PEACE COUNTRY BEEF & FORAGE ASSOCIATION

Annual Report 2016




"Local Information for Peace Country Producers"

Peace Country Beef & Forage Association

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 non-profit, producer driven, unbiased applied research association, focusing primarily on forage and beef research. We are currently made up of 10 directors, 4 full-time staff and approximately 180 members from across the Peace region.

Mission:

The Peace Country Beef & Forage Association is a producer group with the goal to be a hub of innovative, relevant and local beef, forage and crop information for Peace Country Producers.

Vision:

A Peace Country producer's first stop for optimizing beef, forage and crop production to maximize profitability with innovative and credible information.

Mandate:

The Peace Country Beef & Forage Association believes that the sustainability of rural communities in the Peace River region will be dependent upon a strong agricultural economy with livestock production as its foundation.

Our Region:

PCBFA works with producers in an area stretching from High Prairie to the B.C. border and from Manning to Valleyview. Our focus area has 1.9 million acres of pasture land and 118,000 breeding cows.

PCBFA
PEACE COUNTRY BEEF & FORAGE ASSOCIATION

TABLE OF CONTENTS

Introduction

2016 in Review

Section 1: ASB and Extension Highlights

Section 2: Field Trials & Demonstrations Update

TABLE OF CONTENTS

CHAIRMAN'S REPORT
Conrad Dolen

2016 was a very busy year; the staff and directors of the Peace Country Beef and Forage Association once again raised the bar with the quantity and quality of work being done. 2015 was the International Year of the Soils. The momentum that carried forward from this year was tremendous. The Western Canada Conference on Soil Health in 2015 was such a great success; we were able to see the results from this conference being expressed in the Peace Country in 2016. The results of this success kept staff busy as producers from all corners of the Peace Region came out to learn about soil health and how to enhance soils with the use of cocktail cover crops and other management practices best suited to them. 2016 was the International Year of Pulses and PCBFA was in the spirit of this with many different forms of research for pulse varieties. This research was conducted at the research farm in Fairview. PCBFA is still currently working closely with the Alberta Beef Producers on a pasture rejuvenation project at the Wanham Provincial Grazing Reserve. These are just a few of the many things that the PCBFA staff was involved in this past year. Our busy staff has worked very diligently and strategically to see success for 2016.

We were very fortunate to receive additional funding from Alberta Agriculture and Forestry for an Applied Research and Forage Association Enhancement Project, along with funding from some of our close partners. We greatly appreciate the continuous support from those around us.

There were some staffing changes in 2016. Our Manager, Monika Benoit, stepped back from her position to take on a new challenge in her life - the challenge of being a mom. Monika made sure to find a capable replacement, Liisa Vihvelin. Kaitlin McLachlan has also changed career paths and is no longer with us. We have been very fortunate to see the hiring of Jen Allen as the Agri-Environmental Program Coordinator and Lekshmi Sreekumar as a Research Technician. They have been great additions to the PCBFA team.

I have enjoyed the past four years that I spent on the board. I look forward to future encounters with the PCBFA. Good luck to the new Chairman and all of the new board members in 2017.

Sincerely,

Conrad Dolen

Board Members & Staff 2016
Back Row (left to right): Akim Omokanye, Stan Logan, Jordan Barnfield, Conrad Dolen, Preston Basnett, Thomas Claydon, Faron Steffen
Front Row (left to right): Joyleen Tindall, Gary Gurtler, Nancy Van Herk, John Prinse, Liisa Vihvelin, Jen Allen, Lekshmi Sreekumar

MANAGER'S REPORT

Liisa Vihvelin, BSc(Agr)

Hello everyone! As many of you know, I relocated to the Peace Country all the way from New Brunswick this past September. Monika and her husband Mike began a brand new adventure when they welcomed a baby boy, Carter Ross Benoit, on December 1st. The past few months I've been busy getting to know my way around, learning the area, meeting the people, and wrapping my head around everything there is to know and do in this job. It's been crazy, stressful, overwhelming and hectic, all at the same time – and I've loved every minute of it! I'm so grateful to be out here and to be involved in this great organization and the fantastic work they do. Not to mention the amazing staff, board of directors, and members that we are so fortunate to have! It's been wonderful getting to know all of you that I have so far, and I look forward to continuing to meet and work with many other great producers in this region.

In 2016, we wrapped up the three-year Ag Service Board Enhanced Environmental funding program, which included a project that measured and compared the distribution of nutrients in the soil between different cropping and grazing systems. The results are here for you to read! We've spent the last few months planning for the next three-year program, and finally just submitted the new application on January 31st, in collaboration with 7 municipalities.

This past summer, we also launched a brand new farm-scale three-year Pasture Rejuvenation project funded by Alberta Beef Producers. The project is taking place at the Wanham Provincial Grazing Reserve, and we also have a site in Oyen that is being maintained by the Chinook Applied Research Association, under the supervision of Akim. In August, staff attended the sold-out first ever Canadian Beef Industry Conference in Calgary. The conference was a huge success, and we hope to return this summer for the second annual CBIC!

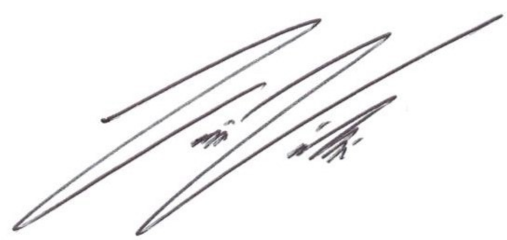
This upcoming year, we are very excited to be receiving some support from Northern Sunrise County. We greatly appreciate the support offered by the 10 municipalities we work with; our programs would not be possible without them!

In March, two of our board members, Conrad Dolen and Stan Logan, will be ending their terms and the two new directors will have big shoes to fill! Thank you both for your support, and your contributions to PCBFA.

Thank you to everyone who made this past year such a great success, and here's to 2017!

Staff Members 2016

Left to right: Lekshmi Sreekumar, Jen Allen, Liisa Vihvelin & Akim Omokanye



2016 Report from the Agriculture Research Extension Council of Alberta

Ian Murray, Chair

2016 was a good year for ARECA. We worked with our 9 member associations to deliver programs across the province.

RVTs: 5 of our member associations delivered pea, wheat, barley, oats and flax Regional Variety Trials on 22 sites across the province. Yield data is collected and distributed in the Alberta Seed Guide.

Pest Monitoring: As in the past, 6 of our associations worked with AAF to monitor insect infestations across the province. We monitored 8 insect pests in 260 field visits over the summer and submitted the data for inclusion in the Alberta Insect Pest Monitoring Network releases.

We launched a new website in 2016. It is cleaner, leaner and full of information about programs delivered by our member associations (www.areca.ab.ca).

Connections Newsletter: We created and distributed 9 newsletters with the intent of increasing the connection between our member association boards. Each edition featured one member association. The newsletter is distributed internally to all association board members.

Janette McDonald, Executive Director

Environmental Farm Plan: In 2016, we introduced the Web 3.0 edition of the EFP. As well, ARECA was instrumental in leading a movement to a national EFP. We hope to move this plan further in 2017. Late in 2016, we started preparing the Alberta EFP 5-year Business Plan for 2018-2023.

Sustainable Sourcing: ARECA was awarded Green Intern funding in 2016 and our intern has completed an excellent summary of potential global sustainability requirements and how those requirements will impact Alberta farmers.

Governance: In 2016, the ARECA Board spent time developing sound processes around how projects are approved and managed within ARECA and between ARECA and our members. Our new processes have resulted in successful programs and co-operation between our members.

Sainfoin Pasture: All associations are collaborating with ARECA and Alberta Agriculture and Forestry (AAF) on a province-wide sainfoin pasture project. We established 10 sites and will be measuring plant health and grazing yield in 2017.

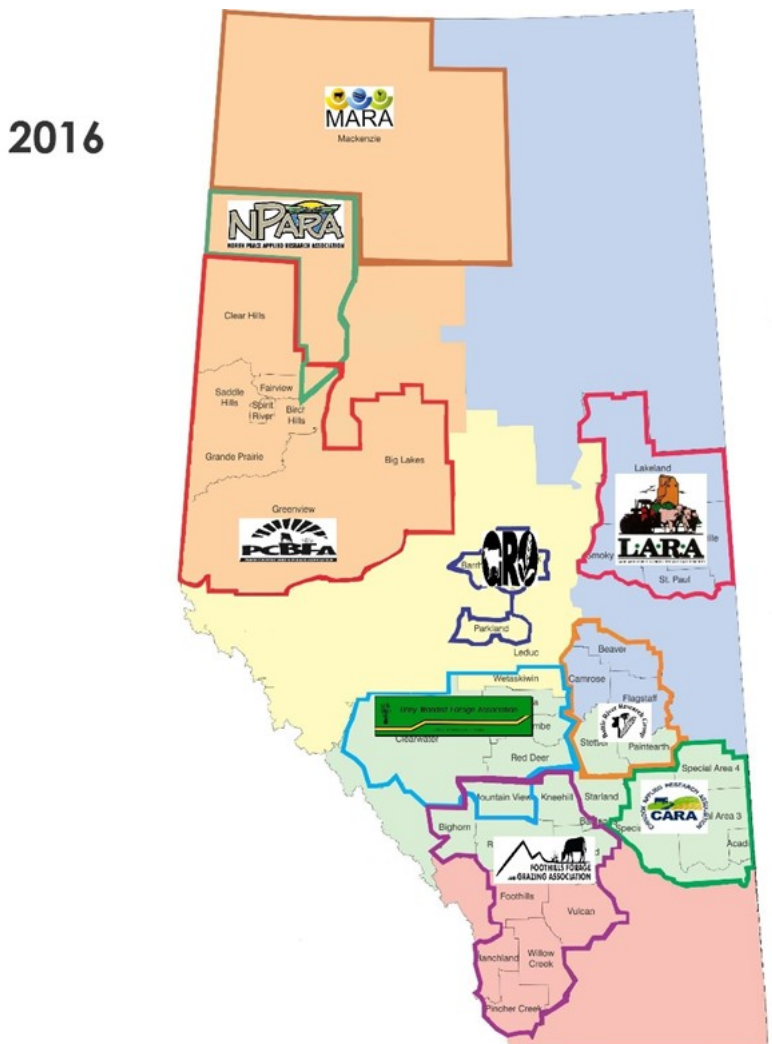
ARECA

Blackleg Surveillance: ARECA and 7 associations co-operated with AAF to collect and submit samples from 171 canola fields across the province. This project is a significant benefit to canola producers and we have the opportunity to expand it in 2017 and beyond.

Project Management Training: All ARECA associations and their staff manage projects. Project Management is a valued skill. Late in 2016, ARECA paid for training of 10 staff from 7 associations. This was an excellent course. If we work at what we learned, our projects will get better and better. Some staff comments:

> "We will be more organized and take less time to complete events or projects….Great course!"
> "Projects will be better understood and support more buy –in."
> "This was one of the best training workshops I have ever been to. "

Strategic Planning Conference: In November, ARECA hosted 35 association board members at a conference in Lacombe. It was an excellent session and will lead to greater collaboration between our associations, government and industry in 2017.



2016 BOARD OF DIRECTORS

Chairman:	Conrad Dolen	Fourth Creek
Vice Chair:	Jordan Barnfield	Teepee Creek
Treasurer:	John Prinse	Enilda
Secretary:	Nancy Van Herk	Eureka River
Directors:	Thomas Claydon	Valleyview
	Stan Logan	Cleardale
	Preston Basnett	Eureka River
	Gary Gurtler	North Star
	Faron Steffen	Grimshaw
	Joyleen Beamish	High Prairie

Staff and Contact Information

Manager:
Liisa Vihvelin liisa@pcbfa.ca
Cell: 780 523 0443

Agri-Environmental Program Coordinator:
Jen Allen jen@pcbfa.ca
Cell: 780 772 0277

Research Coordinator
Akim Omokanye akim@pcbfa.ca
Cell: 780 835 1112

Research Technician:
Lekshmi Sreekumar lekshmi@pcbfa.ca
Cell: 780 536 7373

Rm. 229 Trades Instructional Bldg, GPRC
Box 3000
Fairview, AB T0H 1L0
Phone: 780 835 6799 Fax: 780 835 6628

High Prairie Provincial Building
Box 2803
High Prairie, AB T0G 1E0
Phone: 780 523 4033 Fax: 780 523 6569

Municipalities and Counties

MD of Fairview No. 136
MD of Peace, No. 135
Clear Hills County
Saddle Hills County
MD of Spirit River, No. 133
Birch Hills County
Big Lakes County
MD of Greenview, No. 16
County of Grande Prairie

Alberta Agriculture & Forestry Advisory

Calvin Yoder, Forage Specialist	Spirit River
Freeman Iwasiuk, Beef Business Development	High Prairie

ACKNOWLEDGEMENTS

PCBFA greatly appreciates the following contributors for helping us deliver important extension programs and conduct essential projects in 2016:

Funders

Agriculture Opportunity Fund (AOF)
Alberta Agriculture and Forestry (AAF)
Agriculture & Agri-Food Canada (AAFC)
Alberta Crop Industry Development Fund (ACIDF)
Alberta Beef Producers (ABP)

Municipal Districts & Counties

County of Grande Prairie
MD of Fairview, No. 136
MD of Peace, No. 135
Clear Hills County
Saddle Hills County
MD of Spirit River, No. 133
Birch Hills County
Big Lakes County
MD of Greenview, No. 16

Corporate Sponsors

Golden Acre Seeds
Pickseed

Agri-Business & Collaborators

Thunder Seed
Dynamic Seeds
Rocky Mountain Equipment
Dunvegan Ag Solutions
Wanham Grazing Association
Prairie Coast Equipment
BrettYoung Seeds
DuPont Pioneer
CPS
ReNew Ag
Barenbrug, USA
BEST Environmental Technologies
Teepee Creek Hauling
Grande Prairie Regional College
Weaver Bros. Auctions Ltd.
Union Forage
Kubota Country

Co-operators

Conrad Dolen
Pat & Jay Eaton
Allan McLachlan
Chris Roy
Murray Lewis
Soames Smith
Zahacy Farms
Kevin Meneice
Bill Smith
Bev & Greg Wieben
Christine & Wally Lentz
Mark Martin
Steve & Peggy Johnson
Koos & Barbara Bos
The Hales
Mackay Ross
Jordan Barnfield
Preston Basnett
James Bozarth

Partners

North Peace Applied Research Association
Mackenzie Applied Research Association
Smokey Applied Research & Demonstration Association
Calvin Yoder, AAF, Spirit River
Agriculture & Agri-Food Canada
Alberta Agriculture & Forestry
Lesser Slave Watershed Council
Heart River Watershed Riparian Team

SERVICES PROVIDED BY PEACE COUNTRY BEEF & FORAGE ASSOCIATION

- Extension services: production decision making, technical assistance and problem solving
- Workshops, Pasture Walks, Grazing Schools, Tours and Field Days
- Feed Testing and Ration Balancing
- Soil Testing and Fertilizer Analysis
- Livestock Water Quality Testing
- Environmental Farm Plan Assistance and Workshops
- Growing Forward 2, Water Management Planning Assistance
- Nutrient Management Analysis and Assistance
  - Informing producers on the benefits of manure as a fertilizer source
  - Proper manure testing techniques
- Peace Country Beef School
  - To inform and educate producers on beef fabrication and marketing of beef (gate to plate)
  - Hands on learning involving live and slaughtered carcass evaluation
- Gallagher Portable Scale and an Electronic Tag Reader for Rent ($25/day or $40/day for both)
- 320 bushel Creep Feeder Available for Use
- Portable Solar Watering System Available for Use
- Feed Probes Available for Use

2016 IN REVIEW

ASB AND EXTENSION HIGHLIGHTS

Extension Activities for Every Producer

Highlights from our Extension Activities Across the Peace Country

Sprayer Workshop – April 12th & 14th

To kick off the year, we hosted two Sprayer Workshops in Grimshaw and Spirit River. We talked about new sprayer technologies, tips for getting ready for spray season, as well as an overview of Growing Forward 2 programs and Environmental Farm Plans.

Livestock Handling Systems Tour – June 3rd

June saw us hosting our Livestock Handling Systems Tour in Fairview. We hosted Dr. Cody Creelman as well as Jack Nester of Nester Livestock to talk about handling system design. In the afternoon we toured three local handling systems and talked about their set up and their effectiveness. We had over 40 attendees and the day was enjoyed by all.

Soil Health: The Bottom Lines with Nicole Masters – June 22nd

We wrapped up June with a soil health event in collaboration with North Peace Applied Research Association (NPARA). We hosted New Zealand soil health guru Nicole Masters in Rycroft. This was a very well attended event that began with a morning classroom session. In the afternoon we broke into small groups and were able to examine the soil ourselves. We learned about being able to tell the health of our soil using visual indicators.

Field Day at the Research Farm – July 20th

July 20th was a rainy Wednesday, however we were joined by over 60 local producer to tour our small plot research at the Fairview Research Farm. We were joined by representatives from the Alberta Pulse Growers as well as other local Applied Research Associations.

Pasture Walk Series – July 26th-28th

We hosted 3 pasture walks across the Peace, in Fourth Creek, Grimshaw, and Valleyview. Our day in Fourth Creek also included a special presentation on sainfoin. For all three days we were joined by guest speakers Kelly Sidoryk of Holistic Management Canada and Karin Lindquist, Forage/Beef Specialist with Alberta Agriculture & Forestry. In Fourth Creek we were also joined by guest speaker Ian Murray, ARECA Chair.

Whole Farm Water Planning Workshops – August 3rd & 4th

Jesse Lemieux of Pacific Permaculture came back to the Peace for two 1 day workshops—one in Blueberry Mountain and one in Hines Creek. At each workshop, attendees learned how to plan to store water by using the big picture of their farm with techniques such as permaculture and key-line design. We also worked with Jesse at the end of December to produce a video series on Whole Farm Water Planning and his time in the Peace Country over the past 3 years. Stay tuned to our YouTube channel for this video series!

Watering Systems Tour – September 9th
In September, we partnered with Lesser Slave Watershed Council (LSWC) to put on a watering systems tour geared towards summer systems. We had Marvin Jackson of Sundog Solar come up and we toured 2 sites with different watering challenges in Big Lakes County.

Cattle Market Outlook Evening – September 19th
With the fall run upon us, we hosted Brian Perillat of Canfax for a cattle market update and outlook in Teepee Creek. The outlook was a bit more depressing than hopeful at that point, but was well attended none the less.

Beavers in Our Landscape Workshops – October 11th & 12th
We were joined by Cows and Fish to put on 2 one day workshops on living with beavers. We partnered with the County of Grande Prairie for the October 11th workshop in Clairmont, and Lesser Slave Watershed Council (LSWC) for the October 12th workshop in High Prairie. Cows and Fish touched on both the good and the bad about beavers, as well as how to manage and work with them on your landscape. Both workshops were full of conversation, questions, and learning.

Ration Balancing Workshops – November 22nd & 23rd
With the wet conditions in the area this year, we hosted two ration balancing workshops, one in Valleyview and the second in Spirit River. Barry Yaremcio from Alberta Agriculture and Forestry lead each workshop. Producers were able to learn the basics of formulating a ration, and how to utilize the CowBytes ration balancing software to create and verify their own rations.

Dugout Workshop – November 24th
Dan Benson, Alberta Ag & Forestry's Agricultural Water Specialist joined us in Grimshaw to talk dugout design! He also gave us an update on the Growing Forward 2 On-Farm Water Management Program.

East Peace Beef Cattle Day – November 30th
To finish off November, we had a great day lined up in High Prairie with 3 special guest speakers covering a variety of topics. Kelly Sidoryk of Holistic Management Canada did a brief introduction to holistic management and its significance to producers. Herman Simons, Alberta Ag & Forestry's Farm Business Specialist presented on the economics and competiveness of cow/calf producers in Alberta. PCBFA's Dr. Akim Omokanye gave a research update on Peace Corn Field Trials, and Peace Country producer Pat Eaton was also there to share his own operational experiences of growing and grazing corn. To top the day off, we also debuted PCBFA's newest publication - *Corn: Field Guide for Grazing and Silage in the Peace*.

We have been contacted by many producers in the Peace Region, not only to do Environmental Farm Plans, but to also help with filling in forms for grants that are available through Growing Forward 2. We always take time to help producers fill out these grant applications and give them tips on the best way to do so. Our staff is also available to help complete Environmental Farm Plans. We are always on the lookout for information to provide to producers on any available programs and help them identify which projects qualify and which do not.

Growing Forward 2
A federal-provincial-territorial initiative
Alberta Government
Canada
Alberta EFP Environmental Farm Plan

<u>Environmental Farm Plan & Growing Forward 2 Workshop</u> – December 6th

We hosted an Environmental Farm Plan & Growing Forward 2 Workshop in Hines Creek, where producers received updates, information, and assistance on GF2 Programs and EFPs. PCBFA is able to assist you with completing both EFPs & GF2 applications at any time, just give us a call!

<u>Agri-Clear Cattle Marketing Workshop</u> – January 4th

In High Prairie, we were joined by guest speakers from Agri-Clear and Boehringer Ingelheim for a Cattle Marketing Workshop. Producers who attended were able to learn about the benefits of using Agri-Clear and Express Verified to market cattle. The close-knit setting allowed for great round-table discussion and participation from both producers and speakers.

<u>Peace Agronomy Update</u> – January 18th

We were happy to collaborate with the North Peace Applied Research Association (NPARA) to host the Peace Agronomy Update in Fairivew. The day was very well attended! Speakers presented on a variety of topics including the development of oat varieties, oat marketing opportunities, inoculants and nodulation, modernization of Canadian wheat classes, and a market update on grain, pulse and oilseed. January 18th was also 'Global Pulse Day' and we celebrated with pulse inspired dishes for lunch and dessert! Recipes included chickpea and bean salads, black bean brownies, chickpea chocolate chip cookies, and chickpea spiced carrot cookies.

<u>Transition Planning Workshop</u> – January 19th and February 16th

In collaboration with Alberta Agriculture & Forestry, we put on a 2 day workshop in Grande Prairie to assist producer families to get started on shaping the future ownership of their farm or ranch. By working with the professionals at the workshop, families are able to design their own transition plan and are provided with creative solutions to implement the plan. For Day 1 of the workshop, we were joined by a representative from the Alberta Business Family Institute. For Day 2 taking place on February 16th, additional business, tax, financial and legal experts will be present to take the succession planning strategies to the next level.

<u>Winter Watering Systems Tour</u> – January 21st

It was bit of a chilly, slippery, and windy day for our Winter Watering Systems Tour, but we had a great crowd come out none the less! We toured 2 unique winter watering system sites in Clear Hills County, where our hosts showed us the ins and outs of their systems, and answered any questions from the attendees. We were also joined by special guest speakers Steve Kenyon of Greener Pastures Ranching Ltd. and Dan Benson, Agriculture Water Specialist with Alberta Agriculture & Forestry. The tour allowed for a lot of engagement opportunities between producers and speakers, creating thought-provoking conversation throughout the entire day!

Become a PCBFA member to stay up to date on all upcoming extension events!

Forage Facts

Forage Facts is a monthly newsletter that provides timely information relevant to the beef and forage sector. It is also the best source of information about extension events we have planned and how you can participate! Forage Facts is sent out to our entire membership, by email or by mail. This newsletter is an invaluable way to communicate information to our members, as well as inform them of new ideas on the horizon.

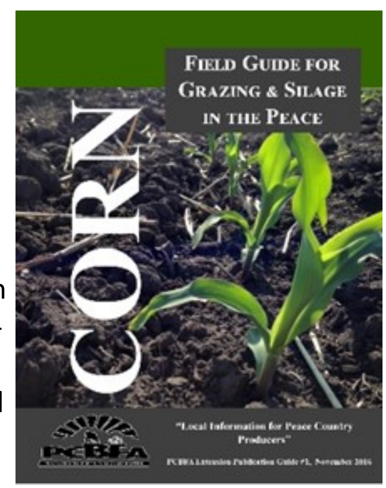
Forage Country Magazine

Our association produces a bi-annual publication to highlight past projects, new projects, and innovative information, as well as current, past, and future extension events. This publication is distributed to 4000 rural mail boxes in our partnering municipalities throughout the Peace Country. Keep your eye out for both our winter edition and summer edition for 2017!

Corn: Field Guide for Grazing & Silage in the Peace

Hot off the press, PCBFA now has our first Corn Guide extension publication available for producers. The guidelines and recommendations within the Corn Guide are based on research and extension activities conducted across the Peace Country by PCBFA and from studies elsewhere in Canada and the US. In the future, the Corn Guide will be revised and updated with information such as herbicide options, benefits of using higher seeding rates, and cost-benefit analysis of open pollinated corn varieties versus hybrids. Be sure to stop by either PCBFA office to pick up a copy!

Website



If you haven't already, be sure to check out the PCBFA website at www.peacecountrybeef.ca! Our website continues to be a great asset to the association and is a great way to target a larger audience and keep people informed of all the happenings of PCBFA. Information about the association, upcoming events, ongoing projects, career opportunities and publications (i.e. published research papers, Forage Facts, Forage Country, or Annual Reports) are all available on our website.

Social Media

PCBFA is very active on social media, extending our reach to connect with producers in more non-traditional ways. Through our social media accounts, we are able to instantly share news, updates, or stories that are affecting or related to the beef and forage industry. It is also a wonderful tool for advertising our upcoming events and sharing all PCBFA updates right at our fingertips! Stay connected—follow us!

facebook @peacecountrybeef – We currently have 299 likes on Facebook.

twitter @PCBFA – We currently have 586 followers on Twitter.

Instagram @peacecountrybeef – We currently have 100 followers on Instagram.

YouTube We are beginning to be more active on YouTube. Search "Peace Country Beef and Forage Association" and subscribe to our channel!

ASB Environmental Program Update

2016 wrapped up our 3-year Agriculture Service Board Environmental Program funding. This program was being run in collaboration with Big Lakes County, Birch Hills County, MD of Spirit River, Saddle Hills County, MD of Fairview, Clear Hills County, and the MD of Peace. We are excited to start the next 3-year ASB Environmental Program for 2017-2019!

On-Farm Nutrient Budgeting 2014-2016

The third and final year of data was collected on 6 farms across the Peace for the On-Farm Nutrient Budgeting project. From this data, we will be able to create awareness of nutrient distribution through nutrient budgeting to decrease the potential for water body and riparian area contamination from crop land, pasture land and livestock wintering sites. We hope to create site-specific nutrient budgets and maps of each site at the end of the three years to get an understanding of nutrient distribution on different types of production systems. Overall, the goal will be to be to gather information that will help to utilize farm nutrient resources. The sites chosen across the region range from annual cropping sites to a wintering site, and one site that is used for both annual cropping and livestock grazing.

Check out page 122 for the complete update on this project.

Whole Farm Water Planning Projects

The goal of this project is to implement whole farm water planning to utilize water that is currently present and that which comes from rain/snow events more efficiently and effectively (for household, landscape and/or livestock use). The project uses keyline design and permaculture principles.

This year we worked with Jesse Lemieux of Pacific Permaculture once again to host two field days where we looked at two sites, one in Blueberry Mountain at Lorinda & Rick Thome's, and the second in Hines Creek at Kim & Dave Kuntz's. Jesse showed us a holistic way to look at how water flows over the landscape. We surveyed areas at each site and Jesse helped identify a few different projects that could be done on the sites to help better hold water on the land. We also worked with Jesse to wrap up the time he spent in the Peace County over the past few years with a Whole Farm Water Planning video series—check out PCBFA's YouTube channel to view the series!

Riparian Protection through Pasture Management

Cross-fencing, the creation of riparian pastures, the use of off-site watering systems, and the implementation of rotational grazing regimes are all tools that can help ranchers to become better environmental stewards. We are available to help producers implement riparian projects. In addition, Growing Forward 2 offers producers the support they need to upgrade current grazing and watering systems, and we are kept busy helping producers fill out their applications. We also have 2 portable watering systems that are available for producers to try out during the summer months, which has been a very well-received project.

2016 IN REVIEW

FIELD TRIALS & DEMONSTRATIONS UPDATE

(Local Research for Local Producers)

Methods of Statistical Analysis & Reporting

Field Data Analysis

Where necessary, field data were subjected to analysis of variance (ANOVA) using a pre-defined model in Costat procedure (CoStat Version 6.4, 2005). When ANOVA indicated significant treatment effects, the means were separated by the least significant difference (LSD) at the 0.05 probability level. Significant differences (*) in the write-up refer to *P*<0.05, while NS indicates Not Significant (no differences exist). We also used ARM statistical software to manage & summarize a few research trials.

The coefficient of variation (CV, %) is a measure of spread that describes the amount of variability relative to the mean. The CV is therefore a relative measure of variation of the treatment averages that cannot be accounted for by the effects of treatments and replications. Large CVs mean a large amount of variation could not be attributed to differences between treatments. Lower CV % indicates that experimental conditions were relatively uniform.

Presentations of Results

The findings from the 2016 field trials and demonstrations and their implications are highlighted in this report. The feed test results are interpreted with focus on nutrition quality in relation to "*Beef Ration Rules of Thumb"* by Alberta Agriculture & Forestry, and National Research Council (NRC, 1996 & 2000) nutrient requirements of beef cattle.

Nutrients Required by Beef Cattle

Feed costs represent the largest annual operating cost for cow-calf operations in the Peace. In order to maintain an optimum balance between feed costs and production, feeds should be analyzed and these analyses used to formulate rations and (or) supplements.

Beef cattle require nutrients to support body maintenance, reproduction, lactation, and growth. The nutritional needs of beef cattle vary by age, class, stage of production, performance level, and weight. Table 1 shows suggested nutrient requirements for beef cattle. The Table can assist producers in determining specific beef cattle nutrient requirements.

Table 1. Suggested nutrient requirements for beef cows from NRC (2000) and AAF (2004)

Nutrient	Requirement		
	Growing & finishing calves	Dry Gestating cows	Lactating cows
Crude protein (CP), %	12-13	7-9*	11
Ca, %	0.31	0.18	0.42
P, %	0.21	0.16	0.26
Mg, %	0.1	0.12	0.2
K, %	0.6	0.6	0.7
Na, %	0.06-0.08	0.06-0.08	0.1
S, %	0.15	0.15	0.15
Cu, ppm	10	10	10
Zn, ppm	30	30	30
Fe, ppm	50	50	50
Mn, ppm	20	40	40
NE_M, MCal kg^{-1}	1.08-2.29	0.97-1.10	1.19-1.28
NE_G, MCal kg^{-1}	0.53-1.37	NA[Y]	NA
TDN, %	65-70[w]	55,60[z]	65

*, 7% for middle 1/3 of pregnancy, 9% for late 1/3 of pregnancy.
[Z], 55% for middle 1/3 of pregnancy, 60% for late 1/3 of pregnancy.
[Y], NA, not available. [W], for 6-10 months old growing bulls.

The values listed in Table 1 serve as a general guide for matching forage and feeding programs to cattle nutrient needs. Actual nutrient requirements vary depending on many animal and environmental factors. There are generally six measures for energy, but in this report only one (total digestible nutrients, TDN) has primarily been used to interpret the feed tests from our trials and demonstrations.

The Relative Feed Value index (RFV) estimates digestible dry matter (DDM) from acid detergent fiber (ADF) , and calculates the dry matter (DM) intake potential (as % of body weight, BW) from neutral detergent fiber (NDF). For years, RFV has been used to compare the quality of legume and legume/grass hays and silages.

Multi-species Cover Crop Mixtures (Cocktails) for Silage

By Akim Omokanye, PCBFA

Interest in the potential for a multispecies cover crop (CC) blend for silage, swath grazing and greenfeed has been growing amongst beef cattle producers in the Peace. The idea of CC mixtures (cocktails) is new, indicating that the concept of a CC cocktail mix is an area where local research for local producers is needed. Research elsewhere and reports from producers who have experience with CCs have shown that CCs can provide many environmental and agronomic services within agroecosystems. These include reduced soil erosion, increased biological diversity (e.g., microbes, insects), increased nutrient cycling and biological N_2 fixation, increased soil organic matter (SOM), improved weed control, and increased crop yield. Forage quality of CC mixtures for beef cattle has also been reported. Legume cover crops are an essential component of good soil management. Cereals grow very quickly and provide quick ground cover. They can provide a tremendous amount of biomass that not only smothers weeds and prevents soil erosion, but also puts huge amounts of green matter, or green manure, back into the soil which improves the soil's tilth. These cover crops are nature's great nutrient recyclers. This year, we tested several cocktail mixtures for forage yield and quality.

Methods

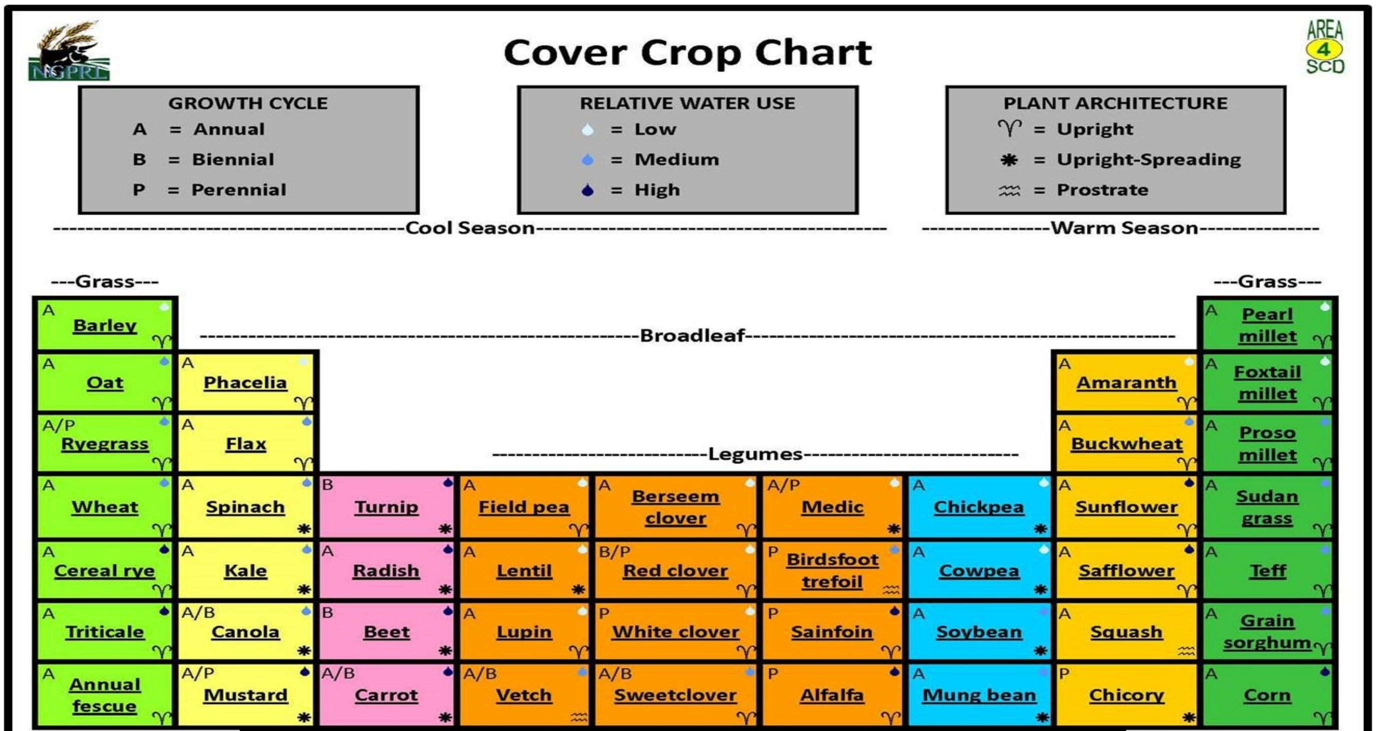
The study site was at the Fairview Research Farm(NW5-82-3W6) on RR #35. Soil tests at 0-6" prior to seeding showed SOM of 7.1%, a pH of 5.5 (acidic) and an electrical conductivity of 0.35 dS/m.

Randomized complete block design in 3 replications was used. Thirteen (13) CC mixtures (cocktails) and a barley crop (check) were seeded. Table 1 shows cocktail mixtures seeded and each crop seeding rates.

Table 1. Cocktail mixtures and their seeding rates (lbs/acre)

Cocktail #1 Peas 60 lbs Oats 45 lbs Hairy vetch 4 lbs Radish 0.5 lb Turnips 0.5 lb Crimson clover 1 lb	**Cocktail #4** Proso millet- 2 lbs Oats- 15 lbs Barley- 15 lbs Peas- 15 lbs Tillage radish- 1 lb Hairy vetch- 5 lbs Kale- 1 lb Crimson - 1 lb Persian Clover – 1 lb	**Cocktail #8** Barley 36 lbs CDC Horizon peas 36 lbs Triticale 36 lbs **Cocktail #9** 25% Peas 25% Hairy vetch 25% Crimson clover 25% Faba bean *Seeding rate: 15.0 lbs/acre*	**Cocktail #11** **(Union Forage Relay Mix)** 60% Italian ryegrass 20% Hairy vetch 10% Hunter forage brassica (turnip/Asiatic leaf veg) 10% Winfred forage brassica (kale/turnip cross) Seeding rate: 8.5 lbs/acre + CDC Haymaker 50 lbs
Cocktail #2 Annual Ryegrass - 2 lbs Proso millet- 2 lb Barley- 20 lbs Peas- 20 lbs Purple top turnip- 1 lb Kale- 1 lb Crimson Clover- 1 lb	**Cocktail #5** Barley 48 lbs CDC Horizon peas 8 lbs Hairy vetch 4 lbs Crimson clover 1 lb Winfred forage brassica 1 lb GreenSpirit annual ryegrass 1 lb Sunflower 1 lb **Cocktail #6** Barley 50 lbs Hairy vetch 6 lbs - inoculated	**Cocktail #10** **(Union Forage Ultimate Annual Mix)** 30% Hairy vetch 25% Italian ryegrass 15% sorghum 10% crimson clover 10% Winfred forage brassica 5% Hunter forage brassica 5% Graza forage brassica *Seeding rate: 8.5 lbs/acre* + CDC Haymaker 10 lbs CDC Horizon peas 10 lbs	**Cocktail #12** **(PGG Annual mix)** 29.8% Hairy vetch 24.7% GreenSpirit Italian ryegrass 14.95% Sorghum Sudan 9.85% Crimson clover 9.98% Winfred rape 5.0% Goliath Rape 4.98% Graza radish *Seeding rate: 15.0 lbs/acre*
Cocktail #3 Annual Ryegrass- 2 lbs Oats- 35 lbs Peas- 25 lbs Purple top turnip- 1 lb Forage rape- 1 lb Persian clover- 2 lbs	**Cocktail #7** Barley 50 lbs Hairy vetch 6 lbs - not inoculated	**Check** CDC Haymaker oat 100 lbs/acre	**Cocktail #13** **(Pinpoint from Barenbrug)** 45% GreenSpirit Italian ryegrass 20% BMR hybrid sorghum 10% Super 10% berseem clover 8% Barsica forage rape 7% T raptor forage Turnip x Rape 5% CW0604 Teff Grass 5% Laser Persian clover *Seeding rate: 15.0 lbs/acre*

A cocktail mixture is a number of cover crop species mixed together to take advantage of each of its species' unique offering to the farmer's soil. A cocktail mixture provides multiple agronomic benefits. Cover crop species for cocktails are commonly grouped into 6 major categories: cool season grasses, cool season legumes, cool season broadleaves, warm season grasses, warm season legumes and warm season broadleaves. For a list of crop varieties that belong to each category, please see the cover crop chart below:



Source: www.ars.usda.gov/plains-area/mandan-nd/ngprl/docs/cover-crop-chart/

The cocktails were pre-mixed before seeding. A 6-row Fabro plot drill at 9" row spacing was used to seed. Seeding was done on May 18. No fertilizer application was done to any of the mixtures, even the CDC Haymaker oat (check). Except for cocktail #7, where legumes were included in the mixtures - the legumes were inoculated before seeding.

Roundup WeatherMAX® was used as pre-emergent 7 days after seeding. In-crop spraying was done with 2, 4 - D 700 at 0.35 L/acre only on CDC Haymaker oat (check). Forage harvest was done on August 2, 2016 and dry samples were shipped out to the laboratories for feed tests.


Cocktail #10: Union Forage Ultimate Annual Mix


Cocktail #9: All legumes (Peas, Hairy vetch, Crimson clover & Faba bean)

Prior to harvest, efforts were made to identify the crop varieties in each cocktail mixture and we compared these crop varieties to the supposed list of seeded crop varieties in the mixtures. This was done to ensure that the final result of a particular cocktail mixture reflects the intended crop composition.

Results and Interpretation

Forage DM Yield

Cocktail #1 had higher DM yield (9600 lbs/acre) than other cocktails as well as check (Table 2). Three (Cocktails #1, 4 & 8) had >8000 lbs/acre, while others had <8000 lbs/acre. Six (6) cocktails produced more DM yields (109-137%) than check (CDC Haymaker oat) (Table 2).

Cocktails #6 & #7 contained only barley and hairy vetch. The hairy vetch in Cocktail #6 was inoculated, while that of cocktail #7 was not. The differences between the two, which was in favour of cocktail #6 (inoculated) was high, resulting in a yield advantage of 1076 lbs/acre over cocktail #7. This confirms the need to inoculate legumes before seeding.

The lowest DM yield obtained for cocktail #13 was due to the fact that 20% of what was seeded contained crop varieties which did not germinate or varieties that performed very poorly such as BMR hybrid sorghum, berseem clover, Teff Grass and Laser Persian clover.

Forage Quality

Crude Protein (CP) - All cocktail mixtures had higher protein than CDC Haymaker oat (Check, Table 2). The forage CP was highest for cocktail #12 (24% CP), followed by cocktail #13 (21% CP) and then cocktails #9 and #10 (19 and 18% CP). All cocktails had 11% CP or more, while CDC Haymaker oat (check) had less than 10% CP. The differences obtained in forage CP between all cocktails and check show the benefits of seeding mixtures of different cover crop types for the purpose of improving forage protein.

Generally, all cocktails were able to meet the 11% CP needed by mature beef cattle, and in most cases, the CP requirements of mature beef cattle were exceeded by cocktails tested. For growing and finishing calves, most cocktail mixtures fell within the required 12-14% CP by these calves. CDC Haymaker oat (check) was only able to meet the CP requirements of a dry gestating beef cow (7% at 2nd trimester & 9%, 3rd trimester).

Table 2. Dry matter (DM) yield, % yield advantage, crude protein (CP) and CP fractions of 13 cocktail mixtures and oat (check)

Cocktail Mixture	DM yield Lbs/acre	DM as % of check (Haymaker oat)	CP %	Soluble Protein, %	ADF-CP %	NDF-CP %	UIP Bypass protein, %)
Check (CDC Haymaker oat)	7024	100	8.87	40.0	1.07	3.05	30.0
Cocktail 1	9600	137	14.2	40.6	1.12	3.49	29.7
Cocktail 2	7115	101	14.4	42.0	1.29	3.62	29.0
Cocktail 3	5823	83	13.3	46.1	1.10	3.41	27.0
Cocktail 4	8762	125	13.9	43.6	1.07	3.65	28.2
Cocktail 5	6114	87	13.7	44.1	1.24	3.81	28.0
Cocktail 6	7638	109	12.1	40.0	1.22	3.48	30.0
Cocktail 7	6562	93	11.6	38.8	1.09	3.31	30.6
Cocktail 8	8763	123	11.1	41.5	0.98	3.03	29.3
Cocktail 9	4611	66	18.5	48.1	1.46	4.55	26.0
Cocktail 10	7919	113	18.3	48.7	1.30	4.88	25.7
Cocktail 11	7683	109	15.3	57.4	1.10	3.78	21.3
Cocktail 12	4816	69	23.7	54.4	1.16	4.62	22.8
Cocktail 13	3816	52	21.0	36.1	1.90	5.50	32.0
$LSD_{0.05}$	2313		7.58	14.6	0.39	1.52	7.29
Significance (*P<0.05*)	*		*	*	NS	NS	*
Mean	6865		14.2	45.2	1.14	3.66	27.3
CV, %	15.4		17.2	10.4	11.3	13.4	8.65

Macro-Minerals (Table 3)
The forage Ca was lower for check (CDC Haymaker oat) and cocktail #7 (barley + un-inoculated hairy vetch) than other cocktails. But both check (CDC Haymaker oat) and cocktail #7 were only able to meet the Ca requirements of a gestating beef cow (0.18% Ca). Other cocktails exceeded the Ca requirements of mature beef cattle (0.42% Ca). For growing and finishing calves, the Ca requirements (0.31%) have been met by all cocktails as well as check.

All cocktails as well as check only had sufficient P for a gestating beef cow (0.16% P). The P requirements of a lactating cow (0.26% P) were not met by any of the cocktails or check. The P requirements by growing and finishing calves were only met by 7 of the cocktails tested as well check.

The K and Mg requirements of a gestating cow were met by all cocktails and check. All cocktails and check also met the K requirements of a lactating beef cow. For the Mg requirements of a lactating beef cow, CDC Haymaker oat, cocktail # 6 (barley + inoculated hairy vetch), cocktail #7 (barley + un-inoculated hairy vetch) and cocktail #8 all fell short of the 0.20% of Mg needed by this category of cow.

The forage Na was as high as 0.57% for the cocktails tested. In terms of Na requirements by mature beef cattle, only cocktails #7 and #9 did not have enough Na for mature beef cattle. All other cocktails as well as check did have adequate Na for all categories of mature beef cattle.

The S requirements of all categories of mature beef cattle have been met by all cocktails as well as check (CDC Haymaker oats).

Trace-Minerals (Table 3)
The forage Cu, Fe, Zn and Mn respectively varied from 3.16 - 6.25 ug/g Cu, 91 - 186 ug/g Fe, 25-80 ug/g Zn and 32 - 107 ug/g Mn. All cocktails and check had adequate Fe and Mn for growing and finishing calves. For mature beef cattle, the requirements for Fe were met by all cocktails and check, but cocktails #5 and #7 fell short of meeting the Mn requirements of mature beef cattle.

Only CDC Haymaker oat (check) fell short of meeting the Zn requirements of young and mature beef cattle, which all require 30 ug/g Zn. All cocktails exceeded the 30 ug/g Zn needed by mature beef cattle. None of the cocktails or check had enough Cu for a mature beef cow as well as growing and finishing calves.

Detergent Fibers (ADF & NDF) and Non-Fiber Carbohydrates (NFC)
The acid detergent fiber (ADF) content is important because it reflects the ability of an animal to digest the forage. As the ADF content increases, digestibility of a forage decreases along with the energy. The neutral detergent fiber (NDF) content is important in ration formulation because it reflects the amount of forage the animal can consume. As NDF content increases, dry matter intake (DMI) will decrease. Lower values are preferred for both ADF and NDF. From Table 4, cocktail #11 seemed to be of better quality than other cocktails and check. The ADF and NDF values obtained for check compared to all cocktail mixtures indicate that check (CDC Haymaker oat) was of lower forage quality than any of the cocktails tested in this study.

NFC is more rapidly digested than fibers (ADF & NDF) and it is a significant source of energy for the rumen microbes. The microbes also use NFC to make microbial protein. Cocktail #11 had the highest NFC (Table 4).

Looking at the cocktails and check tested here Table 4, cocktail #11 (with the lowest ADF & NDF values and highest NFC value) seemed to fare better than other cocktails and check in terms of potentially available microbial protein in the rumen, amount of forage an animal would consume and better forage digestibility.

Table 3. Forage macro- and trace-minerals of CDC haymaker oat (check) and cocktails tested in 2016										
	Macro-minerals						Trace-minerals			
	Ca	P	K	Mg	Na	S	Cu	Fe	Zn	Mn
Cocktail Mixture	%						Ug/g			
Check (CDC Haymaker oat)	0.31	0.17	2.17	0.14	0.13	0.16	3.16	98	25	107
Cocktail 1	0.62	0.18	1.71	0.22	0.67	0.25	3.76	102	42	81
Cocktail 2	0.81	0.18	1.96	0.28	0.35	0.29	3.61	120	46	42
Cocktail 3	0.72	0.19	2.35	0.23	0.50	0.29	3.85	104	41	105
Cocktail 4	0.79	0.20	2.03	0.24	0.28	0.33	3.81	99	45	55
Cocktail 5	0.78	0.21	2.13	0.22	0.20	0.26	4.21	103	40	38
Cocktail 6	0.48	0.19	1.77	0.19	0.11	0.19	3.87	91	40	43
Cocktail 7	0.40	0.22	1.73	0.16	0.05	0.17	4.26	94	47	32
Cocktail 8	0.49	0.17	1.79	0.19	0.19	0.20	4.37	106	40	63
Cocktail 9	0.97	0.24	2.00	0.26	0.08	0.20	6.25	145	80	49
Cocktail 10	1.73	0.25	3.33	0.34	0.35	0.51	4.49	143	59	52
Cocktail 11	1.28	0.23	3.28	0.31	0.21	0.4	4.55	186	44	70
Cocktail 12	1.46	0.24	3.01	0.42	0.57	0.57	4.91	171	67	61
Cocktail 13	1.37	0.24	3.28	0.37	0.46	0.45	4.44	183	43	70
$LSD_{0.05}$	0.60	0.08	1.27	0.17	0.80	0.22	2.26	48.9	26.6	23.2
Significance ($P<0.05$)	*	NS	*	*	NS	*	NS	*	*	*
Mean	0.79	0.20	2.24	0.24	0.33	0.29	4.07	117	46	68
CV, %	24.6	13.8	18.5	22.8	78.2	24.3	18.1	13.5	18.8	11.1

Energy

The forage energy (% TDN) was highest for Cocktail #11 (70% TDN) and lowest for check (CDC Haymaker oat, 60% TDN). All cocktails tested here had >60% TDN (Table 4).

All cocktails and check had sufficient %TDN for a gestating beef cow, which requires 55% TDN at mid-pregnancy stage and 60% TDN at late-pregnancy stage. But for a lactating beef cow, which requires 65% TDN, only 8 of the 13 cocktails tested had at least 65% TDN needed by this category of cow.

Table 4. Forage fibers (ADF & NDF), NFC and energy of 13 tested cocktails and CDC Haymaker oat (check) in 2016								
	Detergent fibers			Energy				
	ADF	NDF	NFC	TDN	NEL	NEG	NEM	RFV
Cocktail Mixture	%	%	%	%	MCal/kg	MCal/kg	MCal/kg	MCal/kg
Check (CDC Haymaker oat)	37.0	59.9	19.7	60.1	1.36	0.74	1.46	93
Cocktail 1	33.9	54.9	19	62.5	1.42	0.81	1.53	106
Cocktail 2	28.8	46.2	28	66.5	1.52	0.92	1.64	134
Cocktail 3	34.8	56	19	61.8	1.4	0.79	1.51	103
Cocktail 4	33.5	49.7	25	62.8	1.43	0.82	1.54	118
Cocktail 5	31.3	50.5	24.3	64.5	1.47	0.87	1.59	119
Cocktail 6	28.9	48.6	27.8	66.4	1.51	0.92	1.64	127
Cocktail 7	28.2	48.8	28.1	66.9	1.53	0.94	1.66	128
Cocktail 8	33.1	52.4	25	63.1	1.43	0.82	1.55	112
Cocktail 9	28.5	39	31.1	66.7	1.52	0.93	1.65	159
Cocktail 10	31.1	41.1	29.1	64.7	1.47	0.87	1.59	153
Cocktail 11	24.1	35.1	38.1	70.1	1.61	1.03	1.75	186
Cocktail 12	27.7	35.9	28.9	67.3	1.53	0.95	1.67	178
Cocktail 13	26.8	36.4	27.5	66.6	1.52	0.92	1.65	179
$LSD_{0.05}$	5.56	13.3	11.1	4.33	0.10	0.12	0.12	55.8
Significance ($P<0.05$)	*	*	*	*	*	*	*	*
Mean	31.3	48.7	25.6	64.5	1.46	0.86	1.58	128
CV, %	5.77	8.86	14.1	2.17	2.32	4.64	2.49	14.1

Conclusion

From forage DM yield and quality obtained in this trial for all cocktails and check (CDC Haymaker oat), it is evident that all cocktails had higher DM yield as well as better quality than CDC Haymaker oat (check). Six (6) cocktails (#1, 4, 6, 8, 10 and 11) produced more DM yields (109-137%) than check (CDC Haymaker oat). Overall, Cocktail #1 produced the most DM yield in this study. Generally, all cocktails had 11% CP or more, while CDC Haymaker oat (check) had less than 10% CP. All cocktails were able to meet the protein requirements of mature beef cattle, and in most cases, cocktails were well within the protein requirements of 12-14% CP for growing and finishing calves. The cocktails in most cases, had enough TDN for mature beef cattle. On the other hand, the check was only able to meet the protein and TDN requirements of a gestating cow. Looking at the forage minerals of check and the cocktails, the benefits of cocktails were obvious with higher forage minerals than check. The differences in forage DM and quality between cocktails #6 and #7 further confirms the need to inoculate legumes before seeding. Taking into consideration the higher forage DM yields obtained from of cocktails #1, 4, 8 and 10 and their ability to meet the protein, energy and minerals (except for Cu) of a gestating beef cow, cocktails #1, 4, 8 and 10 are therefore suggested for growing in the Peace. It is important to note that nitrates may need to be tested before feeding to cows in a situation where brassicas are included in the mixtures. Care needs to be taken if including Persian clover, BMR hybrid sorghum, berseem clover and teff grass as these crops did very poorly.

Some Notes on Tillage Radish

The tillage radish has been bred/developed to produce a large taproot and penetrate compacted soil layers in an effort to increase soil aeration and water infiltration, decrease compaction and provide increased rooting depth opportunities to successive crops. Although tillage radish may not penetrate and grow as deeply in some of our “gumbo” type soils as we might hope, they can serve another useful purpose that can be of great value to producers; nutrient retention. The large taproot that is developed by tillage radish can absorb and retain a significant amount of macro- and micronutrients that might otherwise be prone to leaching or other loss mechanisms. Think of the tillage radish taproot as a giant sponge that will absorb residual nutrients from the soil and hold them until termination in the fall. The other nice thing is that the nutrients which are absorbed by the taproot are readily available to the following crop as the taproot is mostly water and desiccates and decays, quickly releasing those nutrients for uptake and utilization by the following crop. However, care needs to be taken on the amount of tillage radish used in cocktails because of the competitive nature of tillage radish, which results from its deep tap root sucking up nutrients from the soil at the expense of nearby or surrounding crops.

On-farm Demonstration of Cocktail Mixtures

By Akim Omokanye, PCBFA

Collaborating Producers:

Conrad Dolen, Fourth Creek   Greg & Bev Wieben, Fairview   Allan McLachlan, Fairview

Cover crops (CCs) and their mixtures (cocktail mixtures) are an important tool that producers can use to generate multiple benefits on the farm, including improved soil health, nutrient supply to companion or subsequent crops, weed suppression, insect pest management, forage production, pollinator resources, and clean water and air. There are many different CC species to choose from, and each CC species has different abilities to provide the benefits mentioned above. Cocktail cover cropping involves using complex mixtures of CC seeds, which can be up to 5, 8 or more varieties of seed in a single mix to achieve multiple soil health, production and profit goals. Three on-farm field scale demonstrations were carried out in 2016 with a variety of cocktail mixtures. Soil tests (except for one site) were carried out before seeding for base data. Subsequent soil tests (2017 & 2018) would be compared to the base data to assess any soil health improvements.

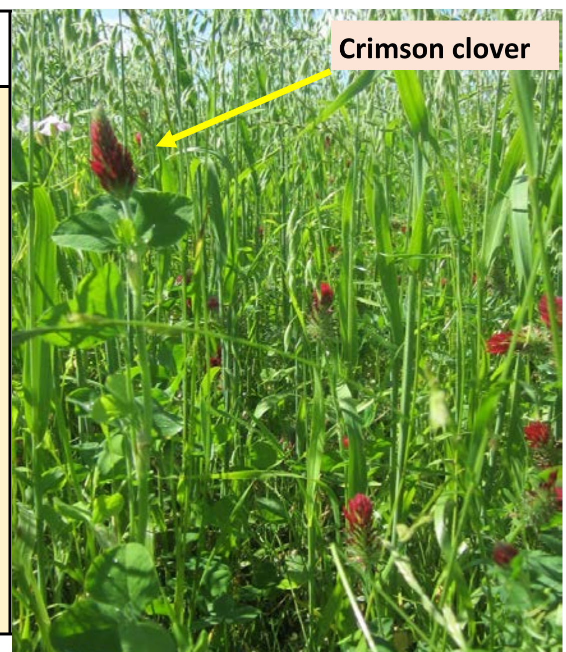
Site 1: Conrad Dolen, Fourth Creek: Cocktails for Silage

Methods

For this site, we used 4 fields for the trial. The cocktails seeded in those fields are shown in Table 1. Harvesting was done on August 3 for dry matter (DM) yield determination. Field #1 and Home N & S were harvested when barley was at the soft-dough stage. Field #6 was harvested when oat was at the late milk stage. Forage samples were analyzed for quality.

Table 1. Cocktail mixtures tested in 4 fields and their seeding rates (lbs/acre)

Field #1	**Fields Home N & S**	**Field # 6**
Horizon pea 40 lbs Oats 40 lbs Barley 40 lbs Sunflower 1 lbs Hairy vetch 6 lbs Kale/turnips 1 lb	Horizon pea 40 lbs Oats 40 lbs Barley 40 lbs Hairy vetch 4 lbs Ryegrass 5 lbs Kale/turnips 1 lb	Ryegrass 5 lbs Kale/turnips 1 lb Crimson clover 2 lbs Tillage radish 1 lb Oats 40 lbs
Field info: 130+ acres 2015: Millet swath-grazing 2016: for Silage	*Field info:* 2015: Seeded oats 2016: for silage	*Field info:* 80 acres Previously a pasture paddock. 2015: seeded pasture mix, but no germination (dry year) 2016: for silage



Field #6 cocktail mixture

Results and Interpretation

Forage Moisture Content at Harvest

Forage from Field #1 was moister (74%) than forages from other fields. As expected, both Home N & S fields had similar forage moisture. This is because both Home N & S fields contained the same type of cocktails. Except for Field #1, which had higher moisture content than others at harvest, the forages from the fields had appropriate moisture content for ensiling. The higher moisture content observed for field #1 could be due to a combination of factors, including more hairy vetch seeded, some sunflower in the mixture and high soil fertility observed at the site following soil tests before seeding.

Dry matter (DM) yield (Table 2)
The forage DM yield was highest for Field #1 (6.09 tons/acre), followed by Home-S (4.52 tons/acre), Home-N (4.05 tons/acre) and then Field #6 (2.91 tons/acre). The impressive DM yield from Field #1 was due to the initial soil nutrients just before seeding. Field #1 had better soil nutrients than other fields used. Also, every crop included in the cocktail for Field #1 grew very well including sunflower, which grew taller than other crops and flowered as well. Sunflower is a warm season crop and our observation for about 3 years now in the Peace is that sunflower does well in cocktails in this region.

Crude Protein (CP, Table 2)
The forage CP was highest for Field #1 (15% CP). Field #6 had the lowest CP (7.81% CP). All fields had sufficient CP for a gestating beef cow at the second trimester stage, which requires 7% CP. For a gestating beef cow at the third trimester stage that needs 9% CP, only Field #6 fell short of meeting the 9% CP needed by this category of beef cow. Field #1 exceeded the CP requirements of mature beef cattle as well as growing and finishing calves that require 12-14% CP.

Detergent Fibers (ADF & NDF) *and Non-fiber Carbohydrates (NFC)*
Home-S had the lowest ADF (26.4%) & NDF (43.7%) and the highest NFC (34.7%) (Table 2). In terms of forage quality, lower values are preferred for both ADF & NDF, while a higher value is preferred for NFC.

The ADF value is important because it relates to the ability of an animal to digest the forage. As ADF increases, digestibility of forage usually decreases. The NDF value is important in ration formulation because it reflects the amount of forage the animal can consume. As NDF percentages increase, forage DM intake will generally decrease. NFC is more rapidly digested than detergent fibers. NFC is a significant source of energy for the rumen microbes. The microbes also use NFC to make microbial protein.

Table 2. Forage moisture, DM yield, CP and energy of cocktails tested in 4 Fields in 2016

				Fibers			Energy				
	Moisture	Dry yield	CP	ADF	NDF	NFC	TDN	NEL	NEG	NEM	RFV
Cocktail	%	tons/acre	%	%	%	%	%	MCal/kg	MCal/kg	MCal/kg	
Field #1	74.3	6.09	14.5	31.4	51.6	22.5	64.4	1.46	0.86	1.58	116
HOME-S	63.6	4.52	10.1	26.4	43.7	34.7	68.4	1.56	0.97	1.70	146
HOME-N	65.2	4.05	9.59	29.8	48.8	30.1	65.7	1.49	0.90	1.62	125
Field #6	65.3	2.91	7.81	36.5	55.3	25.4	60.5	1.37	0.75	1.47	102

From Table 2, Home-S, followed by Home-N appeared to be of better forage quality then Fields #1 and #6. Considering that as ADF and NDF increase, both digestibility and consumption of forage usually decrease, it is reasonable to say that when all the cocktails are presented side by side to cows in a preference study, the cocktails in Home-N & S would likely be consumed before the cocktails in Fields #1 and #6. The cocktails in Home-N & S would also provide more energy and microbial protein sources in the rumen.

Energy
The forage energy was generally enough for a gestating beef cow, which requires 55% at mid-pregnancy stage and 60% at late-pregnancy stage. For a lactating beef cow, the cocktails (except for Field #6 cocktail) were able to meet the 65% needed by a nursing beef cow.

Minerals
In terms of forage minerals, Field #1 had the highest Ca, P, K, S, Fe and Zn. Except for cocktails contained in Field #6, the Ca requirement of mature beef cattle was met by all cocktails tested here. Only Field #1 and Field #6 had adequate P needed by mature beef cattle. Generally, the requirements of K, S, Fe and Mn by mature beef cattle were sufficiently met by all cocktail mixtures. The requirements for Cu were not met by any of the cocktails tested here.

Table 3. Forage minerals (on DM basis) of cocktails tested in 2016

Cocktails	Macro-minerals						Trace-minerals			
	Ca	P	K	Mg	Na	S	Cu	Fe	Zn	Mn
	%	%	%	%	%	%	Ug/g	Ug/g	Ug/g	Ug/g
Field #1	0.68	0.35	3.10	0.26	0.16	0.30	4.93	134	34	62
HOME-S	0.42	0.19	1.68	0.19	0.18	0.21	5.03	85	31	52
HOME-N	0.46	0.20	1.94	0.18	0.23	0.26	4.12	103	26	41
Field #6	0.34	0.30	2.22	0.18	0.02	0.26	3.95	85	28	104

Site 2 (Greg & Bev Wieben - Redstar Farms Ltd, Fairview): Cocktails for Swath Grazing vs Corn

Methods
We tested 4 cocktail mixtures and we used corn as check. The cocktail mixtures seeded are shown in Table 1. Seeding was done on June 2, 2016. Corn was seeded with a Seed Master at 12” spacing. Ammonium nitrate was applied at 90 lbs/acre to each of the cocktails and check.

We harvested the cocktails on August 17, 2016 for dry matter (DM) yield determination, forage quality and nitrates (except for corn).

Table 1. Cocktails seeded at Redstar Farms Ltd

Cocktail Mixture #1	Cocktail Mixture #2	Cocktail Mixture #3	Cocktail Mixture #4	Check (corn)
(Custom brassica mix) 33% Kale 34% Purple Turnip 33% Radish	30% Purple turnip 30% Radish 30% Hairy vetch 10% Crimson clover	**(Union Forage Ultimate Annual Mix)** 30% Hairy vetch 25% Italian ryegrass 15% sorghum10% crimson clover 10% Winfred forage brassica (kale/turnip cross) 5% Hunter forage brassica 5% Graza forage brassica	25% Crimson clover 50% Radish 25% Rape	30% PS Exleafy RR PS 2501 RR P7213 R

Results and Interpretation

Forage DM yield

The forage DM was highest for cocktail #3 (6.9 tons/acre), followed by cocktail #1 (6.01 tons/acre) and then corn (5.30 tons/acre) (Table 2). Cocktail #3 contained more cover crop types (7) than other cocktails, so the higher yield from Cocktail #3 over other cocktails could be the effect of a possible yield advantage of cocktails with more cover crops in the mixture.

Forage Protein Content (Table 2)

The forage crude protein (CP) was highest for cocktail #3 (24% CP). All cocktails tested had higher CP than corn (check). Overall, all cocktails as well as corn had sufficient CP for mature beef cattle. The higher CP values obtained for both cocktails #2 and #3 than cocktails #1 and #4 and corn was probably due to the presence of legumes (40% - hairy vetch & crimson clover) in cocktails #2 and #3. The four cocktails also had adequate CP for growing and finishing calves, which require 12-14% CP.

Overall, Cocktails #1, #2 and #3 far exceeded the CP requirements of both young and mature beef cattle, while corn fell short of meeting the CP requirement of calves.

Detergent Fibers (ADF & NDF) *and non-fiber carbohydrates (NFC)*

In terms of forage quality, lower values are preferred for both ADF and NDF, while a high value is preferred for NFC. Looking at Table 2 below, cocktail #2 appeared to have lower ADF and NDF values and higher NFC value compared to other cocktails and corn (check). This therefore indicates that cocktail #2 is of better quality than the other cocktails and corn.

Considering that as ADF and NDF increase, both digestibility and consumption of forage usually decrease, it is reasonable to say that when all the cocktails and corn are presented side by side to cows in a preference study, cocktail #2 would likely be consumed first, as well as provide more energy and microbial protein sources in the rumen.

Energy

Cocktail #2 had higher total digestible nutrients (TDN, 63%) than the other cocktails and corn. Corn and both Cocktails #2 and #3 had >60% TDN, while both cocktails #1 and 4 had lower than 60% TDN.

Using %TDN, the Rule of Thumb says that for a mature beef cow to maintain her body condition score through the winter, the ration must have a TDN energy reading of 55 per cent in mid pregnancy, 60 per cent in late pregnancy and 65 per cent after calving. This shows that from this demonstration, all cocktails and corn had sufficient TDN for a pregnant cow in the second trimester. For a pregnant cow in the third trimester stage, cocktails #2 and #3 as well as corn were able to meet the 60% TDN needed by this category of cow.

Table 2. Forage dry matter (DM) yield, protein and energy of cocktails and corn tested at Redstar Farms Ltd in 2016

Cocktail/Corn	Moisture %	DM tons/acre	CP %	ADF %	NDF %	NFC %	TDN %	NEL Mcal/kg	NEG Mcal/kg	NEM Mcal/kg	RFV
Cocktail Mixture #1	77.1	6.01	16.9	41.5	52.8	18.8	56.6	1.27	0.63	1.35	99.8
Cocktail Mixture #2	77.5	5.14	19.1	33.8	37.7	31.7	62.6	1.42	0.81	1.53	154
Cocktail Mixture #3	74.9	6.94	24.1	35.5	44.4	20.1	61.3	1.39	0.77	1.49	128
Cocktail Mixture #4	75.6	4.01	13.9	40.9	50.1	24.5	57.0	1.28	0.65	1.37	106
Corn (check)	80.9	5.24	11.3	35.6	61.0	16.2	61.2	1.38	0.77	1.49	93

Minerals

All cocktails had higher minerals than corn (Table 3). All cocktails had sufficient minerals (except Cu) for mature beef cattle. Cocktail #4 did not have enough Na for beef cattle.

Corn was only able to sufficiently meet the Ca, P and Mg requirements of a gestating beef cow, but not that of a lactating beef cow. Corn also fell short of meeting the S and Cu requirements of all categories of beef cattle.

The higher macro- and trace-minerals obtained by all cocktails compared to corn in this demonstration further confirms the potential benefits of cover crop mixtures in improving forage quality.

Table 3. Forage minerals of cocktails and corn tested at Redstar Farms Ltd in 2016

Cocktail/Corn	Macro-minerals						Trace-minerals			
	Ca %	P %	K %	Mg %	Na %	S %	Cu ug/g	Fe ug/g	Zn ug/g	Mn ug/g
Cocktail Mixture #1	1.64	0.58	3.07	0.74	1.52	1.24	4.42	194	44.89	47.9
Cocktail Mixture #2	1.51	0.63	4.46	0.88	1.51	1.42	4.78	286	48.35	60.4
Cocktail Mixture #3	1.37	0.42	3.04	0.65	0.71	0.7	4.96	340	46.69	70.4
Cocktail Mixture #4	1.62	0.46	4.59	0.3	0.04	0.69	5.56	232	49.84	53.7
Corn (check)	0.19	0.25	1.18	0.18	0.01	0.1	2.01	115	20.29	30.4

Cocktail under snow for swath grazing

Site 3 (Allan McLachlan, Fairview): Cocktails for Silage

Methods

The site for this trial, which was about 120 acres, was on RR 44/TWP 804 (SE29 80 04 W6) in Fairview. In 2015, barley-pea mixture was seeded for silage. It was grazed in the fall. We had 5 treatments consisting of one crop (barley - check) to 7 cover crops in a mixture as shown in Table 1. In order to assess the potential benefits of including legumes in forage-based production systems, we decided to test mixtures of barley and hairy vetch (with or without inoculant) for forage yield and quality improvements as well.

Hairy vetch is a forage legume. It fixes nitrogen and can add enough nitrogen to provide almost all of the needs of the subsequent crop. Hairy vetch can contribute 70-150 lbs N/acre. Studies in US have shown that hairy vetch mixed with rye fixes almost the same amount of nitrogen as if it were grown without a companion. Hairy vetch can make K more accessible to subsequent crops. Hairy vetch is especially known for erosion control, bank stabilization, winter cover crop, and soil conditioning. It can be a suitable plant in organic and no-till pasture and cropping systems.

We harvested the cocktails on August 3, 2016 for dry matter (DM) yield determination, when barley was at the soft dough stage. Forage samples were analyzed for quality.

Table 1. Cocktails tested at the McLachlan's in Fairview in 2016

Cocktail #1	Cocktail #2	Cocktail #3	Cocktail #4	Cocktail #5
Barley 50 lbs Hairy vetch 6 lbs (not inoculated)	Barley 50 lbs	Barley 50 lbs Hairy vetch 6 lbs (inoculated)	Barley 50 lbs Peas 38 lbs Triticale 36 lbs	Barley 48 lbs Triticale 36 lbs CDC Horizon peas 8 lbs Hairy vetch 4 lbs Crimson clover 1 lb Winfred forage brassica 1 lb Green Spirit annual ryegrass 1 lb Sunflower 1 lb

Results and Interpretation

Forage DM yield (Table 2)

Cocktail #3 had the highest forage DM yield (about 5.0 tons/acre). Though we did not look at the proportion of individual crop in the total forage DM yield, visual observation showed that triticale (Bunker variety, a forage type) probably contributed greatly to the higher DM yield obtained for Cocktail #3 over other cocktails and check. Bunker grew very tall and its growth was generally impressive. Bunker is an awnletted (reduced awn expression) standard height spring triticale line intended for use as a feed grain and conserved forage. The high silage yield and reduced awn expression in Bunker will diversify the use of spring triticale as a conserved forage (for silage and greenfeed/hay).

The DM yield as % of mono-crop barley (check) varied from 113% for cocktail #1 to 146% for cocktail #3. The forage DM yield as a result of inoculating hairy vetch over un-inoculated hairy vetch seed with barley was 857 lbs/acre in favour of inoculated hairy vetch. Overall, using hairy vetch as a companion crop with barley gave 1315 lbs DM/acre over mono-crop barley (check).

Generally in 2016, we observed that hairy vetch could have an initial slow establishment in the spring in the Peace, but once established, hairy vetch can be aggressive and competitive particularly going into early fall . Research elsewhere has shown that:

- Pure barley reduced N leaching but caused a low N availability in the soil.
- Pure hairy vetch supplied a lot of N, but was ineffective in reducing the N leaching risk.
- Barley–vetch mixture assured a stable N accumulation (*buffered system*).
- Barley–vetch mixture reduced NO_3-N leaching risk (*buffering system*).
- An optimized "cover crop strategy" should always prefer mixtures to pure stands.

Forage quality

Crude protein (CP, Table 2)— Cocktail #4, which had more cover crops in the mixture had the highest forage protein (14% CP). All mixtures had 0.7 to 3.5% more CP than mono-crop barley (check). Inoculating hairy vetch seeded with barley did not improve forage CP over un-inoculated hairy vetch seeded with barley, as both mixtures had similar CP.

For a mature beef cow, 7% CP is required at mid-pregnancy stage, 9% at late-pregnancy and 11% during lactation. Looking at Table 2, all cocktails as well as mono-crop barley (check) were able to meet the protein requirements of a mature beef cow at different physiological states. For growing and finishing calves, only cocktail #4 had enough CP (14%).

Energy

The forage energy (%TDN) appeared to be higher for barley check and cocktails #1 & 2 than other cocktails. Barley check and cocktails #1 & 2 were able to meet the 65% TDN required by mature beef cattle. Both cocktails # 3 & 4 were only able to meet the 60% TDN needed by a gestating beef cow.

Table 2. Forage dry matter (DM) yield, crude protein (CP), detergent fibers and energy of cocktails tested at the McLachlan's in Fairview in 2016

Cocktail	Moisture %	DM lbs/acre	% DM of check	CP %	ADF %	NDF %	NFC %	TDN %	NEL Mcal/kg	NEG Mcal/kg	NEM Mcal/kg	RFV
Barley (check)	62.5	6858	100	10.6	28.7	48.8	29.1	66.6	1.52	0.92	1.64	127
Cocktail #1	60.0	7744	113	11.6	29.1	48.2	28.7	66.2	1.51	0.91	1.63	128
Cocktail #2	65.2	8601	125	11.5	29.9	46.2	30.8	65.6	1.49	0.89	1.61	132
Cocktail #3	65.4	9981	146	11.3	33.6	51.9	25.3	62.7	1.42	0.81	1.53	112
Cocktail #4	71.0	8932	130	14.1	32.8	48.6	25.8	63.3	1.44	0.83	1.55	121

Minerals (Table 3)

The forage Ca appeared to be increased by including hairy vetch in cover crop mixtures (Cocktails #1, #2 and #4). The benefit in terms of forage Ca improvement was pronounced with inoculated hairy vetch (cocktails #2 and #4). Both barley check and Cocktail #3 (barley, peas & triticale) had lower forage Ca than those cocktails with hairy vetch.

Similarly, forage P appeared to be increased by inoculating hairy vetch before seeding. Both cocktails #2 and #4, which had inoculated hairy vetch, had higher forage P than the other cocktails and check.

Generally, cocktail #4, which had more cover crops in the mixture, had higher forage Ca, P, K, Mg, Na, S and Fe than the other cocktails with less cover crops in them.

All cocktails as well as barley check were able to meet the Ca, P, Mg, K, Na, S and Fe requirements of a gestating cow.

The Zn requirements of a gestating cow were only met by Cocktails # 1 and #4. Other cocktails and check failed to meet the Zn requirements of a dry gestating cow.

None of the cocktails or barley (check) had enough Mn (40 ug/g) and Cu (10 ug/g) needed by mature beef cattle (40 ug/g).

Table 3. Forage minerals of cocktails tested at the McLachlan's in Fairview in 2016

Cocktail	Macro mineral						Trace mineral			
	Ca	P	K	Mg	Na	S	Cu	Fe	Zn	Mn
	%	%	%	%	%	%	Ug/g	Ug/g	Ug/g	Ug/g
Mono-crop barley (check)	0.36	0.19	1.87	0.15	0.14	0.15	3.72	50.9	20.0	20.6
Cocktail #1	0.44	0.16	1.39	0.18	0.14	0.15	5.07	57.5	32.1	14.7
Cocktail #2	0.51	0.23	1.86	0.17	0.06	0.16	4.14	57.9	27.5	29.1
Cocktail #3	0.27	0.19	2.06	0.14	0.06	0.18	3.25	49.6	26.7	23.2
Cocktail #4	0.67	0.24	2.42	0.25	0.18	0.32	4.44	63.1	30.5	26.5

Regional Silage Variety Trials: Barley Varieties

By Akim Omokanye, PCBFA

The Regional Silage Variety Trials (RSVTs) are an important source of information for livestock forage based production regarding the forage yield potential and quality performance of new crop varieties as they become available. The RSVTs are carried out in small plot replicated trials. PCBFA provides unbiased, comprehensive information that assists producers to make better crop choices for silage or greenfeed production. In addition to the findings presented here from our trial, the results from the RSVTs across the different trial sites in the province will also be reported in the Alberta Seed Guide (www.seed.ab.ca).

Methods

Site: The study site was at the Fairview Research Farm (NW5-82-3W6) on RR #35, MD of Fairview. The site had soybeans in 2015. Soil test at 0-6" soil depth done at Exova laboratory (Edmonton) prior to seeding showed an organic matter content of 7.3%, a pH of 5.4 (acidic) and an electrical conductivity of 0.58 dS/m. The field was cultivated before seeding.

Experimental Design: Randomized complete block design in 4 replications. Small plots measuring 11.04 m^2 (118.8 ft^2) were used.

Treatments (Varieties): The following 13 barley varieties consisting of eleven 2-row & two 6-row varieties were seeded:

1. Amisk- 6-row, rough awned, semi-dwarf, general purpose barley
2. **CDC Austenson (Check) -** 2-row, rough awned variety, high feed yield
3. CDC Coalition - 2-row, feed barley
4. CDC Maverick - a new 2-row forage variety, smooth awned for improved palatability
5. Champion - 2-row, feed barley
6. Claymore - 2-row, semi-erect, feed barley
7. CDC Cowboy - 2-row, forage variety
8. CDC Meredith - 2-row, malting barley
9. Canmore - a new 2-row general purpose barley
10. Conlon- 2-row, feed and malting barley
11. Gadsby - 2-row, rough awned, general purpose barley
12. Sundre - 6-row, feed barley for grain and forage
13. TR13740 - 2-row, feed barley

Seeding Rate: We seeded 300 plants/m^2 (27.8 plants/ft^2). A 6-row Fabro plot drill at 9" row spacing was used to seed. Seeding was done on May 16.

Fertility according to soil tests (actual lbs/acre): 0 N + 33 P + 47 K + 0 S (broadcast). Soil test showed adequate amounts of N & S for the crop, so N & S were not applied.

Spraying: Roundup WeatherMAX® was used as pre-emergent 7 days after seeding. In-crop spraying was done with 2, 4 - D 700 at 0.35 L/acre. Rouging (hand weeding) was done a few times.

Measurements taken at soft dough stage:

- Prior to harvest, stand assessment for stand uniformity was done.
- Crop height: Random plants were selected for plant height measurement at soft dough stage. Plant height was measured up to the flag leaf.
- Forage yield & quality determination: At soft dough stage, plants in the 4 centre rows 10 feet long were harvested, weighed fresh, sub-sampled (about 500 grams), air dried for some days and then weighed to determine dry matter (DM) content. Forage samples were analyzed for quality using standard procedures for wet chemistry at A & L Laboratory, Toronto.

Results & Interpretation

Plant Height & Lodging

CDC Maverick significantly grew tallest (94 cm) of all varieties (Table 1). CDC Maverick was followed by CDC Cowboy (88 cm). Both CDC Maverick and CDC Cowboy grew far taller than other varieties by as much as 30 to 35 cm.

No lodging was observed with any of the varieties tested.

Forage DM yield

The forage DM was highest for TR13740 (4.4 tons/acre) and lowest for Claymore (3 tons/acre) (Figure 1). The top 3 varieties with DM yields >4.0 tons/acre were TR13740, CDC Maverick and Champion. The DM yields of TR13740, CDC Maverick and Champion as % of check (CDC Austenson) were 114, 112 and 105%, respectively.

CDC Maverick is a 2 row, smooth awned, new forage barley with CDC Cowboy parentage. In the present test, CDC Maverick had a yield advantage of 1199 lbs DM/acre over CDC Cowboy.

Forage Quality

Crude Protein (CP) - The forage CP was generally above 12% for all barley varieties tested. Only Gadsby, Amisk and CDC Coalition appeared to have higher CP than check (CDC Austenson)(Figure 2).

Table 1. Plant height and forage moisture content at harvest of 13 barley type forage varieties tested in 2016

Variety	Plant height+	Moisture
	cm	%
TR13740	65.4	65.2
CDC Maverick	93.6	65.5
Champion	69.4	69.7
CDC Meredith	74.1	69.9
CDC Coalition	66.1	70.0
CDC Austenson	70.1	71.3
Canmore	71.3	69.8
CDC Cowboy	88.1	69.8
Sundre	76.6	67.9
Gadsby	76.7	69.4
Amisk	65.7	72.2
Conlon	58.2	65.9
Claymore	72.7	70.0
$LSD_{0.05}$	*5.06*	*5.11*
Significance (P<0.05)	*	*NS*
Mean	*72.9*	*69.1*
CV, %	*4.84*	*4.46*

+, plant height measured up to the flag leaf only.
CV, coefficient of variation.
NS, Not Significant (P>0.05).

Overall, the varieties had forage CP content that exceeded the protein requirements of a mature beef cow, which requires 7, 9 and 11% at mid-pregnancy, late-pregnancy and during lactation. The varieties also met or exceeded the 12-13% protein needed by growing and finishing calves.

Figure 1. Forage DM yields (tons/acre) of 13 barley varieties tested in Fairview in 2016. *($LSD_{0.05}$=0.71, Significance (**, P<0.01), Mean=3.80 tons/acre, CV, % = 11.3%)*

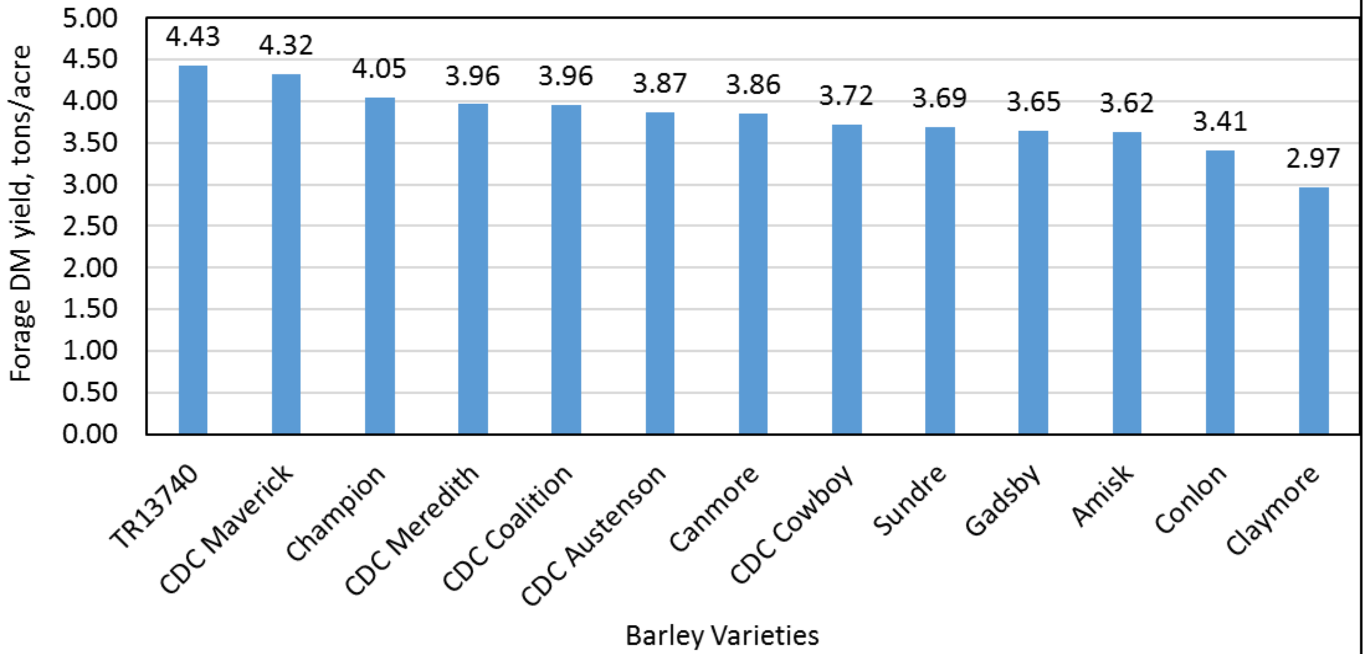
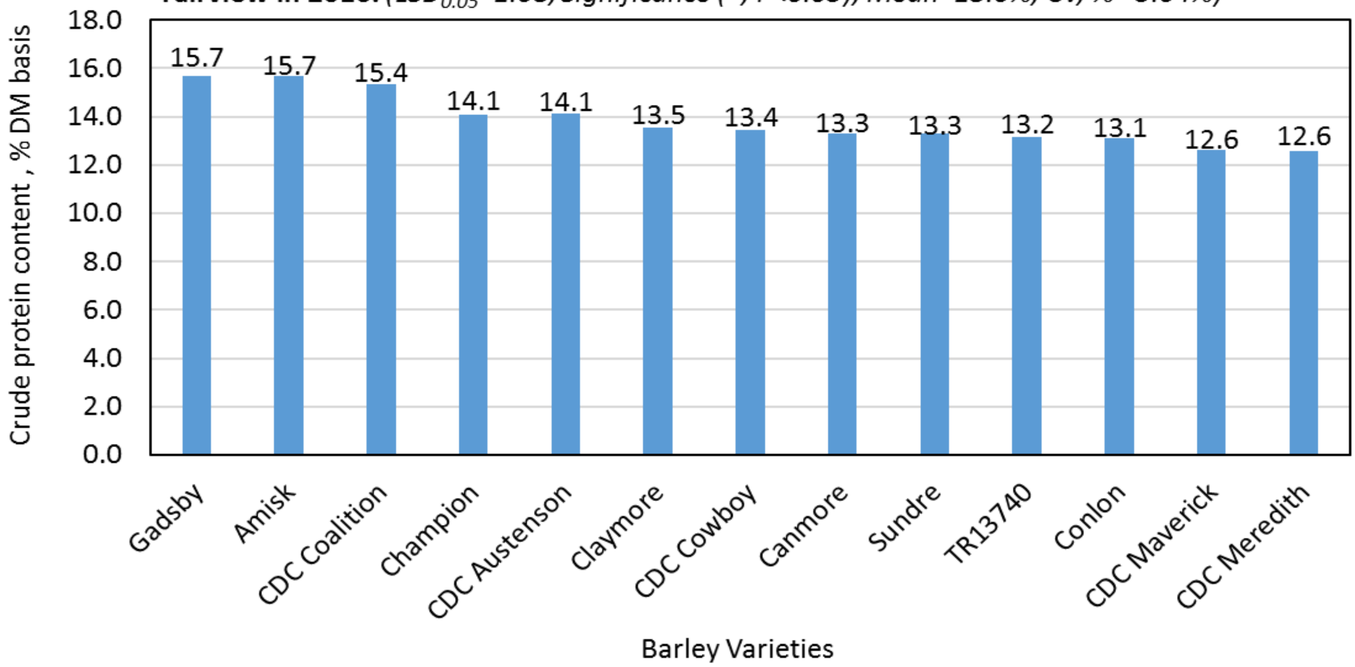
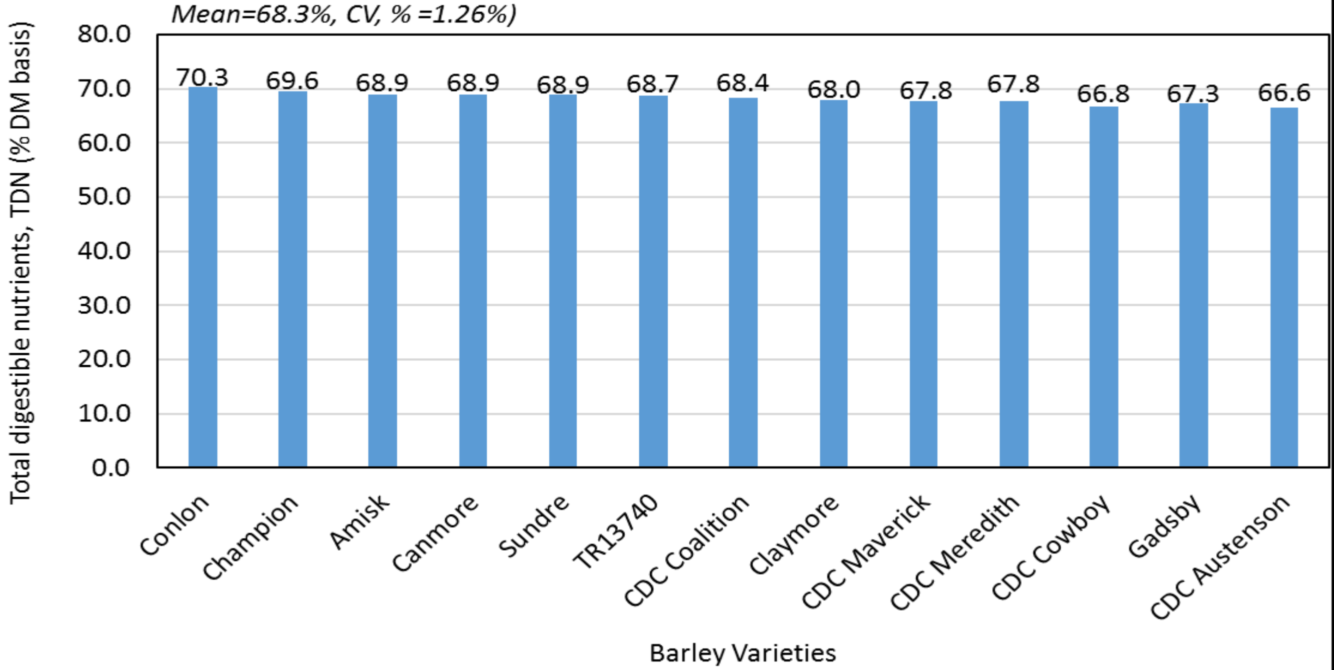


Figure 2. Forage crude protein content (% DM basis) of 13 barley varieties tested in Fairview in 2016. *($LSD_{0.05}$=1.68, Significance (*, P<0.05), Mean=13.6%, CV, % =5.64%)*



Total Digestible Nutrients (TDN) - The forage energy content (TDN) varied from 67% for CDC Austenson to 70% for Conlon and Champion (Figure 3). All varieties had adequate amounts of TDN to meet the requirements of a mature beef cow, which is 55% at second trimester, 60% at third trimester and 65% by a lactating cow. Also, the TDNs were generally well within the ranges suggested for growing and finishing calves (65-70%).

Figure 3. Forage energy (total digestible nutrients, TDN on % DM basis) of 13 barley varieties tested in Fairview in 2016. *($LSD_{0.05}$=1.87, Significance (*, P<0.05), Mean=68.3%, CV, % =1.26%)*



Other forms of energy - Energy is probably the most important nutritional consideration in beef cattle production. A range of 0.90-1.32 Mcal kg.-1 NE_M (net energy for maintenance) has been recommended for beef cows (NRC, 2000). The NE_M is an estimate of the energy value of a feed used to keep an animal in energy equilibrium, i.e. neither gaining nor losing weight.

Generally, all barley varieties screened had sufficient amounts of NE_M needed for mature beef cattle during pregnancy and nursing of calves. The ability of tested barley varieties to be able to meet beef cows' energy requirements is important to cow-calf producers in the Peace Region, particularly during winter, as this will mean a substantial savings in feed energy costs.

Minerals - The forage macro and trace minerals are shown in Table 2. The forage Ca content varied from 0.42% for CDC Cowboy to 0.60% for Amisk. Forage P, K and Mg values respectively varied from 0.17 to 0.21% P, 1.37 to 1.90% K and 0.23 to 0.31% Mg. The forage Na was highest for CDC Cowboy (0.65%) and lowest for CDC Austenson (0.46%). Forage S varied from 0.23% for Sundre to 0.29% for CDC Cowboy.

All varieties were well within the recommended Ca content for a mature beef cow, which is 0.18% Ca when pregnant or 0.42% Ca after calving.

All varieties met the P requirements of a dry gestating beef cow, but all varieties fell short of meeting the 0.26% P that is required by a lactating beef cow. The requirements of K, Mg, Na and S by a mature beef cow have been met by all barley varieties tested.

For the trace-minerals, the forage Cu, Fe, Zn and Mn contents were respectively in the ranges of 1.98 - 3.23Ug/g Cu, 99 - 154Ug/g Fe, 53 - 72 Ug/g Zn and 55 - 85 Ug/g Mn. With the exception of Cu, all the trace-minerals measured here exceeded the content needed by a mature beef cow during and after pregnancy stages. The forage Cu content of barley was far less than the 10Ug/g required by growing and finishing calves as well as mature beef cattle.

According to the Alberta Agriculture & Forestry publication "Trace Minerals for Beef Cows", more than 90 percent of the feed produced in Alberta is low in copper. Cases of copper deficiency are common. Symptoms of deficiency include anaemia, impaired reproduction in cows, bleaching of the hair coat, scours, unthriftiness, stunted growth and sudden death. A greater incidence of internal and external parasites has been noted in copper deficient animals. There is also an increased tendency for bones to fracture in calves and an increased incidence of lameness. Mineral mixes containing Ca and/or P would be good sources of supplementary trace elements if the levels of trace elements in the mix fell in the middle to upper end of the following recommended range for Cu: 2,000-3,000 mg/kg. Such minerals could be fed with red or blue salt.

Table 2. Forage minerals (macro & trace) of 13 barley varieties tested in 2016

Variety	Macro-Minerals						Trace-Minerals			
	P	K	Mg	Ca	Na	S	Cu	Fe	Zn	Mn
	%	%	%	%	%	%	%	%	%	%
TR13740	0.19	1.55	0.24	0.48	0.48	0.25	2.45	114	58	65
CDC Maverick	0.19	1.39	0.26	0.48	0.48	0.25	2.84	135	58	69
Champion	0.18	1.58	0.24	0.46	0.47	0.27	3.23	111	64	64
CDC Meredith	0.18	1.43	0.23	0.43	0.59	0.24	2.42	107	53	63
CDC Coalition	0.21	1.80	0.28	0.43	0.58	0.28	2.56	121	60	82
CDC Austenson	0.18	1.90	0.24	0.48	0.46	0.27	2.77	154	56	63
Canmore	0.19	1.57	0.26	0.47	0.53	0.25	2.49	101	53	67
CDC Cowboy	0.18	1.76	0.28	0.42	0.65	0.29	2.91	115	62	85
Sundre	0.17	1.37	0.25	0.48	0.57	0.23	2.25	101	59	55
Gadsby	0.21	1.69	0.25	0.57	0.62	0.28	2.66	108	58	62
Amisk	0.19	1.57	0.31	0.60	0.55	0.28	1.98	114	60	79
Conlon	0.17	1.44	0.29	0.51	0.50	0.25	2.99	110	72	68
Claymore	0.19	1.56	0.28	0.54	0.54	0.26	2.38	99	57	76
$LSD_{0.05}$	*0.03*	*0.17*	*0.04*	*0.17*	*0.24*	*0.03*	*0.66*	*48*	*22*	*30*
Significance ($P<0.05$)	*NS*	*	*	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*
Mean	*0.19*	*1.58*	*0.26*	*0.49*	*0.54*	*0.26*	*2.61*	*114*	*59.3*	*69*
CV, %	*7.00*	*5.02*	*7.06*	*16.4*	*20.6*	*6.22*	*11.6*	*19.3*	*16.9*	*19.7*

Detergent Fibers (ADF & NDF) *and non-fiber carbohydrates (NFC)*

Both acid and neutral detergent fibers (ADF & NDF) and NFC values for barley varieties tested are shown in Table 3. The forage fiber content (measured by ADF or NDF) in particular is a strong predictor of forage quality, since it is the poorly-digested portion of the cell wall. The ADF values are important because they relate to the ability of an animal to digest the forage. As ADF increases, digestibility of forage usually decreases. The NDF values are important in ration formulation because they reflect the amount of forage the animal can consume. As NDF percentages increase, forage DM intake will generally decrease.

Generally, NFC is more rapidly digested than fiber. It is a significant source of energy for the rumen microbes. The microbes also use NFC to make microbial protein. Conlon, Champion, TR13740 and CDC Maverick varieties in that order had the top 4 NFC values, indicating more energy and microbial protein sources in the rumen.

Table 3. Forage detergent fibers and forms of energy of 13 barley varieties tested in 2016							
Variety	**Fibers**			**Other Forms of Energy**			
	ADF	**NDF**	**NFC**	**NE_L**	**NE_G**	**NE_M**	**RFV**
	%	**%**	**%**		**MCal/Kg**		
TR13740	25.9	47.1	28.2	1.56	0.98	1.70	136
CDC Maverick	27.1	48.7	27.2	1.54	0.95	1.68	130
Champion	24.7	44.4	30.0	1.59	1.01	1.73	146
CDC Meredith	27.4	49.4	26.5	1.54	0.95	1.67	127
CDC Coalition	26.3	48.1	25.0	1.56	0.97	1.70	132
CDC Austenson	28.7	50.9	23.5	1.51	0.92	1.64	122
Canmore	25.7	48.3	26.9	1.57	0.99	1.71	133
CDC Cowboy	28.4	51.3	23.8	1.52	0.93	1.65	121
Sundre	25.7	49.1	26.1	1.57	0.99	1.71	131
Gadsby	27.8	51.9	23.5	1.53	0.94	1.66	121
Amisk	25.7	46.3	26.5	1.57	0.99	1.71	138
Conlon	23.9	45.1	30.4	1.6	1.03	1.75	145
Claymore	26.8	49.3	25.7	1.55	0.96	1.68	128
$LSD_{0.05}$	*2.41*	*3.93*	*4.55*	*0.05*	*0.05*	*0.05*	*14*
Significance ($P<0.05$)	*	*	*NS*	*	*	*	*
Mean	*26.5*	*48.5*	*26.4*	*1.55*	*0.97*	*1.69*	*132*
CV, %	*4.17*	*3.72*	*7.92*	*1.37*	*2.63*	*1.47*	*4.76*

Regional Silage Variety Trials: Oat Varieties

By Akim Omokanye, PCBFA

Oat is the most popular cool-season cereal crop grown for forage and has become a reliable source of conserved forage for over-wintering beef cattle in the Peace Country region. In an effort to continue to identify oat varieties that have superior forage production for the region, PCBFA tested several oat varieties in Fairview in 2016. The test was part of the Regional Silage Variety Trials (RSVTs) testing program, which includes testing of new oat varieties as they become available for adaption, forage yield and quality across Alberta. In addition to the findings presented here from our trial, the results from the RSVTs across the different trial sites in the province will also be reported in the Alberta Seed Guide (www.seed.ab.ca).

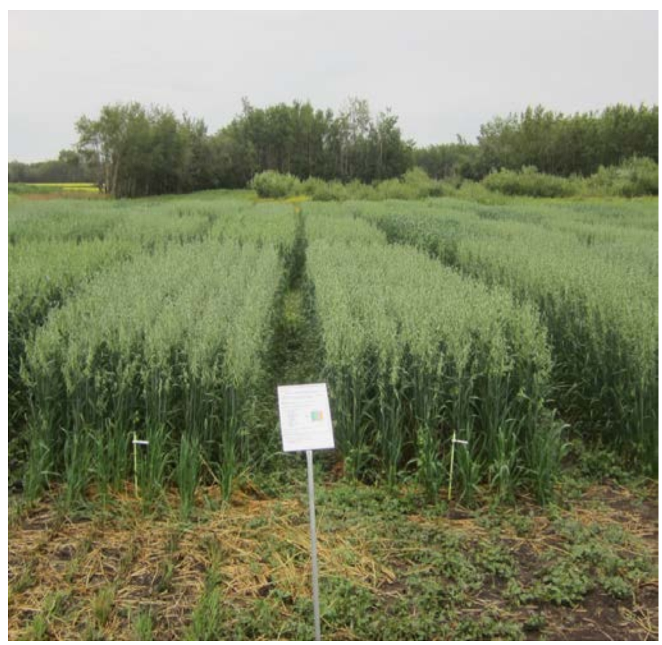
Methods

Site: The study site was at the Fairview Research Farm (NW5-82-3W6) on RR #35, MD of Fairview. The site had soybeans in 2015. Soil test at 0-6" soil depth done at Exova laboratory (Edmonton) prior to seeding showed an organic matter content of 7.3%, a pH of 5.4 (acidic) and an electrical conductivity of 0.58 dS/m. The field was cultivated before seeding.

Randomized complete block design in 4 replications was used in small plots measuring 11.04 m^2 (118.8 ft^2).

Treatments (Varieties): A total of 10 oat varieties was tested in 2016.

1. AC Juniper – general purpose oat, early maturing
2. AC Morgan –milling or feed oat, but commonly used for silage or green feed, late maturing
3. AC Mustang – feed oat
4. CDC Baler – forage oat
5. CDC Haymaker - forage oat
6. CDC Seabiscuit - milling oat
7. CDC SO-1—(Super Oat number 1) – Feed/forage oat
8. Derby– general purpose, late maturing
9. Murphy– forage oat
10. Waldern – feed oat



CDC Haymaker is a forage oat variety that offers a high forage yield advantage in the field versus normal grain varieties. Haymaker produces huge leaves and thick stems to deliver impressive forage tonnage. Growers have been finding success with CDC Haymaker in green-feed, silage, and swath grazing applications both grown alone or in a forage blend.

Seeding rate and date: A rate of 300 plants/m^2 (27.8 plants/ft^2) was used. A 6-row Fabro plot drill at 9" row spacing was used to seed. Seeding was done on May 16.

Fertility according to soil tests (actual lbs/acre): 0 N + 33 P + 47 K + 0 S (broadcast). Soil test showed adequate amounts of N & S for the crop, so N & S were not applied.

Spraying: Roundup WeatherMAX® was used as pre-emergent 7 days after seeding. In-crop spraying was done with 2, 4 - D 700 at 0.35 L/acre. Rouging was done a few times.

Measurements taken at milk stage:

- Prior to harvest, stand assessment for stand uniformity was done.
- Random plants were selected for plant height (up to flag leaf only) measurement at milk stage.
- Forage yield & quality determination: at soft dough stage, plants in the 4 centre rows 10 feet long were harvested, weighed fresh, sub-sampled (about 500 grams), air dried for some days and then weighed to determine dry matter (DM) content. Forage samples were analyzed for quality using standard procedures for wet chemistry at A & L Laboratory, Toronto.

Results & Interpretation

Plant Height & Lodging

Varieties showed significant differences in plant height (Table 1). Plant height was highest for Waldern (85.9 cm).

No lodging was observed for any of the varieties tested in 2016.

Table 1. Plant height (cm) and forage moisture content at harvest of forage type oats tested in Fairview in 2016

Variety	Plant height+	Moisture
	cm	%
CDC Haymaker	81.3	67.0
CDC Baler	84.3	67.5
AC Morgan	75.6	72.1
CDC SO-1	75.4	70.9
Derby	80.4	70.8
CDC Seabiscuit	69.9	71.7
AC Mustang	74.0	72.7
Waldern	85.9	72.3
Murphy	82.7	74.1
AC Juniper	70.8	68.8
$LSD_{0.05}$	7.71	4.98
Significance (P<0.05)	*	NS
Mean	77.4	69.1
CV, %	6.94	4.46

+, plant height measured up to the flag leaf only.
CV, coefficient of variation.
NS, not significant (P>0.05).

Forage DM yield

The forage DM yield varied from 3.12 tons/acre for AC Juniper to 4.44 tons/acre for CDC Haymaker (Figure 1). CDC Haymaker oat had significantly higher forage DM yield than both Murphy and AC Juniper oat varieties. Of the 9 varieties compared to check (CDC Baler), only one (CDC Haymaker) had higher yield advantage with 109% of check. Other varieties appeared to have 77 to 99% DM of check.

Forage Quality

Crude Protein (CP) - The forage CP content did not significantly differ among varieties tested. The protein varied from 11.7% for Waldern variety to 13.8% for CDC SO-I oat, indicating that CP was generally above 11% (Figure 2). Only CDC SO-I, AC Mustang and CDC Seabiscuit had >13% CP.

The CP content obtained in this test therefore shows that the oat varieties tested here at the milk stage all met the protein requirement of a mature beef cow, which is 7% at second trimester, 9% at third trimester and 11% after calving (during lactation). In terms of the protein requirement of growing and finishing calves, varieties were well within the recommended 12-13% protein.

Total Digestible Nutrients (TDN) - The forage TDN differed significantly among varieties tested. Except for CDC Baler, CDC SO-I had significantly higher TDN than other varieties tested (Figure 3). The forage TDN varied from 61% for Waldern to 65% for CDC SO-I oat.

The TDN values show that all varieties had enough TDN for a dry gestating cow, which requires 55% TDN at second trimester and 60% TDN at third trimester. But for a lactating beef cow, only CDC SO-I oats met the 65% TDN needed.

Figure 1. Forage DM yields (tons/acre) of 10 oat varieties tested in Fairview in 2016.
($LSD_{0.05}$=0.67, Not Significant (P>0.05), Mean=3.90 tons/acre, CV, % = 11.9%)

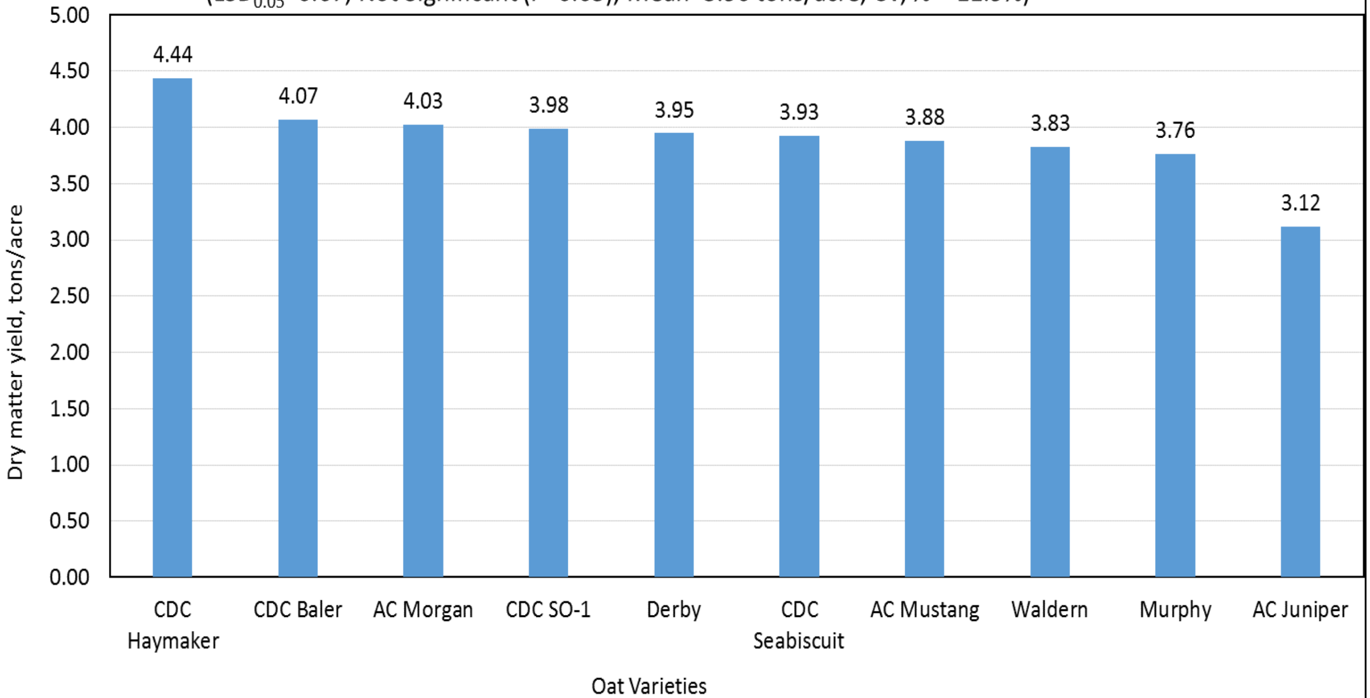
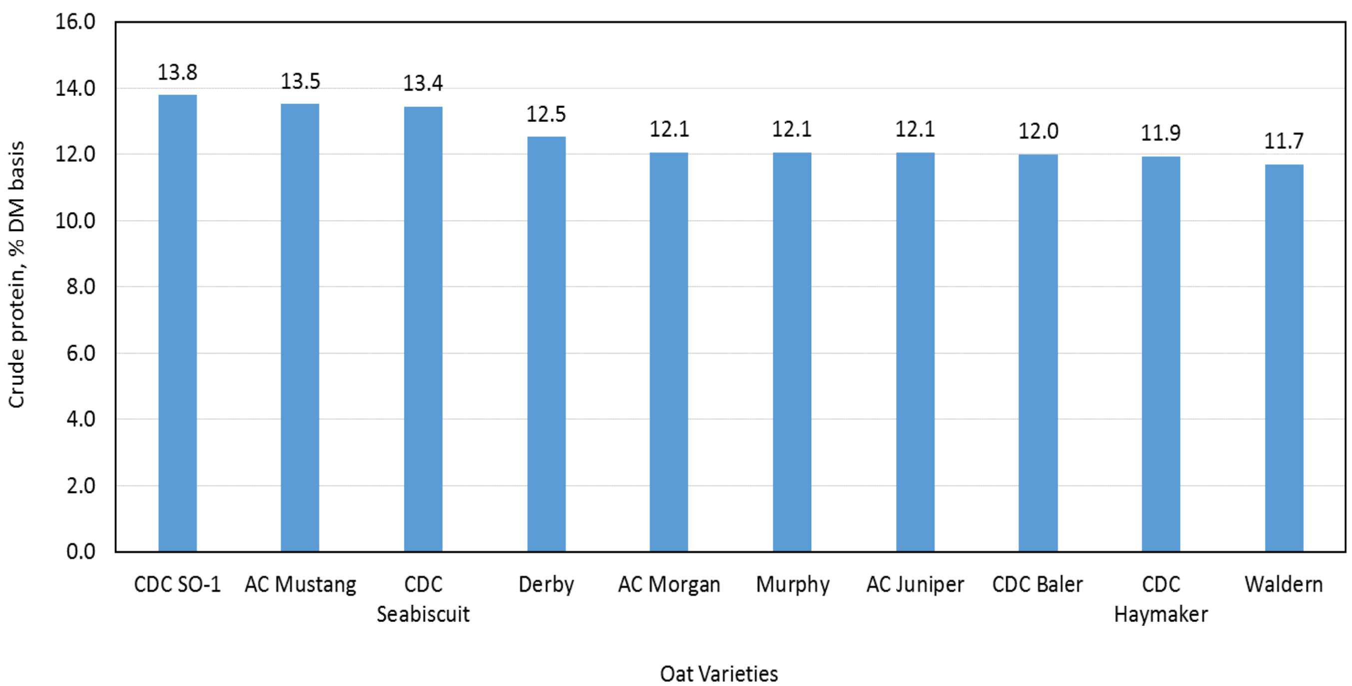
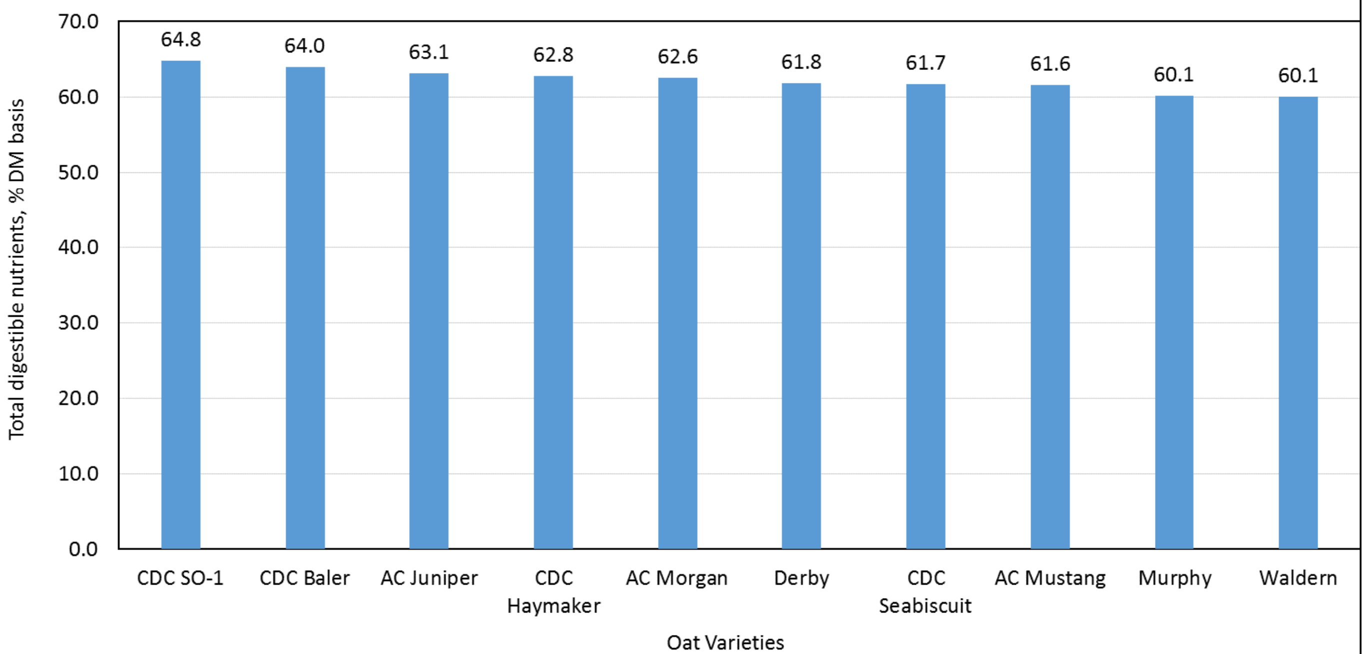


Figure 2. Forage crude protein content (% DM basis) of 10 oat varieties tested in Fairview in 2016.
($LSD_{0.05}$=1.66, Not Significant (P>0.05), Mean=12.6%, CV, % =5.82%)



Minerals - The forage macro– and trace-minerals are shown in Table 2. For a dry gestating cow, all varieties have sufficient minerals (except for Cu). But for a lactating cow, Ca and P were inadequate in meeting the requirements of this category of cow. The forage Cu content from all varieties tested was far less than 10 ug/g needed by calves and mature beef cattle.

Figure 3. Forage energy (TDN, on % DM basis) of 10 oat varietries tested in Fairview in 2016.
*($LSD_{0.05}$=1.45, Significance (***, P<0.001), Mean=62.3%, CV, % =1.03%)*



According to Alberta Agriculture & Forestry publication "Trace Minerals for Beef Cows", more than 90 percent of the feed produced in Alberta is low in copper. Cases of copper deficiency are common. Symptoms of deficiency include anaemia, impaired reproduction in cows, bleaching of the hair coat, scours, unthriftiness, stunted growth and sudden death. A greater incidence of internal and external parasites has been noted in copper deficient animals. There is also an increased tendency for bones to fracture in calves and an increased incidence of lameness. Mineral mixes containing Ca and/or P would be good sources of supplementary trace elements if the levels of trace elements in the mix fell in the middle to upper end of the following recommended range for Cu: 2,000-3,000 mg/kg. Such minerals could be fed with red or blue salt.

Table 2. Forage minerals (macro & trace) of 10 oat varieties tested in 2016

Variety	Macro-minerals						Trace-minerals			
	Ca	P	K	Mg	Na	S	Cu	Fe	Zn	Mn
	%	%	%	%	%	%	Ug/g	Ug/g	Ug/g	Ug/g
CDC Haymaker	0.34	0.19	1.57	0.27	0.96	0.27	2.45	91	41	127
CDC Baler	0.34	0.21	1.63	0.27	0.90	0.26	3.24	105	45	122
AC Morgan	0.34	0.22	1.72	0.25	0.95	0.27	2.76	89	40	127
CDC SO-1	0.29	0.19	1.62	0.25	1.07	0.24	2.95	85	38	108
Derby	0.32	0.18	1.59	0.26	1.09	0.23	2.44	77	38	99
CDC Seabiscuit	0.29	0.19	1.80	0.27	1.18	0.26	3.08	92	38	65
AC Mustang	0.34	0.21	1.80	0.25	0.99	0.26	2.53	88	36	123
Waldern	0.36	0.17	1.76	0.26	0.89	0.28	2.79	109	31	123
Murphy	0.30	0.19	1.69	0.28	1.21	0.29	2.85	78	39	92
AC Juniper	0.32	0.19	1.88	0.27	0.46	0.26	3.09	90	35	114
$LSD_{0.05}$	0.06	0.04	0.25	0.06	0.29	0.05	0.56	25	9	23
Significance (P<0.05)	NS	NS	NS	NS	*	NS	NS	NS	NS	*
Mean	0.33	0.19	1.71	0.26	0.97	0.26	2.82	90	38	110
CV, %	7.8	9.04	6.48	10.2	13.2	7.89	8.08	12.4	9.85	9.18

CV, coefficient of variation. NS, not significance (P>0.05).

Detergent Fibers (ADF & NDF) *and non-fiber carbohydrates (NFC)*

Both detergent fibers (ADF & NDF) as well as NFC are shown in Table 3. The forage fiber content (measured by ADF or NDF) in particular is a strong predictor of forage quality, since it is the poorly digested portion of the cell wall. The ADF values are important because they relate to the ability of an animal to digest the forage. As ADF increases, digestibility of forage usually decreases. The NDF values are important in ration formulation because they reflect the amount of forage the animal can consume. As NDF percentage increases, forage DM intake will generally decrease.

Generally, NFC is more rapidly digested than fibers. It is a significant source of energy for the rumen microbes. The microbes also use NFC to make microbial protein. Looking at Table 3, of the 10 oat varieties tested, CDC SO-I had the lowest ADF & NDF, higher NFC and highest values for other forms of energy as well as RFV. This therefore confirms the better quality of CDC SO-I as previously reported in PCBFA studies. Because of the high NFC value for CDC SO-I, this variety will provide more energy and microbial protein sources in the rumen than other varieties (except for AC Juniper which had higher NFC value than CDC SO-I).

Table 3. Forage fibers (ADF & NDF), non-fiber carbohydrates and other forms of energy of 10 oat varieties

	Fibers			Other Forms of Energy			
	ADF	NDF	NFC	NEL	NEG	NEM	RFV
Variety	%	%	%	MCal/Kg	MCal/Kg	MCal/Kg	
CDC Haymaker	33.5	58.3	18.2	1.42	0.81	1.53	100
CDC Baler (Check)	31.9	58.6	17.9	1.45	0.84	1.57	102
AC Morgan	33.8	59.3	17.1	1.41	0.80	1.53	98
CDC SO-1	31.0	54.5	20.2	1.47	0.87	1.59	111
Derby	34.7	58.6	17.4	1.40	0.78	1.50	98
CDC Seabiscuit	34.9	59.2	15.8	1.39	0.78	1.50	97
AC Mustang	35.0	59.7	15.3	1.39	0.77	1.50	96
Waldern	37.0	60.8	16.1	1.36	0.73	1.45	92
Murphy	36.9	60.7	14.4	1.36	0.73	1.45	92
AC Juniper	33.1	55.4	21.0	1.43	0.82	1.54	106
$LSD_{0.05}$	1.9	2.5	2.9	0.04	0.04	0.05	6.15
Significance ($P<0.05$)	*	*	*	*	*	*	*
Mean	34.2	58.5	17.3	1.41	0.79	1.52	99.2
CV, %	2.4	1.9	7.39	1.2	2.49	1.39	2.74

CV, coefficient of variation.

Regional Silage Variety Trials: Spring Triticale Varieties for Silage

By Akim Omokanye, PCBFA

Triticale is a cross of wheat and rye. Triticale is a cool season cover crop. Spring triticale provides an excellent high yielding alternative to barley and oat forage. Studies have shown that a silage yield advantage of around 10 percent over barley and oats under dryland conditions makes triticale an excellent choice for livestock producers. Triticale generally ranks between barley and oats for silage quality. The RSVTs help to provide information with regard to the quantity and quality of annual crops cut for green-feed and silage to local producers. Triticale is later maturing than oats or barley. For greenfeed or silage, triticale should be cut at the late milk stage. Because of its aggressive root system, it promotes water penetration and erosion control during the rainy season. Use this crop to take up excess nitrogen. In addition to the findings presented here from our trial, the results from the RSVTs across the different trial sites in the province will also be reported in the Alberta Seed Guide (www.seed.ab.ca).

Methods

The study site was at the Fairview Research Farm (NW5-82-3W6) on RR #35, MD of Fairview. The site had soybeans in 2015. Soil test at 0-6" soil depth done at Exova laboratory (Edmonton) prior to seeding showed an organic matter content of 7.3%, a pH of 5.4 (acidic) and an electrical conductivity of 0.58 dS/m. The field was cultivated before seeding.

We used randomized complete block design in 4 replications. Small plots measuring 11.04 m^2 (118.8 ft^2) were used.

The following 5 spring triticale varieties were tested in 2016:

1. Tyndal
2. Sunray
3. Bunker
4. 94L043057
5. Taza

We seeded on May 16 at a seeding rate of 370 plants/m^2 (34.3 plants ft^2) with a 6-row Fabro plot drill at 9" row spacing.

Fertility according to soil tests (actual lbs/acre): we applied 0 N + 33 P + 47 K + 0 S (broadcast). Soil test showed adequate amounts of N & S for the crop, so N & S were not applied.

Spraying: Roundup WeatherMAX® was used as pre-emergent 7 days after seeding. In-crop spraying was done with 2, 4 - D 700 at 0.35 L/acre. Rouging was done a few times.

Measurements taken at late milk stage (harvest stage):

- Prior to harvest, stand assessment for stand uniformity was done.
- Random plants were selected for plant height measurement (up to flag leaf) at late milk stage.
- Forage yield & quality determination: At late milk stage, plants in the 4 centre rows 10 feet long were harvested, weighed fresh, sub-sampled (about 500 grams), air dried for some days and then weighed to determine dry matter (DM) content. Forage samples were analyzed for quality using standard procedures for wet chemistry at A & L Laboratory, Toronto.

Results & Interpretation

Plant Height & Lodging

Triticale varieties differed significantly in plant height. Bunker variety grew taller (100 cm) than other triticale varieties tested here (Table 1).

Forage Dry Matter (DM) Yield

The forage DM was statistically similar among triticale varieties tested (Table 1). Tyndal produced the highest DM yield (8448 lbs/acre) followed by Sunray (8302 lbs/acre), Bunker (7859 lbs/acre), 94L043057 (7717 lbs/acre) and then Taza (6911 lbs/acre).

Yield advantage as % of check varied from 112% for 94L043057 to 122% for Tyndal.

The reduced awn expression in Bunker will diversify the use of this spring triticale as a conserved forage (for silage and greenfeed/hay).

Table 1. Plant height, moisture content at harvest, DM yield and DM yield as % of check of spring triticale varieties tested in 2016

Variety	Plant height+ cm	DM yield lbs/acre	Yield as % Check
Tyndal	95.6	8448	122
Sunray	81.5	8302	120
Bunker	100	7859	114
94L043057	82.6	7717	112
Taza (check)	87.5	6911	100
$LSD_{0.05}$	*8.13*	*1346*	
Significance	*	*NS*	
Mean	*89.5*	*7848*	
CV, %	*5.51*	*11.13*	

+, plant height measured up to the flag leaf only.
CV, coefficient of variation.
NS, not significant (P>0.05).

Forage Quality

Crude protein (CP) - The forage CP was similar for all triticale varieties. The CP was generally above 10% for all varieties. At the late milk stage of harvest for greenfeed or silage, all varieties tested here have been able to meet the protein requirements of a mature beef cow at different physiological states.

Minerals

For a dry gestating cow, all spring triticale varieties tested here had sufficient mineral values (except for Na and Cu) (see Table 2).

Table 2. Forage protein (CP) and mineral contents of 5 spring triticale varieties tested in 2016

Variety	CP %	Ca %	P %	K %	Mg %	Na %	S %	Cu Ug/g	Fe Ug/g	Zn Ug/g	Mn Ug/g
Tyndal	10.9	0.23	0.25	1.26	0.17	0.01	0.19	3.72	82	44	101
Sunray	10.6	0.23	0.21	1.55	0.20	0.04	0.27	3.48	97	53	95
Bunker	10.9	0.23	0.22	1.29	0.18	0.03	0.19	3.21	75	52	110
94L043057	11.3	0.20	0.23	1.10	0.17	0.01	0.20	4.02	75	45	82
Taza	11.1	0.25	0.24	1.56	0.19	0.05	0.23	3.52	94	56	106
$LSD_{0.05}$	*1.34*	*0.02*	*0.09*	*0.28*	*0.02*	*0.26*	*0.04*	*1.36*	*16*	*16*	*42*
Significance (P<0.05)	*NS*	*	*NS*	*	*NS*	*NS*	*	*NS*	*NS*	*NS*	*NS*
Mean	*11.0*	*0.23*	*0.23*	*1.35*	*0.18*	*0.06*	*0.22*	*3.59*	*85*	*50*	*99*
CV, %	*4.51*	*3.39*	*14.5*	*7.54*	*5.01*	*141*	*6.24*	*13.7*	*6.99*	*11.1*	*15.4*

CV, coefficient of variation.
NS, not significant (P>0.05).

Energy

The forage total digestible nutrients (TDN) varied from 63% for Bunker to 70% for 94L043057 (Table 3), indicating that energy (TDN) was generally >60% TDN. This shows that the suggested 60%TDN value for a dry gestating cow has been met by these varieties. Tyndal, Sunray and 94L043057 exceeded the 65% TDN recommended for a lactating cow.

For all other forms of energy, 94L043057 consistently had higher values compared to other varieties tested. A mature beef cow requires 0.97-1.10 MCal Kg-1 NE_M (net energy for maintenance) during pregnancy and 1.19-1.28 MCal Kg-1 NE_M during lactation. Looking at Table 3, all spring triticale varieties tested here have been able to meet the net energy for maintenance requirements by these categories of cows. NE_M is an estimate of the energy value of a feed used to keep an animal in energy equilibrium, neither gaining nor losing weight.

Detergent Fibers and Non-fiber Carbohydrates (Table 3)

In terms of the detergent fibers (ADF & NDF) and NFC, 94L043057 is of better forage quality than other spring triticale varieties tested here. Forages with lower ADF values are usually preferred, because it means higher net energy. NDF gives bulk or fill to the diet and is negatively correlated with feed intake. Low NDF is usually desired. NFC is the highly digestible carbohydrate fraction of feeds consisting of starch, sugar, and pectin. Generally, NFC is more rapidly digested than fiber. It is a significant source of energy for the rumen microbes. The microbes also use NFC to make microbial protein. Therefore, in terms of NFC values obtained for spring triticale tested here, 94L043057 appeared to fare better than other varieties in providing significant source of energy for the rumen microbes.

Table 3. Forage fibers (ADF & NDF), non-fiber carbohydrates and other forms of energy of 5 spring triticale varieties

Variety	ADF	NDF	NFC	TDN	NE_L	NE_G	NE_M	RFV
	%	%	%	%	MCal/kg	MCal/kg	MCal/kg	MCal/kg
Tyndal	28.5	47.9	29.7	66.7	1.52	0.92	1.64	130
Sunray	28.1	47.1	30.8	67.0	1.53	0.93	1.65	136
Bunker	32.8	51.5	27.1	63.3	1.44	0.82	1.54	114
94L043057	24.3	40.1	37.1	70.0	1.60	1.02	1.74	162
Taza	31.4	49.1	28.3	64.5	1.46	0.86	1.58	122
$LSD_{0.05}$	*6.50*	*10.2*	*10.1*	*5.10*	*0.13*	*0.14*	*0.14*	*39*
Significance (P<0.05)	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*
Mean	*29.0*	*47.1*	*30.6*	*66.3*	*1.50*	*0.91*	*1.63*	*133*
CV, %	*8.11*	*7.83*	*11.9*	*2.76*	*3.06*	*5.73*	*3.20*	*10.7*

CV, coefficient of variation. NS, not significant (P>0.05).

Triticale Varieties for Swath Grazing

By Akim Omokanye, PCBFA

Swath grazing is one of the commonly used methods in the Peace to extend the field grazing season. Swath grazing eliminates the cost and time of baling or silaging. It also eliminates the cost of cleaning corrals and hauling manure from feedlots. In the Peace, oats are commonly used for swath grazing. Triticale is a dual-purpose cereal crop and it therefore has the potential to provide economic benefits for both grain and forage based production systems. Studies have shown that when grown for forage production in dryland conditions, triticale has the potential to produce around 10 per cent more forage yield than barley and oats and its forage quality lies between barley and oats. When compared to general purpose/feed wheat or barley, triticale showed superior yields on marginal lands and in drought conditions. In 2016, we tested 5 spring triticale varieties for their suitability for swath grazing.

Methods

The study site was at the Fairview Research Farm (NW5-82-3W6) on RR #35, MD of Fairview. The site had soybeans in 2015. Soil test at 0-6" soil depth done at Exova laboratory (Edmonton) prior to seeding showed an organic matter content of 7.3%, a pH of 5.4 (acidic) and an electrical conductivity of 0.58 dS/m. The field was cultivated before seeding.

We used a randomized complete block design in 4 replications. Small plots measuring 11.04 m^2 (118.8 ft^2) were used. 5 spring triticale varieties (Tyndal, Sunray, Bunker, 94L043057 and Taza) were seeded at the rate of 370 plants/m^2 (34.3 plants ft^2) with a 6-row Fabro plot drill at 9" row spacing. Seeding was done on May 16.

For fertility (actual lbs/acre), 0 N + 33 P + 47 K + 0 S (broadcast) was applied. Soil test showed adequate amounts of N & S for the crop, so N & S were not applied.

Roundup WeatherMAX® was used as pre-emergent 7 days after seeding. In-crop spraying was done with 2, 4 - D 700 at 0.35 L/acre. Rouging was done a few times.

At the swath grazing stage (mid-dough), forage DM yield was estimated & the forage nutritional value was determined.

Results and Interpretation

Forage DM yield (Table 1)

The DM yield as percent of check (Taza) was highest for Bunker (120%), followed by Sunray (113%) and then Tyndal (109%). Only 94L043057 had less yield (85%) than Taza (check).

Protein

The forage crude protein (CP) was highest for Taza (check, 11.3% CP). A dry gestating cow in the mid-pregnancy stage requires 7% CP, and 9% CP at the late-pregnancy stage. Looking at the CP values obtained for the triticale varieties (Table 1), 94L043057, Taza (check) and Sunray had enough CP for a gestating cow. Bunker and Tyndal were just barely able to meet the 9% CP needed by a cow in the late-pregnancy stage. Out of the 5 triticale varieties tested here, only Taza had adequate CP for mature beef cattle. It is important to test the swath for nutritional value so as to be able to provide any form of protein supplementation if necessary (when CP is lower than 7%) during swath grazing of triticale. The supplementation could be a random placement of good alfalfa hay across the field.

Table 1. Forage DM yield, crude protein (CP) and CP fractions of 5 triticale varieties tested for swath grazing suitability							
Variety	DM yield lbs/acre	DM Yield as % Check	Crude protein (CP) and CP fractions				
			CP %	Sol Protein %	ADF-CP %	NDF-CP %	UIP (Bypass) %
94L043057	4.73	85	9.94	64.59	0.54	1.07	17.7
Bunker	6.7	120	8.55	62.81	0.82	1.17	18.6
Taza (check)	5.59	100	11.26	67.85	0.43	1.04	16.08
Tyndal	6.09	109	8.59	64.84	0.64	0.98	17.58
Sunray	6.29	113	9.45	72.17	0.36	1.21	13.92

Minerals

The forage minerals (macro and trace) are shown in Table 2. None of the triticale varieties tested here had enough Ca, Na and Cu for a gestating cow. But all triticale varieties tested were able to meet the P, K, Mg, S, Fe, Zn and Mn requirements of a gestating cow in the mid-pregnancy stage. For a dry gestating cow in the late-pregnancy stage, only the requirements for K, S, Fe, Zn and Mg were met by all triticale varieties tested here. Because of the inconsistencies in minerals, it is recommended that mineral supplementation be provided to cows when using triticale for swath grazing.

Table 2. Forage minerals of 5 triticale varieties tested for swath grazing suitability										
	Macro minerals						Trace minerals			
	Ca	P	K	Mg	Na	S	Cu	Fe	Zn	Mn
Variety	%	%	%	%	%	%	%	%	%	%
94L043057	0.17	0.18	0.87	0.12	0.01	0.18	2.38	96	38.4	65.6
Bunker	0.17	0.17	0.83	0.16	0.02	0.19	1.23	82	45.3	84.5
Taza	0.13	0.25	0.89	0.12	0.02	0.17	2.04	90	52.6	88.6
Tyndal	0.16	0.20	0.91	0.11	0.01	0.15	2.20	116	36.1	75.8
Sunray	0.12	0.21	0.81	0.15	0.02	0.19	2.07	83	45.3	73.5
$LSD_{0.05}$										
Significance										
Mean										
CV,%										

Energy

The forage energy (%TDN) was generally >60% TDN (Table 3). All varieties tested here were therefore able to meet the TDN requirements of a gestating cow. For a lactating cow, which requires 65% TDN, all varieties (except for Bunker), met the 65% TDN requirement.

Detergent Fibers (ADF & NDF) *and Non-fiber Carbohydrates (NFC) (Table 3)*

The ADF values are important because they relate to the ability of an animal to digest the forage. As ADF increases, digestibility of forage usually decreases. The NDF values are important in ration formulation because they reflect the amount of forage the animal can consume. As NDF percentage increases, forage DM intake will generally decrease. Generally, NFC is more rapidly digested than fiber. It is a significant source of energy for the rumen microbes. The microbes also use NFC to make microbial protein. From the triticale varieties tested here, Sunray seems to fare slightly better than other varieties taking into consideration the ADF, NDF and NFC values.

Other forms of energy - Energy is probably the most important nutritional consideration in beef cattle production. A range of 0.90-1.32 Mcal kg.-1 NE_M (net energy for maintenance) has been recommended for beef cows (NRC, 2000). The NE_M is an estimate of the energy value of a feed used to keep an animal in energy equilibrium, i.e., neither gaining nor losing weight. Generally, all triticale varieties tested here exceeded the NE_M requirements by mature beef cattle during pregnancy and even after calving. The ability of all triticale varieties tested to be able to meet beef cows maintenance energy requirements is important to cow-calf producers in the Peace Region, particularly during winter, as this will mean a substantial savings in feed energy costs.

Table 3. Forage detergent fibers (ADF & NDF), non-fiber carbohydrates (NFC), energy and relative feed value (RFV) of 5 triticale varieties tested for swath grazing suitability

	Detergent fibers			Energy				
Variety	**ADF**	**NDF**	**NFC**	**TDN**	**NEL**	**NEG**	**NEM**	**RFV**
	%	**%**	**%**	**%**	**Mcal/kg**	**Mcal/kg**	**Mcal/kg**	
94L043057	26.7	41.5	37	68.1	1.55	0.97	1.69	153
Bunker	32.6	53.9	26.1	63.5	1.44	0.83	1.55	110
Taza	24	41.5	35.8	70.2	1.61	1.03	1.75	158
Tyndal	29	44.9	35	66.4	1.51	0.92	1.64	137
Sunray	23.4	41.2	37.8	70.7	1.62	1.04	1.76	159

Conclusion

The high forage DM yields particularly for Bunker, Sunray and Tyndal, which all had >6.0 tons DM/acre (109-120% of check) along with the fact that all triticale varieties had CP values that were mostly within the 7-9% CP needed by a gestating beef cow, seem to suggest that any of the triticale varieties (except for 94L043057) can be grown in the Peace for the purpose of swath grazing. The triticale varieties were not consistent in meeting some of the mineral requirements of dry gestating and lactating cows. Because of these inconsistencies, some form of commercial mineral supplement would be required during swath grazing of these varieties.

Regional Silage Variety Trials: Pulse Mixtures (Pea-Cereal Mixtures)

By Akim Omokanye, PCBFA

The growing of two crops simultaneously on the same field, particularly growing of legumes with cereals is known to offer scope for developing energy-efficient cropping systems and sustainable agriculture. Mixed cropping of certain annual legumes with cereals is extensively used for forage production in Alberta. Mixtures have different microenvironments compared to pure stands. Legumes such as peas are usually included in mixes to improve the quality of the feed. Pea silage could be 13-18% protein so theoretically a pea/cereal mix should have higher protein than a cereal silage alone which is usually about 10% protein. In reality however, the potential protein benefits of peas in silage mixtures often are not attained because of the competitive effects of the cereal crop. In addition to the findings presented here from our trial, the results from the RSVTs across the different trial sites in the province will also be reported in the Alberta Seed Guide (www.seed.ab.ca).

Methods

The study site was at the Fairview Research Farm (NW5-82-3W6) on RR #35, MD of Fairview. The site had soybeans in 2015. Soil test at 0-6" soil depth done at Exova laboratory (Edmonton) prior to seeding showed an organic matter content of 7.3%, a pH of 5.4 (acidic) and an electrical conductivity of 0.58 dS/m. The field was cultivated before seeding.

We used randomized complete block design in 4 replications.

Treatments: 3 Mono-crop cereals (1 barley, 1 oat & 1 spring triticale) & 2 pea varieties (CDC Meadow & CDC Horizon) were used in the following pea-cereal mixtures:

1. Taza triticale mono-crop
2. CDC Baler oat mono-crop
3. CDC Austenson barley mono-crop
4. Taza triticale/CDC Meadow pea mixture
5. Taza triticale/CDC Horizon pea mixture
6. CDC Austenson barley /CDC Horizon pea mixture
7. CDC Baler oat /CDC Meadow pea mixture
8. CDC Austenson barley/CDC Meadow pea mixture
9. CDC Baler oat/CDC Horizon pea mixture

Seeding Rates:
1. CDC Austenson barley- 300 plants/m^2 (27.8 plants/ft^2)
2. CDC Baler oat - 300 plants/m^2 (27.8 plants/ft^2)
3. Taza triticale - 370 plants/m^2 (34.3 plants/ft^2)
4. Pea-cereal mixtures - 75% of pea seeding rate + 50% of cereal seeding rate
   - Pea seeding rate used was 90 plants/m^2 (8.3 plants/ft^2)

A 6-row Fabro plot drill at 9" row spacing was used to seed. Seeding was done on May 16
Fertility according to soil tests (actual lbs/acre): 0 N + 33 P + 47 K + 0 S (broadcast). Soil test showed adequate amounts of N & S for the crop, so N & S were not applied.

Roundup WeatherMAX® was used as pre-emergent 7 days after seeding. In-crop spraying was done with 2, 4 - D 700 at 0.35 L/acre for triticale, oat and barley. Basagran Forte was used on pea-cereal mixtures.

At harvest, plants in the 4 centre rows 10 feet long were harvested, weighed fresh, sub-sampled (about 500 grams), air dried for some days and then weighed to determine dry matter (DM) content. Forage samples were analyzed for quality using standard procedures for wet chemistry at A & L Laboratory, Toronto.

Results & Interpretation

Forage Moisture

The forage moisture content at harvest was far lower for Taza triticale mono-crop and pea-triticale mixtures than other mono-crop cereals (barley & oat) or pea-cereal mixtures (Table 1). The CDC Baler oat and CDC Austenson barley and their mixtures with peas had the right moisture content for silage at harvest.

Forage DM yield

The Taza triticale/CDC Horizon pea mixture had significantly higher forage DM yield (8451 lbs/acre) than other mono-crop cereals (7030 - 7573 lbs/acre) and pea-cereal mixtures (6816 - 7726 lbs/acre). Compared to check (CDC Austenson barley) used in this test, only two mixtures (CDC Austenson barley/CDC Meadow pea and CDC Baler oat/CDC Meadow pea) appeared not have any yield advantage over check (Table 1). Looking at a particular cereal and its mixtures with any of the peas (CDC Horizon & CDC Meadow), only pea-triticale mixtures appeared to have some yield advantage over the mono-crop triticale (Taza) tested. Barley and oat when mixed with peas did not seem to have any influence on forage DM yield.

Table 1. Forage DM yield and DM yield as % of check of pea-cereal mixtures tested in 2016

Pea-Cereal Mixture	Moisture %	Forage DM yield lbs/acre	Yield as % Check (CDC Austenson)	Yield of mix as % mono cereal
Taza	40.5	7568	108	
Taza/CDC Horizon	40.2	8451	120	112
Taza/CDC Meadow	40.7	7726	110	102
CDC Austenson	67.3	7030	100	
CDC Austenson/CDC Horizon	68.6	7529	107	99
CDC Austenson/CDC Meadow	71.5	6816	97	90
CDC Baler	65.8	7573	108	
CDC Baler/CDC Horizon	67.5	7124	101	94
CDC Baler/CDC Meadow	67.9	6934	99	92
$LSD_{0.05}$	*2.06*	*700*		
Significance (P<0.05)	*	*		
Mean	*58.87*	*7417.15*		
CV, %	*3.6*	*6.46*		

Forage Quality

Protein - The forage CP content was generally above 10% for all mono-crop cereals and pea-cereal mixtures. For some reason, CP was significantly higher for CDC Baler oat/CDC Meadow peas (15% CP) than others. With the exception of pea-oat mixtures (CDC Baler oat/CDC Horizon pea and CDC Baler oat/CDC Meadow pea) which appeared to improve forage CP over mono-crop oat, other pea-cereal mixtures did not seem to improve forage CP over their respective mono-crop cereals. Overall, the 3 cereals and the pea-cereal mixtures had adequate CP for a mature beef cow. Only Taza triticale and Taza triticale/CDC Meadow pea fell slightly short of meeting the 12-13% protein needed by growing and finishing calves. CDC Baler oat/CDC Meadow pea far exceeded the protein requirements of all categories of beef cattle.

Minerals - The forage Ca, K, Mg, Na, Fe and Mn contents appeared to be higher for CDC Baler oat/CDC Meadow pea mixture (Table 2) than other mono-crop cereals or pea-cereal mixtures. There was no consistent improvement in forage minerals for pea-cereal mixtures over their respective mono-crop cereals. Generally, the requirements of a gestating cow in the mid-and late-pregnancy stages have all been met for the minerals (except for Cu) analyzed in this study.

Table 2. Forage crude protein (CP) and mineral contents of pea-cereal mixtures tested in Fairview in 2016

Pea-Cereal Mixture	CP	Ca	P	K	Mg	Na	S	Cu	Fe	Zn	Mn
	%	%	%	%	%	%	%	Ug/g	Ug/g	Ug/g	Ug/g
Taza	11.2	0.26	0.22	1.26	0.18	0.14	0.20	3.49	89	46	100
Taza/CDC Horizon	12.2	0.58	0.23	1.46	0.26	0.17	0.21	3.49	111	70	111
Taza/CDC Meadow	10.9	0.41	0.20	1.36	0.23	0.07	0.21	3.07	76	53	99
CDC Austenson	13.0	0.35	0.19	1.45	0.22	0.43	0.24	2.83	91	49	56
CDC Austenson/CDC Horizon	13.0	0.51	0.18	1.68	0.28	0.34	0.25	2.80	89	45	56
CDC Austenson/CDC Meadow	12.9	0.62	0.22	1.57	0.27	0.33	0.24	3.01	95	48	53
CDC Baler	12.1	0.44	0.19	1.73	0.28	0.77	0.24	3.16	141	46	132
CDC Baler/CDC Horizon	12.9	0.44	0.21	1.56	0.28	0.80	0.25	3.48	164	48	133
CDC Baler/CDC Meadow	15.0	0.87	0.20	1.82	0.41	0.81	0.26	3.22	190	54	146
$LSD_{0.05}$	1.76	0.24	0.03	0.27	0.08	0.35	0.03	0.93	33	19	13
Significance (*P<0.05*)	*	*	NS	*	*	*	*	NS	*	NS	*
Mean	12.6	0.49	0.2	1.54	0.26	0.42	0.23	3.16	116	51	98
CV, %	6.10	21.5	7.05	7.81	14.2	35.7	4.95	12.7	12.3	16.2	5.70

CV, coefficient of variation. NS, not significant (P>0.05)

Energy

The forage energy (TDN) was generally >60% for the mono-crops and the pea-cereal mixtures (Table 3). Mono-crop Taza triticale and CDC Austenson barley and their mixtures with peas had significantly higher TDN than mono-crop CDC Baler oat and pea-CDC Baler oat mixtures.

Table 3. Forage detergent fibers, energy and relative feed value of pea-cereal mixtures

Pea-Cereal Mixture	ADF	NDF	NFC	TDN	NEL	NEG	NEM	RFV
	%	%	%	%	MCal/kg	MCal/kg	MCal/kg	
Taza	27.5	48.6	28.7	67.5	1.54	0.95	1.67	129
Taza/CDC Horizon	29.4	49.4	26.9	66.0	1.51	0.91	1.63	125
Taza/CDC Meadow	29.3	49.0	28.6	66.1	1.51	0.91	1.63	125
CDC Austenson	27.0	50.4	25.1	67.9	1.55	0.96	1.68	125
CDC Austenson/CDC Horizon	27.6	47.4	28.1	67.4	1.54	0.95	1.67	132
CDC Austenson/CDC Meadow	27.9	48.0	27.6	67.2	1.53	0.94	1.67	130
CDC Baler	33.8	58.2	18.3	62.6	1.42	0.81	1.53	100
CDC Baler/CDC Horizon	32.7	57.8	17.8	63.5	1.44	0.84	1.56	102
CDC Baler/CDC Meadow	33.4	54.0	19.6	62.9	1.43	0.82	1.54	109
$LSD_{0.05}$	4.34	6.21	6.24	3.38	0.85	0.09	1.62	20
Significance (P<0.05)	*	*	*	*	*	*	*	*
Mean	29.8	51.4	24.5	65.7	1.50	0.90	0.09	120
CV, %	6.31	5.24	11.0	2.23	2.48	4.75	2.61	7.4

CV, coefficient of variation

Generally, all mono-crop cereals and pea-cereal mixtures were able to meet the TDN requirements of a gestating beef cow. For a lactating beef cow, which requires 65% TDN, mono-crop Taza triticale and CDC Austenson barley and their mixtures with peas exceeded the requirement. Mono-crop CDC Baler oat and its mixtures with peas all fell short of meeting the 65% TDN needed by a lactating beef cow. This shows that using silage from mono-crop oats or pea-oat mixtures for lactating beef cows may require additional energy sources.

2016 Regional Silage Variety Trials

Annual forages make up a large component of the yearly feed supply for many cattle producers in the form of silage, green feed and swath grazing. Selection of varieties which produce the highest forage yield and/or nutritional quality becomes increasingly important. Silage is an integral forage source in feedlots across the province and has become more prevalent in cow herds as well. With many producers trying to lower production costs, swath grazing of cow herds has increased dramatically in the last few years. It could be argued that there is more grain forage than cereal grain fed to take many market animals from conception to plate.

Participating Organizations

Nine applied research groups performed the project at twelve locations throughout the province.
Battle River Research Group, Forestburg, AB, (780) 582-7308
Chinook Applied Research Association, Oyen, AB, (403) 664-3777
Gateway Research Organization, Westlock, AB, (780) 349-4546
Lakeland Agricultural Research Association, Bonnyville, AB, (780) 826-7260
Smoky Applied Research and Demonstration Association, Falher, AB, (780) 837-2900
West-Central Forage Association, Evansburg, AB, (780) 727-4447
North Peace Applied Research Association, Manning AB, (780) 836-5230
Peace Country Beef and Forage Association, Fairview, AB, (780) 835-6799
Mackenzie Applied Research Association, Fort Vermilion, AB, (780) 927-3776

Major Sponsors

Government of Alberta (AAF) – Alex Fedko RVT Coordinator; Doug MacAuley AOF Coordinator
A & L Canada Laboratories Inc.
Association of Alberta Co-op Seed Cleaning Plants
Alberta Seed Growers' Association
CPS Canada
Canterra Seeds
SeCan
Solick Seeds Ltd.

Trial Information

Objective of the trials was to determine yield and nutritional values of the various crops and cereal/pulse combinations. The tables below show a summary of data from 2016 as compared to the control variety (in bold).

Yield of the test varieties are expressed as wet tons/acre (ie. 65% moisture, typical of silage production). Data sets which did not meet minimum quality standards (variance levels) were excluded.

Varieties of barley, oats, triticale and peas commonly used for silage, green feed and swath grazing were included in the trial, as well as new varieties showing good potential for these uses. The cereal trials (barley, oats & triticale) were seeded at recommended seeding density rates and recommended fertility.

The pulse mixture trial looked at increasing the nutritional value of silage, with a potential side benefit of decreasing future nitrogen costs. The pulse mix plots were seeded with 50 pounds of 11-52-0-0 only, while the monoculture cereal comparison plots were fertilized with 50 percent of the recommended cereal rates. Peas were seeded at 75 percent of their recommended seeding rate and cereals at 50 percent when in mixtures.

Test Yield Categories

The defined range for each Test Yield Category is provided in tons per acre. Variety yields are reported as average yields in Low, Medium and High Test Yield Categories for comparison with the check for productivity regimes and environments that may be anticipated. Varieties that are statistically higher (+) or lower (–) yielding than the standard check are indicated. No symbol after the yield figure indicates that there is no statistical difference. Caution is advised when interpreting the data with respect to new varieties that have not been fully tested.

Maturity, plant height and lodging were not measured in the trials as it is extensively reported on in the Cereal RVT program.

To make effective use of the yield comparison tables, producers first need to decide if their target yield for the season fits within the Low, Medium or High Test Yield categories. It should be noted that the indicated yield levels are those from small plot trials, which are often 15 to 20 per cent higher than yields expected under commercial production. Also remember that yield is not the only factor that affects net return. Be sure to consider the other important agronomic and disease resistance characteristics. The genetic yield potential of a variety is often masked by various crop management factors, some of which can be controlled.

Site Information

There were 12 sites across the province, representing various agro-ecological zones. Sites were located near Castor, Stettler, Fort Kent, Lac La Biche, High Prairie, Wildwood, Hanna, Manning, Fairview, St. Paul, Fort Vermilion and Westlock. The pulse mixes were not seeded at all sites.

Nutritional Analysis

Nutrition was assessed using wet chemistry analysis. Full nutritional analysis was done on each sample, however, only six nutritional categories are reported: crude protein (CP), total digestible nutrients (TDN) which is an estimation of energy, calcium (Ca), phosphorus (P), potassium (K) and magnesium (Mg).

OATS

Variety	Overall Yield	Overall Station Years of Testing	Area					Yield Category			Nutritional Data					
			2	3	4	5	6	Low < 7.0 (t/ac)	Medium 7.1 - 10.0 (t/ac)	High > 10.1 (t/ac)	CP (%)	TDN (%)	Ca (%)	P (%)	K (%)	Mg (%)
Varieties tested in the 2016 trials (Yield, significant differences and agronomic data only directly comparable to CDC Baler)																
CDC Baler (t/ac)	10.1		12.4	10.7	8.6	10.8	8	5.8	9.1	12.9	9.3	61.7	0.3	0.2	1.8	0.2
CDC Baler	100	33	100	100	100	100	100	100	100	100	100	100	100	100	100	100
AC Juniper	94-	23	91	98	98	87	103	111	84-	93	101	102	92	112	102	106
AC Morgan	100	32	102	100	92-	96	114	108	96-	101	99	101	100	114	99	97
AC Mustang	98	33	99	97	95	100	97	95	97	100	103	99	99	106	102	99
CDC Haymaker	99	28	105	96	100	97	99	105	94	100	97	100	98	100	104	98
CDC Seabiscuit	94	6	91	XX	108	78	96	78	96	99	96	100	89	94	100	100
CDC SO-I	94-	33	84	102	88	93-	96	92	94	95-	103	102	96	105	97	104
Derby	96	6	100	XX	106	89	94	89	93	101	89	100	98	99	100	110
Murphy	103	27	106	104	102	103	103	104	104	102	91	95	95	96	102	99
Waldern	104	26	100	104	98	101	115	101	112+	99	93	99	105	106	94	99
Previously tested varieties (Yield, significant differences and agronomic data only directly comparable to CDC Baler)																
Everleaf	94	5	XX	113	106	72	XX	108	76	67	96	98	105	97	110	92
Foothills	99	21	103	95	101	99	103	99	96	102	99	98	103	103	102	100
Jordan	100	20	107	92	88	100	121	102	102	96	97	100	96	105	97	112

BARLEY

Variety	Overall Yield	Overall Station Years of Testing	Area					Yield Category			Nutritional Data					
			2	3	4	5	6	Low < 8.0 (t/ac)	Medium 8.1 - 12.0 (t/ac)	High > 12.1 (t/ac)	CP (%)	TDN (%)	Ca (%)	P (%)	K (%)	Mg (%)
Varieties tested in the 2016 trials (Yield and agronomic data only directly comparable to CDC Austenson)																
CDC Austenson (t/ac)	**10.8**		**11.8**	**12.1**	**11**	**11.5**	**8**	**6.7**	**9.3**	**12.8**	**10.1**	**67.9**	**0.3**	**0.2**	**1.3**	**0.2**
CDC Austenson	**100**	**35**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
Amisk	90-	23	102	92-	91	88-	83-	85	93	90-	104	99	132	106	107	109
CDC Coalition	92-	27	92	93	92	86-	102	92	92	92-	102	100	104	107	106	99
CDC Cowboy	102	27	102	103	98	103	100	106	99	100	95	98	117	107	110	115
CDC Maverick	103	29	105	96	96	104	108	111+	102	101	95	98	123	106	96	116
CDC Meredith	102	16	114	106	93	99	103	111	102	100	95	97	97	98	101	91
Canmore	98	16	105	99	93	99	97	101	93	99	100	99	119	103	98	104
Champion	102	16	104	97	100	102	106+	106	101	101	98	99	105	97	104	100
Claymore	100	16	114	102	97	100	94	106	87	103	93	96	122	93	98	100
Conlon	86-	21	82	95	86	79-	92	80-	80-	91-	99	101	128	111	101	104
Gadsby	100	27	103	106	94	100	101	104	101	98	95	99	129	99	100	103
Sundre	92-	27	97	93	87-	88-	96	86-	96	93-	102	99	134	104	114	115
TR13740	100	16	103	92	99	99	107	95	99	101	99	97	105	97	104	92
Previously tested varieties (Yield and agronomic data only directly comparable to CDC Austenson)																
Busby	93-	19	91	98	71	96	88	86-	95	97	105	99	128	100	100	103
Chigwell	90-	19	80	95	87	86-	97	91-	82-	91-	106	99	152	101	105	116
Muskwa	90-	13	101	93	XX	86-	91	86-	91	91-	114	100	167	107	121	127
Ponoka	96	19	90	100	100	96	95	96	94	97	101	99	148	103	104	115
Ranger	95	13	104	99	XX	96	88	85-	97	99	109	98	171	101	128	131
Seebe	96-	19	95	103	92	95-	95	95	96	97	109	96	136	109	113	103
Trochu	88-	18	XX	91	73	91-	85-	82-	89	92-	103	101	139	107	109	119
Vivar	93-	19	95	99	78	92-	93	90-	98	93	108	100	144	99	104	123
Xena	95-	19	87	101	84	92-	101	96	90	95	106	99	111	105	102	106

TRITICALE

Variety	Overall Yield	Overall Station Years of Testing	Area					Yield Category			Nutritional Data					
			2	3	4	5	6	Low < 8.0 (t/ac)	Medium 8.1 - 12.0 (t/ac)	High > 12.1 (t/ac)	CP (%)	TDN (%)	Ca (%)	P (%)	K (%)	Mg (%)
Varieties tested in the 2016 trials (Yield and agronomic data only directly comparable to Taza)																
Taza (t/ac)	**10.7**		**12.3**	**12.3**	**8.8**	**10.4**	**9.5**	**6.3**	**10.7**	**14.5**	**8.8**	**62.8**	**0.2**	**0.2**	**1.3**	**0.1**
Taza	**100**	**37**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
94I043057	100	7	103	XX	110	93	101	89	103	100	106	102	91	102	90	108
Bunker	99	29	99	93	111+	99	100	106	98	98	103	99	111	96	97	115
Sunray	101	30	97	100	105	100	105	99	102	100	104	104	105	103	103	109
Tyndal	99	36	98	105	109	96-	96	100	98	99	103	101	101	102	97	105
Previously tested varieties (Yield and agronomic data only directly comparable to Taza)																
AAC Chiffon	111	8	124	123	118	92	126	105	113	114	97	101	88	97	106	108
AAC Innova	104	8	121	119	123	83	102	95	107	107	108	100	87	106	109	107
AAC Ryley	97	8	108	104	87	87	110	86	100	101	103	100	95	106	89	117
AC Ultima	103	7	104	98	120	100	XX	109	100	104	110	100	101	93	97	122
Pasteur	94	8	110	96	97	84	103	91	99	91	107	103	96	99	107	117
Pronghorn	102	21	107	103	114	99	101	108+	99	103	103	100	102	99	109	106
Sadash	102	8	111	102	109	91	121	101	108	97	99	99	88	91	110	105

PULSE MIXTURES

Variety	Overall Yield	Overall Station Years of Testing	Area 2	3	4	5	6		Yield Category Low < 8.0 (t/ac)	Medium 8.1 - 10.0 (t/ac)	High > 10.1 (t/ac)		Nutritional Data CP (%)	TDN (%)	Ca (%)	P (%)	K (%)	Mg (%)
Varieties tested in the 2016 trials (Yield and agronomic data only directly comparable to CDC Austenson)																		
CDC Austenson (t/ac)	**7.4**		**5.3**	**XX**	**XX**	**7.2**	**8.7**	**5**	**5.2**	**8.9**	**XX**		**10**	**65.9**	**0.3**	**0.2**	**1.4**	**0.2**
CDC Austenson	**100**	**5**	**100**	**100**	**100**	**100**	**100**		**100**	**100**	**100**		**100**	**100**	**100**	**100**	**100**	**100**
CDC Baler	116	5	111	XX	XX	108+	126		111+	119	XX		95	96	113	110	106	124
Taza	109	5	110	XX	XX	104	114		109	110	XX		86	96	77	104	103	89
CDC Austenson/CDC Horizon	105	5	109	XX	XX	100	107		108	102	XX		101	97	156	102	111	133
CDC Austenson/CDC Meadow	101	5	105	XX	XX	96	104		104	99	XX		113	77	165	106	106	164
CDC Baler/CDC Horizon	101	5	111	XX	XX	102	96		113	94	XX		109	94	173	101	123	145
CDC Baler/CDC Meadow	103	5	105	XX	XX	102	103		108	100	XX		107	96	164	105	120	144
Taza/CDC Horizon	108	5	96	XX	XX	105	119		104	111	XX		116	96	179	106	106	137
Taza/CDC Meadow	100	5	99	XX	XX	97	104		104	98	XX		101	95	194	98	103	145
Varieties tested in the 2012 - 2014 trials (Yield and agronomic data only directly comparable to Vivar)																		
Vivar (t/ac)	**8.6**		**7.9**	**11.2**	**4.4**	**9**	**8**		**5.8**	**9.7**	**10.3**		**9.4**	**64**	**0.5**	**0.2**	**1.2**	**0.2**
Vivar	**100**	**19**	**100**	**100**	**100**	**100**	**100**		**100**	**100**	**100**		**100**	**100**	**100**	**100**	**100**	**100**
Murphy	119+	18	102	106	158	123+	100		129	108	125+		88	94	77	99	129	88
Pronghorn	111	19	98	96	109	116	114		106	105	122		96	101	63	105	103	75
Murphy/40-10	105	12	XX	90	132	102	92		122	86	113		142	98	161	129	117	141
Pronghorn/40-10	104	12	XX	97	112	105	93		110	88	122		125	98	150	115	103	134
Vivar/40-10	97	12	XX	68	108	92	121		114	84	97		140	98	170	107	108	141
Murphy/CDC Horizon	112	19	82	106	144	113	102		121	97	120+		114	94	130	100	124	114
Pronghorn/CDC Horizon	111	19	85	98	133+	111	117		120	101	112		125	98	143	105	105	106
Vivar/CDC Horizon	98	19	94	99	112	96	94		103	87-	105		128	97	162	101	107	116
Murphy/CDC Meadow	105	7	74	105	XX	117+	103		96	94	119+		104	95	116	101	123	95
Pronghorn/CDC Mead-ow	101	7	81	91	XX	109	118		107	95	101		122	99	124	113	105	95
Vivar/CDC Meadow	99	7	92	94	XX	104	98		101	98	98		115	100	187	89	98	119

Forage DM Yield and Nutritional Value of Oat Varieties Harvested at 3 Stages of Maturity

By Akim Omokanye, PCBFA

Producers in Alberta harvest significant acreage of annual crops for greenfeed and silage every year. There are specific requirements for hay for the export market that are different from usual on-farm requirements. These include earlier cutting times, green hay colour, low moisture content, freedom from weeds and thin-strawed varieties. Studies elsewhere have shown that some oat varieties do not meet the exporters' standard. Export markets demand bright green, dry hay. Selecting appropriate oat cutting time is critical in achieving this standard whilst maintaining oat hay yield and quality. For us in Alberta, the recommended harvest stage for oat is early to late milk stage. Some export processors however may prefer oat hay cut at a different development stage. In 2016, three forage type oat varieties were selected and compared at the various growth stages by PCBFA.

Methods

The study site was at the Fairview Research Farm (NW5-82-3W6) on RR #35, MD of Fairview. The site had soybeans in 2015. Soil test at 0-6" soil depth done at Exova laboratory (Edmonton) prior to seeding showed an organic matter content of 7.3%, a pH of 5.4 (acidic) and an electrical conductivity of 0.58 dS/m. The field was cultivated before seeding.

We used randomized complete block design in 4 replications in small plots.

Treatments: 3 forage type oat varieties (CDC Baler, CDC Haymaker, AC Mustang) were seeded and harvested at 3 stages of maturity (boot, heading, milk). AC Mustang is a feed oat but commonly used for silage or greenfeed.

We seeded 300 plants/m^2 (27.8 plants/ft^2). A 6-row Fabro plot drill at 9" row spacing was used to seed. Seeding was done on May 16.

Fertility according to soil tests (actual lbs/acre): 0 N + 33 P + 47 K + 0 S (broadcast). Soil test showed adequate amounts of N & S for the crop, so N & S were not applied.

Spraying: Roundup WeatherMAX® was used as pre-emergent 7 days after seeding. In-crop spraying was done with 2, 4 - D 700 at 0.35 L/acre. Rouging was done a few times.

Measurements taken:

- Prior to harvest at the boot stage, stand assessment was done for stand uniformity.
- Field notes were taken on lodging.
- Forage yield was determined at boot, heading and milk stages.
- Forage samples were measured for nutritional value.

Results & Interpretation

Forage Moisture Content

The forage moisture content at harvest was significantly affected by oat variety x stage of maturity interaction effects. As expected the forage moisture content at harvest dropped as each oat variety grew older (boot to milk stage, Table 1). For the varieties tested, moisture content was generally below 70% at the milk stage.

Forage Dry Matter (DM) Yield

For oats tested, forage DM yield was similar with delayed harvest stage. This means that forage DM yield was statistically influenced by oats x stages of maturity interactions (Figure 1). The milk stage only produced more DM yield by about 1000 lbs DM/acre over the earliest harvest stage (boot stage), but not over heading stage.

Pooled across stages of maturity at harvest, oat varieties had similar mean forage DM yields, varying from only 3.32 to 3.87 tons DM/acre.

However, stages of maturity did show significant differences on forage DM yield (Figure 2B). Forage DM yield increased from 2.98 tons/acre for boot stage through 3.54 tons/acre for heading stage to 4.13 tons/acre for milk stage. Delaying harvesting till the milk stage had 1.2 tons DM/acre advantage over boot stage.

Figure 1. Variety x stage interaction effects on forage dry matter yield for greenfed.

(Variety x Stage (Not significant- P=0.342, Mean=3.59 tons/acre, CV = 16.9%)

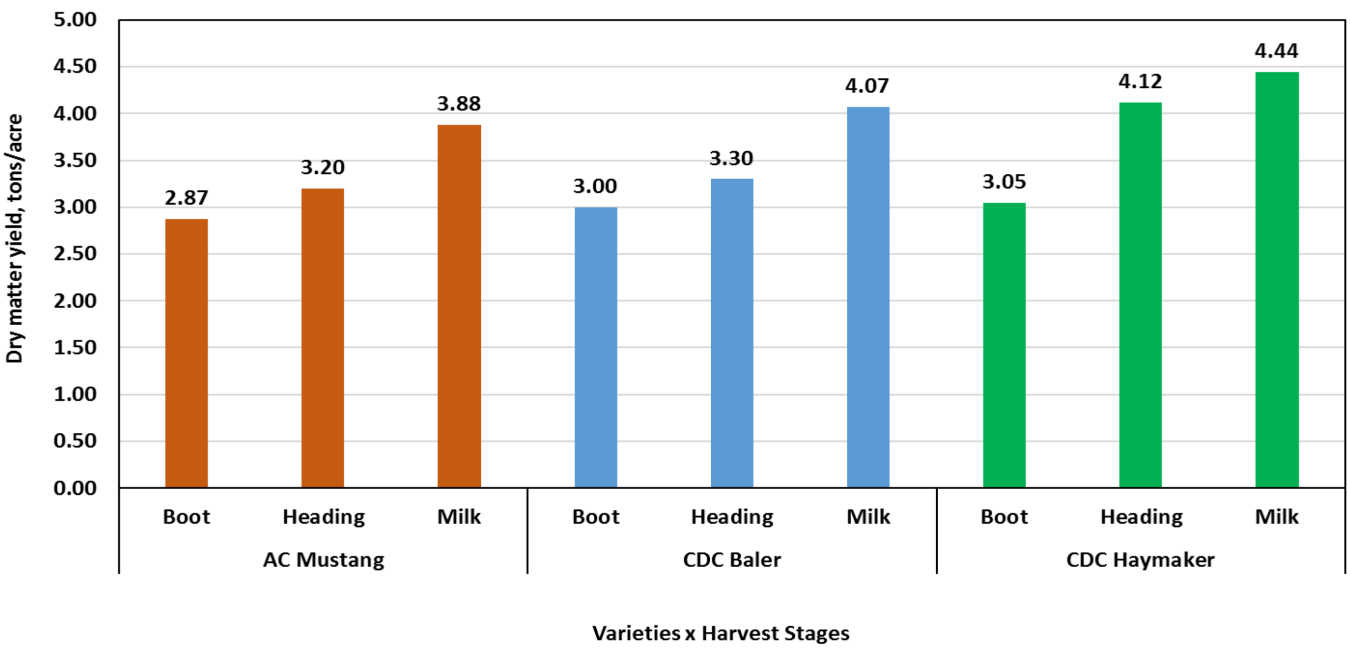
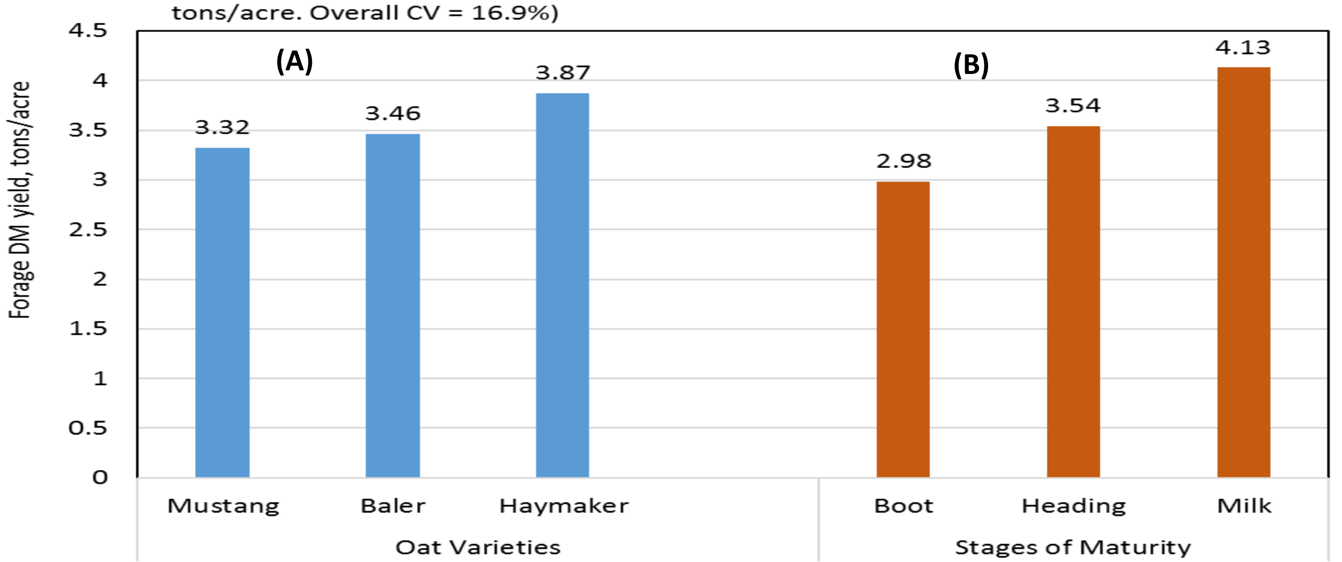


Figure 2. Forage DM yields of oat varieties (A) and stages of maturity at harvest (B). (Variety: not significant- P=0.135. Stage: significant- P=0.001. Overall mean = 3.55 tons/acre. Overall CV = 16.9%)



Protein

The forage crude protein content (CP, % DM basis) was similar for the oat variety x stage interactions. The CP was also similar for oat varieties (over stages of maturity) as well as stages of maturity (over oat varieties). But generally, for each oat variety, earliest harvest (boot stage) appeared to have the potential to give higher CP content (Table 1). For each variety, CP seemed to decrease slightly with advanced stage of maturity.

The Beef Cow Rule of Thumb with protein is 7-9-11%, which means an average mature beef cow requires a ration with CP of 7% in mid-pregnancy, 9% in late pregnancy and 11% after calving. Looking at Table 1, with a range of 13-18% CP, regardless of when any of the oat varieties were harvested for greenfeed, the CP requirements by mature beef cattle have generally been met. Similarly, the CP values of all oat varieties at any particular stage of maturity were well within the 12-14% CP needed by growing and finishing calves, and in a few cases the requirements have been exceeded.

Table 1. Forage moisture, CP and CP fractions of oat varieties at 3 harvest stages for greenfeed.
NS, indicates not significant (P>0.05)

			Crude protein (CP) & CP fractions				
	Harvest	**Moisture**	**CP**	**Sol Protein**	**ADF-CP**	**NDF-CP**	**UIP (Bypass)**
Variety	**Stage**	**%**	**%**	**%**	**%**	**%**	**%**
CDC Baler	Boot	72.7	17.5	52.3	1.29	3.99	23.9
	Head	72.2	13.6	56.9	0.82	2.73	21.6
	Milk	68.9	13.5	48.1	1.00	3.50	26.0
CDC Haymaker	Boot	75.8	16.8	45.1	1.46	3.51	27.5
	Head	77.6	14.8	54.1	0.86	2.65	23.0
	Milk	65.8	14.0	49.0	1.08	3.52	25.5
AC Mustang	Boot	73.1	16.1	45.0	1.37	3.32	27.5
	Head	72.0	14.3	55.1	0.81	2.57	22.4
	Milk	69.0	13.4	46.2	1.06	3.60	25.9
$LSD_{0.05}$		2.25	3.55	7.00	0.64	1.39	2.38
Significance (P<0.05)		*	NS	NS	NS	NS	NS
Mean		71.9	14.8	50.2	1.08	3.26	24.8
CV,%		3.63	7.51	6.51	6.24	10.2	6.87

Minerals

The forage minerals (macro and trace) are shown in Table 2. Only forage K content showed a consistent decrease from boot to milk stage. Other minerals did not show any consistencies. Generally, when harvesting at the boot stage, the oats had more minerals than later stages of maturity. For a dry gestating cow, the mineral requirements (except for Cu) have all been met by all oats at any particular harvest stage.

Energy

The forage TDN was not significantly affected by oat varieties x stages of maturity interactions. The mean TDN across oat varieties or stages of maturity was also not significantly affected. The forage TDN varied from 61 to 64% TDN (Table 3). As expected, the TDN values show a tendency for oats harvested at milk stage to have higher TDN than those harvested earlier.

Using TDN%, the Rule of Thumb is 55-60-65. This rule says that for a mature beef cow to maintain her body condition score through the winter, the ration must have a TDN reading of 55% in mid pregnancy, 60% in late pregnancy and 65% after calving. Looking at the TDN values in Table 3, only the TDN requirements of a gestating beef cow have been met by all oat varieties at any particular stage of maturity.

Table 2. Forage minerals of 3 forage type oat varieties at 3 harvest stages for greenfeed in 2016											
		Macro minerals						Trace minerals			
	Harvest	Ca	P	K	Mg	Na	S	Cu	Fe	Zn	Mn
Variety	Stage	%	%	%	%	%	%	Ug/g	Ug/g	Ug/g	Ug/g
CDC Baler	Boot	0.44	0.26	2.72	0.36	1.4	0.33	5.76	815	61	164
	Head	0.4	0.21	2.35	0.27	1.05	0.26	3.44	121	45	125
	Milk	0.34	0.24	1.73	0.27	0.88	0.27	3.1	103	48	150
CDC Haymaker	Boot	0.41	0.24	2.57	0.29	1.43	0.31	3.42	119	48	112
	Head	0.35	0.19	1.97	0.26	1	0.25	2.54	110	44	116
	Milk	0.39	0.22	1.81	0.32	1.17	0.29	2.85	112	48	146
AC Mustang	Boot	0.41	0.26	2.37	0.28	1.21	0.31	2.74	108	41	133
	Head	0.36	0.22	2.09	0.26	0.83	0.28	2.73	88	40	125
	Milk	0.31	0.22	1.79	0.25	0.93	0.29	2.57	85	40	119

Table 3. Forage detergent fibers (ADF & NDF), non-fiber carbohydrate (NFC), energy and relative feed value (RFV) of 3 forage type oats at 3 harvest stages for greenfeed in 2016									
		Detergent fibers			Energy				
	Harvest	ADF	NDF	NFC	TDN	NEL	NEG	NEM	
Variety	Stage	%	%	%	%	Mcal/kg	Mcal/kg	Mcal/kg	RFV
CDC Baler	Boot	34.2	56.6	14.4	62.2	1.41	0.8	1.52	102
	Head	33.6	56.1	18.8	62.8	1.43	0.81	1.54	104
	Milk	33.1	57.6	17.3	63.1	1.43	0.82	1.54	104
CDC Haymaker	Boot	34.2	59.4	12.3	62.2	1.41	0.8	1.52	97
	Head	33.1	55.9	17.8	63.1	1.44	0.82	1.54	105
	Milk	32.6	55.3	19.1	63.5	1.44	0.84	1.56	105
AC Mustang	Boot	35.8	60.2	12.2	61	1.38	0.76	1.49	94
	Head	35.1	58.4	15.9	61.6	1.4	0.78	1.5	98
	Milk	33.9	55.7	19.4	62.5	1.42	0.8	1.52	104

Conclusion

When planning for hay cutting it is important to consider rain events. Rain on cut hay may drastically downgrade it compared to hay left standing for an extra week. One of the major factors that affects the nutritional value of a plant to be used as a forage is the stage of maturity at which it is harvested. The forage protein and K decreased slightly with advancing maturity. The RFV appeared to be better at milk stage than other stages.

Demonstration of Cover Crop Types as Mono-crops for Forage Yield and Nutritional Value

By Akim Omokanye, PCBFA

Annual crops for forages can be used to provide an additional source of hay, silage or pasture when perennial forage crops are in short supply. Many annual crops are suitable for inclusion in cocktail mixtures for forage production (for grazing, silage or greenfeed) and to improve soil health. Also, grain crops affected by extreme environmental conditions can be salvaged for livestock use. In the peace, barley and oat are the most common annual cereal forage; there are also acreages of millet, annual ryegrass and annual pulses used for forage. Because of the increasing number of acreages of cocktail mixtures in parts of the Peace, there is a need to regularly test new annual crops as they are introduced to the Peace for their adaptation, potential for forage yield, and suitability for soil health improvement and livestock production. Most of the annual crop types tested in 2016 were those that PCBFA did not have much experience with in this region.

Methods

The study site was at the Fairview Research Farm (NW5-82-3W6) on RR #35, MD of Fairview. Soil test at 0-6" soil depth done at Exova laboratory (Edmonton) prior to seeding showed an organic matter content of 7.1%, a pH of 5.5 (acidic), an electrical conductivity of 0.35 dS/m and a base saturation of 55.2%.

A demonstration strip design was used in small plots. We seeded a total of 40 annual crops, which consisted of 9 grasses, 23 legumes, 3 brassicas and 5 other types of crops (Table 1). More legumes were seeded to mark the 2016 International of Pulses, in order to create awareness of the various available legume types.

Legumes were inoculated at seeding.

Table 1. Annual crops tested in 2016 and their respective seeding rates

Grass	Legumes		Brassicas	Others	Poor Performers
Festulolium 20 lbs	Fenugreek 27 lbs	Dry bean (Red kidney bean) 5.2 seeds/ft^2	Goliath forage brassica 4.5 lbs	Flax 35 lbs	Balansa clover (L) 7 lbs
Annual ryegrass 12 lbs	Hairyvetch 17.5 lbs	Faba beans (Broad windsor) 5.2 seeds/ft^2	T-Raptor forage Rape x kale 3 lbs	Buckwheat 25 lbs	Subterranean clover (L) 10 lbs
Sorghum grazex III 22 lbs	Lentils 12.1 seeds/ft^2	Faba beans (Snowdrop) 5.2 seeds/ft^2	Winfred forage brassica 3 lbs	Phacelia 3 lbs	Persian clover (L) 5 lbs
Proso millet 22 lbs	Field pea (CDC Meadow) 8.1 seeds/ft^2	Faba beans (Snowbird) 5.2 seeds/ft^2			Iron & Clay cowpea (L) 30 lbs
German millet 22 lbs	CDC Horizon peas 8.1 seeds/ft^2	CDC Orion Chick pea 5.1 seeds/ft^2			Black-eyed peas (L) 30 lbs
Siberian millet 22 lbs	40-10 peas 8.1 seeds/ft^2	CDC Frontier Chick pea 5.1 seeds/ft^2			Ife brown cowpea (L) 30 lbs
Sorgum Sudangrass 22 lbs	Faba beans (Vroma) 4.2 seeds/ft^2	CDC Cory Chick pea 5.1 seeds/ft^2			Sugar beet 4.5 lbs
Forage sorghum 22 lbs	Dry bean (Black bean) seeds/ft^2	CDC Corrine Chick pea 5.1 seeds/ft^2			Ethiopian cabbage 6 lbs
	Crimson clover 15 lbs				Teff (G) 11 lbs

We seeded on May 18 with a 6-row Fabro plot drill at 9" row spacing. Seeding rates are shown in Table 1.

Fertility according to soil tests (actual lbs/acre):
Grasses - 56 N + 19 P + 46 K + 0 S
Legumes - 0 N + 33 P + 47 K + 0 S
Brassicas & others– 0N (adequate soil N) + 21 P + 31 K + 0 S.
- Soil test showed adequate amounts of S for the crops, so S was not applied.

Festulolium was cut twice. Other crops were only cut once.

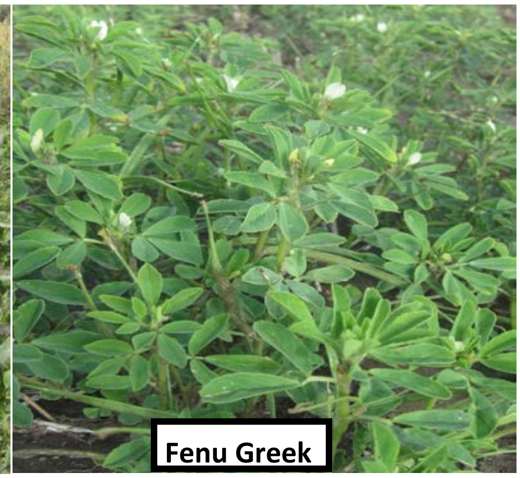
Results & Interpretation

Forage DM yield


German Millet


Festulolium


Proso millet


Fenu Greek


Hairy vetch


Chickpea

<u>Cereals/Grasses</u> - Among the group of grasses tested, Festulolium had the highest forage DM yield (5248 lbs DM @ 1st cut & 3272 lbs @2nd cut), followed by Sorghum Sudangrass (5160 lbs DM/acre). The other types of grasses had 3498 to 4671 lbs DM/acre *(Table 2)*. A total of 8520 lbs DM/acre was obtained from festulolium in the year.

Festulolium is a high (sugar) energy grass that is obtained by crossing a ryegrass (perennial or an Italian) with a meadow fescue or tall fescue variety. Festuloliums like fertile soils and respond well to nitrogen. They are better than ryegrass in drought tolerance but not as good as fescues. They are excellent for silage or balage and also very good for grazing. Can successfully be used to extend the growing season of hay fields and pastures.

<u>Legumes</u> - The forage DM yield of legume crops tested generally varied from 1318 lbs DM/acre for crimson clover to 4777 lbs DM/acre for CDC meadow pea (Table 2). Only 4 legumes (hairyvetch, red kidney dry bean, CDC Meadow pea, CDC Horizon pea) had 2.0 tons DM/acre or more. Other legumes had <2.0 tons DM/acre.

Faba beans can be used as either forage or silage for animals. Faba beans are the highest nitrogen fixing annual grain legume. Though broad Windsor faba beans and Vroma faba beans yielded more DM than the 2 other faba bean varieties tested (snowbird and snowdrop), they may not fit well into our field scale cropping systems because of their large seed size, which will pose a great issue going through seed drills. They are therefore only better seeded on a small scale in gardens. For field scale and for inclusion in cocktails, snowbird and snowdrop faba beans are suggested. Faba beans' taproots also have the added benefit of being able to break-up hard compacted soil. Faba beans, like all legume plants have nitrogen-rich nodules on their roots and contribute to replenishing nitrogen in the soil.

Studies elsewhere have shown that hairy vetch can contribute 70 - 150 lbs N/acre. Hairy vetch can add enough nitrogen to provide almost all of the needs of the subsequent crop and can make K more accessible to subsequent crops. Hairy vetch adds to soil biological diversity and supports several beneficial insects.

<u>Others (broadleaf)</u> - Buckwheat had the highest DM yield (3957 lbs DM/acre), followed by flax (2331 lbs DM/acre) and then phacelia (1889 lbs DM/acre) (Table 2).

Buckwheat solubilizes and takes up phosphorus that is otherwise unavailable to crops, then releases these nutrients to later crops as the residue breaks down. The roots of the plants produce mild acids that release nutrients from the soil. These acids also activate slow-releasing, organic fertilizers, such as rock phosphate. Buckwheat's dense, fibrous roots cluster in the top 10 inches of soil, providing a large root surface area for nutrient uptake. Buckwheat's abundant, fine roots leave topsoil loose and friable after only minimal tillage, making it a great mid-summer soil conditioner preceding fall crops in temperate areas.

Phacelia has beautiful scented purple/blue flowers with dense fern-like foliage. It smothers weeds and has an extensive root system that improves the soil structure. However it does self-seed very easily so if it is used as a green manure dig in before flowering or cut down and compost the foliage. Phacelia is listed as one of the top 20 honey-producing flowers for honeybees and is very attractive to bumblebees.

Forage Quality (Table 2)
Forage Crude Protein (CP) - All grasses had high forage CP, which varied from 16% for Siberian millet to about 24% for Sorghum grazex III.

The legumes' forage CP values were mostly >20% CP, reaching up to 29% CP for CDC Orion chickpea forage. Both hairy vetch and CDC Corrine chickpea forage also had impressive forage CP. The 3 peas tested (CDC Meadow, CDC Horizon & 40-10) had lower CP than other legumes.

The brassicas had between 19-26% CP.

For other crop group types, forage CP was similar for flax, buckwheat and phacelia.

Overall, the mean CP for each crop type showed the following order:
Brassicas (24% CP) > legumes (22% CP) > grasses (20% CP) > others (14% CP).

Comparing the CP requirements of beef cattle (young & mature), the CP values obtained for all 40 crops tested here generally exceeded the CP requirements of young and finishing calves as well as mature beef cattle.

Detergent fibers (ADF & NDF) and non-fiber carbohydrates
The ADF values relate to the ability of an animal to digest the forage, while NDF values reflect the amount of forage the animal can consume. Lower values are preferred for both ADF & NDF.

Generally, NFC is more rapidly digested than fiber. NFC is a significant source of energy for the rumen microbes. The microbes also use NFC to make microbial protein.

Looking at the detergent fibers (ADF & NDF) and NFC values in Table 2, Festulolium seemed to fare better than other cereals/grasses in the cereal/grass group. The 3 forage type peas appeared to do better than other legumes in the legume group.

Table 2. Forage DM yield, protein, energy and minerals of 40 cover crop types tested in Fairview in 2016

			Fibers			Energy				Macro minerals						Trace minerals (ppm)				
	DM Lb/ac	CP %	ADF %	NDF %	NFC %	TDN %	NE_L	NE_G	NE_M	Ca %	P %	K %	Mg %	Na %	S %	Cu	Fe	Zn	Mn	RFV
Cereal/Grass																				
Festulolium- 1st cut)	5248	17.5	31.6	53.6	17.5	64.3	1.46	0.86	1.58	0.60	0.26	1.59	0.32	0.62	0.29	2.60	130	44	85	112
2nd cut)	3272	22.1	25.9	41.5	24.9	68.7	1.57	0.99	1.71	0.51	0.39	1.62	0.33	0.88	0.34	2.04	209	39	103	154
Annual ryegrass	3800	18.8	30.2	54.2	15.5	65.4	1.49	0.89	1.61	0.68	0.27	1.39	0.37	0.92	0.28	2.85	166	52	110	112
Sorghum grazex III	4660	23.6	32.9	56.6	8.30	63.3	1.44	0.83	1.55	0.82	0.31	3.27	0.55	0.02	0.26	7.43	320	185	102	104
Proso millet	4117	17.1	32.0	60.2	11.1	64.0	1.45	0.85	1.57	0.38	0.37	2.37	0.62	0.01	0.26	4.44	145	53	112	99
German millet	4222	21.7	33.6	59.1	7.70	62.8	1.42	0.81	1.53	0.69	0.31	3.48	0.70	0.02	0.25	5.87	263	147	106	99
Siberian millet	3498	16.0	33.7	59.9	12.6	62.7	1.42	0.81	1.53	0.65	0.34	2.62	0.53	0.08	0.47	5.82	175	70	169	97
Sorghum Sudangrass	5160	21.9	28.6	53.8	12.8	66.6	1.52	0.92	1.65	0.46	0.52	4.16	0.62	0.02	0.31	4.38	326	73	91	115
Forage sorghum	4671	22.7	33.2	57.8	8.01	63.0	1.43	0.82	1.54	0.76	0.31	3.38	0.63	0.02	0.26	6.65	291	166	104	101
Mean	4320	20.1	31.3	55.2	13.2	64.5	1.47	0.86	1.59	0.62	0.34	2.65	0.52	0.29	0.30	4.68	225	92	109	110
Legumes/Pulses																				
Fenugreek	1603	18.9	34.9	47.4	22.2	61.7	1.40	0.78	1.50	2.37	0.26	0.95	0.52	0.90	0.46	6.07	268	79	82	121
Crimson clover	1318	23.8	33.8	41.9	23.1	62.8	1.43	0.81	1.53	1.83	0.3	2.92	0.82	0.56	0.41	6.39	227	106		
Hairyvetch	4039	27.7	31.6	37.0	23.8	64.3	1.46	0.86	1.58	1.26	0.36	4.88	0.51	0.24	0.36	6.78	190	130	74	162
Lentils	1420	20.8	34.3	42.1	25.6	62.2	1.41	0.80	1.52	1.82	0.21	1.13	0.46	0.02	0.20	3.61	351	44	78	137
CDC Meadow pea	4777	13.9	27.1	32.5	42.2	67.8	1.55	0.96	1.68	2.02	0.21	0.82	0.48	0.06	0.15	3.31	82	72	62	194
CDC Horizon pea	4301	12.6	29.1	34.8	41.1	66.3	1.51	0.91	1.63	2.49	0.16	1.00	0.62	0.09	0.17	2.42	108	105	116	177
40-10 pea	3534	16.7	26.1	31.3	40.6	68.6	1.57	0.98	1.70	2.43	0.17	0.82	0.86	0.12	0.16	3.77	143	74	84	204
Vroma faba beans	2797	24.1	31.6	35.4	29.0	64.3	1.46	0.86	1.58	1.47	0.22	1.23	0.69	0.79	0.23	3.25	247	107	123	169
Black dry bean	2040	24.4	26.7	33.4	30.8	68.1	1.55	0.97	1.69	2.82	0.26	1.45	1.15	0.01	0.22	6.12	366	58	124	190
Red kidney dry bean	4605	23.5	31.6	35.2	29.8	64.3	1.46	0.86	1.58	2.02	0.37	1.98	0.84	0.01	0.19	5.49	420	56	117	170
Windsor faba beans	3804	22.7	51.6	54.0	11.8	48.7	1.08	0.40	1.12	1.61	0.29	1.03	0.54	0.73	0.27	5.29	367	97	128	84
Snowdrop faba beans	2208	25.8	30.9	40.4	22.4	64.9	1.47	0.87	1.59	1.28	0.35	0.83	0.69	1.47	0.26	7.45	393	115	138	149
Snowbird faba beans	1802	25.5	30.2	37.2	25.8	65.4	1.49	0.89	1.61	1.29	0.2	1.24	0.44	0.38	0.19	2.34	189	97	173	163
CDC Orion Chick pea	1516	29.0	26.4	32.4	27.1	68.4	1.56	0.97	1.70	2.10	0.24	0.86	0.63	0.03	0.22	5.30	329	46	97	196
CDC Frontier Chick pea	1483	23.5	32.2	35.8	29.2	63.9	1.45	0.84	1.56	1.76	0.28	1.07	0.69	0.04	0.24	4.96	326	57	88	166
CDC Cory Chick pea	2842	20.8	34.3	42.1	25.6	62.2	1.41	0.80	1.52	1.82	0.21	1.13	0.46	0.02	0.20	3.61	351	44	78	137
CDC Corrine Chick pea	2973	27.4	23.6	29.9	31.2	70.5	1.61	1.04	1.76	2.44	0.3	1.01	0.55	0.02	0.24	3.98	291	50	99	219
Mean	2768	22.4	31.5	37.8	28.3	64.5	1.46	0.86	1.58	1.93	0.26	1.43	0.64	0.32	0.25	4.71	273	78	104	165
Brassica																				
Goliath for. rape	NA	25.6	28.6	34.8	28.0	66.6	1.52	0.92	1.65	1.97	0.54	2.56	0.92	1.61	1.31	3.92	226	39	70	178
T-Raptor F. Rape x kale	NA	19.4	27.9	31.2	40.9	67.1	1.53	0.94	1.66	3.27	0.42	3.68	0.42	0.43	1.32	6.48	177	155	86	200
Winfred forage brassica	NA	26.6	28.9	27.3	40.1	67.8	1.56	0.97	1.69	2.14	0.42	2.68	0.49	0.49	1.32	6.50	171	115	86	201
Mean		23.9	28.5	31.1	36.3	67.2	1.54	0.94	1.67	2.46	0.46	2.97	0.61	0.84	1.32	5.63	191	103	81	193
Others (broadleaf)																				
Flax	2331	15	40.8	53.8	19.7	57.1	1.28	0.65	1.37	1.05	0.31	1.48	0.46	0.32	0.31	4.31	153	83	106	99
Buckwheat	3357	14	30.2	39.1	35.3	65.4	1.49	0.89	1.61	0.18	0.16	1.54	1.32	0.01	0.33	3.77	116	59	64	155
Phacelia	1989	13.7	31.2	41.8	32.9	64.6	1.47	0.87	1.59	4.11	0.14	1.54	0.81	0.02	0.26	4.32	142	42	73	144
Mean	2559	14.2	34.0	44.9	29.3	62.4	1.41	0.80	1.52	1.78	0.20	1.52	0.86	0.12	0.30	4.13	137	61.3	81.0	133

Energy
Except for flax (57% TDN) and broad Windsor faba beans (49% TDN), all crops tested here had 62% TDN or more (Table 2). CDC Corrine chickpea had the highest TDN (71%). Only broad Windsor faba beans fell short of the minimum TDN required by a mature beef cow (55% TDN). For a gestating cow in the late-pregnancy stage, which requires 60% TDN, only 2 (broad Windsor faba beans and flax) out of the 40 crops tested fell short of meeting the TDN requirements of this category of beef cow.

The mean TDN for each crop type showed that brassicas had 67% TDN, grasses - 65% TDN, legumes - 64% TDN and other crop types - 62% TDN (Table 2).

Minerals
The mean forage Ca, P, K, Mg and Na (macro minerals) values showed the following orders:
Ca - brassicas (2.46% Ca) > legumes (1.93% Ca) > others (1.78% Ca) > grasses (0.62% Ca)
P - brassicas (0.46% P) > grasses (0.34% P) > legumes (0.26% P) > others (0.20% P)
K - brassicas (2.97% K) > grasses (2.65% K) > others (1.52% K) > legumes (1.43% K)
Mg - others (0.86% Mg) > legumes (0.64% Mg) > brassicas (0.61% Mg) > grasses (0.52% Mg)
Na - brassicas (0.84%) > legumes (0.32% Na) > grasses (0.29% Na) > others (0.12% Na)

Except for both proso millet and buckwheat, all crops tested here had sufficient amounts of Ca needed by mature beef cattle.

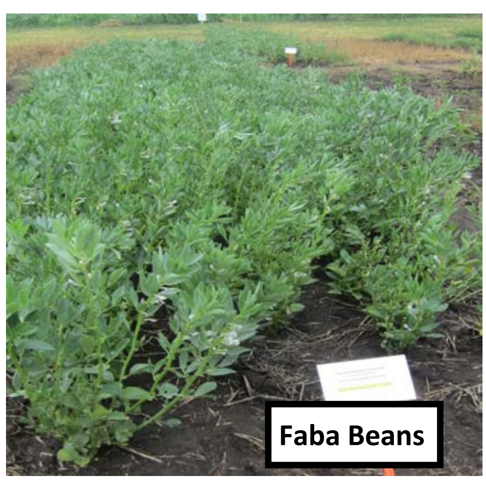
All crops had adequate P contents for a gestating beef cow, which requires 0.16% P, but some crops were short of meeting the 0.26% P recommended for a lactating beef cow.

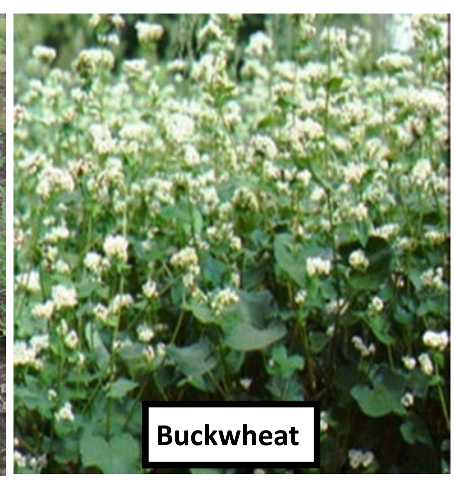
All crops had adequate K, Mg, S, Fe, Zn and Mn values for mature beef cattle.

The requirement for Na was not generally met by all crop types.

All crops fell short of 10 ppm copper (Cu) needed by mature beef cattle.

Poor Performers
The following crops did not do well in our tests (see Table 1): Balansa clover, Subterranean clover, Persian clover, Iron & Clay cowpea, Black-eyed peas, Ife brown cowpea, Sugar beet, Ethiopian cabbage and Teff. Some of them did not emerge, and for those that emerged, the seedling counts were very low relative to the seeding rates. These crops would not be recommended for inclusion in cocktails for now. Trials will continue on other or newer varieties for their suitability for the Peace.





Caution on the use of cover crop species

The fact that most of the cover crops that we use for cocktail mixtures are being introduced to us in the Peace region, the use of these cover crops therefore requires *very good understanding of plant growth habits and management*, particularly when seeded as monocrops.

Cover crops can cause serious problems if not managed carefully. They can deplete soil moisture; *they can become weeds*; and—when used as an intercrop—they can compete with the cash crop for water, light, and nutrients.

Some cover crops can become unwanted weeds in succeeding crops. Cover crops are sometimes allowed to flower to provide pollen to bees or other beneficial insects. Some cover crops or their mixtures if not harvested at the right time for silage or greenfeed, the plant can actually set seed, the cover crop may reseed unintentionally the following year in crop rotation systems. Cover crops that may become a weed problem include buckwheat and ryegrass. On the other hand, natural reseeding of crimson clover or hairy vetch might be beneficial in some situations.

Annual & Italian Ryegrass Variety Trial For Forage and Re-Growth Potential

By Akim Omokanye, PCBFA

Annual and Italian ryegrasses are easier to establish. Producers ask many questions about annual and Italian ryegrass varieties. Producers want to know what annual ryegrass varieties to seed as monocrop or in cocktail mixtures for greenfeed or silage and which varieties have better re-growth potential after cutting for the purpose of extending fall grazing. It's important to choose a variety that establishes quickly, a variety that is well-adapted to the area, yields plenty, very palatable and yields consistently throughout the season after harvesting. Annual ryegrass varieties fall into two types, which are called tetraploid or diploid. Tetraploid varieties are usually marketed as producing more forage biomass than diploids, but this could depend on location, management, fertility, and environmental conditions. Diploids have the advantage of a greater cold tolerance and quicker recovery. Annual ryegrass as a cover crop has the following benefits: tolerance to a wide range of soils, can tolerate compacted soils, minimizes soil compaction, N scavenger, suppresses weeds in 4-6 weeks, good erosion control and improves soil aggregate.

Methods

The study site was at the Fairview Research Farm (NW5-82-3W6) on RR #35, MD of Fairview. Soil test at 0-6" soil depth done at Exova laboratory (Edmonton) prior to seeding showed an organic matter content of 7.1%, a pH of 5.5 (acidic) and an electrical conductivity of 0.35 dS/m. The field was cultivated before seeding.

The varieties were arranged in a randomized complete block design in 3 replications. Small plots measuring 11.04 m^2 (118.8 ft^2) were used.

Treatments (Varieties): The following 7 annual and Italian ryegrasses were tested in 2016 (see Table 1).

Table 1. Varieties of annual and Italian ryegrasses

Variety	Plant Type[1]
Common (check)	
Danegro	4n
GreenSI	2n & 4n
Gulf	2n
Italian	4n
Sabroso	4n
Tetilla	4n

[1]Type: 2n = diploid.
4n = tetraploid.

We seeded on May 18 at 12 lbs/acre with a 6-row Fabro plot drill at 9" row spacing.

Following initial soil tests, we applied (actual lbs/acre): 82 N + 24 P + 54 K + 0 S (broadcast). Soil test showed adequate amounts of S for the crop, so S was not applied.

Spraying: Roundup WeatherMAX® was used as pre-emergent 7 days after seeding. In-crop spraying was done with 2, 4 - D 700 at 0.35 L/acre. Rouging was done a few times.

Harvesting for forage yield and quality determination was done twice, first on July 25th and then the re-growth was harvested on August 30th

Results & Discussion

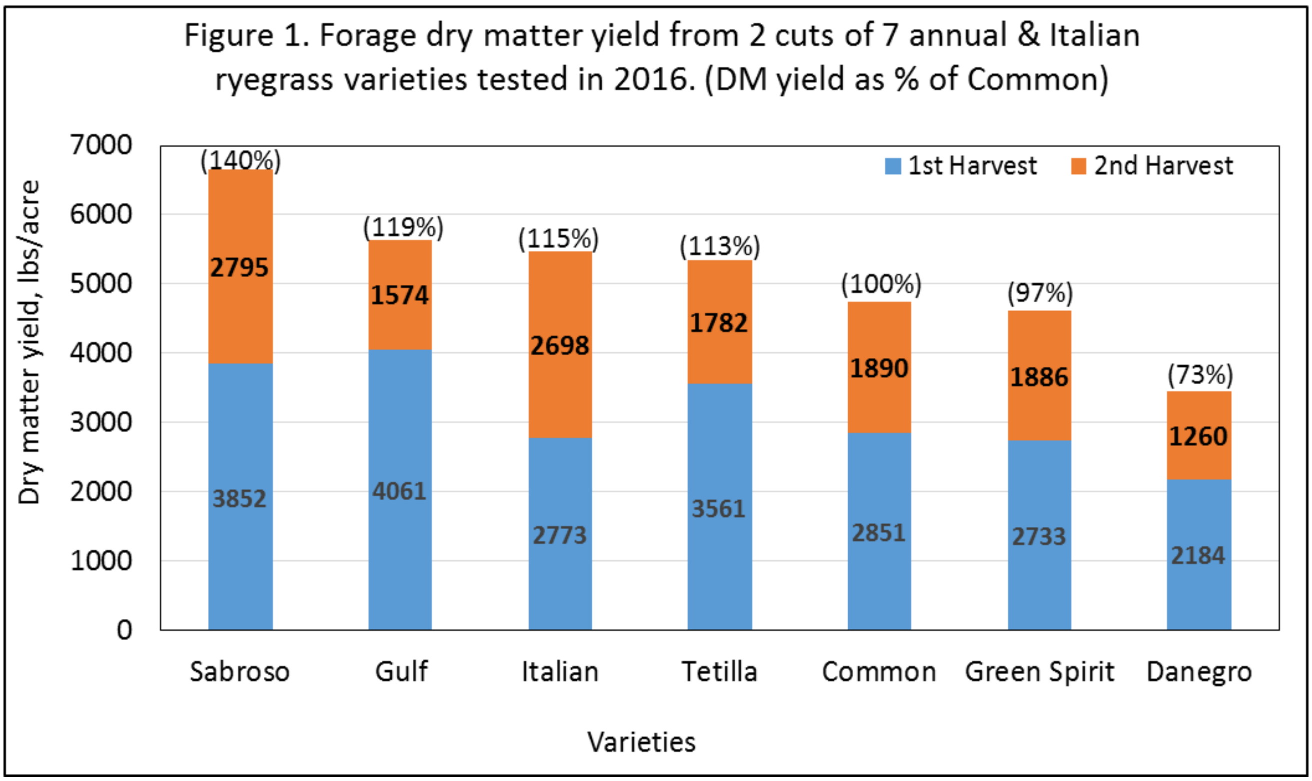
Forage Dry Matter Yield (Figure 1)

Multiple harvest is possible with most annual and Italian ryegrass varieties in the Peace.

For the first harvest which took place on July 25th, the top 3 varieties with >3500 lbs/acre were Gulf, Sabroso and Tetilla. Gulf variety produced the highest DM yield (4061 lbs/acre), followed by Sabroso (3852 lbs/acre) and then Tetilla (3561 lbs/acre). The other 4 varieties had less than 3000 lbs/acre.

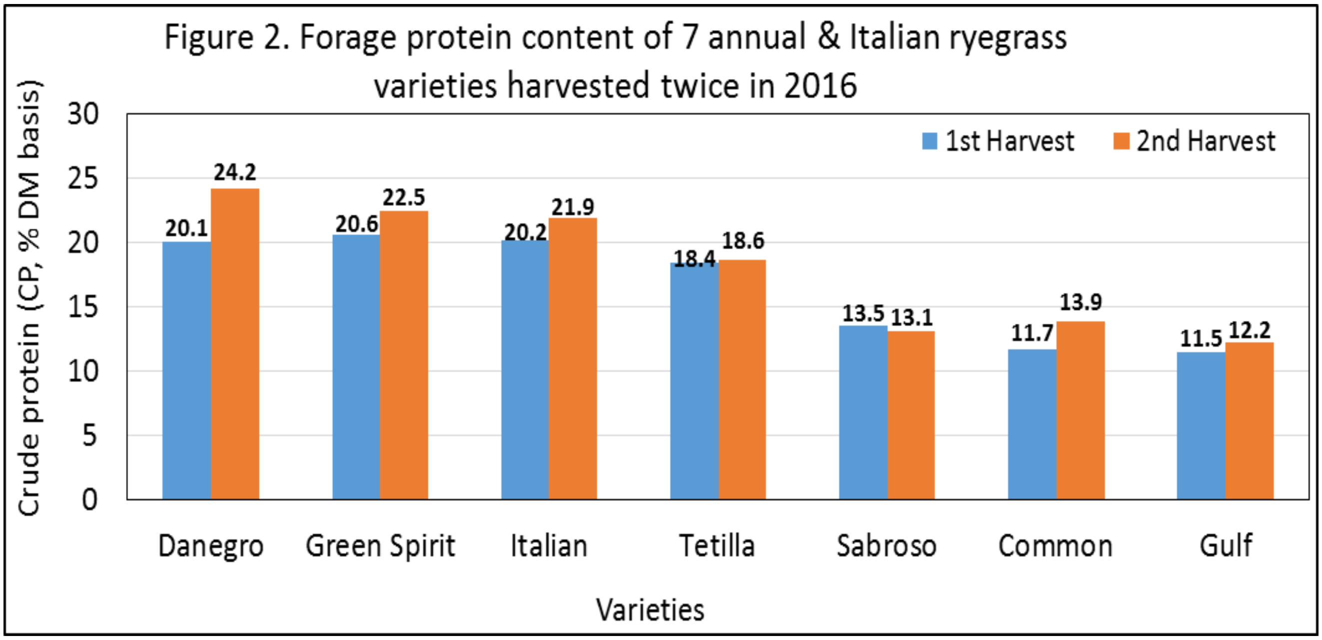
For the second harvest, only two (Sabroso & Italian) of the seven varieties had higher DM yields (2795 & 2698 lbs/acre) than other varieties. The other 5 varieties yielded less than 2000 lbs/acre.

Total DM yield from the 2 harvests was highest for Sabroso (6647 lbs/acre), followed by Gulf (5635 lbs/acre), Italian (5471 lbs/acre) and then Tetilla (5343 lbs/acre). Overall, Sabroso, Gulf, Italian and Tetilla varieties appeared to have 113 - 140% more DM yield than Common variety (check).



Forage Quality

Crude Protein (Figure 2) - The forage crude protein (CP) content for the first harvest on July 25th varied from about 12% CP for both Common & Gulf varieties to about 21% CP for Green Spirit variety. For the second cut, Danegro had the highest protein (24% CP). Protein content was generally higher at the second harvest for all varieties (except for Sabroso). Generally, three (Danegro, Green Spirit and Italian) of the varieties consistently had >20% protein at any particular harvest. Overall, all varieties at any particular harvest exceeded the protein requirements of a mature beef cow.



Minerals

The forage mineral contents (average of 2 harvests) are shown in Table 2.

Except for forage K, Na and Fe, all varieties had similar mineral contents.

The forage Ca content was generally above 0.40%.

The forage P content was highest for Green Spirit (0.28%).

Overall, except for P, Mg and Cu, the mineral requirements of a mature beef cow have all been met by the varieties tested. The forage P and Mg contents of all varieties for the most part were able to meet the requirements of a gestating cow in the mid- and late-pregnancy stages. Overall, only Green Spirit was able to meet the requirements for all minerals listed in Table 2 by a mature beef cow.

Table 2. The mean (over 2 harvests) forage minerals of annual & Italian ryegrass varieties tested in Fairview in 2016

	Macro minerals						Trace minerals			
	Ca	P	K	Mg	Na	S	Cu	Fe	Mn	Zn
Varieties	%	%	%	%	%	%	Ug/g	Ug/g	Ug/g	Ug/g
Common	0.47	0.23	2.24	0.19	0.33	0.26	5.61	101	91	37
Danegro	0.56	0.25	3.73	0.32	0.72	0.38	6.96	216	143	41
GreenSI	0.51	0.28	3.69	0.29	0.89	0.34	6.60	196	117	35
Gulf	0.47	0.19	1.59	0.18	0.27	0.24	5.14	118	84	41
Italian	0.44	0.24	3.53	0.30	0.86	0.35	6.71	163	120	36
Sabroso	0.47	0.18	2.32	0.23	0.35	0.27	4.45	99	112	39
Tetilla	0.41	0.23	2.59	0.26	1.05	0.32	7.16	134	102	37

Detergent Fibers, Non-fibrous Carbohydrates (NFC) and Energy (Table 3)

The forage fiber content (measured by ADF or NDF) in particular is a strong predictor of forage quality, since it is the poorly-digested portion of the cell wall. Forages with higher ADF are lower in digestible energy than forages with lower ADF, which means that as the ADF level increases, digestible energy levels decrease. As NDF in the forage increases, animals will consume less forage.

Generally, lower ADF and NDF values are preferred . NFC is more rapidly digested than fiber. It is a significant source of energy for the rumen microbes. The microbes also use NFC to make microbial protein. Therefore, looking at the values of ADF, NDF and NFC obtained for the varieties tested here, the top 3 varieties with lower ADF & NDF, and higher NFC were Italian, Green Spirit and Danegro in that order. The forage quality of the top 3 varieties have also been reflected in their RFVs, which were higher than the other 4 varieties.

The energy contents (TDN and other forms of energy) also appeared to be consistently higher for Italian, Green Spirit and Danegro than other varieties. Italian, Green Spirit and Danegro had >67% TDN, while others had <65% TDN.

All varieties tested here had sufficient TDN for a dry gestating beef cow, but only Italian, Green Spirit, Danegro and Tetilla had adequate TDN content for a lactating beef cow. This therefore indicates that only Italian, Green Spirit, Danegro and Tetilla have been able to meet the energy requirements of mature beef cattle.

Table 3. The mean (over 2 harvests) forage detergent fibers (ADF & NDF) and energy of annual & Italian ryegrass varieties tested in Fairview in 2016

Variety	Fibers			Energy				RFV
	ADF	NDF	NFC	TDN	NEL	NEG	NEM	
	%	%	%	%	MCal/kg	MCal/kg	MCal/kg	
Common	36.1	56.9	18.7	60.8	1.38	0.75	1.47	100
Danegro	25.5	43.6	22.8	69.0	1.58	1.00	1.72	149
Green Spirit	27.1	45.2	21.8	67.8	1.55	0.96	1.68	142
Gulf	34.7	55.7	21.8	61.9	1.40	0.79	1.51	103
Italian	24.2	42.2	25.3	70.0	1.60	1.02	1.74	156
Sabroso	36.6	56.9	18.4	60.4	1.37	0.74	1.46	99
Tetilla	31.1	48.9	20.9	64.7	1.47	0.87	1.59	124

Annual Crop Mixtures for Beef Swath Grazing and Dairy Silage

By Akim Omokanye, PCBFA
Collaborator: Devesh Singh, Barenbrug USA, Director of Research

Swath grazing is a management practice that can be used to extend the grazing season and to reduce feed, labor and manure handling costs for cattle producers. The practice may also eliminate or reduce the costs for corral cleaning, manure spreading and feed handling. Producers have looked at a number of crops for silage production. Oats, barley and triticale have traditionally been the most widely used cereals for swath grazing and silage. Livestock may be able to obtain all or part of their winter feed requirements through swath grazing. The objective of this study was to test annual forage crop types and their mixtures on forage production for beef swath grazing & dairy silage. The project is being carried out in collaboration with Barenbrug Seed Company, which is based out of the States.

Methods

The study site was at the Fairview Research Farm (NW5-82-3W6) on RR #35, MD of Fairview. Soil test at 0-6" soil depth done at Exova laboratory (Edmonton) prior to seeding showed an organic matter content of 7.1%, a pH of 5.5 (acidic), an electrical conductivity of 0.35 dS/m and a base saturation of 55.2%. The field was cultivated before seeding.

Thirteen (13) treatments which are listed in Table 1 were arranged in a randomized complete block design in 4 replications. We used small plots measuring 11.04 m^2 (118.8 ft^2).

The 13 treatments consisted of 5 mono-crops & 8 crop mixtures and their respective seeding rates for the purpose of testing them for beef swath grazing and dairy silage are shown in Table 1 below.

Table 1. Annual crops and their mixtures for beef swath grazing and dairy silage

Objective	Treatment	Crop	Seed Rate (lbs/acre)
Beef	1	Oats	100
Beef Swathing grazing	2	Oats	80
Beef Swathing grazing	2	Green Spirit ryegrass	5
Beef Swathing grazing	3	Oats	60
Beef Swathing grazing	3	Green Spirit ryegrass	10
Beef Swathing grazing	4	Oats	100
Beef Swathing grazing	4	T-Raptor hybrid Rape	5
Beef Swathing grazing	5	Oats	100
Beef Swathing grazing	5	Barsica	5
Beef Swathing grazing	6	Oats	60
Beef Swathing grazing	6	Green Spirit ryegrass	10
Beef Swathing grazing	6	Barsica	5
Dairy Silage	7	Barley	100
Dairy Silage	8	Barley	60
Dairy Silage	8	Green Spirit ryegrass	10
Dairy Silage	9	Triticale	100
Dairy Silage	10	Triticale	60
Dairy Silage	10	Green Spirit ryegrass	10
Dairy Silage	11	Green Spirit ryegrass	25
Check 1	12	Gulf annual ryegrass	25
Check 2	13	Tetilla annual ryegrass	25

Seeding was done on May 18 with a 6-row Fabro plot drill at 9” row spacing. For treatments with 2 or more crops in the mixtures, the individual seed was weighed separately and pre-mixed before seeding.

Fertility according to soil tests (actual lbs/acre): 91 N + 36 P + 72 K + 0 S (broadcast). Soil test showed adequate amount of S for the crops, so S was not applied.

Spraying: Roundup WeatherMAX® was used as pre-emergent for the entire trial 7 days after seeding. In-crop spraying was done with 2, 4 - D 700 at 0.35 L/acre on 10 treatments, these were treatments which contained mono-crop cereals. No in-crop spraying was done on treatments consisting of mixtures of cereals and brassicas (Treatments 4, 5 & 6).

Harvest stage for dry matter yield and quality (forage quality is not provided in this report):

1. Barley mono-crop or treatments with barley in the mixtures - barley soft dough stage (July 29)
2. Oats mono-crop or treatments with oats in the mixtures - oats milk stage (August 02)
3. Triticale mono-crop or treatments with triticale in the mixtures - triticale late milk stage (August 16)
4. Ryegrasses (mono-crops only)- July 25 (68 days after seeding)

Results & Discussion

Forage Moisture & Dry Matter Yield

The forage moisture content was 65% and above for 10 out of the 13 treatments tested. The forage moisture content at harvest was lower (<65%) for Treatment 9 (mono-crop triticale), Treatment 10 (triticale + Green Spirit ryegrass) and Treatment 12 (mono crop Gulf annual ryegrass) than other treatments.

Forage DM yield was higher for Treatment 9 (dairy silage with mono-crop Triticale, 9080 lbs/acre) and Treatment 6 (beef swath grazing with oats, Green Spirit and Barsica mixtures, 8929 lbs/acre) than other treatments.

Four (Treatments 9, 6, 7 & 4) of the 13 treatments had >4.0 tons DM yield/acre. All mono-crop annual and Italian ryegrasses including the two checks (Treatments 12 & 13) were in the bottom three.

Table 2. Forage dry matter (DM) yields and moisture content

Treatment	DM yield, lbs/acre	Moisture, %
Treatment 9	9080	53.6
Treatment 6	8929	72
Treatment7	8156	68.6
Treatment 4	8088	67.5
Treatment 5	7677	73.4
Treatment 8	7319	64.8
Treatment 10	7143	61.6
Treatment 1	7064	71.7
Treatment 2	6769	72.9
Treatment 3	6737	71.1
Treatment 12 (check)	6327	58.6
Treatment 11	5587	76.4
Treatment 13 (check)	4552	77
$LSD_{0.05}$	*1177*	*4.97*
Significance (P<0.05)	*	*
Mean	*7187*	*68.4*
CV, %	*9.76*	*4.33*

Annual Ryegrass

Testing of New Sainfoin Lines for Bloat-free Alfalfa Pasture Mixtures

By Akim Omokanye, PCBFA

Sainfoin is a perennial forage legume that does not cause bloat because of its condensed tannin concentration. The condensed tannin is vey effective at preventing deadly pasture bloat in ruminants. Studies have shown that 15% or more sainfoin in alfalfa mixture can significantly lower, and in certain cases eliminates, the risk of pasture bloat. However, until recently, available sainfoin varieties have not survived well in mixed stands with alfalfa or have not regrown at the same rate after the first cut or grazing and so cannot be used with alfalfa for reducing pasture bloat. Recent studies have shown that new experimental sainfoin lines are more competitive and have improved regrowth rates compared to older sainfoin varieties. Sainfoin is said to be as nutritious and palatable as alfalfa, and more cold and drought tolerant.

In collaboration with Dr. Surya Acharya (AAFC, Lethbridge), PCBFA tested some experimental sainfoin lines (LRC 3900, LRC 3901 & LRC 3902) in mixtures with AC Grazeland alfalfa variety to evaluate their growth, persistency and forage yield. The experimental sainfoin lines were developed by Dr. Surya Acharya. The tests were to help us determine if these experimental sainfoin lines developed for their ability to survive with alfalfa could outperform an older sainfoin variety called Nova. One of the experimental sainfoin lines (LRC-3902) was recently released as AC Mountainview by Dr. Surya Acharya.

Methods

Three experimental sainfoin lines (LRC05-3900, LRC05-3901, LRC05-3902) along with an older sainfoin variety called Nova (check) were each seeded in mixtures with AC Grazeland alfalfa on May 23, 2013 at the Fairview Research Farm (NW5-82-3W6) on RR #35. Both sainfoin and alfalfa were seeded in the same row (same row mixtures). *AC Grazeland alfalfa is a low-bloat potential alfalfa, because this variety results in a slower initial rate of digestion, which helps prevent the onset of bloat*. The soil at the test site had a pH of 5.4 and 8.8% organic matter before seeding. Each mixture was seeded with 15 lbs/acre of sainfoin and 6 lbs/acre of AC Grazeland alfalfa, indicating that half of the usual recommended seeding rates were used for both legumes. The 4 treatment mixtures were replicated 4 times in small plots, which had been arranged in a randomized complete block design. Seeding was 0.5-0.7” deep, and the seed was inoculated. We applied 40 lbs/acre of 11-52-0 at seeding in 2013. Assure II and Basagran Forte were used to control volunteer oats & canola and other broad leaf weeds in the seeding/establishment year (2013).

Cutting was done twice yearly from 2014 to 2016. The first cut was when sainfoin was at 40-50% bloom (alfalfa was at 20-30% bloom) and mostly from June 20-23 every year. The second cut was at 6 weeks after the first cut. *Please note that the highest risk of bloat occurs when legumes are in the pre-bud or vegetative stage.* In 2015, only one cut was possible because deer had selectively grazed down all sainfoin stands in the mixtures just before the second cut was to be taken. From 2014 to 2016, forage dry matter (DM) yield and percent composition (proportion) of sainfoin and alfalfa in the mixtures were determined. In 2016, second cut was done on August 2. Rainfall received at the site from April 1 to August 31 was 9.516” (2013), 4.944” (2014), 6.726” (2015) and 13.504” (2016).

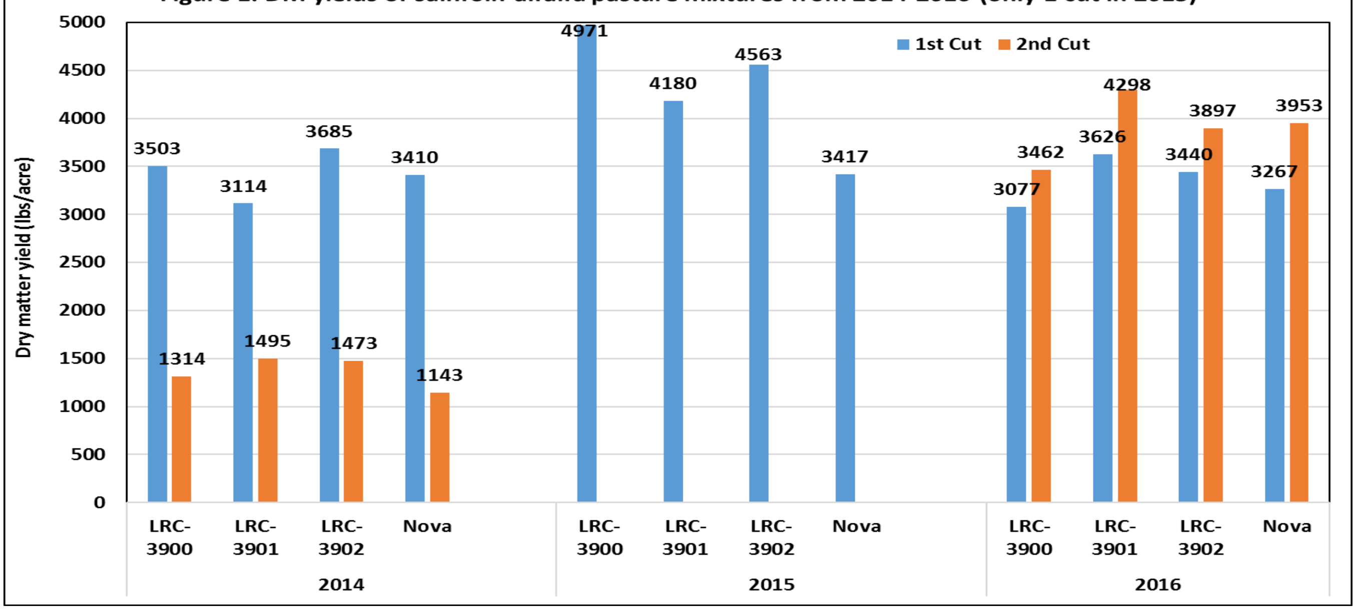
Results Obtained and Implications

Forage Dry matter yield (Figure 1)

In general, DM yield at any particular cut was statistically similar for the sainfoin - alfalfa mixtures in 2014, 2015 or 2016. In 2014 (one year after seeding), DM yield was generally lower for the 2nd cut (1143-1495 lbs DM/acre) than 1st cut (3114-3685 lbs DM/acre). The lower DM yield obtained for the 2nd cut in 2014 was due to low moisture. In Fairview and area, 2014 was a very dry year.

Overall, from 2014 to 2016, including any particular sainfoin in the legume mix did not appear to reduce yields.

Figure 1. DM yields of sainfoin-alfalfa pasture mixtures from 2014-2016 (only 1 cut in 2015)



Proportion of Sainfoin and alfalfa in the mixtures

The proportions of sainfoin in alfalfa mixtures at every cut are shown in Table 1. Generally, except for Nova sainfoin in 2016 (which had 5-6% sainfoin in the mixtures), sainfoin formed 18% or more of the total forage composition. Overall, the 3 experimental sainfoins produced higher proportion of DM in alfalfa pasture mixtures than Nova. The 3 experimental sainfoins consistently formed 20% or more in the mixtures. This is important because at least 15% sainfoin needs to be present in the alfalfa stand to avoid bloat.

Table 1. Proportion (%) of sainfoin and alfalfa in the mixtures from 2014-2016

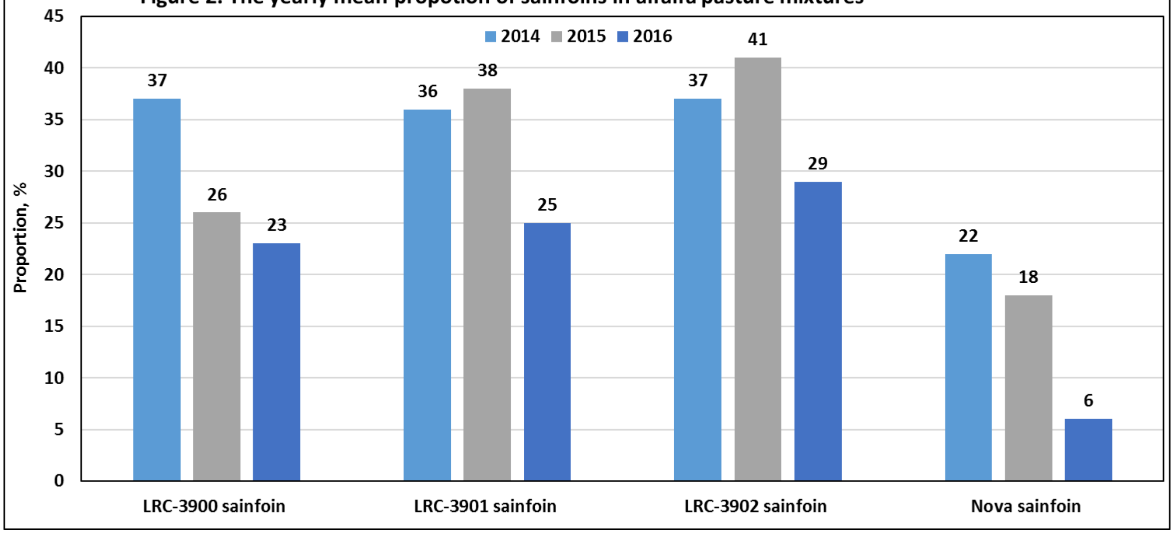
		2014 Cuts (%)			2015 Cut* (%)			2016 Cuts (%)		
Sainfoin- Alfalfa Mixture	**Forage**	**1st**	**2nd**	**Mean**	**1st**	**2nd**	**Mean**	**1st**	**2nd**	**Mean**
LRC-3900 + alfalfa	LRC-3900 sainfoin	39	34	37	26	-	26	22	24	23
	AC Grazeland alfalfa	61	66	63	74	-	74	78	76	77
LRC-3901 + alfalfa	LRC-3901 sainfoin	31	40	36	38	-	38	26	23	25
	AC Grazeland alfalfa	69	60	64	63	-	63	74	77	76
LRC-3902a + alfalfa	[a]LRC-3902 sainfoin	36	38	37	41	-	41	28	29	29
	AC Grazeland alfalfa	64	62	63	59	-	59	72	71	72
Nova Sainfoin + alfalfa	Nova sainfoin	20	24	22	18	-	18	5	6	6
	AC Grazeland alfalfa	80	77	78	82	-	82	95	94	95

*Only one cut was done. [a]Recently released as AC Mountainview sainfoin.

Compared to the 3 experimental lines, the drastic drop in the proportion of sainfoin for Nova from a mean of 22% in 2014 to a mean of 6% in 2016 (Figure 2) probably confirms that an older sainfoin variety such as Nova would not be as competitive as the new sainfoin in alfalfa pasture mixtures.

Overall, LRC-3900, LRC-3901 and LRC-3902 dropped by 14, 11 and 8% over the 3 years of cut. Nova dropped by 16% over the same period. Our study further shows that when seeded with alfalfa, the experimental sainfoins should be able to provide bloat protection for more growing seasons than Nova or other older sainfoin varieties.

Figure 2. The yearly mean propotion of sainfoins in alfalfa pasture mixtures



Conclusion

Our results show that Nova sainfoin may not be good competitor with alfalfa in pasture mixtures compared to any of the 3 experimental lines. As indicated earlier, studies have shown that 15% or more sainfoin in an alfalfa pasture mixture would significantly lower, and in certain cases eliminates, the risk of bloat. Our study here at the Fairview Research Farm, indicates Nova sainfoin, which contained only 6% in 2016 in alfalfa pasture mixtures may not have the potential to lower bloat a few years after seeding.

One (LRC05-3902) of the 3 experimental sainfoin lines used in this study has been released as AC Mountainview sainfoin. The use of AC Mountainview sainfoin variety in alfalfa pasture mixtures is recommended.

Some Tips to Manage Bloat (Extracts from AAF: Feeding Legumes to Cattle, Agdex 420/62-1)

- Use non-bloating legumes such as cicer milkvetch, sainfoin and birdsfoot trefoil. Be aware, these forages are not as good as alfalfa in terms of yield, re-growth and persistence in the stand.
- Low-bloat potential alfalfa - AC Grazeland. This variety results in a slower initial rate of digestion, which helps prevent the onset of bloat.
- Legume-grass mixtures - improves animal and pasture productivity as well as managing bloat. When legumes are planted with grasses, their presence can improve animal performance by as much as 30%, and even more when seeded in pure stands.
- Products or supplements to manage bloat - AlfasureT, Bloat Guardr (Poloxalene) and ionophores.
- NEVER move hungry cattle into legume pastures in the morning.
- Put animals out to pasture in the afternoon, so plants have a chance to dry off.

PCBFA High Legume Pasture Project site & the collaborators

- Feed another source of dry roughage (long fibre) before grazing bloat-causing legumes.
- Maintain a uniform and regular intake of forages. Once cattle have started grazing, leave them on the pasture, even at night.
- When animals are first put on pasture, check them at least twice a day. Some animals are chronic bloaters. Watch for these animals, and remove them from the pasture if needed.
- Graze full bloom mature plants.

PCBFA On-going High Legume Pasture Project with Sainfoin

Collaborator: Conrad Dolen, Fourth Creek

PCBFA is part of a two-year province wide field scale trial (10 acres) to showcase the potential of sainfoin in a high-legume pasture mix. Our site is at the Dolen's in Fourth Creek. A high legume pasture mix (60% legumes, 40% grasses) was seeded in 2016. AC Mountainview sainfoin variety was used in the mixture. PCBFA is planning a field day at the site in summer 2017 to highlight the project.

For more information on the province wide High legume Pasture Project with Sainfoin, visit: http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/faq14389

Managing Roundup Ready Canola in Corn

Calvin Yoder[1], Akim Omokanye[2], Kim Schoorlemmer[3]
1 Alberta Agriculture and Forestry, Spirit River, AB
2. Peace Country Beef and Forage Association, Fairview, AB
3. DuPont Pioneer, Rycroft, AB

Introduction

Corn acreage in the Peace River Region for livestock feed has steadily increased over the past number of years. Most of the corn seeded is Roundup Ready (RR) which provides a good system for controlling weeds. Volunteer RR canola is also a common weed on fields where corn is grown. Managing volunteer RR canola in RR corn requires a broadleaved herbicide that can be mixed with glyphosate and be safely applied prior to seeding corn or applied in-crop.

Selecting a corn herbicide should be based on weeds present, crop stage, crop tolerance and price. There are a number of broadleaved herbicides that can be tank mixed with glyphosate and used on corn as pre-seed or in-crop applications. Tank mixing a broadleaved herbicide with glyphosate will improve control of a number of weeds including volunteer RR canola. Herbicides that can be tank mixed with glyphosate and applied prior to seeding corn are Heat, Pardner, Conquor, MCPA and 2,4-D. Some herbicides that are registered for use on corn and can be tank mixed with glyphosate include Pardner, Buctril M, 2,4-D, MCPA, Banvel and a new herbicide Armezon. Although Banvel, 2,4-D and MCPA are registered for use on corn, agronomists prefer not to recommend them as they can cause stunted growth and poor brace root development resulting in lower yields. Bromoxynil, which is the main active ingredient of Pardner, tends to be safer although can cause some leaf burn.

Methods

Trials were conducted in 2015 and 2016 to evaluate several herbicide tank mixes with Roundup WeatherMax to control volunteer RR canola and other weeds in field corn. One trial in 2015 compared several treatments applied prior to seeding (Table 1) and the second trial conducted in 2015 and 2016 compared treatments applied in-crop (Table 2). All treatments included in the trials are registered for use on corn.

Experimental design for the Pre-Seed Herbicide trial was a randomized complete block design with three replications and plots were 2m x 7m in size. Experimental design for the 2015 In-Crop Herbicide trial was a randomized complete block design with 2 replicates. Experimental design for the 2016 In-Crop Herbicide trial was a randomized complete block design with 4 replicates.

Herbicides were applied with a hand held plot sprayer, calibrated to deliver 100 l/ha of water at 270 kPa.

Pre-seed Herbicide Applications

The trial was conducted on a RR canola stubble field near Debolt. The site had uniform populations of volunteer RR canola. Herbicide treatments (Table 1) were applied on May 25th when the canola was at the 1-3 leaf stage. Corn was direct seeded into stubble through the trial area several days following the pre-seed herbicide applications. Visual weed control ratings (percent control) were conducted 22 and 35 days after application (DAA). No crop tolerance data was collected.

Table 1. Herbicide treatments applied prior to seeding corn, Debolt 2015.

TREATMENT	Formulation g/l	RATE ml/acre	$/ACRE
Check			
Roundup WeatherMax	540	335	2.66
Heat LQ+ Roundup WeatherMax+ Merge	342 540	21 335 0.5% v/v	6.40
Heat LQ+ Roundup WeatherMax+ Merge	342 540	42 335 0.5% v/v	10.14
Pardner+ Roundup WeatherMax	280 540	400 335	9.76
MCPA Ester+ Roundup WeatherMax	600	300 335	7.66
Conquer+ Roundup WeatherMax	240+235 540	240+15 335	8.91

In-Crop Corn Herbicide Applications

This study was conducted in 2015 and 2016 on a field of RR corn along Alder Ridge Rd. that had been seeded to corn for a number of years but continued to have issues with volunteer RR canola. The trial area had uniform weed populations of volunteer RR canola, wild buckwheat and lamb's-quarters and smart weed.

2015

Herbicide treatments (Table 2) were applied on June 17th when the corn was in the 5-6 leaf stage. Volunteer canola was in the 3-6 leaf stage, lamb's-quarters 3-4 leaf stage and wild buckwheat at the 3-6 leaf stage. Visual weed control ratings (percent control) were conducted 26, 41 and 56 days after application (D-A-A). No crop tolerance data was collected.

2016

Herbicide treatments (Table 2) were applied on June 17th when the corn was in the 2-3 leaf stage. Volunteer RR canola was in the 2-3 leaf stage, lamb's-quarters 3-4 leaf stage, wild buckwheat at the 1-4 leaf stage, hemp-nettle at the 1-3 leaf stage and smartweed at the 1-4 leaf stage. Visual weed control ratings (percent control) were conducted 16 and 28 days after application (D-A-A). No crop tolerance data was collected.

Table 2. In crop herbicide treatments applied to corn, Alder Ridge, 2015 and 2016.

TREATMENT	Formulation	RATE	$/ACRE
	g/l	ml/acre	
Check			
Roundup WeatherMax	540	335	2.60
Buctril M+ Roundup WeatherMax	280 and 280 540	400 335	10.41
Armezon Roundup WeatherMax+	336 540	15 335	12.66
Pardner+ Roundup WeatherMax	280 540	400 335	11.31
MCPA Ester 600+ Roundup WeatherMax	600	300 370	8.66
MCPA amine 500+ Roundup WeatherMax	 540	450 335	8.50

Results and Discussion

Pre-seed Herbicide Applications

Percent visual volunteer RR canola control following several pre-seed herbicide applications are shown on Table 3.

Table 3. Visual percent control ratings of volunteer Roundup Ready canola following herbicide applications prior to seeding corn, Debolt 2015.

TREATMENT	RATE ml/acre	22 D-A-A	35 D-A-A*
Check		0	0
Roundup WeatherMax	335	0	0
Heat LQ+ Roundup WeatherMax+ Merge	21 335 0.5% v/v	100	77
Heat LQ+ Roundup WeatherMax+ Merge	42 335 0.5% v/v	100	87
Pardner+ Roundup WeatherMax	400 335	100	0
MCPA Ester+ Roundup WeatherMax	300 335	100	58
Conquer+ Roundup WeatherMax	240+15 335	100	0

*Roundup Ready canola emerged after the initial herbicide application.

All pre-seed herbicide applications with the exception of Roundup WeatherMax provided excellent control of volunteer RR canola plants that were emerged at the time the herbicides were applied. Heat+Roundup WeatherMax and MCPA ester+Roundup WeatherMax provided some residual control of volunteer canola that was germinating after the application. Pardner and Conquer tank-mixed with Roundup WeatherMax provided excellent control of emerged canola but did not provide any residual activity.

In-Crop Corn Herbicide Applications

Tables 4, 5 and 6 show control of volunteer RR canola, wild buckwheat and lamb's -quarters following the application of several herbicide treatments applied in-crop on corn from the trial conducted in 2015.

Table 4. Visual percent control ratings of volunteer Roundup Ready canola following in-crop herbicide applications to corn, Alder Ridge 2015.

TREATMENT	26 D-A-A	41 D-A-A	56 D-A-A
Check	0	0	0
Roundup WeatherMax	0	0	0
Buctril M+ Roundup WeatherMax	80	80	75
Armezon Roundup WeatherMax	100	93	95
Pardner+ Roundup WeatherMax	75	85	80
MCPA Ester 600+ Roundup WeatherMax	95	90	88
MCPA amine 500+ Roundup WeatherMax	78	70	73

Table 5. Visual percent control ratings of wild buckwheat following in-crop herbicide applications to corn, Alder Ridge 2015.

TREATMENT	26 D-A-A	41 D-A-A	56 D-A-A
Check	0	0	0
Roundup WeatherMax	70	68	60
Buctril M+ Roundup WeatherMax	88	88	85
Armezon Roundup WeatherMax+	100	98	85
Pardner+ Roundup WeatherMax	75	80	83
MCPA Ester 600+ Roundup WeatherMax	80	80	83
MCPA amine 500+ Roundup WeatherMax	85	78	70

Table 6. Visual percent control ratings of lamb's-quarters following in-crop herbicide applications to corn, Alder Ridge 2015.

TREATMENT	26 D-A-A	41 D-A-A	56 D-A-A
Check	0	0	0
Roundup WeatherMax	70	63	60
Buctril M+ Roundup WeatherMax	80	70	75
Armezon Roundup WeatherMax+	95	98	85
Pardner+ Roundup WeatherMax	75	75	83
MCPA Ester 600+ Roundup WeatherMax	83	83	83
MCPA amine 500+ Roundup WeatherMax	80	75	80

Tables 7 and 8 show control of volunteer RR canola, wild buckwheat, lamb's–quarters, hemp-nettle and smartweed following the application of several herbicide treatments applied in-crop on corn from the trial conducted in 2016.

Table 7. Visual percent control ratings of weeds 16 D-A-A in-crop herbicide applications to corn, Alder Ridge 2016.

TREATMENT	RR Canola	Lamb's-quarters	Hemp-nettle	Wild Buckwheat	Smartweed
Check	0	0	0	0	0
Roundup WeatherMax	0	88	78	70	95
Buctril M+ Roundup WeatherMax	98	100	89	100	100
Armezon Roundup WeatherMax	86	98	91	95	93
Pardner+ Roundup WeatherMax	91	98	81	100	100
MCPA Ester 600+ Roundup WeatherMax	81	93	98	70	90
MCPA amine 500+ Roundup WeatherMax	80	98	87	78	96

Table 8. Visual percent control ratings of weeds 28 D-A-A in-crop herbicide applications to corn, Alder Ridge 2016.

TREATMENT	RR Canola	Lamb's-quarters	Hemp-nettle	Wild Buckwheat	Smartweed
Check	0	0	0	0	0
Roundup WeatherMax	0	89	89	94	100
Buctril M+ Roundup WeatherMax	99	90	89	95	98
Armezon Roundup WeatherMax	88	100	95	88	86
Pardner+ Roundup WeatherMax	94	93	92	98	100
MCPA Ester 600+ Roundup WeatherMax	96	100	97	95	94
MCPA amine 500+ Roundup WeatherMax	94	98	85	84	84

The addition of a broad-leaved herbicide to Roundup WeatherMax was needed to control volunteer RR canola. In most cases control of lamb's-quarters, wild buckwheat and hemp-nettle was improved when a broad-leaved herbicide was tank-mixed with RU WeatherMax as compared to RU WeatherMax applied alone.

All broad-leaved herbicide tank-mixes with Roundup WeatherMax were effective at controlling RR canola, although the broadleaved herbicides MCPA ester, Armezon and Pardner appeared to provide more consistent control than the other products. Pardner and Buctril M treatments tank mixed with Roundup WeatherMax also provided more consistent control of wild-buckwheat than the other treatments. MCPA ester+Roundup WeatherMax provided slightly better control on all three weeds than MCPA amine+Roundup WeatherMax.

Summary

The addition of a broad-leaved herbicide to Roundup WeatherMax for in-crop herbicide applications on RR corn will improve control of most weeds particularly RR canola. Pardner, Armezon, Buctril M or MCPA ester tank-mixed with Roundup WeatherMax generally provided good control of all weeds sprayed in the study. It should be noted that herbicides containing MCPA, 2,4-D or dicamba are not generally recommended by agronomists for use on corn as they can cause damage to the corn crop.

Peace Corn Variety Trial

By Akim Omokanye, PCBFA

Collaborators: Tom Fromme, North Peace Applied Research Association (NPARA)
Jacob Marfo & Sabrina Westra, Mackenzie Applied Research Association (MARA)

In the Peace Country region, winter feeding costs make up the bulk of the overall cost of production for cow-calf producers. There are many different traditional ways to extend the grazing season, which include swath grazing and bale grazing. Benefits from extending the grazing season include reducing winter feed costs, improving manure distribution, decreasing fertilizer costs, reducing labour and time spent feeding, increasing soil organic matter content, yardage cost savings and improving animal performance and health. Corn grazing is increasing in the region as an option for producers looking to reduce feed costs per cow per day and to extend the grazing season into the fall and winter months. The objective of this trial was to test corn varieties with low heat unit requirements for suitability for silage/grazing at 3 different locations in the Peace. We have always tested Roundup Ready corn hybrids, but for this trial, we have included some conventional non-Roundup Ready, open-pollinated and organic type varieties. This would enable us to identify and select alternative corn varieties to Roundup Ready corn types.

Methods

The variety trial was carried out at 3 sites (Fairview (PCBFA), North Star (NPARA) & Fort Vermillion (MARA)).

Experimental Design: Randomized complete block design with 4 replicates.

Treatments (corn varieties): a total of 23 corn hybrids/varieties were used. Varieties used consisted of 17 roundup ready corn varieties, 5 conventional hybrids and an open pollinated variety (see Table 2).

Seeding, fertility and spraying information for some of the sites is provided in Table 1.

Table 1. Site, corn seeding and management information for some of the sites

	Fairview	Fort Vermilion
	NW5-82-3W6) on RR #35	58.383759, -116.050797
Soil (0-6”)	Organic matter (OM) 7.1%	OM (4.4%)
	pH 5.5	pH (6.1)
	EC 0.35dS/m	EC
Tillage operation	tilled	no till
Seeding Rate & Date	30,000 kernels/acre	24,900 kernels/acre
	17-May-16	23-May-16
Seeding method	6-row corn planter	4 row corn planter
	30” row spacing	36" row spacing
Fertility (lbs actual/acre)	84 N + 30 P + 66 K + 0 S	90 N + 30 P + 30 K + 10 S + 5 Zn
Spraying - Pre-seed/pre-emergent	Roundup Weather Max	Pardner & Roundup Weathermax
In-crop	Basagran Forte @4-6 leaf	Buctril M
Rainfall (seeding-Killing frost, inches)	13.8	7.34
Date of first killing frost	04-Sep	27-Sep
Total corn heat units (seeding-Killing frost)	1711	2225

Measurements taken at harvest: plant height, final plant population, number of ears/plant and forage yield and quality.

Field notes were taken on ear development and kernel stage at harvest.

Table 2. Corn hybrid/varieties tested for silage across 3 sites in the Peace (Fairview, North Star & Fort Vermilion) in 2016				
	Corn hybrid/variety	**Marketed by**	**Type**	**Heat unit requirement**
1	2501 RR	PickSeed	Roundup Ready	2300
2	2262 RR	PickSeed	Roundup Ready	2075
3	Extreme RR	PickSeed	Roundup Ready	2775
4	PS 221OVT2P RR	Pickseed	Roundup Ready	2275
5	PS Exleafy RR	Pickseed	Roundup Ready	2700
6	Baxxos RR	Dow Seeds™	Roundup Ready	2300
7	X12003X3+	Dow Seeds ™	Roundup Ready	
8	X13002S2+	Dow Seeds ™	Roundup Ready	
9	Fusion	Brett Young	Roundup Ready	2350
10	E48A27	Brett Young	Roundup Ready	2150
11	E44A02	Brett Young	Roundup Ready	2150
12	E47A17	Brett Young	Roundup Ready	2050
13	13-8084+	Brett Young	Roundup Ready	
14	Venza R	Brett Young	Roundup Ready	2500
15	EXP 1002	Masters Choice	Conventional hybrid	
16	MC4560	Masters Choice	Conventional hybrid	2875
17	Master Graze*	Masters Choice	Conventional hybrid	1800
18	OG 4830	Masters Choice	Organic	
19	OG 4680	Masters Choice	Organic	
20	Catt	Catt	Open pollinated	2150-2350
21	P8210	Pioneer	Roundup Ready	2425
22	XP3901+		Roundup Ready	
23	A4414 RR	Pride Seeds	Roundup Ready	2125

*Mastergraze is a tillering cobless corn

+Experimental lines– not available in the market

Results & Discussion

Fairview

All varieties were similar in plant height, but 2501RR variety seemed to have the potential to grow taller than other varieties. Generally, all varieties grew taller than 6ft (Table 3).

Forage DM yield was significantly highest for X13002S2 (7.26 tons DM/acre). The top four varieties (with up to 6.00 tons DM/acre) were X13002S2, MC4560, PS2210VT2 & PS-Exleaf. Other varieties had DM yields varying from 3.12 to 5.66 tons/acre.

The forage crude protein content was highest for PS-Exleaf (13%). Thirteen (13) of the 23 varieties had 10% or more protein. Generally, all varieties seemed to have enough protein for a gestating beef cow.

The forage energy (%TDN) was generally >65% for all varieties tested in Fairview (Table 4). The top 3 varieties with the most TDN were Baxxos RR, MC4560 & OG4680, which had 70% TDN or more. All varieties tested have been able to meet the energy (%TDN) requirements of a mature beef cow.

Fort Vermilion

The corn varieties tested all had similar plant height, Venza R seemed to have the potential to be taller than other varieties.

In terms of forage DM yield, all corn varieties had similar yields, but X13002S2 in particular appeared to have the potential to produce higher yields than other varieties.

All varieties had similar forage crude protein content and the protein content varied from 8.12 to 9.72%, indicating that all varieties tested had enough protein for gestating cows in the mid-pregnancy stage. For a cow in the late pregnancy stage, which requires 9% protein, only 13 varieties met the required protein content for this category of cow.

All varieties had similar energy (TDN) content and generally above 65% TDN. The >65% TDN obtained for these corn varieties was adequate for the TDN requirements of mature beef cattle at different physiological stages.

Table 3. Plant height, forage dry matter (DM) yields and crude protein of 23 corn varieties tested at 3 sites in the Peace in 2016. NS indicates not significant (P>0.05)

	Plant height (ft)			Dry yield (tons/acre)				Crude protein			
Variety	**Fairview**	**Fort Vermilion**	**Mean**	**Fairview**	**Fort Vermilion**	**North Star**	**Mean**	**Fairview**	**Fort Vermilion**	**North Star**	**Mean**
2501RR	8.59	8.05	8.32	5.37	4.66	3.96	4.67	10.1	9.32	8.30	9.49
PS2210VT2	7.62	7.77	7.70	6.08	4.47	3.19	4.58	10.8	8.87	8.60	9.11
Baxxos RR	7.55	8.01	7.78	5.66	4.10	3.38	4.38	9.5	8.94	8.00	8.93
X13002S2	7.45	8.50	7.98	7.26	5.64	4.91	5.94	9.3	8.41	7.99	8.66
MC4560	7.31	8.25	7.78	6.10	4.12	3.74	4.65	9.4	9.43	9.14	9.26
E47A17	7.30	7.87	7.59	4.55	4.81	3.94	4.44	12.0	9.49	8.61	9.69
XP3901	7.26	7.53	7.42	5.22	3.92	3.71	4.28	10.3	8.12	8.78	8.58
Fusion	7.15	8.32	7.79	4.92	4.86	4.42	4.73	10.1	8.63	8.76	8.82
PS-Exleaf	7.09	8.06	7.61	6.05	4.38	2.51	4.31	13.0	9.00	8.27	9.63
E44A02	7.06	7.98	7.54	4.92	5.05	4.14	4.70	11.5	9.22	9.51	9.49
OG4680	7.03	8.43	7.75	4.79	4.65	3.36	4.27	11.2	8.96	9.42	9.50
2262RR	6.96	8.28	7.66	5.22	4.76	3.57	4.52	10.6	8.84	9.01	8.99
Master Gr	6.96	8.22	7.59	3.63	4.04	1.74	3.14	11.3	8.51	9.57	8.99
X12003X3	6.96	7.72	7.34	4.96	4.22	2.69	3.96	11.0	9.02	8.79	9.35
E48A27	6.96	8.09	7.53	5.22	3.66	3.32	4.07	8.4	9.64	8.58	9.25
138084	6.91	8.08	7.49	4.75	4.32	4.03	4.37	11.3	9.04	10.0	9.25
A4414RR	6.90	8.14	7.52	5.23	3.53	3.63	4.13	9.9	9.21	8.98	9.33
Catt	6.87	8.56	7.71	5.30	2.88	2.74	3.64	11.4	9.64	9.07	9.79
P8210	6.77	7.72	7.24	3.57	4.12	3.51	3.73	10.4	9.37	8.37	9.49
Venza R	6.72	9.34	8.03	5.17	3.79	3.58	4.18	9.5	8.67	8.34	8.89
EXP1002	6.45	8.77	7.61	4.17	3.65	2.72	3.51	10.3	9.35	9.29	9.52
Extreme R	6.27	7.93	7.10	5.19	3.29	4.13	4.21	10.3	9.72	9.01	9.78
OG4830	6.12	7.98	7.05	3.11	3.07	3.28	3.16	8.8	9.66	8.45	9.41
$LSD_{0.05}$	*1.22*	*1.06*	*0.88*	*1.15*	*1.85*	*0.87*	*0.82*		*1.27*		*1.01*
Significance	*NS*	*NS*	*NS*	*	*NS*	*	*		*NS*		*NS*
Mean	*7.07*	*8.16*	*7.61*	*5.06*	*4.17*	*3.48*	*4.24*		*9.09*		*9.27*
CV, %	*12.3*	*9.25*	*11.8*	*16.0*	*31.4*	*17.68*	*24.1*		*9.93*		*9.52*

North Star

X13002S2 variety had the highest forage DM yield (4.92 tons DM/acre), followed by Fusion (4.42 tons DM/acre), and then E44A02 & Extreme R (with about 4.0 tons DM/acre) in that order (Table 3).

All varieties had similar crude protein content and the protein content (about 9-10%) was enough for what a gestating cow would need at both mid- and late-pregnancy stages.

The forage energy content (TDN) was generally between 62 and 65% TDN for varieties tested.

Table 4. Forage energy (total digestible nutrients) of 23 corn varieties tested at 3 sites in the Peace in 2016. NS indicates not significant (P>0.05)

Variety	TDN			
	Fairview	Fort Vermilion	North Star	Mean
2501RR	67.7	71.3	62.9	69.3
PS2210VT2	68.4	71.5	63.2	69.5
Baxxos RR	72.6	70.0	64.4	69.4
X13002S2	69.2	70.3	64.4	69.9
MC4560	76.7	69.1	63.2	69.2
E47A17	67.6	69.1	63.7	67.7
XP3901	69.1	69.0	63.9	68.2
Fusion	69.0	71.6	64.5	69.7
PS-Exleaf	69.1	71.7	62.1	70.0
E44A02	68.4	72.5	63.3	70.4
OG4680	70.1	70.4	63.9	68.9
2262RR	69.0	72.2	63.5	70.4
Master Gr	68.1	66.6	62.6	66.4
X12003X3	69.6	68.2	64.3	67.6
E48A27	67.0	70.0	64.2	68.4
138084	68.0	71.1	62.2	69.5
A4414RR	69.1	71.1	63.1	69.3
Catt	66.5	68.0	63.8	67.1
P8210	64.8	69.4	63.9	67.7
Venza R	68.1	71.2	62.8	69.3
EXP1002	68.4	68.5	62.6	67.7
Extreme R	68.7	69.8	63.0	68.5
OG4830	69.4	69.2	62.4	68.3
LSD(0.05)		4.46		3.13
significance		NS		NS
Mean		70.1		68.8
CV %		4.5		3.98

Across Sites (combined results)
The mean of plant height across the 3 sites was similar for all varieties tested (7-8 ft), but 2501RR seemed to have the potential to grow taller than other varieties.

Forage DM yield was significantly different among varieties tested. X13002S2 significantly had the highest forage DM yield compared to other varieties across the 3 sites.

The forage crude protein content was similar for all varieties across sites (8.6-9.8% CP). This shows that the varieties tested were well within the 7-9% CP needed by a gestating cow, depending on its physiological state (mid- or late-pregnancy stage).

The forage energy (TDN) content was similar for all varieties across sites (66-70% TDN). Generally, the TDN requirements of a dry gestating cow (55-60% TDN) as well as that of a lactating cow (65% TDN) have been met.

Determining Optimum Nitrogen Rates for Corn

By Akim Omokanye, PCBFA

One of the most costly and important inputs in corn production is nitrogen fertilizer. The objective of this project is to help develop appropriate N rate recommendations for corn. In order to become more confident with this new nitrogen rate recommendation approach we will continue building the response database with more nitrogen trials during the next few years.

Methods

The study site was at the Fairview Research Farm (NW5-82-3W6) on RR #35, MD of Fairview. The soil test at 0-6" soil depth done at Exova laboratory (Edmonton) prior to seeding showed an organic matter content of 7.1%, a pH of 5.5 (acidic) and an electrical conductivity of 0.35 dS/m. The field was cultivated before seeding.

The treatments mentioned below were arranged in a randomized complete block design in 4 replications.

The treatments consisted of 3 corn types and 4 N fertilizer rates as provided below:

Three (3) Corn types:

1. RR hybrid (A4414RR)
2. Conventional hybrid (Master Graze)
3. Open-pollinated (Catt)

4 N-rates (lbs N/acre):

1. 0 N lb/acre
2. 60 N lb/acre
3. 100 N lb/acre
4. 140 N lb/acre

Each corn type was tested with the 4 N rates. Regardless of the N rates applied, all corn types received a uniform application of 30 P + 66 K + 0 S (lbs actual/acre).

Seeding Rate & Date: 30,000 kernels/acre, May 17

Seeding Method: We used a 6-row John Deere corn planter at 30" row spacing.

Pre-emergent used was Roundup Weather Max. In-crop was done with Basagran Forte @4-6 leaf stage.

The amount of rainfall received from seeding to killing frost was 13.8 inches.

Date of first killing frost: September 4

Total corn heat units from seeding to Killing frost: 1711

In-crop spraying was with Basagran Forte.

Measurements taken at harvest: plant height, final plant population, number of ears/plant and forage yield and quality. Field notes were taken on ear development and kernel stage at harvest.

Results and Discussion

Number of ears/plant (Table 1)

The number of ears per plant averaged about 3 ears/plant for 0, 60 and 100 lbs N/acre and this appeared to increased to about 4 ears/ plant for 140 lbs N/acre.

The number of ears/plant was similar for all corn types and this averaged 3 ears/plant for each of the corn types tested.

Overall, except for the highest N rate (140 lbs N/acre) which seemed slightly increased over other rates, number of ears was not generally affected by corn types and N fertilizer rates.

Plant height (Table 1)

All corn types and N rates had similar plant heights. Though Catt, an open pollinated variety, seemed to have the potential to grow taller than Master Graze and A4414RR.

Moisture (Table 1)

The forage moisture content at harvest was similar for all corn types as well as for all N rates applied. The forage moisture content varied from 79-80% for N rate and from 78-80% for corn types.

Table 1. Number of ears per plant, plant height (m), moisture content at harvest and forage crude protein content for corn types and 4 N rates.

	Nitrogen rates (lbs/acre)				
	0	**60**	**100**	**140**	**Mean**
	Number of Ears				
Catt	3.04	3.36	3.43	3.50	3.33
Master Graze	2.89	2.95	3.23	3.48	3.14
A4414RR	3.04	3.07	3.18	4.00	3.32
Mean	2.99	3.13	3.28	3.66	
	Plant height (m)				
Catt	2.17	2.29	2.33	2.40	2.30
Master Graze	2.12	2.12	2.15	2.17	2.14
A4414RR	2.11	2.16	2.19	2.35	2.20
Mean	2.13	2.19	2.22	2.31	
	Moisture (%)				
Catt	78.8	78.4	75.2	79.6	78.0
Master Graze	79.3	79.9	80.4	81.4	80.3
A4414RR	79.3	78.6	81.3	79.1	79.6
Mean	79.1	79.0	79.0	80.0	
	Crude protein (%)				
Catt	11.2	13.2	11.6	13.2	12.3
Master Graze	10.1	11.4	12.6	12.6	11.7
A4414RR	11.1	11.2	12.3	11.4	11.5
Mean	10.8	11.9	12.2	12.4	

Forage Crude Protein (Table 1)

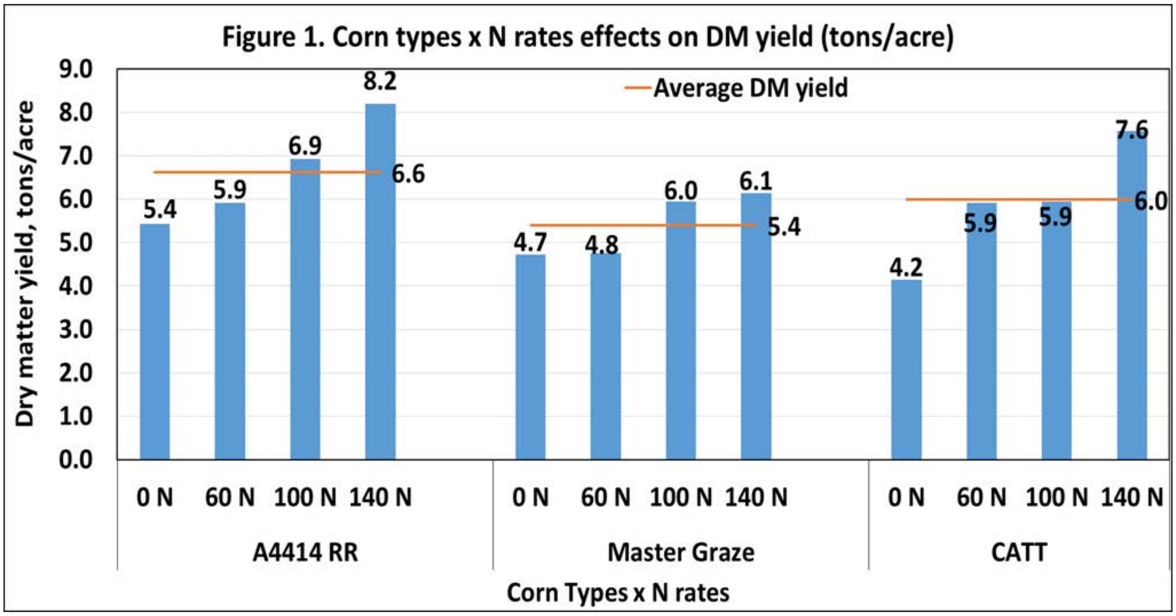
The forage crude protein (CP) content was similar for the 3 corn types, varying from 11.5% CP for A4414RR to 12.3% CP. Both fertilizer N rates of 100 and 140 lbs N/acre showed significant CP improvement over 0 lbs N/ acre. The application of 60 lbs N/acre did not improve forage CP content over 0 lb N/acre rate. The CP required for a gestating cow is 7% in the second trimester and 9% in the third trimester.

Looking at the protein values in Table 1, the protein requirements of these categories of cows have been sufficiently met by all corn types at any particular N rate.

Forage DM yield (Figure 1)

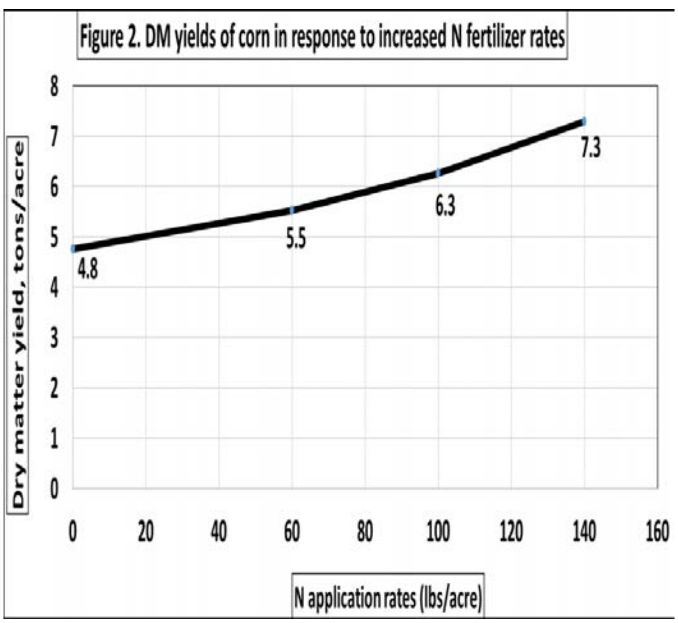
For each corn type, N application rates had significant effects on forage DM yield. The forage DM yield increased with increased N rates for all corn types. The response to applied N rates was more for A4414RR than Master Graze or Catt. The highest N rate (140 lbs N/acre) increased DM yield by 2.8, 1.4 and 3.4 tons DM/acre over check (0 lb N/acre) respectively for A4414RR, Master Graze and Catt.

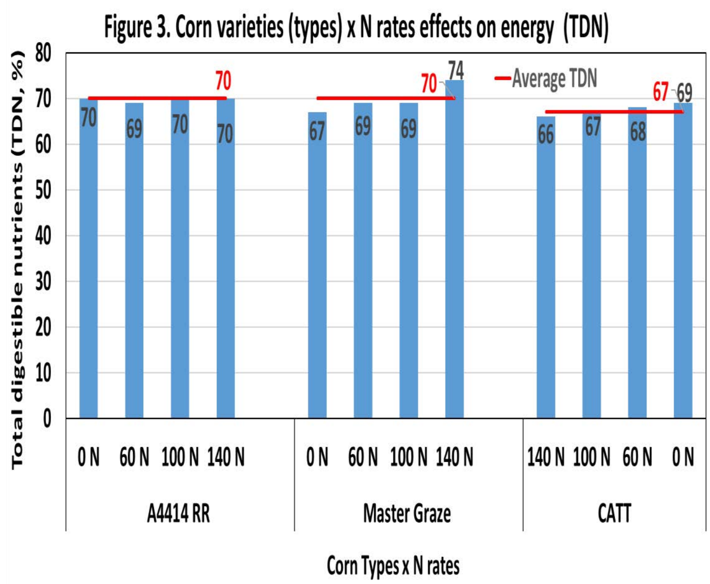
Figure 2 shows the mean DM yield (across corn types) for N rates. The DM yield seemed to respond linearly to increased N rates. The application of 60 - 140 lbs N/acre fertilizer improved DM yield by 0.7 to 2.5 tons DM/acre.



Forage Energy

The forage energy (%TDN) was generally above 65% TDN for all corn types at all N rates including the control (0 lb N/acre) (Figure 3). This shows that the energy (%TDN) requirements of a gestating cow of 55% at mid-pregnancy stage and 60% at late-pregnancy have been exceeded.





Summary

Corn responds well to nitrogen, so adequate availability of nitrogen is critical to profitable corn production. However, excess nitrogen adds unnecessary expense and increases the risk of nitrate movement to groundwater. In the present study, the forage DM yield increased with increased N rates for all corn types. The highest N rate (140 lbs N/acre) increased DM yield by 2.8, 1.4 and 3.4 tons DM/acre over check (0 lb N/acre) respectively for A4414RR, Master Graze and Catt. We observed N deficiency in some plants with 0 lb N/acre. The deficiency first appeared on the lower leaves, manifested as yellowing, beginning at the tip of the leaf and proceeding down the midrib.

Field Scale Corn Seeding Rate Trial

By *Akim Omokanye, PCBFA*
Collaborating Producer: Koos & Barbara Bos, Peace River

Plant population refers to the number of plants per acre; planting or seeding rate refers to the number of seeds planted per acre. Optimum plant population depends on factors such as hybrid, moisture stress level, soil fertility, and yield goal. In the Peace, for silage or grazing, the suggested seeding rate has been 30,000 kernels per acre for years and the recommendation is based on studies carried out elsewhere, outside of the Peace region. A few producers seed more than the 30,000 kernels/acre suggested seeding rate in the Peace. We are aware that more plants per acre should equal more ears/acre which should be beneficial for optimizing yield. On the other hand, kernel numbers per plant and weight per kernel eventually decrease with increasing plant populations. PCBFA conducted on-farm studies on seeding rates for 2 years to determine how corn yield responds to plant population.

Methods

The trial site was at Koos & Barbara Bos, near the Peace River Airport in 2015 and 2016. The site has had corn for some years, so no fertilizer was applied to the corn crop in both years.

Demonstration strip design was used in large plots. DuPont Pioneer 39F44 corn hybrid (Roundup Ready corn) with 2000 corn heat units (CHUs) requirement was seeded in 2015 and in 2016, we used DuPont Pioneer P7213.

We used a 12-row corn planter at 22" seed row spacing to seed. There were 4 treatments (seeded kernels per acre) consisting of approximately:

1) 38,000 kernels/acre
2) 36,000 kernels/acre
3) 34,000 kernels/acre
4) 32,000 kernels/acre

Seeding was done on May 17 in both years (2015 & 2016). Roundup® was used to control weeds.

Corn forage yield was determined from several 23.8' row lengths when most cobs were at the half milk line stage. Plant height was measured and the number of ears per plant counted at harvest. We also determined final plant population. Notes were also taken on cob development and kernel stage. Wet corn forage samples (whole plant) were analyzed by A&L Canada Laboratories Inc., London, Ontario.

Results & Discussion

Final Plant Population, Plant Height & Number of Ears

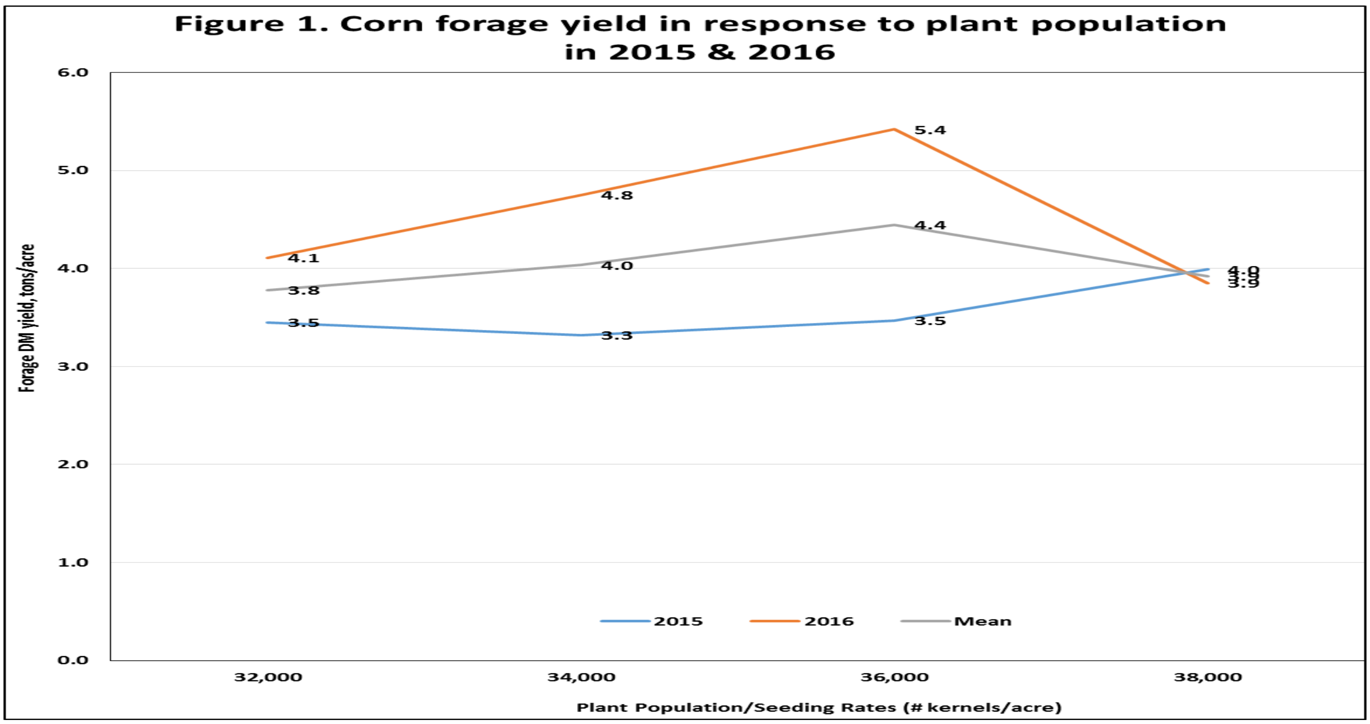
In the 2 years (2015 & 2016), the mean percent stand (final population divided by seeding rate) was 94% (ranging from 91% to 100%) and there was no consistent difference in the final population recorded following the different seeding rates tested. This indicates that seed germination, emergence and vigor were very good for all seeding rates. It is important to note that final populations are usually expected to be lower than the seeding rates due to germination problems, emergence problems, or subsequent plant mortality.

Plant height is an important component which helps determining the growth attained during the growing period. The mean plant height over both years (2015 & 2016) was significantly affected by seeding rates (Table 1). Plant height decreased from 225 cm for 32,000 kernels/acre to 190 cm for 38,000 kernels/acre, the result of the competition-density effect of plant populations.

The number of ears per plant was similar for all seeding rates and the average was 2 ears per plant. However, we observed that lower seeding rates showed better cob development. Lower seeding rates also attained about 3/4 milk-line stage at harvest compared to the highest seeding rates (38,000 kernels/acre), which seemed to have milk-line just about the half mark.

Corn Forage DM Yield

Over the 2 years (2015 & 2016), the mean corn forage DM yield increased from 3.8 tons DM/acre for the lowest seeding rate (32,000 kernels per acre) to 4.4 tons DM/acre for the mid-range seeding rate (36,000 kernels per acre), after which it decreased to 3.8 tons DM/acre for the highest seeding rate tested here (38,000 kernels per acre). Though we used different varieties in both years and we did not calculate the economical optimum plant population for various seed costs and corn silage prices, the decrease in corn forage DM yield beyond 36,000 kernels per acre probably suggests that we could increase the seeding rate from the 30-32,000 kernels per acre that is currently suggested for producers in the Peace, to 36,000 kernels per acre for grazing or silage purposes.



Protein

The forage crude protein (CP) did not show any consistent response to increased seeding rates (Table 1), indicating that plant population may not play any significant role in corn forage CP content. For a gestating beef cow, the forage CP values obtained for all seeding rates were enough for this category of beef cow, which requires 7% CP at mid-gestation and 9% CP at late-gestation.

Energy

The forage energy (%TDN) varied from 66% for 32,000 kernels/acre to 63% for 38,000 kernels/acre (Table 1). All seeding rates had the 55-60% TDN required by a gestating beef cow, depending on its pregnancy stage.

Minerals

The minerals tested here, in most cases, were similar for all the seeding rates (Table 1).

Table 1. The mean (2015 & 2016) plant height (Plant H) and forage minerals																	
Kernels	**Plt H**	**CP**	**Ca**	**P**	**K**	**Mg**	**Na**	**S**	**Cu**	**Fe**	**Zn**	**Mn**	**NEL**	**NEG**	**NEM**	**TDN**	**RFV**
per acre	**cm**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**ug/g**	**ug/g**	**ug/g**	**ug/g**	**Mcal/kg**	**Mcal/kg**	**Mcal/kg**	**%**	
38,000	190	9.42	0.19	0.21	1.19	0.19	0.01	0.09	4.14	268	31	31	1.42	0.81	1.53	62.7	97
36,000	217	10.7	0.19	0.22	1.14	0.23	0.01	0.10	4.89	255	28	24	1.46	0.85	1.57	64.1	106
34,000	217	9.68	0.17	0.20	1.15	0.19	0.01	0.10	4.47	259	25	22	1.46	0.86	1.58	64.3	108
32,000	225	10	0.18	0.20	1.20	0.22	0.01	0.10	4.79	264	23	23	1.42	0.81	1.53	65.6	100

Conclusion

The optimum final plant population is that which best balances the benefit of more ears per acre (since ears form about 60% of corn total DM yield) with the disadvantage of smaller ears and lighter grain. Over the 2 years (2015 & 2016), forage DM yield peaked at 36,000 kernels/acre. This therefore seems to suggest that up to 36,000 kernels could be used as a corn seeding rate without much compromising on forage protein, energy and minerals for a dry gestating beef cow. Please note that stalk health and integrity often falter as plant population increases beyond some maximum threshold as we observed for the highest seeding rates used in this tests (38,000 kernels/acre). The primary exception to what we observed here would be those soils or growing conditions that severely limit yield potential (e.g. low moisture).

Demonstration of Corn Intercropping Systems to Improve Corn Forage Quality

By Akim Omokanye, PCBFA

Over 100 corn forage samples have been analyzed for quality by PCBFA in the last few years, and the majority of the samples came from producers' fields. In summary, the forage quality results have shown that corn would normally have adequate protein and energy values needed by gestating cows. Essential minerals (except for Na) are always being met as well by corn forage. Occasionally, the protein content may fall short of what is needed by cows at the late-pregnancy stage and for producers wanting to use corn silage for backgrounding calves, the 12-13% protein required by these calves can hardly be met by a sole corn crop. To address this issue, we decided to test a few different crop types with corn as companion crops in order to determine biomass yield and silage quality of corn mixed with other crop types. Studies elsewhere have shown that intercropping of corn with legumes is an alternative to corn mono-cropping and has a number of advantages, for example, lower levels of inputs, lower cost of production and better silage quality than monocrop systems.


Mono-corn (check), Aug 25


Crimson clover- broadcast after spraying


Crimson clover- after spraying corn

Methods

The demonstration site was at the Fairview Research Farm (NW5-82-3W6) on RR #35, MD of Fairview. Soil test at 0-6" soil depth prior to seeding showed an organic matter content of 7.3%, a pH of 5.4 (acidic) and an electrical conductivity of 0.58 dS/m.

The field was cultivated before seeding corn.

Rainfall from seeding-killing frost was 13.8". The date of killing frost was September 4 and the total corn heat units (seeding-Killing frost) recorded was 1711.

Demonstration strip design was used in small plots measuring 11.04 m^2 (118.8 ft^2).

Treatments (Varieties): A corn mono-crop (check) was tested against the following corn intercrops:

1. Corn/crimson clover (CC) broadcast (C-CCB) - CC was broadcast onto corn plot after corn spraying @ 4-6 leaf stage with Roundup Weather Max
2. Corn/CC intercrop (C-CCD)- CC was drilled between corn rows after corn spraying @ 4-6 leaf stage with Roundup
3. Corn/Tillage radish (TR) intercrop (C-TR) - TR was drilled between corn rows after corn spraying @ 4-6 leaf stage with Roundup
4. Corn/Hairy vetch (HV) intercrop (C-HVD)- HV was drilled between corn rows after corn spraying @ 4-6 leaf stage with Roundup
5. Same day seeding of Corn/Hairy vetch (HV) intercrop & sprayed with Roundup Weather Max (C-HVD-RR) - HV and corn seeded in alternate rows same day and later sprayed with Roundup when corn was @ 4-6 leaf stage

6. Same day seeding of Corn/Hairy vetch (HV) intercrop and sprayed with Basagran Forte (C-HVD-BF) HV and corn seeded in alternate rows same day and later sprayed with Basagran Forte when corn was @ 4-6 leaf stage
7. Corn/soybean intercrop (C-SOY) - same day seeding of both corn & soybean, followed by spraying of both crops with Roundup when corn was @ 4-6 leaf stage

Seeding rates:
1. Corn - 30,000 kernels per acre
2. Crimson clover broadcast - 4.0 lbs/acre, drill - 3.0 lbs/acre
3. Tillage radish - 2.0 lbs/acre
4. Hairy vetch - 3.75 lbs/acre
5. Soybeans - 70,802 seeds/acre

Corn as well as same day intercropping treatments were seeded on May 17, 2016. We used a 6-row John Deere corn planter at 30" row spacing. Fertility (lbs actual/acre) was 84 N + 30 P + 66 K + 0 S and broadcast just before the land was tilled.

Results & Discussion

Forage Yield

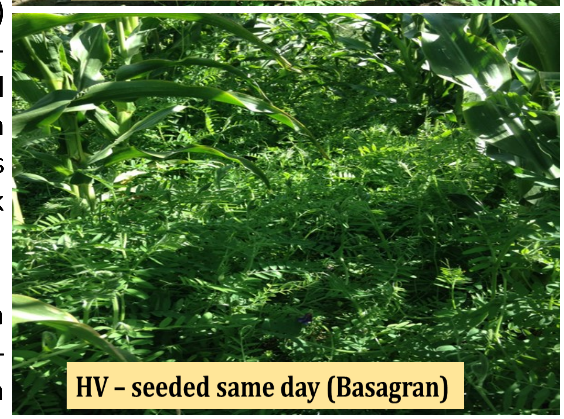
Most intercrops appeared to have some influence on total forage yield. Forage yield was much higher (5.9 tons/acre or more) for soybeans (C-SOY), hairy vetch seeded after corn spraying (C-HVD) and same day seeding of corn/hairy vetch & sprayed with Basagran Forte (C-HVD-BF) than check (mono-crop corn). The total forage yield as percent of check (mono-crop corn) varied from 98% for (C-CCB) to 127% for (C-SOY). The following intercrops did not seem to have any forage yield improvement over check (sole corn): C-CCB and C-HVD-RR.

We observed that corn height, corn cob development and corn forage yield were negatively affected by corn-tillage radish intercrop system (C-TR). Tillage radish significantly reduced corn height compared to check and other intercrops. This is probably because tillage radish is known to take up N from both topsoil and from deeper soil layers, storing the N in their shoot and root biomass. *Studies elsewhere have shown that more than 100 lbs/acre of N has been reported to be taken up by tillage radish from both layers, though it releases the N in spring. Tillage radish root dry matter has also been reported to commonly contain more than 0.5% P and 4% K.*

It has been reported that Roundup is not effective in killing hairy vetch, so we decided to test that theory by seeding corn and hairy vetch same day (C-HVD-RR) and this was later sprayed with Roundup. We observed that Roundup did affect hairy vetch greatly, though it did not completely kill hairy vetch stands.


Hairy vetch - after spraying corn


Hairy vetch- same day (R UP)


HV – seeded same day (Basagran)


Tillage radish root sample in C-TR intercrop

Hairy vetch did recover slowly and the forage yield from Roundup sprayed hairy vetch plot was far lower than C-HVD-BF treatment, which was sprayed with Basagran Forte (Table 1).

Protein (Table 1)
Using tillage radish, crimson clover (when drilled), soybeans and hairy vetch as companion crops appeared to have improved forage crude protein (CP) content of the respective intercrops (12-14% CP) compared to check (11% CP). Overall, the CP exceeded the protein requirements of mature beef cattle and, in some cases, were well within the 12-14% CP needed by growing and finishing calves.

Energy
The forage energy (TDN) content of the intercrops (except for corn-tillage intercrop) as well as check was 67% TDN or higher (Table 1). The Corn + drilled hairy vetch (sprayed with Basagran Forte, C-HVD-BF) had the highest TDN (73%). Overall, except for corn-tillage intercrop, all intercrops and check had enough TDN for mature beef cattle, and were well within the 65-70% TDN required by growing and finishing calves. The C-HVD-BF intercrop system however, far exceeded the required energy for young and mature beef cattle.

Minerals
The forage Ca, K, Mg, Na and S values were higher for Corn + drilled tillage radish (C-TR) than other intercrops and check (Table 1). The forage P content was higher for both C-TR and C-HVD-BF than other intercrops and check.

Table 1. Forage DM yield, crude protein (CP) and minerals of corn intercrop systems

Corn Intercrop System	DM (ton/ac)	CP %	TDN %	Ca %	P %	K %	Mg %	Na %	S %
Corn + broadcast crimson clover (C-CCB)	4.7	11	67	0.36	0.20	1.10	0.31	0.02	0.14
Corn + drilled crimson clover (C-CCD)	5.3	14	69	0.58	0.24	1.60	0.32	0.07	0.16
Corn + drilled tillage radish (C-TR)	5.7	14	70	0.85	0.29	1.93	0.46	0.31	0.42
Corn + drilled hairy vetch (C-HVD)	5.7	14	60	0.51	0.25	1.61	0.30	0.01	0.15
Sole corn (check)	4.8	11	67	0.51	0.24	1.36	0.33	0.01	0.18
Corn + drilled soybeans (C-SOY)	6.1	13	69	0.59	0.25	1.27	0.42	0.03	0.17
Corn + drilled hairy vetch & sprayed with Basagran Forte (C-HVD-BF)	6.0	14	73	0.58	0.29	1.61	0.35	0.01	0.17
Corn + drilled hairy vetch & sprayed with Roundup (C-HVD-RR)	4.9	12	68	0.45	0.23	1.14	0.36	0.01	0.14

All intercrops as well as check met the Ca, P, K and Mg requirements of a dry gestating cow, but a few (C-CCB and C-HVD-RR) fell slightly short of meeting the 0.15% S required by this category of cows. Corn + drilled tillage radish (C-TR) had far more Na content than other intercrops and check. The requirement of Na by a mature beef cow was exceeded by up to 0.21% by C-TR. The C-CCD system was within the recommended 0.06-0.10% Na for a mature cow.

The requirements of Ca & P (in some cases), K, Mg and S (except for C-CCB and C-HVD-RR) by mature beef cattle have all been met by these intercrops and check.

Conclusion

Except in a few instances, our observations from this demonstration of corn intercrops seem to show that drilling crops such crimson clover, tillage radish, hairy vetch and soybeans in alternate rows with corn may have the potential of improving both total forage yield and quality for the benefit of mature and young beef cattle. Intercropping corn with legumes such as C-SOY and C-HVD-BF, to some extent appeared to be more effective than mono-crop corn in producing higher DM yield for silage with better quality. Successfully incorporating cover crops into silage corn production will take advanced planning to realize the benefits these crops can offer.

Some characteristics of crops used as companion crops with corn

Hairy vetch

Hairy vetch is a legume and has vine-like growth habit, which is 12 to 20" in monoculture. It grows 3 to 4 ft in height if sown with cereals - but actual vine length may be much longer. It is drought tolerant once established. Does best on sandy soils. Does well on most soils if well drained and prefers soil pH of 6.0 to 7.0. It fixes nitrogen (can contribute up to 150 lbs N/acre) - can add enough nitrogen to provide almost all of the needs of the subsequent crop and can make K more accessible to subsequent crops. Hairy vetch adds to soil biological diversity and supports several beneficial insects.

Crimson clover

Crimson clover is an annual forage legume. Can grow up to 12-20" tall at maturity. It is a good soil builder and prevents erosion. It can produce similar N yields to hairy vetch. Its taproot can reach a depth of 12-21" and produces a good forage crop. There may be a slight risk of bloat when grazing as a mono-crop. Crimson clover grows well in mixtures.

Tillage Radish

Tillage radish is a brassica. It has a deep taproot that drills through compaction. The taproot can reach 30" or more in the soil. The root soaks up N, P, Ca and other key soil nutrients. It is easy to plant and may reach full growth within 30 days when seeded in late summer/early fall. It has rapid root decay, which helps improve water drainage & air movement. It helps to warm up soil in spring, helps to suppress nematodes and attracts earthworms.

Soybeans

An annual legume crop that if properly inoculated, is capable of fixing nitrogen from the atmosphere. This gives them the ability to add nitrogen to the soil, providing 'free' nitrogen to benefit a companion or subsequent crop. Inoculation is important because our soils will not normally contain the required bacterium.

Demonstration of 14 Soybean Varieties for Forage

By *Akim Omokanye, PCBFA*

Soybean plants may be grazed or harvested from the flowering stage to near maturity for use as high-quality hay. Soybeans may also be grown as a silage crop in pure culture or cocktail mixtures (with appropriate varieties). Agronomically, soybeans have the advantage of fixing nitrogen when properly inoculated, and do not require a lot of specialized equipment to grow. Crop species and variety choice for silage or greenfeed is one of the important decisions any beef cattle producer makes. The objective of this trial was to test and select soybean varieties for forage yield and quality for livestock use based on local growing conditions.

Methods

Site used was the Fairview Research Farm (NW5-82-3W6) on RR #35, MD of Fairview. The site had oats planted for greenfeed in 2015. The soil test at 0-6" soil depth done at Exova laboratory (Edmonton) prior to seeding showed an organic matter content of 7.1%, a pH of 5.5 (acidic) and an electrical conductivity of 0.35 dS/m. The field was cultivated before seeding.

Demonstration strip design was used in small plots measuring 11.04 m^2 (118.8 ft^2).

10 Roundup ready soybean varieties (see Table 1) were seeded on May 18, 2016 with a 6-row Fabro plot drill at 9" row spacing. Inoculated soybean seeds were used.

Fertility was 40 lbs/acre of 11-52-0. Seeding rate was 222,672 seeds/acre (5.1 seeds/sq ft).

Roundup was used for in-crop weed control once. Hand weeding took place twice.

Notes were taken on seedling emergence, flowering, lodging and plant height. Crop harvest for forage yield estimation and feed quality test was done on August 25, 2016.

Results

Forage Moisture (Table 1)

The forage moisture content at harvest of standing soybean forage (on August 25, 2016) varied from 64-70% and at this stage the varieties were within the 65% moisture for ensiling.

Forage DM yield (Table 1)

The forage DM yield was highest for Vito (6167 lbs DM/acre). Only 4 (Vito, TH 330033, Mammoth R2 and Agris R2) out of the 10 soybean varieties tested produced 5600 lbs DM/acre or more.

Forage Quality

The forage protein (CP) content varied from 15-25% for soybean varieties tested here (Table 1). Only 3 (Alotus R2, Mcleod R and Pekko R2) out of the 10 varieties had <20% CP, others had 20% CP or more. The forage CP far exceeded the protein requirements of growing and finishing calves (12-13% CP) as well as mature beef cattle (11%).

Table 1. Forage DM yield, crude protein (CP) and minerals of 10 soybean varieties tested in 2016												
	DM yield	CP	Macro minerals						Trace minerals			
			Ca	P	K	Mg	Na	S	Cu	Fe	Zn	Mn
Variety	lb/ac	%	%	%	%	%	%	%	Ug/g	Ug/g	Ug/g	Ug/g
Akris R2	5647	25.3	2.12	0.37	1.50	1.15	0.01	0.25	4.67	192	91.5	133
Alotus R2	3242	17.2	2.54	0.34	1.33	1.15	0.01	0.25	6.03	214	87.5	76
Chadburn R2	4577	20.2	2.30	0.36	1.58	0.92	0.01	0.24	4.67	223	100	108
Currie R2	3226	23.5	1.95	0.46	1.91	0.93	0.01	0.29	6.87	158	66.2	85
Mammoth R2	5717	25.0	2.31	0.31	1.80	0.79	0.01	0.26	5.25	245	82.0	92
Mcleod R	4896	16.2	2.38	0.34	1.75	0.88	0.01	0.24	5.91	176	99.7	95
Pekko R2	3832	15.4	1.99	0.34	1.33	0.65	0.01	0.20	4.31	174	88.7	100
POO1T342	1903	20.0	2.23	0.34	1.19	1.67	0.01	0.23	5.14	220	69.8	76
TH 330033	5935	23.5	2.34	0.34	1.37	0.86	0.01	0.24	4.21	157	78.4	113
Vito	6167	22.9	2.16	0.31	1.51	0.78	0.01	0.25	5.15	174	86.1	102

The forage Ca and P were generally high for all soybean varieties tested. Comparing the forage mineral values obtained in this study with beef cattle (young and mature) mineral requirements, only Na and Cu requirements were not met by any of the soybean varieties tested. Other mineral requirements by beef cattle were met by all soybean varieties.

Forage energy content (TDN) was >60% for all varieties and this was sufficient for cows in the mid- and late-pregnancy stages, but only 6 varieties had adequate TDN for a lactating cow (65% TDN) (Table 2).

Table 2. Forage detergent fibers (ADF & NDF) and energy of 10 soybeans								
	Fibers			Energy				
	ADF	NDF	NFC	TDN	NEL	NEG	NEM	RFV
Variety	%	%	%	%	MCal/kg	MCal/kg	MCal/kg	
Akris R2	29.7	36.4	26.8	65.8	1.50	0.90	1.62	174
Alotus R2	34.2	36.0	35.3	62.2	1.41	0.80	1.52	161
Chadburn R2	31.6	35.2	33.1	64.3	1.46	0.86	1.58	171
Currie R2	30.3	33.3	31.7	65.3	1.49	0.89	1.61	182
Mammoth R2	29.1	32.6	30.8	66.3	1.51	0.92	1.64	190
Mcleod R	32.9	38.0	34.3	63.3	1.44	0.83	1.55	155
Pekko R2	28.0	30.1	43.0	67.1	1.53	0.94	1.66	207
POO1T342	36.5	45.1	23.4	60.5	1.37	0.75	1.47	125
TH 330033	25.3	31.7	33.3	69.2	1.58	1.00	1.72	203
Vito	28.5	33.7	31.9	66.7	1.52	0.93	1.65	184

Conclusion

Soybeans can be harvested as a hay or silage crop. By August 25, 2016, when the varieties were harvested, all varieties were within the 65% moisture content for ensiling. The forage yield potential of soybeans can be as high as 3.1 tons DM per acre. We observed that soybean forage varieties are similar to most legumes, making soybeans a good forage if harvested properly and at the right stage of maturity.

Using Subsoiling to Reduce Soil Compaction in Pastures

By Akim Omokanye & Lekshmi Sreekumar, PCBFA
Collaborator: *Mackay Ross, Cleardale*

On beef cattle operations, at some point, forage production of hay fields and pastures will no longer meet minimum production expectations based on previous years' production. This could be due to several factors such as reduced stand vigour, invasion of less productive plant species, over grazing, reduced soil fertility and general poor soil health. The consistent use of heavy machinery for conserved forage production practices (hay, haylage, greenfeed or silage production) or cattle trampling in pastures have been identified as factors responsible for compacted soil layers in beef cattle production systems. Compacted soils could restrict water infiltration into soil, root penetration and nutrient uptake, and reduce soil respiration by reducing pore space and limiting oxygen diffusion. The overall effect of compacted and unhealthy soil is reduced forage yield.

Rejuvenation of old forage stands is always a complex and costly challenge for beef cattle producers. Studies have shown that subsoiling could be used to loosen the compacted soil layers, allowing roots to penetrate deeper into the soil profile, increasing water infiltration and retention, increasing air spaces in the soil and improving conditions conducive to biological activity and overall soil health. Subsoiling fractures compacted soil without adversely disturbing plant life, topsoil, and surface residue. In choosing the type of subsoiler, the objectives of the operation and the field characteristics must be taken into account. The objective of this study was to conduct a preliminary assessment on the suitability of different types of subsoilers (in combination with or without rolling) for reducing soil compaction, improving water infiltration and increasing forage yield.

Methods

An on-farm study was conducted from fall (October 2015) to summer (July 2016) on a pasture paddock in Cleardale. The paddock was initially seeded to creeping red fescue. Alsike clover was later broadcast (12 years later, 2011) onto the paddock.

A demonstration strip design was used.

We used 2 types of subsoilers - a Sumo (GLS-Grassland) subsoiler and an Agrowplow (Model AP91).

The subsoiling treatments consisted of the following:

1. Sumo alone – subsoiling to a depth of 12''
2. Sumo + rolling - subsoiling to a depth of 12'' followed by rolling
3. Agrowplow alone - subsoiling to a depth of 12''
4. Agrowplow + rolling - subsoiling to a depth of 12'' followed by rolling
5. Control (check)

The treatments were implemented in early fall on October 9, 2015.

At approximately 9 months after subsoiling, the following field measurements were taken on July 7, 2016:

1. Water infiltration with aluminized coated rings of 6'' diameter and 5 ¼'' height.
2. Compaction reading with a digital penetrometer at 1" interval to a soil depth of 12"
3. Soil moisture content from 0-6" soil depth with gravimetric method
4. Forage DM yield and nutritional value

Results and Interpretation

Soil Moisture (Table 1)

The soil moisture content was significantly affected by subsoiling treatments. A combination of Agrowplow subsoiling plus rolling gave the highest soil moisture content (20.3%), while the control recorded the lowest moisture content (15.4%).

The higher soil moisture content obtained for all subsoiling treatments (subsoiling alone or subsoiling + rolling) over control, clearly shows the benefits of subsoiling pasture paddock for soil water storage.

Infiltration (Table 1)

Soil infiltration refers to the ability of the soil to allow water to move into and through the soil profile. Infiltration allows the soil to temporarily store water, making it available for use by plants and soil organisms. The infiltration rate is a measure of how fast water enters the soil, typically expressed in inches per hour. If the rate is too slow, it can result in ponding in level areas, surface runoff, erosion in sloping areas, and can lead to flooding or inadequate moisture for crop production. Sufficient water must infiltrate the soil profile for optimum crop production.

In our study, water infiltration rate was highest for Agrowplow + Rolling (3.84 inches/hour), followed by Agrowplow alone (3.07 inches/hr), and water infiltration was lowest for control (0.29 inches/hr). Generally, the Agrowplow seemed to allow more water to infiltrate at a higher rate than the Sumo type of subsoiler, but a combination of Agrowplow + rolling seemed to have more beneficial soil water intake effects. The mean infiltration rate following subsoiling alone (Sumo & Agrowplo, 2.26 inches/hr) was lower than the mean infiltration rate following subsoiling + rolling (Sumo & Agrowplo + rolling, 2.33 inches/hr). Agrowplow + rolling appeared to improve infiltration rate better than Agrowplow alone by 0.77 inches/hr. This was not the case with Sumo + rolling over Sumo alone.

Soil acts as a sponge to take up and retain water. The downward movement of water within the soil is called percolation, permeability or hydraulic conductivity. Permeability also varies with soil texture and structure. Permeability is generally rated from very rapid to very slow (Table 2). Looking at Table 2, with an infiltration rate of 3.84 inches/hr recorded for Agrowplow + rolling, it shows that Agrowplow + rolling had a moderately rapid water infiltration. On the other hand, the control, which had 0.29 inches/hr seems to show a moderately slow infiltration. Overall, our results show that subsoiling alone or a combination of subsoiling + rolling improved infiltration more than control. A high infiltration rate is generally desirable for plant growth and the environment. The results obtained in this study for subsoiling treatments compared to control clearly show that infiltration rate can be improved temporarily with tillage such as subsoiling that breaks the compaction layer, fractures dense soil profiles, and improves soil physical quality.

Table 1. Soil moisture, infiltration rate and compaction, and forage moisture and dry matter yield following subsoiling treatments on pasture paddock

Treatment	Soil Moisture (%)	Infiltration Rate (inches/hr)	Compaction (PSI)	Forage Moisture (%)	DM Yield (lb/acre)
Sumo	16.9	1.45	72	71.8	1653
Agrowplow	17.2	3.07	50	76.1	2229
Sumo-R	19.2	0.83	33	86.8	1866
Agrowplow + Rolling	20.3	3.84	36	77.0	1760
Control	15.4	0.29	312	76.7	1306
$LSD_{0.05}$	*0.49*	*0.31*	*34*	*1.79*	*92.2*
Significance (P<0.05)	*	*	*	*	*
CV, %	*1.50*	*15.5*	*22.7*	*1.23*	*2.78*

Table 2. Permeability classification systems	
Permeability class	**Rate (inches/hour)**
Very rapid	Greater than 10
Rapid	5 to 10
Moderately rapid	2.5 to 5
Moderate	0.8 to 2.5
Moderately slow	0.2 to 0.8
Slow	0.05 to 0.2
Very slow	Less than 0.05

Compaction

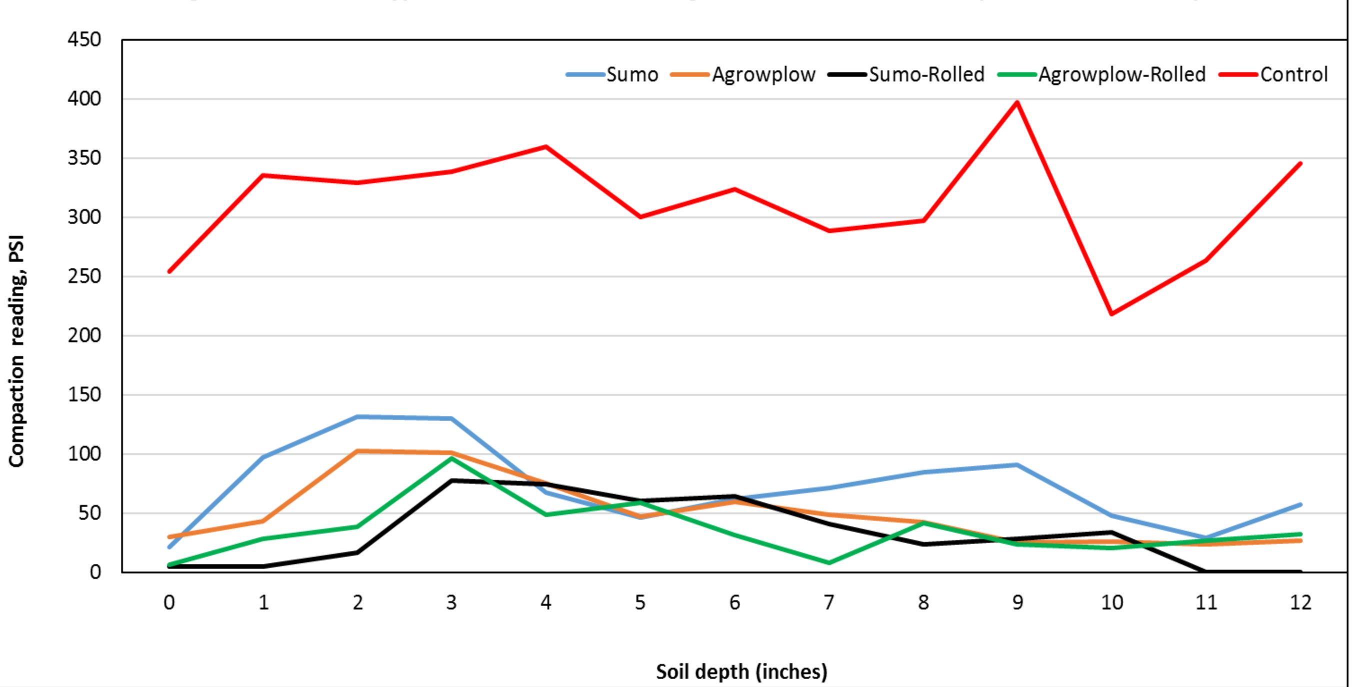
Readings of 400 to 500 PSI would indicate potential soil compaction. With a compaction reading of 312 PSI for the control, the pasture paddock used for this study did not seem to have a serious compaction issue. However, subsoiling alone or with rolling was still able to reduce soil compaction compared to control. But subsoiling + rolling with both Sumo and Agrowplow seemed to reduce compaction better than subsoiling alone. This therefore confirms that tillage such as subsoiling can be used to reduce compaction issues on pasture paddocks.

Looking at each subsoiler type alone or a combination of subsoiling with rolling as well as control (Figure 1), control appeared to be consistently higher than all subsoiling treatments at every soil depth from 0 to 12". Generally, at <150 PSI from 0-12" for Sumo and Agrowplow with and without rolling indicate a lack of any compaction issues.

Soil penetrometers, designed to test soil strengths when a rod is pushed into the ground, can be used in some applications to identify compacted layers and how well subsoiling operations fracture the soil.

Determining the optimum time to subsoil depends on several factors, including maximizing belowground soil disruption, minimizing aboveground soil disruption, and minimizing tillage energy requirements.

Figure 1. Subsoiler types with or without rolling and their effects on compaction at 0-12" depth



Soil compaction (>400 PSI) can have a number of negative effects on soil quality and crop production including the following:

1. causes soil pore spaces to become smaller
2. reduces water infiltration rate into soil
3. decreases the rate that water will penetrate into the soil root zone and subsoil
4. increases the potential for surface water ponding, water runoff, surface soil waterlogging and soil erosion
5. reduces the ability of soil to hold water & air, which are necessary for plant root growth and function
6. impedes root growth and limits the volume of soil explored by roots
7. decreases the ability of crops to take up nutrients and water efficiently from soil
8. reduces crop yield potential

Table 3. Forage nutritional value following subsoiling with or without rolling

Subsoiler Type/ Rolling	CP	Ca	P	Mg	K	ADF	NDF	TDN	RFV
	%	%	%	%	%	%	%	%	
Sumo	16.6	1.12	0.28	0.27	3.67	27.1	42.5	69.7	148
Agrowplow	17.5	1.23	0.23	0.31	3.07	32.5	43.0	63.9	137
Sumo-R	16.2	1.49	0.25	0.34	3.09	30.2	43.5	66.4	140
Agrowplow + Rolling	18.3	1.32	0.28	0.32	3.57	28.3	40.4	68.4	154
Control	16.8	1.26	0.33	0.29	3.98	28.9	43.1	67.8	143

For more information on Agricultural Soil Compaction: Causes and Management (Agdex 510-1. October 2010), please visit http://www1.agric.gov.ab.ca/$Department/deptdocs.nsf/all/agdex13331

Forage yield (Table 1)

Agrowplow alone improved forage DM yield (2229 lbs/acre) better than Sumo alone (1653 lbs/acre) or any of the subsoilers + rolling (Table 1). Control had the lowest forage DM yield (1306 lbs/acre) and control had 347 to 923 lbs /acre less DM yield than subsoiling treatments.

The better forage yield obtained from subsoiling treatments compared to control could be a reflection of high soil moisture, improved infiltration rate and reduced compaction.

Forage quality (Table 3)

The forage crude protein (CP) content appeared to be higher for Agrowplow + rolling than any other subsoiling treatment as well as control (Table 3). Generally, the CP obtained for control and the subsoiling treatments was 16% CP or more, indicating that all treatments as well as control had exceeded the CP requirements of growing & finishing calves (12-14% CP) and mature beef cattle (11% CP). The site contained a lot of clover stands and could be responsible for high CP content in the forage across the field.

The forage energy (TDN) was generally >60% TDN for all treatments, and they seemed to be enough for mature beef cattle's energy requirements.

The forage Ca, P, Mg and K did not show any consistent pattern with respect to the treatments tested. All the minerals measured here were adequate for a dry gestating cow. For a lactating cow, all treatments tested fell short of meeting the P requirement.

Overall, subsoiling alone or with rolling did not seem to have improved forage quality in this study.

2016 Forage Quality Summary

By *Akim Omokanye, PCBFA*

Nutrient concentration can vary considerably in feeds, especially forages. Use feed tests to target specific feeds to different livestock. Feed high quality forage to the most productive livestock or when nutrient needs are highest. Feed lower quality forage to animals with lower nutrient needs. Feed tests can help establish the dollar value of a forage, in the cash market or in personal use inventories. Use these tests to establish the value of your forage and to help determine what forages to feed, buy, or sell. Livestock are most productive when fed a ration balanced according to their nutrient needs. CowBytes is an easy-to-use beef ration balancing software package that you can use once you have your feed tests done. Using SheepBytes (for sheep) you can also formulate rations for sheep for different animal types (mature ewes and rams, replacement ewe lambs and ram lambs, early weaned lambs, growing lambs and finishing lambs). PCBFA's services to producers include feed testing, analysis and interpretation of results. This report looks at the 2016 forage type feed tests in the Peace. The results are discussed in relation to the nutrient requirements of mature beef cattle.

Methods

From July 2016 to January 2017, over 130 forage type feed samples from producers in the Peace were analyzed for quality. The feed samples were analyzed by Central Testing Laboratory (Winnipeg) using standard laboratory procedures for wet chemistry or Near-infrared reflectance (NIR) spectroscopy. The samples were grouped by forage/feed type into 10 groups (Tables 1 & 2).

Results and Interpretation

Protein (Table 1)

The forage crude protein (CP) was highest for grain screening with 14% CP, followed by cocktails (12% CP) and then straight legume hay, greenfeed & silage (11% CP). Grass aftermath, pea straw and cereal straw all had <7% CP.

With the exception of straight grass hay, grass aftermath, pea straw and cereal straw, other feed types had adequate CP for mature beef cattle. Straight grass hay was only able to meet the CP requirements of a cow in the mid-pregnancy stage.

Table 1: Different forage feed types analyzed for quality in the Peace in 2016

Forage feed types	No. of samples	% of total samples	Protein (CP, % DM basis)		TDN, % DM basis)	
			Mean	Range	Mean	Range
Straight grass hay	4	3.82	7.14	6.12-8.42	52.9	45.7-62.9
Straight legume hay	14	10.7	11.3	5.27-16.8	52.9	39.8-60.7
Alfalfa grass mix	75	57.3	10.1	4.93-16.0	58.4	52.5-64.2
Cocktails	5	3.05	12.0	10.3-13.1	64.4	53.8-68.3
Greenfeed	5	3.82	11.3	8.5-13.75	62.9	57.7-69.8
Silage	16	12.2	11.4	7.90-18.0	64.8	55.8-69.2
Grass Aftermath	7	5.34	5.75	4.3-7.21	48.6	43.2-50.4
Pea straw	2	1.53	5.18	4.48-5.88	39.2	37.5-41.0
Grain screening	1	0.76	13.5	13.5	66.9	66.9
Cereal Straw	2	1.53	4.47	4.22-4.73	47.6	36.2-59.0
Mean			*9.21*		*54.8*	
$LSD_{0.05}$			*5.87*		*13.6*	
Significant (P<0.05)			*		*	
CV, %			*24.3*		*8.92*	

The lower CP obtained for straight grass hay, grass aftermath, pea straw and cereal straw shows the need to use protein supplements when using any of those forage feed types for gestating beef cows.

Energy (Table 1)

Only four (cocktails, greenfeed, silage and grain screening) of the 10 forage/feed types analyzed had >60% TDN. The energy (%TDN) requirements of mature beef cattle are 55% in the 2nd trimester stage, 60% in the 3rd trimester stage and 65% during lactation. Five (straight grass hay, straight legume hay, grass aftermath, pea straw and cereal straw) of the forage/feed types fell short of meeting the minimum %TDN (55% TDN) needed by a gestating beef cow.

Forage Minerals (Table 2)

Pea straw and straight legume hay had higher forage Ca (>1.00% Ca) than other forage/feed types (Table 2). The forage/feed types analyzed all exceeded the 11% Ca required by a gestating beef cow. For the Ca requirements by a lactating beef cow, seven of the forage /feed types had adequate Ca required by this category of beef cow.

The forage P was higher for both cocktails and grain screening (about 0.30% P) than other forage/feed types (Table Four). Straight grass hay, grass aftermath, pea straw and cereal straw fell far short of 0.16% P needed by a gestating cow. Other feed types had adequate P for a dry gestating cow. For a lactating beef cow that needs 0.26% P, only cocktails and grain screenings had sufficient P.

Calcium and phosphorus are the major mineral constituents of bone. Calcium also plays an important role in muscle function, whereas phosphorus is key to major metabolic functions throughout the body (carbohydrate, protein and fat metabolism, and nerve and muscle function).

For grazing ruminants, Ca generally is adequate in forages (especially legumes). If Ca is not supplemented in adequate amounts, Ca deficiencies can result. These deficiencies will not become apparent until broken bones, convulsions and death occur. Phosphorus however, can be deficient in these forages, and since legumes contain higher levels of Ca, supplemental phosphorus generally is needed in forage-based diets.

The forage Mg varied from 0.07% Mg for cereal straw to 0.49% P for pea straw. Both grass aftermath and cereal straw fell short the Mg requirements of mature beef cattle. Other forage types were with the 0.12 to 0.26% Mg needed by mature beef cattle.

Except for grain screenings, all forage/feed types had >1.00% K. However, all forage/feed types tested here had sufficient K for mature beef cattle.

Potassium should not exceed 3%. If it does, ratios of potassium, magnesium and calcium will have to be adjusted. Magnesium concentration in feed is rarely a problem in beef cattle diets as it does not usually exceed 1.2%.

NE_M - The net energy for maintenance (NE_M) was mostly above 1.00 Mcal/kg for all forage feed types. A dry gestating cow re-quires 0.97-1.10 Mcal/kg NE_M and a lactating cow requires 1.19-1.28 Mcal/kg NE_M. Growing and finishing calves require 1.08-2.29 Mcal/kg NE_M. Looking at the individual NE_M values in Table 2, straight grass hay, grass aftermath, pea straw and cereal straw have failed to meet the NE_M requirements of mature beef cattle as well as growing and finishing calves.

NEG - Growing and finishing calves require 0.53-1.37 Mcal/kg NE_G. All forage feed types (except for straight grass hay, grass aftermath and pea straw) were within the suggested 0.53-1.37 Mcal/kg NE_G for calves.

Table 2: Minerals, ADF & other forms of energy for different forage type feeds in the Peace in 2016 (ADF: Acid detergent fiber, TDN- Total digestible nutrients, ME- Metabolizable energy, NE_G –Net energy for gain, NE_L-Net energy for lactation, NE_M- Net energy for maintenance, RFV-Relative Feed Value). NS, stands for not significant (P>0.05)										
Forage feed types	Ca	P	Mg	K	ADF	ME	DE	NE_L	NE_M	NE_G
	%	%	%	%	%	Mcal/kg				
Straight grass hay	0.32	0.1	0.12	1.39	52.3	1.57	1.89	0.93	0.73	0.19
Straight legume hay	1.15	0.17	0.23	1.72	41.4	1.99	2.39	1.21	1.13	0.57
Alfalfa grass mix	0.94	0.16	0.19	1.5	41.1	2	2.41	1.23	1.15	0.59
Cocktails	0.61	0.30	0.18	1.71	42.9	1.93	2.33	1.18	1.09	0.53
Greenfeed	0.47	0.22	0.23	1.45	43.5	1.94	2.33	1.17	1.09	0.53
Silage	0.91	0.23	0.22	1.83	37.7	2.13	2.57	1.31	1.27	0.69
Grass Aftermath	0.32	0.09	0.1	1.56	46.8	1.78	2.14	1.07	0.94	0.39
Pea straw	1.57	0.05	0.49	1.52	55.6	1.43	1.73	0.84	0.59	0.06
Grain screening	0.44	0.31	0.22	0.69	29.8	2.45	2.95	1.52	1.56	0.96
Cereal Straw	0.21	0.09	0.07	1.05	47.8	1.74	2.09	1.05	0.88	0.73
Mean	0.88	0.17	0.2	1.56	41.5	1.98	2.39	1.21	1.14	0.58
$LSD_{0.05}$	1.07	0.12	0.19	1.33	12.6	0.49	0.6	0.35	0.47	0.41
Significance (P<0.05)	*	*	*	NS	*	*	*	*	*	*
CV %	43.3	24.5	33.6	30.4	10.9	10.9	8.94	10.18	14.84	25.55

Table 3. Suggested nutrients requirements for beef cows from NRC (2000) and AAF (2004)			
Nutrient	**Requirement**		
	Growing & finishing calves	**Dry Gestating cows**	**Lactating cows**
Crude protein (CP), %	12-13	7-9*	11
Ca, %	0.31	0.18	0.42
P, %	0.21	0.16	0.26
Mg, %	0.1	0.12	0.2
K, %	0.6	0.6	0.7
Na, %	0.06-0.08	0.06-0.08	0.1
S, %	0.15	0.15	0.15
Cu, ppm	10	10	10
Zn, ppm	30	30	30
Fe, ppm	50	50	50
Mn, ppm	20	40	40
NE_M, MCal kg^{-1}	1.08-2.29	0.97-1.10	1.19-1.28
NE_G, MCal kg^{-1}	0.53-1.37	NA[Y]	NA
TDN, %	65-70[w]	55,60[z]	65

*, 7% for middle 1/3 of pregnancy, 9% for late 1/3 of pregnancy.
[Z], 55% for middle 1/3 of pregnancy, 60% for late 1/3 of pregnancy.
[Y], NA, not available. [W], for 6-10 months old growing bulls.

Progress Report on On-farm Evaluation of Forage-stand Rejuvenation Methods to Determine the Most Effective and Profitable Methods for Northern Alberta Producers

Collaborators: Soames Smith (Rycroft) & Bill Smith (Grovedale)
Funding Received from: Alberta Crop Industry Development Fund (ACIDF)
By *Akim Omokanye, PCBFA*

Producers' questions in the Peace on forage-stand rejuvenation methods always include: How much more forage does a reseed produce? How will I gain from forage stand rejuvenation? Where will I see the benefits? What reseeding methods or seeding equipment should I use? How can I reduce soil compaction and improve water infiltration? Can I seed in fall instead of spring? Are there studies comparing emerging new ideas of methods of rejuvenation to already established methods? To answer these questions, this project seeks to examine a dozen methods of rejuvenation of depleted forage stands at two locations in the Peace.

The key results of the project will include how to increase economic returns, how to improve forage quality and how to manage degraded soil with minimal environmental effects. The project is aimed at providing producers with a practical look at potential options and methods to improve the productivity of older forage stands. The different methods will be evaluated using the systems approach, which will examine individual production components (soil & environment, forage, livestock, and economics-cost/benefit analysis) and how these components interact.

Methods

There are 2 sites for this project. Site 1 is at Uddersmith Dairy-Soames Smith (organic beef farm), near Rycroft. Site 2 is at Bill Smith's (conventional beef farm) in Grovedale.

The tests were established using a Randomized Complete Block Design (RCBD) with three (3) replications at each site. Each treatment plot is about 0.25 acres in size making it approximately 10 acres (including gaps between treatment plots and replicates.

2015: Prior to any treatment implementation in 2015 and for baseline data, we took soil samples for soil nutrients and quality at 0-6, 6-12, 12-18 and 18-24" soil depths. We also determined forage yield and quality, plant composition/proportion, and took soil compaction readings as well as water infiltration rate. The treatments for different methods were implemented in 2015.

2016: For this report, 10 methods of pasture rejuvenation (treatments) are being examined for Site 2, while for Site 1, eleven (11) methods of pasture rejuvenation (treatments) are being reported on. In early July 2016, we measured forage yield and quality, and soil health (compaction, infiltration, nutrients, organic matter). Field notes on seeding establishment success were taken.

Results

Site 1: Uddersmith Dairy - Soames Smith (Organic beef farm), Rycroft

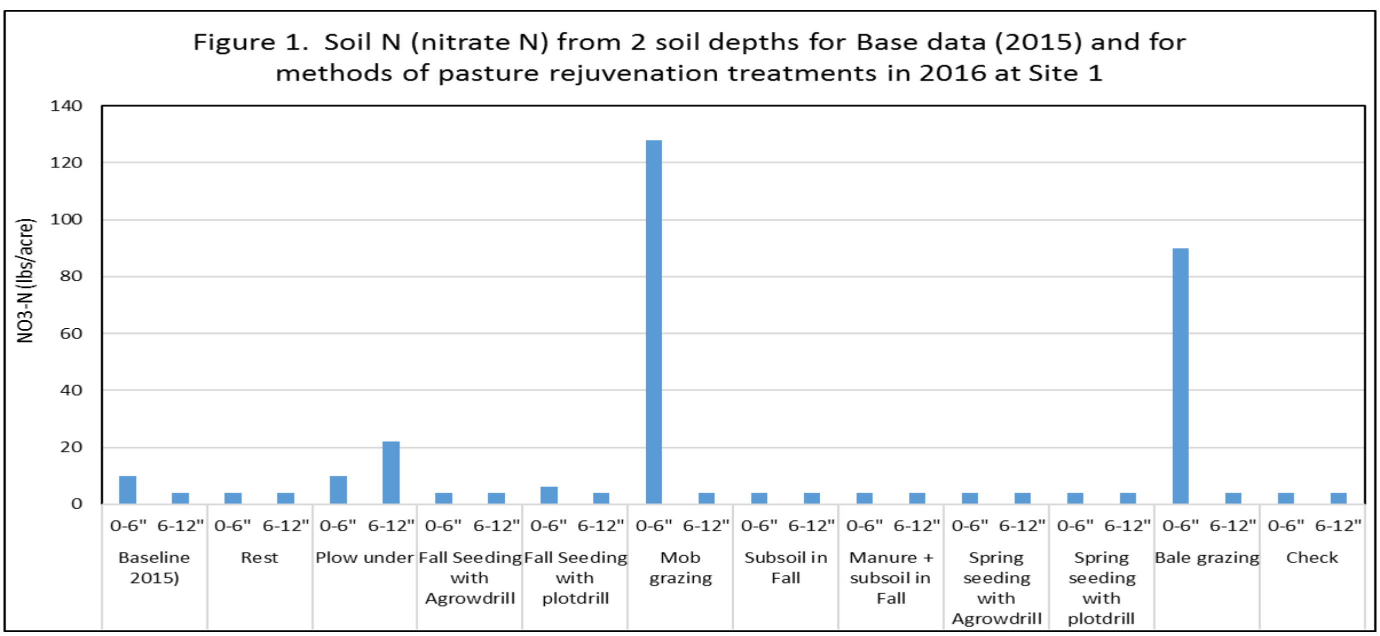
Soil Quality

The soil pH, organic matter and nutrients (N, P, K & S) as well as carbon and N and their ratios are shown in Table 1. The most obvious impact of some methods of pasture rejuvenation from Table 1 was the significant increases in soil N and P from a few methods.

The results of soil N (nitrate N) in 2016 showed that Bale grazing and Mob grazing had far more soil N (90 - 124 lbs/acre) than other methods (Table 1). Soil N for both Mob Grazing and Bale grazing was far more from 0-6” soil depth than at 6-12” depth (Figure 1). For Plow under, soil N seemed to be higher at 6-12” soil depth than 0-6” depth (Figure 1).

Table 1. The soil health indicator values from 0-6” soil depth for SOM, pH, N (nitrate N), P, K ,S and C:N in 2015 (base data) and for 11 treatments measured in 2016 at Site 1 (Uddersmith Dairy)

Methods of pasture rejuvenation	SOM %	pH	EC dS/m	N lbs/acre	P lbs/acre	K lbs/acre	S lbs/acre	C %	N %	C:N
Base data (2015)	5.2	5.7	0.34	10	38	996	8	3.97	0.35	11.3
Check	6.5	7.1	0.27	**10**	38	996	8	4.33	0.36	12.0
Rest	7.8	6.8	0.23	4	28	686	12	4.77	0.43	11.1
Plow under	8.1	6.4	0.29	10	26	1098	10	5.35	0.46	11.6
Fall Seeding with Agrowdrill	7.8	6.9	0.67	4	34	864	14	5.20	0.43	12.1
Fall Seeding with plot drill	7.2	6.8	0.22	6	40	796	10	4.32	0.36	12.0
Subsoil in Fall	7.4	7.3	0.40	4	26	1138	10	5.00	0.44	11.4
Manure + subsoil in Fall	8.4	7.2	0.52	4	120	1070	22	5.12	0.42	12.2
Spring seeding with Agrowdrill	6.9	6.9	0.22	4	32	692	10	4.87	0.43	11.3
Spring seeding with plot drill	7.7	6.8	0.21	4	34	978	12	5.38	0.45	12.0
Bale grazing	7.1	6.6	0.55	90	64	648	14	4.85	0.39	12.4
Mob grazing	6.9	7.0	0.25	128	76	1062	14	4.34	0.37	11.7



The soil P was highest for the method of pasture rejuvenation that involved Manure + Subsoil in Fall (120 lbs/acre), followed by Mob Grazing (76 lbs/acre) and then Bale Grazing (64 lbs/acre). Generally, soil P was higher at 0-6" than 6-12" depth, particularly higher for Manure + Subsoil in Fall.

The soil K was generally higher at 0-6" depth than 6-12" for all methods of pasture rejuvenation (Figure 3). Plow Under, Mob Grazing, Subsoil in Fall and Manure + Subsoil in Fall appeared to have higher soil K than other methods.

Soil water infiltration was higher for Subsoil in Fall, Bale Grazing, Fall Seeding with Agrowdrill, and Manure + Subsoil in Fall than other methods (Table 2).

Readings of 400 to 500 psi would indicate potential soil compaction. With a compaction reading of 399 PSI for the control, some of the methods of pasture rejuvenation being tested here seemed to have lessened the compaction issue (Table 2). On the other hand, Mob grazing and for some reason Spring seeding with Agrowdrill seemed to increased compaction.

Figure 2. Soil P at 2 soil depths for Base data (2015) and for methods of pasture rejuvenation treatments in 2016 at Site 1

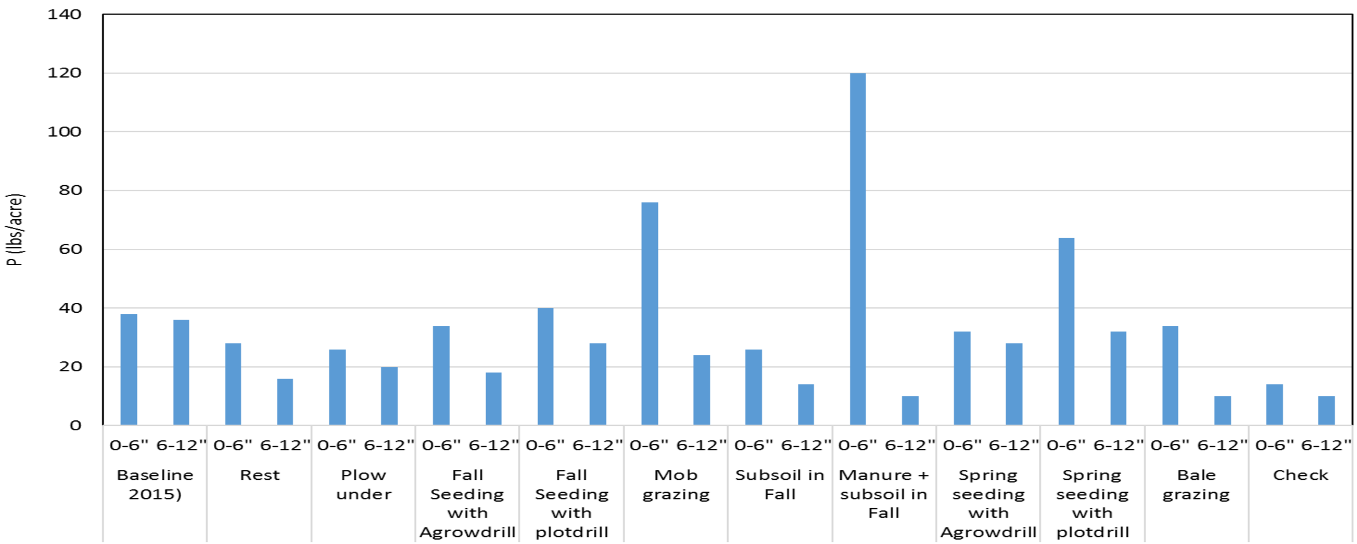
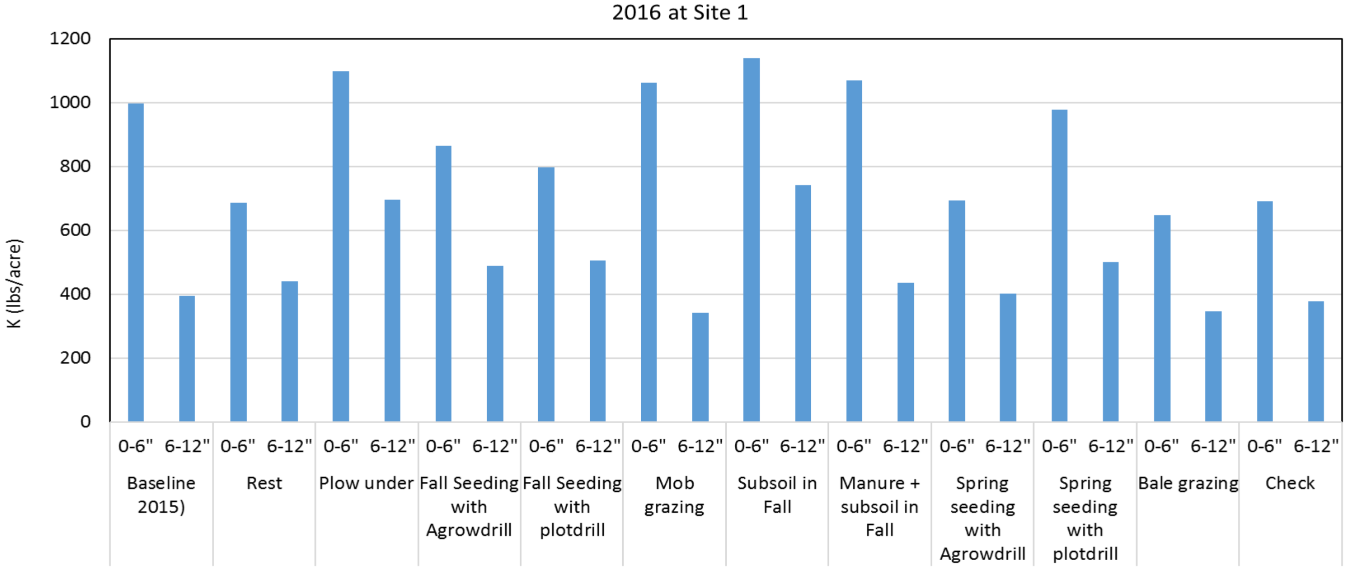


Figure 3. Soil K at 2 soil depths for Base data (2015) and for methods of pasture rejuvenation treatments in 2016 at Site 1



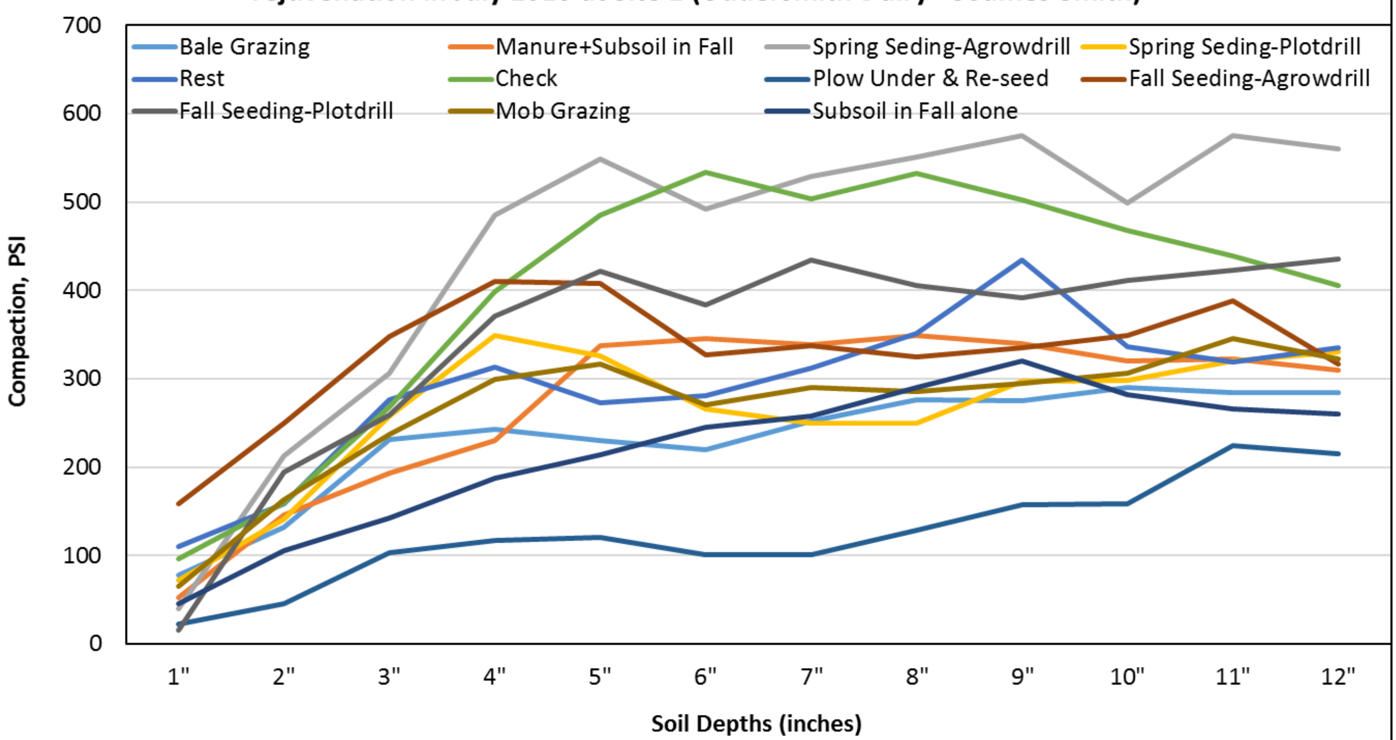
Looking at compaction readings from 0 to 12” in Figure 4, for some reason soil compaction was least improved by Spring seeding with Agrowdrill and Fall seeding with conventional drill. Figure 4 also shows that most methods of pasture rejuvenation showed significant improvement in soil compaction reduction over check.

Table 2. Infiltration rate, soil compaction and soil moisture content of different methods of pasture rejuvenation taken in July 2016 *(NS, not significant)*

Methods of pasture Rejuvenation	Infiltration (inches/hour)	Compaction (PSI)	Soil mositure %
Check	0.05	399	16.5
Subsoil in Fall	0.84	232	19.6
Bale grazing	0.72	233	16.4
Fall Seeding with Agrowdrill	0.67	343	18.6
Manure + subsoil in Fall	0.59	274	16.5
Plow under	0.50	124	13.2
Mob grazing	0.45	446	15.4
Spring seeding with plot drill	0.22	237	16.8
Rest	0.21	292	18.7
Spring seeding with Agrowdrill	0.09	448	14.2
Fall Seeding with plot drill	0.07	345	13.4
$LSD_{0.05}$	0.66	153	5.05
Significance ($P<0.05$)	NS	*	NS
Mean	0.37	308	16.5

A section of Plow under and re-seed method

Figure 4. Soil compaction from 0-12 inches for different methods of pasture rejuvenation in July 2016 at Site 1 (Uddersmith Dairy - Soames Smith)



Forage Dry Matter (DM) Yield

The forage DM yield was highest for Bale grazing (1939 lbs/acre), followed by Spring seeding with Agrowdrill (1533 lbs/acre), Manure + subsoil in Fall (1506 lbs/acre) and then Plow under (1447 lbs/acre) (Table 3). Except for Spring seeding with plotdrill, all methods of pasture rejuvenation improved forage DM over check by 104-177%.

Comparing Subsoil in Fall and Manure + subsoil in Fall with check, it is apparent that both subsoiling and Manure + subsoil in Fall improved forage DM over check. The forage yield improvement over check was higher with Manure + subsoil in Fall than Subsoil in Fall.

Resting a pasture for a year seemed to slightly improve forage DM yield over check, by about 242 lbs/acre. It is important to note that 2015 (when the treatment was rested) was very dry and grasshopper infestation was very high as well, and this probably affected the following year's forage production.

A section of Bale grazing method of pasture

Table 3. Forage DM yields and the proportion of forage types following the implementation of different methods of pasture rejuvenation. *NS indicates not significant (P>0.05).*

Treatment	Dry matter yield, lbs/acre				Proportion of forage type, %		
	Grass	Legume	Other	Total	Grass	Legume	Other
Check	587	145	238	970	60.5	14.9	24.6
Subsoil in Fall	774	347	89	1210	64.0	28.7	7.3
Bale grazing	1265	674		1939	78.4	32.5	
Fall Seeding with Agrowdrill	592	566		1158	51.1	48.9	
Manure + subsoil in Fall	834	516	159	1506	55.4	34.3	10.3
Plow under	1273		173	1447	88.0		12.0
Mob grazing	1063			1063	100		
Spring seeding with plotdrill	617	193		810	76.2	23.8	
Rest	764	262	186	1212	63.0	21.6	15.4
Spring seeding with Agrowdrill	604	730	198	1533	39.4	47.6	12.9
Fall Seeding with plotdrill	644	245	176	1066	60.4	23.0	16.5
$LSD_{0.05}$	513	338	90	705			
Significance (P<0.05)	*	**	NS	*			
Mean	764	359	166	1265			

Site 1: Bill Smith (Conventional Beef Farm), Grovedale

Soil Quality

The soil pH, organic matter and nutrients (N, P, K & S), as well as carbon and N and their ratios are shown in Table 4. The most obvious impact of some methods of pasture rejuvenation from Table 4 was the significant increases in soil N and P from a few methods of pasture rejuvenation.

The results of soil surface N (nitrate N) in 2016 showed that Bale grazing had more than tenfold soil N (48 lbs/acre) than other methods (Table 4) and even appeared to be higher at 6-12" soil depth than most methods of pasture rejuvenation (Figure 5).

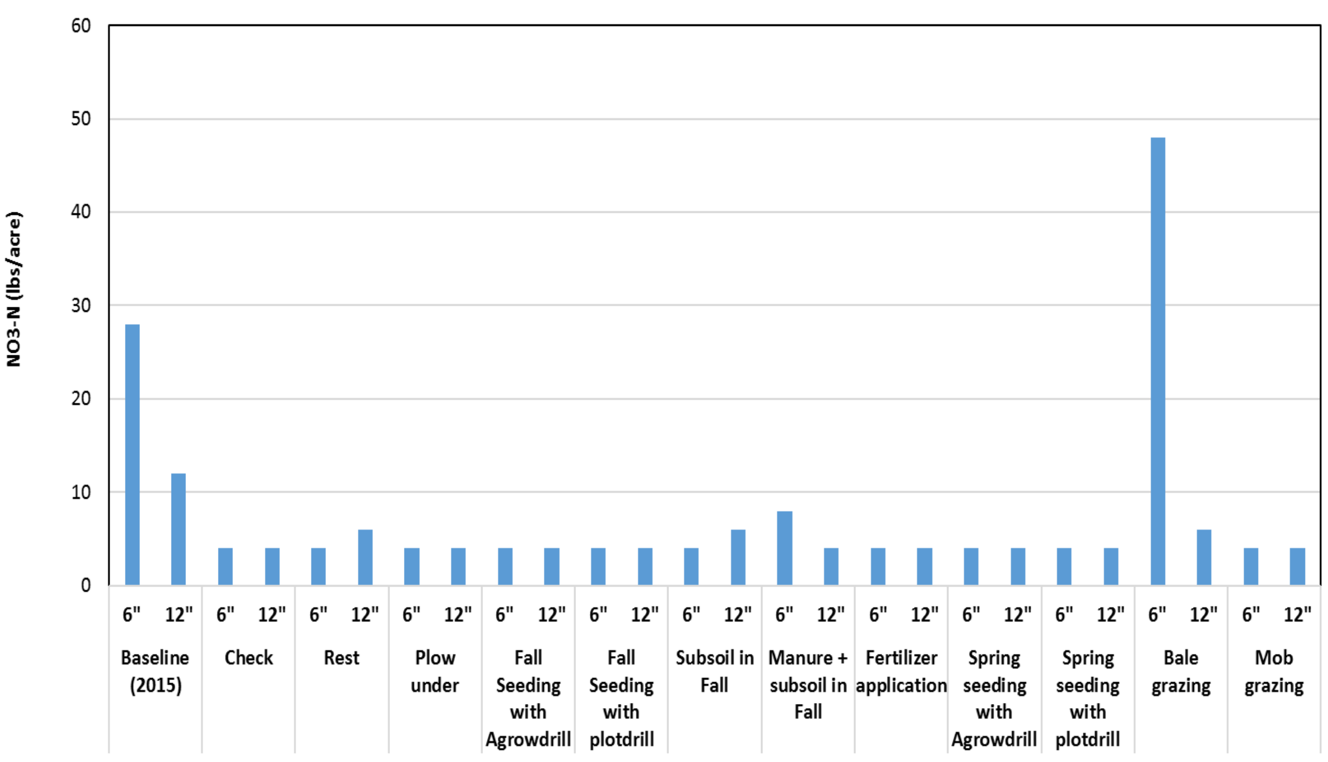
The soil surface P varied from 12 to 22 lbs/acre (Table 4).

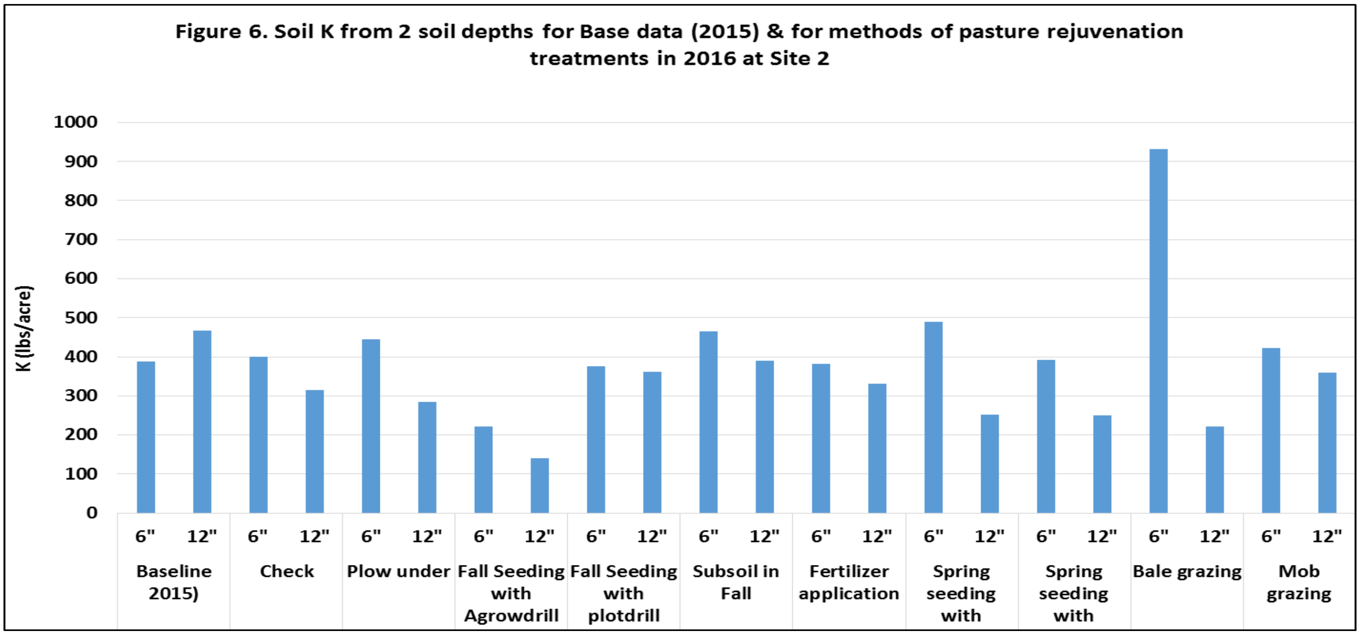
At a soil depth of 0-6”, Bale Grazing had the most soil K(Table 4). Most of the methods tested appeared to have higher soil K in the 6-12” region than Bale grazing (Figure 6). Generally, the soil surface (0-6”) seemed to have higher soil K than deeper depth (6-12”) (Figure 6).

Table 4. The soil health indicator values from 0-6” soil depth for SOM, pH, N (nitrate N), P, K ,S and C:N in 2015 (base data) and for 10 treatments measured in 2016 at Site 2 (Bill Smith, Grovedale)

Methods of pasture rejuvenation	SOM	pH	EC	N	P	K	S	C	N	C:N
	%		dS/m	lbs/acre	lbs/acre	lbs/acre	lbs/acre	%	%	
Baseline (2015)	6.9	6.9	0.31	28	18	388	8	3.44	0.23	15.0
Check	0.1	6.7	0.34	4	18	400	18	3.73	0.28	13.3
Plow under	6.6	6.6	0.27	4	22	444	10	3.56	0.26	13.7
Fall Seeding with Agrowdrill	5	6.5	0.25	4	20	222	6	3.33	0.24	13.9
Fall Seeding with plotdrill	6.8	6.7	0.3	4	14	376	8	4.39	0.31	14.2
Subsoil in Fall	6.1	6.9	0.28	4	16	464	12	3.89	0.28	13.9
Fertilizer application	4.9	6.6	0.27	4	14	382	6	2.83	0.2	14.2
Spring seeding with Agrowdrill	5.5	6.7	0.26	4	16	490	8	3.14	0.23	13.7
Spring seeding with plotdrill	5.5	6.8	0.28	4	12	392	8	3.62	0.23	15.7
Bale grazing	7.2	6.7	0.52	48	20	932	10	4.01	0.24	16.7
Mob grazing	6.9	6.5	0.27	4	16	422	8	5.29	0.37	14.3

Figure 5. Soil N (nitrate N) from 2 soil depths for Base data (2015) & for methods of pasture rejuvenation treatments in 2016 at Site 2





Soil water infiltration rate was higher for Subsoil in Fall, Plow under and Bale Grazing in that order (Table 5). All other methods had similar infiltration rates.

Readings of 400 to 500 psi would indicate potential soil compaction. With compaction readings of 144 PSI for Sub-soil in Fall and 268 PSI for Bale grazing, these 2 methods seemed to have the greatest reduction in compaction compared to most other methods, particularly those that showed >400 PSI (Table 5).

Table 5. Infiltration rate, soil compaction and soil moisture content of different methods of pasture rejuvenation taken in July 2016 at Site 2 *(NS, not significant)*

Rejuvenation Treatment	Infiltration (inches/hour)	Compaction (PSI)	Soil H2O %
Check	0.05	420	13
Subsoil in Fall	0.94	144	12.1
Plow under	0.81	351	12.7
Bale grazing	0.26	268	11.6
Fall Seeding with Agrowdrill	0.08	374	12.9
Mob grazing	0.07	463	10.1
Spring seeding with Agrowdrill	0.05	445	11.6
Fall Seeding with plotdrill	0.05	414	10.8
Fertilizer application	0.05	388	11.1
Spring seeding with plotdrill	0.04	458	12.8
$LSD_{0.05}$	*0.6*	*119*	*5.9*
Significance (P<0.05)	***	***	*NS*
Mean	*0.24*	*372*	*11.9*

Forage Dry Matter (DM) Yield

The following year after treatment implementation, forage DM yield differed among methods tested. The top 3 in DM yield were Bale Grazing (2203 lbs/acre), Fertilizer application treatment (1644 lbs/acre) and Mob grazing (1380 lbs/acre) in that order (Table 6).

Table 6. Forage dry matter yield and proportion of forage types in each method at Site 2

	Dry matter yield, lbs/acre				Proportion of forage type		
Treatment	**Grass**	**Legume**	**Other**	**Total**	**Grass**	**Legume**	**Other**
Check	390	390	136	917	42.5	42.5	14.8
Subsoil in Fall	323	387	146	856	37.7	45.2	17.1
Plow under	575	155	240	972	59.2	15.9	24.7
Bale grazing	891	613	699	2203	49.0	21.2	29.8
Fall Seeding with Agrowdrill	556	374	259	1188	46.8	31.5	21.8
Mob grazing	580	278	522	1380	48.7	10.0	41.3
Spring seeding with Agrowdrill	500	94	328	923	54.2	10.2	35.5
Fall Seeding with plotdrill	326	429	180	935	34.9	45.9	19.3
Fertilizer application	551	603	490	1644	33.7	40.7	25.5
Spring seeding with plotdrill	294	151	310	756	38.9	20.0	41.0
$LSD_{0.05}$	*162*	*111*	*103*	*658*			
Significance (P<0.05)	*	*	*	*			
Mean	*409*	*257*	*241*	*1177*			

A Progress Report on Fall or Spring Management Options for Pastures: Renovate or Rejuvenate?

Funding Received from: Alberta Beef Producers (ABP)
Collaborators: Provincial Grazing Reserve (PGR)/Wanham Grazing Association
Chinook Applied Research Association (CARA), Oyen
By *Akim Omokanye, PCBFA*

The purpose of this study is to investigate the effects of different methods of rejuvenating old forage stands and brush control in comparison with a complete renovation (break and re-seed) as well as to demonstrate practical and low cost options with maximal success. This will be achieved by using the systems approach to analyzing the collected data to enable livestock producers to make better decisions in choosing the proper option(s) that may exist for them to rejuvenate their own forage stands.

With this project, our specific objectives are:

1. To test a variety of methods to rejuvenate the productivity of low producing forage stands and how to improve soil conditions under a grazing system.
2. To examine the effect of herbicide application on brush control in pastures and forage stand rejuvenation.
3. To demonstrate practical and sustainable forage production with minimal costs under farm conditions.
4. To provide a guide for the producer or manager when alternatives to breaking need to be considered.

The project is taking place at two (2) sites, one in the Peace (Provincial Grazing Reserve, Wanham) and the second site is with Chinook Applied Research Association in Oyen.

We are testing the following methods of pasture rejuvenation:

1. Check (control)- grazed or hayed only, no treatment will be imposed
2. Summer rest- one year summer rest, no grazing or haying in 2016
3. Fertility/fertilization- fertilize with dry inorganic fertilizer in spring. Field soil sampling and testing will be done to develop proper fertilizer recommendations
4. Renovation- complete cultivation (plow under/cultivate) & seed in spring
5. Spray Roundup® herbicide in spring and seed
6. Spray Grazon® herbicide in spring and seed
7. Spray field in fall, cultivate & seed in spring
8. Spray field in fall, direct seed in spring
9. Aerate/spike in fall
10. Aerate/spike in spring
11. Broadcast seed & aerate/spike in fall
12. Broadcast seed & aerate/spike in spring
13. Subsoil in the fall to a depth of 9-12”
14. Subsoil in the fall to a depth of 9-12” and seed in the spring

This year, prior to any treatments implementation and for baseline data collection, we did the following in the spring:

1. We took soil samples at random from 0 to 24” soil depths for soil nutrients and quality.
2. We measured soil compaction with a digital penetrometer up to 12” soil depth.
3. We also measured surface soil water infiltration using the ring method in the top 2”.
4. We determined forage yield and quality, and identified the different plant species growing at the site. This helped us to determine plant composition or the proportion of each plant identified at the site.

After the baseline data collection, we marked out the plots. Each plot is about 3 acres in size. Every plot has been well-labelled with plot number, method of pasture rejuvenation being tested and replicate number.

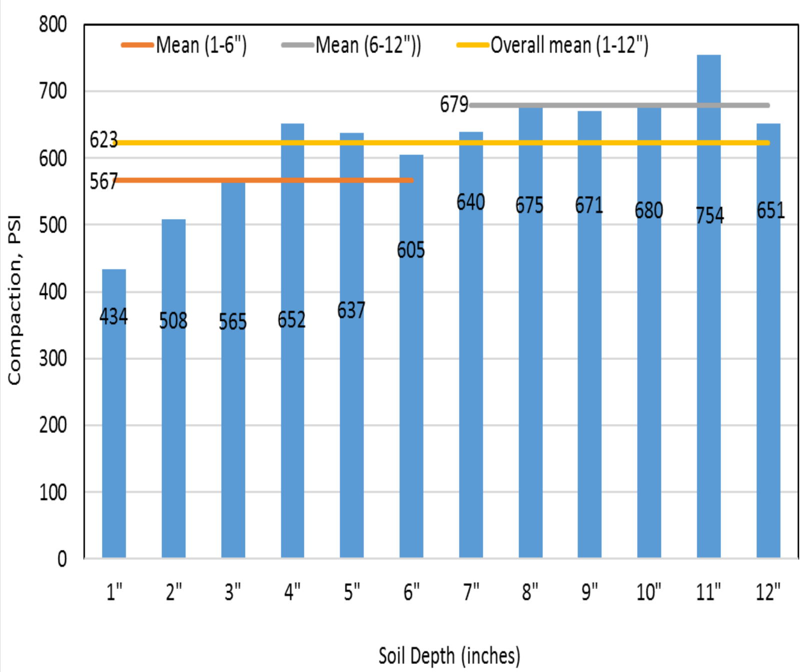
So far, all the proposed treatments were implemented with the exception of complete renovation and subsoiling treatments. Wet weather prevented us from carrying out these operations.

Some Preliminary Observations (Base data) from PGR (Wanham) Site

Infiltration: In the surface soil, the mean infiltration rate was 0.04 inches of water per hour, with a range of 0.02 - 0.07 inches of water per hour.

Compaction: The soil compaction varied from 434 PSI at 1” depth to 754 at 11” depth. The mean compaction from 1-6” was 567 PSI, while compaction from 1-12” was 623 PSI.

Figure 1. Baseline soil compaction readings (PSI) at PGR (Wanham) site in June 2016



Activities for next year (Year 2, 2017):

We will do the subsoiling treatments and complete the tillage & seeding for the “Complete renovation and reseed” treatment. We will collect all the necessary soil and forage data.

Grazon® treatment to control brush

Plow under treatment

Spray & no-till drilling of pasture mixture

Demonstration of Quality and Persistence of Perennial Forage Mixtures

By Akim Omokanye, PCBFA
Collaborator: Devesh Singh, Barenbrug USA, Director of Research

In collaboration with Barenbrug, USA, seven (7) forage grass mixtures were established in 2016 at the Fairview Research Farm (NW5-82-3W6) on RR #35, MD of Fairview. The grasses, their varieties and seeding rates in the mixtures are shown in Table 1 below.

All the treatments established well by late summer. The intention is to maintain and keep the plots for 4 or 5 years. The plots have been well labelled for easy identification of the grass mixtures.

This project will assess the compatibility, adaptation and persistency of the grasses. Field notes will be taken on agronomic and nutritional potential of grass mixtures as harvested forage for dairy and beef cattle.

Table 1. Multi-purpose forage Grass mixtures established in 2016

Treatment	Variety	Grass type	Seed rate lbs/ac
1	BarElite	Softleaf Fescue	8
1	Bariane	Softleaf Fescue	8
2	Courtney	Tall Fescue	16
3	Bariane	Soft Leaf Fescue	6
3	Pradel	Meadow Fescue	10
4	Intensive	Orchard grass	4
4	Barlegro	Orchard grass	4
5	Potomac	Orchard grass	8
6	Pradel	Meadow Fescue	16
7	Bariane	softleaf Fescue	7
7	Pradel	Meadow fescue	7
7	Intensive	Orchard grass	3

Nitrate Levels in Selected Cocktails in 2016: The Risk of Nitrate Toxicity

By Akim Omokanye, PCBFA

Cocktail cover crops are often used to further increase the benefits of a one-species cover crop. Cocktail cover crops offer more diversity and allow more goals to be achieved than with one crop. For example, tillage radishes could be added to a mix to reduce compaction, a legume seeded to fix nitrogen and barley added to the mix because it has an extensive root system and will increase the organic matter. In the end, the soil condition is improved and there would be forage available for grazing. There are many options based on a farm's needs, and to implement a cover-crop program many things must be considered, including the economics, as many of the benefits will be seen over the long-term, not immediately.

While nitrates (NO_3) are not very toxic, nitrites (NO_2) are toxic. Nitrate poisoning occurs when the nitrite level in the rumen exceeds the capacity of the microbes to convert it to ammonia. When this happens, nitrate and nitrite are absorbed through the rumen wall into the bloodstream. It is the nitrite that causes toxicity. Nitrite combines with hemoglobin to form methemoglobin. Hemoglobin carries oxygen to body tissues while methemoglobin is unable to do so. When enough hemoglobin is converted to methemoglobin the animal begins to suffer from oxygen starvation. The change in the hemoglobin (red blood cells) is influenced by: (1) rate of nitrate intake (amount of feed and how quickly it is consumed), (2) rate of conversion of nitrite to ammonia in the rumen, (3) rate of digestion of feeds and the subsequent release of nitrates and (4) movement of nitrite (feed passage rate) out of the rumen. Chronic nitrate toxicity is a form of nitrate poisoning where the clinical signs of the disease are not observed. With acute poisoning the signs of poisoning are observed and the animal is in critical condition.

Livestock health problems from grazing brassicas are relatively rare, but elsewhere brassica crops have been associated with some animal health problems. These problems can largely be avoided by good agronomic and grazing management. The key to avoiding these problems is to understand how the crop, and particularly the variety, should be managed. Nitrates accumulate in plant leaves and very high concentrations may cause livestock death. Introduce stock slowly to the brassica crop and never with an empty rumen to minimize problems. This year, several cocktails from producers' fields (particularly cocktails with brassicas) were analyzed for their nitrate levels in order to determine their safety and any possible risk of high nitrate problems. Table 2 shows nitrate levels in 21 cocktails and one oat swath sample.

What levels of nitrate are safe to feed?

Nitrate levels may be reported in three different ways depending on the analytical procedure used. The results may be reported as nitrate (NO_3), nitrate nitrogen (NO_3-N) or potassium nitrate (KNO_3). Be sure you know which method was used before trying to interpret the results. Refer to the following table.

Table 1. Method of nitrate analysis and data reporting *(Source: Agdex 400/60-1. July 1991).*

Category	% NO_3	% NO_3-N	% KNO_3	Remarks
I	**0.5**	**0.12**	**0.81**	**Generally safe**
2	0.5 - 1.0	0.12 - 0.23	0.81 - 1.63	Caution - some subclinical symptoms may appear
3	1.0	0.23	1.63	High nitrate problems - death losses and abortions can occur

Results & Interpretation

Six (6) of the 22 samples tested for nitrates had nitrate levels varying from 0.04 to 0.12% NO_3-N, one of which was oat swath sample (Table 2). These 6 samples were within the nitrate levels generally considered safe (see Table 1 above).

One cocktail sample had 0.19% NO_3-N. With this level, caution needs to be taken when feeding a cocktail with that level of nitrate, as some subclinical symptoms may appear.

The majority (15) of the cocktail samples analyzed for nitrates showed significantly high nitrate levels. Their nitrate levels varied from 0.63 to 3.75% NO_3-N. According to Table 1 above, these 15 cocktail samples would be prone to high nitrate problems. Death losses and abortions can occur.

The high nitrate levels observed for most of the samples analyzed here stresses the need for feed tests including NO_3-N. It is important to consider very strongly the number of brassicas, how much (lbs/acre) and what types to include in cocktails before seeding. High NO_3-N problem in crops, and in brassicas as well is largely caused by high soil nitrate levels and dry conditions.

Please note that hungry livestock suddenly introduced to nitrate bearing plants are more exposed to nitrate poisoning.

Table 1. Nitrate levels in sampled cocktails in 2016

	Forage sample	Nitrates (%)	TDN (%)	NE_M (Mcal/kg)	Comment
1	Cocktails	0.04	67.1	1.66	Samples taken on August 3rd, 2016
2	Cocktails	0.09	62.7	1.53	Samples taken on August 3rd, 2016
3	Oats	0.11	62.3	1.48	Oat swath, early November 2016
4	Cocktails	0.12	62.6	1.53	Samples taken on August 17th, 2016
5	Cocktails	0.06	61.3	1.49	Sampled January, 2017
6	Cocktails	0.08	51.1	1.03	Samples taken early November 2016
7	Cocktails	0.19	57.1	1.24	Sampled January, 2017
8	Cocktails	0.63	58.1	1.27	Samples taken on August 17th, 2016
9	Cocktails	0.64	56.6	1.35	Samples taken on August 17th, 2016
10	Cocktails	0.66			3 weeks after swathing, mid October 2016
11	Cocktails	0.80	54.9	1.16	Cocktail swath- samples taken early January 2017
12	Cocktails	0.92	43.8	0.77	Cocktail swath- samples taken early January 2017
13	Cocktails	0.94			Re-growth sampled in early November 2016
14	Cocktails	1.00			Samples taken on August 3rd, 2016
15	Cocktails	1.13			3 weeks after swathing, mid October 2016
16	Cocktails	1.19	57	1.37	Samples taken on August 17th, 2016
17	Cocktails	1.51			3 weeks after swathing, mid October 2016
18	Cocktails	1.57			Re-growth sampled in early November 2016
19	Cocktails	1.55			Sampled January, 2017
20	Cocktails	1.54			Sampled January, 2017
21	Cocktails	3.75	54.7	1.15	Sampled January, 2017
22	Cocktails	1.06	56.2	1.21	Sampled January, 2017

Livestock health problems from grazing brassicas are relatively rare, but elsewhere brassica crops have been associated with some animal health problems. Here are a few notes on mono-crop brassicas or where large amounts of brassicas are included in cocktails:

The grazing of brassica crops for protracted periods can sometimes result in rumen stasis (rumen stops moving) and constipation.

Affected stock will appear depressed and lack appetite.

Goitre (enlarged thyroid) - This is sometimes a problem in young lambs, where pregnant ewes have been grazing leafy brassica crops. Contact your veterinarian for advice on iodine supplements for lambs or supplements for the pregnant ewes.

Blindness - Occasional outbreaks of the condition that involves blindness, aimless wandering and unpredictable hyperexcitability are observed in cattle grazing brassica crops.

Kale Anaemia - This disorder (sometimes referred to as red water) can occur with all brassica crops, but is more common with kale crops. Anaemia is caused by excess levels of the amino acid compound S-methyl Cysteine Sulphoxide (SMCO) in the plant. SMCO causes a decrease in haemoglobin concentration and a depression of appetite. This condition tends to be worse when soil phosphorous is low and soil nitrogen and sulphur levels are high. Stock should be removed from the crop if they develop this disease.

Respiratory Problems - Grazing brassicas has sometimes been associated with cases of pulmonary oedema (fluid in lungs). Affected animals display respiratory distress.

Pulpy Kidney - Pulpy kidney is most common in young stock. Stock are most at risk when they have been on low quality feed for a period of time, and are then placed onto a highly digestible brassica crop. Vaccination is the best way to guard against this disease.

ASB Environmental Project: On-farm Soil Nutrient & Health Assessments

By Akim Omokanye & Lekshmi Sreekumar, PCBFA

The PCBFA has been actively involved in the facilitation and delivery of the ASB Environmental Program for Big Lakes County, Clear Hills County, MD of Fairview, MD of Peace, MD of Spirit River, Saddle Hills County and Birch Hills County. For the last ASB Environmental Program (2014-2016), which involved on-farm soil nutrient budgeting and mapping, PCBFA identified 6 livestock and cropping operations across the Peace Country for the project. Baseline and subsequent yearly data on water and soil were collected from these sites from 2014 - 2016. The goal is to decrease water body/source and riparian area contamination in the Peace Country by creating awareness of nutrients, nutrient distribution, collection and management on farm from wintering sites to pastures and crop land. This report presents a summary of our findings.

Methods:

For this project, we worked with the producers listed in Table 1. The production systems examined are also shown in Table 1. Soil particle size analysis carried out in 2014 showed that the soil texture of the sites used was mostly silt clay (Table 2).

Table 1. Collaborating producers and production systems being investigated from 2014-2016

MD/County	Collaborating Producer	Production System Being examined
Fairview	Chris Roy (Site 1)	Winter pen Some shelters on site 3 acres used
Spirit River	Soames Smith (Site 2)	Pasture 15 acres used
Saddle Hills County	Conrad Dolen (Site 3)	Bale grazing 7 acres used
Clear Hills County	Murray Lewis (Site 4)	Grain production (Canola- wheat-Canola rotation) Zero-tillage & controlled traffic 24 acres used
Big Lakes	Kevin Meneice (Site 5)	Swath grazing 15 acres used
	Garrett Zahacy (Site 6)	Canola in 2014, silage corn in 2015 & 2016 15 acres used

Table 2. Soil particle size analysis from the soil surface (0-6”) in 2014

Site	Soil texture	Sand %	Silt %	Clay %
Chris Roy (Site 1)	Silt clay	10.6	47.5	42
Soames Smith (Site 2)	Silt clay	8.4	53	38.6
Conrad Dolen (Site 3)	Silt clay	15.7	54	30.4
Murray Lewis (Site 4)	Clay	11.4	38.2	50.4
Kevin Meneice (Site 5)	Silt clay	24.4	47.8	27.8
Garrett Zahacy (Site 6)	Silt clay	18	42	40

For each site, 5-25 acres were used for the studies. Baseline data collection was done in 2014. Baseline and subsequent data collection (2015 & 2016) for each project site (or selected production system) involved:

1. Soil nutrients & nutrient leaching in 0 to 24 inches soil depths
2. Soil temperature and Water infiltration in 0 to 6 inches soil depth

3. Soil compaction reading with a digital penetrometer in 0 to 6 inches soil depth
4. Water sampling from on site dugout for water quality issues

Soil sampling - for both bale grazing and bale processing, soil sampling was done within the areas where bales have been previously fed. Soil sample frequency ranged from taking 2 to 3 samples in 0.5 acre units of the field.

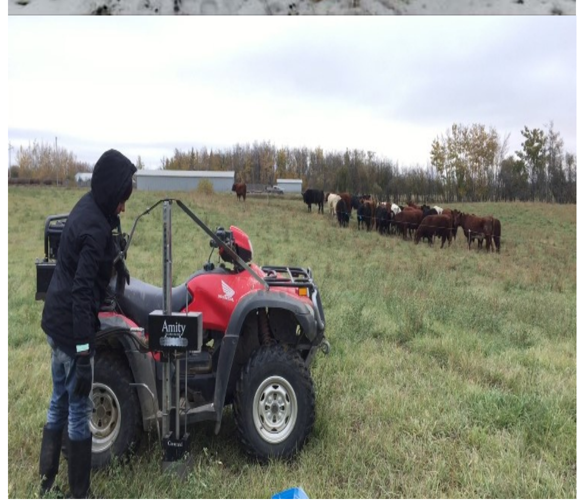
Both soil & water samples were submitted to Exova Edmonton for analyses using standard laboratory procedures. Water samples were also analyzed by Exova for water quality using stand laboratory methods provided by the American Public Health Association Standard Methods for the Examination of Water.

Results and Interpretation

Soil organic matter (SOM)

The SOM was consistently higher at the 0-6” depth at the winter feeding site than other sites examined (Figure 1). Swath grazing site was second in SOM at 0-6” depth, followed by grain-corn grazing site. In this study, both pasture and bale grazing sites had similar SOM at the 0-6” over the course of the project.

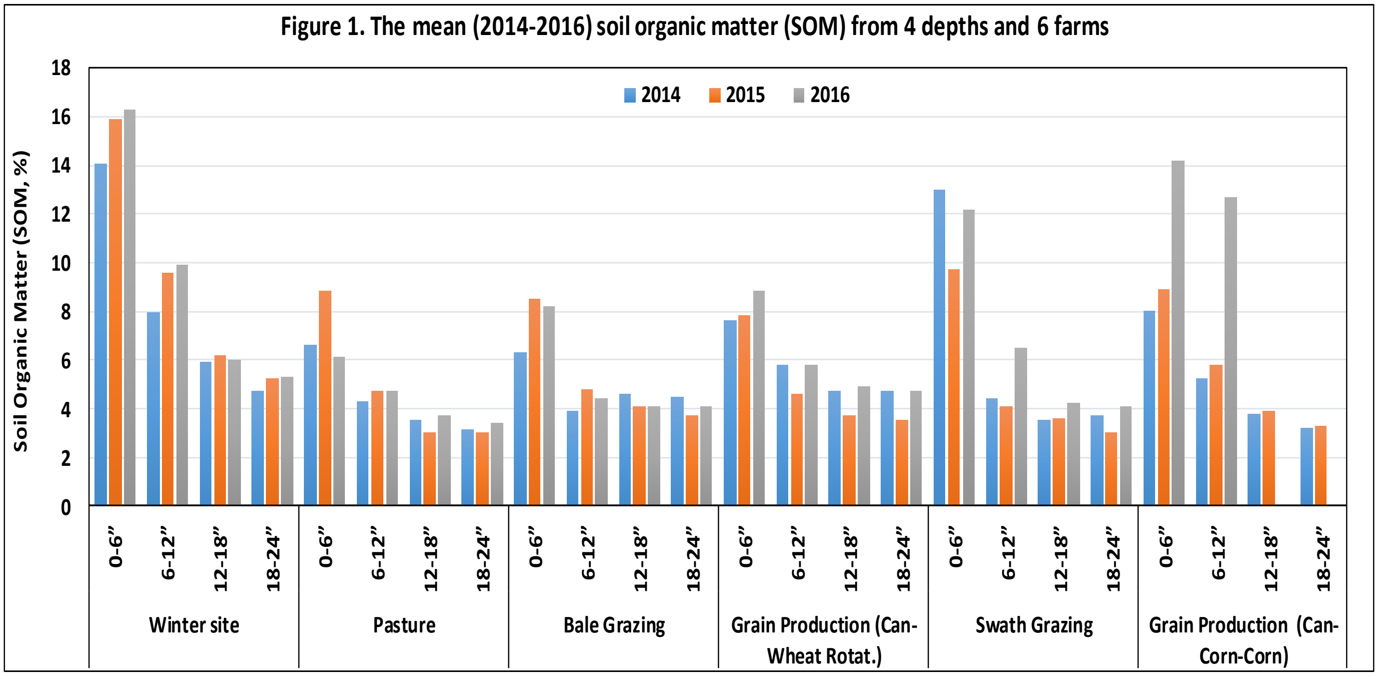
In some cases, SOM increased slightly at a particular depth over the study period (2014-2016). This pattern was more obvious with winter feeding, grain production (canola-wheat-canola rotation) and canola-corn silage production sites particularly at the 0-6” depth (Figure 1). The canola-corn silage production (Site 6) field had a dramatic increase in SOM at 0-6” from 2014 to 2016 compared to other sites. The canola-corn silage production (Site 6) had manure applied to the field in 2015 after the corn was silaged, and this was thought to be responsible for the sharp increase over a short period.



Overall, increases in SOM from 2014 to 2016 came from 3 sites/productions systems in the following order: Bale grazing & Pasture (each with 2.2% SOM) > Winter feeding site (1.9% SOM). The changes with other systems or sites were far less or inconsistent.

There are many advantages to increasing or maintaining a high level of SOM. These are reduced bulk density, increased aggregate stability, resistance to soil compaction, enhanced fertility, reduced nutrient leaching, resistance to soil erosion, increased biological activity and reduction of greenhouse gases by soil C sequestration. In most agricultural soils, organic matter is increased by leaving residue on the soil surface, rotating crops with pasture or perennials, incorporating cover crops into the cropping rotation, or by adding organic residues such as animal manure.

It is very important for producers to know that even for every fraction of SOM built, there will be more water holding capacity. Research studies have shown that every 2% SOM will hold 32,000 gallons of water (or 21% of a 5.5 inch rain). Every 5% SOM will hold 80,000 gallons (or 53% of a 5.5 inch rain) and every 8% SOM will hold 128,000 gallons of water (or 85% of a 5.5 inch rain).



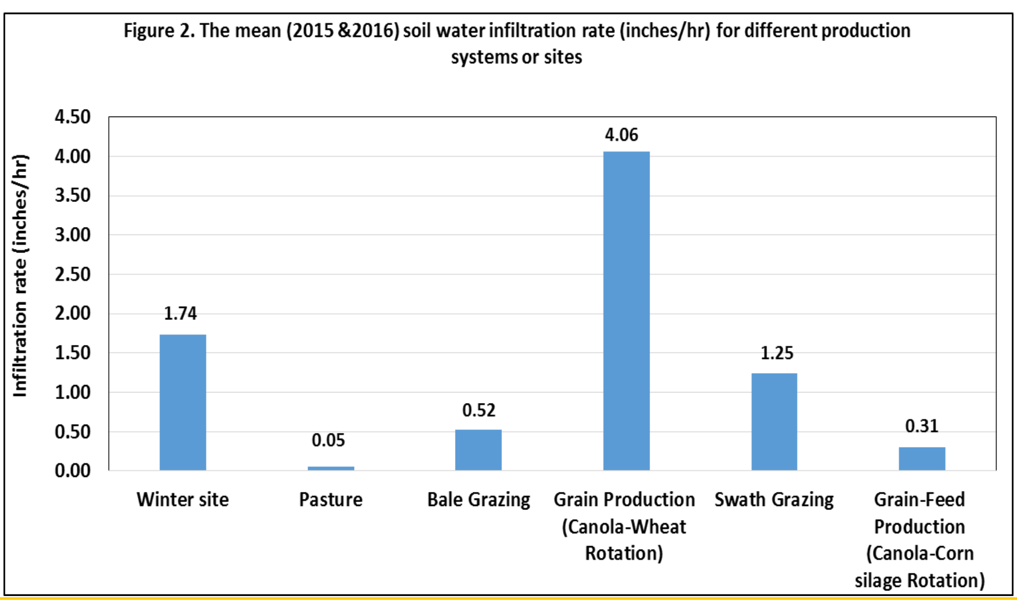
Soil Infiltration rate

Soil infiltration is the ability of soil to allow the intake of water into and through the soil profile.

The mean infiltration rate (2014 - 2016) was highest for the grain production (canola-wheat-canola rotation) site (4.06 inches/hour) (Figure 2). The winter site came second (1.74 inches/hour), followed by swath grazing (1.25 inches/hour) and then bale grazing (0.52 inches/hour). The pasture site had the lowest infiltration rate (0.05 inches/hour).

The compacted soil layers in pasture might have contributed to the poor water infiltration rate at the pasture site (see compaction below).

Going by the standard permeability classification system, grain production (canola –wheat rotation), with the highest infiltration rate, had moderately rapid infiltration.



Soil Compaction

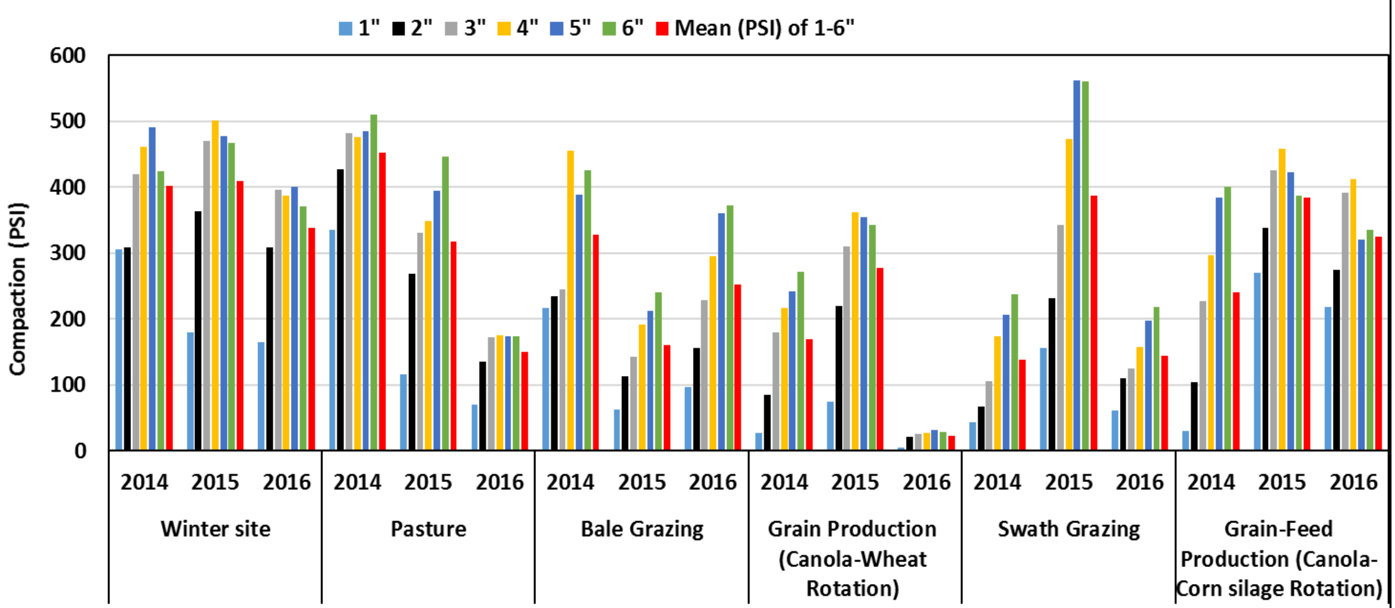
Soil compaction occurs when soil particles and aggregates are forced together so as to reduce the pore space for air and water. Readings of 400-500 PSI indicate potential soil compaction. The winter site showed the most compacted soil out of the 6 sites examined (Figure 3). On the other hand, the least compacted soil was with the grain production site (canola—wheat—canola rotation), followed by bale grazing. For each site, compaction was least at 1" and then compaction increased gradually, in most cases, with increasing depths.

Soil Mineral Nitrogen (SMN)

Nitrogen is available (soluble N) to plants as either ammonium or nitrate and comprises only 2-3% of the total soil N. Both ammonium and nitrate are called the mineral N fraction.

Overall, the bale grazing site had the most SMN, followed by the winter site (Figure 4). Surprisingly, the pasture site had lower SMN than other sites. In most cases, SMN was higher at 0-6" depth than other depths. Both bale grazing and swath grazing showed potential for SMN leaching through soil depth over the years, as SMN seemed to be higher at 18-24" depth in 2016 than 2014. The higher SMN at 0-6" for site 6 (canola-corn silage) was due to the manure applied in the fall of 2015.

Figure 3: Soil compaction readings from 0-6" soil depth from 2014 to 2016 for 6 sites



Soil P

From 2014 to 2016, soil P appeared to be highest at 0-6" and then it decreased with increasing soil depth (Figure 5). At the 0-6" depth, the winter site had the highest mean soil P (109 lbs P/acre), followed by the canola – corn silage production site (93 lbs P/acre), bale grazing (77 lbs P/acre) and then pasture (64 lbs P/acre).

Soil K

The highest level of soil K was observed in the subsurface soil depth (18-24") for the second year in the canola-wheat rotation production site (1404 K lbs/acre) (Figure 6). In the winter site the soil K level remained constant for the surface soil depth (0-6"). Also, there is a constant decrease in the soil K level for the subsurface soil depth (6-12 - 18-24") for the winter site from 2014 to 2015. For bale grazing site, in the second and third year the soil K level remain constant in the surface soil (0-6") and subsurface soil depths (6-12", 12-18" and 18-24"). In the pasture, the highest K level was observed in the surface soil (1068 K lbs/acre) in the third year (2016) and there is a constant decrease in the level of soil K in the subsurface soil from 2014 to 2016.

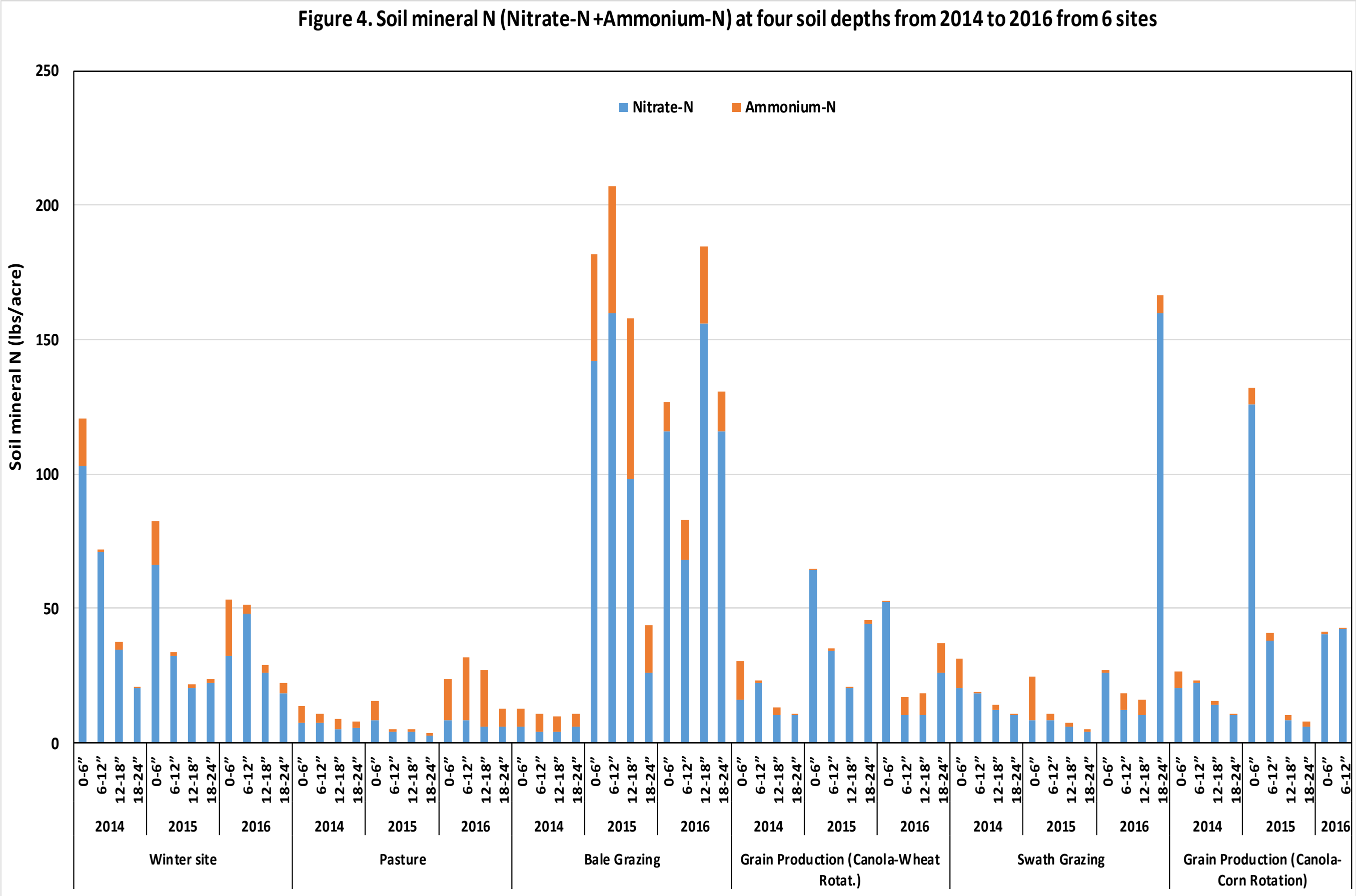


Figure 4. Soil mineral N (Nitrate-N +Ammonium-N) at four soil depths from 2014 to 2016 from 6 sites
Nitrate-N
Ammonium-N
Soil mineral N (lbs/acre)
0
50
100
150
200
250
0-6"
6-12"
12-18"
18-24"
2014
2015
2016
Winter site
Pasture
Bale Grazing
Grain Production (Canola-Wheat Rotat.)
Swath Grazing
Grain Production (Canola-Corn Rotation)

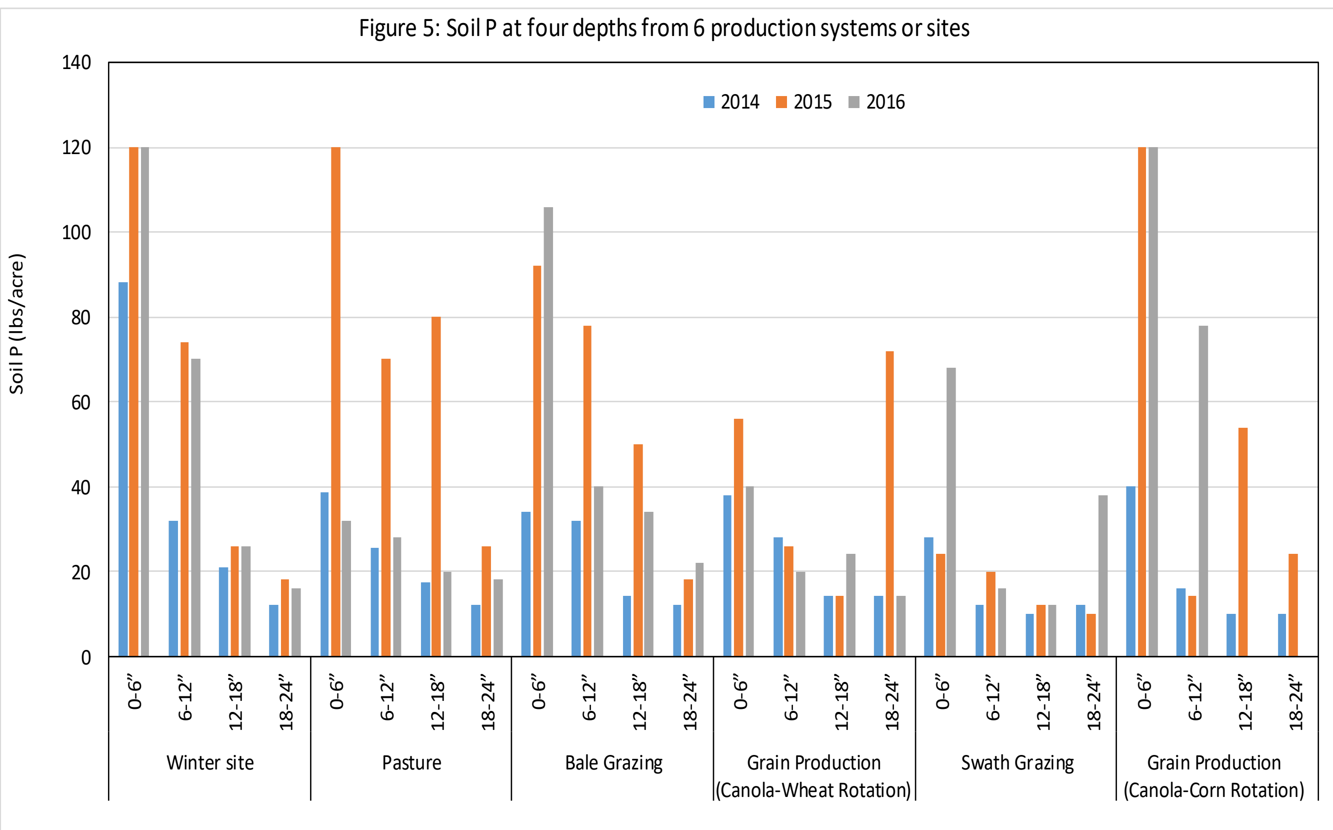
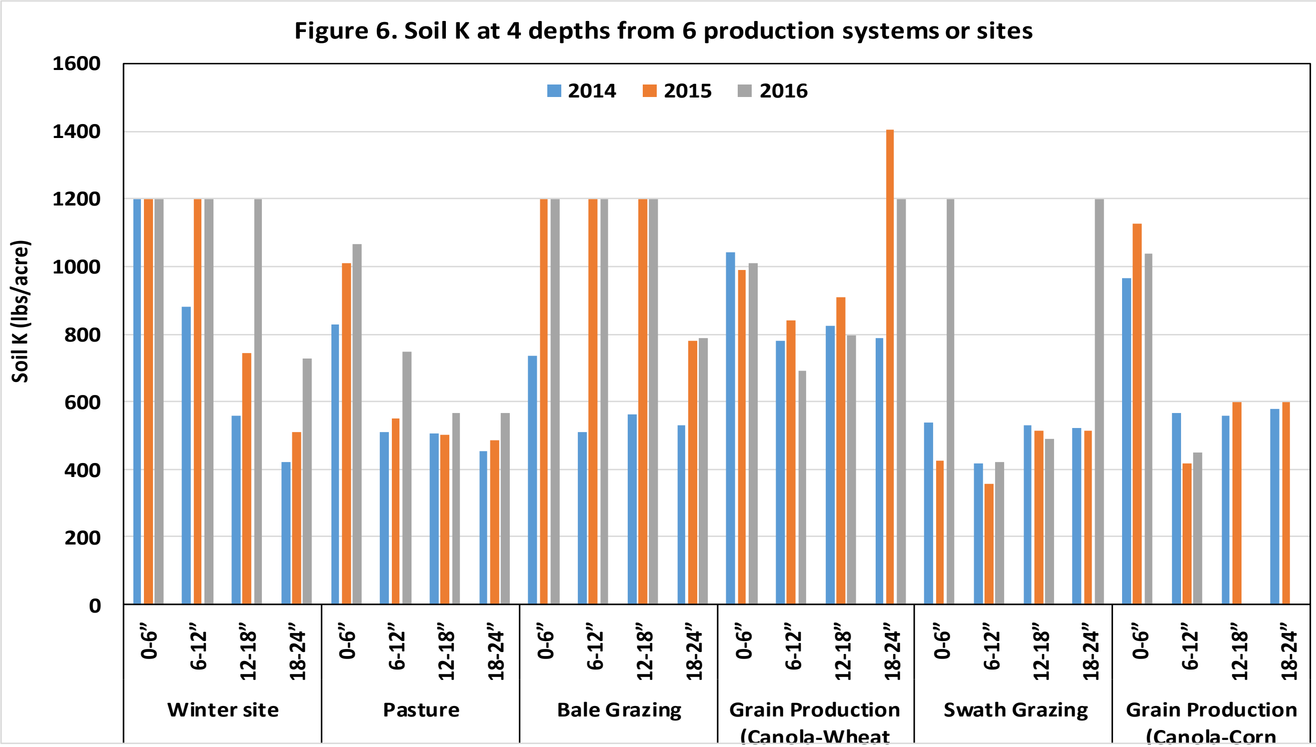


Figure 5: Soil P at four depths from 6 production systems or sites
2014
2015
2016
Soil P (lbs/acre)
0
20
40
60
80
100
120
140
0-6"
6-12"
12-18"
18-24"
Winter site
Pasture
Bale Grazing
Grain Production (Canola-Wheat Rotation)
Swath Grazing
Grain Production (Canola-Corn Rotation)



Summary

The soil nutrients (N, P & K) and health indicators (infiltration rate and compaction) from 2014 to 2016 examined here have been most improved by bale grazing. The grain production system, which involved canola - wheat - canola rotation and no-till systems appeared to have the least compacted soil than other systems as well as the highest infiltration rate than other systems or sites.

MUNICIPAL DISTRICT & COUNTY REPORTS

Clear Hills County Report

The County experienced very high precipitation in 2016 along with cooler than normal temperatures, which made for a challenging harvest. Many acres of crop were left out in the fields. Hopefully these acres will be salvaged in the spring. Deep ruts were left in many fields from producers trying to harvest in the wet conditions. These will have to be dealt with in the spring as well.

The County completed 972 weed inspections on 742 sites in 2016. The conversion from paper reports to inspection reports generated by GPS tablets has been a success. More locations with Scentless Chamomile were discovered in the green zone over the past season. These areas will be monitored closely this upcoming season.

Spot spraying was done where needed along county roads by our weed inspectors. We will continue with this approach for the upcoming season. A contract sprayer will be used for any large areas of weeds that are encountered in our ditches.

Our rental equipment fleet grows each year. Please contact us at the County Office or online at www.clearhillscounty.ab.ca for a complete list of available equipment.

We will be hosting our 23rd Annual Agricultural Trade Show on April 8, 2017 at the Dave Shaw Memorial Complex in Hines Creek. For information on the show, sponsorship, or being an exhibitor, contact the County at 780-685-3925, or email greg@clearhillscounty.ab.ca or sarah@clearhillscounty.ab.ca

Greg Coon, Agricultural Fieldman

MD of Peace No. 135 Agricultural Service Board 2016 Report

The Alberta Government declared a state of agricultural disaster in November 2016. The Minister of Agriculture and Forestry said "It's been a heartbreaker of a year. We understand the wet and snowy conditions are delaying harvest and having an impact on quality of crops in many parts of Alberta" This perfectly sums up what kind of year 2016 was from producers' perspective. Very good crops but harvesting was a never ending challenge. In the MD of Peace almost 30% of the crops are still out in the field. A map of crops out in the fields was prepared and it is on the MD website and Facebook page in order to create awareness that recreational vehicles should not be driven on fields with crops.

On the vegetation management front, it was also a challenging year due to lot of moisture in the ditches. In spite of that, we were able to mow 1100 miles of road ditches by giving 25 ft first cut and more than half of roads' ditches were given second cut. Under full ditch mowing program to clean ditches of rocks, we purchased Flexifinger Rock Picker which can be attached to a skid steer. Rock picker's drum diameter is 36" and can pick rocks from 2.5 inch to 34 inch size.

Sprayed half of municipality road ditches for weed control south of HWY 2. The North of HWY 2 we sprayed road shoulder with Roundup. Tried Esplanade, a new herbicide which works well to control Foxtail Barley at some road shoulder and results were encouraging. Sprayed Garlon for control of brush in all ditches that were brushed in 2015. Spot sprayed 46 miles of MD road ditches for control of noxious weeds and also sprayed 7.5 miles under free fenceline spraying program. Beside this, sprayed 51.5 miles of HWY's as per agreement with Alberta Transportation. Provided weed inspection services to Town of Grimshaw and inspected private properties in the MD under weed inspection program.

It was not all that gloomy 2016. MD of Peace No. 135 had its centennial celebration in 2016. The Municipal District of Peace was incorporated on December 11, 1916. Centennial Celebrations were organized in July 2016 at Lac Cardinal Hall. The grand opening of our new administration building and 100 year anniversary was celebrated on December 1, 2016.

Wish you a healthy, wealthy, peaceful and enjoyable 2017!

Nasar Iqbal (P. Ag.)

Manager of Agricultural Services

Municipal District Of Spirit River No. 133 Report

This was our Centennial Anniversary year. The Municipal District celebrated our incorporation in 1916 with three days of events August 5-7, 2016 in cooperation with the Town of Spirit River. The settlers that came to this country were faced with many challenges for the opportunity to farm the rich soils around the MD. 2016 was also filled with challenges for those currently farming these lands. Our crop year began with good growing conditions as we went into seeding with adequate moisture from the late 2015 rain replenishing the soil moisture which was depleted from the dry 2014 season. It was cool but not cold. Crops began well but unlike 2015 where we were dry most of the year we were faced with weekly precipitation and high winds. The hay crops cut early were baled in excellent shape but the rest suffered with quality issues after that and some were not baled at all. Pastures were plentiful and green right into the early snowfall with animals still grazing in some areas as of the New Year. The rains of late August mixed with hard frost and early snow in September reduced many grades on wheat, peas, barley and canola. We had at one point 25-30 percent of the crop snowed under waiting for an October opportunity that really did not come. Many have continued to combine through deep snow and bitter cold to continue to bring in what were good yields.

Our field surveys showed very little disease or insect pressure in August however there has been Wheat Midge found in the area and predicted to increase in the coming year. Our municipality mows all of the right of ways to control weeds and brush and this has significantly reduced the amount of spraying that we require each year. This year the mowing was not completed as the ditches were full of water and we were shut down by early snow. We still require spraying to control the small patches of scentless chamomile, tansy and field scabious. We had very little toadflax in 2015 but this year we saw a significant increase in patches found. The added moisture and challenges of wind during spraying season removed a lot of grass competition along the field edges allowing room for toadflax and Canada thistle to flourish. We appreciate all of the farmers' cooperation and diligence in weed control; we encourage farmers to actively manage the field borders so as to promote the grasses and prevent the growth of thistle and toadflax through competition. More effort to control these field edges will be made by the MD in the upcoming year and we will be looking to renew our agreements with the landowners to do so.

We appreciate the cooperation of the PCBFA around our region and their support of our farmers locally.

Agricultural Service Board Report submitted by Kelly Hudson

Municipal District Of Fairview #136 Report

As many of you producers not only within our municipality but our neighboring municipalities have noticed, PCBFA has been very busy in the 2016 year with several workshops, tours and events that were of great interest to many of you. The overall attendance was a huge acknowledgement and compliment to their efforts. For the MD of Fairview Agricultural Service Board and Council, we are very pleased with the subject matter and programs PCBFA delivers. We are very lucky to have a local association to deliver such amazing programs, and find great value in seeing that not only our producers, but producers from around the region find topics and research demonstrations that are an asset to their farming and ranching businesses. We are very proud of the staff at PCBFA for working diligently at bringing great information to us all. The MD of Fairview looks forward to what you have in store for 2017 and is happy to be part of PCBFA funding, not only for the Forage Association but the Environmental Stream also that you deliver on our behalf.

So now onward to the Agricultural Service Board (ASB) business. We had a very challenging year with our ditch mowing program due to higher than average moisture conditions. It seemed that grass was re-growing directly behind the mower but we did manage to complete our program. New noxious weed areas were also abundant and we tried our best between rains to keep those areas at bay. 2017 will hopefully be much better for both the mowing program and the herbicide application program.

As far as insect pests go, we had a few problem areas with lygus bugs and flea beetles. Early in May, we felt the grasshopper numbers were going to be very high as they were ridiculous to start with, although they were very young then and did not create much damage. The snowfall in the long weekend of May had cut their population down to almost nil which was great! The same went for the tent caterpillars as they were very abundant early in May and literally disappeared after the snowfall. We also do several surveys for the Pest Surveillance Branch on various insect pests such as grasshopper counts, wheat midge counts and Bertha Armyworm counts and they use that information to help them with their pest forecast maps.

We, Council and the Agricultural Service Board, appreciate the efforts our producers put into their farming/ranching practices. It does not go un-noticed and we thank you for that. May 2017 be a very good successful year to all of you!

Fred Sawchuk, Agricultural Fieldman

THANK YOU TO OUR SUPPORTERS

THANK YOU TO OUR SUPPORTING MUNICIPALITIES

THANK YOU TO OUR CORPORATE SPONSORS

THANK YOU TO OUR FUNDING PARTNERS