/9	23/16/10	23/15/8
Legend	*H= High*	*A= Average*	*L= Low*		

Growing degree days (GDD) around the region, were very similar to the previous seasons as seen in Table 2. The chosen period was the same as the previous two seasons to allow for direct comparison, although seeding for many producers started in late April/early May. Overall, the GDD's demonstrate a general trend of increasing slightly from 2021 till last season. This is also correlated with the table showing all sites having higher GDD's than the previous two seasons. The Rolla area continues to have the highest GDD of the sites listed which is consistent to the previous seasons. Other sites shown in the table, the Dawson BCGPA, Montney-Bickfords, Flatrock and Prespatou are in the same range of each other. Around 1040 GDD (base 5°C) is needed for canola to reach maturity.

Precipitation during the season varied from area to area, with the month of May having quite a wide variation of rainfall. Rainfall amounts recorded for May were down compared to the 2022 season, with Bear Flats and Dawson BCGPA having the lowest recordings, however the Doe River area experienced higher precipitation than in 2022. The large variation of rain recorded in May continued into June with sites like Farmington, Rolla recording nearly half the amount of rain compared to the previous year. July had higher amounts of precipitation across the region, with the localized rains, some areas had more rainfall as seen in the Farmington area, which saw 102.6mm in the month. When comparing rainfall between years, some areas had higher amounts of precipitation versus some having significantly lower amounts overall.

Table 2. GDD (Base 5 °C) Accumalated from May 15 - September 7

	Year		
Township	**2021**	**2022**	**2023**
Rolla	1304	1312	1392
Farmington	1091	1191	1211
Flatrock	1174	1237	1249
Montney-Bickfords	1207	1216	1274
Dawson BCGPA	1191	1202	1277
Prespatou	1139	1190	1237

Table 3. Monthly Precipitation (mm) comparison of 2022 and 2023

	Weather Stn.		Legend: 2022/2023				
Month	**DC BCGPA**	**Rolla**	**Farmington**	**Cecil Lake**	**Rose Prairie**	**Bear Flats**	**Doe River**
May	77.2/36.6	73.9/58.7	74.7/42.7	54.1/67.6	94.7/39.4	77.5/37.1	14.2/62.5
June	33.2/25.7	39.4/20.3	18/9.4	50.5/32	70.9/43.9	49.5/26.2	33.5/51.6
July	15.9/48.3	19.6/59.9	6.6/102.6	20.6/60.7	5.6/49.3	38.4/38.4	22.1/38.9
August	15/36.3	22.6/30	6.3/31.4	31.2/71.6	50.8/27.9	13/25.7	45.7/0
Total	**141.3/146.9**	**155.5/168.9**	**105.9/186.2**	**156.4/231.6**	**222/160.5**	**178.4/127.4**	**115.5/153**

Climate Normals from 1981-2010 provided by Environment Canada					
FSJ Airport	May	June	July	August	Total
Max Temp (°C)	15.5	19.6	21.7	20.5	
Mean Temp (°C)	9.8	14.1	16.2	10.1	
Min Temp (°C)	4	8.6	10.7	9.2	
Precipitation (mm)	37.9	65.6	75.2	51.2	229.9
DC Airport	May	June	July	August	
Max Temp (°C)	16.4	20.1	22.2	21.5	
Mean Temp (°C)	9.3	13.6	15.5	14.4	
Min Temp (°C)	2.1	6.9	8.9	7.2	
Precipitation (mm)	34.4	67.4	84.9	54.2	240.9

For more information the BC Grain Producers Association

or to sign up for e-mail updates scan the above QR Code to visit

www.bcgrain.com

Box 6004 Fort St. John, B.C. V1J 4H6

(250) 785-5774 F: (250) 785-5713 admin@bcgrain.com