



2024

Peace Country Beef & Forage Association Annual Report



Strengthening Agriculture, One Farm At A Time

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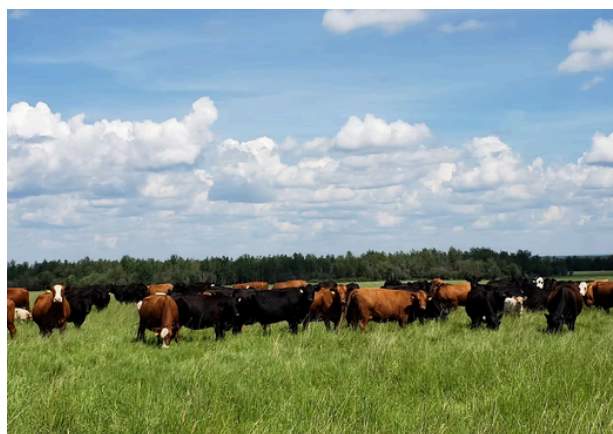
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ABOUT US

The Peace Country Beef & Forage Association was founded in 1982 by livestock producers in the Fairview and Hines Creek area for the purpose of demonstrating new forage varieties and technology. The PCBFA is a charitable, producer-driven organization that strives to develop regenerative, profitable, and sustainable agricultural systems. We provide leading-edge, credible, and locally viable information to Peace Country producers through our applied research and knowledge transfer programs. We are currently made up of 9 producer directors, 8 permanent staff, and approximately 124 member farms from across the Peace Region.



THE YEAR IN REVIEW



**124 Farm
Members**

**14 Small Plot
Projects**

**8 On Farm
Projects**



**10 Partnering
Municipalities**



**56,400
Kilometers
Travelled**



**9 Board of
Directors**



**8 Permanent
Staff**

A MESSAGE FROM THE BOARD CHAIR

2024 was a year of learning and change for our board. We welcomed three new board members and one returning past board member this year. Our board early on formed seven sub committees, these committees were made up of board members, staff and producers. The committees helped bring communication between the board, the staff and members. These committees had about four meetings each throughout the year. Thank you to producers Allan McLachlan and Mark Vetsch for taking part in our committees.

A couple highlights from these committees for the year are: the Hiring Committee started discussions on reformatting the staff positions and roles for this coming year, and the Equipment Committee is working on delegating grant funds to fill some equipment needs, which will help the staff with collecting timely, accurate and accountable data. Having these committees really helped with speeding up our monthly board meetings and connecting the board with the staff.

In March one of our board members, Todd Sadlier, resigned off of the board so that he could give more time to his family. Thank you Todd for all of your contributions while on the board. We hope to see you back sometime in the future.

In September, our board was happy to welcome our Executive Director Liisa Jeffrey back after being out on maternity leave. Thank you to Mimi Vanderheide for filling in for Liisa this past year.

This year the board has stayed with the trend of doing lots of their meetings from home over Zoom. Doing this sure has helped with saving time, and decreasing the travel and food budget. It has also helped with improving meeting attendance during busy seasons like calving and harvest.

The PCBFA Research Farm had a successful field day this year despite the cold, wet weather that day. It was great to see the PCBFA Young Agrarians doing some public speaking and displaying some of their projects at the field day. The staff's research plots and projects were great to tour and learn about. It is great to see some projects getting funding extensions. Making for what I see as more realistic research that looks at some longevity while projects have to deal with different conditions over the years, like drought, severe temperatures, and pests like grasshoppers.

Thank you to all that had a part in this year's canola crop at the Research Farm. It was great to hear that the crop had been harvested and delivered to the elevator for another year.

The Peace Country saw lots of variance in forage and crop yields this year. With some areas dealing with droughts and very small yields, others having an average year and some areas having great yields. Feed prices have held high again this year. Thankfully we have been seeing excellent calf prices for this fall run. It sure helps to even out rising expenses that producers face each year. Also it was good to see staff helping producers out with grant applications again this year and good to see more producers taking advantage of grants while they are available to us.

A big thank you to all the staff, the board, and everyone that makes PCBFA successful. I look forward to this next year for PCBFA. There are exciting times ahead.

Cheers,



Jordan Barnfield

Jordan operates Shooting Star Station with his partner, Renee, in the Teepee Creek area along the Smoky River. They raise beef and sheep using holistic practices. A longtime supporter of PCBFA, Jordan first connected through a forage event and now serves as the 2025 Chair. He enjoys working with land, livestock, and community.

Jordan Barnfield

A MESSAGE FROM THE EXECUTIVE DIRECTOR

Hello everyone,

I'm going to keep this fairly brief, as I've been out on maternity leave for most of this year, only returning to work in September. My husband Tyler and I welcomed our second baby boy in August of last year, and then recently added a puppy into the mix as well, so it's been a beautiful but very chaotic year, and I'm so happy to be able to return to this team and this organization. This September marked 8 years since I first joined the PCBFA Team, which is hard to believe, but I'm so proud of how far we've come in that time and all that our organization has accomplished.

After quite a few years of almost no turnover and a very consistent, solid staff team - in the year and a half since my last report, we've experienced an unusually high level of turnover. We had to say goodbye to Kaitlin McLachlan, Shelley Henkel, Johanna Murray, Buthaina Al-Maqtari and most recently, Chelsey Hostettler.

We were very sad to see each of them go, but we wish them all the best of luck as they move on to the next step in their careers, and we know that they will accomplish great things.

We were fortunate enough to have Mimi Vanderheide cover my maternity leave this time. She brought with her extensive skills and experience running non-profits and working with a board of directors, and she has left a lasting impression on the association - transforming our weekly team meetings, our safety program, and our human resources program. We wish her the best of luck as she moves on to what is next, and we appreciate everything she did for us.

Just before I went on leave last summer, we welcomed Alaina Archibald to the team as our Extension & Office Manager. Alaina has done a fantastic job running our extension program, and managing the day-to-day needs of the office and the staff team.

We were also thrilled to make Hayford Gyamfi a permanent member of the team, as our new Research Coordinator, after having worked with him for the past several years on his PhD project, which he completed at our Fairview Research Farm.

Then Cameron Bilodeau joined us last year, first as a Research Intern, then signing on as our Lead Research Technician, and finally taking on a Safety Coordinator role as well, which marks the first time PCBFA has ever had a dedicated safety person.

And finally, Alex Jolicoeur stepped in to fill in some gaps within our extension team, as our Extension & Admin Assistant, on a temporary contract.

Through 2023 and 2024 we received several human resources grants from Ag for Life, which resulted in the development of a new employee policy manual, new compensation and benefit guidelines for our staff team, a leadership training program, training on recruitment and retention of staff, and a new employee onboarding program, among other things.

We are also going to be receiving a significant capital grant from Alberta Agriculture & Irrigation in 2025, which will allow us to upgrade some very old pieces of equipment and take our research quality and efficiency to the next level.

As always, a HUGE thank you to all our staff, directors, members, funders, collaborators, sponsors, volunteers, and other stakeholders!



Liisa Jeffrey

Originally from New Brunswick's Bay of Fundy coast, Liisa found her passion for ag during college in Nova Scotia. She joined PCBFA in 2016 and loves leading the team. Outside work, she enjoys photography, archery, and dirt biking with her husband and two boys.

A handwritten signature of Liisa Jeffrey in a cursive script.

A MESSAGE FROM THE SCIENCE DIRECTOR

Dear PCBFA Community and Partners,

The research program at PCBFA continues to grow in strength, thanks to a dedicated team and the continued support of producers, collaborators, and funders.

In 2024, our capacity expanded with the addition of Dr. Hayford Gyamfi as Research Coordinator. Dr. Gyamfi, who completed his PhD at the University of Alberta, brings critical expertise in perennial forage mixtures developed specifically for northern Alberta. We also welcomed Cameron Bilodeau, who now serves as Safety & Research Tech Lead. Her leadership has been instrumental in fostering a culture of safety and excellence in our research operations.

This year, we concluded the province-wide Perennial Cereal Grain trial, led by Cosmas Ugwu, a PhD student at the University of Alberta, with field support from Chelsey Hostettler. The study explored intercropping perennial cereals and legumes to improve soil health and dual-purpose production, contributing to long-term agricultural resilience in the region.

The crop variety and forage stand rejuvenation projects with Saddle Hills County entered the second year of a 3-year collaboration.

With funding from Alberta's Rangeland Sustainability Program, we launched two on-farm and one replicated small-plot trial at four strategic locations, addressing topics like liming, silvopasture, forage longevity and productivity. We thank the participating producers whose contributions were essential to kick-starting trials.

The Peace Region Living Lab marked its third year in 2024. PCBFA currently hosts 10 of 56 producer sites, where we co-develop and test practices including winter cereal systems, cocktail cover crop blends, bale grazing, and forage rejuvenation with legumes. These innovations have received strong interest from the producers and media community.

Across all projects, we are building reliable datasets on soil microbial activity, forage yield and quality, and plant species diversity. These insights will inform practical, locally adapted strategies to improve soil health, productivity, and environmental resilience in the Peace.

Our research team meets regularly (weekly during the growing season) to coordinate fieldwork and share insights. We collaborate closely with the extension team to share findings through field days, technical bulletins, and presentations to Ag Service Boards and industry groups.

To our partners, supporters, and especially the Peace Region producers, I say thank you! Your engagement, ideas, and feedback continue to shape our research and push us to do better.

I leave you with words from producers themselves:

"Your trials are designed with producers in mind. The results we take from your research have been both practical and game-changing for our operation."

"With all these field instruments for data collection, it's encouraging to see science happening on our land, with results that are local and matter."

"PCBFA doesn't just study things—they listen and ask for ideas."



Dr. Akim Omokanye

Akim leads PCBFA's research program and loves working directly with producers to shape practical, local solutions. Originally from Nigeria, he holds a PhD in Systems Agriculture and now calls Fairview home with his family. He enjoys travel, photography, tennis, and the occasional episode of Survivor.

Dr. Akim Omokanye

A MESSAGE FROM THE OPERATIONS DIRECTOR

Dear PCBFA Community,

Reflecting on my journey since joining the Peace Country Beef and Forage Association in July 2023, I am filled with gratitude for the incredible support from our team, industry professionals, and producers. 2024 was a momentous year, where we attended or hosted 36 Extension Events throughout the Peace.

I appreciate those who laid the groundwork for agricultural research in the Alberta Peace Region, emphasizing the crucial role of Canadian agriculture in feeding the nation and supporting the economy. With a focus on sustainability, I am excited to continue contributing to this vital sector.

The Alberta Peace Region offers rich agricultural opportunities for innovation. Our 2024 events highlighted soil health, cattle nutrition, and alternative farming methods to reduce environmental impact. Networking with producers has been a rewarding experience, fostering valuable insights and promoting sustainable practices.

Historical figures in agriculture have shaped our industry, and I am grateful to work alongside some of these influential individuals. As we face challenges like climate change and evolving consumer preferences, collaboration is essential for sustainable agriculture.

Thank you to everyone who has supported the Peace Country Beef and Forage Association. Your dedication inspires me, and I look forward to continuing our journey together to positively impact agriculture.

Best regards.



Alaina Archibald

Since settling in the Fairview area in 2010, Alaina has combined her business background with a love for farming, marketing, and community. Alongside raising her daughter and running Fairhaven Equestrian, she brings energy, creativity, and a strong passion for sustainable agriculture to the PCBFA team.

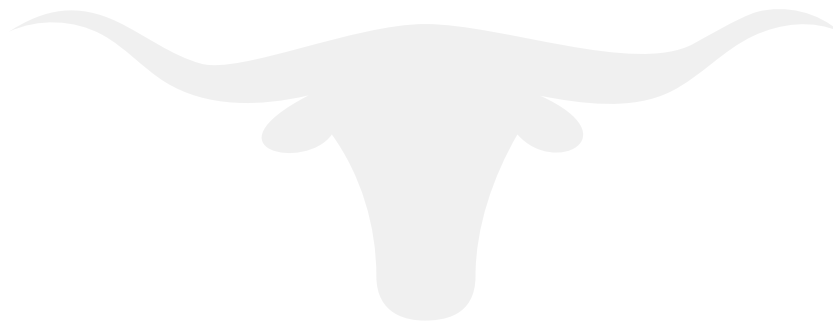
Alaina Archibald

2024 Board of Directors

The Peace Country Beef & Forage Association is governed by 10 volunteer producers from across the Peace Region who actively voice questions, ideas, and concerns to address the needs of the agricultural industry in the Peace.

Our area is designated into three zones, with producer representation from each zone. The North Zone is north of the Peace River, from the Town of Peace River, west to the BC border. The Southwest Zone is south of the Peace River, and from the Smoky River to the BC Border. The Southeast Zone is south of the Peace River, and east of the Smoky River to Slave Lake.

There are also two At Large positions, filled by producers from anywhere in the Peace Region.



Jordan Barnfield
Chair
Southwest
Teepee Creek

Corey Beck
Vice Chair
Southwest
Teepee Creek

Michael Strebchuk
Treasurer
Southeast
High Prairie

Kasity Bilous
Secretary
North
Fairview

Andrew Hale
Director
North
Worsley

Bonnie Wanchuk
Director
At Large
Grimshaw

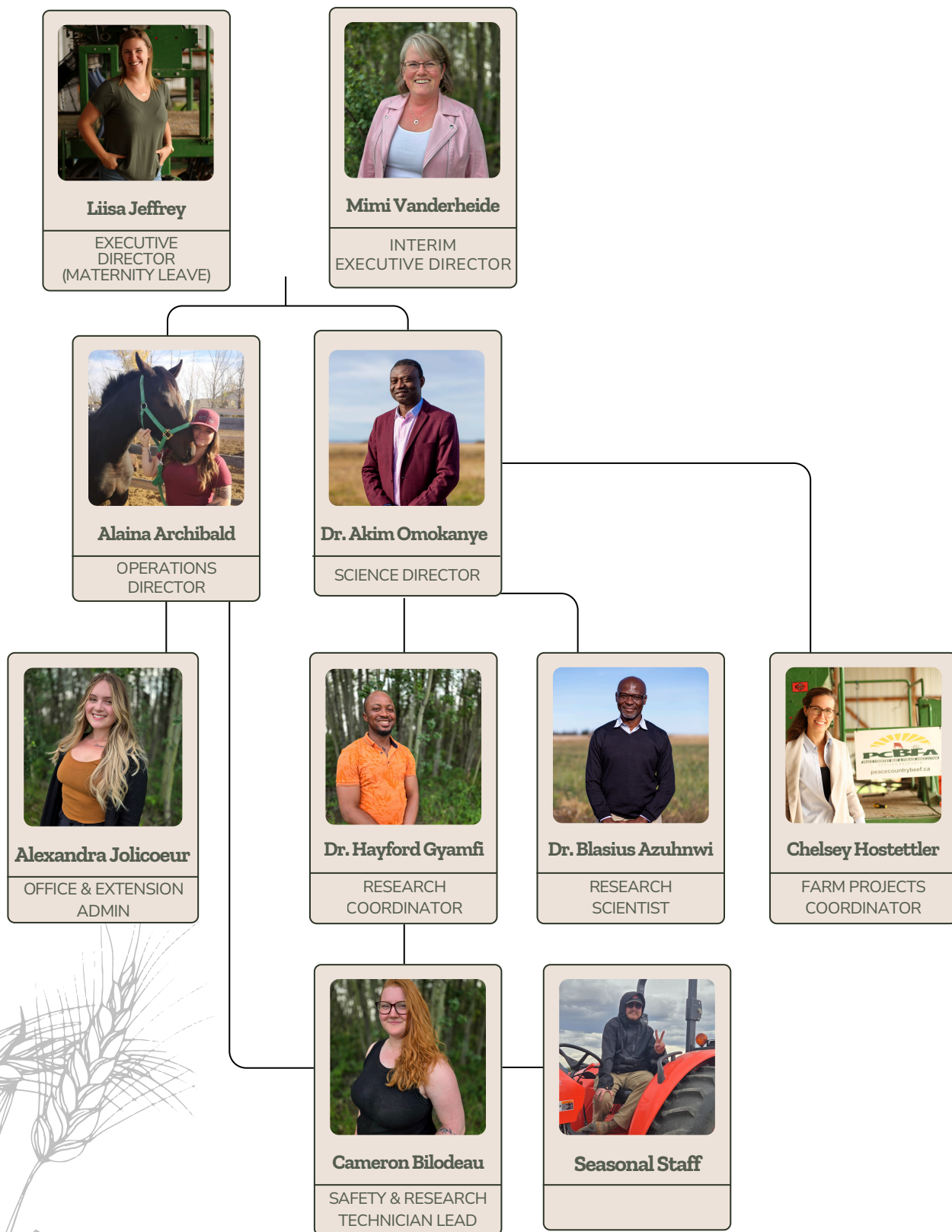
Garth Shaw
Director
North
Fairview

Clay Hanson
Director
Southeast
Valleyview

Andrew Miller
Director
At Large
Bay Tree

Organizational Chart

2024



Honouring Brock Friedel, a Steward of the Land and Livestock



Brock Friedel has been involved in agriculture his whole life, having grown up on a diversified livestock operation in northeast Alberta. Upon completion of his Bachelors of Science in Agriculture from the University of Saskatchewan, he moved up to the beautiful Peace Country to help manage the multigenerational farm located near Fairview.

Here, they grow conventional grain crops, annual and perennial feed sources, raise registered Black Angus cattle and background commercial livestock. Brock enjoys being able to appreciate the Lord's blessings each day as he works to apply science to everyday management decisions to promote production potential alongside economic sustainability.

Brock has worked with PCBFA on several research projects in the area of livestock production, soil health, and feed production. Brock always appreciates the producer-minded approach they consistently bring forward.

We want to send a heartfelt thank-you to Brock for his unwavering support of PCBFA, and his undeniable passion for agriculture in the Peace Region.

Lifetime Member Award

Honouring Garry Gurtler's Dedication to PCBFA



The Lifetime Member Award is one of the highest honors presented by the Peace Country Beef & Forage Association (PCBFA). With only three recipients before him, Garry Gurtler of Manning, Alberta, becomes just the fourth individual to receive this prestigious lifetime membership, recognized for his outstanding service and unwavering support.

A third-generation rancher, Garry's roots trace back to the 1920s, when his grandfather homesteaded in the Manning area. Today, the Gurtler farm, fondly nicknamed Texas Alberta, spans over 4,000 acres and is known for its distinctive steel fencing, built in response to a government introduction of 270 elk that nearly devastated local farms. Garry now laughs about the elk that once dined alongside cattle in their feedlot.

Together with his wife, Trudy Rasmussen, and their son, Garry manages 200 cattle across 25 continuous quarter sections. Their operation includes 100 registered Polled Herefords and a commercial herd of equal size. Since 1970, they've utilized artificial insemination to enhance genetics, trying nearly every breed along the way.

Garry's interest in experimentation extended beyond cattle. Over the years, he cultivated hard red spring wheat, barley, canola, and even gave corn a try which he humorously recalls didn't quite go as planned. Brome seed production, however, proved successful, producing over 1,000 pounds per acre and leading to lush aftermath forage supported by Alsike clover.

In the 1960s, Garry unintentionally participated in one of the earliest local examples of a polyblend or cover crop. A neighbor's leftover seed mix planted on 60 idle acres was too wet to plow, so they hayed it instead. The result: an astonishing eight bales per acre of what Garry still calls the best feed he's ever seen.

His contributions extend far from his farm. Garry spent 16 years with the Alberta Beef Commission, later joined the board of the North Peace Forage Association (now PCBFA), and served on the inaugural board of the North Peace Applied Research Association. Throughout his involvement, Garry played a key role in shaping the organization now known as PCBFA including helping hire long-serving team members Dr. Akim Omokanye and Liisa Jeffrey.

Reflecting on his journey, Garry shared a piece of advice that captures the spirit of lifelong learning: "The decisions that you make always come back to haunt you or show you what a good move you made. No matter the outcome, all you can do is see the lesson and learn from it."



Grant Gaschnitz Memorial Ag Knowledge Sponsorship Winner, 2024

Emma Heringer



Grant Gaschnitz was a prominent figure in the Peace Region with a lasting impact on the agricultural community. He was a strong advocate for strengthening Peace Country farms and ranches, ensuring the region received the attention it deserved. One of his greatest passions was encouraging and supporting young people in becoming successful and thriving farmers and ranchers.

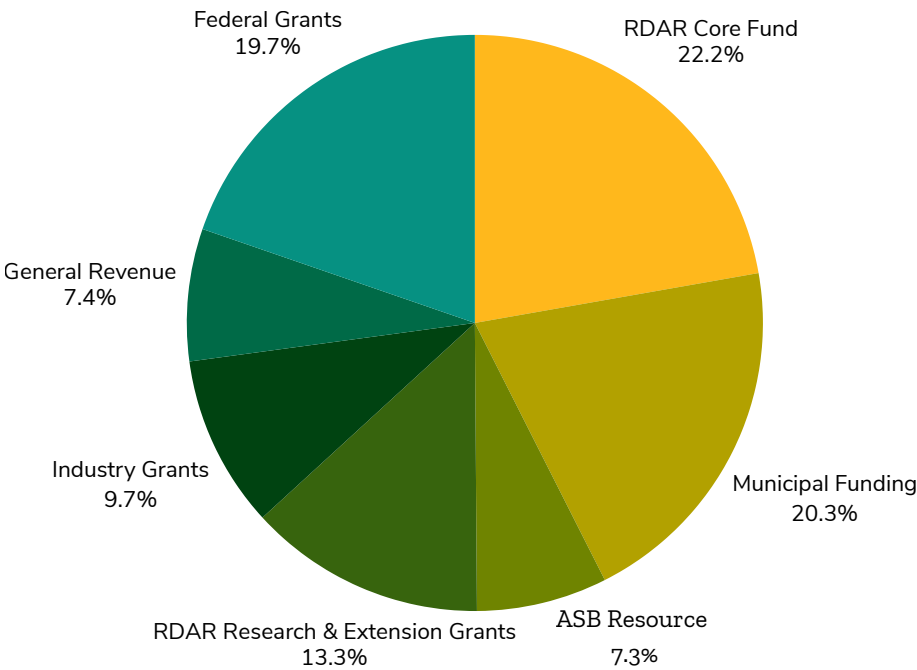
To honour his legacy, the Grant Gaschnitz Memorial Ag Knowledge Sponsorship was created by the Gaschnitz family and is administered by the **Peace Country Beef & Forage Association** an organization Grant deeply supported. He was a long-time member, served on the board of directors, and was awarded a lifetime membership. The sponsorship reflects Grant's long-standing commitment to young producers and supports Peace Region farmers or ranchers between the ages of 17 and 40 as they pursue education or training that will help them succeed in their operations and grow their management skills.

This year's recipient, **Emma Heringer of Teepee Creek, Alberta**, is a dedicated young cattle producer with six years of experience working alongside her father. She is currently enrolled in the Animal Science Technology diploma program at Lakeland College, where she's building on her hands-on experience with formal training in sustainable ranching. With the support of the Gaschnitz family and this \$500 sponsorship, she aims to enhance her skills in sustainable livestock management and contribute to the continued success of agriculture in the Peace Region.

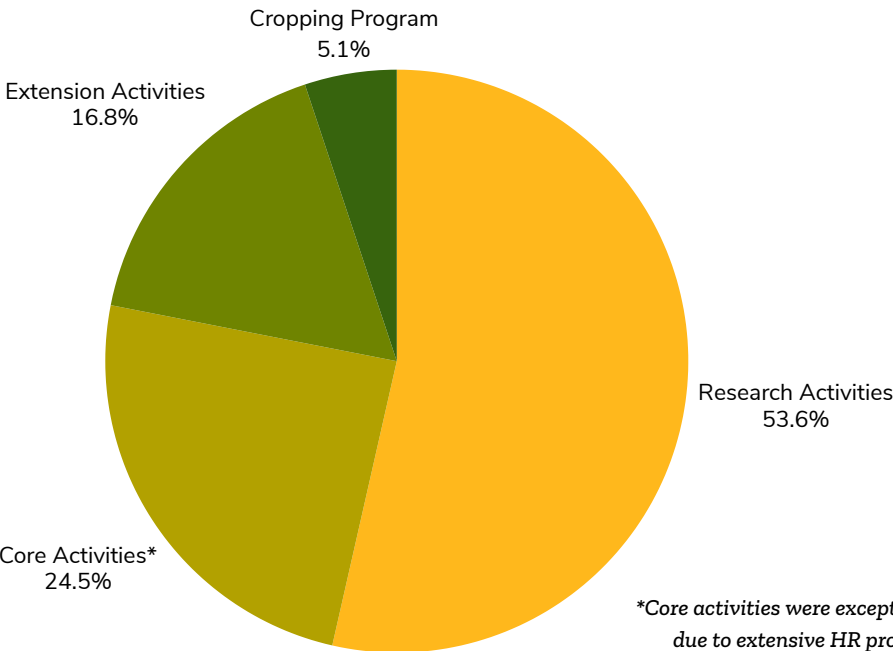
We want to wish a huge congratulations to Emma and we wish you great success on your future studies.

2023-24 FINANCIAL SUMMARY

Revenue Breakdown Total: \$1,499,364



Expense Breakdown Total: \$1,394,260



**Core activities were exceptionally high in 2023-24 due to extensive HR program improvement consultant work, covered by an AgForLife grant*

Acknowledgements



Brett Young

NORTHWESTERN
POLYTECHNIC

Clearfab
780-834-7512

Fora Seed



**COVERS
& CO.**

BASF



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**RICHARDSON
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Fabian
Seed Farms Inc.
"Planting the Seeds of Success..."



PRAIRIECOAST
equipment

Nutrien
Ag Solutions



MJ
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Solutions

Canada



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RANCH



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Limoges

Prestville Seed

Hostettler Farms

DSV Seed

Boisvert Farms

J Six Acres

Canadian AgriChar

Replenish Products

Velocity Engineering

A & L Laboratory Inc

Central Testing Lab

Carl's Ag Ventures

Gouw Naturals

UFA

Brock Friedel

Jack & Hilli DeJong

Brent Kobbert

Peace Country Beef & Forage Association
2024 Annual Report

Thank you

Conrad Dolen

Randy Alexander

Paul & Lori Kinnee

Kelvin & Marianne Krahn

Kyle Davies

Mackenzie Fingerhut

Marc Pellerin

James Bozarth

Garth Shaw

James Yuha

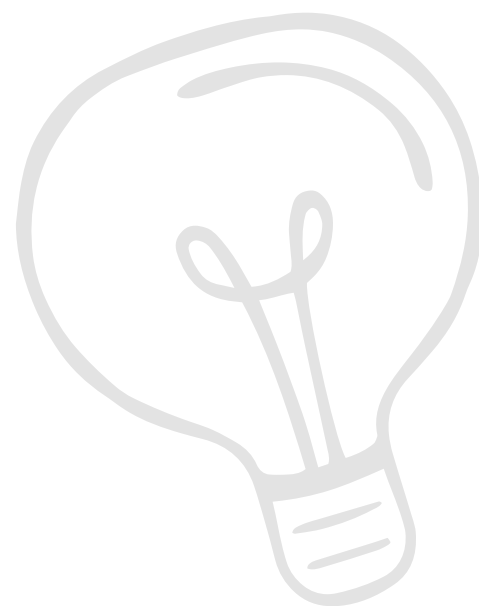
Donovan Kitt

Clay & Ash Armstrong

Mack Erno

List of Abbreviations

AB - Alberta	
ADF - Acid Detergent Fibre	
ASI - Aggregate Stability Index	
BCS - Body Condition Score	
BD - Bulk Density	
BMP - Best/Beneficial Management Practice	
bu/ac - Bushels per Acre (unit for grain yield)	
BS - Base Saturation	
Ca - Calcium	
CCE - Calcium Carbonate Equivalent	
C:N Ratio - Carbon: Nitrogen Ratio	
CP - Crude Protein	
Cu - Copper	
CV - Coefficient of Variation	
DM - Dry Matter	
dS/m - Deciseconds Per M (units for electrical conductivity, EC, a measure of soil salinity)	
EC - Electrical Conductivity	
EEF - Enhanced Efficiency Fertilizers	
ENR - Estimated Nitrogen Release	
ESN - Environmentally Smart Nitrogen Fertilizer	
Fe - Iron	
GHG - Greenhouse Gas	
HSDG - High Stock Density Grazing	
K - Potassium	
lbs/ac - Pounds per Acre (unit for forage yield)	
CEC - Cation Exchange Capacity	
CO ₂ - Carbon dioxide	



List of Abbreviations

lbs/bu - Pounds per Bushel (unit for bushel weight or test weight)

LL - Living Lab

LSD - Least Significant Difference

Mg - Magnesium

Mn - Manganese

Mo - Molybdenum

NDF - Neutral Detergent Fibre

NDFD-48 hrs - Neutral Detergent Fibre Digestibility after 48 hrs

NDVI - Normalized Difference Vegetative Index

P - Phosphorus

PB - Plant Biostimulant

pH - Potential of Hydrogen (degree of acidity or alkalinity)

ppm - Parts Per Million

PRL - Peace Region Living Lab

psi - Pounds Per Square Inch (units for pressure)

SN - Soil Nitrogen

SOC - Soil Organic Carbon

SOM - Soil Organic Matter

TDN - Total Digestible Nutrients (energy)

TKW - Thousand Kernel Weight

TSW - Thousand Seed Weight (pea)

VAST - Volumetric Aggregate Stability

VWC - Volumetric Water Content

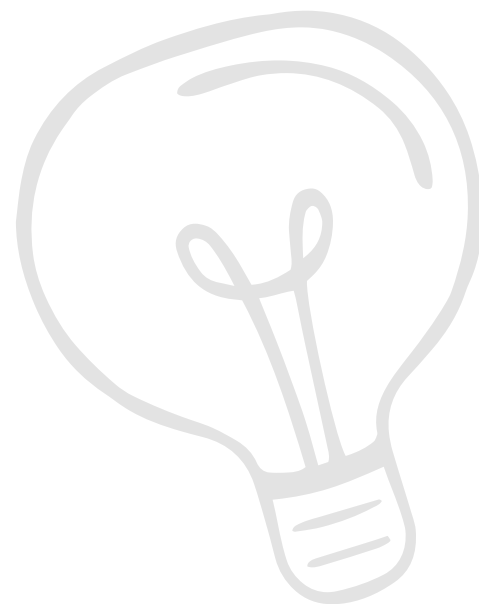
WUE - Water Use Efficiency

Zn - Zinc

PCA - Principal Component Analysis

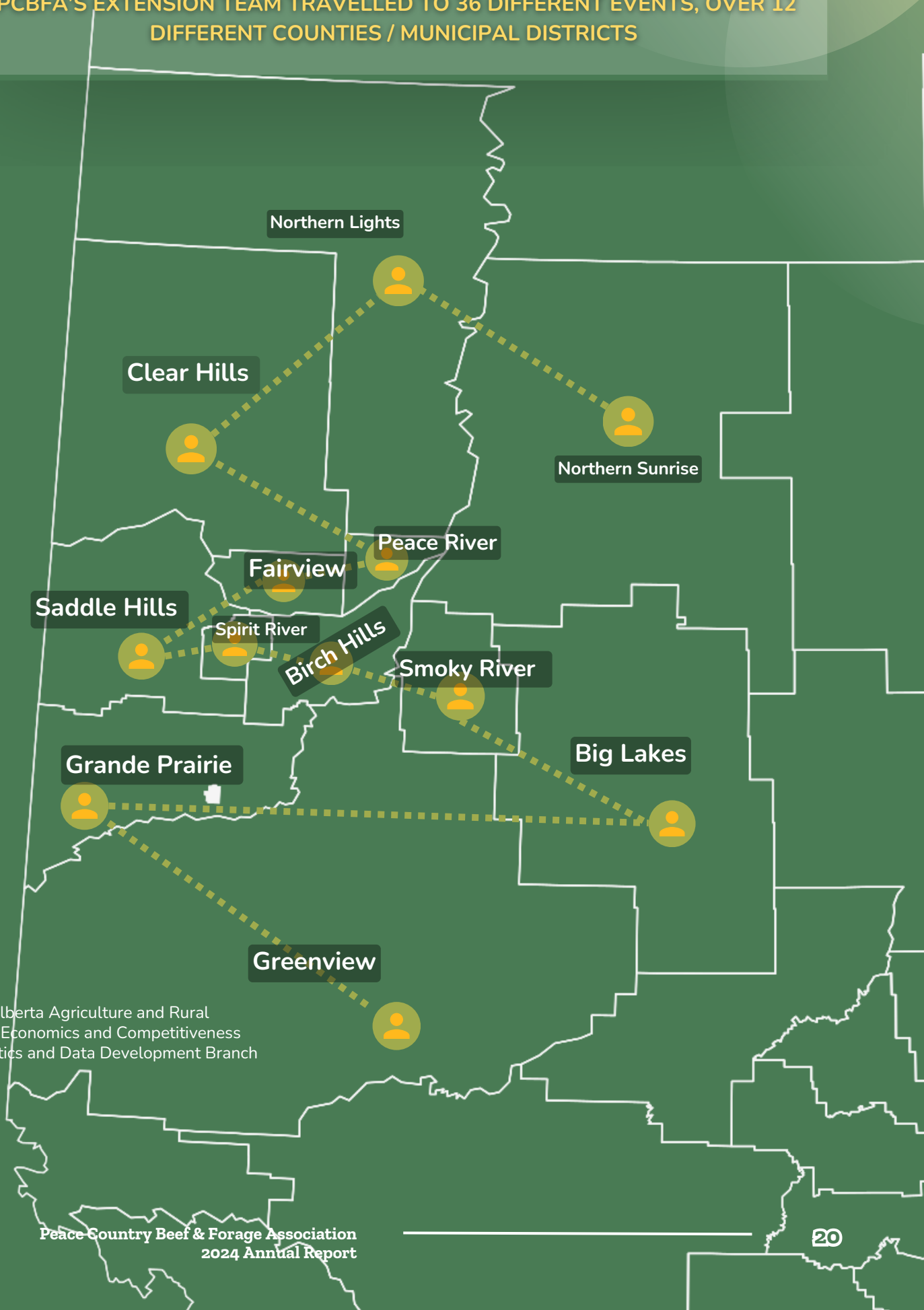
PERP - Percent Saturation of Phosphorus

p value - A Statistical Measure of Probability



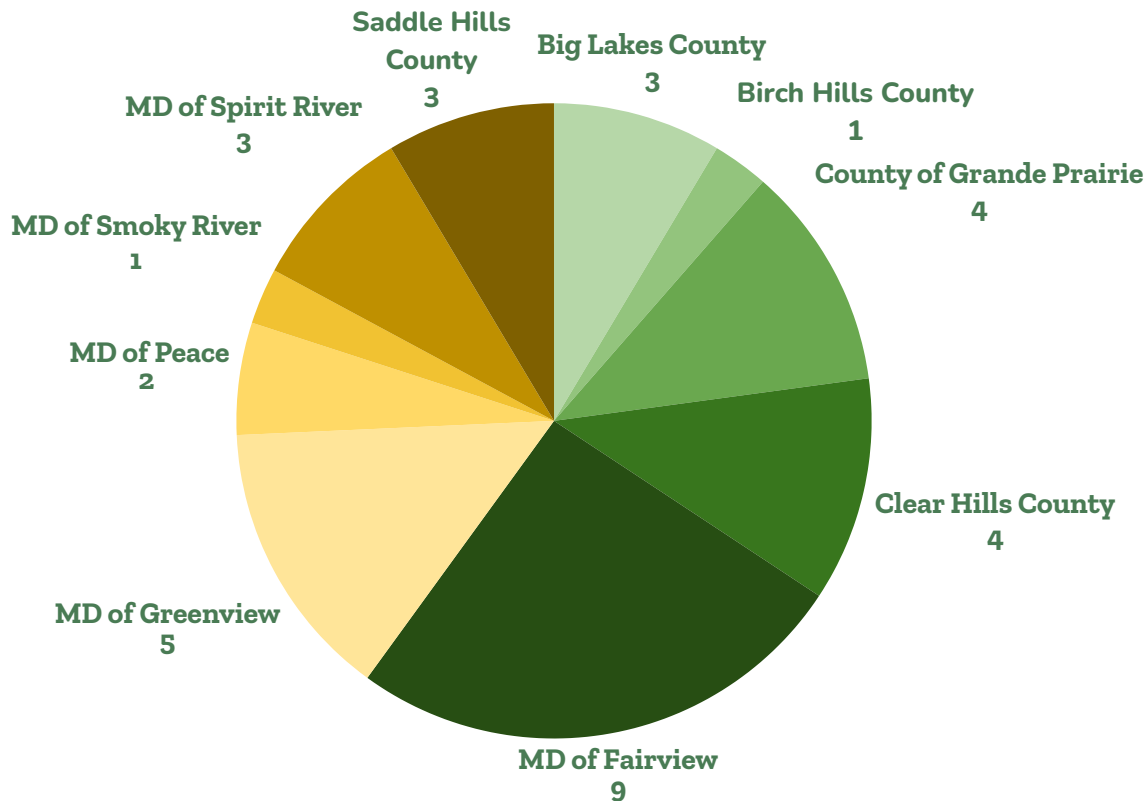
PCBFA 2024 EXTENSION REACH

PCBFA'S EXTENSION TEAM TRAVELLED TO 36 DIFFERENT EVENTS, OVER 12 DIFFERENT COUNTIES / MUNICIPAL DISTRICTS

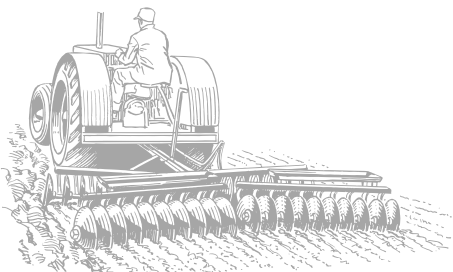


Map Source: Alberta Agriculture and Rural Development, Economics and Competitiveness Division Statistics and Data Development Branch

OUR EXTENSION SUMMARY



Throughout 2024, PCBFA delivered a wide range of extension events across the Peace Region, engaging producers, students, and community members through conferences, seminars, tours, and school programs. From launching our first Women in Agriculture Conference to introducing Junior Agrarians, our first kids' summer camp, the year was filled with fresh ideas and strong community connections.



We hosted or attended over 35 events covering everything from soil health and cover crops to succession planning and low-stress cattle handling. Hands-on farm tours, in-depth seminars, and one-on-one producer visits allowed us to share research, answer questions, and support real-world decision-making.

2024 was a year of growth, collaboration, and meaningful conversations—and we're proud of the impact made together with producers and partners across the region.

2024 PCBFA EVENT SUMMARY

January 19, Northern Women in Agriculture Conference

MD of Fairview (Fairview)

PCBFA hosted their first annual Northern Women In Ag Conference, which was a full day in Fairview. With 5 speakers and the option to participate in 1 of 2 breakout workshops, we welcomed over 80 women from all throughout the Peace Region through the doors. The MD of Fairview, Farm Credit Canada & Emerson Trail Vet Clinic sponsored this event to help offset expenses, and we received fantastic feedback.



February 5, EFP & Grant Funding Seminar

Clear Hills County (Eureka River)

PCBFA hosted a series of Environmental Farm Plans & Grant Funding Opportunities in the peace; one in Clear Hills County, and one in the MD of Greenview a few days later. The Clear Hills County event brought in 41 attendees. With 3 speakers present, attendees left with the knowledge and confidence to source funding.



February 7, EFP & Grant Funding Seminar

MD of Greenview (Valleyview)

Structured identically to the event in the Clear Hills, we travelled to the MD of Greenview to reduce travel for producers. This event brought in 37 attendees. Despite struggles with the venue, we persevered and helped provide valuable information to those present.



February 9, Peace Beef Cattle Day

MD of Peace (Grimshaw)

PCBFA hosted their annual Peace Beef Cattle Day in the MD of Peace in Grimshaw. This was one of the largest turnouts for Peace Beef Cattle Day, bringing in 45 attendees to listen to 4 incredible speakers. We started the day with a brief presentation from AFSC, followed by a research report from PCBFA's own Dr. Blasius Azuhnwiri and Chelsey Hostettler discussing Cover Crops. This event was sponsored by Vivigro Sustainable Solutions, and their President and CEO headlined the event with an afternoon of Soil Health and Nitrogen Reduction.



February 23, Coffee With Kevin

MD of Fairview (Fairview)

Kevin Elmy was in the Peace Region for another event in Fort St John, so we hosted a Coffee with Kevin at the Research Farm. 12 producers were present for this laid-back event, which ran 2 hours over the scheduled time due to the invigorating conversation!



March 8, Vivigro Soil Health Seminar

MD of Spirit River (Rycroft)

While PCBFA didn't host this event specifically, Vivigro Sustainable Solutions asked us to assist them with the marketing, and advertising and have a booth at their event in the MD of Spirit River in Rycroft. Roughly 30 people were in attendance and enjoyed an informative presentation on Soil Health and regenerative farming.



March 10, Cover Crops Seminar

County of Grande Prairie (Grande Prairie)

On Sunday, March 10th PCBFA hosted our annual Cover Crop Seminar in collaboration with Covers & Co. This event brought in 16 attendees, one of whom was simply a backyard gardener but was passionate about building soil, and allowed the PCBFA research team to present our own data, as well as a presentation on the symbiotic relationship of plants by a representative of Covers & Co. This event brought lengthy conversation and the forging of fantastic connections for those present.



March 13, NWP Career Fair

MD of Fairview (Fairview)

The Extension Team attended the Northwestern Polytechnic Career Fair in Fairview, where over 80 high school students, as well as the general public, were present. We spoke to 76 people to spread awareness about what PCBFA does, our vision, and any open positions.



April 4 - 6, Northern Link Ag Fair

MD of Fairview (Fairview)

PCBFA shared a booth at the Northern Link Ag Fair with 2 sister groups, NPARA and MARA, to spread knowledge and awareness about the Applied Research Associations in the area, as well as our recent data and plans for the future. Alaina & Chelsey also hosted an info session at this event, equipped with a slideshow presentation and swag for those who chose to attend.



April 12, Afternoons with Akim

Big Lakes County (High Prairie)

On April 12, we hosted an intimate "Afternoons with Akim" session in Big Lakes County (High Prairie), where three dedicated producers joined us for an in-depth discussion. Topics included optimal seeding rates, crafting custom blends, and evaluating the benefits and risks associated with cover crops. This small group setting allowed for personalized insights, thoughtful questions, and meaningful exchanges, making it a valuable afternoon for everyone involved.



April 13, Clear Hills County Ag Fair

Clear Hills County (Hines Creek)

On April 13, we had the pleasure of participating in the Clear Hills County Ag Fair in Hines Creek, where we connected with over 120 attendees. It was a bustling and exciting event, filled with engaging conversations and community spirit. Our team enjoyed meeting so many passionate producers and agricultural enthusiasts, making it a fantastic experience for everyone involved.



April 18, Afternoons with Akim

MD of Fairview (Fairview)

On April 18, we hosted a focused "Afternoons with Akim" session in the MD of Fairview, where we had the opportunity to connect one-on-one with a dedicated producer. The discussion centred on seeding rates and creating effective custom blends, allowing for a personalized and in-depth exchange. This intimate setting provided valuable insights tailored to the producer's specific needs, making it a productive and insightful afternoon.



April 26, Afternoons with Akim

Saddle Hills County

On April 26, we welcomed three producers to our "Afternoons with Akim" session in Saddle Hills County. The discussion covered a diverse range of topics, including elk, goat, and cattle management, as well as strategies for pasture rejuvenation and livestock nutrition. This small group setting fostered meaningful exchanges and provided practical insights across various areas of interest, making it an informative and productive afternoon for all involved.



May 7, Classroom Ag Presentation

MD of Smoky River (McLennan)

On May 7, in collaboration with Ag In The Classroom, we visited with Grade 3's and 4's in McLennan to discuss the importance of Agriculture.



May 10, Afternoons with Akim

MD of Greenview (Valleyview)

On May 10 we travelled to the MD of Greenview to engage with 1 producer regarding their farm.

May 14, Classroom Ag Presentation

Clear Hills County (Worsley)

On May 14, in collaboration with Ag In The Classroom, we visited with Grade 3's and 4's in Worsley to discuss the importance of Agriculture.

June 1, Spirit River Trade Show

MD Spirit River (Spirit River)

We had the pleasure of participating in the Spirit River Trade Show, where we enjoyed connected with many diverse attendees.



June 18, AgricultHER School

County of Grande Prairie
(Goodfare/Demmitt)

55 women joined us for the AgricultHER School, a day dedicated to female-focused agriculture. The event began with a guided farm tour near Goodfare, led by Bluesette Campbell, covering holistic farm management, grazing techniques, soil health, and riparian management at a Peace Region Living Labs Core Producer Site. The day continued at Demmitt Hall with an interactive afternoon featuring keynote speakers on mental health, farm management, and herd health, including insights from Emerson Trail Veterinary Services. It was an inspiring day of learning and community for women in agriculture.



June 26, Hedging & Hobby Farm Tour

Birch Hills County (Peace Acres Farm)

PCBFA hosted a Hedging & Pasture Farm Tour at Scott Andrews and the family's Peace Acres in Birch Hills County. The event brought in 28 attendees, who enjoyed a wonderful time touring the farm. Participants learned about various farm management practices including live hedge fencing, chicken tractors, egg production, forest-raised pork, and rotational grazing of goats to build and improve soil health.



July 10, Alberta Pulse Growers Tour

MD of Fairview (PCBFA Research Farm)

The board of the Alberta Pulse Growers and local producers gathered at the Fairview Research Farm to gain insights into our operation, and enjoy our Pulse Demo Plot, designed by Dr. Akim Omokanye for this dedicated group of visitors.



July 25, 10th Annual Field Day at the Fairview Research Farm

MD of Fairview (PCBFA Research Farm)

The 10th Annual Field Day, hosted by the Peace Country Beef & Forage Association (PCBFA), took place on July 25, 2024, at the PCBFA Research Farm. The event attracted over 75 attendees and featured wagon rides, kids' activities, agricultural demonstrations, vendor booths, and farm tours. It was a successful blend of education, entertainment, and community engagement, making it a memorable day for all.



July, Junior Agrarians

MD of Fairview (PCBFA Research Farm)

We welcomed 10 enthusiastic children to the Research Farm every Thursday in July. They explored topics like water and farm safety, plant stages, environmental impacts of agriculture, invasive species, plant ID, working with nature, and public speaking. Each participant studied a crop throughout the program and delivered an presentation at our 2024 Field Day. PCBFA was proud to partner with the Mighty Peace Watershed Alliance, the MD of Fairview, and Vivigro Sustainable Solutions on this project.



August 8, Strebchuk Farm Tour

Big Lakes County (High Prairie)

Strebchuk Farms Field Day attracted around 45 attendees, offering insights into organic farming practices and research. Highlights included presentations on oat beta-glucan research by SARDA, soil supplement trials by RezFree, and field input trials by Cargill. The day also featured a wine cooler tasting by Shady Lane Orchard, and attendees enjoyed a free organic lunch and refreshments.



August 9, Saddle Hills Plot Tour

Saddle Hills County

We had a great afternoon with 15 engaged producers at our Annual Project Tour in Saddle Hills County. Highlights included a drone demo by Landview Drones, presentations on our agricultural research, and a catered supper from M&K's Burger Run.



August 15, Holistic Ranching Tour

MD of Greenview (Valleyview - Hansons Ranch)

The Holistic Management Farm Tour brought together 33 participants to discuss calving pastures, rotational grazing, high-intensity stock grazing, bale grazing, and regrowth management. Bluesette Campbell led the discussions. Alaina served burgers and hot dogs, with drinks provided by the MD of Greenview, making it a productive and enjoyable gathering.



August 29, DeBolt Plot Tour

MD of Greenview (DeBolt)

We had a great day at the DeBolt Perennial Trial Tour in the MD of Greenview, with 3 participants viewing over 50 plots of perennial legumes, grasses, and legume-grass mixes. These crops, harvested five weeks prior, were showing impressive regrowth and energy storage for winter.



September 6, Cattle Market Evening

MD of Spirit River (Rycroft)

The Annual Peace Country Beef & Forage Association's Cattle Market Evening on September 6, 2024, was a success, with 37 participants attending at the Rycroft Ag Society Hall. Keynote speaker Brenna Grant, Executive Director of Canfax, shared valuable insights on market trends, helping cattle producers maximize their profits. The event, which included supper and a cash bar, provided a great opportunity for both new and seasoned cattle farmers to network and learn.



September 13, Low-Stress Cattle Handling Workshop

County of Grande Prairie (Teepee Creek)

The Low-Stress Livestock Handling Workshop, held on September 13, 2024, at Teepee Creek Ag Events Centre, welcomed 27 participants for an insightful and hands-on experience led by Kobe Fehr of RCK Cowdogs. Participants enjoyed a classroom presentation followed by live animal demonstrations. After lunch, attendees had the chance to work with their own dogs or horses, practicing the low-stress handling techniques discussed. The event was well-received, offering valuable skills for anyone involved in livestock management.



October 4, Fall Grazing & Farm Management Seminar

Saddle Hills County (Bay Tree)

Our 25 attendees and supporters had a successful event in Saddle Hills County, despite the rain! The seminar featured Holistic Management and Succession Planning with Kelly Wobeser-Sidoryk. After lunch catered by M&K's Burger Run, we discussed the Peace Region Living Lab's objectives, followed by a presentation from Hayford Gyamfi on data collection. We then toured Dan & Lucy Martin's farm to view their Living Labs project field, exploring grazing methods, soil health, and plant species.



October 11, East Peace Cattle Day

Big Lakes County (High Prairie)

We gathered in Big Lakes County (High Prairie) for an intimate evening with 19 attendees focused on valuable insights for local producers. The night featured a lineup of engaging presentations, starting with Joe Engelhart on managing predation, followed by a session from PCBFA on perennial forages. Dr. Josee Marcoux shared her expertise on reproductive health, and Barry Yaremicio provided strategies for maximizing the value of poor forage. Attendees also enjoyed a catered supper, creating a relaxed and enjoyable setting for learning and networking. It was an evening full of practical knowledge and meaningful connections.



October 25, Harvest Supper

Clear Hills County (Eureka River)

We had the pleasure of hosting 49 attendees in Clear Hills County, where producers came together for an informative and engaging session. The event began with a presentation from Sarah Cairns, who provided insights into Environmental Farm Plans and shared valuable information on OFCAF and SCAP Grant opportunities. Following her presentation, attendees enjoyed a delicious meal catered by Worsley Gateway Inn, which offered the perfect break to connect and share ideas. To conclude, Dr. Blasius Azuhwi presented recent research on Perennial Forages in the Peace region, highlighting advancements relevant to local producers. It was a successful event full of knowledge-sharing and community-building.



November 13, Winter Grazing Tour

MD of Fairview (Garth Shaw's Farm)

Our 16 attendees explored innovative winter grazing techniques, including the use of corn and alternative feed sources to support herds during the cold months. Lyndon Popovitch with ReNew Ag shared his expertise on growing corn in the Peace region, offering valuable insights for local producers. The tour provided a great opportunity to learn new strategies, network with fellow producers, and gain practical knowledge for effective winter grazing management.



November 16, Succession Planning with Annessa Good

MD of Greenview (Valleyview)

In collaboration with the MD of Greenview, we hosted a Succession Planning Workshop which brought in over 40 attendees.



November 20, Winter Watering Tour

County of Grande Prairie (The Kitt's)

On a snowy afternoon in the County of Grande Prairie No. 1, 14 participants gathered at The Homestead with the Kitt family to explore practical strategies for sustainable winter livestock management. The session featured discussions on various winter watering systems, the benefits of bale grazing, and integrated approaches to raising pastured pork and poultry. Despite challenging weather conditions, attendees actively engaged in knowledge exchange and on-site demonstrations, fostering a deeper understanding of adaptive practices for cold-climate agricultural systems.



November 30, Annual General Meeting

MD of Peace (Peace River)

The 2024 Annual General Meeting was held at the Chateau Nova Hotel in Peace River, welcoming 67 attendees. The event began with networking at 3:30 PM, followed by a business meeting and awards ceremony at 4:30 PM, recognizing the "Member of the Year" and the "Grant Gaschnitz Sponsorship Award." Attendees enjoyed a supper and networking session at 5:30 PM. The evening concluded with an engaging keynote speech by Brett Gardiner and discussions on research and extension updates, fostering collaboration and celebrating the achievements of the PCBFA community.



Effects of Seeding Rate on Yields and Yield Components of the Most Popular Wheat Varieties in Alberta Peace Region

Funded by Alberta Grains

Introduction and Objectives

Seeding an accurate amount of high-quality seeds is foundational in achieving a correct plant stand and growing a successful cereal crop. The optimum target seeding rate range for spring wheat in Alberta varies between 250 and 400 seeds/m² (25 and 40 seeds/ft²), with the lower end sufficient to attain maximum yields. In comparison, the higher end can provide slight increases in yield, economic return, weed suppression, and aid in crop uniformity (Alberta Grains, 2022).

This trial evaluates the effect of different seeding rates on four wheat varieties. We hypothesized that differences in varieties or seeding rates would influence the outcome of grain yield and grain attributes.

What We Did

The project was implemented at the Fairview Research Farm. Table 1 gives site history, soil information, treatments, field operations, and data collected for this trial. The experimental design includes a randomized complete block design using four replications in small plots measuring 8m x 1.14m.

For this project, AAC Brandon, AAC Redberry, AAC Viewfield, and AAC Wheatland were chosen as the most

popular wheat varieties among growers in the Peace Region of Alberta and seeded at four different seeding rates: 25, 30, 35, and 40 plants/ft². This report highlights the results obtained in the final year of this two-year trial.

Seeding was carried out using a 6-row Fabro Small Plot Drill with disc-type openers on 23 cm row spacing, complete with side banding. The site received about 10" of rainfall for the growing season (April 1 – Sept 30) and about 1,414 Growth Degree Days.



Table 1. Site information, soil history, treatments, field operations, and data collection

Parameter/Task	Description										
Site history and seedbed preparation	Summer fallowed and harrowed in early spring										
Site soil information at 0-6" soil depth	pH = 5.5; Organic matter = 4.0; CEC = 11.3 meq/100g; Nutrient analysis of soil gave N = 14 ppm, P = 18 ppm, K = 102 ppm and S = 8 ppm. Soil base saturation was Ca = 46%, Mg = 19%, Na = 1.0%, K = 2.3% and H = 31.6%.										
Pre-pass herbicide, rate and date	Transorb Glyphosate @ 0.67L/acre in 40 L/acre of water on May 24.										
Treatments (16) and seeding rate	<table> <tr> <th>Variety</th><th>Seeding rate (plants/sq ft)</th></tr> <tr> <td>AAC Brandon</td><td>25, 30, 35, 40</td></tr> <tr> <td>AAC Redberry</td><td>25, 30, 35, 40</td></tr> <tr> <td>AAC Viewfield</td><td>25, 30, 35, 40</td></tr> <tr> <td>AAC Wheatland</td><td>25, 30, 35, 40</td></tr> </table>	Variety	Seeding rate (plants/sq ft)	AAC Brandon	25, 30, 35, 40	AAC Redberry	25, 30, 35, 40	AAC Viewfield	25, 30, 35, 40	AAC Wheatland	25, 30, 35, 40
Variety	Seeding rate (plants/sq ft)										
AAC Brandon	25, 30, 35, 40										
AAC Redberry	25, 30, 35, 40										
AAC Viewfield	25, 30, 35, 40										
AAC Wheatland	25, 30, 35, 40										
Seeding date	May 17, 2024.										
Seeder and row spacing	6-row Fabro Small Plot Drill with disc-type openers @ 9" row spacing										
Seeding depth	3/4"										
Nutrient recommendations for an average yield of wheat (56 bu/ac)	N, P ₂ O ₅ , K ₂ O, S - 41, 22, 12, 48 lbs/ac actual respectively)										
In-crop spray, rate, and date	@ Low rates (0.24L/ac of Flu + 0.28 L/ac MCPA + 0.084 L/ac for Clopy) on June 18th 2024										
Desiccant	Heat LQ @43 ml/ac + glyphosate @ 1 L/ac + Merge @400 ml/ac on Sept 06, 2024										
Grain harvest stage and date	Ripening stage on September 18										
Harvest method	Small-plot combine										
Area harvested	6.5 – 7.5 m ² on average										
Data Collected	Plant height Grain yield Grain attributes (thousand kernel weight, bushel weight) Grain quality (protein content)										

Results

The results of wheat grain yields, height, and various grain attributes are shown in Table 2 below.

Wheat Height and Lodging

Wheat heights ranged from 49 – 65 cm, and variety had a significant effect, but seeding rate did not. AAC Redberry was the tallest of all four varieties at all the seeding rates, while AAC Viewfield was the shortest. AAC Brandon and AAC Wheatland were intermediate in height compared to the other wheat varieties. No lodging was observed with any wheat variety at any seeding rate.

Wheat Grain Yields

Across all four varieties and seeding rates, wheat yields ranged from 25 – 36 bu/ac and averaged just above 31 bu/ac. A significant effect was observed for variety, but no significant effect was found for seeding rate. Grain yields for AAC Redberry and AAC Viewfield decreased as seeding rates increased. Conversely, AAC Wheatland yield increased with higher seeding rates, peaking at 36 bu/ac at 30 plants/sq ft, before declining at higher seeding rates. AAC Brandon, however, showed a decrease to about 29 bu/ac at 30 plants/sq ft, followed by an increase in yield at higher seeding rates. Overall, there was no significant interaction between variety and seeding rate.

Thousand Kernel Weight (seed weight) and Bushel Weight (test weight)

There were significant differences between treatments for both of these two seed attributes. The Thousand Kernel Weights (TKW) generally decreased with the increased seeding rate for all four wheat varieties. AAC Wheatland had the highest TKWs (30.7 grams/1000 seeds), while Viewfield had the lowest TKWs across all four seeding rates. AAC Wheatland consistently had the highest bushel weights at all seeding rates.

Protein Content

Protein content narrowly ranged between 16.1% and 17.7% across the treatments.

Conclusion

Wheat yields averaged 30.5 bu/ac. Variety had a significant effect; seeding rate did not. AAC Wheatland yielded the highest (35.5 bu/ac) with top TKW, bushel weight. Protein generally ranged from 16.1 to 17.7%.

References

Alberta Grains (2022): *Wheat and barley target seeding rates - Alberta Grains*

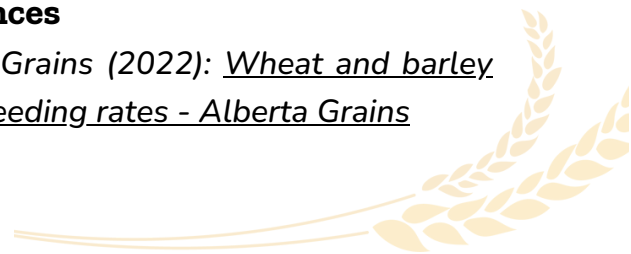


Table 2: Wheat height, grain yields, and various grain attributes.

Wheat Varieties	Seeding rate (plants/ft)	Grain Yield (bu/ac)	Plant Height (cm)	TKW* (g/1000)	Bushel Weight (lbs/bu)	Protein (%)
AAC Brandon	25	33.8	59.7	28.5	58	17.1
	30	29.0	55.8	26.4	56	17.5
	35	30.7	54.6	27.0	57	17.3
	40	33.1	57.0	26.5	56	17.3
AAC Redberry	25	31.5	62.5	29.5	59	16.6
	30	27.5	64.6	27.0	58	17.4
	35	25.6	62.7	25.7	56	17.7
	40	26.1	60.1	26.3	56	17.6
AAC Wheatland	25	32.8	53.7	30.7	59	16.1
	30	35.5	56.9	29.1	59	16.2
	35	34.1	53.2	29.3	59	16.1
	40	32.1	53.0	28.0	58	16.3
AAC Viewfield	25	31.7	49.3	27.2	58	16.8
	30	29.6	53.7	25.0	57	17.3
	35	26.7	50.0	24.8	56	17.4
	40	27.8	53.0	25.4	56	17.2
MEAN		30.5	56.2	27.3	57.4	17.0
<i>p-value Variety</i>		0.002	0.001	0.001	0.002	0.001
<i>p-value Seeding Rate</i>		0.21	0.28	0.001	0.007	0.09
<i>p-value Variety x Seeding Rate</i>		0.65	0.51	0.92	0.96	0.61

*TKW – Thousand kernel weight

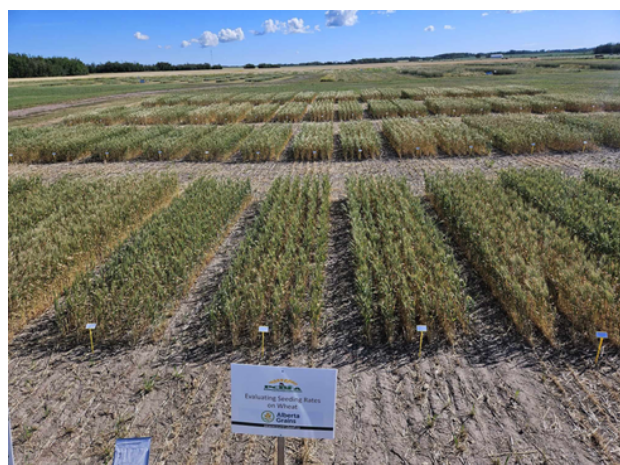


Figure 1. Wheat plots nearing maturity



Figure 2. Taking plant heights of plots

Effect of Various Forms of Enhanced Efficiency Fertilizers in the Development and Yield of Wheat

Funded by Alberta Grains

Introduction & Objective

Intensified agricultural strategies and novel genetic varieties can improve Spring Wheat yield production, but questions persist about optimal soil nitrogen (N) release and precise nitrogen (N) uptake by crops. At Agriculture and Agri-Food Canada in Lethbridge, Dr. Brian Beres has a research program evaluating different fertilizers designed to provide better nitrogen (N) availability to wheat crops than through traditional banded urea. This experiment explores N-Enhanced Efficiency Fertilizers (EEF) set at different N application rates and yield estimates. The goal is to investigate the agronomic benefits of using EEFs on wheat.

What We Did

The project was implemented at the Fairview Research Farm (FRF). Table 1 gives site history, soil information, treatments, field operations, and data collected for this trial. The experimental design included a randomized complete block design using three replications on small plots measuring 8m x 1.14m. Seeding was carried out using a 6-row Fabro Small Plot Drill with disc-type openers on 23 cm row spacing, complete with side banding.

The efficiency fertilizers used for this experiment were Urea, Environmentally Smart Nitrogen (ESN), and SuperU. Fertilizer rates were set at 100% and 70% of the recommended rate and adjusted to meet 1x and 1.5x of the grain target yield. The site received 10" of rainfall for the growing season (April 1 – Sept 30) and about 1,414 Growth Degree Days. Data was subjected to the One-Way Analysis of Variance (ANOVA) procedure with treatment as the only fixed factor, and significance was declared at $p \leq 0.05$. Also, we used Principal Component Analysis (PCA), a multivariate statistical approach to simplify and represent patterns in the dataset in fewer dimensions or factors.

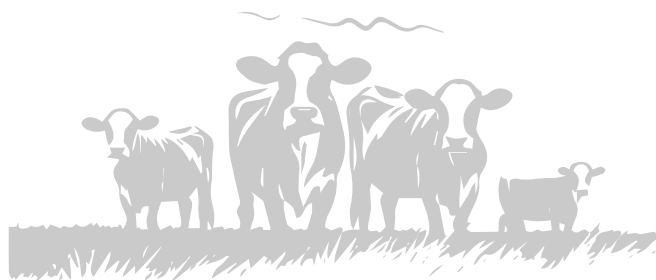


Table 1. Site information, soil history, treatments, field operations, and data collection

Parameter/Task	Description					
Site history and seedbed preparation	Summer fallowed in 2023 and harrowed in early spring 2024					
Site soil information at 0-6" soil depth	pH = 5.5; Organic matter = 4.0; CEC = 11.3 meq/100g; Nutrient analysis of soil gave N (nitrate N) = 14 ppm, P = 18 ppm, K = 102 ppm and S (sulphate-S) = 8 ppm. Soil base saturation was Ca = 46%, Mg = 19%, Na = 1.0%, K = 2.3% and H = 31.6%.					
Pre-pass herbicide, rate and date	Transorb Glyphosate @ 0.67L/acre in 40 L/acre of water on May 24					
Treatments and fertility rates (12)		Target Yield (%)	N Fertility Rate (%)	EEF Products	Rate - Total (lbs/ac)	Treatment Code
	100 (56 bu/ac)	70	ESN Super U Urea	261.7	70N100YdESN	
				255.0	70N100YdSuperU	
				261.7	70N100YdUrea	
		100	ESN Super U Urea	337.6	100N100YdESN	
				327.6	100N100YdSuperU	
				337.6	100N100YdUrea	
	150 (85 bu/ac)	70	ESN Super U Urea	215.3	70N150YdESN	
				210.6	70N150YdSuperU	
				215.3	70N150YdUrea	
		100	ESN Super U Urea	268.4	100N150YdESN	
				261.4	100N150YdSuperU	
268.4				100N150YdUrea		
Seeding date and rate	May 17, 2024. 30 seeds per sq ft (323 per sq m)					
Seeder and row spacing	6-Row Fabro Small Plot with disc-type openers @ 9" row spacing					
Seeding depth	3/4"					
In-crop spray, rate, and date	@ Low rates (0.24L/ac of Flu + 0.28 L/ac MCPA + 0.084 L/ac for Clopy) on June 18th 2024					
Desiccant	Heat LQ @43 ml/ac + glyphosate @ 1 L/ac + Merge @400 ml/ac on Sept 06, 2024 for cereal					
Grain harvest stage and date	Ripening stage on September 18					
Harvest method	Small Plot Combine					
Area harvested	6.5 – 7.5 m² on average					
Data Collected	Emergence Counts Plant Height Grain Yield Grain Attributes - Thousand Kernel Weight (TKW), Bushel Weight (BW) Grain Quality (protein content)					

Results

Table 1 gives the fertilizer treatments, plant counts, heights, yields, and grain attributes.

Wheat Counts

Plant counts determined 3 weeks after seeding ranged from 226 – 299 plants/m² and did not vary significantly between fertilizer treatments.

Wheat Heights and Lodging

Plant heights ranged from 47–57cm and varied significantly among treatments. On average, ESN and Urea treatments were taller than Super U treatments. No lodging was observed amongst any treatments.

Wheat Yields

The yields ranged from 23–29 bu/ac and varied insignificantly between fertilizer treatments. On average, ESN treatments had higher yields than Urea and SuperU treatments.

Wheat Thousand Kernel Weights (TKW) and Bushel Weights (BW)

For TKW and BW, 23–27 g/1000 and 53–59 lbs/bu were obtained, respectively. No significant differences were observed between treatments.

Wheat Grain Quality

The Crude Protein (CP) content of wheat ranged between 15% and 18% and varied significantly between treatments. ESN

treatments generally had lower protein contents than the SuperU and Urea treatments.

Principal Component Analysis (PCA)

The results of the PCA are shown in Figure 1. The first two principal components explained 76% of the variation in the dataset, with Grain Yield, TKW, BW after drying, Crude Protein, and BW at harvest mainly on PC1, while Plant Height and Plant Counts loading primarily on PC2. Grain Yield was inversely proportional ($R = 0.60$; $p = 0.03$) to Protein Content.

Conclusion and Implications

These findings highlight that fertilizer treatments, at the rates used in this trial, had limited impact on wheat plant establishment (i.e., no detrimental impact on emergence - important for early vigour), yield, or kernel weights. However, the significant differences in plant height and protein content suggest that specific fertilizer types, such as ESN, may influence wheat growth dynamics. There is a trade-off between yield and protein, as yield increases, protein tends to decrease. This reflects a dilution effect, common in cereals.

Overall, the study suggests that while fertilizer type minimally impacts yield and kernel weights, it significantly affects protein content and plant height.

Table 2. Plant counts, yields and grain attributes for various treatments

Treatment	Yield (bu/ac)	Plant Counts (Plants/m ²)	Plant Height (cm)	TKW (g/1000)	BW (lb/bu)	Protein (%)
100N100YdUrea	26.3	261	52	24.9	56.5	17.1
70N100YdUrea	22.6	252	54	22.6	53.9	17.4
100N150YdUrea	23.1	290	53	23.7	55.2	17.5
70N150YdUrea	27.5	249	54	24.3	55.0	17.1
100N100YdESN	24.9	299	53	24.4	53.2	16.7
70N100YdESN	24.3	262	57	23.6	54.4	17.0
100N150YdESN	28.8	288	57	26.4	58.1	15.9
70N150YdESN	26.3	241	52	26.7	58.6	15.5
100N100YdSuperU	25.1	241	47	26.4	57.9	16.6
70N100YdSuperU	25.5	275	52	24.7	56.6	16.7
100N150YdSuperU	23.5	226	47	26.1	58.1	16.7
70N150YdSuperU	26.6	236	50	26.1	58.1	16.8
MEAN	25.4	260	52	25.0	56.3	16.8
LSD	18.3	129	6.6	4.4	6.5	1.5
p-value	0.90	0.81	0.002	0.15	0.20	0.03
CV	25.6	18.9	7.3	7.9	5.0	4.5

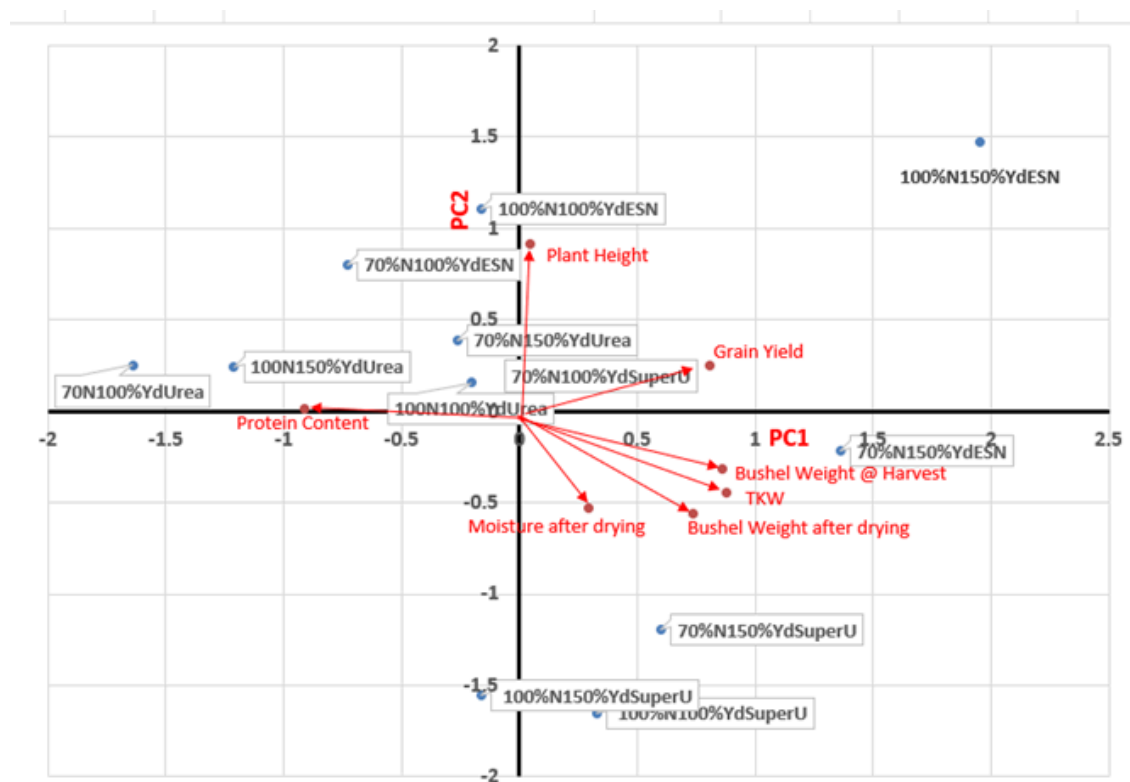


Figure 1. Score Plot of first 2 Principal Components



Figure 2. Alberta Grain Slow Release Fertilizer plots approaching field day at Fairview Research Farm.



Exploring the Agronomic and Soil Health Benefits of Peneergetic Biological Amendments on Crop Production in the Peace Region

Funded by Gouw Naturals & Peneergetic Canada

Introduction

Soil amendments and foliar applications have the potential to enhance soil health and increase canola productivity. To test this hypothesis, the Peace Country Beef & Forage Association in collaboration with Gouw Naturals & Peneergetic Canada, started a multi-year field trial beginning in the 2023 growing season.

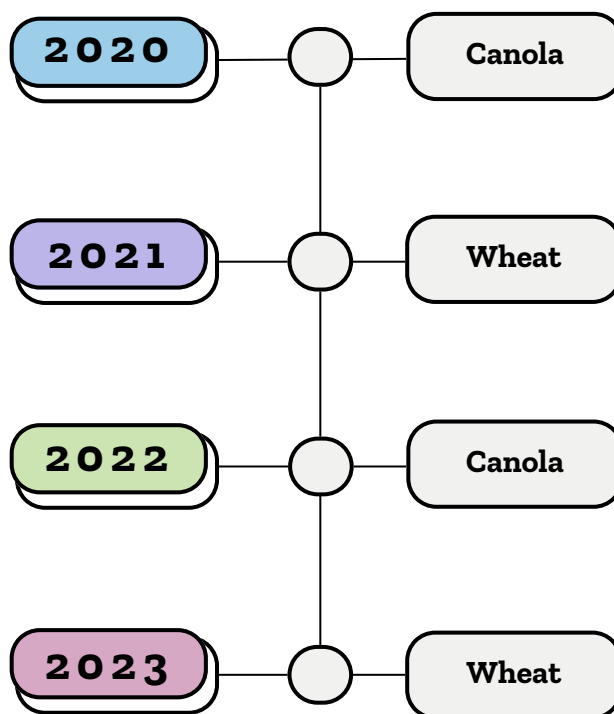
Objective

This three-year trial aims to evaluate the effects of Peneergetic KTM Soil Treatment and Peneergetic PTM Foliar Fertilizer on canola productivity, as well as crop and soil health in the Peace Region of Alberta. This report provides progress on the second year of production of the multi-year field project in a wheat-canola-barley rotation.

Methods Used For Testing

Peneergetic Products

The project took place at the Fairview Research Farm (FRF). Before seeding, surface soil (0–6" depth) had the following properties: pH of 6.1, Organic Matter at 6.1%, and Electrical Conductivity of 0.25 dS/m.



The experiment followed a randomized complete block design with two replications in plots measuring 16 m × 2 m. Seeding was done using a 6-row Fabro Plot Drill with disc-type openers and 23 cm row spacing, including mid-row banding. After harvest, soil samples were collected from each plot, processed and sent to A&L Lab for nutrient and health analysis. Along with seed yield, protein and oil content were also measured.



Table 1. Field operations and data collection in 2024

	Seeding Date	May 24th, 2024
	Harvest Date	September 18th, 2024
	Seeding Depth	0.75" into a dry soil
	Seeding Rate	7 plants/ft ² (76 plants/m ²)
	Surface Soil Temp and Moisture	13°C and 6.9% volumetric moisture content
	Treatments	T4: Penergetic K™ (400 g/ac) Soil Treatment before seeding + Penergetic P™ (100 g/ac) Foliar Enhancer at stem elongation + 100% of standard fertility [K400 + P100 + F100] T3: Penergetic K™ (200 g/ac) Soil Treatment before seeding + Penergetic P™ (100 g/ac) Foliar Enhancer at stem elongation + 100% of standard fertility [K200 + P100 + F100] T2: Penergetic K™ (400 g/ac) Soil Treatment before seeding + Penergetic P™ (100 g/ac) Foliar Enhancer at stem elongation + 75% standard fertility [K400 + P100 + F75] T1: Penergetic K™ (200 g/ac) Soil Treatment before seeding + Penergetic P™ (100 g/ac) Foliar Enhancer at stem elongation + 75% of standard fertility [K200 + P100 + F75] T0: Untreated control – standard fertility only [Control]
		up) at 0.67L/ac. Fertility: (based on soil test reports, NPKS): 100% (standard rate) = 61-40-20-25 actual lbs/ac 75% of standard rate = 47-30-16-19 actual lbs/ac. In-crop herbicide: Esteem at 0.604 L/ac on June 18th 2024 at 3-leaf stage.
	Data Collection	-Plant emergence count (21 days after seeding) -Soils: samples for soil health (0-3") -Grain: yield and seed attributes

In Field Observations

Canola plots established well. However, with a temporary dry spell between mid-June to mid-July, some plants thinned out leaving gaps within plots. Although the plots were sprayed to control weeds, manual hand weeding was also implemented to keep plots clean of weed regrowth.



Figure 1. Penergetic treatment plots (canola)

Our Findings

Canola yield, crude protein (CP), oil content, plant headcount, and thousand kernel weight (TWK) were all similar across the treatments (Table 2).



Figure 2. Weed control (hand weeding plots)

Table 2. Yield and seed attributes of various Penergetic treatments on canola in 2024

Treatments	Yield (bu/ac)	% increase in yield relative to control	Protein (%)	Oil	Head count (plants/m ²)	Thousand Kernel Weight (g/1000 seeds)
T0	30.7	-	29.1	37.9	137	69.2
T1	31.5	3%	27.0	40.0	141	71.5
T2	32.7	6%	27.8	40.9	187	94.3
T3	35.7	15%	28.5	38.7	138	69.8
T4	33.7	9%	28.2	40.5	144.5	73.1
Mean	32.8	-	28.2	39.6	149.5	75.5
Coefficient of variation (%)	13.3	-	3.9	3.34	24.5	24.3

The highest seed yield (35.7 bu/ac) was recorded in Treatment 3 (T3), at 35.7 lb/ac. This treatment, as outlined above, included Penergetic K (200 g/ac) Soil Treatment before seeding, Penergetic P (100 g/ac) Foliar Enhancer at stem elongation, and standard fertility. The lowest yield (30.7 bu/ac) was in the control (T0)

All Penergetic treatments showed a yield increase over the control,

with Treatment 3 producing up to 15% more.

- **Protein content:** All treatments had high crude protein levels (>25%), exceeding the typical 20% in canola seeds.
- **Oil content:** Ranged from 37.9% to 40.9%.
- **Plant head count:** 137 to 187 plants per m².
- **Thousand kernel weight:** 69.2 to 94.3 g per 1,000 seeds. (Table 2)

Table 3. Soil nutrient availability after harvest, fall 2023 vs 2024.

Treatments	Year	P	K	Ca	Mg	Na	Zn	Mn	Fe	ENR
		ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	
T0	2023	54	152	1420	217	24	11.4	27	81	75
T1		34	124	1200	164	18	10.2	20	71	75
T2		37	208	1470	206	15	11.7	23	71	76
T3		49	368	1510	192	10	12.8	28	74	70
T4		35	290	1480	176	12	11.4	24	75	72
Mean		41.8	228.4	1416	191	15.8	11.5	24.4	74.4	73.6
P-value		<0.01	0.02	0.01	0.01	0.041	0.012	0.03	0.04	0.01
T0	2024	50	311	1950	233	11	16.8	31	89	76
T1		51	384	1800	237	10	16.8	32	81	69
T2		31	180	1580	226	16	13.4	28	73	78
T3		39	160	1540	216	16	14.4	23	76	75
T4		39	108	1500	229	21	12.7	23	79	72
Mean		42	228.6	1674	228	14.8	14.8	27.4	79.6	74
P-value		0.02	0.04	0.001	0.04	0.03	0.005	0.02	0.01	<0.01

ENR; Estimated Nitrogen Release, P; Phosphorus, K; Potassium, Ca; Calcium, Mg; Magnesium,

Na; Sodium, Zn; Zinc, Mn; Manganese, Fe; Iron.

In 2024, soil Phosphorus levels were similar in T3 and T4, as well as in the control, T0 and T1.

- **Potassium:** Highest in T1, lowest in T4.
- **Calcium:** Highest in T0.
- **Magnesium:** Ranged from 216 ppm (T3) to 237 ppm (T1). (Table 3)

- Compared to 2023, potassium increased significantly in T0 (159 ppm) and T1 (259 ppm).
- The highest **increase** in Calcium was in T1 (600 ppm).
- Overall, Penergetic treatments with lower application rates and 75% fertility (T1) showed higher soil Potassium and Phosphorus levels.

Table 4. Soil health indicators taken at 0-3" depth in fall of 2024

Treatments	Active Carbon (ppm)	CO ₂ Respiration (ppm)	Mineralizable Nitrogen (ppm)	Nitrogen Fixers	Total soil microbial activity	Total bacteria (ug/g)	Soil Fungi
T0	844	69	39	1836	13936	11154	1759
T1	905	33	25	2190	16460	11787	2273
T2	931	48	32	2130	16947	13163	2188
T3	947	46	31	1981	15024	12818	1269
T4	883	48	32	1951	14324	12016	1534
Mean	902	49	32	2018	15338	12188	1805
P-value	<0.001	0.023	0.041	0.01	0.021	0.011	<0.01

All Penergetic K Soil Amendments and Penergetic P Foliar Applications increased Soil Active Carbon (SAC) compared to the control (T0).

- T3 had the highest Soil Active Carbon (SOC).

- Penergetic treatments also led to more soil nitrogen fixers and higher microbial activity compared to the control.
 - T1 and T2 showed the highest improvements in these areas.

Conclusion

- Although no statistical difference in yield was found between treatments, there was a trend of higher yield with Penergetic product treatments, particularly for T3 compared to control.
- The Crude Protein (CP) and oil content were similar between treatments.
- A significant increase was found in soil Potassium (259 ppm) and Calcium (600 ppm) for T1.
- Active carbon, nitrogen fixers and total microbial activity were higher with all Penergetic treatments compared to the control.
- Overall, Penergetic applications did not have a significant impact on canola yield and quality. However, there was a noticeable trend of improved soil health indicators, especially in:
 - T1 (Penergetic K 200 g/ac + P 100 g/ac + 75% fertility)
 - T2 (Penergetic K 400 g/ac + P 100 g/ac + 75% fertility)
 - T3 (Penergetic K 200 g/ac + P 100 g/ac + standard fertility)



Assessing the Advantages of Using a Full-Season Cover Crop Blend for Forage Production and Soil Health in Alberta’s Peace Country Region

Funded by Covers & Co.

Introduction

Traditionally, cover crops are grown primarily to protect and improve soil health. Common examples include hairy vetch, peas, oats, barley, and brassicas such as radish and turnips. They can be planted as monocultures or species mixtures, offering benefits like erosion control, weed suppression, and enhanced soil structure. The effectiveness of cover crops often depends on the diversity and functional traits of the species used. In beef production systems, they also serve as valuable forage for cattle. Cover crops are categorized by growing season—either full-season or short 'shoulder season' types, which grow between the main crop's harvest and the next planting. These may include cool- or warm-season species, or a combination of both.

Objective

The objective of this field trial was to evaluate forage yield, nutritive value, and soil health impacts of a full-season cover crop blend (with and without dry fertilizer application) on a subsequent monoculture oat crop.

Methods

The project was carried out at the Fairview Research Farm (FRF). The experimental design was a randomized complete block design using three replications in small plots measuring 8 m x 1.14 m. Seeding was carried out using a 6-row Fabro Plot Drill equipped with disc-type openers on 23 cm row spacing, complete with mid-row banding.

Table 1. Summary of treatments in 2023 and 2024 growing seasons

Treatments	2023	2024
T1	Full-season cover crop blend with 100% fertilizer	Monoculture oats (CDC Haymaker), 0% fertilizer
T2	Full-season cover crop blend with no (zero) fertilizer	Monoculture oats (CDC Haymaker), 0% fertilizer
T3	Monoculture Oats with 100% fertilizer	Monoculture oats (CDC Haymaker), 0% fertilizer
T4	Monoculture Oats with no (zero) fertilizer	Monoculture oats (CDC Haymaker), 0% fertilizer



- In 2023, land was seeded to either a full-season cover crop blend or monocrop oats, and each of these treatments was further broken into either no fertilizer (0% application) or fertilizer at 100% of soil test recommendations.
- In 2024, a monoculture of oats was seeded across all previous treatments, and no fertilizer was applied.
- The monocrop oats were seeded at 300 plants/m².
- The full-season cover crop blend was seeded at a rate of 60 lbs/acre
- The full-season cover crop blend included:
 - Hairy vetch (4%)
 - Italian ryegrass (5%)
 - Spring triticale (3%)
 - Forage oats (23%)
 - Daikon radish (1%)
 - Berseem clover (2%)
 - Forage peas (25%)
 - Forage barley (20%)
 - Purple top turnip (1%)
 - Sorghum-Sudan (6%)
 - German millet (3%)
 - Flax (1%)
 - Sunflower (1%)
 - Non-GMO soybeans (3%)
 - Buckwheat (2%)
- During the growing season, Normalized Difference Vegetation Index (NDVI) was measured using the handheld Trimble Greenseeker® Optical Sensor, which was placed at 31 cm above the plant canopy.

- On July 30, 2024, four inner rows were harvested at the milk stage of forage oat using a custom-made self-propelled forage harvester.
- Fresh forage was weighed and subsamples (up to 650 g) were taken and dried for Forage Dry Matter content. The dried samples were shipped to A&L Laboratories, ON for feed quality analysis.
- At forage harvest, soil infiltration was measured using the single-ring method and soil samples at 0-6" were taken and shipped to the A&L Lab to evaluate soil health parameters.
- Raw data was analyzed using the R statistical software (version 4.2.3) to determine how the different treatments impacted yield and soil health indicators.

In Field Observations

Oat plants took advantage of the precipitation received during the early growing season. The soil remained moist for most of the season resulting in better stand establishment and growth. The plots were void of weeds. We monitored the re-growth ability of oats after harvest, but unfortunately, plants did not produce sufficient biomass for a second cut.





Figure 1. Oat plots during growing season



Figure 2. Re-growth of oats after harvest

Results (2024)

Forage Dry Matter (DM) of oat monocrop

The Forage Dry Matter yield of monoculture oats showed no significant difference between treatments ($P > 0.05$). This ranged between 3,292 lb/ac for T1 (plots previously seeded to full-season cover blend with 100% fertilizer) and 3,004.6 lbs/ac for T4 (plots previously seeded to monocrop oats with zero fertilizer). Although not statistically significant, T1 tended to produce higher forage DM yields compared to T2, T3, and T4 (Figure 3), possibly due to the residual benefits of the full-season cover crop blend and fertilization in the previous season.

Forage Nutritive Value

The Forage Nutritional Value of the oat forage showed no significant differences in Crude Protein (CP), Total Digestible Nutrients (TDN), Relative Feed Value (RFV), Calcium, Potassium, and Magnesium between treatments ($P > 0.05$).

- Phosphorus content varied across treatments:
 - T1 (full-season cover blend + 100% fertilizer): 0.25%
 - T2 (full-season cover blend + no fertilizer): 0.28%
 - T3 (monocrop oats + 100% fertilizer): 0.28%
 -
- Highest nutrient values by treatment:
 - T1 had the highest CP (14.3%), TDN (59.5%), RFV (100.7), and potassium (1.46%).
 - T2 had the lowest CP (13.7%).

The CP content is sufficient to meet the nutritional needs of all beef cattle categories.

The TDN content is only adequate for beef cattle in mid-gestation.

Soil health parameters of soil sampled at 0-3" in fall 2024

- Soil biological properties varied significantly between treatments ($P < 0.05$), except for nitrogen fixers.
- Overall, T4 (previously seeded to monoculture oats with no fertilizer) exhibited higher levels of active carbon, CO₂ respiration, mineralizable

nitrogen, Rhizobium bacteria, and total microbial activity compared to T1, T2, and T3.

Conclusion

Monoculture CDC Haymaker oats produced similar Forage Dry Matter Yield and nutritional values across all treatments (T1, T2, T3, T4), regardless of prior cover cropping or fertilizer use. While T1 (full-season cover crop with fertilizer) showed slightly higher forage yield and nutrient content, the differences were not statistically significant.

All treatments provided adequate protein to meet the needs of all cattle classes, though energy levels (TDN) may only be sufficient for animals in mid-gestation.

In this one-time rotation trial, T4 (previous monoculture oats with no fertilizer) demonstrated the highest soil biological activity, suggesting that even low-input systems can support strong soil health. So why higher in T4? T4 may have resulted in optimal conditions for microbial activity and nutrient cycling, particularly in this trial. However, it's important to note that growing oats after oats is not a recommended best management practice due to the increased risk of disease and yield decline over time.

Table 2. Nutritive value (DM basis) of oat monocrops harvested from plots previously seeded to full season cover crop blend and monoculture oats with or without fertilizer in Fairview, AB.

Treatments	CP (%)	TDN (%)	RFV	Calcium (%)	Phosphorus (%)	Potassium (%)	Magnesium (%)
T1	14.3	59.5	100.7	0.55	0.25	1.46	0.33
T2	13.7	58.5	97.2	0.54	0.28	1.31	0.36
T3	13.9	58.3	96.3	0.64	0.28	1.38	0.34
T4	13.9	58.2	97.4	0.57	0.26	1.36	0.33
CV	4.6	2.43	4.2	15.9	4.33	9.75	6.5
P value	0.76	0.69	0.59	0.55	0.049	0.61	0.57
Mean	13.9	58.6	97.8	0.57	0.27	1.37	0.34

P<0.05, CP; Crude Protein, TDN; Total Digestible Nutrients, RFV; Relative Feed Value, CV; Coefficient of Variation.

Table 3. Biological properties of soil sampled in 2024 at Fairview Research Site.

Treatments	Active Carbon (ppm)	CO ₂ Respiration (ppm)	Mineralizable Nitrogen (ppm)	Nitrogen Fixers	Rhizobium bacteria	Total microbial activity
T1	1037	70	39.3	1788.3	426	12454
T2	1037	75	41	1821.3	415	9833
T3	995	59.3	34.3	1620	497.3	11086.3
T4	1044	79	41.3	1975	922.3	12590
Mean	1028.3	70.8	39	1801.2	565.2	11490.8
p value	0.04	0.02	0.01	0.69	0.02	0.05
Significance	**	**	**	ns	**	*
CV (%)	3.67	25.7	16.5	19.8	57.8	23.7

T; treatments, CV; coefficient of variance, ppt; parts per million, ns – not significant; * - $p < 0.05$; ** - $p \leq 0.01$.

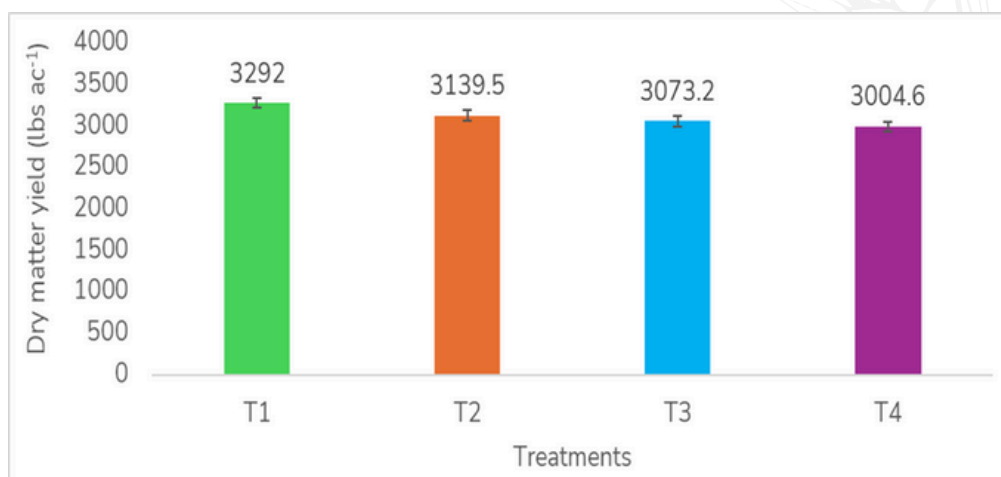


Figure 3. Dry matter yield (lbs/acre) of oats in 2024, following treatment implementation in 2023.

Effect of Different Biostimulants and Soil Amendments on Crop Production and Soil Health

Funded by: Peace Region Living Lab; Agriculture & Agri-Food Canada

Introduction and Objective

A plant biostimulant (PB) or soil amendment (SA) is any substance or microorganism applied to plants to enhance nutrition efficiency, abiotic stress tolerance, and/or crop quality traits. While some can cultivate improvement, their primary focus is not necessarily to increase nutrient content. There are dozens of plant biostimulant products on the market. Our trial examined various plant biostimulants and soil amendments to assess their impact on wheat crop yields, grain quality, and soil health characteristics. This project aims to support agronomic decisions and assist producers in optimizing their inputs to achieve improved economic and environmental outcomes.

What We Did

The project was implemented at the Fairview Research Farm (FRF). Table 1 gives the site history, soil information, treatments, field operations, and data collected for this trial.

The experimental design includes a randomized complete block design using four replications in small plots measuring 8 m x 1.14 m. Seeding was carried out using a 6-row Fabro Plot Drill with disc-type openers on 23 cm row spacing, with mid-row fertilizer placement.

The site received 10" of rainfall for the growing season (April 1 – Sept 30) and about 1,414 Growth Degree Days.

Observations

Despite the in-crop herbicide, the plots showed high weed pressure from volunteer canola. As such, hand weeding was required.

Results

Plant Counts

Plant emergent counts ranged from about 200 to 250 plants/m² and varied insignificantly between treatments. These are low compared to the target of 320 plants/m².

Wheat Seed Yields

Wheat seed yields averaged only 26.5 bu/ac and ranged from 17 to 34 bu/ac, but did not differ significantly between treatments. These yields are low, and the low plant counts and high weed pressure could be a possible explanation for this.

Wheat Seed Attributes

Thousand kernel weights and bushel weights ranged between 33.0 and 35.0 g/1000 seeds and 59 to 63 lbs/bu, respectively, and varied insignificantly between treatments. Protein content ranged between 16% and 18% and varied significantly ($p = 0.01$) between treatments.

Soil Health Properties

After combining wheat, fall soil samples showed that the **BIOCHARHUM**, i.e Biochar + Humalite + Standard Fertilizer treatment, had the highest organic matter. It also had:

- The highest pH
- The highest estimated Nitrogen Release Ratio, indicating potential nitrogen release from organic matter over a year
- The highest Phosphorus saturation, meaning more available Phosphorus in the soil

Table 1. Site information, soil history, treatments, field operations, and data collection.

Parameter/Task	Description
Site history and seedbed preparation	Wheat (2022), Canola (2023).
Site soil information at 0-6" soil depth	pH = 5.5; Organic matter = 4.0%; CEC = 11.3 meq/100g; Nutrient analysis of soil gave N (nitrate-N) = 14 ppm, P = 18 ppm, K = 102 ppm and S(sulphate-S) = 8 ppm. Soil base saturation was Ca = 46%, Mg = 19%, Na = 1.0%, K = 2.3% and H = 31.6%.
Pre-pass herbicide, rate, and date	Transorb Glyphosate @ 0.67L/acre in 40 L/acre of water on May 24
Treatments (7)	Control – Chem Fertilizer only [CONT] Biochar + Chem Fertilizer [BIOCHAR] Humalite + Foliar Fert + Chem Fertilizer [HUMFOF] Foliar Fert + Chem Fertilizer [FOFERT] Biochar + Humalite + Chem Fertilizer [BIOCHARHUM] Penergetic K + Penegetic P + Chem Fertilizer [PENEGKP] EcoTea (dry seed Rx) + EcoTea Foliar Fert + Chem Fertilizer [ECOTEA]
Seeding date and rate	May 17 with Brandon Wheat at 320 plants sq. m (29.6 plants per sq ft or 1.96 bu/ac)
Seeder and row spacing	6-row Fabro Small Plot with disc-type openers @ 9" row spacing
Seeding depth	3/4"
Nutrient recommendations for an average yield of wheat (56 bu/ac)	N, P ₂ O ₅ , K ₂ O, S - 41, 22, 12, 48 lbs/ac actual respectively)
In-crop spray, rate, and date	@ Low rates (0.24L/ac of Flu + 0.28 L/ac MCPA + 0.084 L/ac for Clopy) on June 18th 2024
Desiccant	Heat LQ @43 ml/ac + glyphosate @ 1 L/ac + Merge @400 ml/ac on Sept 06, 2024 for cereal
Grain harvest stage and date	Ripening stage on September 18
Harvest method	Small-plot combine
Area harvested	6.5 – 7.5 m ² on average
Data Collected	Plant height Grain yield Grain attributes (thousand kernel weight, bushel weight) Grain quality (protein content) Soil health characteristics

Conclusion and Implications

The findings suggest that plant emergence, wheat seed attributes, and canola yields were largely unaffected by the different treatments. However, soil health showed notable improvements under the **BIOCHARHUM** treatment. Higher organic matter, pH, estimated Nitrogen Release Ratio, and Phosphorus saturation indicate enhanced soil fertility, which could lead to long-term benefits

such as improved nutrient availability, better water retention, and sustained crop productivity. The low wheat yields were likely due to low plant counts and high weed pressure observed in the test plots. We plan to stay on top of the weed situation in 2025 by using a Liberty Link canola hybrid in the wheat-canola rotation and will also seed into the wheat stubble.

Table 2. Plant counts, grain yield and wheat seed attributes.

Treatment	Plant Counts (plants/m ²)	Yield (bu/ac)	TKW (g/1000 seeds)	BW (lbs/bu)	Protein (%)
CONT	214	28.6	33.5	62.7	16.4
BIOCHAR	190	25.8	35.2	62.9	17.3
HUMFOF	240	17.4	34.6	62.8	17.4
FOFERT	236	23.7	33.2	62.5	16.3
BIOCHARHUM	220	33.7	35.0	62.7	17.6
PENEGKP	207	26.2	35.3	62.6	16.7
ECOTEA	254	31.7	33.8	62.5	16.2
MEAN	220	26.5	34.6	62.3	16.8
p-value	0.59	0.11	0.32	0.27	0.01
LSD	106	15.4	3.9	4.3	1.2

TKW – Thousand Kernel Weight; BW – Bushel Weight

Table 3. Effect of Plant Biostimulants & Soil Amendments on Soil Health Properties
(standard deviation in brackets, n=2)

Treatment [#]	Organic Matter (%)	pH	ENR (lbs/ac)	PERP (%)	KMG
CONT	3.9 (0.9)	5.9 (0.3)	50.5 (9.2)	6.0 (1.4)	0.2 (0)
BIOCHAR	3.8 (0.1)	6.1 (0.4)	49.5 (0.7)	7.0 (0)	0.3 (0.1)
HUMFOF	3.9 (0.6)	5.8 (0.4)	51.0 (5.7)	6.0 (1.4)	0.2 (0)
FOFERT	3.8 (0.7)	5.7 (0.1)	50.5 (7.1)	6.0 (2.8)	0.2 (0.1)
BIOCHARHUM	4.1 (0.1)	6.2 (0.2)	52.5 (0.7)	7.0 (0)	0.2 (0.1)
PENEGKP	3.7 (0)	5.8 (0.4)	49.0 (0)	6.5 (0.7)	0.3 (0)
ECOTEA	3.6 (0.1)	6.1 (0.1)	48.0 (1.4)	6.0 (0)	0.2 (0.1)
MEAN	3.8 (0.4)	5.9 (0.3)	50.1 (3.9)	6.4 (1.1)	0.2 (0.1)

[#]See able 1 for full names of Treatments; **ENR** – Estimated Nitrogen Release; **PERP** – Percent Saturation of Phosphorus; **KMG** – Potassium: Magnesium Ratio

Evaluation of Early Seeded Multiple-Cuts Winter Cereals for Livestock Feed as a Drought Management Strategy in Alberta.

Funded by Results Driven Agriculture Research (RDAR)

Background & Objective

Since 2021, many regions in Alberta have faced severe drought and grasshopper infestations, with over 30% decline in crop yields. These conditions have forced producers to overgraze pastures to feed their livestock, compromising forage recovery and productivity for the following year. Seeded in the fall, winter cereals offer an early-season grazing option for livestock, allowing stressed perennial pastures more recovery time. Alternatively, spring-seeded winter cereals remain vegetative through summer and fall, providing additional forage when production from spring cereals declines after July.

This province-wide study (carried out at four different sites throughout the province) aims to provide unbiased regional data on the establishment, dry matter yield and nutritional quality of ultra-early spring-seeded winter cereals as livestock feed in Alberta. It compares cereals seeded in cooler soils (2-6°C) with those seeded at warmer temperatures (>10°C) and evaluates their potential for additional forage production for livestock during the growing season. The study also assesses the impact of soil and climate types on forage yield and quality for early-seeded winter cereals.

Adopting early seeded winter cereals in Alberta can enhance drought management, increase grazing days, reduce production costs, and alleviate mental health stress for producers by ensuring adequate livestock feed.

Methods

Fairview Research Farm (FRF) at RR 35 Fairview, AB, served as one of the four sites for this 3-year project. Table 1 gives the site history, soil information, treatments, field operations, and data collected for this trial. The experimental design includes a randomized complete block design using four replications in small plots measuring 8m x 1.14m. Seeding was carried out using a 6-row Fabro Plot Drill with disc-type openers on 23 cm row spacing, complete with mid-row banding. The site received 10" of rainfall for the growing season (April 1 – Sept 30) and about 1,414 Growth Degree Days.



Table 1. Site information, soil history, treatments, field operations, and data collection

Parameter/Task	Description		
Site history and seedbed preparation	Summer fallow and harrowed in early spring		
Site soil information at 0-6" soil depth	pH = 5.5; Organic matter = 4.0; CEC = 11.3 meq/100g; Nutrient analysis of soil gave N = 14 ppm, P = 18 ppm, K = 102 ppm and S = 8 ppm. Soil base saturation was Ca = 46%, Mg = 19%, Na = 1.0%, K = 2.3% and H = 31.6%.		
Pre-emergent herbicide, rate, and date	Transorb Glyphosate @ 0.67L/acre @ 40 ml/acre on May 24th		
Treatments (11) and seeding rates			
	Variety	Species	Seed Rate (plants/sq ft)
	AC Branco	Winter Triticale	29
	AB Provider	Winter Triticale	29
	KWS Serafino	Fall rye	24
	SU Performer	Fall rye	24
	AC Hazlet	Fall rye	24
	AAC Coldfront	Winter Wheat	23
	AAC Wildfire	Winter Wheat	23
	Tadeus	Winter Wheat	29
	Pintail	Winter Wheat	23
	CDC Austenson	Spring Barley	23
AC Brandon	Spring Wheat	23	
Seeding date	1 st seeding window (between 2 – 6°C) – Not seeded* 2 nd seeding window (above 10.0°C) – May 14 th , 2024		
Seeding temperature and moisture @ 6"	1 st seeding window (between 2 – 6°C) – Not seeded* 2 nd seeding window (above 10.0°C) – 12.6°C, 7.1 % vwc		
Seeder and row spacing	6-row Fabro Small Plot with disc-type openers @ 9" row spacing		

Seeding date	1 st seeding window (between 2 – 6°C) – Not seeded* 2 nd seeding window (above 10.0°C) – May 14 th , 2024
Seeding temperature and moisture @ 6"	1 st seeding window (between 2 – 6°C) – Not seeded* 2 nd seeding window (above 10.0°C) – 12.6°C, 7.1 % vwc
Seeder and row spacing	6-row Fabro Small Plot with disc-type openers @ 9" row spacing
Seeding depth	3/4"
Nutrient recommendations for an average silage yield of 2 tons/ac	N, P, K, S - 55, 30, 16, 64 lbs/ac Actual respectively lbs/ac Total.
In-crop spray, rate, and date	@ Low rates (0.24L/ac of Flu + 0.28 L/ac MCPA + 0.084 L/ac for Clopy) on June 18th 2024 at 4-5 leaves stage.
Harvest dates	Initial cut – July 19th Regrowth – Oct 25th
Harvest method	Forage plot harvester
Area harvested	≈ 3.0 m ² on average
Data Collected	Normalized Difference Vegetation Index (NDVI) - Forage yield (initial cut and regrowth) Forage quality

*Funding for the project was accepted late, when soil temperatures had already surpassed the required (2 – 6°C).

Results

Forage DM Yield

DM Yield obtained from the initial cut varied significantly between treatments, with the two spring cereal controls (CDC Austenson barley and AC Brandon wheat) out-yielding all the winter cereals by over 5 times. (Table 2).

- NDVI readings obtained before the initial harvest significantly ($p < 0.02$) differed between treatments but, interestingly, correlated ($R^2 = - 0.14$, $p = 0.34$) poorly with initial forage DM yields.

- Forage DM Yield of regrowth widely ranged between 2,000 – 4,800 lbs/ac but did not significantly differ between treatments.
- No clear patterns emerged for the DM Yields of the regrowths.
- CDC Austenson barley (Control 1) produced the highest Forage DM Yield in this trial.

Forage Quality

Forage Quality Differences:

- Most winter cereals, except Tadeus (Winter Wheat), had higher **Crude Protein (CP)** than both spring cereal controls.
- Winter cereals had lower **Neutral Detergent Fiber (NDF)** (ranging 45–48%) than spring cereals (56–58%).
- Spring cereals tended to have higher **Acid Detergent Fiber (ADF)** and **Energy (TDN)** ($p = 0.07$) than winter cereals.

Mineral Content:

- No significant differences in **macro minerals** (Ca, P, K, Mg) were observed among the cereal crops.
- **Microminerals** were similar, except that **Manganese (Mn)** varied.

Regrowth Quality:

- Winter cereals maintained better overall forage quality than spring cereals.
- **Tadeus** (Winter Wheat) had the **lowest protein** (14.4%).

- **NDF** (45–55%) remained similar, but **ADF** and **TDN** (23–35% and 61–71%) varied significantly.
- **AC Brandon** had the lowest digestibility (34.6%).

Mineral Variation in Regrowth:

- Macro minerals varied; spring cereals had lower levels, except for Tadeus (Winter Wheat).
- **Microminerals:** Copper (2.6–7.2 ppm), Iron (162–317 ppm), Manganese (48–135 ppm).
- **AC Brandon** had the **lowest micromineral** levels.

Conclusion and Implications

- Despite lower initial yields, winter cereals offer high-quality regrowth, demonstrating strong potential to extend the grazing season and reduce dependence on stored forages.
 - Winter cereals show strong potential due to their higher crude protein (CP) content and lower neutral detergent fibre (NDF), which enhances digestibility and supports the nutritional needs of growing cattle and lactating cows. Among the varieties tested, Tadeus—a winter wheat—was atypical, differing from the others in protein content for both the initial cut and subsequent regrowth.

- Spring cereal controls provided a high initial Forage DM Yield and ample early-season forage. They also offered good regrowth Forage DM Yields. Mineral supplementation, especially for Calcium and Phosphorus, is necessary for growing calves and lactating cows when fed on the spring cereals tested in this study.
- Some treatments (e.g., AC Brandon wheat) have higher ADF and lower TDN, indicating reduced energy availability, and therefore require additional supplementation for high-performance cattle.
- Integrating spring and winter cereals better optimizes forage availability and quality year-round, with strategic supplementation needed to address mineral and energy gaps.



Figure 1. Forage harvesting of plots

Table 2: Forage DM Yield of winter cereal and spring cereal checks (2nd seeding window - temperature > 10° C)

Treatments	NDVI [§]	DM Yield - Initial Cut* (lbs/ac)	DM Yield - Regrowth [#] (lbs/ac)	Average DM Yield (lbs/ac)
AC Branco (WT)	0.59	520	3140	1487
AB Provider (WT)	0.48	536	2957	1475
KWS Serafino (FR)	0.62	616	2575	1347
SU Performer (FR)	0.64	689	3199	1643
AC Hazlet (FR)	0.59	821	2950	1651
AAC Coldfront (WW)	0.55	531	3442	1627
AAC Wildfire (WW)	0.61	876	4454	2196
Tadeus (WW)	0.56	556	4238	1995
Pintail (WW)	0.55	771	2630	1437
CDC Austenson (SB) [†]	0.56	3515	4760	3765
AC Brandon (SW) [‡]	0.46	3114	2004	3100
MEAN	0.57	1140	3294	1975
p-value	0.02	0.001	0.32	0.003
LSD	0.05	852	3128	1770

NDVI – normalized difference vegetative index; DM – dry matter; WT – winter triticale; FR – fall rye; WW – winter wheat; SB – spring barley; SW – spring wheat; LSD – least significant difference.

[§]NDVI reading taken on 07/19/2024

*DM Yield (initial) taken on 07/19/2024

[#]DM Yield (regrowth) taken on 10/25/2024

[†]Check treatment

Table 3: Forage Quality of winter cereal and spring cereal checks (2nd seeding window - temperature > 10° C)

Treatments	CP %	NDF %	ADF %	TDN %	Ca %	P %	K %	Mg %	Cu ppm	Fe ppm	Mn ppm
AC Branco (WT)	26.8	45.9	27.5	67.4	0.54	0.28	3.4	0.34	8.0	332	145
AB Provider (WT)	25.5	46.9	28.0	67.1	0.56	0.27	3.0	0.29	8.1	757	144
KWS Serafino (FR)	26.6	44.6	25.4	69.1	0.53	0.29	3.3	0.35	8.1	501	136
SU Performer (FR)	26.6	45.8	26.7	68.1	0.54	0.33	4.0	0.33	8.2	400	135
AC Hazlet (FR)	26.4	47.0	27.6	67.4	0.59	0.35	3.7	0.34	8.8	363	130
AAC Coldfront (WW)	26.0	46.4	27.2	67.7	0.35	0.30	3.0	0.25	6.7	342	95
AAC Wildfire (WW)	24.7	47.7	28.7	66.5	0.39	0.30	3.1	0.27	6.1	292	94
Tadeus (WW)	18.3	44.7	26.6	68.2	0.49	0.27	3.0	0.27	7.7	332	137
Pintail (WW)	23.9	47.1	28.2	66.9	0.39	0.29	2.9	0.27	6.4	443	95
CDC Austenson (SB) [†]	17.1	55.5	33.4	62.9	0.41	0.21	1.8	0.27	6.8	345	59
AC Brandon (SW) [†]	15.5	58.1	35.9	60.9	0.33	0.20	1.9	0.25	6.0	279	75
MEAN	24.1	47.3	28.1	67.0	0.48	0.29	3.1	0.30	7.5	407	118
p-value	0.001	0.002	0.07	0.07	0.47	0.11	0.12	0.71	0.82	0.91	0.02
LSD	7.90	7.92	7.99	6.23	0.41	0.13	1.93	0.2	5.61	924	80.5

WT – winter triticale; FR – fall rye; WW – winter wheat; SB – spring barley; SW – spring wheat; LSD – least significant difference.

Table 4: Forage Quality of regrowth of winter cereal and spring cereal checks (2nd seeding window)

Treatments	CP %	NDF %	ADF %	TDN %	Ca %	P %	K %	Mg %	Cu ppm	Fe ppm	Mn ppm
AC Branco (WT)	24.4	46.3	25.6	69.0	0.35	0.26	2.9	0.26	6.6	162	128
AB Provider (WT)	24.0	46.9	24.6	69.7	0.45	0.28	2.6	0.26	7.0	317	158
KWS Serafino (FR)	25.1	45.6	23.2	70.8	0.37	0.30	2.7	0.28	7.2	230	48
SU Performer (FR)	26.0	46.5	24.6	69.8	0.40	0.33	3.3	0.21	6.5	169	135
AC Hazlet (FR)	25.5	47.9	26.2	68.5	0.47	0.37	3.0	0.27	6.9	239	126
AAC Coldfront (WW)	23.5	45.6	24.3	70.0	0.27	0.32	2.7	0.21	5.6	162	94
AAC Wildfire (WW)	22.4	48.6	26.6	68.2	0.29	0.31	2.7	0.21	5.0	129	76
Tadeus (WW)	14.4	44.8	23.1	70.9	0.28	0.23	1.7	0.17	5.3	132	95
Pintail (WW)	21.8	48.6	25.2	69.2	0.30	0.29	2.4	0.21	4.6	131	82
CDC Austenson (SB) [†]	13.9	44.8	25.7	68.9	0.25	0.21	0.7	0.17	4.1	196	48
AC Brandon (SW) [†]	10.6	54.9	34.6	61.9	0.26	0.12	0.5	0.16	2.6	196	48
MEAN	22.3	47.0	25.2	69.3	0.35	0.29	2.5	0.23	5.9	187	111
p-value	0.001	0.54	0.01	0.01	0.001	0.03	0.001	0.001	0.006	0.51	0.06

WT – winter triticale; FR – fall rye; WW – winter wheat; SB – spring barley; SW – spring wheat; LSD – least significant difference.

References

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Evaluation of the Ecosystem Services and Profitability of Perennial Cereal Grain Crops (PCGC) for Integrated Grain and Forage Production in Alberta

Funded by Results Driven Agriculture Research (RDAR)

Collaborators: University of Alberta, Mackenzie Applied Research Association (MARA), Gateway Research Organization (GRO), Battle River Research Group (BRRG), Chinook Applied Research Association (CARA)

This dual-purpose research study, initiated in 2022, focused on both grain and forage production. The research extensively examined the potential of perennial cereal-legume intercropping systems to provide both high-quality forage and grain yield. We used two Perennial Cereal Grain Crops (PCGC) and three legumes. Key focus areas included forage productivity and quality, ecosystem functions (such as nitrogen fixation by legumes and subsequent transfer to perennial grain yields), and the effects of the cropping system on soil properties and overall soil health. By investigating these dual-purpose objectives, the study aims to enhance sustainable agricultural practices, improve long-term productivity, and promote soil health across diverse agroecosystems in Alberta.

This province-wide project, coordinated by PCBFA, established research plots at six locations: Fairview, Breton, Westlock, Fort Vermilion, Forestburg, and Oyen. The project is led by Cosmas Ugwu, a Ph.D. candidate at the University of Alberta,

working under the supervision of Dr. Guillermo Hernandez and Dr. Akim Omokanye. Fieldwork began in 2022, marking the first production year, and concluded in the summer of 2024, the third production year. This report highlights the findings from the Fairview Research Farm (PCBFA). A comprehensive summary of results and take-home messages from all sites will be released in 2026.

Objectives

In the final field year (2024), we evaluated the second-year productivity of forage and grain from intercropping PCGC with legumes, seeded in both alternate and same-row seeding methods. Additionally, we measured the nitrogen fixed by legumes within forage stands and assessed soil health improvements by analyzing key indicators, including chemical, physical, and biological properties.

Methodology

The trial took place at the Fairview Research Farm (FRF). The experimental design was a randomized complete block design with four replications in small plots measuring 8 m x 1.14 m. Seeding was carried out using a 6-row Fabro Plot Drill equipped with disc-type openers on 23 cm row spacing, complete with side banding. Table 1 shows treatments tested, establishment and management. Specific field work carried out in 2024 included:

- Bi-weekly Normalized Difference Vegetation Index (NDVI), soil moisture, soil compaction, and temperature measurements.
- 15N isotope application for nitrogen fixation measurements in early spring.
- Plant tissue analyses on the perennial cereals.
- Soil sampling to determine nitrate concentration.
- Forage and grain yield estimation (dual purpose utilization).

Table 1. Treatments, field operations, and data collection.

	Seeding Date	June 2022
	Harvest Date	July 2024, Late summer 2024
	Seeding Depth	½" (Clover, Alfalfa) 1" (Sainfoin, Perennial Cereals)
	Seeding Rate	Monocultures were seeded at 100% of their normal seeding rates, while intercropping treatments were seeded at 100% of the cereal's seeding rate and 50% of the legume's seeding rate. ACE-1 Perennial Rye - 260 plants/m ² Kernza® Perennial Wheat - 320 plants/m ² Sainfoin - 125 plants/m ² Alfalfa - 300 plants/m ² White Clover - 350 plants/m ²
	Soil Temp	12° C from 0-6" soil depth at seeding
	Treatments (Forage Mixtures)	Three legume species (alfalfa, sainfoin, and white clover) were intercropped with two PCGC varieties (Intermediate Wheatgrass variety Kernza® and Perennial Rye variety ACE-1), along with monocultures of Kernza® wheatgrass and ACE-1 perennial rye, resulting in a total of eight different treatments. The seeding method used was either in the same row (SR) or Alternate Rows (AR) for intercropping.
	Varieties	Kernza® wheatgrass, ACE-1 perennial rye, AC Yellowhead alfalfa, AAC Glenview sainfoin, and white clover.
	Field Operations	Plot maintenance: Not applicable Bi-weekly measurements for NDVI, moisture, compaction, and temperature readings were conducted.
	Data Collection	Bi-weekly measurements (NDVI, soil compaction, moisture & temperature measurement), plant tissue samples for nutrient measurement, soil sampling for HYPROP (water retention curve), forage yield, grain yield, forage quality samples, 15N samples for nitrogen fixation analyses, soil nitrogen and carbon samples.

In Field Observations

At the Fairview Research Farm:

- Ergot was present in perennial rye heads, but no disease was observed in perennial wheat.
- The growing season started dry, but received 240 mm of precipitation, with high temperatures early in the season that persisted through summer.
- In 2022, ACE-1 perennial rye was a lush, well-established stand.
- In 2023 and 2024, severe winterkill in ACE-1 perennial rye led to reduced regrowth.
- Perennial wheat showed resilience, maintaining strong growth and foliage throughout the season.
- Legume varieties were scanty in many same-row-seeded plots, making them hard to locate.
- Sparse ACE-1 perennial rye stands and winterkill increased weed pressure, which is expected to continue into 2025 due to the lack of herbicide applications in 2023 and 2024.



Figure 1. Perennial cereal and legume intercrop at the Fairview site



Figure 2. Bi-weekly soil moisture measurements at Fairview Research Farm

Results

Forage Dry Matter (DM) Yield

There was a noticeable trend in Forage Dry Matter (DM) yield and grain yield across different treatments and seeding methods.

- Figure 3 shows that the highest Forage Dry Matter yield was found in the Kernza wheatgrass-Alfalfa treatment (8009 lbs/ac), followed by Kernza wheatgrass-Sainfoin (6703 lbs/ac) and Kernza wheatgrass-White Clover (6443 lbs/ac).
- The monocrop Kernza wheatgrass treatment yielded slightly lower forage (6475 lbs/ac) but still higher than the ACE-1 perennial rye treatments (Figure 3).
- In general, Kernza wheatgrass treatments produced higher Forage Dry Matter yields than ACE-1 perennial rye treatments.

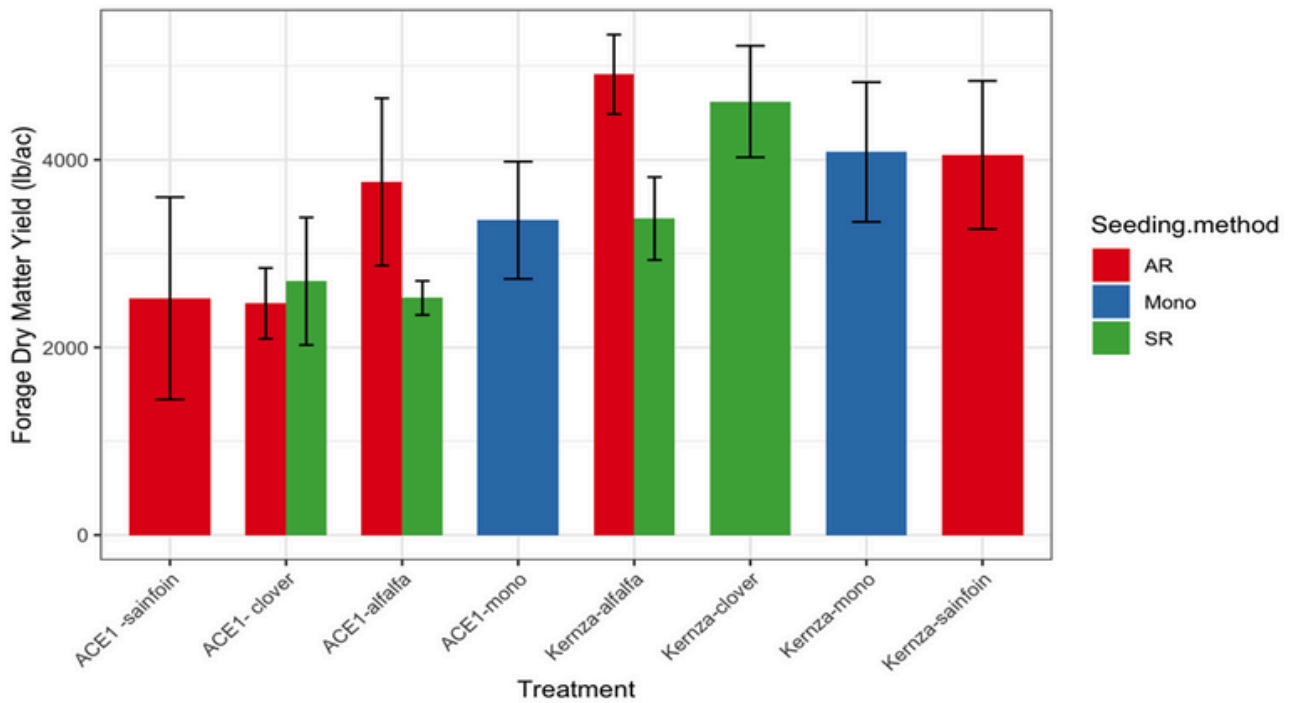


Figure 3. Forage dry matter yield (lbs/ac) at Fairview Research Farm in Alternate Row (AR), Same Row (SR), or Monocrop seeding methods for 2024.

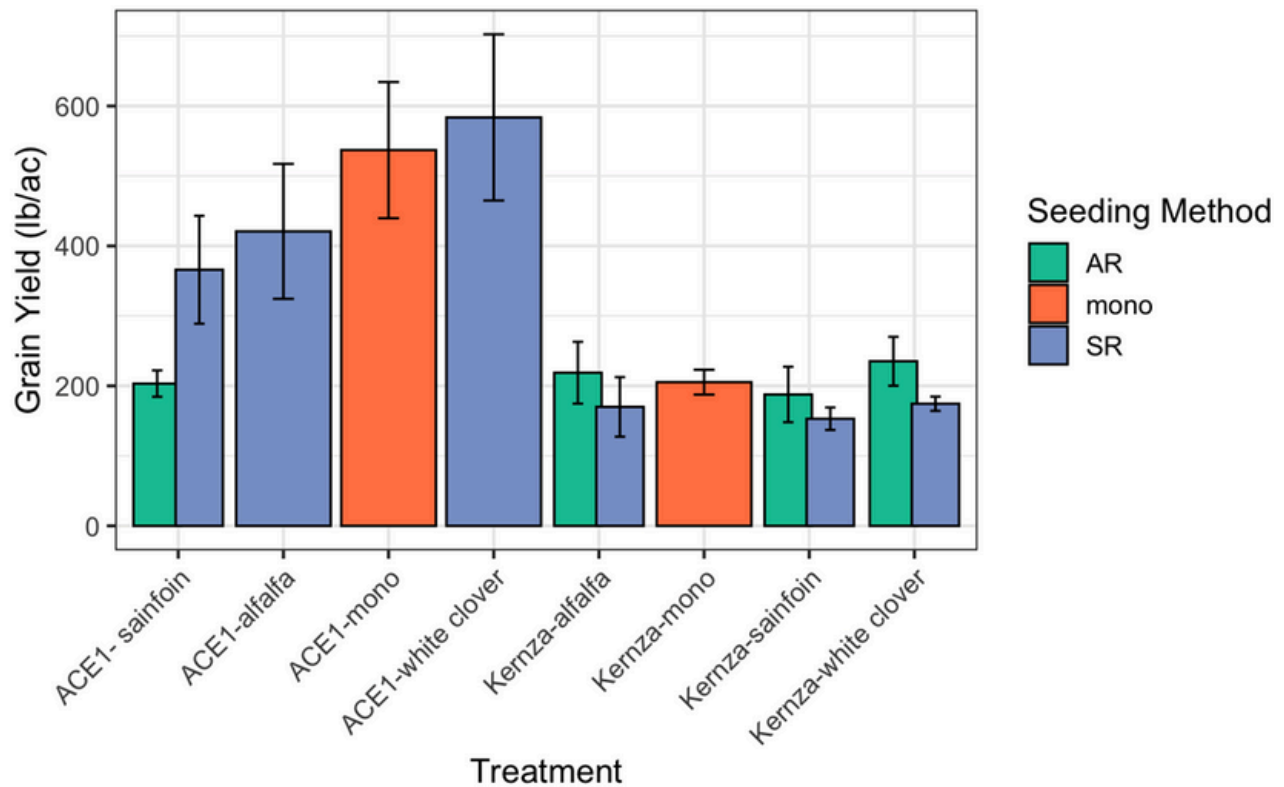


Figure 4. Grain yield (lbs/ac) of KENZA® wheatgrass and ACE-1 perennial rye at Fairview site in Alternate Row (AR) and Same Row (SR), or Monocrop seeding methods in 2024.

In Field Observations

PCGC Grain Yield at Fairview Research Farm for 2024

For grain yield, the ACE-1 perennial rye-Sainfoin treatment had the highest yield at 1,230 lbs/ac, followed by ACE-1 perennial rye-White Clover (584 lbs/ac) and ACE-1 perennial rye-Alfalfa (299 lbs/ac). The ACE-1 perennial rye Monocrop treatment produced 419.1 lbs/ac.

- Kernza® wheatgrass-Alfalfa: 250.4 lbs/ac
- Kernza® wheatgrass-Sainfoin: 227.3 lbs/ac
- Kernza® wheatgrass monocrop: 206.2 lbs/ac

While Kernza® wheatgrass treatments excelled in forage dry matter yield, the ACE-1 perennial rye treatments performed better in grain yield.

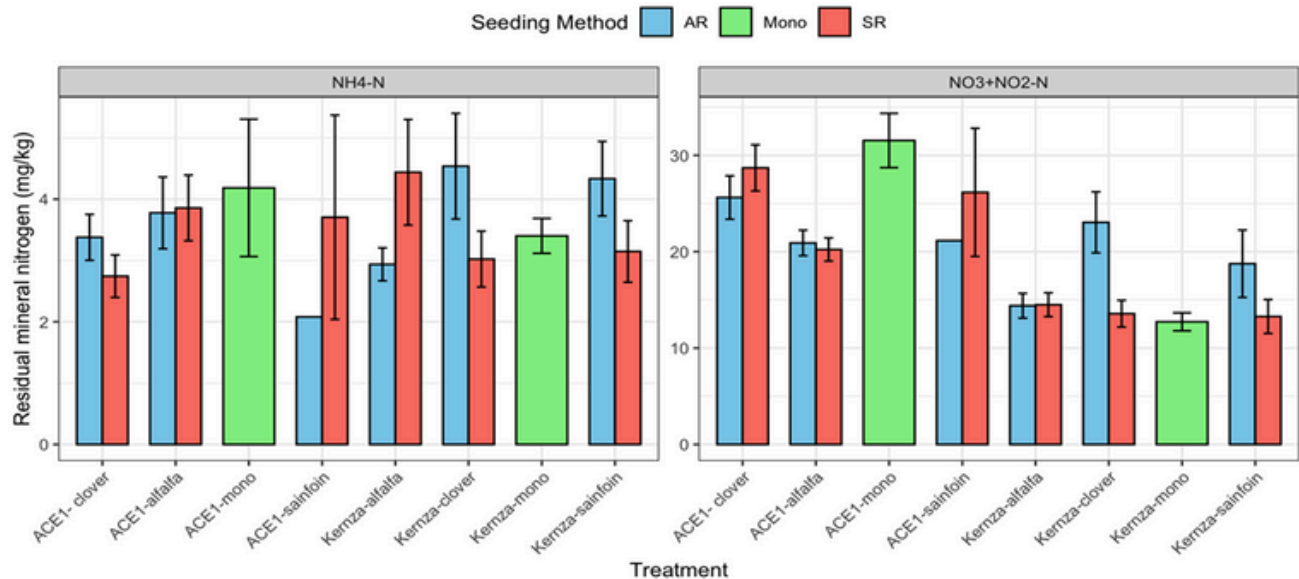


Figure 4. Soil mineral nitrogen measured from 0-6" soil samples taken from Fairview site in the fall of 2023

The residual nitrogen levels after the 2023 fall harvest showed notable differences in ammonium (NH₄-N) and nitrate/nitrite (NO₂+NO₃-N).

- Ammonium levels were low across all treatments, ranging from 2 to 4 mg/kg.
- Nitrate levels were higher in ACE-1 perennial rye-Clover and ACE-1 perennial rye Monocrop, ranging from 18 to 32 mg/kg.

The higher nitrate levels, especially in the ACE-1 perennial rye monocrop, indicate that nitrogen remained in a form easily usable by plants. This residual nitrogen could potentially reduce the need for synthetic fertilizers in the future.



Forage Quality

The 2024 PCGC project at the Fairview Research Farm showed significant differences in forage nutritive value across treatments.

- Kernza® wheatgrass treatments combined with alfalfa and white clover had slightly higher Crude Protein (CP) than the ACE1 perennial rye cereal treatments. For example, Kernza® wheatgrass -Alfalfa had the highest CP at 11.5% (Table 1).
- In terms of fiber content, ACE-1 perennial rye combined with sainfoin or white clover had the lowest Neutral Detergent Fiber (NDF) (53.2%) and Acid Detergent Fiber (ADF) (40.2%), which suggests better intake and digestibility.

- Conversely, Kernza® wheatgrass Monocrop and Kernza® wheatgrass treatments with white clover had the highest Total Digestible Nutrients (TDN) at 56%.
- Neutral Detergent Fiber (NDF) digestibility at 48 hours (NDFD-48) was highest in Kernza® wheatgrass - White Clover and Kernza® wheatgrass Monocrop, indicating improved digestibility over time (Table 1).

These results highlight the nutritional diversity among forage treatments, offering useful insights for optimizing livestock feed strategies.

Table 1. A summary of forage and grain production, and forage quality indicators at the FRF in 2024

Forage mixture	Seeding method	Dry matter yield (lb/ac)	Grain yield (lb/ac)	Crude protein (%)	NDF (%)	ADF (%)	TDN%	NDFD-48
Kernza® wheatgrass Monocrop	Same row	6475	206	11.4	59.4	40.9	56.5	49.6
Kernza® wheatgrass - Sainfoin	Same row	6703	227	10.1	59.9	44.3	54.1	45.0
Kernza® wheatgrass- Alfalfa	Same row	8009	250	11.5	59.9	41.6	55.5	48.1
Kernza® wheatgrass- White Clover	Same row	6443	194	11.7	59.6	40.2	56.3	49.8
ACE-1 perennial rye Monocrop	Alternate row	1454	419	11.6	58.6	40.8	56.4	48.9
ACE-1 perennial rye- Sainfoin	Alternate row	1100	1230	12.3	53.2	43.8	55.7	41.4
ACE-1 perennial rye- Alfalfa	Alternate row	2397	299	13.2	54.0	42.3	55.8	43.6
ACE-1 perennial rye- White Clover	Alternate row	1917	584	-	-	-	-	-
Coefficient of variation, %		31.0		19.5	35.8	-	-	-
p-value		0.357		0.012	0.33	0.012	0.0929	0.468

Conclusion

The 2024 PCGC project at the Fairview Research Farm revealed distinct trends in forage and grain productivity. Kernza® wheatgrass consistently outperformed ACE-1 perennial rye in forage dry matter yield, especially under same-row seeding configurations. In contrast, ACE-1 perennial rye produced higher grain yields, highlighting its potential as a grain-focused perennial cereal. These results suggest that Kernza® wheatgrass

is better suited for forage production, while ACE-1 perennial rye may be more favourable for grain yield, particularly when intercropped with legumes such as sainfoin and white clover.

Soil health indicators, including nitrate levels, also demonstrated the beneficial effects of legume intercropping on soil fertility. These early findings point to a promising approach for integrated forage-grain systems that enhance both productivity and sustainability

Longevity and Ecosystem Services of Perennial Forage Mixtures

Funded by Results Driven Agriculture Research (RDAR)

Perennial forage is key to beef cattle production systems. This project evaluates the long-term performance of already established perennial forage stands, both as mixtures and monocultures (pure grasses and pure legumes), across two locations in the Peace Region: Fairview and DeBolt. Research on the longevity of perennial forages is vital for developing resilient, cost-effective forage systems amid climate change and price volatility in forage seed and beef cattle markets.

Objective

- Determine the Dry Matter (DM) Yield and nutritional value of perennial forage mixtures, monoculture grasses, and legumes.
- Evaluate the effects of legumes (in both pure stands and mixtures) on water-use efficiency.
- Assess weed suppression, longevity, and the decline of forage stand over time.

Methods

The project was implemented at the Fairview Research Farm (FRF) (Range Rd. 35) and DeBolt (Township Rd. 740). The stands in Fairview were established in June 2020, whereas those at the DeBolt site were seeded in May 2021.

Grass species/varieties, legume

species/varieties, and grass-legume mixtures were established in separate blocks, each replicated four times, using small plots measuring 8 m × 1.14 m. Seeding was conducted with a 6-row Fabro Small Plot Drill, featuring disc-type openers spaced 23 cm apart and equipped for side banding.

The forage nutritive value indicators presented here are on a dry matter basis.



Table 1. Treatments, field operations, and data collection.

	Seeding Date	Fairview: June 2020 DeBolt: May 2021
	Harvest Date	Fairview: July 12, 2024 DeBolt: July 18, 2024
	Seeding Depth	¾"
	Seeding Rate	According to standard monoculture seeding rates for legumes and grasses. See 2023 PCBFA Annual Report for details
	Soil Temp and Moisture	N/A
	Treatments	Fairview site: 27 legumes (including varieties of Alfalfa, Sainfoin, AC Cicer Milkvetch, and Birdsfoot Trefoil), 24 mixtures comprising grass-legume mix, all-grass mix, all-legume mix, and 35 monoculture grasses. DeBolt site: 15 mixtures consisting of grass-legume mix, all-legume mix, and all-grass mix, 20 monoculture grasses, and 20 legumes comprising varieties of Alfalfa, Sainfoin, AC Cicer Milkvetch, and Birdsfoot Trefoil.
	Varieties Included	Alfalfa: Peace, Beaver, Trueman, AC Grazeland, Anik, AC Yellowhead. Sainfoin: AC Mountainview, AC Glenview. Birdsfoot trefoil: Bull. AC Cicer milkvetch: Veldt. Grasses: Hybrid bromegrasses, timothy, orchard grass, meadow brome, Italian rye, wheatgrass.
	Field Operations	Plot maintenance: Weed whacking in-between plots and trimming back plots. Forage harvest using a self-propelled custom-made forage harvester.
	Data Collection	Soil volumetric water content, soil sampling nutrients, forage yield and quality, and surface infiltration rates.

In Field Observations

Fairview Research Farm site: Forage stands received sporadic precipitation from mid-May until mid-June. After this, the site was hit with a temporary dry spell until forage harvest. A closer look at the individual species within mixtures showed that the proportions of sainfoin species had declined similarly to monoculture sainfoin stands.

DeBolt site: Received precipitation was fairly well distributed during the growing season. The sainfoin had declined within stands, but AC cicer milkvetch and birdsfoot trefoil had increased significantly in proportions.



Figure 1. Legume variety plots at the DeBolt site



Figure 2. Soil sampling at the Fairview site

Results

Forage Dry Matter (DM) Yield

Fairview Site

Legume Varieties (27 Tested Varieties):

- We observed significant differences in DM yield among the legume species and varieties.
- The top five highest-yielding legume varieties varied from 5,489 to 5,779 lbs/ac for Rugged alfalfa, Spredor 4 alfalfa, Boost HG alfalfa, Anik alfalfa, and AC Grazeland alfalfa (Table 2).
- Lowest yielding legumes:
 - ACC Mountainview sainfoin (2,697 lbs/ac)
 - ACC Veldt cicer milkvetch (2,481 lbs/ac)
 - Bull birdsfoot trefoil (2,093 lbs/ac)
 - (Table 2)

Monoculture Grasses:

- Forage DM yield also varied widely among grasses.



- Top five highest yields (Table 2):
 - AC Saltlander wheatgrass: 3,528 lbs/ac
 - to Palatin reed canarygrass: 2,172 lbs/ac
- Lowest yields:
 - Fojtan festulolium: 590 lbs/ac to AC Success hybrid brome grass: 699 lbs/ac
 - (Table 2)

Forage Mixtures:

- Forage mixtures also differed widely in DM yield.
- Top five highest-yielding mixtures, out of 24 mixtures (Table 2):
 - Meadow brome grass + Greenleaf pubescent wheatgrass + AC Yellowhead alfalfa (M11): 5,176 lbs/ac
 - AC Success hybrid brome grass + AC Yellowhead alfalfa (M3): 4,730 lbs/ac
- Lowest-yielding mixtures:
 - M0: 1,773 lbs/ac
 - M13: 1,973 lbs/ac
 - (Table 2)

Overall, the DM yield of forage harvested from the Fairview site followed the order legumes > mixtures > grasses.

DeBolt Site

Legumes (20 Tested Varieties):

- Also widely varied in DM yield.

- Top five highest-yielding alfalfa varieties:
 - Rugged alfalfa: 8,045 lbs/ac to AC Yellowhead alfalfa: 7,374 lbs/ac (Table 3)
- Lowest-yielding legumes (Table 3):
 - Bull birdsfoot trefoil: 5,080 lbs/ac
 - AC Veldt cicer milkvetch: 3,133 lbs/ac
 - ACC Mountainview sainfoin: 2,338 lbs/ac

Monoculture Grasses:

- Significant differences in DM yield existed.
- Highest yielding monoculture grass:
 - Greenleaf pubescent wheatgrass: 4,393 lbs/ac
- Lowest yielding monoculture grass:
 - Savoury tall fescue: 1,812 lbs/ac
 - (Table 3)

Forage Mixtures (15 mixtures):

- Significant variations in DM yield ($P < 0.05$).
- Top five yielding mixtures:
 - Haymix: 9,937 lbs/ac to Cattlemans forage mix: 7,703 lbs/ac
- Lowest three yielding mixtures:
 - All Grass Pasture mix "0": 4,574 lbs/ac
 - Bloat-free legume mix (33% AC Mountainview sainfoin + 33% AC Veldt cicer milkvetch + 33% birdsfoot trefoil): 4,138 lbs/ac
 - Horsemans Forage mixture: 3,892 lbs/ac

Overall, the forage mixtures yielded higher than both monoculture legumes and grasses. The trend of DM yield was forage mixtures>legumes>grasses.

Forage Nutritive Value

Many forage nutritive value measurements were evaluated, however, a selected few have been reported here. This includes Crude Protein (CP), Total Digestible Nutrients (TDN), and Relative Feed Value (RFV).

Fairview Site

Crude Protein (CP)

Significant differences were observed in monoculture grasses and mixtures, but no differences in monoculture legumes were seen.

Legumes:

- Top five legumes (highest CP):
 - Spredor 5 alfalfa: 16.3% to Dalton alfalfa: 16.8%
- Lowest CP legumes:
 - AC Veldt cicer milkvetch: 14.8%
 - Bull birdsfoot trefoil: 13.5%
 - ACC Mountainview sainfoin: 13.5%

Monoculture grasses:

- Top five grasses (highest CP)
 - Killarney orchard grass: 12.9% to Cowgirl tall fescue: 11.9%
- Lowest CP legumes:
 - Rocky Mountain fescue: 8.2%

Forage Mixtures:

- **Highest in legume-dominated mixtures**, e.g., AC Yellowhead alfalfa + Rugged alfalfa + AC Veldt cicer milkvetch + ACC Mountainview sainfoin + birdsfoot trefoil (M16): 17.3%
- **Lowest in grass-only mixtures**, e.g., AC Success hybrid brome grass + Greenleaf pubescent wheatgrass + Kirk crested wheatgrass + Italian ryegrass + smooth meadow brome grass (M13): 9.5%

Overall CP Trend: Legumes > Grass-legume mixtures > Grass-only mixtures.

Total Digestible Nutrients (TDN):

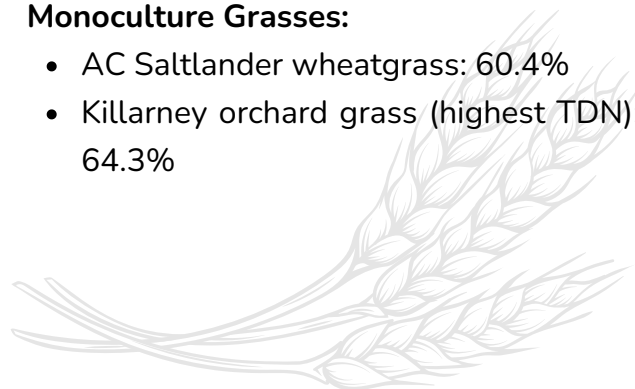
- Significant differences across legumes, grasses, and mixtures were observed.

Legumes:

- Top five legumes (highest TDN):
 - ACC Mountainview sainfoin and AC Veldt cicer milkvetch: 61.4%
- Lowest TDN legumes:
 - HPS premium coated alfalfa: 55.9%

Monoculture Grasses:

- AC Saltlander wheatgrass: 60.4%
- Killarney orchard grass (highest TDN): 64.3%



Forage Mixtures:

- **Highest in grass-only mixtures**, e.g., AC Success hybrid brome grass + Greenleaf pubescent wheatgrass + Kirk crested wheatgrass + Italian ryegrass + smooth meadow brome grass (M13): 61.2%
- **Lowest in legume-dominated mixtures**, e.g., ACC Mountainview sainfoin + Spredor 5 alfalfa + AC Veldt cicer milkvetch (M14): 55%

Overall TDN Trend: Monoculture grasses > All-grass mixtures > Legumes.

Relative Forage Value (RFV):

Legumes:

- Top five legumes (highest RFV):
 - Boost HG alfalfa: 119.3 to Peace alfalfa: 112.8
- Lowest RFV legumes:
 - Algonquin alfalfa: 102.3
 - AC Yellowhead alfalfa: 103.7
 - Halo alfalfa: 100.8

Monoculture Grasses:

- Highest RFV grass forage:
 - HTK or festulolium: 112.9
- Lowest grass forage:
 - Rocky Mountain fescue: 82.0

Forage Mixtures:

- **Highest in legume and grass-legume mixtures**, e.g., AC Success hybrid brome grass + Greenleaf pubescent wheatgrass + AC Yellowhead alfalfa: 108.3

- **Lowest in all-grass mixtures**, e.g., Fleet meadow brome grass + AC Yellowhead alfalfa + ACC Mountainview sainfoin (M0): 91.5

Overall RFV Trend: Legumes > Grass-legume mixtures > Monoculture grasses.

A higher RFV means better forage quality — **more digestible and more intake**, which typically supports **better beef cattle performance**.

DeBolt Site

Crude Protein (CP)

- Significant differences in CP for monoculture grasses, legumes, and mixtures (**P<0.05**).

Legumes:

- Top five legumes (highest CP):
 - AC Veldt cicer milkvetch: 18.8%
- Lowest CP legumes:
 - ACC Mountainview sainfoin: 15.8%
 - Algonquin alfalfa: 15.7%
 - Anik alfalfa: 13.6%

Monoculture Grasses:

- Cowgirl tall fescue (highest): 11.2%
- Kirk crested wheatgrass (lowest): 6.6%



Forage Mixtures:

- **Highest in all-legume mixtures**, e.g., AC Yellowhead alfalfa + Rugged alfalfa + AC Veldt cicer milkvetch + ACC Mountainview sainfoin + birdsfoot trefoil: 17.5%
- **Lowest in grass mixtures**, e.g., All Grass Pasture Mix “0”: 6.9%

Overall CP Trend: Legumes > Grass-legume mixtures > Monoculture grasses.

Total Digestible Nutrients (TDN)

- Significant differences in TDN for grasses, legumes, and mixtures ($P < 0.05$).

Legumes:

- Top five legumes (highest TDN):
 - AC Veldt cicer milkvetch: 62.2%
- Lowest TDN legumes:
 - Halo alfalfa: 52.1%
 - Rugged alfalfa: 51.7%
 - Beaver alfalfa: 50.5%

Monoculture Grasses:

- Highest TDN:
 - Fojtan festulolium: 61.4%
 - Milkway tall fescue: 59.9%

Forage Mixtures:

- Highest in all-grass mixtures, e.g., All-grass mix: 59.3%
- Lowest in legume-dominated mixtures, e.g., All-legume mix: 48.7%

Overall TDN Trend: Grass forages > Grass-only mixtures > Legume mixtures.

Relative Forage Value (RFV)

Legumes:

- Top five legumes (highest RFV):
 - AC Veldt Cicer Milkvetch: 112.4
 - ACC Mountainview Sainfoin: 105.3
 - Bull Birdsfoot Trefoil: 103.3
- Lowest RFV legumes:
 - Beaver Alfalfa: 86.4

Grass Monocultures:

- Highest RFV grasses:
 - Fojtan festulolium: 91.2
 - Comtail timothy: 88.9
 - Richmond timothy: 85.7
- Lowest RFV grasses:
 - AC Success hybrid brome grass: 70.8

Forage Mixtures:

- Highest in legume-dominated mixtures, e.g., Bloat-free legume mix: 97.4
- Lowest in all-grass mixtures, e.g., All Grass Pasture Mix “0”: 70.7

Overall RFV Trend: Legumes > Grass-legume mixtures > Monoculture grasses.



Conclusion

Forage Dry Matter (DM) Yield

The DM yield results from both sites demonstrated that alfalfa varieties outperformed other legume species, such as sainfoin, cicer milkvetch, and birdsfoot trefoil. Among the top-performing varieties, **Rugged alfalfa** yielded the highest DM at both the **Fairview** (5,779 lbs/ac) and **DeBolt** (8,045 lbs/ac) sites. Similarly, the **Legumaster** mixture (55% sainfoin, 25% cicer milkvetch, 20% Spredor 5 alfalfa) also showed high DM yield, suggesting these varieties are adaptable to various agro-ecological zones.

At the **Fairview** site, legumes generally had higher DM yields than **monoculture grasses** and **grass-legume mixtures**. At **DeBolt**, **grass-legume mixtures** outperformed **monoculture grasses** and **monoculture legumes**. Overall, **monoculture grasses** and **all-grass mixtures** exhibited the lowest DM yields across both sites. However, grasses such as **reed canary grass**, **meadow brome**, and **wheat grasses** demonstrated the potential for high forage productivity.

Crude Protein (CP)

The CP content varied significantly across forage types. The highest CP values were found in **AC Veldt cicer milkvetch** (18.8%) and **all-legume mixtures** (17.3%). Grasses, on the other hand, generally had lower CP values. Most of the forages met

the CP requirements for beef cattle across different categories (7-9-11%). However, grasses like **Peak brome**, **Kirk crested wheatgrass**, and **all grass Pasture mix "0"** fell short of the 7% CP threshold.

Total Digestible Nutrients (TDN)

TDN values ranged from **48.7% to 64.3%** across all treatments. **Monoculture grasses** and **all-grass mixtures** showed the highest TDN, with **orchard grass** exceeding 64%. **Legumes** and **legume-dominated mixtures** generally had lower TDN values. Many legume-dominated mixtures did not meet the TDN requirements for **beef cattle** during **mid-gestation** (55%), **late-gestation** (60%), and **post-calving** (65%). In contrast, **monoculture grasses** and **all-grass mixtures** met the required TDN levels. Since TDN is essential for maintaining body temperature during extreme weather (such as winter), producers feeding low TDN diets will need to supplement, which can increase production costs.

Relative Forage Value (RFV)

RFV, an indicator of forage intake and digestibility, was higher in **legumes** and **legume mixtures** compared to **monoculture grasses** and **grass mixtures**. All **alfalfa** varieties, **sainfoin**, **birdsfoot trefoil**, and **cicer milkvetch** had higher RFV, meaning these legumes offer better intake and digestibility. In comparison, grasses showed lower RFV values.

Table 2. Top five yielding legumes, grasses, and mixtures versus three poorest yielding at the Fairview site.

Legume Forage	Dry Matter Yield (lbs/ac)	Grass Forage	Dry Matter Yield (lbs/ac)	Forage Mixtures	Dry Matter Yield (lbs/ac)
Rugged alfalfa	5,779.3	AC Saltlander wheatgrass	3,528.7	Mix 11	5,176.0
Spredor 4 alfalfa	5,698.3	Bellevue reed canary grass	2,610.0	Mix 1	4,962.2
Boost HG alfalfa	5,673.8	Admiral meadow brome	2,469.5	Mix 2	4,885.8
Anik alfalfa	5,647.6	AC Armada meadow brome	2,343.0	Mix 14	4,777.0
AC Grazeland alfalfa	5,489.7	Palatin reed canary grass	2,172.6	Mix 3	4,730.6
AC Mountainview sainfoin	2,697.5	AC Succession hybrid brome	699.0	Mix 10	2,812.7
AC Veldt cicer milkvetch	2,481.5	KY Early timothy	694.2	Mix 15	1,973.4
Bull birdsfoot trefoil	2,093.1	Fojtan festulolium	590.4	Mix 0	1,773.9
CV (%)	14.1	-	15.9	-	11.8
P value	0.0002	-	0.0025	-	0.0003

CV, coefficient of variation. LSD, least significant difference.

Note: The first five are the highest-yielding varieties, whereas the last three are the lowest-yielding.

Table 3. Top five yielding legumes, grasses, and mixtures versus three poorest yielding at the DeBolt site.

Legume Forage	Dry Matter Yield (lbs/ac)	Grass Forage	Dry Matter Yield (lbs/ac)	Forage Mixtures	Dry Matter Yield (lbs/ac)
Rugged alfalfa	8,045.3	Greenleaf pubescent WG	4,393.4	Haymix #1	9,937.1
Dalton alfalfa	7,859.3	Fleet Meadow Brome	4,303.9	Legumaster	9,369.0
Peace alfalfa	7,739.0	Peak brome	4,247.9	Haygraze Forage Mixture	9,258.7
Halo alfalfa	7,684.0	MBA meadow brome	4,202.1	All Legume Mix	8,053.0
AC Yellowhead alfalfa	7,374.2	Reed canary grass	3,821.3	Cattlemans Forage Mixture	7,703.8
Bull birdsfoot trefoil	5,080.3	Hktor festulolium	2,039.7	All Grass Pasture mix "0"	4,574.4
AC Veldt cicer milkvetch	3,133.4	Cowgirl tall fescue	1,915.8	Bloat-Free Mix	4,138.4
AC Mountainview sainfoin	2,338.4	Savoury tall fescue	1,812.1	Horsemans Forage Mixture	3,892.8
CV (%)	9.1	-	8.7	-	13.8
P value	<0.0001	-	0.015	-	0.003

CV, coefficient of variation. LSD, least significant difference.

Note: The first five are the highest-yielding varieties, whereas the last three are the lowest-yielding.

Table 4. Nutritive value on DM basis (Crude Protein, Total Digestible Nutrients, Relative Feed Value) of top five and lowest three legume varieties from the Fairview site.

Legume forage	CP (%)	Legume forage	TDN (%)	Legume forage	RFV
Dalton alfalfa B	16.8	AC Mountainview sainfoin	61.4	Boost HG alfalfa	119.3
Halo 2 alfalfa	16.6	AC Veldt cicer milkvetch	61.4	Dalton alfalfa B	115.9
Phabulous alfalfa	16.5	Boost HG alfalfa	60.1	Halo 2 alfalfa	113.5
AC Grazeland alfalfa	16.4	Bull birdsfoot trefoil	59.7	Phabulous alfalfa	114.3
Spredor 5 alfalfa	16.3	PV Ultima alfalfa	59.0	Peace alfalfa	112.8
AC Mountainview sainfoin	13.5	Algonquin alfalfa	56.6	Algonquin alfalfa	102.3
AC Veldt cicer milkvetch	14.8	Halo alfalfa	56.5	AC Yellowhead alfalfa	103.7
Bull birdsfoot trefoil	13.5	HPS Premium Coated alfalfa	55.9	Halo alfalfa	100.8
CV (%)	11.5	-	2.9	-	7.9
P value	0.78	-	0.016	-	0.039
LSD	11.5	-	3.6	-	18.2

CV, coefficient of variation. LSD, least significant difference.

Note: The first five are the varieties with superior nutritive value, whereas the last three are the poorest.



Table 5. Nutritive value on DM basis (Crude Protein, Total Digestible Nutrients, Relative Feed Value) of top five and lowest three grass varieties from the Fairview site.

Grass forage	CP (%)	Grass forage	TDN (%)	Grass forage	RFV
Killarney orchard grass	12.9	Killarney orchard grass	64.3	HTKor festulolium	112.9
Comtail timothy.	12.0	Blizzard orchard grass	64.0	Killarney orchard grass	107.5
Rival reed canary grass	11.9	Perun festulolium	63.7	Cowgirl tall fescue	107.1
Blizzard orchard grass	11.8	Rival reed canary grass	63.7	Blizzard orchard grass	107.0
Cowgirl tall fescue	11.9	Oracle fescue	63.0	Perennial ryegrass	106.3
KY Early timothy	8.4	AC Saltlander wheatgrass	60.0	Bellevue reed canary grass	92.8
Rocky Mountain fescue	8.2	Bellevue reed canary grass	60.4	AC Saltlander wheatgrass	89.9
AC Armada meadow brome	8.5	Admiral meadow brome	60.4	Rocky Mountain fescue	82.0
CV (%)	13.9		2.31		6.5
P value	0.0048		0.004		0.0005
LSD	2.31		2.35		10.5

CV, coefficient of variation. LSD, least significant difference.

Note: The first five are the varieties with superior nutritive value, whereas the last three are those with the lowest.

Table 6. Nutritive value on DM basis (Crude Protein, Total Digestible Nutrients, Relative Feed Value) of top five and lowest three forage mixtures from the Fairview site.

Forage Mixture	CP (%)	Forage Mixture	TDN (%)	Forage Mixture	RFV
M16	17.3	M13	61.2	M12	108.3
M22	16.1	M0	60.4	M4	108.2
M5	16.46	M15	59.9	M5	106.2
M6	15.5	M22	58.9	M16	107.4
M4	15.5	M4	58.7	M8	103.7
M15	9.17	M23	55.9	M18	92.5
M0	9.9	M20	55.7	M19	93.5
M13	9.5	M14	55.0	M7	91.5
CV (%)	9.7	-	2.7	-	6.1
P value	0.0001	-	0.0001	-	0.0128
LSD	2.3	-	2.6	-	10.0

CV, coefficient of variation. LSD, least significant difference.
 Note: The first five are the varieties with superior nutritive value, whereas the last three are those with the lowest.



Table 7. Nutritive value (Crude Protein, Total Digestible Nutrients, Relative Feed Value) of top five and lowest three legume varieties from the DeBolt site.

Legume forage	CP (%)	Legume forage	TDN (%)	Legume forage	RFV
AC Veldt cicer milkvetch	18.8	AC Veldt cicer milkvetch	62.2	AC Veldt cicer milkvetch	112.4
Peace alfalfa	18.5	Bull birdsfoot trefoil	58.3	AC Mountainview sainfoin	105.8
55Q27 alfalfa	18.2	Mountainview sainfoin	57.6	Bull birdsfoot trefoil	103.3
Assalt alfalfa	17.7	PV Ultima alfalfa	56.6	Assalt alfalfa	100.4
54VQ54 alfalfa	17.4	Assalt alfalfa	56.1	PV Ultima alfalfa	99.7
Mountainview sainfoin	15.8	Beaver alfalfa	50.5	Algonquin alfalfa	85.7
Algonquin alfalfa	15.7	Rugged alfalfa	51.7	Anik alfalfa	85.9
Anik alfalfa	13.6	Halo alfalfa	52.1	Beaver alfalfa	86.4
CV (%)	15.6	-	6.31	-	10.5
P value	0.04	-	0.03	-	0.048
LSD	4.3	-	5.7	-	16.5

CV, coefficient of variation. LSD, least significant difference.

Note: The first five are the varieties with superior nutritive value, whereas the last three are those with the lowest.

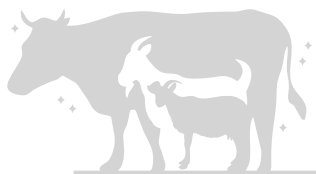


Table 8. Nutritive value on DM basis (Crude Protein, Total Digestible Nutrients, Relative Feed Value) of top five and lowest three grass varieties from the DeBolt site.

Grass Forage	CP (%)	Grass Forage	TDN (%)	Grass Forage	RFV
Cowgirl tall fescue	11.2	Fojtan festulolium	61.4	Fojtan festulolium	94.0
Savoury tall fescue	10.5	Milkway tall fescue	59.9	Comtail timothy	88.9
Fojtan festulolium	10.1	AC Knowles hybrid brome	59.8	Richmond timothy	85.7
Comtail timothy	9.9	Cache meadow brome	58.1	Cowgirl tall fescue	84.2
MBA meadow brome	9.6	Richmond timothy	57.6	Milkway tall fescue	87.0
AC Success hybrid brome	7.1	Cowgirl tall fescue	54.9	Admiral meadow brome	76.9
Peak brome	6.9	Savoury tall fescue	54.9	AC Success hybrid brome	76.7
Kirk crested wheatgrass	6.6	Fleet meadow brome	54.0	Fleet meadow brome	74.4
CV (%)	15.9	-	4.6	-	8.5
P value	0.017	-	0.042	-	0.018
LSD	2.3	-	4.4	-	11.6

CV, coefficient of variation. LSD, least significant difference.

Note: The first five are the varieties with superior nutritive value, whereas the last three are those with low nutritive value.

Table 9. Nutritive value on DM basis (Crude Protein, Total Digestible Nutrients, Relative Feed Value) of top five and lowest three forage mixtures from the DeBolt site.

Forage Mixture	CP (%)	Forage Mixture	TDN (%)	Forage Mixture	RFV
All Legume mix	17.5	All Grass Mix	59.3	Bloat-free Legume Mix	97.4
Legumeaster	15.4	Sallinemaster Mix	56.1	All Grass Mix	84.9
Bloat-free Legume Mix	15.2	Bloat-free Legume Mix	56.2	All Legume Mix	85.7
Haygraze Forage Mx	13.8	All Grass Pasture mix "0" Mix	53.6	Legumeaster	83.8
Extreme Legume Mix	13.7	Horseman's Forage Mix	54.4	Extreme Legume Mix	82.7
Sallinemaster Mix	8.7	Legumeaster	49.2	Haymix #1	74.0
All Grass Mix	7.9	Haygraze Forage Mix	50.2	Cattlemans Forage Mix	72.9
All Grass Pasture Mix "0"	6.9	All Legume Mix	48.7	All Grass Pasture Mix "0"	70.7
CV (%)	13.3	-	6.3	-	9.3
P value	0.0001	-	0.0005	-	0.0011
LSD	2.3	-	4.7	-	10.4

CV, coefficient of variation. LSD, least significant difference.

Note: The first five are the varieties with superior nutritive value, whereas the last three are those with low nutritive value.



Assessing Replenish Nutrient Products on Forage Productivity and Soil Health in the Peace Country Region of Alberta

Collaborators and Funders: Replenish Nutrients

Introduction

Regenerative agriculture has garnered significant attention in Canada over the years. This approach involves implementing farming strategies that leverage natural processes to boost biological activity, improve soil health, enhance nutrient cycling, and reduce dependency on synthetic inputs. These practices aim to restore landscape functionality, support sustainable food and fiber production, and maintain or improve farm profitability. The application of biofertilizers can play an important role in building soil health through biological processes and the timely release of nutrients. In the medium and long-term, soil health can improve soil fertility and increase crop production. The Replenish Nutrient product “HESO” is a soil probiotic fertilizer (0-9-20-20) that has the potential of helping to achieve this goal.



Figure 1. Established alfalfa plant, site #1

Objectives

To evaluate the effects of such biofertilizers, this research was conducted with the following goals;

- To evaluate the impact of different application rates on forage yields.
- To assess plant nutrient uptake at late vegetative and early flowering stages of growth.
- To compare the effects of Replenish Nutrients products at different application rates on soil health outcomes.

Methods

Field research commenced in the spring of 2024 involving two sites, Fairview (site #1, Township Rd 824) and Brownvale (site #2, legal land description SW-33-82-25 W5). The research design was a completely randomized design with 3 replications. Each replicate contained three strips measuring 10m wide x 25m in length.



Figure 2. Established alfalfa plant, site #1

Table 1. Field operations and data collection

	Seeding Date	Site #1: May 22 Site #2: Already established perennial stand.
	Harvest Date	Site #1: October 22 (after the plants have gone dormant) Site #2: July 11
	Seeding Depth	3/4"
	Seeding Rate	Site #1: Alfalfa = 8 lbs/ac, Brome and Timothy = 15 lbs/ac.
	Surface Soil Temp and Moisture	Site #1: 13.4 °C and 11.2% volumetric moisture content
	Treatments	Site #1 & Site#2: T0: Control, 0% Replenish Nutrient HESO application T1: 100 lbs/acre of Replenish Nutrient HESO application T2: 200 lbs/acre of Replenish Nutrient HESO application
	Crop Species/Varieties	Site #1 and #2: Yellowhead and purple flowered alfalfa, brome and timothy.
	Field Operations	• Site #1: Replenish Nutrient HESO application to strips on May 22. • Site #2: Replenish Nutrient HESO application to strips on May 21. • Baseline soil sampling in the spring before treatments application
	Data Collection	Plant tissue collection and analysis Botanical composition estimates Forage dry matter yield determination Sampling for soil health parameters in Fall (0-6" soil depth) Raw data was analyzed using R Statistical Software

Results

Forage Dry Matter (DM) Yield

Site #1:

- No significant difference in DM yield between treatments ($P > 0.05$).
- DM yield generally varied from 1537-1701 lbs/ac (Figure 3)

Site #2:

- Significant differences in DM yield between treatments ($P < 0.05$).
- T1 had the highest forage yield.
- T2 recorded the lowest yield. (Figure 4)
- No significant difference between T0 and T1, but both yielded 385–445 lbs/ac more than T2.

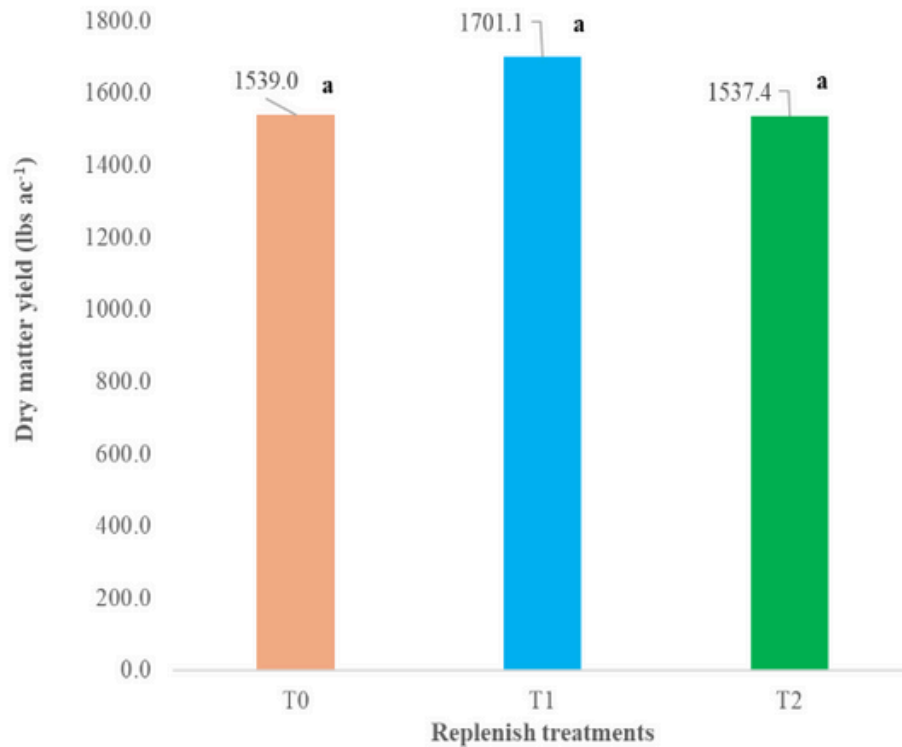


Figure 3. The forage dry matter (DM) yield accrued from the application of Replenish Nutrient's HESO product (Site #1). T1 (100 lbs/acre rate application) had a higher yield than T2 (200 lbs/ac rate application) and T0 (control). However, no difference was found between T0 and T1. Same letter denotes no statistical difference in DM yield.

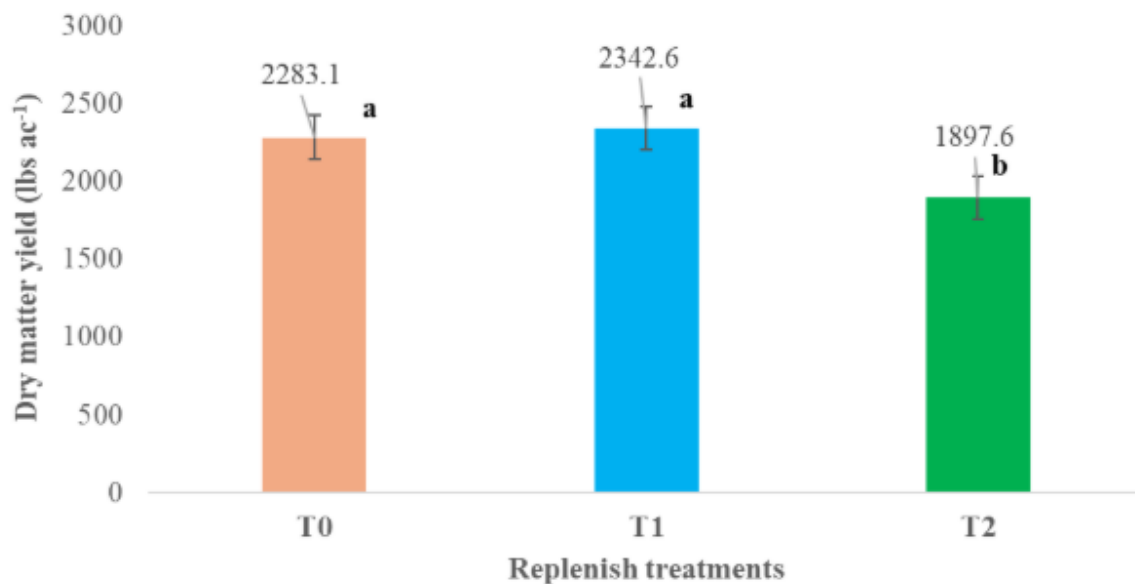


Figure 4. The forage dry matter (DM) yield accrued from the application of Replenish Nutrient's HESO products (Site #2). T1 (100 lbs/ac rate application) had a higher yield than T2 (200 lbs/ac rate application) and T0 (control). However, no difference was found between T0 and T1. Same letter denotes no statistical difference in DM yield.

Forage Nutritive Value

Site #1:

- Significant differences in CP, NDFD-48hr, Calcium, Potassium, and Magnesium ($P < 0.05$).
- No significant variation in TDN, RFV, and Potassium.
- Higher CP and Calcium in T0 (control) and T1 (100 lbs/ac application).
- Highest NDFD-48hr in T1 and T2 (200 lbs/ac application).
- High Phosphorus in T0 and high magnesium in T1. (Table 2)

Site #2:

- No significant differences in Forage Nutritive Value ($P > 0.05$).
- Slight numerical differences observed:
 - RFV in T0
 - NDFD-48hr in T2
 - Potassium in T1 (Table 3)

Table 2. Nutritive value of forage harvested from three treatments in site #1.

Treatments	CP (%)	TDN (%)	RFV	Calcium (%)	Potassium (%)	Phosphorus (%)	Magnesium (%)	NDFD 48hr
T0	15.0	63.3	112.9	1.49	1.19	0.28	0.31	52.9
T1	15.9	62.0	116.0	1.59	1.13	0.25	0.44	48.3
T2	11.8	64.1	117.7	1.32	1.25	0.24	0.39	53.1
P-value	0.045	0.210	0.454	0.031	0.628	0.003	0.002	0.008
Mean	14.26	63.13	118.86	1.47	1.19	0.25	0.38	51.46
CV	10.76	1.86	5.34	5.18	11.75	2.62	4.79	2.04

$P < 0.05^*$; T; treatments, CP; crude protein, TDN; total digestible nutrients, RFV; relative feed value, NDFD 48hr; neutral detergent fiber digestibility.

Table 3. Nutritive value of forage harvested from three treatments in site #2.

Treatments	CP (%)	TDN (%)	RFV	Calcium (%)	Potassium (%)	Phosphorus (%)	Magnesium (%)	NDFD 48hr
T0	13.9	60.9	117.7	1.36	1.61	0.29	0.23	49.3
T1	13.3	61.7	114.0	1.27	1.72	0.30	0.28	51.3
T2	13.5	62.6	109.8	1.08	1.54	0.29	0.22	54.4
P-value	0.08	0.58	0.51	0.39	0.23	0.73	0.73	0.44
Mean	13.6	61.8	113.8	1.24	1.62	0.29	0.25	51.7

$P < 0.05^*$; CP; crude protein, TDN; total digestible nutrients, RFV; relative feed value, NDFD ; neutral detergent fiber digestibility.

Plant Tissue Analysis

Nitrogen (N):

- At the late vegetative stage, nitrogen (N) availability differed significantly among treatments ($P < 0.05$).
- T1 had the highest N, while T0 and T2 had equal amounts.
- At early flowering, N concentrations were lower, with no significant differences between treatments.
- N levels for both stages remained within the acceptable range (1.79 - 2.50%).

Sulphur (S) & Phosphorus (P):

- No significant differences in S and P at any growth stage ($P > 0.05$).
- S levels were below the standard range (0.29 - 0.45%), while P was sufficient (0.17 - 3.0%).

Potassium (K):

- Late vegetative stage: T2 had the highest K, while T0 and T1 had the lowest. (Figure 5)
- Early flowering stage: T1 had the highest K, while T2 had the lowest.
- Overall, K concentrations remained within the acceptable range (1.59 - 2.50%).

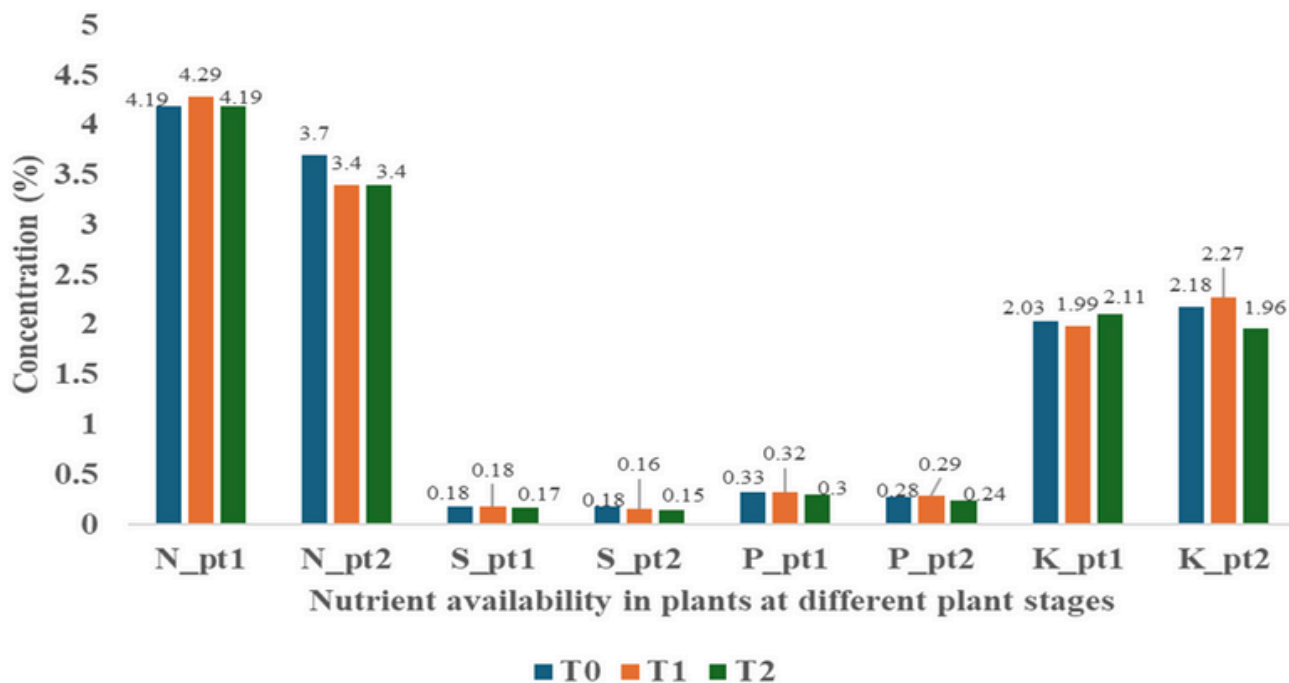


Figure 5. Nutrient availability in plant tissues sampled at late vegetative (pt1) and early flowering (pt2) stages under three treatments at site #2. T0; control, T1; 100 lbs/ac rate application, T2; 200 lbs/ac rate application, N; nitrogen, S; sulphur, P; phosphorus, K; potassium.



Soil Health Indicators

Site #1:

- Microbial CO₂ respiration increased, indicating improved microbial populations, though still outside ideal ranges.
- Soil nutrient changes followed the order T1 > T0 > T2 after HESO application.
- Increases were observed in potassium, calcium, iron, and total organic phosphorus.
- No significant differences between treatments for potassium, iron, or total organic phosphorus.
- Calcium levels were highest in T0 and T1. (Table 4)
- Calcium, iron, and total organic phosphorus levels exceeded the soil's ideal ranges.

Site #2:

- Microbial CO₂ respiration increased in all treatments after the growing season.
- The highest values were in T0 (control) and T1 (100 lbs/ac rate application), though not statistically different.
- Potassium, calcium, iron, and total organic phosphorus increased after application.
- Calcium was highest in T1, while potassium, iron, and total organic phosphorus were highest in T2 (200 lbs/ac rate application).
- Nitrate and ammonium nitrogen, total nitrogen, and inorganic phosphorus decreased after the trial. (Table 5)

Table 4. Soil health parameters before and after Replenish Nutrient's HESO application at site #1.

Treatments	Time of Replenish application	Microbial (CO ₂) Respiration	Plant Available Nutrients							Organic Fractions	
			Nitrate-Nitrogen	Ammonium Nitrogen	Total Nitrogen	Inorganic Phosphorus	Potassium	Calcium	Iron	Total Organic Carbon	Total Organic Phosphorus
			ppm								
T0	Before	24.7	59.6	3.3	42.0	5.1	7.2	49.0	22.4	69.3	3.9
T1		24.3	46.7	3.2	32.0	5.4	6.5	43.0	21.9	57.7	3.5
T2		23.0	56.9	2.9	39.3	4.7	6.0	44.9	20.8	62.3	3.0
T0	After	69.4	6.6	8.0	5.3	3.9	54.8	387.2	332.5	62.8	50.0
T1		70.9	6.7	8.7	5.8	3.9	55.4	392.3	349.2	69.8	53.9
T2		54.9	5.7	7.1	5.3	4.5	58.6	341.7	353.1	64.7	54.1
Ideal Range	low	100	159	5	90	8	28	216	4.05	200	25.4
	High	200	172	7	140	10	34	270	4.95	400	31.1

*Ideal ranges were provided by the A&L Laboratory, ON, Canada.



Table 5. Soil health parameters before and after Replenish Nutrient's HESO application at site #2.

Treatments	Time of Replenish application	Microbial (CO ₂) Respiration	Plant Available Nutrients							Organic Fractions	
			Nitrate-Nitrogen	Ammonium Nitrogen	Total Nitrogen	Inorganic Phosphorus	Potassium	Calcium	Iron	Total Organic Carbon	Total Organic Phosphorus
			ppm								
T0	Before	30.33	56.87	3.57	41.00	6.03	5.92	42.93	13.20	66.67	4.98
T1		26.67	51.57	3.50	25.67	5.31	5.38	42.87	11.69	59.33	3.27
T2		24.67	42.53	3.43	29.33	5.03	4.54	44.73	10.77	53.67	2.89
T0	After	141.00	4.17	8.90	3.70	2.50	45.13	293.80	185.03	41.20	30.80
T1		139.67	5.58	7.88	3.80	3.48	50.30	314.63	204.40	41.73	37.60
T2		130.00	6.00	7.70	3.63	3.93	53.57	302.03	208.10	34.17	46.67
Ideal Range	low high	100 200	159 172	5 7	90 140	8 10	28 34	216 270	4.05 4.95	200 400	25.4 31.1

*Ideal ranges were provided by the A&L Laboratory, ON, Canada.

Conclusion

As the project is taking place on perennial forage stands, please be aware that this marks the initial year of a three-year project, establishing preliminary baseline data. Subsequent data will contribute to trend analysis.

- For dry matter yield of newly established stand (site #1), no differences were observed between the three treatments (T0, T1, and T2). However, at site #2, there was a significant difference where T1 and T0 had higher forage DM than T2.
- The rate of application of Replenish Nutrient's HESO did not affect forage productivity in newly established stands but improved the forage yield in old stands, where 100 lbs/ac rate produced the highest yield.
- The application of Replenish Nutrient's HESO improved soil health parameters such as the microbial CO₂ respiration, Potassium, Calcium, Iron, and Total Organic Phosphorus at both sites. However, no differences were found between the application rates.



Sod Seeding of Legumes to Improve Forage Production, Forage Quality and Soil Benefits

Funders

Beef Cattle Research Council, University of Saskatchewan,
Agriculture and Agri-Food Canada's Agricultural Climate Solutions Program
Peace Region Living Lab

Introduction and Objective

Over time, pasture productivity and its carrying capacity decline due to overgrazing, poor soil fertility, invasion by unproductive species and unfavourable weather conditions. Rejuvenating these stands with persistent legumes can enhance biomass production and nutritive value for grazing cattle. Pastures with high legume content offer several benefits such as higher profit per acre, greater overall production, improved weight gain per acre per animal, better cow condition and conception rates, as well as an extended grazing season.

In this project, our objective was to introduce legumes into degraded, grass-dominated pastures to enhance forage quality, quantity and persistence while improving soil health and boosting agroecosystem services.

What We Did

In 2023, a first attempt was made to rejuvenate a grass-dominated pasture on a beef cattle producer's farm in Brownvale (Legal Land Description: SE 32 83 1 W6). The seeding in 2023 produced very little or no emergence, resulting from a prolonged dryness. The strips were reseeded on June 26, 2024.

We direct seeded the following four treatments on approximately 2-acre strips, each replicated twice:

T1 - Yellow Flower Alfalfa at 10 lbs/ac

T2 - Spredor Alfalfa (50%) + aac Glenview Sainfoin (50%) at 27.5 lbs/ac

T3 - Spredor Alfalfa (50%) + Cicer Milkvetch (50%) at 13 lbs/ac

T0 - Control (no seeding, left as it was)

Table 1: Baseline soil physical indicators of treatment strips (n=3 or 4)

Treatment	Infiltration Rate (in/hr)	Soil Moisture (% vwc)	Soil Temperature (°C)	Bulk Density (g/cm ³)	Soil Compaction (psi)		
					4"	8"	12"
Alfalfa (T1)	2.4	26.7	11.6	0.524	360	564	498
Alfalfa + Sainfoin (T2)	2.4	26.9	12.5	0.539	332	469	396
Alfalfa + Cicer MV (T3)	3.2	25.3	12.7	0.512	400	471	475
Check (T0)	2.4	30.3	15.1	0.504	445	573	558
MEAN	2.6	27.3	15.1	0.520	384	519	482

Cicer MV – Cicer milkvetch

We used an Agrowplow® DF 1000 Series No-Till Drill with 16 rows and 6" row spacing. The seeding depth was roughly 1" to enable some degree of soil-to-seed contact and cut through the thick grass sod.

Before seeding, we collected the following baseline data from 4 georeferenced points per strip:

- **Botanical Composition** was performed to determine the amount of different plant functional groups (grasses, legumes, forbs, weeds) on a dry matter basis.
- **Forage Yield** from hand clippings were sent for forage quality analysis at A&L Lab (London, Ontario).
- **Soil Water Infiltration** was measured using the single-ring method with 0.5L of water.
- **Soil Temperature and Moisture** were measured using the FieldScout TDR 250 probe at 0-6".
- **Soil Compaction** was measured using the SpotOn Digital Compaction Meter (penetrometer) at 4, 8 and 12".
- **Soil Bulk Density** was taken at 0 – 6" and 6 – 12".
- **Laboratory Soil Analysis** was taken at 0 – 6" and 6 – 12" for Soil Organic Carbon, nutrients (Nitrogen, Phosphorous, Potassium, Sulphur), and soil health indicators (full reports not available yet).

Table 2: Baseline botanical composition and forage DM yield.

Treatment	Botanical Composition			Forage Yield (lbs/ac)
	Grass (%)	Legume (%)	Weeds (%)	
Alfalfa (T1)	90.7	-	9.3	514
Alfalfa + Sainfoin (T2)	78.7	-	18.0	565
Alfalfa + Cicer MV (T3)	78.1	-	13.9	646
Control (T0)	90.8	-	9.3	486
MEAN	88.2	-	10.3	632

Table 3: Plant emergence, botanical composition and forage DM yield of strips after sod seeding

Treatment	Plant Emergence (plants/m ²)	Botanical Composition				Forage Yield (lbs/ac)
		Alfalfa (%)	Sainfoin (%)	CCMV (%)	Grasses/Weeds (%)	
Alfalfa (T1)	300	85.1	-	-	14.9	1777
Alfalfa + Sainfoin (T2)	201	62.4	9.9	-	27.7	1547
Alfalfa + Cicer MV (T3)	123	81.9	-	5.7	12.4	2380
Control (T0)	-	-	-	-	-	-
MEAN	208	76.5	3.3	1.9	18.3	1901

Observations

Figure 1 shows the weather (precipitation, average air temperature, and growing degree days) over the growing season from the nearest AGCM Weather Station in Brownvale, AB. 2024 was characterized by relatively higher moisture (13.5", compared to 8.5" in 2023).

What The Baseline Data Showed Us

Soil Water Infiltration: 2.4 - 3.2 in/hr,

Soil Moisture Percentage: 25.3% - 30.3%

Soil Temperature: 11.6°C - 15.1°C

Soil Bulk Density: 0.504-0.539 g/dm³

Compaction generally increased with depth, with the hardpan threshold of 300 psi exceeded in all strips and depths.

The baseline botanical composition showed a predominance (about 90%) of the Brome and Timothy family of grasses, some weeds (about 10%) and hardly any legumes.

Forage Dry Matter Yield across the field averaged just about 632 lbs/ac.

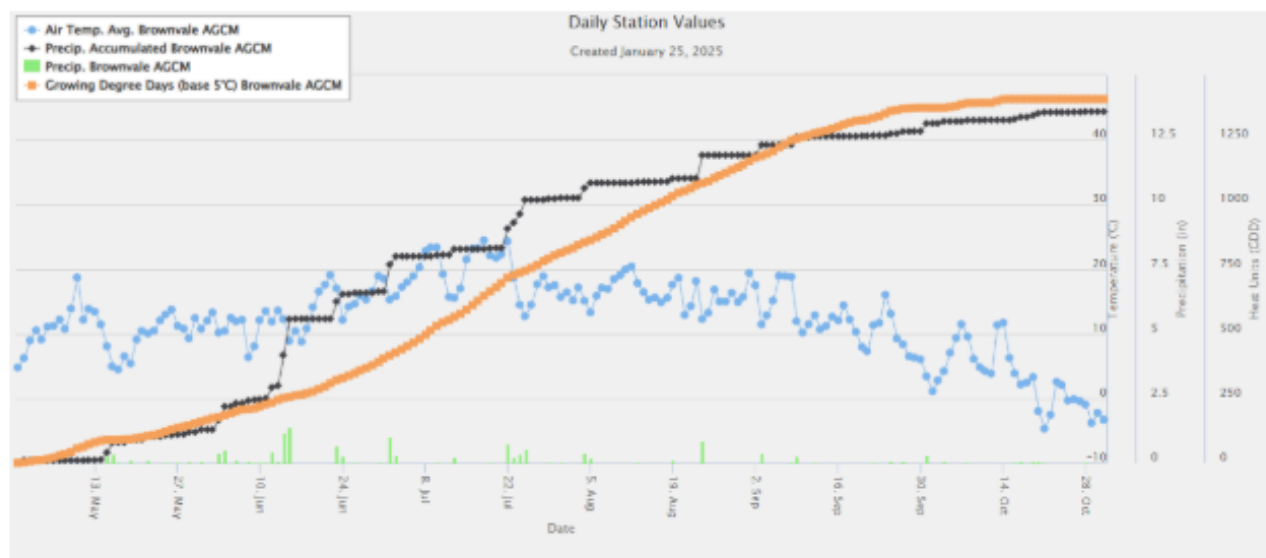


Figure 1: Growing season weather conditions registered at Brownvale AGCM Weather Station



Results Following Sod Seeding of Legumes

Botanical Composition

Table 4 outlines the Botanical Composition and Forage Dry Matter Yield of the treatments estimated after sod seeding. Sod seeding the legumes into the predominantly grass stand led to good establishment. A marked increase in legume proportion in the stand composition was observed in all treatment strips. The monoculture Yellowhead Alfalfa treatment (T1) witnessed an increase from virtually no legumes to 85% legume proportion in the stand. This was the same for the binary mixtures of Spredor Alfalfa + Sainfoin (T2) and Spredor Alfalfa and AC Cicer Milkvetch (T3), which saw increases to 72% and 88%, respectively, of legume proportions in the forage stand.

Forage Yield

Two to four-fold increases in Forage Dry Matter Yield were observed after sod seeding. The Alfalfa + AC Cicer Milkvetch treatment (T3) produced the highest (268%) increase in Forage Dry Matter Yield followed by the Alfalfa monoculture (T1, 245%) and the Alfalfa + Sainfoin (T2, 174%). Unfortunately, no comparisons could be made for the control strips, as the producer grazed them before forage DM Yield data collection due to a shortage of feed for their cattle.



Table 4: Forage quality of seeded strips (n=2)

Treatment	CP (%)	ADF (%)	NDF (%)	TDN (%)	NDFD ₄₈ (%)	Ca (%)	P (%)	K (%)	Mg (%)
Alfalfa (T1)	16.9	36.4	46.3	60.6	52.6	1.30	0.28	2.7	0.20
Alfalfa + Sainfoin (T2)	14.1	34.5	51.1	62.0	57.8	0.77	0.25	2.2	0.18
Alfalfa + Cicer MV (T3)	14.9	38.2	51.2	59.2	56.0	0.91	0.31	3.1	0.17
Control (T0)	11.5	34.2	52.8	62.3	66.2	0.39	0.33	2.4	0.15
MEAN	14.7	36.0	50.0	60.8	57.0	0.91	0.29	2.6	0.18

CP – Crude Protein; ADF – Acid Detergent fiber; NDF – Neutral Detergent fiber; TDN – Total Digestible Nutrients; NDFD₄₈ – Neutral Digestible Fiber Digestibility; Ca – Calcium; P – Phosphorus; K – Potassium; Mg – Magnesium.

Forage Quality

Crude Protein (CP) was highest for the AC Yellowhead Alfalfa treatment (T1, 16.9%), followed by Spredor Alfalfa and AC Cicer Milkvetch (T3, 14.9%) and Alfalfa + Sainfoin (T2, 14.1%). Total Digestible Nutrients (TDN), otherwise referred to as Energy, narrowly ranged between 59 – 62.0%. The Neutral Digestible Fiber Digestibility (NDFD48), which represents the digestibility of NDF after 48 hours in the digestive tract and is a good proxy for digestibility of forage, showed a wider variation of 52 – 66%, despite the narrow range in fibre values amongst treatments. Calcium levels ranged from 0.4 – 1.3%, while Phosphorus ranged 0.25 – 0.33%, Potassium 2.2 – 3.1%, and Magnesium 0.15 – 0.20 % were observed.

Conclusion

Sod seeding legumes into grass-dominated stands significantly improved Botanical Composition, Forage Dry Matter Yield, and Forage Quality. The legume proportion increased Crude Protein and mineral content and showed how it could benefit livestock nutrition. Improved digestibility (NDFD48) suggests enhanced forage utilization. Higher forage yields mean more grazing days per acre and reduce dependency on external feed, increasing farm sustainability. Soil improvements (moisture retention, infiltration) may improve pasture resilience and as a result, these will be continuously monitored for the length of this project. Grazing management is also crucial for maintaining the benefits of legume integration. All data will be collected again in the spring of 2025 before the producer grazes their cattle on the stands.



Forage Productivity and Ecosystem Services of Silvopasture Systems

Funded by Rangeland Sustainability Program, Government of Alberta
Collaborators: Kelvin & Marianne Krahn, Beef Cattle Producers, High Prairie
Forestry and Parks, Government of Alberta

Silvopasture is the intentional combination of trees, forage, and livestock managed as a single integrated practice to transform farmland into a resilient, high-yield ecosystem. This system has the potential to provide multiple benefits to livestock and the plant community, such as providing shade for livestock, expanding pasture acreage and diversity, increasing carrying capacity and forage yields while reducing water consumption, and cost-effective vegetation control. To evaluate these and other benefits, a field trial was started in 2024 on a beef cattle producer's farm across three silvopasture systems: an Open System (no tree canopy), a Semi-Closed System (approximately 50% canopy), and a Closed System (full canopy).

Objectives

The objectives of the trial were to evaluate the effects of three silvopasture systems on:

- Forage Dry Matter (DM) yield and nutritive value.
- Livestock performance, measured by body condition scores, weight and temperament.
- Soil health indicators such as carbon sequestration, Total Organic Carbon (TOC), Total Nitrogen (TN), Total Carbon (TC), and soil infiltration rates.

Methods

Before the implementation of the three silvopasture systems, the following baseline measurements were taken in 2024 for each system:

- Soil sampling (0-15 cm and 15-30 cm depths) and analysis for soil nutrients, TN, TOC, TC, and carbon sequestration.
- Soil infiltration (single-ring method), compaction, moisture and temperature.
- The systems were assessed for the botanical composition of individual plant species in collaboration with experts from Forest Range Health Assessment (Government of Alberta).
- Measurements just before introducing cows for grazing include weekly visits to the site for:
 - Determination of forage DM yield and nutritional value. This aided in DM yield estimates and nutritional value analysis lasting for 3 weeks.
 - Each paddock had a watering system with a gauge which monitored the weekly water consumption.
 - Soil moisture and temperature using the FieldScout TDR (Time Domain Reflectometry)-350.

- Five selected cows were monitored for their temperament and scored from 0-2 (i.e., 0 is good condition, 1 is compromised condition, and 2 is poor condition) twice weekly. The body condition scores of cows were noted before and after grazing.

All forage and soil samples for baseline and subsequent measurements were sent to the A&L Laboratory (Ontario) for analysis.

Grazing Schedule (3 weeks duration)

First Grazing Week

- Grazing of paddock 1 in the Closed, Semi-Closed, and Open Systems started on June 21 with 35, 75, and 45 cow-calf pairs, respectively.

Second Grazing Week

- Grazing of paddock 2 in the Semi-Closed and Open Systems commenced on June 28 with 35 cows and 110 cow-calf pairs, respectively. However, the Closed System was re-fenced into a smaller paddock to accommodate only 3 cows. This strategy was needed by the producer for the Closed System to avoid missing the oestrus cycle of cows.

Third Grazing Week

- Grazing of paddock 3 in the Closed, Semi-Closed, and Open Systems began on July 7 and ended on July 13 with 3 cows, and 35 and 110 cow-calf pairs, respectively.

Data analysis

The raw data collected during the 2024 season were analyzed with R Statistical Software (version 4.2.3) using the Analysis of Variance (ANOVA) program.

In Field Observations



Figure 1. Producer partaking in sampling

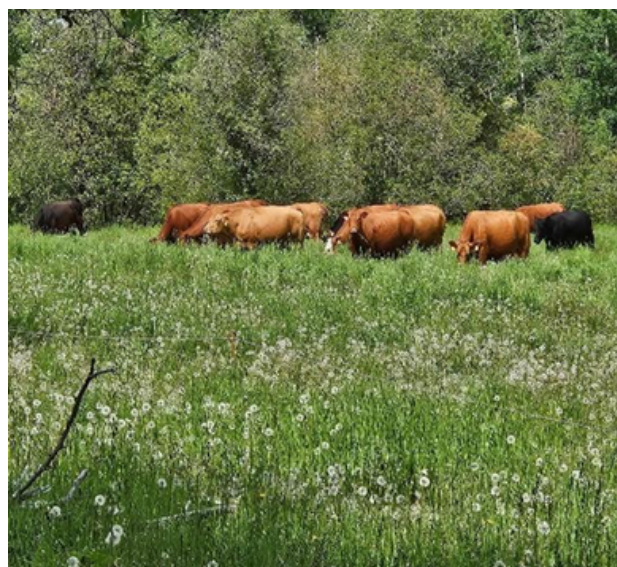


Figure 2. Grazing cows in Semi-Closed System

Preliminary Baseline Outcomes for the Grazing Season

Dry Matter Yield

The baseline forage DM yield from the experimental paddocks varied from 874 for the Closed system to 3,112 lbs/acre for Open system, with an average of 2,132 lbs/acre. The Open System produced 2,200 and 701 lbs/ac more DM than both the Closed and Semi-Closed Systems, respectively (Table 1).

Forage Nutritive Value and Mineral Concentration

- No significant differences in CP, NDF, ADF, TDN, and RFV. (Table 1)
- NDFD48 varied among the three systems.
- Calcium (Ca) content was different for the systems:
 - Highest in the Open System (0.88%).
 - Similar levels in the Closed and Semi-Closed Systems. (Table 1)
- No differences in P, K, Mg, and Na across the systems.

Soil Carbon Sequestration

The average baseline of carbon (0-30 cm) accumulated in the grazing systems showed high carbon in the Open System, approximately 3,700 and 1,872 lbs/ac more than Semi-Closed and Closed Systems, respectively (Figure 3). By comparing the Semi-Closed and Closed Systems, it was apparent that the Closed

System sequestered more soil carbon than the Semi-Closed system.

Behaviour Monitoring and Scoring

First Week:

- No cases of lameness, bloat, nasal or ocular discharge, or persistent cough.
- All cows in good health (score 0) across all systems.
- Open System cows grouped during the day due to high temperatures (avg. 15°C), reducing daytime forage intake but increasing evening grazing. (Figure 4)
- Closed and Semi-Closed System cows grazed freely throughout the day and ruminated under trees.

Second Week:

- No signs of bloat, ocular/nasal discharge, or persistent cough.
- All cows remained healthy (score 0), except one bull in the Closed System, which was lame.
- Open System cows grazed less, but drank more water (avg. 23°C).
- Closed and Semi-Closed System cows sought shade under trees, with some grazing during the hot afternoons.

Third Week:

- At 30°C, Open System cows drank more water, but appeared restless. (Figure 5)
- Closed and Semi-Closed System cows continued grazing and sought shade under trees.
- Overall, all cows remained healthy (score 0) with good overall welfare.

Conclusion

Please note that these are baseline results of the three grazing systems. A clearer comparison of effects of the systems will be captured in subsequent years (2025 and 2026). However, we conclude based on our results that:

- The Open System had the highest DM yield, followed by the Semi-Closed and Closed Systems.
- No differences were observed in the nutritive values evaluated, except for NDFD48 and calcium contents, where the Open System had the highest calcium and the Semi-Closed System had the highest NDFD48.
- Soil carbon sequestration was higher under the Open System compared to both the Closed and Semi-Closed systems.
- Though beef cattle in all systems were healthy, their body temperature was higher for those in the open systems, and they also consumed more water compared to the rest.

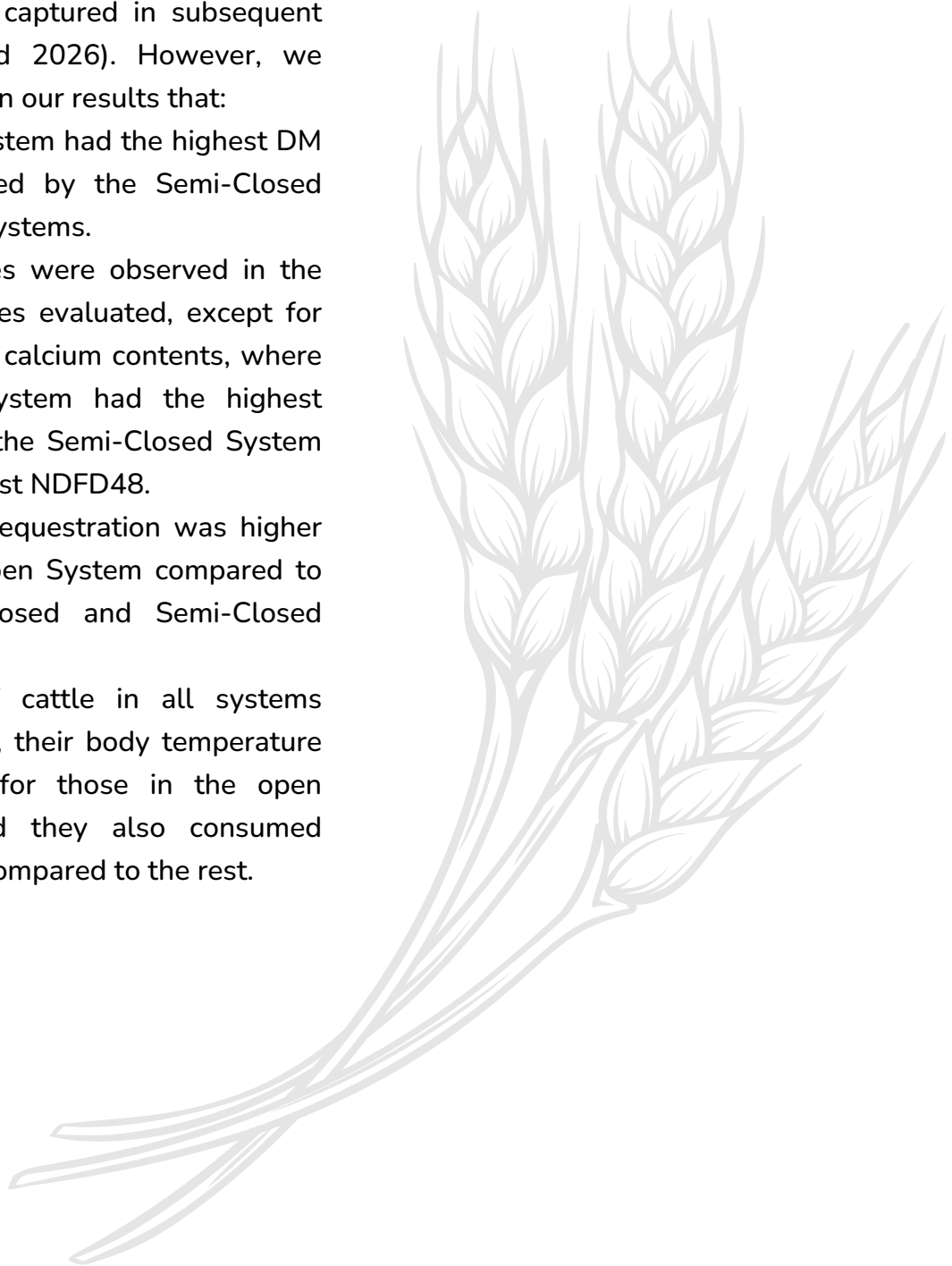


Table 1. Baseline DM yield of the three grazing systems.

Systems	DM yield	CP(%)	NDF (%)	ADF (%)	TDN (%)	NDFD48	RFV
Open System	3112.4	11.9	58.0	40.3	61.5	55.5	92.3
Semi-Closed System	2410.5	10.5	58.8	40.5	63.9	60.4	90.8
Closed System	874.1	11.7	60.0	40.9	61.1	56.	88.7
P-value	0.042	0.35	0.59	0.93	0.15	0.036	0.76
Mean	2132.3	11.3	58.9	40.5	62.2	57.6	90.6

P<0.05*, CP, crude protein; NDF, neutral detergent fiber; ADF, acid detergent fiber; TDN, total digestible nutrients; NDFD48, neutral detergent fiber digestibility; RFV, relative feed value.

Table 2. Baseline mineral concentration in forages under three grazing systems.

Systems	Ca (%)	P (%)	K (%)	Mg (%)	Na (%)
Open System	0.88	0.30	1.9	0.27	0.30
Semi-Closed System	0.64	0.31	2.1	0.24	0.30
Closed System	0.68	0.31	1.9	0.24	0.30
P-value	0.002	0.87	0.45	0.45	0.69
Mean	0.73	0.31	1.9	0.25	0.027

P<0.05*, Ca; Calcium, P; Phosphorus, K; Potassium, Mg ; Magnesium, Na; Sodium.



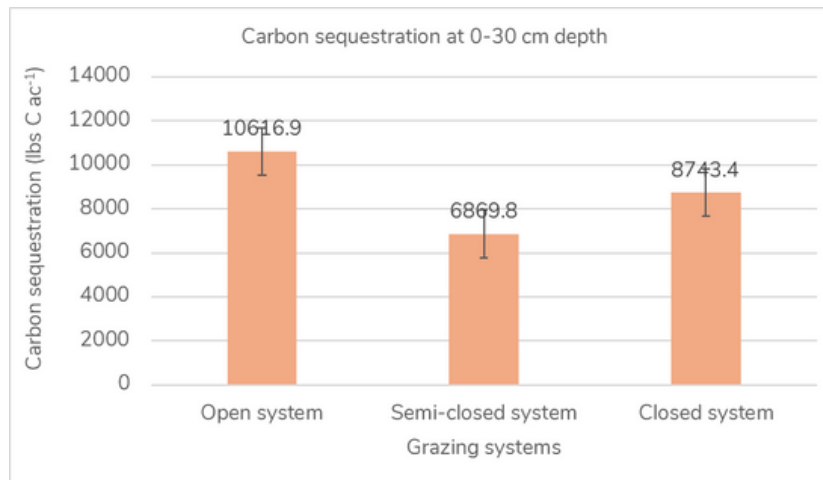


Figure 3. Baseline carbon sequestration within 0-30 cm soil depth under three grazing systems.

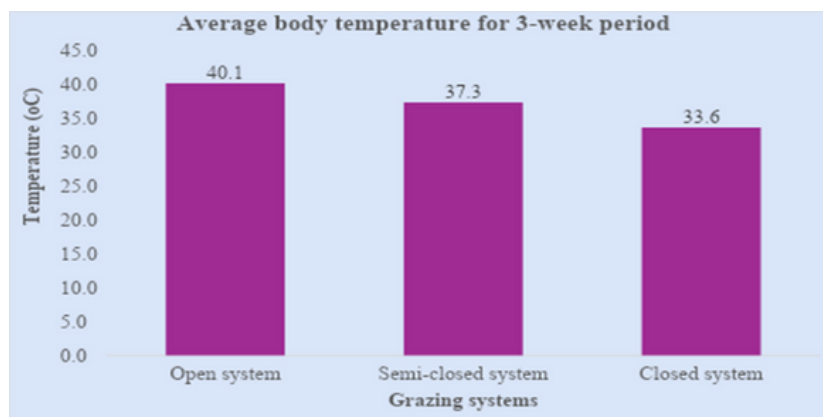


Figure 4. Average body temperature of cows under the three grazing systems during the 3-week trial.

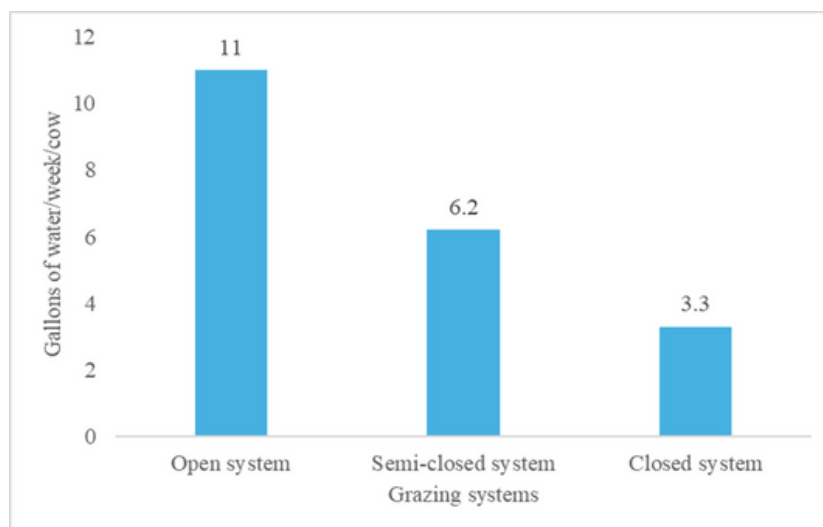


Figure 5. Water consumption by cows during the third week of the grazing.

Crop Variety Trial for Saddle Hills County

Funded by Saddle Hills County

Introduction & Objective

With new crop varieties continually emerging, producers seek those best suited to their agroecological conditions and rely on performance evaluations conducted by independent third-party organizations under standardized and unbiased conditions to make informed decisions. This Crop Variety Trial is designed to provide Saddle Hills County producers with objective data on the agronomic performance of various barley, oat, wheat, field pea, and canola varieties under local growing conditions. The goal is to assist in selecting the most suitable varieties for the region. This three-year trial began in 2023 and will conclude in 2025.

What We Did

The project was implemented at a satellite site in Saddle Hills County, located at the Junction of Hwy 725/TWP 814 in Fourth Creek, Alberta. The trial was a randomized complete block design with four replications. Figure 1 shows the weather (including precipitation, minimum & maximum air temperatures, and growth degree days) before seeding until harvest, recorded at the nearest AGCM Weather Station in Savanna, AB; less than 7 km from the trial site. Low spring moisture conditions marked the 2024 growing season after the initial 2" early spring

moisture. More than half (55%) of the annual precipitation occurred between June 10th and August 10th, a key period of plant growth and development. Detailed information on site history, soil data, treatments implemented, and cultural practices followed are outlined in Table 1. The study adhered to the Alberta Cereal and Flax Regional Variety Testing Protocols (ARVAC, 2023), Canola Performance Trials Small Plot Protocol (Canola Council of Canada, 2023), and Alberta Regional Pulse Variety Testing Protocols (Osion and Fedko, 2015).



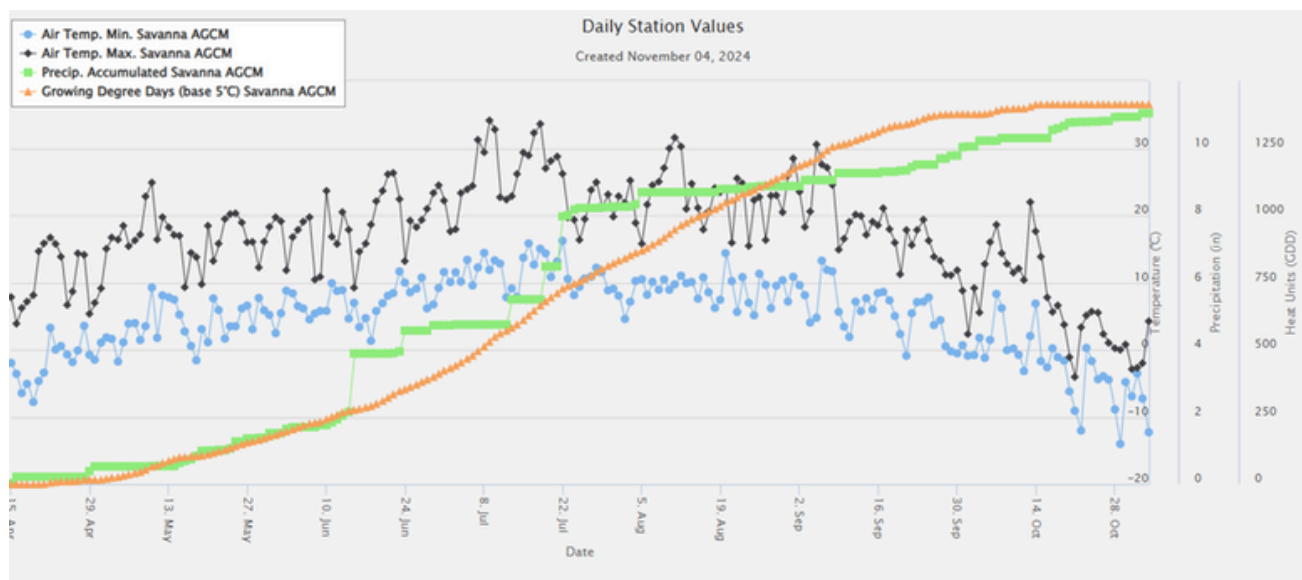


Figure 1: Weather conditions recorded at the AGCM Weather Station in Savanna, AB

Table 1. Treatments, field operations and data collection.

Parameter/Task	Description
Site history	New cereal grass hayland, disced the previous fall and harrowed in spring (May 02, 2024), just before seeding.
Site soil information at 0-6" soil depth	pH = 6.0; Organic Matter = 6.6; Electrical Conductivity = 0.38 dS/M; Nutrient analysis of soil gave N (nitrate-N) = 10 ppm, P = 176 ppm, K = 494 ppm and S (sulphate-S) = 6 ppm. Soil Base Saturation was Ca 49.8%, Mg 18.9%, Na 0.5%, K 8.1% and H 22.7%.
Pre-Pass herbicide, date, and rate	Smoke® 540 Glyphosate @ 0.67L/acre + FBN Florasulam @ 40 mL/acre in fall.
Treatments: 12-14 varieties each of Barley, Oats, Wheat, Peas and Canola	Barley varieties (12) Feed and food Barley varieties AAC Synergy, CDC Austenson, CDC Durango, Sirish, AB Advantage, CDC Renegade, Canmore, AB Wrangler, AB Tofield. Malt Barley varieties AAC Connect, CDC Churchill, CDC Copper. Oat varieties (12) CS Camden, AC Morgan, Kalio, AAC Douglas, SO1, CDC Haymaker, AC Mustang, Arborg, CDC Endure, Kyron, Ore3542M, CDC Nasser. Wheat varieties (12) Canada Western Red Spring Wheat (CWRS) AAC Viewfield, AAC Redberry, Tracker, CDC Go, AAC Hodge, AAC Hockley, AAC Wheatland, AAC Redstar, Parata, AAC Brandon Canada Prairie Spring Red Wheat (CPSR) AAC Penhold, CS Accelerate Canola Varieties (14) Roundup Ready (RR) varieties (6) CS3000TF, CS2600CR-T (Cantera Seeds); BY23-0943TF, BY23-0041TF (Brett Young); P511G, P515G (Pioneer Corteva). Liberty Link (LL) varieties (6) CS4000LL (Cantera Seeds); P509L, PS505MSL (Pioneer Corteva); BY23-0827LL, BY7204LL, Cropland CP21L3C Clearfield varieties (2) BY23-0246CF (Brett Young), Clearfield UA Gold Pea Varieties (12) Green Pea Varieties (2) CDC Limerick, CDC Raezer

	Yellow Pea Varieties (9) CDC Saffron, AAC Carver, CDC Canary, CDC Profit, CDC Meadow, AAC Chrome, CDC Ardill, AAC Peace River, CDC Forest Forage Pea Varieties (1) DL Delicious
Seeding date and rate	May 10th, 2024, into a disced and harrowed field at: - 300 seeds/sq m (28 seeds sq ft) for barley & oats - 320 seeds/sq m for wheat - 65 plants/sq m for canola - 90 plants/sq m for peas
Seeder and row spacing	6-Row Fabro Small Plot with disc-type openers @ 9" row spacing
Seeding depth	Cereals - 3/4" Canola - 1/2" Pea - 1"
Nutrient recommendations for an average yield of barley and oats (76 bu/ac and 100 bu/ac, respectively)	N=54 lbs/ac; P₂O₅= 35 lbs/ac; K₂O=15 lbs/ac; S=30 lbs/ac N=54 lbs/ac; P₂O₅= 50 lbs/ac; K₂O=20 lbs/ac; S=30 lbs/ac
Nutrient recommendations for an average yield of wheat (56 bu/ac)	N=50 lbs/ac; P ₂ O ₅ = 30 lbs/ac; K ₂ O=15 lbs/ac; S=30 lbs/ac
Nutrient recommendations for an average yield of canola (40 bu/ac)	N=51 lbs/ac; P ₂ O ₅ = 35 lbs/ac; K ₂ O=20 lbs/ac; S=30 lbs/ac
Nutrient recommendations for an average yield of peas (50 bu/ac)	N=0 lbs/ac; P ₂ O ₅ = 30 lbs/ac; K ₂ O=15 lbs/ac; S=30 lbs/ac
In-crop spray, rate and date	For Cereals: Esteem® (Flu + MCPA + Clopy) @ Low rates (0.24L/ac of Flu + 0.28 L/ac MCPA + 0.084 L/ac for Clopy) on June 18th 2024. For Canola: Glyphosate for RR @ 0.4L/ac; Liberty for LL at 1.09L/ac; Adama @ 11.7g/acre + Merge @ 0.5% v/v for Clearfield applied on June 18 2024 For Pea: Basagran Forte + Assure II + Merge (actual tank mix in 20L of water – 400 ml of Basagran + 100 ml of Assure II + 100 ml of Merge) applied on June 18, 2024.
Harvest stage	- At the ripening stage for cereals - At the browning of pods for canola - At full maturity for peas
Desiccant	Heat LQ @43 ml/ac + Glyphosate @ 1 L/ac + Merge @400 ml/ac used on Sept 06, 2024 for cereals
Grain harvest date	Peas: August 21, 2024 Wheat and Barley: Sept 12, 2024 Oats and Canola: Sept 18, 2024
Harvest method	Peas: Manually Cereals and Canola: Small Plot Combine
Area harvested	6.5 – 7.5 m ² on average
Data collected	Grain/seed yield Plant height Grain attributes (Thousand Kernel Weight, Bushel Weight, Protein and Oil Content)



Results - Barley

The results for the Barley variety trial are shown in Table 2 below.

Plant Count

Plant counts (not shown here) taken three weeks after seeding varied between 224 and 318 plants per m² and did not differ significantly between varieties.

Plant Height and Lodging

Plant height ranged from about 47 to 70 cm, with the smooth awn varieties AB Advantage and AB Renegade coming in first and second position, respectively, in terms of height. No lodging was observed amongst barley varieties at maturity.

Barley Grain Yield

Grain yield ranged between 56–79 bu/ac amongst barley varieties but did not vary significantly. The following barley varieties (recruited mainly from the feed and food barley varieties) yielded comparatively higher than the check variety AAC Synergy: CDC Renegade, AB Tofield, AB Advantage, Sirish, and Canmore, while AB Wrangler yielded just 85% compared to the control.

Barley Test and Seed Weight

The test and seed weights ranged between 43–52 lbs/bu varieties and about 33–43 g/1000 seeds, respectively.

Barley Grain Quality

The protein content ranged from 13–17%

and varied significantly between varieties, with the malt barley varieties having higher protein contents on average.

Conclusion and Implications

Yield Stability Across Varieties

Despite differences in yield, all varieties fell within a narrow range, suggesting a relatively stable production potential across these varieties at the site. This may allow farmers flexibility in choosing barley based on other traits, such as height or protein content, without sacrificing yield.

Variety Selection for Height and Lodging Resistance

No lodging was observed, and some varieties showed greater height (e.g., AB Advantage and AB Renegade). These taller varieties may provide advantages in harvesting and potentially reduce disease spread by improving airflow.

Enhanced Grain Quality for Malt Production

The higher protein content in malt barley varieties highlights their suitability for brewing applications, which often require specific protein levels. This can guide growers aiming to meet quality standards in the malting industry.

Seed and Test Weight Consistency

The range in seed and test weights, though varied, was relatively narrow, which could benefit consistency in grain processing and storage and help maintain

grain quality during handling and distribution.

Table 2: Plant height, grain yield and attributes of barley varieties.

Barley Varieties	Grain Yield (bu/ac)	Grain Yield (% of check)	Plant Height (cm)	TKW (g/1000 seeds)	BW (lbs/bu)	Protein (%)
AAC Synergy [§] *	66	100	56	33	43	15.4
AAC Connect*	65	99	59	37	47	15.2
CDC Churchill*	59	89	54	38	48	16.3
CDC Copper*	68	103	54	37	47	15.5
CDC Austenson [#]	65	99	52	39	49	15.5
CDC Durango [#]	64	97	54	36	45	14.9
Sirish [#]	74	112	47	40	52	14.9
AB Advantage [#]	75	114	70	42	48	14.7
CDC Renegade [#]	79	120	67	43	48	13.8
Canmore [#]	72	109	62	43	51	15.9
AB Wrangler [#]	56	85	60	40	47	16.4
AB Tofield [#]	76	115	60	41	52	13.4
MEAN	68	-	58	39	48	15.2
p value	0.15	-	0.001	0.003	0.001	0.001
LSD	34	-	10.4	6.9	4.8	1.7
CV (%)	15.3	-	8.0	8.0	4.5	5.2

[§]Check variety; [#]Feed and food barley; *Malt barley, LSD – Least significant difference; CV – coefficient of variation.

Results - Oats

The results for the oat variety trial are shown in Table 3 below.

Plant Count

Plant counts (not shown here) taken 3 weeks after seeding varied between 240 and 380 plants per m² and did not differ significantly between varieties.

Plant Height and Lodging

Plant height ranged from about 55 to 67 cm and varied significantly between varieties. Interestingly, the forage oat

variety, CDC Haymaker, was not the tallest. No lodging was observed amongst oat varieties.

Oat Yield

Oat yield ranged widely (138-175 bu/acre) but did not differ significantly between varieties. AAC Douglas and CDC Nasser produced 113% and 105%, respectively, compared to the check variety CS Camden. The yields from Kalio, CDC Haymaker (the forage oat variety), and SO1 were 93%, 93%, and 89% of the check variety, respectively.

Oat Test and Seed Weight

The oat test (bushel) weight ranged from 32-39 lbs/bu and significantly varied between varieties, while the seed weight (TKW) ranged from about 16-25 g/1000 seeds.

Conclusion and Implications

Yield Consistency and Potential

Despite the range in yield, the oats generally performed well, with AAC Douglas and CDC Nasser outperforming the check. This could make these two varieties attractive to farmers aiming for higher yields.

Seed and Test Weight for Processing and Quality

The wide range in test and seed weights could impact processing qualities and market preferences, as higher test weights are often desired in grain markets. These differences may guide selection toward varieties that better meet specific industry or quality requirements.

The wide ranges in oat grain yields registered here indicate that some high-yielding varieties may adapt well to Saddle Hills growing conditions. The differences between varieties in other traits, such as plant height, test weight, and seed weight, also support this. All these differences will have to be confirmed in subsequent years of the trial.

Table 3: Plant height, grain yield and attributes of oat varieties.

Oat Varieties	Grain Yield (bu/ac)	Grain Yield (% of check)	Plant Height (cm)	TKW (g/1000 seeds)	BW (lbs/bu)	Protein (%)
CS Camden ⁵ *	155	100	57	17	38	13.1
AC Morgan*	156	101	63	25	38	13.0
Kalio*	144	93	57	16	38	13.0
AAC Douglas*	175	113	61	21	38	13.1
SO1*	138	89	57	22	32	12.8
Arborg*	155	100	60	18	39	13.2
CDC Endure*	155	100	63	27	37	13.5
Kyron*	147	95	55	17	38	13.5
Ore 3542M*	150	98	58	23	37	13.5
AC Mustang [#]	149	96	67	18	39	13.5
CDC Nasser [#]	163	105	59	17	35	11.9
CDC Haymaker [#]	143	93	63	17	33	12.7
MEAN	153	-	60	20	37	13.1
p value	0.86	-	0.03	0.16	0.001	0.14
LSD	56	-	9.7	13	3.2	1.5
CV (%)	15	-	14.0	14.4	14.0	14.4

⁵Check variety; *Milling oat; [#]Feed oat; [†]Forage oat; LSD – Least significant difference; CV – coefficient of variation.

Results - Wheat

The results of the wheat variety trial are shown in Table 4 below.

Plant Count

Plant counts (not shown here) taken three weeks after seeding ranged between 156 to 292 plants per m² and varied significantly between varieties.

Plant Height and Lodging

Plant height ranged from 55 to 69 cm, with Parata and AAC Redberry being the tallest varieties. CS Accelerate (56 cm) and AAC Penhold (55 cm) were the shortest varieties. No lodging was observed amongst varieties.

Wheat Yield

Wheat yielded about 41 bu/ac on average, ranging from 31 to 47 bu/ac with no significant difference between varieties. Compared to the control, 113% and 110% yield advantages were evident for AAC Hodge and CS Accelerate/AAC Wheatland. CDC Go yielded just 74% compared to the control.

Wheat Bushel and Thousand Kernel Weight (TKW)

The test (bushel) weight narrowly ranged from 61-64 lbs/bu, while the TKW ranged from 33 – 45 g/1000 seeds. There were significant differences between varieties for both of these grain attributes.

Wheat Quality

Wheat protein values narrowly ranged between 16-18% with no significant differences between test varieties.

Conclusion and Implications

Yield Consistency and Potential

Yield averaged 41 bu/ac, with AAC Hodge and CS Accelerate/AAC Wheatland outperforming (> 110%) the control, while CDC Go yielded just 74% of the control.

Height and Lodging Resistance

Plant heights were between 55 and 69 cm, and no lodging was observed. The lack of lodging implies that these varieties are structurally stable, which is advantageous in varied growing conditions.

Yield Consistency and Potential

Bushel weight, TKW, and protein content showed some variability, with consistent protein levels across varieties but significant differences in TKW and bushel weight.

Variation in TKW and test weight highlights potential differences in grain size and bushel weight.



Table 4: Plant height, grain yield, and attributes of wheat varieties.

Varieties	Grain Yield (bu/ac)	Grain Yield (% of check)	Plant Height (cm)	TKW (g/1000 seeds)	BW (lbs/bu)	Protein (%)
AAC Brandon ^{5*}	41.5	100	61.1	38.5	64	16.6
Tracker*	45.1	109	64.8	32.7	62	16.6
AAC Wheatland*	45.4	110	63.3	37.8	64	16.4
AAC Hodge*	46.8	113	60.6	37.0	63	16.7
Parata*	35.7	86	69.3	35.1	62	17.7
AAC Redstar*	42.9	104	65.1	37.9	62	17.4
AAC Redberry*	36.9	89	67.7	36.0	62	17.2
AAC Hockley*	41.5	100	58.4	37.7	64	17.5
AAC Viewfield*	41.2	99	56.7	35.3	64	17.0
CDC Go*	30.7	74	63.4	36.9	61	16.2
CS Accelerate [#]	45.4	110	56.3	34.9	64	16.4
AAC Penhold [#]	41.4	100	55.2	44.6	62	16.9
MEAN	41.2	-	61.8	37.0	63	16.9
p value	0.21	-	0.001	0.001	0.001	0.36
LSD	16.8	-	8.9	3.2	0.84	1.9
CV (%)	19.2	-	6.8	4.0	0.6	5.3

⁵Check variety; *Canada Western Red Spring Wheat (CWRS); [#]Canada Prairie Spring Red Wheat (CPSR); LSD – Least significant difference; CV – coefficient of variation.

Results - Canola

The results of the canola variety trial are shown in Table 5 below.

Plant Count

Plant counts (not shown here) taken three weeks after seeding ranged between 70 to 148 plants per m² and did not vary significantly between varieties.

Plant Height and Lodging

Plant height ranged from 91 to 108 cm and did not vary significantly between varieties. No lodging was observed amongst canola varieties at maturity.

Canola Yield

The test canola hybrids yielded an

average of 46.8 bu/ac. On average, the Roundup Ready hybrids yielded better than the Liberty Link and Clearfield hybrids.

Canola Bushel and Thousand Seed Weight (TSW)

The test (bushel) weight narrowly ranged from 49 - 53 lbs/bu, while the TSW ranged from 4.12 – 5.39 g/1000 seeds. There were significant differences between varieties for both grain indicators.

Canola Quality

Canola protein values ranged between 22% and 27%, while oil content ranged from 42% to 49% and significantly differed between test varieties.

Conclusion and Implications

Plant Height and Lodging

Plant height ranged from 91 to 108 cm, and no lodging was observed at maturity, suggesting robust structural integrity across varieties.

Yield Consistency and Potential

The canola hybrids yielded an average of 46.8 bu/ac, with Roundup Ready hybrids out yielding Liberty Link and Clearfield hybrids. Bushel weights for canola ranged from 49 to 53 lbs/bu, and thousand-seed weights (TSW) were between 4.12 and 5.39 grams, with significant differences among varieties for both weight indicators.

Seed and Test Weight for Processing and Quality

Quality analyses revealed that protein levels ranged from 22% to 27%, and oil content varied from 42% to 49%, with both quality metrics differing significantly across the varieties tested.

References

- Alberta Regional Variety Advisory Committee (2023). Alberta Cereal and Flax Regional Variety Testing Protocols.
- Canola Council of Canada (2023). 2022 Canola Performance Trials Small Plot Protocol.
- Olson, M. and Fedko, A. (2015). Alberta Regional Pulse Variety Testing Protocols.

Table 5. Plant height, grain yield and attributes of canola varieties.

Varieties	Grain Yield (bu/ac)	Grain Yield (% of check)	Plant Height (cm)	Thousand seed weight (g/1000seeds)	Bushel weight (lbs/bu)	Protein content (%)	Oil content (%)
CS2600CR-T ⁵ *	60.1	100	102	4.83	53	22.3	49.0
CS3000TF*	53.7	89	108	4.31	53	23.1	48.9
BY23-0943TF*	53.2	89	102	5.39	52	24.6	47.6
BY23-0041TF*	58.2	97	98	4.26	53	21.9	48.9
P511G*	41.8	70	97	4.64	51	24.7	45.6
Pf15G*	48.7	81	99	4.60	51	25.0	46.8
CS4000LL ⁵	42.9	100	93	4.97	53	25.1	45.7
P505MSL	37.0	86	97	4.71	49	26.8	42.0
P509L	43.5	102	98	4.82	51	24.8	46.6
BY23-0827LL	47.5	111	97	4.73	51	25.3	46.4
BY7204LL	45.4	106	100	4.13	51	24.3	47.2
Cropland CP21L3C	42.1	98	98	4.64	52	25.9	44.5
BY23-0246CF ⁵	45.4	100	91	4.91	52	23.3	47.1
UA GOLD	37.5	83	95	4.12	53	22.0	48.5
MEAN	46.8	-	98	4.65	52	24.2	46.7
p value	0.001	-	0.88	0.001	0.001	0.001	0.001
LSD	11	-	22.7	0.73	2.3	2.8	3.5
CV (%)	10.7	-	10.5	7.3	2.0	5.3	3.4

⁵Check variety: LSD – Least significant difference; CV – coefficient of variation.

Fieldscale Evaluation of Pasture Rejuvenation Methods

Funded by Saddle Hills County

Objectives

Livestock producers are increasingly seeking alternative strategies to improve unproductive and aging forage stands without fully terminating them, as doing so is costly and often removes land from production for one or more years. This project aims to explore practical and cost-effective methods to rejuvenate perennial pasture land by reseeding, without the need to kill off existing forage. This will enhance both forage yield and quality, providing producers with more productive pastures while maintaining continuous use of the land.

This project was initially established in 2023; however, poor emergence was observed from the seeded strips. We reseeded an adjacent plot in 2024.

What We Did

The trial took place at the Saddle Hills County pasture land site along Hwy 719 in Pillsworth, AB, utilizing grass-legume pasture land that had been subjected to grazing for over 10 years. Site soil information taken before implementation of treatments from the surface soil (0-6" soil depth): pH=6.2, organic matter = 5.8%, electrical conductivity = 0.2 dS/m, while the nutrient analysis of the soil gave N = 8 ppm, P = 9 ppm, K = 260 ppm and S = 1 ppm.

Soil base saturation was 70.9% (Ca = 40.1%, Mg = 23.2 15.3%, Na = 1.7%, K = 5.9 %). Figure 1 shows the weather (including precipitation, air temperature, and growing degree days) for the growing season recorded at the nearest Saddle Hills Auto weather station. Overall, the 2024 growing season was characterized by relatively low moisture (< 8").



Figure 2: HAYBUSTER No-Till drill used for seeding of the legume mixture



Figure 3: Collaborating producer at project site

Table 1: Composition of legume mixture

No	Species/Varieties	Pastureland	
		% in stand	Seeding rate (lbs/acre)
1	Sainfoin vr AAC Mountainview	34	16.5
2	Cicer milkvetch vr Windsor	33	4.5
3	Birdsfoot trefoil vr Leo	33	3
	Total	100	24

The following 5 treatments were set out, each on a 0.4-acre strip, replicated three times.

T0 - Control or check strips – no seeding at all.

T1 - High stock density grazing (HSDG) + sod seeding: HSDG (to create a mob grazing effect) was implemented from June 05 to June 06 by strip-grazing 25 yearlings + 1 cow. The yearlings were removed after grazing down the treatment strips, and a legume mixture (see composition in Table 1) was then seeded into the 3 replicated strips with a Haybuster 107 no-till drill at about 3/4". This treatment was not grazed for the rest of the year following seeding.

T2 - Broadcast seeding + HSDG: On June 05, legume seeds (Table 1) were broadcast using a Haybuster seed drill (same as above). The coulters and discs on the Haybuster were raised to prevent them from cutting into the soil, thereby disabling the drilling action and



Figure 4: Cattle being fed seeds

Table 2: Fertilizer blend rates for T4

No	Fertilizer [§]	Rate (lbs/acre)
1	Urea (N)	0
2	Monoammonium Phosphate (P)	77
3	Potash (K)	0
4	Ammonium Sulfate (S)	63
	TOTAL	140

[§]Nutrient recommendations for average forage yield (4.5 T/ac): Nitrate N=11 lbs/ac; P₂O₅=40 lbs/ac; K₂O=0 lbs/ac; Sulphate-S=15 lbs/ac

allowing the seed to drop onto the soil surface simply. Later, 25 yearlings and 1 cow were introduced into the strips to create a mob grazing effect (after spending 24 hours) to work seeds into the soil. This treatment was also not grazed for the rest of the year following seeding and HSDG.

T3 - Feed seeds to Cattle: The 25 yearlings + 1 cow were fed a legume mix (Table 1) on June 06 while still in T2 treatment strips and then introduced into the T3 treatment strips the following day (June 07). The cattle were provided access to a dugout and a bale of hay. They were removed from the strips after spending about 60 hrs on them.

T4 - Broadcasting fertilizer in the spring: A fertilizer blend (Table 2) was applied with a Haybuster seed drill by simply dropping the fertilizer on the ground as described for T3 above on June 05.



Figure 5: Treatment Strips

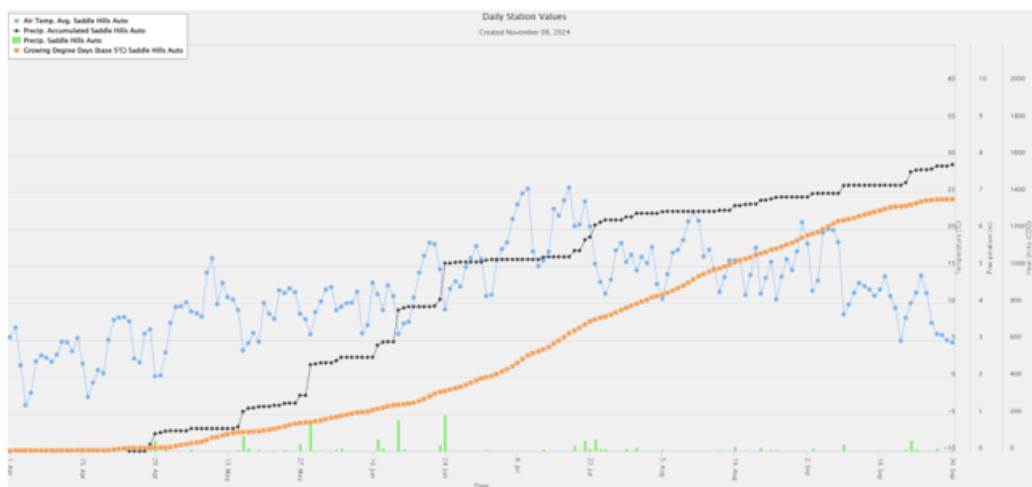


Figure 1: Growing season weather conditions registered at Saddle Hills Auto AG

Baseline Results Before Treatments

Botanical composition and forage yield

The botanical composition and forage yield of the strips taken at the beginning of the trial are given in Table 3. The pastureland is predominantly grass with about 56% grass and just 10% legumes. Weeds such as dandelion and yarrow make up 35% of the botanical composition. Forage yield from the strips averaged less than 500 lbs/ac.

Forage quality

The forage quality of the herbage from the strips is given in Table 4. Crude protein and energy varied from 10 to 14% and 65 to 68%, respectively. Macronutrients varied from 0.48 to 1.00%; 0.18 to 0.2%, 1.6 to 2.8% and 0.18 to 0.32% for calcium, phosphorus, potassium, and magnesium, respectively. Micro nutrients varied from 5.5 to 8.8 ppm, 177 to 540 ppm, 20.1 to 30.5 ppm, and 55 to 108 ppm for copper, iron, zinc, and manganese, respectively.

Table 3: Baseline botanical composition and DM forage yield, and plant emergence count following seeding of pastureland treatments

Strip No	Treatment	Botanical Composition			Forage Yield (lbs/ac)	Emergence* after seeding (plants/m ²)
		Grass (%)	Legume (%)	Weeds (%)		
1	T0	65	10	25	294	-
2	T4	66	27	7	422	-
3	T0	71	0	29	390	-
4	T4	73	0	27	336	-
5	T4	49	0	51	342	-
6	T0	83	0	17	372	-
7	T1	52	0	48	461	122
8	T1	46	13	40	196	26
9	T1	45	17	38	312	15
10	T2	44	16	39	281	39
11	T2	34	35	31	495	46
12	T2	35	18	47	491	13
13	T3	65	17	18	464	0
14	T3	55	0	45	509	0
15	T3	48	0	52	535	0
MEAN		56.4	9.5	34.0	398	-

*Counted on July 30th, 7 weeks after seeding.

Table 4: Baseline forage quality

Strip No	Treatment	CP (%)	TDN (%)	Ca (%)	P (%)	K (%)	Mg (%)	Cu (ppm)	Fe (ppm)	Zn (ppm)	Mn (ppm)
1	T0	-	-	-	-	-	-	-	-	-	-
2	T4	-	-	-	-	-	-	-	-	-	-
3	T0	-	-	-	-	-	-	-	-	-	-
4	T4	-	-	-	-	-	-	-	-	-	-
5	T4	-	-	-	-	-	-	-	-	-	-
6	T0	-	-	-	-	-	-	-	-	-	-
7	T1	12.9	66.2	0.59	0.21	1.9	0.32	7.7	191	28.6	97.4
8	T1	12.8	67.8	0.55	0.20	2.0	0.29	7.1	355	26.2	79.7
9	T1	13.6	67.8	0.54	0.18	1.6	0.28	7.1	540	29.0	108.1
10	T2	10.3	66.8	0.48	0.19	1.8	0.22	6.0	253	23.9	78.4
11	T2	13.1	67.9	0.72	0.21	1.8	0.31	7.5	363	26.1	72.1
12	T2	13.0	67.0	0.83	0.24	1.9	0.30	7.4	177	28.6	63.5
13	T3	10.8	65.2	0.64	0.21	1.6	0.18	5.5	202	20.1	52.9
14	T3	11.6	67.5	0.54	0.28	2.2	0.20	7.1	269	24.0	55.7
15	T3	11.7	66.2	1.00	0.29	2.8	0.30	8.8	200	30.5	86.4
MEAN		12.2	66.9	0.7	0.2	2.0	0.30	7.1	283.5	26.3	77.1

- Results not available

Soil compaction and water infiltration

Table 5 presents the results for soil compaction and water infiltration in the treatment strips. Penetrometer readings were all above 300 psi, indicating that the pastureland was compacted. We know that high compaction restricts root growth, air, and water movement, potentially reducing plant health and yield. Water infiltration measurement taken before treatments was, on average, 13 in/hr.

Plant emergence

Plant emergence was recorded approximately 7 weeks after seeding, indicating some establishment with approximately 54 plants/m² and 33 plants/m², respectively, for T1 and T2. No plant seedlings were counted on T3 strips.

Follow up Plan in 2025

All parameters will be monitored in 2025 to evaluate the changes in strips resulting from the use of different rejuvenation methods. The project concludes with its final field season in 2025.

Table 5: Penetrometer and water infiltration readings for pastureland treatment strips (n=3)

Strip No	Treatment	Penetrometer Readings @			Infiltration (in/hr)
		4" (psi)	8" (psi)	12" (psi)	
1	T0	704	826	584	9
2	T4	640	760	551	12
3	T0	748	510	459	23
4	T4	502	625	595	10
5	T4	536	820	781	5
6	T0	693	618	771	10
7	T1	678	694	799	12
8	T1	699	767	819	26
9	T1	622	835	646	26
10	T2	651	654	729	10
11	T2	657	674	685	11
12	T2	630	798	834	8
13	T3	557	760	828	16
14	T3	635	832	672	11
15	T3	433	510	543	13
MEAN		626	712	687	13

Fieldscale Evaluation of Hayland Rejuvenation Methods

Funded by Saddle Hills County

Livestock producers are increasingly seeking alternative strategies to improve unproductive and aging forage stands without fully terminating them, as doing so is costly and often removes land from production for one or more years. This project aims to explore practical and cost-effective methods for rejuvenating perennial hay fields by reseeding, without the need to take the land out of production for a season or doing expensive operations like disking or ploughing. This project was established in 2023, but poor emergence was observed from the seeded strips. In 2024, we reseeded the same strips.

What We Did

The trial was conducted at the Saddle Hills County hayland site along Hwy 49, Spirit River, AB. The following five treatments were set out, each on 0.4-acre strips replicated three times:

T0 - Control or check strips: no seeding or fertilizer application at all.

T1 - Stand suppression + spring seeding: Stand suppression was done on June 10th with glyphosate at 1.25 L/ac, followed by seeding with an in-house custom high legume mixture (Table 2) on June 13th at a seeding rate of 24 lbs/ac with a Haybuster no-till drill and at a depth of 1/2".

T2 - Dormant and frost seeding: The

legume mixture (Table 2) was seeded on September 26th using a Haybuster no-till drill at 1/2" depth.

T3 - Summer seeding: This treatment was implemented by direct seeding the high-legume mixture (Table 2) with a Haybuster no-till drill at 1/2" depth on July 30th, following the hay harvest of the treatment strips on July 15th.

T4 - Broadcasting fertilizer only in the spring: A fertilizer blend (Table 2) was applied using a Haybuster no-till drill by raising the coulters and discs on the Haybuster to prevent them from cutting into the soil, thereby disabling the drilling action and allowing the fertilizer to drop onto the soil surface simply.

Site soil information taken in the previous spring before implementation of treatments from the surface soil (0-6" soil depth): pH=6.2, organic matter = 4.3%, electrical conductivity = 0.1 dS/m, while the nutrient analysis of the soil gave N = 3 ppm, P = 8 ppm, K = 171 ppm and S = 2 ppm. Soil base saturation was 70.7% (Ca = 44.5%, Mg = 21.0, Na 1.4%, K=3.8 %). Figure 1 shows the weather (including precipitation, air temperature and growth degree days) over the growing season recorded at the nearest ACIS weather station located at White Mountain. Overall, 2024 was characterized by low spring moisture conditions (less than 10" of precipitation).

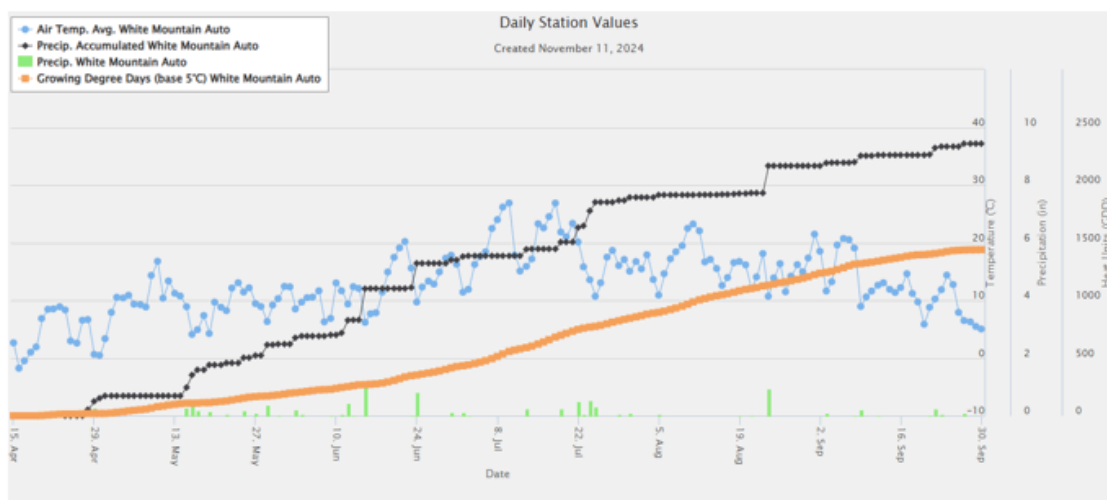


Figure 1. Growing season weather conditions registered at White Mountain Auto ACIS Weather Station

Table 1: High legume seed blend for hayland

No	Species/Variety	Seeding rate (lbs/ac)
1	Sainfoin – AAC Mountainview	15.0
2	Cicer milkvetch	4.1
3	Birdsfoot trefoil	1.0
4	Meadow brome grass- Fleet	4.0
5	Timothy grass - Catapult	0.5

Results - Baseline Before Treatments

Botanical composition and forage yield

The botanical composition and forage yield of the forage stands taken at the beginning of the trial are given in Table 3. The hayland is generally grass-dominated with on average about 50% grasses, 21% legumes and 32% weeds (mostly dandelion and yarrow). Forage yield from the strips ranged between 400 and 660 lbs/ac, averaging less than 500 lbs/ac.

Forage quality

The forage quality of herbage from the various treatment strips is shown

Table 2: Fertilizer blend for T4 treatment*

No	Fertilizer	Rate (lbs/ac)
1	Urea (N)	0
2	Monoammonium Phosphate (P)	100
3	Potash (K)	36.7
4	Ammonium Sulfate (S)	87.5
	TOTAL	224

*Blend from soil test recommendations for an average yield of 3.3 t/ac (N = 12 lbs/ac; P2O5 = 52 lbs/ac; K2O = 22 lbs/ac and S = 21 lbs/ac)

in Table 4. Ranges of between 9 - 14.0% and 63 - 69.0% were observed for protein and energy, while macronutrients ranged from 0.4 - 0.9%, 0.15 - 0.26%, 1.9 - 2.7%, and 0.13 - 0.3% for calcium, phosphorus, potassium, and magnesium, respectively. Micronutrients ranged from 5 - 8 ppm, 60 - 514 ppm, and 26 - 80 ppm for copper, iron, and zinc, respectively.

Table 3: Baseline botanical composition and forage yield of hayland treatment strips (n=3)

Strip No	Treatment	Botanical Composition			Forage Yield (lbs/ac)
		Grass (%)	Legume (%)	Weeds (%)	
1	T1	37	22	41	521
2	T4	67	9	24	543
3	T3	67	21	12	408
4	T0	47	26	27	477
5	T2	54	21	24	382
6	T2	64	24	11	454
7	T4	79	9	12	501
8	T3	41	24	34	438
9	T0	27	26	47	371
10	T1	32	33	35	501
11	T1	19	6	75	657
12	T2	36	10	54	442
13	T0	51	23	26	416
14	T3	35	32	33	553
15	T4	45	25	30	540
MEAN		47	21	32	483

Table 4: Baseline forage quality of hayland treatment strips (n=3)

Strip No	Treatment	CP (%)	TDN (%)	Ca (%)	P (%)	K (%)	Mg (%)	Cu (ppm)	Fe (ppm)	Zn (ppm)
1	T1	14.1	68.4	0.68	0.18	2.1	0.17	8.0	160	43
2	T4	12.6	63.5	0.73	0.24	2.7	0.22	7.2	104	33
3	T3	12.1	67.0	0.70	0.25	2.4	0.21	7.5	514	39
4	T0	9.4	68.3	0.45	0.22	2.2	0.16	4.3	60	26
5	T2	13.7	64.7	0.68	0.25	2.8	0.21	6.8	96	34
6	T2	10.6	67.7	0.54	0.24	2.5	0.18	5.9	89	32
7	T4	12.5	65.3	0.48	0.22	1.9	0.14	4.9	102	80
8	T3	12.4	69.2	0.60	0.19	2.0	0.18	5.8	98	31
9	T0	12.0	68.8	0.51	0.15	2.0	0.17	5.9	92	28
10	T1	13.0	66.4	0.61	0.22	2.4	0.24	8.0	94	34
11	T1	10.0	65.3	0.61	0.22	1.9	0.13	6.9	84	33
12	T2	12.9	66.1	0.89	0.26	2.3	0.3	8.1	98	39
13	T0	12.5	65.4	0.82	0.18	1.7	0.25	7.1	108	33
14	T3	14.4	68.5	1.01	0.24	2.0	0.3	7.4	93	38
15	T4	11.8	67.0	67.0	0.22	2.4	0.18	5.3	91	29
MEAN		12.3	66.8	0.64	0.22	2.21	0.20	6.6	125	33

CP - Protein; TDN - Energy; Ca - Calcium; P - Phosphorus; K - Potassium; Mg - Magnesium; Cu - Copper; Fe - Iron; Zn - Zinc.

Soil compaction and water infiltration

Results for soil compaction and water infiltration are given in Table 5. Penetrometer readings for soil compaction at the site showed a range between 190 – 630 psi with most 4" readings below 300 psi. At 8" and 12" soil depths,

penetrometer readings were generally above 300 psi, indicating compaction at those levels. Soil moisture taken at 4" and 8" averaged 8% and 12% respectively. Water infiltration was generally quick, averaging 28 in/hr and ranging from 17 - 56 in/hr.

Plant emergence

Plant emergence monitored after seeding and all throughout the growing season revealed some emergence on the T1 and none for T2 and T3.

Conclusion and Future Plan

The high compaction at deeper levels and low forage yield underscore the need for

rejuvenation of the hayland. All strips will be monitored in the 2025 growing season to see if any improvements have resulted from administering various treatments. This project concludes with 2025 as its final field season.



Figure 2: Seeding of hayland strips with HAYBUSTER no-till drill.

Table 5: Soil compaction, moisture, and water infiltration for hayland treatment strips (n=3)

Strip No	Treatment	Penetrometer Readings @			Soil Moisture @		Infiltration (in/hr)
		4" (psi)	8" (psi)	12" (psi)	4" (% vwc)	8" (% vwc)	
1	T1	254	393	343	8.0	13.0	39
2	T4	188	347	443	12.3	18.4	28
3	T3	308	499	464	8.5	11.2	20
4	T0	265	417	487	8.6	12.0	17
5	T2	248	323	308	9.3	13.1	22
6	T2	213	282	230	10.1	16.9	28
7	T4	209	319	324	9.3	13.8	25
8	T3	192	236	235	9.2	12.9	27
9	T0	198	333	303	10.4	15.4	21
10	T1	255	467	426	5.8	9.2	38
11	T1	309	614	466	5.5	9.0	30
12	T2	452	598	553	4.3	7.2	23
13	T0	398	523	572	5.7	7.4	33
14	T3	470	561	578	5.5	8.5	56
15	T4	349	478	631	8.8	10.6	20
MEAN		288	425	424	8.1	12.0	28

Psi - Pounds per inch (units for pressure); vwc - volumetric water content

Liming Effects on Forage Sustainability and Economics

Funded by the Rangeland Sustainability Program

Introduction and Objective

The soil pH has a significant influence on soil properties and crop performance. Lower soil pH (acidic soil) can significantly affect the growth and productivity of crops and forage plants. Here are some of the effects of low soil pH on crops and forage:

- **Nutrient Issues:** Low pH reduces the availability of key nutrients [phosphorus (P), calcium (Ca), magnesium (Mg)] and increases toxic elements like aluminum and manganese.
- **Toxicity:** Aluminum can damage roots, while manganese may cause leaf spots or yellowing of leaves.
- **Poor Microbial Activity:** Acidic soils reduce the activity of nitrogen-fixing bacteria, particularly affecting legumes.
- **Crop Impact:** Sensitive crops, such as alfalfa and clover, exhibit reduced growth and yield.
- **Forage Quality:** Lower protein and digestibility, with reduced root growth and drought tolerance.

Liming acidic soils raises pH, reducing aluminum and manganese toxicity and creating favourable conditions for beneficial microbes. Indirectly, liming enhances soil biological activity, improves nutrient release, especially nitrogen and phosphorus, and increases the availability of residual fertilizer phosphorus.

This project aimed to determine the impact of various liming products on legume-dominated pastureland and to assess the economic benefits of using lime over a three-year period.

What We Did

The trial was conducted on a producer's pastureland site at Sexsmith, AB (Legal Land Description: SE 3-74-6 W6). Pre-trial soil samples were collected in early spring and sent to the lab for analysis to determine the suitability of the land for the trial. The reports showed a pH of 5.8 and Ca base saturation (BS) of 42.9%, thus meeting the trial requirements of pH less than 6.0 and Ca BS of less than 60%. The trial was set up as a complete randomized block design trial on strips of 10 x 50 m, replicated three times with similar-sized buffer strips separating the treatments to prevent cross-contamination of lime products and to maintain the integrity of each treatment's effects on soil and plant response.



Spreading of Ag lime with a lime spreader

Table 1: Soil physical baseline measurements on different treatment strips, including compaction and moisture at different depths (4", 8", 12").

Treatment	Strip	GPS Point	Infiltration (in/hr)	Soil compaction @ (psi)			Moisture @ (%)	
				4"	8"	12"	4"	8"
Control	1	1.1	4.3	794	781	830	10.4	25.4
		1.2	-	464	484	374	17.5	29.4
		1.3	4.6	684	543	839	23.2	32.1
Wood ash	2	2.1	2.4	603	521	492	11.2	17.4
		2.2	-	862	759	791	12	17.5
		2.3	2.4	458	512	563	25	32.8
Pelletized lime	3	3.1	2.4	782	860	888	14.7	19.1
		3.2	-	895	716	405	11	15.1
		3.3	5.4	648	715	880	15.8	24.1
Ag Lime	4	4.1	2.4	603	623	604	14.4	19.2
		4.2	-	726	787	944	32.6	32.5
		4.3	2.4	760	568	618	8.5	13.8
Pelletized lime	5	5.1	2.4	436	486	934	10.4	14.2
		5.2	-	544	921	879	9.5	15.8
		5.3	2.4	744	455	390	14.3	28
Control	6	6.1	2.4	845	853	777	21.9	28.7
		6.2	-	904	934	859	8.5	11.5
		6.3	8.4	643	566	691	8.9	14.2
Ag lime	7	7.1	-	801	855	738	13	26.2
		7.2	-	713	496	716	8.3	13.6
		7.3	2.4	801	863	821	14.5	23.4
Wood ash	8	8.1	4.8	898	748	566	8.8	13.6
		8.2	-	797	648	613	9.4	19.4
		8.3	3.9	824	623	872	26.5	26.4
Pelletized lime	9	9.1	3.1	600	657	694	8.4	9.6
		9.2	2.4	886	671	942	10.6	17.8
		9.3	14.7	649	671	667	11.3	17.1
Wood ash	10	10.1	4.0	478	537	409	18.5	25.9
		10.2	2.5	641	692	735	9.1	13.7
		10.3	6.6	938	577	778	12	21.8
Control	11	11.1	8.5	632	807	879	12.2	13
		11.2	2.4	687	831	901	10.9	22.4
		11.3	5.9	698	540	707	18.7	28.4
Ag Lime	12	12.1	2.4	557	660	782	9.9	14.3
		12.2	2.3	857	895	941	8.9	12.2
		12.3	2.4	924	904	675	11.6	22.6

The following treatments were applied to strips:

1. Check (no lime)
2. Pelletized lime (Standard 98G, Calcium Products IA, USA) (94% calcium carbonate equivalent)
3. Ag lime (Ag Lime supplied by Lime Stone Cowboys, Chetwynd, BC) (98% calcium carbonate equivalent)
4. Wood ash (obtained from a local saw mill as a liming alternative) (61% calcium carbonate equivalent)

Baseline data was collected (June 11th) from 3 evenly spread out and centrally located georeferenced points per strip for the following parameters:

- Soil chemical and biological properties from 0-6" depth (including wet aggregate stability, introductory soil chemistry, soil biology [Total bacteria, Total fungi + Total nematode, Active C, Total Organic Carbon & Organic Nitrogen]), with all these analyses carried out at A&L Lab (Ontario).

- Soil physical properties include surface soil temperature and moisture (volumetric moisture content, % using the FieldScout TDR[®] 350 probe at 0-6" depth), soil compaction at 4, 8, and 12" depths (using the SpotOn[®] Digital Compaction Meter), and infiltration (using the single-ring infiltration method).



Spreading of wood ash on strips with a manure spreader



Project consultant Peter Egger (on the right, also an organic beef cattle producer) at the collaborating producer's farm

Table 2: Baseline soil chemical indicators (pooled soil samples from 3 geo-referenced points).

Treatment	Strip	OM (%)	CEC (meq/100g)	pH	K (ppm)	Ca (ppm)	Mg (ppm)	S (lbs/ac)	Na (ppm)	Zn (ppm)	NO ₃ N (lbs/ac)	ENR (lbs/ac)	KMG
Control	1	6.1	23.6	5.6	424	1680	495	9	98	5.1	14	74	0.26
Wood ash	2	6.2	23.1	5.8	243	2000	586	9	107	6.2	12	75	0.13
Pelletized lime	3	5.6	25.6	5.6	230	2000	581	11	139	6.3	12	69	0.12
Ag Lime	4	6.1	23.2	5.8	205	1860	548	9	104	5.5	11	74	0.12
Pelletized lime	5	6.1	22.8	5.9	212	1900	494	10	76	5.7	8	74	0.13
Control	6	6.3	22.8	5.3	341	1570	375	11	42	5.3	36	76	0.28
Ag lime	7	5.3	23.3	5.7	217	1650	545	9	106	3.7	9	66	0.12
Wood ash	8	4.7	23.8	5.6	252	1690	556	10	120	3.7	16	60	0.14
Pelletized lime	9	5.5	21.8	5.5	155	1590	417	11	98	4.8	20	68	0.11
Wood ash	10	5.4	21.5	5.8	165	1480	444	10	88	3.7	14	67	0.12
Control	11	5.1	22.3	5.7	160	1630	580	9	141	3.3	8	64	0.08
Ag Lime	12	6.4	22.8	5.7	255	1770	420	10	56	7.6	12	77	0.19
MEAN		5.7	23.1	5.7	238.3	1735	503	9.8	97.9	5.1	14.3	70.3	0.2

OM – Organic Matter; CEC – Cation-exchange-capacity; ENR – Estimated nitrogen release; KMG – Potassium/Magnesium ratio

Liming application: All treatments were implemented as a one-off. Pelletized lime (applied at 400 lbs/ac) and Ag lime (applied at 4.56 Tons/ac) were spread with a lime spreader equipped with vertical beaters and a spinning disc with a pass width of 2.5 m to ensure a central band of 5 m from which soil and forage samples could be collected and observations made. Wood ash (applied at a rate of 15 Tons/ac) was spread using a burning manure spreader with a spinning disc to ensure a central bandwidth of 5 m. Liming recommendations were based on the spring soil report. The rate of application of each of the liming products was derived from the following calculation:

Rate of product required = (100/CCEof material) x 100/100 - M.C.) x Liming Recommendation (tons/ac), where CCE - Calcium Carbonate Equivalent for the material and M.C. - moisture content.

- The botanical composition of the pastureland was determined by clipping forage material within a 0.25 m² quadrat to identify different functional groups, including grasses, legumes, forbs, and weeds. Forage yield (lbs/ac) and feed quality were determined from clipped forage material in a 1 m² quadrat - weighed fresh, sub-sampled and dried for dry matter content and sent to A&L laboratory for forage quality analyses.

Table 3: Forage baseline measurements. DM - Dry matter; CP - Protein; TDN - Total digestible nutrients; NDFD₄₈ - Nutrient digestible fibre digestibility at 48 hrs, Ca - Calcium, P - Phosphorus; K - Potassium; Mg - Magnesium.

Treatment	Strip	GPS Point	Forage DM Yield (lbs/ac)	Botanical composition (%)			CP (%)	TDN (%)	NDFD ₄₈ (%)	Ca (%)	P (%)	K (%)	Mg (%)
				Grasses	Legumes	Weeds							
Control	1	1.1	687	24	76	0	17.8	63.2	49.6	1.4	0.30	1.5	0.22
		1.2	437	100	0	0							
		1.3	330	44	56	0							
Wood ash	2	2.1	410	21	79	0	17.3	64.6	50.9	1.4	0.31	1.6	0.30
		2.2	446	38	62	0							
		2.3	205	28	41	32							
Pelletized lime	3	3.1	357	33	67	0	20.0	66.4	52.8	1.5	0.32	1.6	0.20
		3.2	80	43	57	0							
		3.3	259	37	63	0							
Ag Lime	4	4.1	339	41	59	0	16.5	66.3	54.2	1.3	0.32	1.8	0.36
		4.2	196	9	91	0							
		4.3	321	31	69	0							
Pelletized lime	5	5.1	321	27	73	0	17.6	66.2	53.1	1.6	0.31	1.6	0.33
		5.2	250	39	61	0							
		5.3	143	30	70	0							
Control	6	6.1	330	23	78	0	16.9	65.1	51.4	1.5	0.30	1.5	0.32
		6.2	375	73	27	0							
		6.3	303	39	61	0							
Ag lime	7	7.1	964	31	43	26	21.0	66.5	53.4	1.5	0.34	1.7	0.20
		7.2	482	23	77	0							
		7.3	705	0	100	0							
Wood ash	8	8.1	571	18	82	0	17.2	64.1	51.2	1.4	0.32	1.7	0.20
		8.2	419	54	46	0							
		8.3	705	44	56	0							
Pelletized lime	9	9.1	428	27	73	0	19.7	65.7	51.9	1.6	0.32	1.6	0.29
		9.2	384	29	71	0							
		9.3	1088	32	68	0							
Wood ash	10	10.1	749	49	51	0	14.1	63.9	55.1	1.0	0.31	1.8	0.20
		10.2	856	31	69	0							
		10.3	589	2	98	0							
Control	11	11.1	1008	39	61	0	17.6	67.0	59.6	1.0	0.31	1.8	0.20
		11.2	553	44	56	0							
		11.3	1374	44	56	0							
Ag Lime	12	12.1	571	52	48	0	17.2	65.7	52.6	1.4	0.31	1.6	0.32
		12.2	375	41	59	0							
		12.3	714	34	66	0							

Baseline Results

Baseline soil physical measurements on different treatment strips

The results of the soil physical baseline measurements on the different treatment strips are given in Table 1. The infiltration rate of treatment strips varied from 2 to 14.7 in/hr, with most strips falling under the moderately rapid infiltration class of 2-6 in/hr, meaning it's not slow enough to cause significant ponding or runoff. Still, it's also not so fast that it overwhelms the soil's capacity to absorb water. In general, penetrometer readings indicated that the soil was heavily compacted at all three depths, with compaction readings exceeding 300 pounds per square inch (psi). Moisture levels in the soil varied between 8% and 33% at 4" and 12% and 33% at 8".

Baseline soil physical measurements on different treatment strips

The results of the baseline soil chemical indicators are given in Table 2. Soil organic matter ranged from 4.7 to 6.4%; Cation exchange capacity varied from 22 to 26 meq/100g, while the pH of strips ranged from 5.7 to 5.9. Ranges of 155 - 424 ppm; 1480 - 2000 ppm; 375 - 586 ppm and 9 - 11 lbs/ac were measured for potassium, calcium, magnesium and sulphur, respectively. Soil health indicators ranged from 64 to 76 lbs/ac, 4 to 6, and 0.08 to 0.28 for estimated nitrogen release (ENR), PERP, and KMG, respectively.

Baseline forage DM yield, botanical - composition, and forage quality

of herbage on different treatment strips

Forage DM yield of sward taken at the prebudding stage averaged just 510 lbs/ac and ranged between 80 and 964 lbs/ac (Table 3). The sward was mainly alfalfa-dominated. The high legume composition of the sward was reflected in the forage quality analysis, which showed a very high crude protein content (14.1 to 20.0%). The total digestible nutrients (TDN, energy) of forage averaged 65.3% and ranged from 63% to 67%. The forage exhibited moderate to high digestibility, with NDFD48 values ranging from 50% to 60%. Macro mineral content of herbage obtained from strips was relatively high, with calcium, potassium, phosphorus, and magnesium levels meeting the requirements of highly demanding beef cattle stock such as growing and finishing calves or lactating cows according to NASEM (2016).

Conclusion and Future Plan

Baseline soil tests indicated a pH range of 5.7-5.9, highlighting the need for liming to enhance forage production in the alfalfa-dominated pasture, which currently averages 510 lbs/ac of dry matter yield. Over the next two years (2025 and 2026), the treatment strips will be monitored for all relevant indicators to assess the impact of the various treatments. An economic analysis will also be conducted to evaluate the cost-effectiveness of the interventions.

Literature Cited: National Academies of Sciences, Engineering, and Medicine. 2016. Nutrient Requirements of Beef Cattle: Eighth Revised Edition. The National Academies Press, Washington, DC.

Update: Verifying the Impact of Management Practices on Changes in Specific Soil Health Parameters

Funded by Results Driven Agriculture Research (RDAR)

Introduction & Objective

The Verification of Management Practices (VMP) Project (2022 - 2024) is a continuation of the Alberta Soil Health Benchmark study (2019 - 2021) aimed at building a provincial database of soil health indicators. Now in its final year, the project has focused on assessing physical, biological, and chemical soil parameters. As a partner group, Peace Country Beef & Forage Association selected and sampled seven sites in the fall of 2021 for baseline data. These sites, representing both grain and beef cattle production systems, were thoroughly documented in terms of field history and management practices.

Methods

In fall 2024, the seven sites originally sampled in 2021 were revisited and similar measurements were conducted. Data collection included on-site assessments of soil compaction and surface infiltration rates, as well as soil cores for bulk density estimates. Soil samples were taken at depths of 0–3 inches and 3–6 inches following Chinook Applied Research Association's Soil Health Lab (CARASHLab) protocols, with eight sampling points per site. The collected samples were sent to CARASHLab for preparation, processing, and analysis under the supervision of Dr.

Yamily Zavala. The soil was evaluated for texture, wet aggregation stability, soil respiration, active carbon, total bacteria, total fungi as well as nematode functional groups. Subsamples were sent to the University of Alberta for quantification of total organic carbon and nitrogen (TOC:TON) ratios and to A&L Labs for complete mineral analysis.

Future Activities

Dr. Yamily Zavala will share the results of the state of farmlands with producers upon finalizing the analysis. This will give producers an overall perspective of how their farm activities have impacted the soil. Furthermore, conscious efforts are being made by Dr. Yamily to meet producers when results are ready, and to provide suggestions and recommendations on strategies for soil health. This will allow producers to share their experiences and challenges.

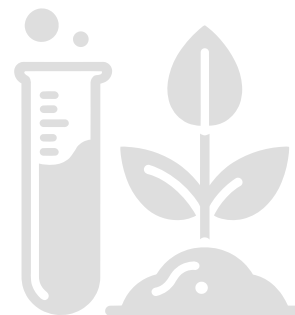


Table 1. PCBFA producer sites revisited in 2024

No.	Producer (initials)	Code	Location	Land Description	Date visited
1	TK	B56	Northern Sunrise County	-	October 2, 2024
2	BK	B59	Hines Creek	SE-1-84-W6	October 3, 2024
3	JL	B61	Worsley	NE-21-87-10-04	October 1, 2024
4	JK	B62	Goodfare	NW 26-71-13-w06	October 7, 2024
5	BO	B65	Gordondale	SE5 87-7-W6	October 1, 2024
6	MB	B66	Gordondale	SW-16-84-25-w05	October 2, 2024
7	GM	B67	Grande Prairie	NW-20-714 W06	October 7, 2024



Figure 1. Participating Applied Research Associations and Forage Associations.



Figure 2. PCBFA staff member taking soil samples in the field.



Innovative Farming in Action: Peace Region Living Lab Project Update

Funded by Agriculture and Agri-Food Canada (Agricultural Climate Solutions -Living Labs) and Cargill

Background

Launched in 2022 and running until March 31, 2027, the Peace Region Living Lab (PRLL) focuses on developing and implementing innovative Best Management Practices (BMPs) to enhance carbon sequestration, reduce greenhouse gases, and provide other environmental benefits.

• Funding & Purpose:

- Funded by Agriculture and Agri-Food Canada's (AAFC) Agricultural Climate Solutions program and Cargill.
- Supports producers and land stewards in adopting and refining sustainable BMPs for long-term land health.

• Collaboration & Knowledge Sharing:

- Participants contribute agronomic insights, management strategies, and cost-of-production data.
- A collaboration between eight partner organizations, project collaborators, and fellow land stewards to promote sustainable farming.

• PCBFA's Role:

- A proud partner in the Peace Region Living Lab.

- Working with core producers at 10 sites in the Peace Region (Figure 1).
- Research focuses on two areas: Beneficial Management Practices (BMPs) and Checks (Control).

Diverse Practices Under BMP Fields:

The BMP fields demonstrate a wide variety of innovative practices, such as intercropping (e.g., canola/oats/peas, camelina/oats/peas), cover cropping, rotational grazing, and sod seeding with legumes. These approaches aim to enhance soil health, forage quality, and overall land productivity, showcasing the adaptability of producers in implementing sustainable farming methods.

Comparative Insights Between BMP and Check Fields:

The Check, or "control", fields typically follow conventional practices, such as monocropping and traditional hayland or pasture management. In contrast, BMP fields integrate innovative strategies that promote biodiversity and ecosystem services, offering valuable opportunities to compare the long-term environmental and economic impacts of traditional versus innovative agricultural practices.

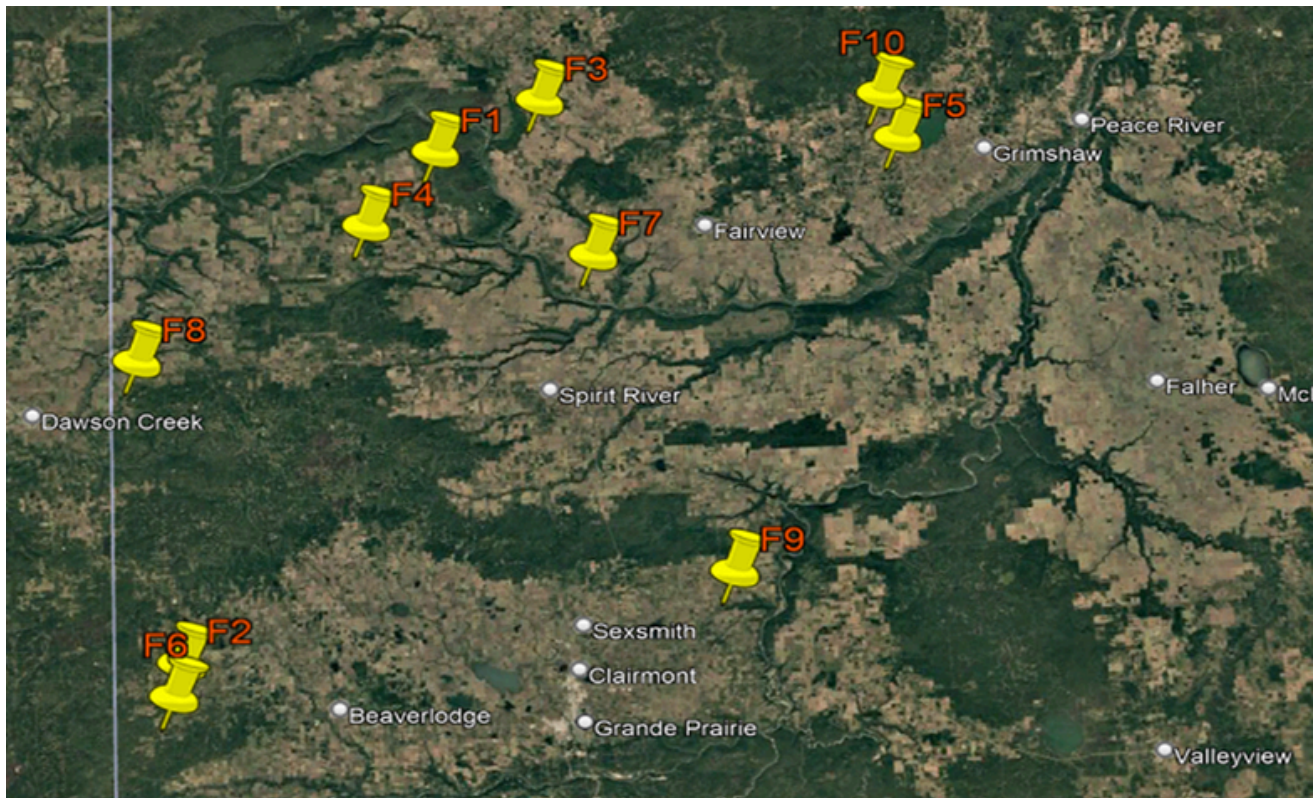


Figure 4. Soil mineral nitrogen measured from 0-6" soil samples taken from Fairview site in the fall of 2023

Methods

As an integral part of the Peace Region Living Lab initiative, PCBFA continues to collect extensive yearly field data to assess co-benefits associated with soil health and productivity. Key measurements include:

Soil Health Parameters: Soil compaction (measured with a SpotOn digital penetrometer), infiltration rates (using the single-ring method), volumetric water content (via Time Domain Reflectometry-350), soil visual assessments, and soil sampling for microbial analysis and carbon sequestration estimates.

Insect Monitoring: Sweep nets and traps are used during the growing season to identify beneficial and predatory pests on select sites.

Forage, Hay, Silage, and Grain Productivity: Regular evaluations of crop performance and yield.

Soil cores are collected at depths of 0-6" and 6-12" to analyze nutrient availability and microbiology, providing critical insights into the impacts of innovative management practices on soil and ecosystem health.

Table 1. The activities undertaken on BMP and Check fields during the 2023 and 2024 growing seasons. Some sites have more than one BMP.

Field #ID	Producer activities undertaken in 2023 and 2024 growing seasons			
	BMP		Check	
	2023	2024	2023	2024
F1	Wheat underseeded with red clover	Peas underseeded with winter wheat	Wheat	Peas
F2	1. Pastureland 2. Pastureland	1. Pastureland 2. Pastureland	Hayland	Hayland
F3	1. Canola/oats/peas intercrop 2. Camelina/oats/peas intercrop	1. Wheat and flax 2. Peas and oats	Canola	Round-up Ready Canola
F4	Hayland (with applied compost)	Hayland (with applied compost)	Hayland	Hayland
F5	Cocktail mix	Cover crop blends	Hayland	Hayland
F6	Pastureland (bale grazing)	Pastureland (bale grazing)	Hayland	Hayland
F7	Hayland	Corn for winter grazing	Hayland	Hayland
F8	Pastureland (rotational grazing)	Pastureland (rotational grazing)	Hayland	Hayland
F9	Rejuvenation methods implemented in 2019: 1. Feed legume seeds with minerals to cows 2. High stock density grazing followed by direct seeding 3. Break and re-seed high legume pasture mix 4. Bale grazing dominated by Cicer Milkvetch pods		Grass-dominated pasture	Grass-dominated pasture
F10	First seeding in 2023: 1. Sod seeding yellowhead alfalfa 2. Sod seeding Spredor alfalfa and sainfoin 3. Sod seeding Spredor alfalfa and cicer milkvetch	Re-seeded in 2024 due lack of establishment: 1. Sod seeding Yellowhead Alfalfa 2. Sod seeding spredor alfalfa and sainfoin 3. Sod seeding Spredor alfalfa and cicer milkvetch	Grass-dominated pasture with volunteer cicer milkvetch	Grass-dominated pasture with volunteer cicer milkvetch

Apart from the on-farm treatment BMP sites, two small plot experiments were conducted at our PCBFA Research Farm under the PRLP project during 2024. These included:

- Biostimulant trial testing the effect of seven different biostimulants and soil amendments on wheat-canola rotation, with wheat seeded in 2024 (separate article).
- Crop-Livestock Integration Project (reported as a separate article).

Future Expectations

As the Peace Region Living Lab project progresses, we eagerly anticipate uncovering new insights and refining best management practices that promote the sustainability of agriculture. The ongoing collaboration with producers will continue to provide valuable data on soil health, crop productivity, and environmental co-benefits. These findings will not only help address current challenges but also pave the way for innovative solutions tailored to the unique conditions of the Peace Region.

We look forward to sharing success stories, learning from the challenges, and demonstrating how sustainable practices can enhance profitability and resilience for producers. Together, we are building a stronger foundation for the future of agriculture. Stay tuned for the exciting developments ahead!



2024 PCBFA Producer Feed Test Quality Reports

Introduction

Since 2007, the Peace Country Beef & Forage Association (PCBFA) has been building a comprehensive regional feed analysis inventory to document feed types and better understand their quality across the Peace Country. Forage samples and other feed types from local producers contribute to this effort. PCBFA encourages local producers to submit forage feed samples for laboratory testing to evaluate their quality. Forage analysis typically includes measurements of crude protein (a key indicator of protein content), total digestible nutrients (a measure of energy), essential minerals (both macro and trace), and detergent fibers. PCBFA supports producers by coordinating the feed testing process, interpreting lab results, and helping develop balanced rations tailored to the nutritional needs of various categories of beef cattle. This service is particularly valuable for producers across the Peace Country region, as it allows them to assess the nutritional value of their available feed sources, such as hay, greenfeed, and silage, and create well-informed feeding plans. Understanding the nutrient content of on-farm feed and comparing it with livestock's nutritional requirements helps producers determine if additional supplements are necessary to maintain or improve animal health and

productivity. This report summarizes the various forage and grain feed samples submitted by producers for testing in 2024 from different municipalities that PCBFA serves. The findings are analyzed in the context of beef cattle nutrient requirements.

Methods

From spring to fall of 2024, 151 (30 fewer than in 2023) feed and grain samples from producers were analyzed for feed quality at the Central Testing Laboratory in Winnipeg, Manitoba, using standard laboratory procedures for wet chemistry and/or near-infrared reflectance spectroscopy (NIRS). For this report, the feed types have been organized into 30 feed types submitted by producers (Table 1). The results are presented and discussed to feed types meeting the minimum daily requirements for crude protein (CP), total digestible nutrients (TDN/energy), macro- and trace-minerals of dry, mid-gestation beef cows (low nutrient requirement) and finishing beef calves (high nutrient requirement) as recommended by National Academies of Science, Engineering and Medicine (NASEM, 2016). In addition, the data for each feed type was analyzed, and where possible, sums, means, percentages/frequencies, and modal values were calculated.

Results

Category of feed types and origin – The main feed category was made up of various hays (81/151 = 54%) and consisted of [Mixed hays (48), Alfalfa hays (20), Grass hays (12) and Cover crop hays (1)] – see Table 1 and Figure 1. Silages came in second place, constituting 19% of all feed and grain samples sent in by producers. Greenfeed of various kinds made up 10% of submitted samples. Also submitted were straws (7%), baleage (4%), haylage (3%) and grain samples (3%).

Figure 2 shows the contribution of the various counties and municipalities to the 151 samples received. Greenview producers came in first place and submitted almost a quarter (25%) of all samples, while Fairview and Saddle Hills came in second and third place, contributing 15% and 13%, respectively. Of interest was the drop in Big Lakes' position from the first in 2023 to the last in 2024.

Protein – A wide range (4.9% - 18.3%) was observed for the protein contents of the feed samples sent, with Mixed haylage, Alfalfa hay, Clover silage, and Pea silage having the highest (> 15%) protein contents on average (Table 1). Straws [Fescue straw (5.4%) and Timothy straw (4.9%)] had some of the lowest protein contents. Protein serves as the building block of nature and, according to

the Beef Cow Rule of Thumb, the protein requirements for average mature beef cattle are 7%, 9%, and 11% CP in mid-pregnancy, late pregnancy, and during lactation, respectively. For proper rumen function, a cow's diet must contain at least 7% crude protein (CP); otherwise, a significant amount of undigested fibre will be excreted in the manure. The Feeder Calf Rule of Thumb suggests that the feeder calves, weighing between 550 and 800 lbs, require a ration of 14% CP; those weighing between 800 and 1050 lbs need 12%; and those weighing 1050 lbs to finishing need 10% CP. Based on these two rules and the data in Tables 1 and 2, we observe that most feed types [except for all the Timothy straw (2 samples), almost all of the Fescue straw and a few Grass hay samples] will meet the nutrient requirements for protein for dry, mid-gestating cows. For high-nutrient requirement beef cattle stock such as growing calves or lactating cows, only a few feed types, such as Alfalfa hay, Haylage mix, or Greenfeed mix, can adequately meet their protein requirements.

Energy - The total digestible nutrients (TDN), commonly called energy, are essential for beef cow rations primarily forages. It serves as a good indicator of the amount of energy a feed provides. The rule of thumb for energy is 55-60-65. The interpretation is that a mature beef cow needs a TDN value of 55% in mid-

pregnancy, 60% in late pregnancy, and 65% after calving (nursing beef cows) to maintain a body condition score (BCS) throughout winter. The energy content of the feed ranged from 44 - 83 % (Table 1), with 100% of straws (Timothy straw and Fescue straw) and 50% of Grass hays not meeting the energy requirements of mid-gestating cows. Very few feed types meet the energy requirements for growing calves with high-energy requirements. These include grains, Greenfeed cocktail, and some silages.

Minerals - The macro mineral contents of the feed types are shown in Table 1. Calcium ranged from 0.05 to 1.5%, Phosphorus from 0.06 to 0.36%, Magnesium from 0.11 to 0.53%, and Potassium from 0.47 to 4.3%. Micro mineral analyses were requested for only 10 (7% of the total) samples with Copper levels ranging from 3.7 – 7.4 ppm, Iron (69 - 392 ppm), Manganese (32 -100 ppm), Molybdenum (0.30 – 4.28 ppm), and zinc (22 - 44 ppm). Regarding meeting the nutrient requirements for animals, most feed types, except the grains and grass straws, will meet the Ca requirements for dry mid-gestating cows (Table 2). In contrast, only the Alfalfa Hay, Haylage mix, Cover crop baleage, Greenfeed cocktail, Cocktail silage and Pea straw meet the Ca requirements for growing calves. The hays were quite poor in Phosphorus levels, with almost half of the Hay mixes, a quarter of the Alfalfa

hays, and three-quarters of the Grass hays not meeting P requirements for mid-gestating cows. Almost all feed types fall short of meeting the high Phosphorus requirements of growing calves. Levels of K (not shown here) and Mg were high in all feed types and would meet the nutritional requirements of all beef cattle stock. For the micro minerals, levels of Cu in all feed types were below the 10 ppm recommended as the minimum requirement for beef cattle stock, while Iron, Manganese, and Molybdenum were sufficient. Nitrates were analyzed only from 4 samples, and levels ranged from 0.05 - 0.23%, far below the 0.5% cut-off level considered detrimental to cattle performance and health.



Results

- There is a dominance of hay, primarily mixed, alfalfa, and grass hays. This suggests that forage-based diets are still the foundation of beef cattle nutrition in the Peace.
- Most feed types (except straws and some grass hays) can meet the minimum 7% protein requirement for mid-gestating cows. Concerns exist for feed types meeting the 12-14% protein requirements of feeder calves or lactating cows, which are met by only high protein feed types such as Alfalfa hay, Haylage mixes, and Greenfeed. Straws (Fescue and Timothy) and some Grass hays are deficient and should not be relied on without supplementation. This implies that beef cattle with high protein requirements require supplementation and ration balancing to avoid reduced growth or milk production.
- All straws and half of the Grass hays have less than the 55% energy needed for mid-gestating cows. Few high-energy feed types are available, such as grains, Greenfeed cocktail, or some silages. Energy supplementation with grains or high-quality silage will be needed for beef cattle on Straw and Grass hays.
- Most feeds meet mid-gestation cow needs for Calcium, but only select feeds (e.g. Alfalfa hay, Haylage and Greenfeed) meet growing calf needs. There is a widespread deficiency of
 - deficiency of Phosphorus, especially in grass and hay mixes, while nearly all feeds fail to meet growing calf requirements. Levels of Potassium and Magnesium are generally high and adequate across all feeds. Copper is consistently deficient while Iron, Manganese and Molybdenum levels are adequate. This implies that supplemental Phosphorus and Copper are necessary in most rations, especially for young and growing animals.
- Some overall implications for management:
 - Supplementation is not optional for certain nutrients (e.g. protein, energy and Phosphorus) if producers want optimal performance.
 - Producers can match high-quality feeds to cattle with high nutrient requirements (e.g. lactating cows and feeder calves) - Reserve low-quality feeds (like straw) for maintenance feeding of dry cows only after balancing the ration. - Feed testing is vital. This report highlights the variability in feed quality. Regular testing allows for precision nutrition and cost-effective feeding.
 - Increase collaboration and coordination between the Agricultural Service personnel of the various municipalities to improve on the number of feed samples received from producers.

Table 1. Average forage quality indicators (dry matter basis) of producer feed test reports in 2024

Feed Type	n	DM (%)	CP (%)	ADF (%)	NDF (%)	Energy (%)	Ca (%)	Mg (%)	P (%)	K (%)
Clover baleage	1	56.7	11.9	40.5	-	55.4	1.28	0.29	0.14	1.5
Cover crop baleage	3	55.7	12.4	34.1	-	62.2	0.74	0.19	0.21	1.9
Mixed baleage	1	49.1	18.3	27.1	-	69.7	0.94	0.52	0.36	4.3
Oat baleage	1	64.1	12.2	25.9	-	70.9	0.26	0.23	0.19	1.8
Barley grain	1	88.0	12.5	-	-	82.8	0.05	0.14	0.36	0.52
Oat grain	1	87.7	11.3	15.2	-	77.3	0.09	0.15	0.34	0.47
Wheat grain	2	88.6	17.2	-	-	85.0	-	-	-	-
Greenfeed cocktail	2	39.5	14.9	30.8	-	65.7	0.95	0.53	0.29	3.4
Greenfeed cover crop	1	89.4	11.9	35.8	58.1	60.4	0.58	0.44	0.18	1.9
Greenfeed mixed	3	88.2	10.8	40.2	58.3	55.7	0.43	0.15	0.21	1.8
Greenfeed oat	5	79.6	11.6	33.8	54.7	62.5	0.40	0.19	0.19	2.0
Greenfeed (unspecified)	5	49.2	12.6	31.3	-	65.2	0.71	0.35	0.25	2.7
Alfalfa hay	20	88.4	15.6	35.2	48.3	60.9	1.38	0.27	0.19	1.94
Cover crop hay	1	89.9	11.0	39.1	58.0	56.8	1.02	0.25	0.13	1.38
Grass hay	12	88.7	7.9	41.9	68.0	53.9	0.39	0.13	0.13	1.62
Mixed hay	48	88.3	12.7	37.6	55.5	59.0	0.92	0.22	0.16	1.64
Mixed haylage	4	60.7	13.6	37.5	55.0	58.6	1.48	0.25	0.18	1.96
Alfalfa silage	1	56.3	13.8	34.0	-	62.3	1.05	0.24	0.23	1.55
Barley silage	1	62.6	10.3	33.7	-	62.6	0.24	0.14	0.19	1.63
Cocktail silage	2	36.1	11.0	31.2	-	65.3	0.59	0.27	0.23	1.56
Cover crop silage	7	50.8	11.3	29.4	-	67.3	0.44	0.22	0.23	1.46
Grass silage	3	39.9	13.6	31.7	58.4	64.8	0.56	0.17	0.25	2.05
Mixed silage	5	35.8	12.6	32.9	-	63.5	0.73	0.29	0.22	1.66
Oat silage	6	41.0	10.1	30.0	-	66.6	0.29	0.18	0.21	1.84
Pea silage	1	40.5	15.8	25.8	-	71.0	0.94	0.23	0.26	1.45
Silage (unspecified)	2	59.3	10.9	31.5	-	65.0	0.43	0.20	0.23	1.50
Fescue straw	7	85.7	4.9	50.2	83.4	45.0	0.26	0.11	0.06	1.48
Pea straw	2	88.6	8.9	50.9	65.0	44.2	1.43	0.30	0.12	1.20
Timothy straw	2	87.1	5.4	49	75.6	46.1	0.23	0.11	0.10	1.15

n - number of samples; DM - dry matter; CP - crude protein; NDF - neutral detergent fibre; ADF - acid detergent fibre; Ca - calcium; Mg - magnesium; P - Phosphorus; K - Potassium

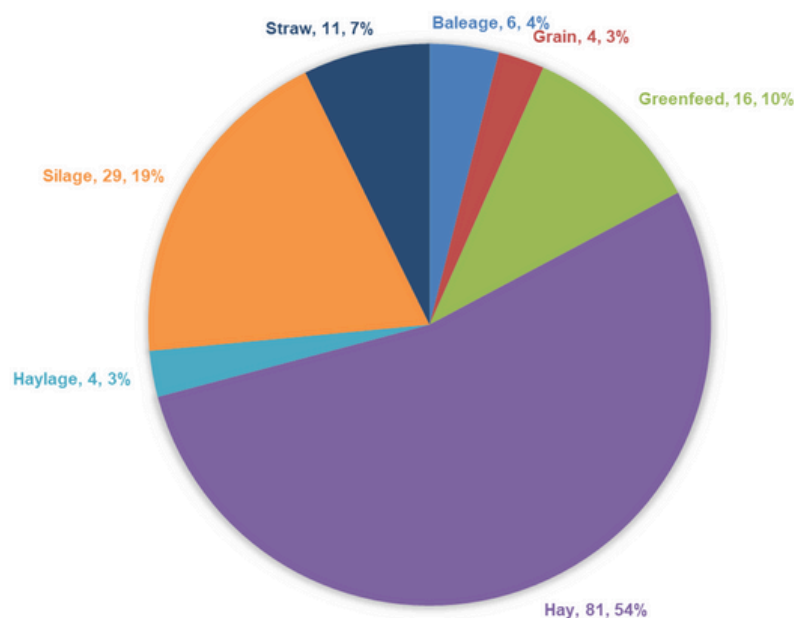


Figure 1. Main categories of feed types analyzed in 2024.

Table 2. Percent of main feed types containing less than the recommended minimum daily nutrient requirements.

Feed Type	% of feed type not meeting <u>Protein</u> requirements for		% of feed type not meeting <u>Energy</u> requirements for		% of feed type not meeting <u>Calcium</u> requirements for		% of feed type not meeting <u>Phosphorus</u> requirements for		% of feed type not meeting <u>Magnesium</u> requirements for	
	Dry cow	Growing calf	Dry cow	Growing calf	Dry cow	Growing calf	Dry cow	Growing calf	Dry cow	Growing calf
Hay mix (n=48)	8	44	23	85	0	21	50	98	2	8
Alfalfa hay (n=20)	0	0	10	65	0	0	25	95	0	0
Grass hay (n=12)	33	100	50	100	0	75	75	100	8	33
Cover crop silage (n=7)	0	57	14	29	0	86	14	86	0	0
Fescue straw (n=7)	86	100	100	100	0	100	100	100	0	71
Oat silage (n=6)	0	100	0	40	0	100	0	100	0	0
Mixed silage (n=5)	0	40	0	60	0	40	0	100	0	0
Oat greenfeed (n=5)	0	60	0	100	0	80	0	100	0	0
Greenfeed (unspecified)	0	20	0	40	0	20	0	80	0	0
Haylage mix (n=4)	0	0	0	100	0	0	0	100	0	0
Cover crop baleage (n=3)	0	0	0	100	0	0	0	100	0	0
Greenfeed mix (n=3)	0	0	33	100	0	66	0	66	0	0
Grass silage (n=3)	0	66	0	66	0	33	0	66	0	0
Greenfeed cocktail (n=2)	0	0	0	0	0	0	0	50	0	0
Cocktail silage (n=2)	0	100	0	50	0	0	0	100	0	0
Pea straw (n=2)	50	100	100	100	0	0	50	100	0	0
Timothy straw (n=2)	100	100	100	100	50	100	100	100	50	100

n = number of samples; Percentages above 50% are bold.

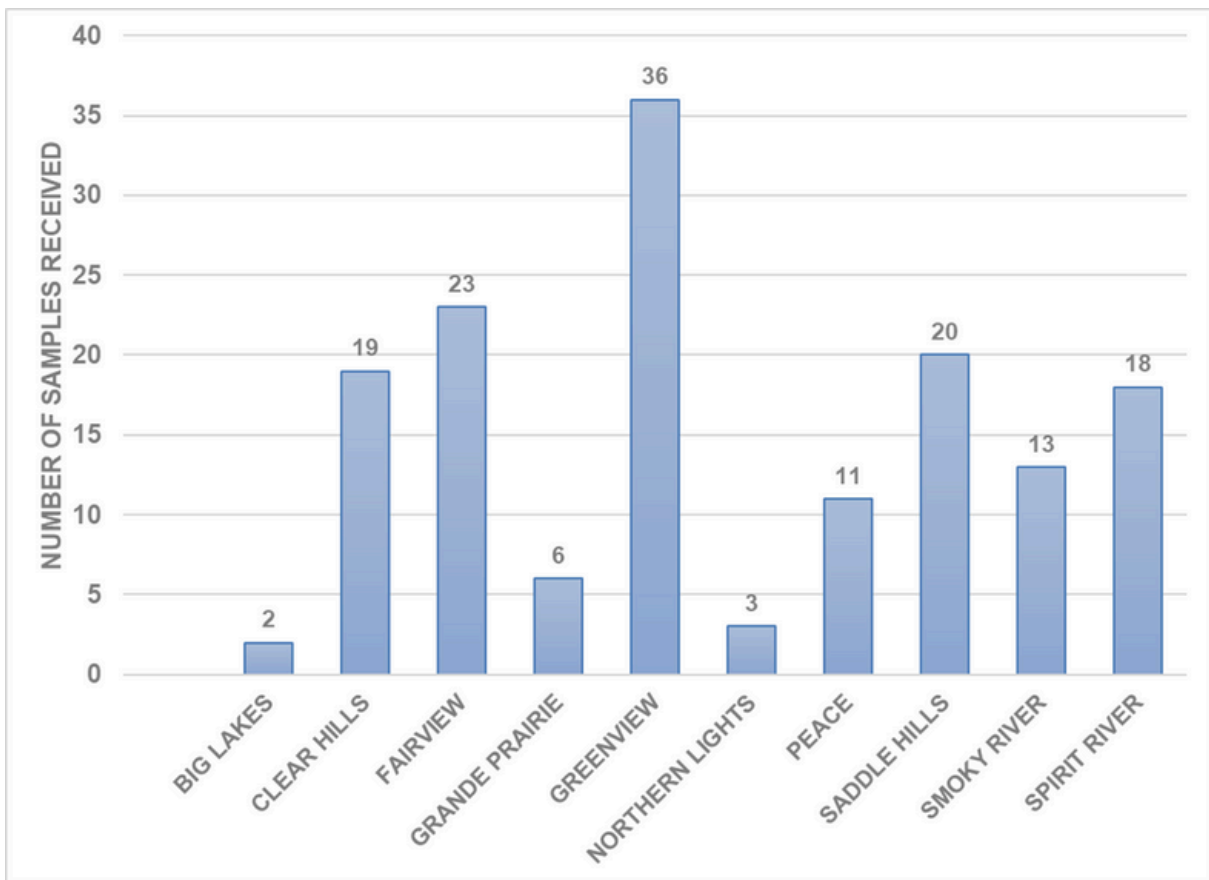


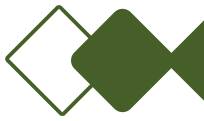
Figure 2. Origin of feed samples from producers in 2024



Our Feed Testing Database goes back to 2007!



Municipal Recognition



Without the generous support and commitment of our municipal funding partners to enhance the sustainability of agriculture, one farm at a time, we would not have been able to conduct such invaluable agricultural research or provide a range of extension events and services.



**NORTHERN SUNRISE
COUNTY**