Member of ARECA

Chinook Applied Research Association

CHINOOK APPLIED RESEARCH ASSOCIATION
CARA

2015 Annual Report

Chinook Applied Research Association

Box 690, Oyen, Alberta, Canada T0J 2J0

Phone: (403) 664-3777 Fax: (403) 664-3007

cara-1@telus.net

Visit our Home Page: www.chinookappliedresearch.ca

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CARA is a producer-directed society dedicated to improving the sustainability and profitability of agriculture in the Special Areas and the MD of Acadia. Our program of applied research, demonstration and extension projects provides a link in the transfer of technology between research and the producer. Producers, industry, government and others can access reliable data on crop, livestock and soils that is relevant to the area and its soil and climatic conditions.

We are pleased to make available the 36th edition of our Projects Report. It contains a description and summary of results of projects carried out or monitored by CARA in 2015

Table of Contents

President's Message

As CARA continue to do research in the brown soil zone, we realize that everything agriculture needs to have a common thread. That thread is "soils". 2015 was declared the year of soils world-wide.

As we exchange data with others across the globe, we find there is a commonalty no matter where you go, soil needs nutrients and minerals to continue to be a productive. Success stories were shared by CARA and other researchers (Christine Jones from Australia and Gabe Brown from United States) on management practices for healthy soils.

Utilizing the information gathered, CARA will take a hands-on approach to apply what is applicable to east central Alberta. We cannot make more land but we can increase production on the same land base with knowledge and innovation to feed the ever increasing population here and abroad.

We are always willing to listen to exchange thoughts and ideas from our producers.

Good Research leads the way to Success Farming

Gloria Nelson

Manager's Message

Weather was the biggest production related story for agriculture in east central Alberta during 2015. It was a not so gentle reminder that the high precipitation levels of the past few years are not to be expected every year. It also demonstrated how management decisions made today have a big impact on next year's production. Areas with good ground cover left from 2014, for example, typically maintained better growth of both annual and perennial crops.

Cold, dry conditions hampered early season growth of both annual and perennial crops in most of our region. By mid-July, there was a sense of desperation as many cattlemen looked for forage to meet their winter feed requirements and croppers were looking to crop insurance to cover input costs. But the rain in August and September brought on lots of annual crop and weed growth, complicating harvest but dramatically increasing the supply of feed. Crops across the district ranged from total write-offs to above average yields for a few farmers. Our project sites had the same range in growth, so you will find some there is no data from some trials while others yielded really well. Years such as 2015 demonstrate the importance of gathering long term data when dealing with agricultural production issues.

CARA joined our ARECA associates in promoting the International Year of Soil as we partnered to bring international speakers to local venues in 2015, developed a web site to share information on soil health and to highlight producers across the province who are doing good things related to sustaining their soil resources. Thanks to ACIDF for supporting this initiative. It was a proud moment for CARA when Yamily opened the Western Canada Soil Health Conference with a great presentation to the full house crowd. Yamily's cocktail cover crop and humalite demonstrations have generated lots of local interest as well and we are looking forward to developing a lab to monitor basic soil health here at the CARA Centre.

Support from Alberta's Barley, Canola, Pulse and Wheat organizations also helped bring key note speakers to local crop events and funded trials and field demonstrations. Their contributions are much appreciated.

We are grateful that an increase in the 2014 AOF grant allowed us to update some equipment and purchase some soil monitoring tools. A reduction in the grant in 2015, however, has required CARA and all producer groups in the province to make adjustments in our annual programming.

I would like to thank the staff for making everything within our program work during the past year. Thanks also to our Board of Directors for guiding the organization through another year of challenges but many accomplishments as well.

With regards and best wishes for a great year in 2016 for our agricultural industry,

Dianne Westerlund

2015 Board Members

Gloria Nelson, Veteran (President)

James Madge, Hanna (Vice President)

David Eaton, Sibbald (Past President)

Marvin Molzan, Sibbald (Financial Supervisor)

Ann Rafa, Acadia Valley (ARECA Rep.)

Richard Bailey,Veteran
Kyle Christianson, Sedalia
Darryl Conners, Hanna
George Doupe, Oyen
Matthew Gould, Consort
Danny Grudecki, Acadia Valley
Craig Horner, Cessford
John Kimber, Youngstown
Kirby Laughlin, Youngstown
Kevin Letniak, Consort
Charles Schmidt, Chinook
Walter Suntjens, Hanna
Stacy Scheuerman, Acadia Valley

2015 CARA Staff

Manager & Forage Agronomist: *Dianne Westerlund*

Crop & Soil Nutrient Management Specialist: *Dr. Yamily Zavala*

Conservation Agronomist & Animal Nutritionist: *Jesse Williams*

Lacey Gould (Part time)

Extension Coordinator: *Olivia Sederberg*

Office Manager: *Shelley Norris*

Field Technician: *Jerry Pratt*

Karen Raynard

Summer Technicians: *Danny Rude, Kale Scarff & Janelle Hawkins*

2015 Acknowledgements

Completion of CARA's 2015 program was again testament to the tremendous support and partnerships we have with a number of organizations and individuals. There is no doubt that the scope of projects CARA is able to carry out would not happen without our local municipalities behind us. There are many benefits to the relationships which have developed with ARECA member groups on projects and extension activities. Contributions from Alberta Agriculture & Forestry and Agriculture Canada specialists have enhanced our work and the information we are able to pass on to our producers.

A number of Agricultural Societies, agri-businesses, producer and community groups support our trials, demonstrations and events in various ways. Finally, we work with a great group of farmers and ranchers in all aspects of the program and are very proud to be part of the agricultural industry in our community.

Many thanks to the following who have contributed to CARA's program by providing funding, donations, inputs, partnering or extension or otherwise have lent a helping hand. *Our sincere apologies for anyone we have missed.*

Many thanks also go to the following for their support in 2015:

20/20 Seed Labs

Canadian Humalite International

A & L Laboratory Group

Agricultural Research and Extension Council of Alberta & Member Groups

Agricultural Service Boards—Special Area 2, 3, 4 & M.D. of Acadia

Agriculture & Agri-Food Canada (AAFC)

Agrisoma

Alberta Agriculture and Forestry (AAFD) & Specialists

Alberta Barley Commission

Alberta Beef Producers

Alberta Canola Producers Commission

Alberta Crop Industry Development Fund (ACIDF)

Alberta Financial Services Corporation (AFSC)

Alberta Pulse Growers

Alberta Wheat Commission

Big Country Adult Learning Centre

Big Country Agricultural Society

Exova Testing Group

Brett Young Seeds

Buffalo & District Agricultural Society

Crop Production Services

Canola Council of Canada

Donna Scory, Oyen

Down to Earth Labs

Empress/Bindloss Agricultural Society

Farm Credit Corporation

Hanna & District Agricultural Society

Hannas Seeds

Lethbridge Agricultural Research Station

Municipal District of Acadia

Murray Beaumont Mechanical

Neutral Hills Ag Society

Oyen Vet Services

Ratepayers of Special Areas and M.D. of Acadia

Richardson Pioneer Grain, Oyen

Rocky Mountain Equipment, Oyen

Saskatchewan Agriculture and Food

SeCan Association

Semi-Arid Prairie Agricultural Research Center (SPARC)

Stoller Enterprises Ltd.

Special Areas Board

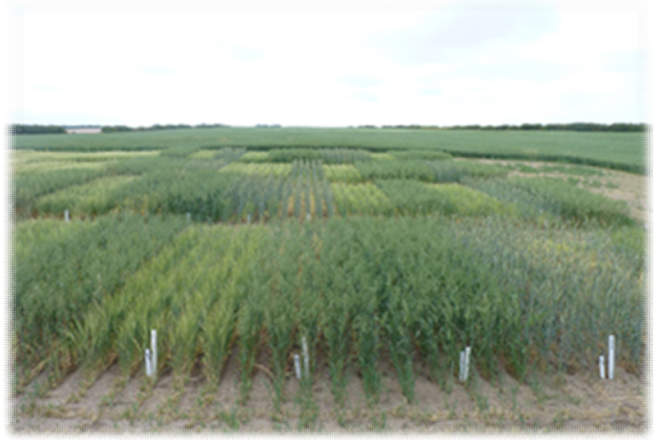
Spondin Agricultural Society

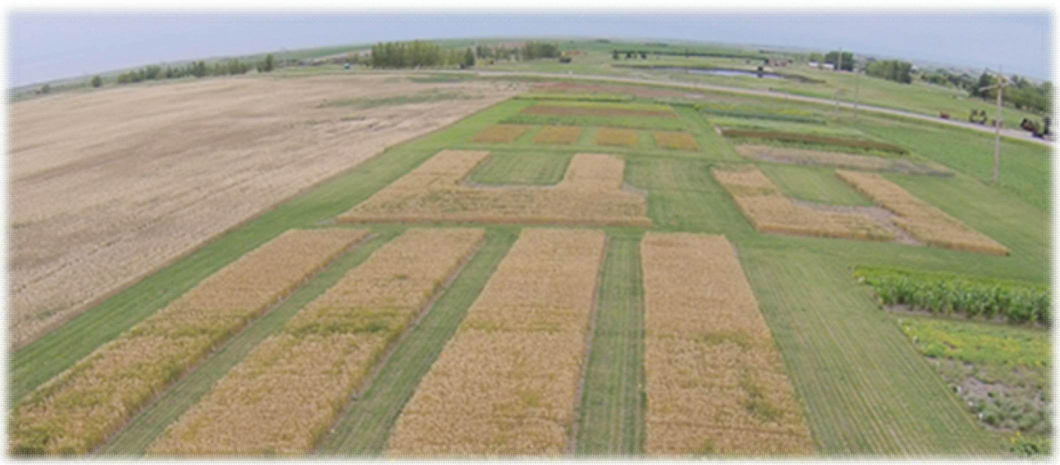
United Farmers of Alberta

University of Alberta

University of Saskatchewan

Crop Trials & Demonstrations





Variety Trials

The following project description applies to all the variety trials. Site differences are noted in the individual reports. Long term data from past years and sites is included in individual reports. Please use caution when interpreting cumulative data if it represents yield from only a few years. Data from long term testing is much more reliable. The number of years the varieties were tested is included in the tables.

Entries in the trials which are part of Alberta's Regional Variety Testing Program are determined by a provincial committee and the desire by seed companies to include specific varieties.

Purpose: To provide information on the performance of new and established crop varieties when grown under dryland conditions in east-central Alberta.

Project Description:

Fallow or stubble fields selected for the project sites are soil tested to determine soil fertility prior to seeding. In the case of stubble seeding, the plots are seeded directly into standing stubble following a pre-seed burn-off with glyphosate. The plots are seeded with CARA's Henderson 500 drill, with Morris contour openers, through a single belt cone with spinner/splitter in 5 paired rows (separated by 4 inches) on 11 inch spacing. Fertilizer is delivered through a chute between the paired rows. Plots are 1.4 m x 5.0 m laid out in a randomized complete block design with 3 or 4 replications.

CARA uses seeding rates that are based on recommendations for this area: the targeted plant population for cereals is 18 - 24 plants per sq. ft. and for pulses is 4 – 12 plants/square foot (field peas 8, fababeans 4, lentils 12 and soybeans 5). The amount of seed required for each plot is calculated using the thousand kernel weight of that particular seed lot, percent germination and estimated seed mortality.

Weed control is obtained by the appropriate use of herbicides. Performance of the varieties is evaluated periodically throughout the season. At maturity, height measurements are taken and the plots are straight cut with a plot combine. The samples are air dried, cleaned and weighed for yield determination. Bushel weight is then determined. Thanks to the Richardson Pioneer Grain staff in Oyen for grade and protein determination of the wheat trials.

Yields reported in this report have been adjusted to 14% moisture. A statistical analysis has been carried out on the yields harvested in 2015. Reference to Least Significant Difference (LSD) in the tables indicates the lb/A difference between yields that is significant at a 95% level of confidence. This also means that if two or more varieties have yields that fall within the LSD range, they are not significantly different from each other at 95% confidence level. The 95% confidence level means that we are 95% certain that the result is not a chance occurrence. A Coefficient of Variance (C.V.) of less than 20 means the data is reliable

Long term yield is reported in the cumulative tables in each report. Variety names are spelled and capitalized as they appear on the registration with the Canadian Food Inspection Agency.

More information on varieties is available in the seed.ab.ca seed guide published by the Alberta Seed Industry Partnership, the www.seed.ab.ca website or the Varieties of Cereal and Oilseed Crops report on the Alberta Agriculture and Rural Development website at www.agric.gov.ab.ca. Feel free to call the CARA office with your questions.

Site Precipitation Summary (May – September inches)

	Oyen	Consort	Hanna	Acadia Valley
1990	3.3	N/A	N/A	N/A
1991	9.1	9.7	9.3	N/A
1992	5.4	6.5	7.5	N/A
1993	6.2	8.6	5.8	13.1
1994	8.2	6.9	11.7	5.7
1995	8.7	5.7	N/A	9.4
1996	6.9	6.5	9.5	3.0
1997	5.2	9.3	4.9	4.9
1998	5.3	3.9	5.8	5.1
1999	12.2	14.5	19.3	12.2
2000	3.6	N/A	6.5	6.8
2001	2.8	N/A	4.0	3.0
2002	N/A	N/A	N/A	N/A
2003	N/A	10.0	6.0	N/A
2004	N/A	15.1	10.9	N/A
2005	N/A	N/A	11.8	N/A
2006	N/A	N/A	6.6	N/A
2007	9.3	N/A	13.1	N/A
2008	10.6	7.95	10.25	N/A
2009	7.8	N/A	N/A	N/A
2010	12.4	N/A	14.0	12.4
2011	8.0	8.0	8.4	8.7
2012	7.6	13.0	9.9	7.0
2013	7.5	9.0	9.7	7.8
2014	7.5	10.0	9.5	8.7
2015	8.7	9.1	11.8	8.8

Wheat and Durum Variety Trial

Summary
Wheat variety trials were conducted in 2015 to evaluate the performance of several varieties in east-central Alberta as part of the Alberta's Regional Variety Testing Program. Varieties of durum, hard red spring, Canada Prairie Spring, and general purpose wheat were tested at Oyen, Hanna and Acadia. All sites were stressed with a lack of early season moisture and cold temperatures in 2015. Most sites did receive adequate levels of moisture in August and early September, although the moisture delayed harvest in some areas resulting in loss of quality. At Pearen site, Oyen, germination and establishment was very thin and uneven so was not harvested.

The long term averages for all sites are included in this report. More information on varieties is available in the seed.ab.ca seed guide published by the Alberta Seed Industry Partnership, the www.seed.ab.ca website or the Varieties of Cereal and Oilseed Crops report on the Alberta Agriculture and Rural Development website at www.agric.gov.ab.ca. Feel free to call the CARA office with your questions.

Cooperators:	Gerry Pearen, Oyen	SW 32-8-3-W4
	Blake Robinson, Hanna	SE 17-31-15-W4
	Vince Grudecki, Acadia Valley	SE 28-24-2-W4
	Irvine Jorgenson, Oyen	SE 15-29-04-W4

Project Description and Precipitation Summary from previous years – see "Variety Trials" report, pages 1 and 2.

Site Information:

Table 1 **Soil Analysis 2015**

Soil Analysis		**Hanna**	**Acadia Valley**	**Oyen**
Nitrogen*	(0-24")	23 lb/A (M)	22 lb/A (M)	9 lb/A (D)
Phosphorus*	(0-6")	18 lb/A (M)	6 lb/A (D)	8 lb/A (D)
Potassium*	(0-6")	473 lb/A (O)	600 lb/A (O)	357 lb/A (O)
Sulfate*	(0-24")	15 lb/A (O)	41 lb/A (O)	17 lb/A (O)
Soil Salinity*	(E.C.)	0.36 (G)	0.97 (G)	0.49 (G)
pH		6.0 (acidic)	7.9 (alkaline)	7.8 (alkaline)
OM	(%)	5.3 (normal)	5.3 (normal)	3.4 (normal)
Soil Texture**		Clay (21% S, 29% Si, 50% C)	Clay (13% S, 29% Si, 58% C)	Clay (13% S, 29% Si, 58% C)

* D = Deficient, M = Marginal, O = Optimum, E = Excess,
** S = Sand, Si = Silt, C = Clay
Note: Soil analysis information not available for Jorgenson winter cereal site.

Table 2 **Precipitation 2015 (inches)**

Month	Acadia Valley	Hanna	Oyen
May	0.0	0.2	0.5
June	1.2	1.6	0.6
July	1.4	2.7	2.3
Aug	4.1	4.3	3.6
Total	6.7	8.9	7.0

Table 3 **Agronomic Information – Spring Wheat Sites**

	Hanna	Acadia Valley	Oyen
	Chem fallow	Chem fallow	Field Peas
Seeding Date	May 13	May 12	May7
Seeding Depth	1.5-2 inches	1.5-2 inches	1.5-2 inches
Seedbed Condition	Good moisture conditions		Poor moisture conditions
Seeding Rate	18 plants per square foot		
Fertilizer* (26-18-5-3)	125 lb/A	160 lb/A	165 lb/A
Seeder**	Henderson 500 drill		
Seedbed Preparation	Pre-seed glyphosate		
Herbicide	Buctril M + Achieve Liquid Gold +Turbocharge		
Fungicide	None applied		
Harvest Dates:			
Durum	September 22	September 19	Not harvested
All wheat	September 22	September 19	Not harvested

*placed between paired rows ** 5 paired rows on 11” spacing,

Table 3a **Agronomic Information – Winter Wheat Site**

	Oyen (Jorgenson)
Previous Crop	Canola (2014)
Seeding Date	September 24, 2014
Seeding Depth	1-1.5 inches
Seedbed Condition	Good moisture conditions
Seeding Rate	18 plants per square foot
Fertilizer* (26-18-5-3)	125 lb/A
Seeder**	Henderson 500 drill
Seedbed Preparation	Pre-seed glyphosate
Herbicide	Buctril M + Achieve Liquid Gold +Turbocharge
Fungicide	None applied
Harvest Date:	August 14

*placed between paired rows ** 5 paired rows on 11” spacing,

Results:

Table 4 **Durum – Acadia Valley 2015**

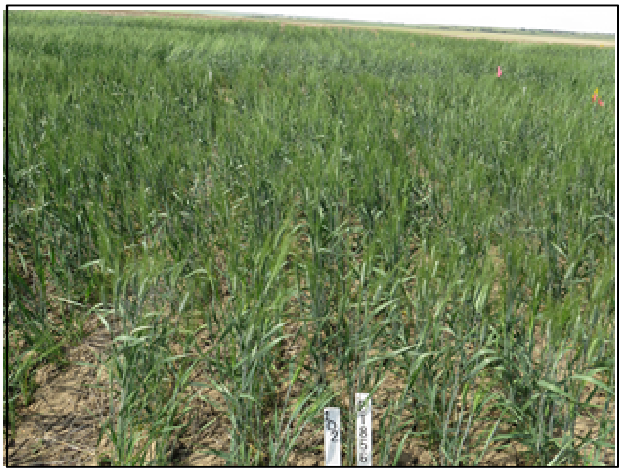
Variety	Yield (lb/A)	Yield (bu/A at 60 lb/bu)	Protein (%)	Height (cm)	Bushel Weight (lb/bu)	TKW (grams)
AAC Cabri	3549	59	14	74	64	45
AAC Current	3579	60	15	77	63	45
AAC Durafield	3028	50	15	72	63	43
AAC Marchwell	3009	50	15	70	63	44
AAC Spitfire	3240	54	14	70	62	44
CDC Carbide	3528	59	14	79	64	42
CDC Fortitude	3686	61	14	69	64	44
DT577	3243	54	15	73	64	45
DT856	3576	60	13	71	63	43
Strongfield	3263	54	15	71	63	44
Mean	3370	56	14	73	63	44
LSD (0.05)	NS					
C.V. %						

Comments: Yield of the durum varieties at Acadia Valley site for 2015 were not significantly different with yields ranging from 50 to 61 bu/A and averaging 56 bu/A. There was a reduction of at least 10 bu/A compared with previous years. The protein average was 14%, up 2% on average from 2014 and all samples graded number 3 primarily because harvest was delayed due to the September moisture. Bushel weight average was 3 lb above the industry standard (60 lb/bu). The reduction of yield and the increase on the percent protein observed during 2015 could be attributed to the drought conditions early in the growing season and late season growth of wild oats.

Table 5 **Durum – Hanna 2015**

Variety	Yield (lb/A)	Yield (bu/A at 60 lb/bu)	Protein (%)	Height (cm)	Bushel Weight (lb/bu)	TKW (grams)
AAC Cabri	2985	50	15	74	62	45
AAC Current	3215	54	15	73	64	46
AAC Durafield	2849	47	15	69	63	44
AAC Marchwell	3118	52	16	73	62	45
AAC Spitfire	3223	54	14	74	62	43
CDC Carbide	3232	54	14	75	63	42
CDC Fortitude	3151	53	15	70	62	44
DT577	3260	54	15	72	63	45
DT856	3464	58	14	74	63	46
Strongfield	2918	49	15	73	63	45
Overall mean	3141	52	15	73	63	44
LSD (.05)	NS					
C.V. %						

Comments: The yield for the durum varieties at the Hanna site in 2015 ranged between 47 to 58 bu/A with an average of 52 bu/A. There was no significant difference in yield (lb/A) between varieties. These yields were at least 20 bu/A higher than 2014 as 2014 yields were unexpectedly below average. This increase may have been influenced by more moisture conditions during July and August. The protein average was 15 % up 3% from 2014. Bushel weight average was 3 lb above the industry standard (60 lb/bu).



Comments: This picture shows the DT856 (highest average yield) and Strongfield varieties at two months of their stage development (July 20, 2015).

Table 6. **General Purpose and Soft White Spring (SWS) Wheat – Hanna 2015**

Variety	Yield (lb/A)	Yield (bu/A at 60 lb/bu)	Protein (%)	Height (cm)	Bushel Weight (lb/bu)	TKW (grams)
AAC Chiffon	4123	69	11	66	62	44
AAC Indus	3546	59	11	74	62	45
AAC Innova	3758	63	12	63	58	41
AAC NRG097	3649	61	13	63	63	46
AC Andrew	4218	70	11	62	60	39
AC Barrie	2974	50	14	64	62	36
Belvoir	4369	73	11	59	59	44
Carberry	3471	58	15	60	63	39
SY087	3060	51	15	68	63	39
Mean	3685	61	12	64	61	41
LSD (0.05)	805	13				
C.V. %	17					

Comments: Yields of the General Purpose wheat and SWS ranged between 50 to 73 bu/A with an average of 61 bu/A. There was significant difference in yield (lb/A) between varieties. Belvoir had the higher yield with 73 bu/A. The protein average was 12%, 2% higher than the previous year. Bushel weights were all slightly above the industry standard of 60 lb/bu. Moisture conditions were favorable for these varieties especially at the Hanna site during July and August.

Table 7 **Hard Red Spring Wheat – Acadia Valley 2015**

Variety	Yield (lb/A)	Yield (bu/A at 60 lb/bu)	Protein (%)	Height (cm)	Bushel Weight (lb/bu)	TKW (grams)
5605HR CL	2332	39	15	76	65	35
AAC Cameron	2667	44	15	80	65	38
AAC Connery	2259	38	15	70	64	35
AAC Prevail	1484	25	15	83	63	37
AC Barrie	1754	29	15	73	63	36
BW472	2220	37	15	70	64	35
BW479	2048	34	16	75	64	35
BW496	2165	36	16	73	63	37
BW963	2065	34	15	77	62	40
BW965	2639	44	14	66	65	35
BW966	2206	37	14	69	64	36
Carberry	2264	38	16	66	65	36
CDC Morris	2249	37	14	73	63	36
CDC	2066	34	15	72	64	35
Coleman	2232	37	15	82	66	33
PT637	1787	30	17	73	63	38
PT769	2211	37	15	80	63	36
Thorsby	1847	31	14	76	62	36
Titanium	2541	42	15	76	64	39
Mean	2160	36	15	74	64	36
LSD (0.05)	NS					
C.V. %						

Comments: The hard red spring wheat varieties at Acadia Valley averaged 36 bu/A, just over 50% of the 2014 yield ranging from 25 to 44 bu/A in 2015. Protein levels averaged 15%, 2% higher than in 2014. The decline in yield may be attributed to drought in the critical stage of early growth and a high incidence of wild oats in the area selected for this test.

Table 8 **Hard Red Spring Wheat – Hanna 2015**

Variety	Yield (lb/A)	Yield (bu/A at 60 lb/bu)	Protein (%)	Height (cm)	Bushel Weight (lb/bu)	TKW (grams)
5605HR CL ®	3115	52	16	71	63	35
AAC Cameron	3537	59	14	80	63	39
AAC Connery	3707	62	15	71	62	36
AAC Prevail	3140	52	15	79	63	37
AC Barrie	3572	60	14	73	62	35
BW472	3178	53	15	64	63	35
BW479	3280	55	16	76	63	36
BW496	2897	48	16	68	63	36
BW963	3310	55	14	74	61	36
BW965	3891	65	15	63	64	35
BW966	2908	48	15	64	64	35
Carberry	3165	53	15	64	64	37
CDC Morris	3170	53	15	66	62	35
CDC Whitewood	3465	58	14	69	63	35
Coleman	2922	49	15	74	52	34
PT637	2794	47	16	70	63	37
PT769	3071	51	15	75	60	36
Thorsby	2944	49	15	73	62	34
Titanium	3513	59	15	68	62	36
Mean	3241	54	15	71	62	36
LSD (.05)	NS					
C.V. %						

®Resistant to Imazamox herbicides.

Comments: The hard red spring wheat varieties at the Hanna site averaged 54 bu/A in 2015, ranging from 47 to 65 bu/A. These yields were twice of the 2014 yields. The protein average was 15% (3% above 2014). There was no significant difference in yield (lb/A) between varieties. Bushel weights were all slightly above the industry standard 60 lb/bu.

Note: The Oyen site for testing CPS, GPS and durum varieties was completely lost in 2015 due to dry conditions during the most critical early season growing period.

Table 9 **Winter Wheat – Oyen 2015**

Variety	Yield (lb/A)	Yield (bu/A at 60 lb/bu)	Protein (%)	Height (cm)	Bushel Weight (lb/bu)	TKW (grams)
AAC Elevate	3785	63	14	53	63	32
AAC Gateway	4074	68	15	61	64	36
AC Broadview	3393	57	14	58	64	36
AC Emerson	1975	33	16	53	64	28
AC Flourish	1472	25	15	41	62	32
AC Radiant	1637	27	14	47	62	34
Accipiter	3435	57	13	54	64	31
CDC Buteo	1951	33	15	53	63	32
CDC Chase	3319	55	13	67	64	32
CDC Falcon	1537	26	14	43	63	32
CDC Ptarmigan	2803	47	12	59	60	32
Moats	1959	33	15	52	60	26
Peregrine	2975	50	12	65	63	32
Pintail	2957	49	12	59	63	32
Sunrise	2237	37	14	57	61	32
Swainson	3583	60	13	68	62	36
Mean	2693	45	14	55	63	32
LSD (.05)	NS					
C.V. %						

Comments: The winter wheat varieties at the Oyen site averaged 45 bu/A in 2015, ranging from 27 to 68 bu/A. There was no significant difference in yield (lb/A) between varieties, however, because there was tremendous variation of yield between the replications. The protein average was 14%. Bushel weights were all slightly above the industry standard 60 lb/bu. **Due to the variability within the data, please interpret these results with caution.**

The following Tables contain summaries data which has been collected over the past several years from various Wheat Variety Trials in the Special Areas and MD of Acadia.

Table 10 **Durum Long Term Yield at Consort**

Variety	Avg. Yield as % of Kyle*	No. of Years Grown*
AC Avonlea	108	3
AC Melita	91	5
AC Morse	119	2
AC Navigator	110	2
Kyle (check)	100	6
Plenty	108	5
Sceptre	104	5
Wakooma	87	3

*During the years 1993, 1995-1999. *Long term average yield of Kyle is 49 bu/A.

Table 11 **Durum Long Term Yield at Oyen**

Variety	Avg. Yield as % of Kyle①	No. of Years Grown①	Avg. Yield as % of Strongfield②	No. of Years Grown②
AC Avonlea	109	5	97	1
AC Melita	97	6	-	-
AC Morse	105	3	-	-
AC Navigator	113	4	114	1
AAC Raymore	-	-	107	1
Brigade	108	2	106	5
CDC Desire	-	-	107	1
CDC Verona	113	1	94	3
CDC Vivid (DT562)			104	1
Commander	145	1	122	1
DT570	-	-	105	1
DT832	-	-	109	1
DT833	-	-	99	1
Enterprise	119	1	98	3
Eurostar	112	2	100	4
Kyle (check)	100	14	88	3
Napoleon	103	1	-	-
Plenty	101	9	-	-
Sceptre*	104	9	-	-
Strongfield	115	3	100	6
Transcend	-	-	91	2
Wakooma	98	7	-	-

Kyle① and Strongfield② average yields were 42 bu/A and 55 bu/A for the period of 1990-2000 and 2007-2011, 2013, respectively.
*De-registered in 2014

Table 12. **Durum Long Term Yield at Hanna**

Variety	Avg. Yield as % of Kyle①	No. of Years Grown①	Avg. Yield as % of Strongfield②	No. of Years Grown②
AC Avonlea	104	6	88	1
AC Melita	96	5	-	-
AC Morse	103	6	96	2
AC Navigator	106	6	94	2
AAC Cabri	-	-	120	1
AAC Current	-	-	122	1
AAC Durafield	-	-	102	1
AAC Marchwell	-	-	102	1
AAC Raymore	-	-	97	3
AAC Spitfire	-	-	102	1
Brigade	94	1	98	2
CDC Carbide	-	-	120	1
CDC Desire	-	-	116	1
CDC Fortitude	-	-	124	1
CDC Verona	-	-	109	1
CDC Vivid	-	-	87	1
DT570	-	-	107	1
DT577	-	-	110	1
DT832	-	-	85	1
DT833	-	-	89	1
DT856	-	-	122	1
CDC Verona	-	-	109	1
Commander	112	3	99	3
Enterprise	-	-	94	1
Eurostar	93	1	100	2
Kyle	100	14	92	5
Napoleon	102	2	-	-
Plenty	98	6	-	-
Sceptre*	108	6	-	-
Strongfield (check)	109	5	100	7
Transcend	-	-	100	1
Wakooma	100	4	-	-

In this table: Data from year 2014 was not included. The varieties are compared to Kyle (the check variety from 1991-2008) and Strongfield (the check variety from 2003-2011, 2013, 2015).

①During the years 1991-92, 1994, 1996-2001, 2003-2006, 2008, Kyle average yield was 52 bu/A.

②During the years 2003-2006, 2008, 2011, 2013, 2015 Strongfield long term average yield was 63 bu/A.

*De-registered in 2014

Table 13 **Durum Long Term Yield at Acadia Valley**

Variety	Avg. Yield as % of Strongfield*	No. of Years Grown**
AAC Current	96	1
AAC Raymore	106	2
Brigade	108	4
CDC Desire	103	2
CDC Fortitude	83	1
CDC Verona	99	4
CDC Vivid (DT562)	110	2
DT561	109	1
DT570	124	1
DT574	95	1
DT575	97	1
DT813	106	1
DT818	98	1
DT832	115	1
DT833	96	2
DT840	101	1
DT844	85	1
Enterprise	101	3
Eurostar	108	2
Strongfield	100	5
Transcend	109	3

*Strongfield long term average (± Std) yield is 63 ± 7 bu/A.

**During the years 2010-2014.

Data from 2015 not included

Table 14 **Canada Prairie Spring, General Purpose & Soft White Long Term Yield at Hanna**

Variety	Class	Avg. Yield as % of AC Andrew	No. of Years Grown*
5702 PR	CPS Red	76	1
AAC Chiffon	Soft White Spring	96	1
AAC Indus	Soft White Spring	84	1
AAC Innova	General Purpose	90	1
AAC NRG097	General Purpose	87	1
AAC Proclaim	General Purpose	71	1
AAC Ryley	CPS Red	85	1
AC Andrew (check)	Soft White	100	4
AC Barrie	CW Red Spring	65	1
AC Crystal	CPS Red	88	1
AC Taber	CPS Red	79	1
Belvoir	General Purpose	104	1
Carberry	CW Red Spring	83	1
CDC NRG003	General Purpose	84	3
Conquer VB ®	CPS Red	77	3
Enchant VB®	CPS Red	83	2
GP087	General Purpose	80	1
GP097	General Purpose	83	1
HY1312	CPS Red	91	1
HY1319	General Purpose	84	1
HY1610	General Purpose	80	1
HY995	General Purpose	78	1
Minnedosa	General Purpose	91	1
NRG010	General Purpose	96	2
Pasteur	General Purpose	93	2
SY087	CPS Red	73	1
SY985	CPS Red	78	2

Data from year 2014 was not included
*During the years 2007, 2011-2015. AC Andrew long term average was 79 bu/A.
®Wheat midge resistant variety blend.

Table 15 **Canada Prairie Spring, General Purpose & Soft White Long Term Yield at Hanna**

Variety		Avg. Yield as % of Carberry*	No. of Years Grown*
5604HR CL®	CWRS	99	3
AAC Cameron	CWRS	111	1
AAC Connery	CWRS	117	1
AAC Prevail	CWRS	98	1
AC Barrie	CWRS	94	3
BW472		100	1
BW479		104	1
BW496	CWRS	91	1
BW963	CWRS	104	1
BW965	CWRS	123	1
BW966	CWRS	91	1
Carberry (Check)	CWRS	100	3
CDC Morris	CWRS	100	1
CDC Whitewood	CWRS	109	1
Coleman	CWHWW	92	1
PT637	CWES	89	1
PT769		96	1
Thorsby	CWRS	92	1
Titanium	CWRS	111	1

*During the years , 2010-2011, 2015.
Carberry long term average yield was 48 bu/A.
®Resistant to Imazamox.
CWRS – Canadian Western Red Spring
CSHWW – Canadian Western Hard White Wheat

Table 16 **Red and White Hard Spring Wheat Long Term Yield at Hanna**

Variety	Avg. Yield as % Katepwa*	No. Years Grown*
5500HR	106	1
5600HR	107	2
5601HR	95	3
5602HR	119	5
5603HR	109	4
5604HR CL ③	110	4
AAC Bailey	121	3
AAC Brandon	146	1
AAC Elie	170	1
AAC Iceberg	113	1
AAC Redwater	120	2
AC Abbey ①	100	4
AC Barrie	104	18
AC Cadillac	102	4
AC Cora	99	6
AC Domain	97	4
AC Eatonia ①	99	5
AC Elsa	103	5
AC Intrepid	106	5
AC Majestic	98	5
AC Minto	95	6
AC Splendor	100	6
Alvena	113	4
BW918	151	1
BW931	125	1
BW932	125	1
BW947	100	1
Carberry	122	2
Cardale	127	2
CDC Abound	121	4
CDC Alsask	117	5
CDC Bounty	109	1
CDC Go	114	5
CDC Imagine	108	3
CDC Kernen	110	3
CDC Makwa	105	9
CDC Osler	109	4
CDC Plentiful	122	2
CDC Stanley	135	4
CDC Teal	100	7
CDC Thrive ③	122	3
CDC Utmost VB ②	149	2
CDC VR Morris	128	2
Columbus	96	6
Conway	91	7
Fieldstar VB ②	119	2
Glenn	112	3
Goodeve VB ②	126	5
Harvest	106	4
Helios	116	1
HW021	115	1
HW612	138	1
Infinity	106	4
Journey	106	3
Kanata (white)	92	5
Kane	119	2
Katepwa (check)	100	20
Laura	111	6
Leader ①	101	4
Lillian ①	119	8
Lovitt	99	2
McKenzie	102	6
Muchmore	122	2
Neepawa	99	6
Park	100	7
Pasqua	103	6
Peace	116	3
Prodigy	99	4
PT584	131	1
PT765	129	1
Roblin	105	7
Shaw VB ②	120	2
Snowbird (white)	95	4
Snowstar (white)	112	3
Somerset	118	3
Stettler	132	3
Superb	120	8
SY 433 (BW 433)	120	3
Unity VB ②	123	3
Vesper VB ②	124	3
Waskada	108	3
Whitehawk	107	3
WR859 CL ③	122	4

Data from year 2014 was not included

①Solid stemmed variety ②Wheat midge resistant variety blend ③Resistant to Imazamox herbicides

*During the years 1991-2008, 2010-2013. *Katepwa long term average yield is 48 bu/A.

AAC Bailey was BW 901

AC Redwater was PT457

Whitehawk was HW024

Table 17 **Hard Red and White Spring Long Term Yield at Acadia Valley**

Variety	Avg. Yield as % of Katepwa	No. of Years Grown*	Variety	Avg. Yield as % of Katepwa	No. of Years Grown*
5500 HR	98	2	CDC Teal	103	7
5600HR	97	2	CDC Thrive ③	102	3
5601HR	77	1	CDC Utmost VB②	118	2
5603HR	114	3	CDC VR Morris	117	1
5604HR CL③	102	4	CDC Whitewood	114	1
5605HR CL	122	1	Columbus	99	2
AAC Bailey	113	4	Conway	103	2
AAC Redwater	109	3	Fieldstar VB②	113	1
AAC Brandon	120	2	Glenn	115	3
AAC Elie	132	2	Goodeve VB②	116	3
AAC Iceberg	112	2	Harvest	115	1
AAC Prevail	97	1	HW021	128	1
AC Abbey①	97	3	HW612	98	1
AC Barrie	104	11	HW363	114	1
AC Cadillac	97	4	Katepwa	100	14
AC Cora	99	5	Laura	100	8
AC Domain	92	7	Leader	102	2
AC Eatonia	92	6	Lillian	107	3
AC Elsa	101	4	McKenzie	104	3
AC Intrepid	98	3	Muchmore	133	2
AC Majestic	96	5	Neepawa	99	6
AC Minto	96	5	Park	95	3
AC Splendor	93	4	Pasqua	99	5
Alikat	96	2	Prodigy	100	3
Alvena	108	1	PT245	88	1
BW479	105	1	PT584	115	1
BW847	115	1	PT637	110	1
BW918	110	1	PT765	101	2
BW931	122	1	PT769	108	1
BW932	124	1	Roblin	95	8
BW947	100	1	Shaw	118	2
BW957	112	1	Snowbird	95	1
BW961	120	1	Stettler	124	2
Carberry	128	2	Superb	119	2
Cardale	116	3	SY 433 (BW 433)	107	3
CDC Abound	108	1	Thorsby	108	1
CDC Bounty	105	2	Titanium	110	1
CDC Go	108	1	Unity VB ②	114	2
CDC Kernen	116	3	Vesper VB②	120	3
CDC Makwa	103	5	Waskada	96	1
CDC Morris	110	1	Whitehawk	96	3
CDC Plentiful	121	3	WR859 CL ③	113	3
CDC Stanley	115	4			

①Solid stemmed variety ②Wheat midge resistant variety blend ③Resistant to Imazamox herbicides
*During the years 1991-2000, 2010-2014. *Katepwa long term average yield is 47 bu/A.
AAC Bailey was BW 901, AC Redwater was PT457, Whitehawk was HW024
2015 data not included

Table 18 **Hard Red and White Spring Long Term Yield at Oyen**

Variety	Avg. Yield as % of Katepwa	No. of Years Grown*
5602HR	122	3
5603HR	108	3
5604HR CL③	107	3
AC Abbey①	101	3
AC Barrie	106	12
AC Cadillac	104	3
AC Cora	103	7
AC Domain	99	6
AC Eatonia①	98	7
AC Elsa	100	5
AC Intrepid	97	4
AC Majestic	96	6
AC Minto	99	9
AC Splendor	99	3
Alvena	105	3
BW 433	106	1
BW 901	120	1
Carberry	116	3
CDC Abound③	122	4
CDC Alsask	107	3
CDC Go	114	1
CDC Kernen	111	3
CDC Makwa	101	11
CDC Stanley	124	3
CDC Teal	105	8
CDC Thrive③	113	3
CDC Utmost VB②	121	3
Columbus	103	8
Conway	97	9
Fieldstar VB②	107	3
Glenn	117	3
Goodeve VB②	108	5
Harvest	110	2
HW024	84	1
Infinity	110	1
Kane	106	3
Katepwa (check)	100	16
Laura	105	8
Leader①	102	5
Lillian①	110	3
McKenzie	104	4
Muchmore	127	3
Neepawa	102	8
Pasqua	103	8
Peace	106	1
Prodigy	100	3
Roblin	93	8
Shaw VB②	125	3
Snowbird (white)	100	1
Snowstar (white)	103	2
Somerset	106	2
Stettler	120	4
Superb	129	4
Unity VB②	115	4
Vesper VB②	112	2
Waskada	109	4
WR859 CL③	118	4

①Solid stemmed variety

②Wheat midge resistant variety blend.

③Resistant to Imazamox herbicides.

*During the years 1990-2000, 2007-2011.

*Katepwa long term average yield is 43 bu/A.

Table 19 **Utility Wheat Long Term Yield at Oyen**

Variety	Type	Avg. Yield as % of AC Taber	No. of Years Grown*
5702 PR	CPS	94	2
AC Andrew	Soft white	137	4
AC Crystal	CPS	99	6
AC Foremost	CPS	110	5
AC Karma	CPS	104	5
AC Meena	Soft white	136	1
AC Taber (check)	CPS	100	12
AC Vista	CPS	110	3
CDC NRG003	General purpose	123	2
Conquer VB ②	CPS	123	2
Minnedosa	General Purpose	113	3
NRG010	General Purpose	119	3
Sadash	Soft white	139	3
SY985 (HY985)	CPS	112	2

*During the years 1991-1998, 2008-2011.
*AC Taber long term average yield is 48 bu/A.
②Wheat midge resistant variety blend.

Table 20 **Canada Prairie Spring Long Term Yield at Consort**

Variety	Avg. Yield as % of AC Taber*	No. of Years Grown*
5702PR	91	1
AC Crystal	93	3
AC Foremost	104	4
AC Karma	104	4
AC Taber (check)	100	6
AC Vista	99	3

*During the years 1993-1998, 2008.
*AC Taber long term average yield is 49 bu/A.

Table 21 **Canada Prairie Spring, General Purpose & Soft White Wheat Long Term Yield at Acadia Valley**

Variety	Type	Avg. Yield as % of AC Taber	No. of Years Grown*
5700 PR	CPS	98	2
5701 PR	CPS	84	1
AC Andrew	Soft white	286	1
AC Crystal	CPS	94	6
AC Foremost	CPS	97	7
AC Karma	CPS	96	7
AC Taber (check)	CPS	100	10
AC Vista	CPS	100	2
CDC NRG003	General Purpose	177	2
Conquer VB	CPS	188	2
Cutler	CPS	79	7
Katepwa/Neepawa	Hard red	90	10
Minnedosa	General Purpose	205	2
NRG010 (GP010)	General Purpose	190	2
SY985	CPS	172	2

*During the years 1992-2000, 2010-2011. 2015 data is not included
*AC Taber long term average yield is 52 bu/A.
②Wheat midge resistant variety blend.
③Resistant to Imazamox herbicides.

Table 22 **Winter Wheat Long Term Yield Acadia Valley/Oyen**

Variety	Avg. Yield as % of % of CDC OSPREY*	No. of Years Grown
AAC Gateway	112	1
AC Bellatrix	105	5
AC Readymade	94	3
AC Tempest	98	3
Accipiter	82	2
3999Blend 1 (F+E)	95	1
Blend 2 (E+G)	100	1
Blend 3 (G+F)	92	1
Broadview	89	2
CDC Buteo	92	5
CDC CLAIR	111	3
CDC Falcon	92	5
CDC Harrier	100	3
CDC Kestrel	103	3
CDC OSPREY (check)	100	5
CDC Ptarmigan	110	2
CDC Raptor	99	3
DH00W31N*34	111	1
DH01-25-135*R	111	1
Emerson	114	1
Flourish	86	2
McClintock	83	3
Moats	92	2
Monopol (Germany)	123	1
Norstar	88	1
Peregrine	92	2
Pintail	110	1
Radiant④	99	5
Reaper (UK)	107	1
Sunrise	92	2

*CDC OSPREY average yield is 45 bu/A.
*Average based on yield at Acadia Valley (AV 2003-2005, 2013) and Oyen (2011).
The 2012 yield from Acadia Valley and the 2015 Oyen yield are not included, due to high variability.
④Radiant is resistant to the wheat curl mite, the insect vector that carries Wheat Streak Mosaic Virus.

Note: The Canadian Grain Commission advises that the varieties CDC CLAIR, CDC Harrier, CDC Kestrel and CDC Raptor were moved to the Canada Western General Purpose class as of August 1, 2013.

The Effect of Nitrogen Placement on Yield and Protein Quality in Hard Red Spring Wheat.*

Yamily Zavala, Ph.D and Dianne Westerlund,

This project was supported by the Alberta Wheat Commission and the Alberta Crop Industry Development Fund

Summary

A research activity was conducted during 2015 to evaluate the effect of rate, timing and source of nitrogen (N) on hard red spring wheat grain yield and protein content on a sandy loam soil in central eastern Alberta. Treatments were: three basal levels of N (0, 25 and 50 lb/a) with urea at sowing, with or without topdressing N (half of recommended N, 25 lb/a) at flag-leaf and anthesis (flowering) stages with two N sources: (urea (broadcast) or urea-ammonium solution (UAN-dribble banded). Wheat average yields were significantly different. An increase in yield was observed up to 53 bu/A when additional N (UAN) was applied at flag stage for the N recommended rate, 10 bu/A grain yield above the control treatment (0 lb N/A). The lower average yield (39 lb/A) was obtained when only the recommended N rate was applied as liquid N at the flag stage. Yield from broadcasted urea at different stages of wheat growth were not significantly different. Leaf N Indexes (LNI) and protein levels were also significantly increased (up to 5 and 2%, respectively) as additional N was added. Strong correlations between LNI and yield (r=0.86) and LNI and grain protein were found. These preliminary results need to be evaluated further before any recommendations can be made

Description

This experiment was conducted in a sandy loam located at NW 35 27 4 W4 (Oyen). Hard red spring wheat (c.v. Stettler) was seeded onto pea stubble to evaluate different N (urea) rate applications at seeding and two growing stages: Flag-leaf (picture 1) and Flowering (anthesis) with two sources of N.

Picture 1. Top-dressing N applications. Broadcast urea (A) and UAN-dribble (B) at flag stage.

Wheat was seeded using CARA's Henderson 500 small plot drill. The experiment was laid out in a randomized complete block design with 4 replications (plots area of 1.4 m by 5 m) and 15 treatments (Table 1). Treatments of N included: three base levels (0, 25, 50 lb/A as urea) at seeding and topdressing N (25 lb/A) at flag-leaf and anthesis (flowering) with urea (broadcast) and UAN (dribble banded), respectively. The recommended rate of nitrogen (50 lb/A) was selected to target 35-40 bu/A. Rains fallowed both N topdressing applications.

Table 1 **Treatment Summary**

Treatment	Description
Control	0 lb
1/2R-N	25 lb/A N
R-N	50 lb/A of N at seeding
R-N_BFlag	50 lb/A of N broadcast at flag leaf
R-N_BFlow	50 lb/A of N broadcast at flowering
1/2R-N+1/2RBFlag	25 lb/A of N at seeding plus 25 lb/A of N broadcast at flag leaf
1/2R-N+1/2RBFlow	25 lb/A of N at seeding plus 25 lb/A of N broadcast at flowering
R-N+1/2RBFlag	50 lb/A of N at seeding plus 25 lb/A of N broadcast at flag leaf
R-N+1/2RBFlow	50 lb/A of N at seeding plus 25 lb/A of N broadcast at flowering
R-N_LFlow	50 lb/A of N dribble banded N* at flag leaf
R-N_LFlag	50 lb/A of N N dribble banded N* at flowering
1/2R-N+1/2RLFlag	25 lb/A N at seeding plus 25 lb/A dribble banded N* at flag leaf
1/2R-N+1/2RLFlow	25 lb/A N at seeding plus 25 lb/A dribble banded N* at flowering
R-N+1/2RLFlag	50 lb/A N at seeding plus 25 lb/A dribble banded N* at flag leaf
R-N+1/2RLFlow	50 lb/A N at seeding plus 25 lb/A dribble banded N* at flowering

Urea for seeding and broadcasted at flag leaf and flowering stage. *urea-ammonium solution (UAN).

Table 2 shows soil analysis and precipitation (inches) for this site. Measurement of leaf N index (chlorophyll) was done using the AtLeaf Chlorophyll meter one week after anthesis treatment was applied. All plots were harvested with a Wintersteiger nursery elite combine. A sub-sample of each plot was analyzed for protein quality. Nitrogen Leaf index, yield and protein data were analyzed for statistical significance by using one-way ANOVA and LSD of the mean by Minitab 17. The economics of the various fertility treatments (fertilizer and application costs vs returns/A) was calculated.

Table 1 **Soil Analysis and Precipitation 2015 (Oyen)**

Soil Analysis		Oyen
Nitrogen*	(0-24")	13 lb/A (M)
Phosphorus*	(0-6")	13 lb/A (M)
Potassium*	(0-6")	280 lb/A (O)
Sulfate*	(0-24")	96 lb/A (O)
Soil Salinity*	(E.C.)	0.54(G)
pH		7.1 (neutral)
OM	(%)	1.7 (low)
Soil Texture**		Sandy loam

Month	**Precipitation** (inches)
May	0.6
June	0.6
July	2.3
Aug	3.6
Total	7.0

* D = Deficient, M = Marginal, O = Optimum, E = Excess,

Results and Discussion:

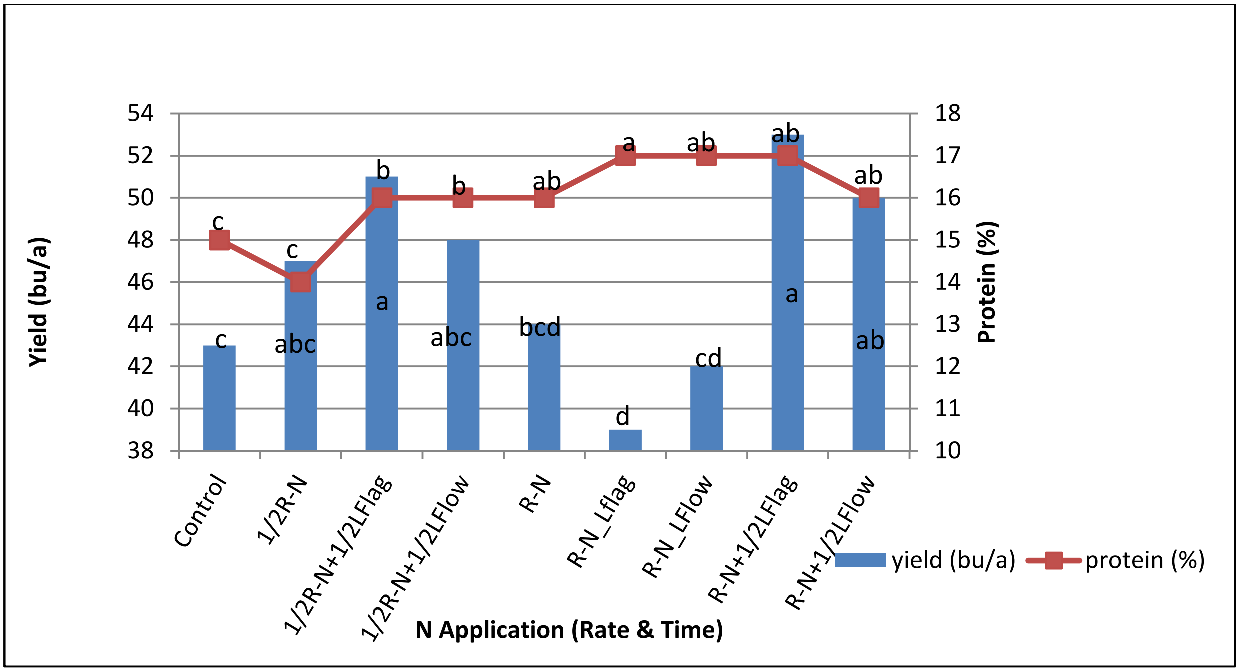
Table 3 shows mean average for grain yield, protein, height at maturity, bushel weight and thousand kernel counts. A strong positive correlation (r=0.86) was found between leaf N index (LNI) and yield. A weaker correlation between protein and LNI was also positive (r=0.59). Grain yields from topdressing N as UAN at flag state were statistical significant higher than the control. The highest yield (53 lb/A) was found for the recommended N rate (Table 3). Protein levels were also statistical higher (2% increase) when compared with the control. Lowest yield (39 bu/A) response was obtained when the recommended N (50 lb/A) rate was applied only at flag as UAN.

Table 3 **Mean average yield, protein and other quality parameter response to different N placements on hard red spring wheat (Stettler).**

Treatment	Yield (lb/a)	Yield (bu/a)*	Protein (%)	Height (cm)	Leaf N Index	Bushel Weight (lb/bu)	TKW (grams)
Control	2585	43	14.5	59	47	63	38
1/2R-N	2828	47	14.4	60	49	63	38
R-N	2607	43	16.1	61	51	62	37
N R-N_BFlag	2954	49	17.0	63	51	62	37
R-N_BFlow	2866	48	16.9	61	51	62	37
1/2R-N+1/2RBFlag	2966	49	16.4	61	51	63	38
1/2R-N+1/2RBFlow	2990	50	16.3	63	50	63	39
R-N+1/2RBFlag	2777	46	16.7	63	52	62	38
R-N+1/2RBFlow	2866	48	16.6	64	50	63	37
R-N_LFlow	2520	42	16.5	58	49	63	38
R-N_LFlag	2343	39	16.6	60	49	62	38
1/2R-N+1/2RLFlag	3085	51	15.8	61	49	63	38
1/2R-N+1/2RLFlow	2901	48	15.9	63	50	63	38
R-N+1/2RLFlag	3174	53	16.5	62	52	63	38
R-N+1/2RLFlow	3018	50	16.2	63	51	63	38
Overall Mean	2832	47	16.2				
LSD (0.05)	417	7	1.5				
C.V. %	12	12					

*60 lb/bu. 0 lb N/A= control, 25 lb/A= 1/2R, 50 lb N/A = Recommended (R-N) L= UAN, Flow= flowering, Flag= flag leaf, B=Broadcast urea

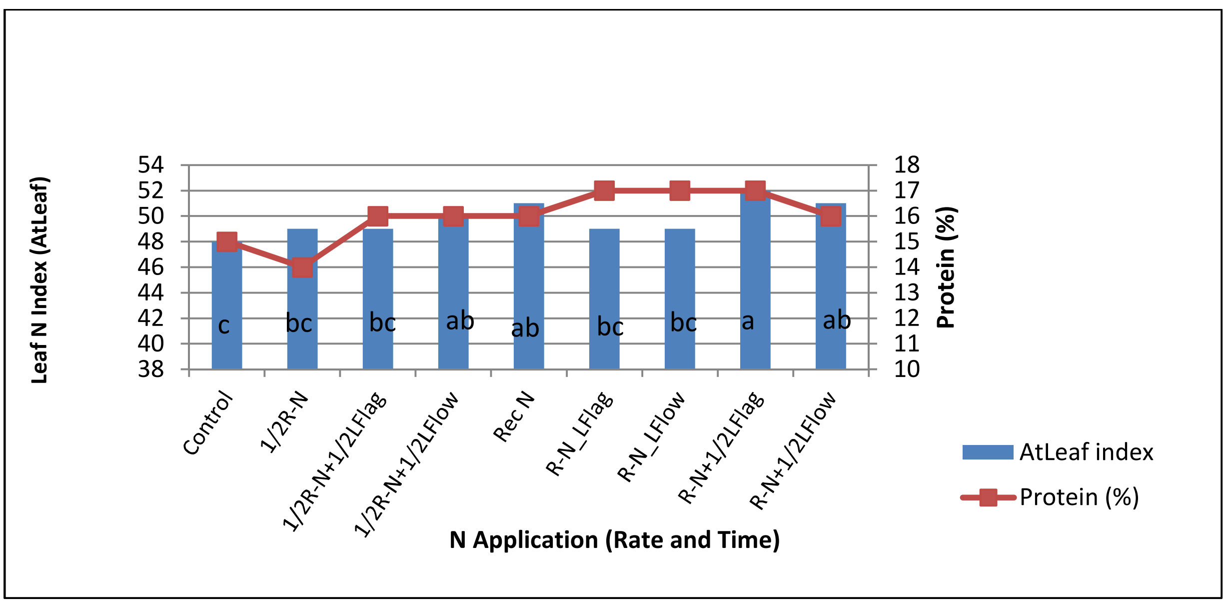
Comparison of grain yield, protein responses, leaf N index and grain protein content for topdressing UAN are reported in Figure 1 and 2, respectively. The same letter indicates that there were no significant differences in yield and protein for those treatments. Topdressing applications seemed to have a positive impact in increasing yield when compared with the control but they were not statistically different than half of the N recommended rate at seeding.



0 lb N/A= control, 25 lb/A= 1/2R, 50 lb N/A = Recommended (R-N), L= UAN, Flow= Flowering,

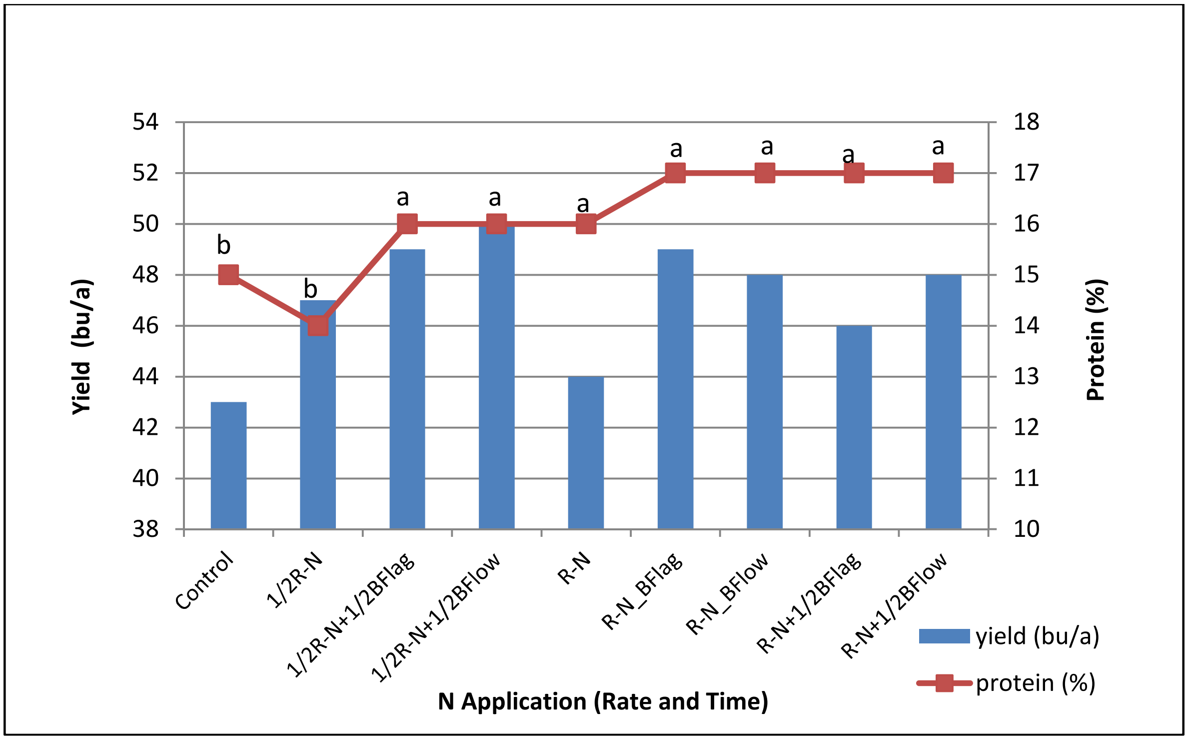
Figure 1. Yield and protein response affected by liquid N application at flag-leaf and anthesis stages compared with urea application at seeding.

Grain yields and protein content response at banded UAN-dribble on top of soil surface presented more variability than banded urea applied at the same time and rates (Table 3 and Figure 3). A high correlation (r=0.69) was found between LNI and protein contents for the UAN treatments (Figure 2).



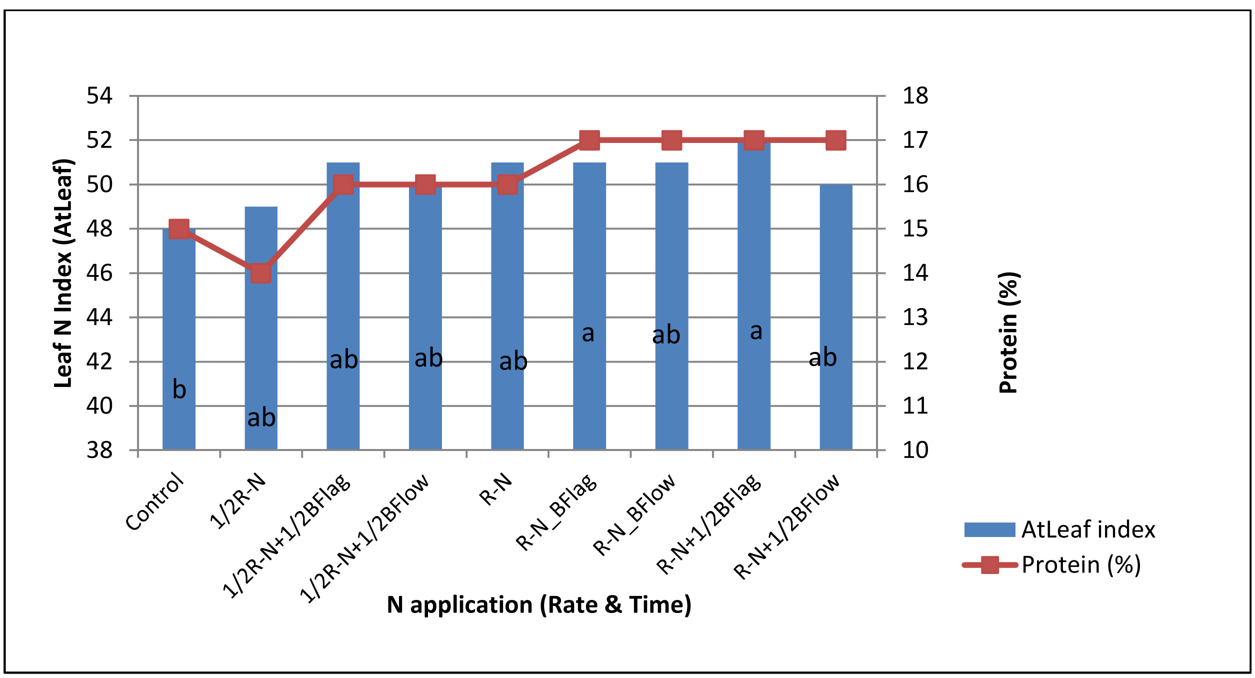
0 lb N/A= control, 25 lb/A= 1/2R, 50 lb N/A = Recommended (R-N), L= UAN, Flow= Flowering,

Figure 2. Leaf N Index and protein relationship affected by UAN application in wheat at flag-leaf and anthesis stages. Correlation r=0.68



0 lb NA/A= control, 25 lb/A= 1/2R, 50 lb N/A = Recommended (R-N), Flow= Flowering, B=Broadcast urea

Figure 3. Yield and protein response affected by broadcast urea application at flag-leaf and anthesis stages compared with urea application at seeding



0 lb N/A= control, 25 lb/A= 1/2R, 50 lb N/A = Recommended (R-N), Flow= Flowering, B=Broadcast urea

Figure 4. Leaf N Index and Protein relationship affected by urea application in wheat at flag-leaf and anthesis stages. Correlation r=0.69

Comparison of grain yield, protein response and leaf N index and grain protein content for topdressing urea are reported in figure 3 and 4. No significant yield differences were found when N was top dressed as urea, but protein content was significantly different. The range of grain yield and protein content was 43 to 50 lb/A and 14 to 17 %, respectively. A high correlation (r=0.68) was found between LNI and protein content for the UAN treatments (Figure 4).

The partial economic analysis considering only fertilizer and application (Table 4) indicates that current prices and bonus for elevated protein did not cover the application of recommended nitrogen fertilizer levels at this site in 2015. There has been no accounting, however, for the potential improvement in soil condition from stubble left behind. Readers must keep in mind this report is based on one site year of data.

Table 4 **Partial Economic Analysis from Various N Placements**

Treatment	Yield (bu/A)	Protein (%)	B.Return ($6.5/bu)	P.Bonus ($.01/.1%)	Gross Return ($)	Fertilizer Cost ($)	Appl'n	Total Cost ($)	Net Return ($)
Control	43	14.5	$94.25	$6.45	$100.70	$0.00	0.00	0.00	100.70
1/2R-N	47	14.4	93.60	6.58	100.18	13.56	0.00	13.56	86.62
R-N	43	16.1	104.65	13.33	117.98	27.12	0.00	27.12	90.86
N R-N_BFlag	49	17	110.50	19.60	130.10	27.12	8.50	35.62	94.48
R-N_BFlow	48	16.9	109.85	18.72	128.57	27.12	8.50	35.62	92.95
1/2R-N+1/2RBFlag	49	16.4	106.60	16.66	123.26	27.12	8.50	35.62	87.64
1/2R-N+1/2RBFlow	50	16.3	105.95	16.50	122.45	27.12	8.50	35.62	86.83
R-N+1/2RBFlag	46	16.7	108.55	17.02	125.57	40.68	8.50	49.18	76.39
R-N+1/2RBFlow	48	16.6	107.90	17.28	125.18	67.80	8.50	76.30	48.88
R-N_LFlow	42	16.5	107.25	14.70	121.95	28.27	7.90	36.17	85.78
R-N_LFlag	39	16.6	107.90	14.04	121.94	28.27	7.90	36.17	85.77
1/2R-N+1/2RLFlag	51	15.8	102.70	14.28	116.98	27.70	7.90	35.60	81.38
1/2R-N+1/2RLFlow	48	15.9	103.35	4.61	107.96	27.70	7.90	35.60	72.36
R-N+1/2RLFlag	53	16.8	109.20	20.14	129.34	41.26	7.90	49.16	80.18
R-N+1/2RLFlow	50	16.2	105.30	16.00	121.30	41.26	7.90	49.16	72.14

B.Return=Base Return, P.Bonus=Protein Bonus. 46-0-0 @ $550/tonne; Broadcast floater truck $8.50/A; High clearance sprayer $7.90/A. Wheat @ $6.50/bu; Protein Bonus $.01 per percentage point above 13%

Observations:

Data collected during the first year of this study suggested that topdressing N may have the potential for targeting wheat grain yield and protein content. This may give farmers the opportunity of making a decision later in the season to apply N. However these responses could be conditional to soil moisture at the time of their applications. The economic analysis showed that the value of yield and protein response did not cover the application of N during this year. However there was a significant increase in yield and protein for the N applications. The yield found for the control treatment may be attributed to the residue effect of N left behind by the previous crop (field pea). The high correlation found among Leaf N Index, yield and protein may be a tool for predicting yield and/or protein content. These preliminary results need to be evaluated further before any recommendations can be made.

Acknowledgement: This study was funded by the Alberta Wheat Commission (AWC) and the Alberta Crop Industry Development Fund (ACIDF).

Flax Variety Trial

Summary

Flax variety trial was conducted in 2015 to evaluate the performance of several varieties in east-central Alberta as part of the Alberta and Saskatchewan Regional Variety Testing Program. The fourteen varieties tested yielded an average of 12 bu/A. This yield represents half of the yield reported in 10 year average of flax yield in bushels per acre for Alberta. The poor performance of these varieties may be related to the weather condition not being favorable for this crop during 2015.

This is the first year for Flax varieties to be tested in east-central Alberta. More information on varieties is available in the seed.ab.ca seed guide published by the Alberta Seed Industry Partnership, the www.seed.ab.ca website or the Varieties of Cereal and Oilseed Crops report on the Alberta Agriculture and Rural Development website at www.agric.gov.ab.ca. Feel free to call the CARA office with your questions.

Cooperators: Donna Scory, Oyen NW 35-27-4 W4

Project Description and Precipitation Summary from previous years – see "Variety Trials" report, pages 1 and 2.

Site Information:

Table 1 **Soil Analysis 2015**

Soil Analysis		Oyen
Nitrogen*	(0-24")	9 lb/A (D)
Phosphorus*	(0-6")	8 lb/A (D)
Potassium*	(0-6")	357 lb/A (O)
Sulfate*	(0-24")	17 lb/A (O)
Soil Salinity*	(E.C.)	0.49 (G)
pH		7.8 (alkaline)
OM	(%)	3.4 (normal)
Soil Texture**		Sandy loam

* D = Deficient, M = Marginal, O = Optimum, E = Excess

Table 2 **Precipitation 2015 (inches)**

Month	Oyen
May	0.5
June	0.6
July	2.3
Aug	3.6
Total	7.0

Table 3 **Agronomic Information**

	Oyen
Previous Crop	Field peas
Seeding Date	May 29
Seeding Depth	1-1.5 inches
Seedbed Condition	Good moisture conditions
Seeding Rate	23 plants per square foot
Fertilizer* (11-52-0)	80 lb/A
Seeder**	Henderson 500 drill
Seedbed Preparation	Pre-seed glyphosate
Herbicide	Buctril M
Fungicide	None applied
Harvest Date:	October 17

*placed between paired rows ** 5 paired rows on 11" spacing,

Results:

Table 4 **Flax – Oyen 2015**

Variety	Yield (lb/A)	Yield (bu/A at 56 lb/bu)	Height (cm)
AAC Bravo	560	10	51
CDC Bethune	651	12	53
CDC Glas	633	11	50
CDC Neela	775	14	47
CDC Plava	600	11	49
FP2316	655	12	50
FP2316	593	11	44
FP2388	583	10	41
FP2454	619	11	48
FP2457	800	14	45
NuLin VT50	684	12	47
Prairie Grande	731	13	52
WESTLIN 71	693	12	49
WESTLIN 72	741	13	46
Mean	666	12	48
LSD (0.05)	NS		
C.V. %			

Comments: Flax seed varieties at the Oyen site averaged 12 bu/A in 2015, ranging from 10 to 14 bu/A. There was no significant difference in yield (lb/A) between varieties. Yields in general were adversely affected by the dry conditions early in the growing season.

Triticale Variety Trial

Summary

Triticale variety trials were conducted in 2015 to evaluate the performance of these varieties in east-central Alberta. The five varieties averaged half (33 bu/A) of their long term average of 67 bu/A.

Six winter triticale varieties were planted as a demonstration strip September 24, 2014 near Oyen. All varieties showed good germination and emergence in the fall; however lack of moisture during the early growing season had a negative impact on their yield potential. Yield range for these varieties was 17 – 43 bu/A (60 lb/bu).

The long term averages for all sites are included in this report. More information on varieties is available in the seed.ab.ca seed guide published by the Alberta Seed Industry Partnership, the www.seed.ab.ca website or the Varieties of Cereal and Oilseed Crops report on the Alberta Agriculture and Rural Development website at www.agric.gov.ab.ca. Feel free to call the CARA office with your questions.

Cooperator: Barry Redel, Consort NE 12-35-6-W4

Project Description: Please see "Variety Trials", page 1.

Site Information:

Table 1 **Soil Analysis**

Soil Analysis		Consort
Nitrogen*	(0-24")	24 lb/A (D)
Phosphorus*	(0-6")	36 lb/A (O)
Potassium*	(0-6")	512 lb/A (O)
Sulfate*	(0-24")	846 lb/A (E)
Soil Salinity*	(E.C.)	0.41 (G)
pH		5.9(neutral)
OM	(%)	4.8 (normal)
Soil Texture**		N/A

* D = Deficient, M = Marginal, O = Optimum, E = Excess,
** S = Sand, Si = Silt, C = Clay

Table 2 **Precipitation 2015**

Month	Consort
May	0.1
June	2.0
July	1.1
Aug	4.0
Total (inches)	7.2

Table 3 **Agronomic Information**

	Consort
Previous Crop	Spring wheat
Seeding Date	May 11
Seeding Depth	1.5 – 2.0 inches
Seedbed Condition	Adequate moisture conditions for germination
Seeding Rate	18 plants per square foot
Fertilizer	100 lb/A of 26-18-5-3 placed between the paired seed rows
Seeder	Henderson 500 drill (5 paired rows on 11" spacing, fertilizer between rows)
Seedbed Preparation	Pre-seed glyphosate
Herbicide	Buctril M, Achieve, Turbocharge
Fungicide	None
Harvest Date	September 2

Results:

Table 4 **Triticale – Consort 2015**

Variety	**Yield (lb/A)**	**Yield (bu/A at 52 lb/bu)**	**Height (cm)**	**Bushel Weight (lb/bu)**	**TKW (grams)**
Bunker	2082	40	75	57	31
Pronghorn	1384	27	75	57	34
Sunray	1728	33	74	55	34
Taza	1531	29	75	57	33
Tyndal	1947	37	74	56	33
Mean	1734	33	75	57	33
LSD (0.05)	NS				
C.V. %					

Comments: There were no significant differences among the variety yields in the 2015 triticale variety trial at Consort. Mean average for the trial was 33 bu/A. These varieties yielded half of previous years, with some variation between replications, so data will not be reported in the long term yield table. Yield reduction may be attributed to the dry weather condition during the early growing season for these varieties.

Table 5 **Triticale Long Term Yield at Consort**

Variety	Avg. Yield as % of AC Ultima	No. of Years Grown*
AC Alta	114	4
AC Certa	101	3
AC Copia	115	4
AC Ultima (check)	100	8
Brevis	107	3
Bumper	96	1
Bunker	72	1
Companion	94	1
Pronghorn	104	6
SANDRO	97	3
Sunray	98	3
Taza	92	4
Tyndal	78	1

*During the years 2000-2014. No data for 2015 included
*AC Ultima long term average yield is 67 bu/A.

Table 6 **Triticale Long Term Yield at Oyen**

Variety	Avg. Yield As % of Pronghorn*	No. of Years Grown*
AC Alta	96	5
AC Certa	95	4
AC Copia	97	4
AC Ultima	105	6
Banjo	94	2
Brevis (T200)	122	1
Bumper	114	3
Bunker	86	3
Companion	94	1
Pronghorn (check)	100	9
SANDRO	92	3
Sunray (T204)	105	2
Taza	101	2
Tyndal	105	3
Wapiti	96	2

*During the years 1997-2000, 2007-2011.
*Pronghorn long term average yield is 64 bu/A.

Table 7 **Triticale Long Term Yield at Hanna**

Variety	Avg. Yield as % of Pronghorn*	No. of Years Grown*
AC Alta	106	8
AC Certa	102	6
AC Copia	106	5
AC Ultima	99	7
Banjo	99	2
Bumper	106	1
Bunker	99	2
Companion	96	3
Pronghorn (check)	100	10
SANDRO	93	5
Sunray (T204)	93	1
Taza (T198)	95	1
Tyndal	97	2
Wapiti	99	2

*During the years 1997-2001, 2003, 2005-2007, 2010

Table 8 **Triticale Long Term Yield at Acadia Valley**

Variety	Avg. Yield as % of Pronghorn*	No. of Years Grown*
AC Alta	104	5
AC Certa	102	5
AC Copia	100	5
AC Ultima	101	4
Banjo	95	3
Brevis (T200)	107	1
Bumper	108	2
Pronghorn (check)	100	7
SANDRO	102	2
Sunray (T204)	92	2
Taza	94	2
Wapiti	108	4

*During the years 1995-2000, 2010, 2011.

*Pronghorn long term average yield is 60 bu/A.

Fall Rye Variety Trial

Summary

Five varieties of fall rye were seeded in the fall of 2014 to evaluate their performance in east-central Alberta as part of Alberta's Regional Variety Testing Program. The five varieties averaged less than half of the reported average yield (40 bu/A) in Alberta. The poor yield performance of these varieties could be attributed to the dry weather condition during the growing season as emergence in all plots was good prior to freeze up in 2014.

Fall rye has been used as a green cover crop for weed control in organic farming production. In the US it has been used to improve soil health for its soil-holding rooting system, reduction of nitrate leaching, for controlling wind erosion as well as for breaking disease cycles in rotation. It is a valuable feed source – both as stored forage and for grazing. With all of these qualities of fall rye, it is important to continue testing these varieties.

Cooperator: Irvine Jorgenson, Oyen SE 15-29-04-W4

Project Description: Please see "Variety Trials", page 1.

Site Information:

Table1 **Precipitation 2015**

Month	Oyen
May	0.5
June	0.6
July	2.3
Aug	3.6
Total (inches)	7.0

Table 2 **Agronomic Information** (note – soil analysis not available)

	Oyen (Jorgenson)
Previous Crop	Canola (2014)
Seeding Date	September 24, 2014
Seeding Depth	1-1.5 inches
Seedbed Condition	Good moisture conditions
Seeding Rate	18 plants per square foot
Fertilizer* (26-18-5-3)	125 lb/A
Seeder**	Henderson 500 drill
Seedbed Preparation	Pre-seed glyphosate
Herbicide	Buctril M + Achieve Liquid Gold +Turbocharge
Fungicide	None applied
Harvest Date:	August 14

*placed between paired rows ** 5 paired rows on 11" spacing,

Results:

Table 4 **Fall Rye – Oyen 2015**

Variety	Yield (lb/A)	Yield (bu/A at 52 lb/bu)	Height (cm)	Bushel Weight (lb/bu)	TKW (grams)
Brasetto	735	12	43	51	25
Danko	685	11	45	53	25
Guttino	995	17	47	51	26
Hazlet	1058	18	54	53	27
Prima	985	16	64	53	29
Mean	891	15	51	52	26
LSD (0.05)	NS				
C.V. %					

Comments: There were no significant differences between the variety yields in the 2015 Rye variety trial at Oyen. Mean average for the trial was 15 bu/A. (only half of reported average potential yield). Yield reduction may be attributed to the dry weather condition during the early growing season.

Barley Variety Trial

Summary:
Barley variety trials were conducted in 2015 to evaluate the performance of several varieties and their potential in the brown soil zone as part of Alberta's Regional Variety Testing Program. 2 row barley varieties were planted near Oyen. This trial was lost completely, due to drought conditions during the early growing season at Oyen.

Only the long term averages from previous trials are included in this report.

Table 1. **Hulless Barley Long Term Yield at Hanna**

Variety	Avg. Yield as % AC Metcalfe	Years Grown*
AC Bacon (6 row)	95	3
AC Hawkeye (6 row)	82	3
AC Metcalfe (check)	100	11
CDC Candle (2 row)	90	4
CDC Carter (2 row)	106	2
CDC Clear (HB08304) (2 row)	80	1
CDC Dawn (2 row)	90	5
CDC ExPlus (2 row)	84	2
CDC Freedom (2 row)	81	1
CDC Gainer (2 row)	87	4
CDC McGwire (2 row)	108	3
CDC Silky (6 row)	85	4
Condor (2 row)	84	2
Falcon (6 row) ①	82	5
Jaeger (6 row)	80	3
Merlin (2 row)	75	1
Millhouse (2 row)	85	2
Peregrine (6 row) ①	72	1
Phoenix (2 row)	82	4
Tercel (2 row)	83	3
Tyto (6 row)	77	3

① Semi-dwarf
*During the years 1995-2000, 2003-4, 2006-7, 2010-2012.
*AC Metcalfe long term average is 88 bu/A.

Table 2. **2 Row Barley Long Term Yield at Hanna***

Variety	Type	Avg. Yield as % Check②	Years Grown**
AAC Synergy	Malt	109	2
ABI Voyager	Malt	106	1
Abee	Feed	108	1
AC Bountiful	Malt	101	4
AC Metcalfe②	Malt	100	16
AC Oxbow	Malt	92	3
B1215	Malt	104	3
Bentley	Malt	109	4
Bridge	Feed	101	4
Busby	Feed	122	1
Calder	Malt	96	3
CDC Austenson	Feed	115	2
CDC Bold ①	Feed	98	1
CDC Clear	Hulless Malt	85	1
CDC Coalition	Feed	109	2
CDC Copeland	Malt	99	3
CDC Cowboy	Forage	92	4
CDC Dolly	Feed	107	7
CDC Fleet	Feed	85	4
CDC Helgason	Feed	107	2
CDC Kendall	Malt	100	7
CDC Kindersley	Malt	111	3
CDC Landis	Malt	87	1
CDC Maverick	Forage	90	3
CDC Meredith	Malt	104	3
CDC Mindon	Feed	103	2
CDC PolarStar	Malt	101	3
CDC Reserve	Malt	102	3
CDC Select	Malt	106	2

Variety	Type	Yield as % Check ②	Years Grown**
CDC STRATUS	Malt	104	5
CDC THOMPSON①	Feed	93	4
CDC Trey	Feed	96	4
Cerveza	Malt	110	2
Champion	Feed	108	7
CONLON	Feed	86	3
Conrad	Malt	89	2
Formosa	Feed	95	2
Gadsby	Feed	124	2
Harrington	Malt	102	10
Major	Malt	107	4
Manley	Malt	106	3
McLeod	Feed	108	5
Merit	Malt	121	4
Merit 16	Malt	96	1
Merit 57	Malt	102	3
Newdale	Malt	121	2
Niobe	Feed	105	2
Norman	Malt	99	2
Ponoka	Feed	105	6
Rivers	Feed	107	2
Seebe	Feed	102	7
Stein	Malt	106	3
TR07728	Feed	105	4
TR10214		82	1
TR10694		90	1
TR11698		102	1
Winthrop	Feed	102	3
XENA	Feed	110	12

① Semi-dwarf

②Check variety is AC Metcalfe (long term average yield of 90 bu/A)
*Data from yield responses for 2014 was not included
**During the years 1995-2000, 2003-08, 2010-13.

Table 3 **6 Row Barley Long Term Yield at Hanna***

Variety	Type	Avg. Yield as % Check②	Years Grown**
AC Albright	Feed	100	2
AC Harper	Feed	105	6
AC Lacombe	Feed	108	8
AC Metcalfe ②	Malt	100	16
AC Ranger	Forage	103	1
AC Rosser	Feed	112	7
Alston	Feed	102	3
B 1602	Forage	102	4
Breton (BT589)	Feed	109	2
BT593		113	1
Brier	Feed	117	3
Bronco	Feed	103	4
CDC Anderson	Malt	92	3
CDC Battleford	Malt	108	5
CDC Clyde	Malt	107	4
CDC EARL ①	Feed	100	3
CDC Kamsack	Malt	92	2
CDC Mayfair	Malt	80	3
CDC Sisler	Malt	102	7
CDC Springside	Malt	117	2
CDC Tisdale	Malt	92	2
CDC YORKTON	Feed	97	2
Celebration	Malt	89	3
Chigwell	Feed	97	3
Duel	Feed	107	3
Foster	Malt	101	3
Johnston	Feed	102	3
Kasota ①	Feed	106	6
Lacey	Malt	114	3
Leduc	Feed	114	3
LEGACY	Malt	105	5
Mahigan ①	Feed	94	1
Manny	Feed	122	4
Muskwa	Feed	101	3
Niska ①	Feed	97	1
Robust	Malt	102	3
Stander	Feed	96	5
Stellar-ND	Malt	88	3
Sundre	Feed	111	3
Tankard	Malt	110	3
Tradition	Malt	103	5
Trochu	Feed	119	4
Tukwa	Feed	107	3
Virden	Feed	111	2
Vivar ①	Feed	119	9

① Semi-dwarf ② AC Metcalfe (long term average: 89 bu/A).
*Data from yield responses for 2014 was not included
**1995-2000, 2003-2008, 2010-2013.

More information on varieties is available in the variety guide in the seed.ab.ca seed guide or website or on the Alberta Agriculture and Rural Development website at www.agric.gov.ab.ca.

Oat Variety Trial

Summary:
Oat varieties were planted near Consort in 2015 to evaluate their potential in east central Alberta, as part of the Alberta and Saskatchewan Regional Variety Testing Programs. Mean yield for oats (82 bu/A) averaged less than the yield of similar varieties tested during 2014.There was no significant difference between varieties. The long term averages for previous oat variety trials are included in this report (averages yields for this year will not be included). More information on varieties is available in the variety guide in the seed.ab.ca seed guide or website or on the Alberta Agriculture and Rural Development website at www.agric.gov.ab.ca.

Cooperator: Barry Redel, Consort NE 12-35-6-W4

Project Description: Please see "Variety Trials", page 1.

Site Information:

Table 1 **Soil Analysis**

Soil Analysis		Consort
Nitrogen*	(0-24")	24 lb/A (D)
Phosphorus*	(0-6")	36 lb/A (O)
Potassium*	(0-6")	512 lb/A (O)
Sulfate*	(0-24")	846 lb/A (E)
Soil Salinity*	(E.C.)	0.41 (G)
pH		5.9(neutral)
OM	(%)	4.8 (normal)
Soil Texture**		N/A

* D = Deficient, M = Marginal, O = Optimum, E = Excess,
** S = Sand, Si = Silt, C = Clay

Table 2 **Precipitation 2015**

Month	Consort
May	0.1
June	2.0
July	1.1
Aug	4.0
Total (inches)	7.2

Table 3 **Agronomic Information**

	Consort
Previous Crop	Wheat HRS
Seeding Date	May 11
Seeding Depth	1.5 – 2.0 inches
Seedbed Condition	Adequate moisture conditions
Seeding Rate	18 plants per square foot
Fertilizer	125 lb/A of 26-18-5-3 placed between the paired seed rows
Seeder	Henderson 500 drill (5 paired rows on 11" spacing, fertilizer between rows)
Seedbed Preparation	Pre-seed glyphosate
Herbicide	Buctril M, Achieve, Turbocharge
Fungicide	None
Harvest Date	September 2

Results:

Table 4 **Oats – Consort 2015**

Variety	**Yield (lb/A)**	**Yield (bu/A at 52 lb/bu)**	**Height (cm)**	**Bushel Weight (lb/bu)**	**TKW (grams)**
AAC Justice	2798	82	70	39.4	39.0
AC Stride	2443	72	69	38.6	34.5
Akina	2620	77	67	37.0	44.5
Bia	2956	87	72	38.8	37.0
CDC Dancer	2698	79	71	39.8	34.0
CDC	2644	78	76	36.2	45.0
CDC Ruffian	3000	88	67	39.3	41.0
CS Camden	3020	89	70	39.0	44.0
Kara	3170	93	70	40.3	44.0
Nice	2762	81	72	38.2	44.5
OT 3066	2630	77	72	37.0	41.0
Mean	2795	82	70	39	41
LSD (0.05)	NS				
C.V. %					

Comments: The oats performed very poorly during 2015 at Consort, with a mean yield of 82 bu/A. There were no significant differences between variety means which ranged from 72 to 93 bu/A.

The following tables show the summaries data for oat variety trials over the past several years at Consort, Hanna and Acadia Valley

Table 5 **Oat Long Term Yield at Acadia Valley**

	Avg. Yield as % of Cascade*	No. of Years Grown
AC Assiniboia	98	6
AC Belmont (hulless)	78	8
AC Ernie (hulless)	73	2
AC Gwen (hulless)	55	2
AC Juniper	96	7
AC Medallion	101	4
AC Morgan	105	3
AC Mustang	110	10
AC Preakness	106	7
AC Rebel	101	5
Boudrias (hulless)	82	1
Bullion (hulless)	59	3
Calibre	109	5
Cascade (Check)	100	10
CDC Boyer	104	8
CDC Dancer	83	2
CDC Pacer	102	4
Derby	105	9
Jasper	99	8
Kaufmann	79	2
Lu	87	1
Pinnacle	103	3
Ronald	89	2
SW EXACTOR	95	3
Triple Crown	98	3
Waldern	113	5

*During the years 1991-1996, 1998-2001.
*The long term yield for Cascade is 89 bu/A.

Table 6 **Oat Long Term Yield at Hanna**

Variety	Avg. Yield as % of CDC Dancer*	No. of Years Grown*
7600M	90	1
AC Morgan	111	3
Bradley	108	2
CANMORE	113	1
Cascade	94	4
CDC Big Brown (OT 3037)	103	2
CDC Dancer (check)	100	6
CDC Minstrel	105	3
CDC Morrison	94	1
CDC Nasser	103	1
CDC Orrin	114	2
CDC ProFi	104	2
CDC Seabiscuit	100	1
CDC Sol-Fi	109	1
CDC Weaver	116	2
Furlong	99	1
HiFi	90	2
Jordan	122	3
Lee Williams (hulless)	88	1
Leggett	107	2
Lu	112	1
Murphy	107	1
Ronald	98	2
Stainless	70	1
Stride (OT 2069)	107	1
SW Betania	106	3
Triactor	113	3

*During the years 2003, 2006-8, 2010-2011.

*The long term yield for CDC Dancer is 106 bu/A.

Table 7 **Oat Long Term Yield at Hanna**

Variety	Avg. Yield as % of CDC Dancer	No. of Years Grown*
AAC Deon	115	1
AAC Justice	98	1
BIA	92	1
CDC Dancer (check)	100	2
CDC Haymaker	86	2
CDC Nasser	106	1
CDC Ruffian	105	2
CDC Seabiscuit	115	1
NICE	87	1
OT3066	91	1
OT4001B	102	1
Souris	86	2
Stride	106	1

*During the years 2012-2014

CDC Dancer two year average yield is 166 bu/A.

Field Pea Variety Trial

Summary:
Seven yellow and four green field pea varieties were grown near Consort and Oyen to determine their performance in the brown soil zone, as part of the Alberta Regional Variety Testing Program. The sites were planted in early May and harvested in early September. The field pea site near Oyen was severely affected by the dry conditions early in the growing season, so the entire site was not harvested for yield evaluation.

Field peas yields at Consort ranged between 52 to 76 bu/A, which is a yield reduction of up to 25 % when comparing the same varieties with last year.

Long term yield for previous field pea variety trials are included in this report. More information on varieties is available in the variety guide in the www.seed.ab.ca seed guide or website or on the Alberta Agriculture and Rural Development website at www.agric.gov.ab.ca.

Cooperator: Barry Redel, Consort NE 12-35-6-W4
Dwayne Smigelski, Oyen SE 16-28-3-W4

Project Description: Please see "Variety Trials", page 1.

Table 1 **Soil Analysis**

Soil Analysis	**Consort**	**Oyen**
Nitrogen* (0-24")	24 lb/A (D)	9 lb/A (D)
Phosphorus* (0-6")	36 lb/A (O)	19 lb/A (M)
Potassium* (0-6")	512 lb/A (O)	451lb/A (O)
Sulfate* (0-24")	846 lb/A (E)	48 lb/A (M)
Soil Salinity* (E.C.)	0.41 (G)	0.73 (G)
pH	5.9(neutral)	7.2 (neutral)
OM (%)	4.8 (normal)	3 (normal)
Soil Texture**	N/A	Sandy Loam (49% S, 23% Si, 28% C)*

* D = Deficient, M = Marginal, O = Optimum, E = Excess,
** S = Sand, Si = Silt, C = Clay

Table 2 **Precipitation 2014**

Month	**Consort**	**Oyen**
May	0.1	0.5
June	2.0	0.6
July	1.1	2.3
Aug	4.0	3.6
Total (inches)	7.2	7.0

Table 3 **Agronomic Information**

	Consort	Oyen
Previous Crop	Canola	Wheat-HRS
Seeding Date	May 11	May 7
Seeding Depth	1.5 inches	
Seedbed Condition	Excellent moisture conditions	
Seeding Rate	6 plants per square foot	
Fertilizer (11-52-0)	70 lb/A placed between the paired seed rows	
Seeder	Henderson 500 drill*	
Seedbed Preparation	Pre-seed glyphosate	
Herbicide	Odyssey	
Fungicide	None applied	
Harvest Dates:		
Green Peas	September 2	Not harvested
Yellow Peas	September 2	Not harvested

* 5 paired rows on 11" spacing,

Results:

Table 4. **Yellow Peas – Consort 2015**

Variety	Yield (lb/A)	Yield (bu/A at 60 lb/bu)	Height (cm)	TKW (g)	Standability*
AAC Peace River	1986	33	56	191	3
AAC Lacombe	1374	23	49	190	4
AAC Peace River	1386	23	53	188	5
CDC Inca	1251	21	52	185	4
AAC Lacombe	1002	17	52	189	3
Mean	1499	25	53	189	4
LSD (0.05)	NS				
C.V. %					

*1 = erect 9 = flat

Comments: Yellow peas average yields ranged from 17 to 33 bu/A, with an average yield of 25 bu/A. There were no significant differences between variety. All varieties performed poorly in comparison to previous year. 2015 yields were not used for the long term yield responses for Consort.

Table 5. **Green Peas – Consort 2015**

Variety	Yield (lb/A)	Yield (bu/A at 60 lb/bu)	Height (cm)	TKW (g)	Standability
AAC Radium	1273	21	50	174	6
AAC Royce	1343	22	34	182	4
CDC Greenwater	1398	23	49	181	3
CDC Limerick	1178	20	51	174	2
Mean	1298	22	46	178	4
LSD (0.05)	NS				
C.V. %					

*1 = erect 9 = flat

Comments: Green peas average yields ranged from 20 to 23 bu/A, with an average yield of 22 bu/A. There were no significant differences between variety means. AAC Radius had the poorest standability. All varieties performed poorly in comparison to 2014. At least a reduction of 50 % of their potential was observed. 2015 yields were not used for the long term yield responses for Consort.

The following tables contain summaries data which has been collected over that past several years from various field peas variety trials in Hanna, Provost and Oyen.

Table 6 **Green Field Pea Long Term Yield at Oyen**

Variety	Avg. Yield as % of Patrick	No. of Years Grown*
CDC Limerick	112	3
CDC Patrick (check)	100	7
CDC Pluto	104	3
CDC Raezer	99	3
CDC Tetris	101	3
Greenwater	109	1
MP 1867	107	1

*During the years 2008-2014.
The long term yield for CDC Patrick is 47 bu/A.

Table 7 **Green Field Pea Long Term Yield at Consort**

Variety	Avg. Yield as % of Patrick	No. of Years Grown*
CDC Limerick	109	2
CDC Patrick (check)	100	3
CDC Pluto	89	3
CDC Raezer	103	3
CDC Tetris	113	3
Greenwater	91	1
MP 1867	75	1
Cooper	130	1

*During the years 2011, 2013 & 2014
The long term yield for CDC Patrick is 59 bu/A.

Table 8 **Yellow Field Pea Long Term Yield at Oyen**

Variety	Avg. Yield % of CDC Meadow*	No. of Years Grown*
AAC Lacombe	106	1
AAC PEACE RIVER	85	2
Abarth	102	3
Agassiz	115	1
CDC Amarillo	96	3
Argus	89	2
Canstar	94	3
CDC Centennial	92	1
CDC Hornet	99	2
CDC Meadow (check)	100	6
CDC Prosper	94	1
CDC Saffron	111	3
CDC Treasure	93	1
CM 3404	87	1
Cutlass (former check)	97	3
Eclipse	101	1
Hugo	92	3
LN4228	68	1
MP1899	124	1
Noble	75	1
Polstead	112	1
Reward	69	1
Stella	85	4
SW Marquee	62	1
SW MIDAS	89	1
Thunderbird	89	1
Tudor	77	1

*During the years 2007, 2010-2014.
*The long term yield for CDC Meadow is 49 bu/A.

Table 9 **Yellow Field Pea Long Term Yield at Consort**

Variety	Avg. Yield % of CDC Meadow*	No. of Years Grown*
AAC Lacombe	106	1
AAC PEACE RIVER	104	2
Abarth	95	2
CDC Amarillo	105	2
Argus	94	1
Canstar	101	1
CDC Meadow (check)	100	3
CDC Saffron	98	2
CM 3404	88	1
Cutlass (former check)	97	1
Hugo	112	1
LN4228	112	1
MP1899	113	1
Stella	76	1

*During the years 2011, 2013 & 2014.

*The long term yield for CDC Meadow is 65 bu/A.

Fababean, Lentil and Soybean Variety Trials

Summary:
Fababean, lentil and soybean varieties were planted near Oyen in 2015 to evaluate their potential in the brown soil zone of east central Alberta, as part of the Alberta Regional Variety Testing Program. Unfortunately varieties were stressed with a lack of early season moisture and cold temperatures in 2015. Establishment was very poor and uneven so they were not harvested. Table 4 shows 2014 soybean yield for future references.

More information on varieties is available in the variety guide in the seed.ab.ca seed guide or website or on the Alberta Agriculture and Rural Development website at www.agric.gov.ab.ca.

Cooperator: Dwayne Smigelski, Oyen SE 16-28-03-W4

Project Description: Please see "Variety Trials", page 1.

Table 1 **Soil Analysis**

Soil Analysis		Oyen
Nitrogen*	(0-24")	9 lb/A (D)
Phosphorus*	(0-6")	19 lb/A (M)
Potassium*	(0-6")	451 lb/A (O)
Sulfate*	(0-24")	48 lb/A (E)
Soil Salinity*	(E.C.)	0.73 (G)
pH		7.2 (neutral)
OM	(%)	3 (normal)
Soil Texture**		Sandy Loam (49% S, 23% Si, 28% C)*

* D = Deficient, M = Marginal, O = Optimum, E = Excess,
** S = Sand, Si = Silt, C = Clay

Table 2 **Precipitation 2015**

Month	Oyen
May	0.5
June	0.6
July	2.3
Aug	3.6
Total (inches)	7.0

Table 3 **Agronomic Information – Oyen Site**

Previous Crop	Durum
Seeding Date	May 7
Seeding Depth	1.5 – 2 inches
Seedbed Condition	adequate moisture conditions
Seeding Rate	4 (fababean) & 5 (soybean) plants/squarefoot
Fertilizer (11-52-0)	80 lb/A (placed between paired seed rows)
Seeder	Henderson 500 drill (5 paired rows on 11" spacings)
Seedbed Preparation	Pre-seed glyphosate
Herbicide	Odessey
Fungicide	None applied
Insecticide	None applied
Harvest Date	Not harvested

Table 4 **Soybeans – Oyen 2014**

Variety	Yield (lb/A)	Yield (bu/A at 60 lb/bu)	Height (cm)	Bushel Weight (lb/bu)	TKW (grams)
NSC Warren	1666	28	63	61	88
900Y61	1783	30	56	61	114
Akras	2002	33	58	62	94
CFS13.2.01	1830	30	67	62	88
Hero	2023	34	62	61	98
Mcleod	1963	33	65	61	122
NSC Moosomin	1336	22	42	61	108
NSC Reston	1522	25	52	60	90
NSC Tilston	1926	32	62	61	98
VITO	1712	29	74	60	111
P001T34	1183	20	42	60	107
P0002T04	1426	24	53	61	92
PEKKO	1818	30	63	61	24
PH14001	1714	29	45	61	117
PH14002	1829	30	49	60	120
PH14003	1597	27	53	60	98
SAMPSA	2074	35	60	62	113
TH32004	2097	35	60	61	93
TH33003	1624	27	63	61	98
TH33005	1407	23	58	61	94
TH35002	1495	25	57	61	107
Mean	1715	29	57	61	99
LSD (0.05)	468	8			
C.V. %	22				

Comments: 2014 soybean variety yields ranged between 20 to 35 bu/A with an average of 29 bu/A yield. There was significant difference in yields. Varieties with mean differences higher than 8 bu/A are statistically different. The CV indicated yield data were variable.

Other Crops

Summary

During 2015 new crops were planted near Oyen at Donna Scory's site (NW 35-27-4 W4, East site of the CARA Centre) to evaluate their performance in east-central Alberta. Flax varieties were part of the Alberta and Saskatchewan Regional Variety Testing Programs. Camelina, carinata and mustard trials were planted for private companies. Strip demos of chickpeas, coriander, fenugreek, soybeans, sunflowers, popcorn were planted as a new crop demo block. A few varieties of soybean were also planted in contour in a small area with a slope. Research activities to evaluate soil minerals (Simplot) and plant bioregulators (Stoller) on canola and wheat were also planted in this site. Different mixtures of cocktail cover crops (CCC) were planted along with individual species to evaluate them separately. A section with a CCC mixture was also planted to improve the soil for a future garden. This site has saline areas located at both north and south portions of the field. These saline areas were seeded with AC Saltlander Green Wheat Grass, a saline tolerant perennial forage. Granular humalite was applied at the south site at the rate of 1000 kg/A to evaluate its effect on saline soils. Figure 1 shows the lay out representing each one of the crops tested during 2015 in this site. Soil analysis and precipitation data are reported in the Flax Variety trial report.

Unfortunately most of the crops did not perform well due to a lack of moisture during the early growing season having a negative impact on the growth development, especially the brassicas and pulse crops. The block area with the new crops and most of the individual species for the CCC had a poor emergency and establishment. Millet was the specie which performed very well (Picture 1) of all the cereal crops. The reason may be that millet is a warm season grass. The wheat research activities were less affected by the drought condition (see AWC-wheat report on page 21). Tillage radish, sunflowers and popcorn had a slow growth at the beginning of their development stages but their growth increased as the moisture condition was improved by late season precipitation.

Picture 1. Millet individual species for September 4, 2015

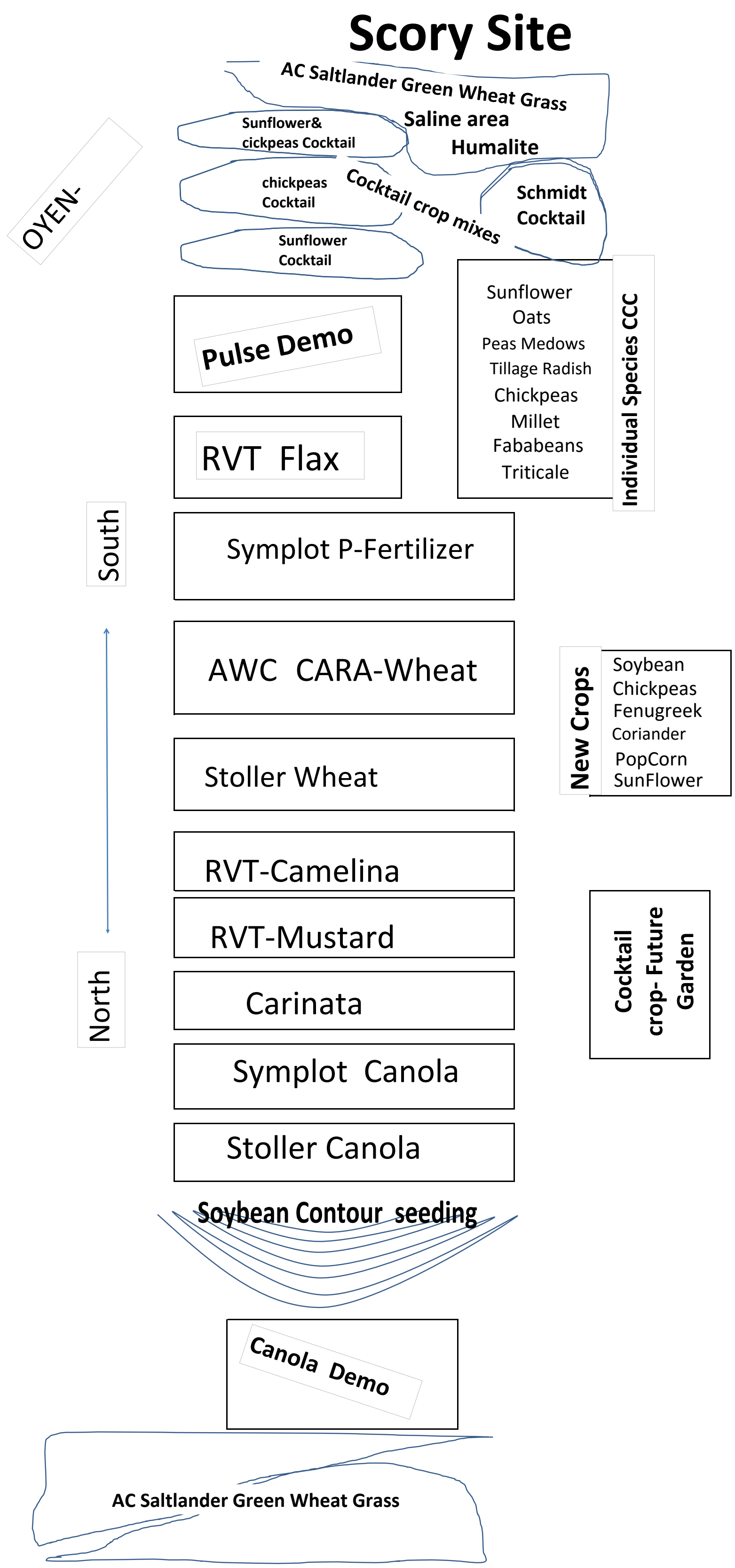


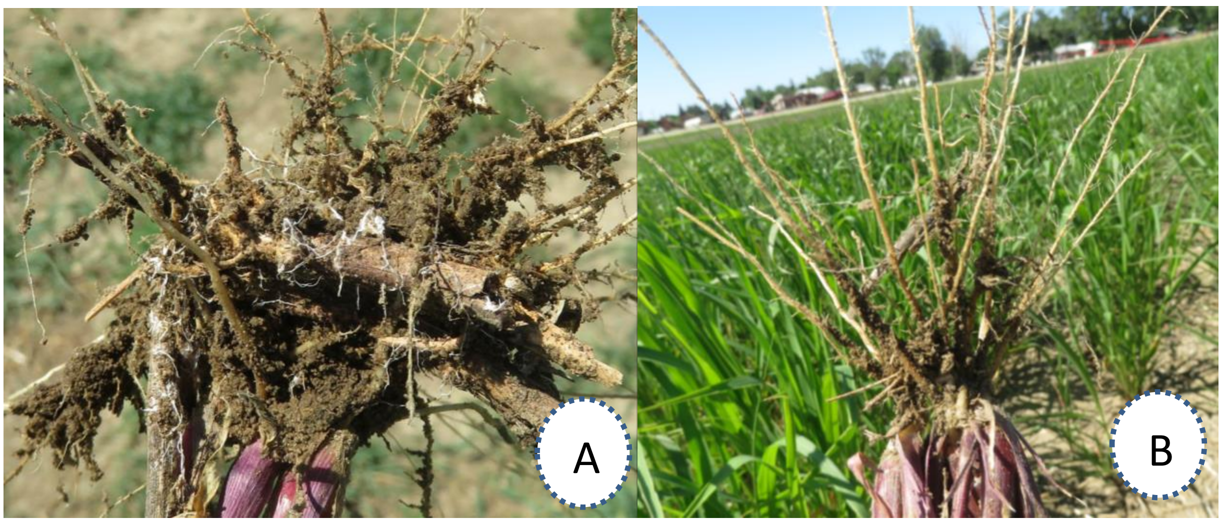
Figure 1. Scory Plot Plan for RVT, New Crops, Research Activities and Cover Crop Cocktails

The cocktail cover crops (Pictures 2 and 3) had very good emergence and establishment except for some patches of weed (kochia). After the kochia was handpicked the CCC had a uniform growth.

Picture 2. Cocktail crop for future garden site.

Picture 3. Three mixtures of Cocktail cover crops (South site Figure 1)

Visual root evaluations for aggregate formation were done for the CCC species planted individually and in the cocktail mix. It was observed that when one species was growing individually it had less aggregate formation that when the same specie was growing in the CCC mix. It has been reported that root exudate will feed the soil microbial and they will contribute with the formation and stabilization of soil aggregates. Soil aggregate formation is the first step for improving the health of the soils. Picture 4 shows the root of the same specie (millet) growing with (A) or without (B) CCC.

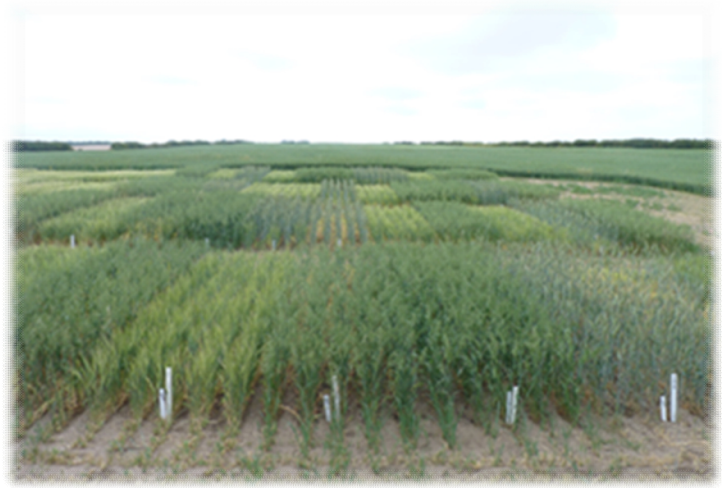


Picture 4. Millet roots growing (A) with cocktail cover crop mix and as single species (B)

This site will be monitored during the next two years to see the response of those CCC mixes on the health of this soil.

CHINOOK APPLIED RESEARCH ASSOCIATION
CARA

Forage Trials & Demonstrations



Annual Forage Dry Matter Trial

Background:
This project is part of a provincial initiative developed to evaluate the yield and quality potential of a number of annual crops grown for forage use. 2015 is the seventh year of this project which includes sites at 10 locations in the province. CARA's sites in the Special Areas represent the brown soil zone in east central Alberta. This report includes a summary of the results from 2010 – 2015 (drought conditions in 2009 resulted in no data). Data from previous CARA projects measuring yield of annual crops for forage yield is also included.

Objective:
To evaluate the forage potential of various annual crops when grown under dryland conditions.

Cooperators: James Madge, Stanmore NE 20-30-11-W4 (Special Area 2) (2010-2015)
Barry Redel, Consort NW 12-37-07-W4 (Special Area 4) (2010-2011)

Project Description:
Seeder: Henderson 500 plot drill with Morris contour openers
Seeding Rate: 18 plants per square foot for cereals
8 plants per square foot for peas
Previous Crop: Fallow
Seedbed Preparation: Glyphosate was applied prior to seeding
Seeding Depth: 2 - 2 ½ inches
Seeding Date: May 28
Plot Size: 1.4 m by 5 m, replicated 4 times in randomized block design
Fertilizer: None applied
Herbicides: MCPA Sodium on July 3
Harvest: The target harvest stage for all crops was soft dough.
Barley & Pulse Mixes – August 5; Oats & Triticale – August 10

Site Information:
Table 1 **Soil Analysis**

Nutrient	Madge Site Spring 2015
Nitrogen (0-24)	183 lb/A (marginal)
Phosphorus (0-6)	86 lb/A (optimum)
Potassium (0-6)	786 lb/A (optimum)
Sulfate (0-24)	717 lb/A (excess)
Soil Salinity (E.C.)	0.67 (good)
pH	7.7 (slightly alkaline)

* D = Deficient, M = Marginal, O = Optimum, E = Excess

Results:

Table 1 **Summary of Dry Matter Forage Yield**

	Stanmore				Consort (2010-2011)
	2015 Yield (lb/A)	**2015 Yield as % Check**	**Average Yield①**	**Average Yield as % Check①**	**Average Yield as % Murphy②**
Oats (Murphy Check)					
AC Juniper	5792^{abc}	96	7180	100 (3)	104
AC Morgan	4696^{bc}	91	6837	96 (5)	104
AC Mustang	5309^{bc}	93	7174	101 (5)	98
CDC Baler	5281^{ab}	102	7313	105 (4)	102
CDC Haymaker	5634^{a}	109	7256	101 (3)	-
CDC Seabiscuit	4787^{bc}	93		93 (1)	-
CDC SO-1	4938^{c}	84	5716	77 (3)	95
Derby	4706^{bc}	91	4878	84 (2)	101
Everleaf	-		6492	95 (2)	99
Foothills	4766^{bc}	92	6453	92 (5)	112
Jordan	-		7460	98 (4)	103
Murphy	5161^{ab}	100	7113	100 (5)	100
Waldern	5322^{ab}	103	5603	94 (5)	104
Murphy/CDC Cowboy	-	-	7870	100 (2)	-
Murphy/Pronghorn	-	-	8618	110 (2)	-
Mean	5126				
LSD (.05)					
CV (%)	11.8				

CDC Haymaker and AC Juniper August 5, 2015

Table 1 con't **Summary of Dry Matter Forage Yield**

	Stanmore				Consort (2010-2011)
	2015 Yield (lb/A)	**2015 Yield as % Check**	**Average Yield①**	**Average Yield as % Check①**	**Average Yield as % check②**
Barley (CDC Austenson Check)					**% Vivar**
AC Lacombe	-	-	4224	86 (1)	94
AC Ranger	-	-	10506	116 (3)	97
Amisk	4568[bc]	109	6572	102 (1)	-
Busby	-	-	9757	103 (4)	109
Canmore	4891[abc]	111	4891	111 (1)	-
CDC Austenson	4186[c]	100	9001	100 (5)	97
CDC Coalition	-	-	10878	96 (3)	-
CDC Cowboy	-	-	8986	100 (4)	106
CDC Maverick	4913[abc]	117	8860	99 (3)	-
CDC Meredith	5317[a]	127	5317	127 (1)	-
Champion	4540[abc]	116	4540	116 (1)	-
Chigwell	-	-	8198	88 (4)	104
Conlon	-	-	8946	75 (2)	-
Gadsby	-	-	10374	99 (3)	-
Muskwa	-	-	11537	103 (2)	-
Ponoka	-	-	9408	101 (4)	98
Seebe	-	-	8827	96 (94)	98
Sundre	-	-	7645	88 (4)	96
Trochu	-	-	8570	94 (3)	96
TR12733	5234[ab]	125	5234	125 (1)	-
TR13740	4561[bc]	109	4561	109 (1)	-
Xena	-	-	9138	96 (4)	92
Vivar	-	-	8414	91 (4)	100
Mean	4776				
LSD (.05)					
CV (%)	10.6				
Triticale & Wheat (Taza Check)					% Pronghorn
AAC Chiffon	5693[a]	124	5693	124 (1)	
AAC Innova	5546[ab]	121	5546	121 (1)	
AAC Ryley	4972[bc]	109	4972	111 (1)	
AC Sadash	5098[abc]	111	5098	111 (1)	
AC Ultima	-	-	7688	182 (3)	94
CDC Bunker	-	-	6077	99 (5)	108
Companion	-	-	7470	175 (3)	90
Pasteur	5020[abc]	110	5020	110 (1)	
Pronghorn	-	-	7472	145 (5)	100
Taza	4582[c]	100	5959	100 (6)	87
Tyndal	4515[c]	99	6542	132 (6)	94
Sunray	4918[bc]	107	5731	94 (2)	-
Mean	5043				
LSD (.05)					
CV (%)	9.2				

① 2010 - 2015 data combined ② 2010 & 2011 data combined

Table 1 con't **Summary of Dry Matter Forage Yield**

	Stanmore				Consort (2010-2011)
	2015 Yield (lb/A)	**2015 Yield as % Check**	**Average Yield①**	**Average Yield as % Check①**	**Average Yield as % Vivar②**
Pulse Combinations (CDC Austenson Check)					
CDC Austenson Barley	4113	109			
CDC Baler Oats	4255	111			
Taza Triticale	4541	110			
CDC Horizon/ CDC Austenson	4482	109			
CDC Horizon/ CDC Baler	4554	111			
CDC Horizon/ Taza	3928	96			
CDC Meadow/ CDC Austenson	4306	105			
CDC Meadow/ CDC Baler	4328	105			
CDC Meadow/ Taza	4090	99			
Mean	4289				
LSD (.05)	NSD				
CV (%)	11.7				
From Previous Years (Vivar Check)					
Murphy			7616	88 (3)	115*
Vivar			8936	100 (3)	100*
Pronghorn			7649	88 (3)	107*
40-10/Murphy			6855	67 (3)	93*
40-10/ Pronghorn			6166	61 (3)	81*
40-10/Vivar			6634	65 (3)	78*
CDC Horizon/ Vivar			6114	76 (2)	-
			5692	92 (1)	-
CDC Horizon/ Pronghorn			5548	70 (2)	-
CDC Meadow/ Murphy			5180	84 (1)	-
CDC Horizon/ Murphy			5693	70 (2)	-
CDC Meadow/ Pronghorn			4994	81 (1)	-

① 2010 – 2014 data combined; number of years tested in brackets
② 2010 & 2011 data combined

Table 2 **Feed Quality Analysis 2015 – Stanmore SIte**

	Feed Quality (as % of Check*)						
	Crude Protein	**ADF**	**TDN**	**Ca**	**P**	**K**	**Mg**
Oats							
AC Juniper	105	101	100	105	94	103	103
AC Morgan	97	103	99	104	88	105	94
AC Mustang	94	113	94	111	85	107	103
CDC Baler	114	100	100	102	106	100	103
CDC Haymaker	106	107	97	104	100	116	97
CDC Seabiscuit	109	101	100	111	106	101	103
CDC SO-1	103	94	103	109	112	92	116
Derby	111	100	100	113	109	110	116
Foothills	107	107	96	118	109	98	109
Waldern	91	110	95	113	91	107	97
***Murphy (Check)**	**9.61**	**37.06**	**60.03**	**0.28**	**0.17**	**1.87**	**0.16**
Barley							
Amisk	93	106	97	122	87	78	109
Canmore	95	96	102	116	84	91	97
CDC Maverick	87	100	100	105	89	80	106
CDC Meredith	85	98	101	109	79	91	94
Champion	90	93	103	95	95	90	82
TR 12733	89	103	99	131	89	81	100
TR 3740	89	98	101	109	87	81	91
CDC Austenson (Check)	**8.75**	**33.9**	**62.5**	**0.29**	**0.19**	**1.29**	**0.17**
Triticale							
AAC Chiffon	89	101	100	72	80	101	100
AAC Innova	108	104	98	84	97	102	113
AAC Ryley	97	93	103	74	83	83	113
AC Sadash	95	96	102	91	77	96	113
Pasteur	91	97	101	102	80	97	125
Sunray	96	94	103	116	91	92	113
Tyndal	102	103	99	102	103	92	104
Taza	**9.28**	**36.08**	**60.8**	**0.22**	**0.18**	**1.44**	**0.12**

Table 2 con't **Feed Quality Analysis 2015 – Stanmore SIte**

	Feed Quality (as % of Check*)						
	Crude Protein	**ADF**	**TDN**	**Ca**	**P**	**K**	**Mg**
Pulse Crop Block							
CDC Baler Oats	79	115	93	105	71	128	89
Taza Triticale	79	113	94	90	88	102	78
CDC Horizon/ CDC Austenson	100	103	99	230	110	100	133
CDC Horizon/ CDC Baler	89	115	93	203	93	114	122
CDC Horizon/ Taza	93	111	95	172	90	101	103
CDC Meadow/ CDC Austenson	90	100	100	174	95	88	119
CDC Meadow/ CDC Baler	96	106	97	193	98	124	119
CDC Meadow/ Taza	83	112	95	238	93	97	125
CDC Austenson Barley	**10.2**	**34.58**	**61.97**	**0.31**	**0.21**	**1.44**	**0.18**

Discussion:
New entries in the annual forage trials lead the triticale/wheat group and the barley group in dry matter yield in 2015 (Table 1). AAC Chiffon and AAC Innova (soft white spring wheats) were higher yielding than AAC Ryley wheat and the Sunray, Taza and Tyndal triticales. CDC Meredith yielded greater than Amisk, TR 13740 and CDC Austenson barley. CDC Haymaker was the highest yielding of the oat varieties. Dry conditions early in the growing season resulted in yields generally lower than long term averages.

Protein levels of the 2014 treatments are typically adequate to maintain a beef cow from fall through calving. Supplementation of minerals may be recommended with some of the crops, so review of the analysis with a ration specialist or with the Cowbytes program is advisable.

AAC Chiffon and Tyndal August 5, 2015

Regional Silage Project Summaries

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

Eight 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, Fairview, AB, (780) 836-3354

Major Sponsors

Government of Alberta (ARD) – Alex Fedko RVT Coordinator; Fred Young AOF Coordinator
A & L Canada Laboratories Inc.
Association of Alberta Co-op Seed Cleaning Plants
Alberta Seed Growers' Association

Trial Information

This is the seventh year the regional silage trials have been conducted by groups across Alberta. 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 2012 through 2015 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 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 11 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 and Westlock. The pulse mixes were not seeded at all sites. The Fairview site contained only the barley and pulse mix trials.

Yield at most sites was reduced in 2015 due to early season drought conditions. Data from the Manning and High Prairie sites were not reported due to poor growth from lack of moisture and grasshopper pressure.

Nutritional Analysis

Nutrition was assessed using wet chemistry analysis. Full nutritional analysis was done on each sample but is not reported in this publication. Nutritional analysis for the Hanna site is included in the preceding report.

BARLEY

Variety	Overall Yield	Overall Station Years of Testing	Area (t/ac)					Yield Category (% Vivar)		
			2	3	4	5	6	Low < 8.0 (t/ac)	Medium 8.1 - 12.0 (t/ac)	High > 12.1 (t/ac)
Varieties tested in the 2015 trials (Yield and agronomic data only directly comparable to CDC AUSTENSON)										
CDC AUSTENSON (t/ac)	**10.5**		**7.2**	**12.1**	**9.7**	**12**	**6.7**	**6.6**	**9.6**	**12.5**
CDC AUSTENSON	**100**	**27**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
Amisk	90-	15	102	92-	97	88-	79	87	93	91-
CDC Maverick	103	21	108	96	101	104	105	111	101	101
CDC Meredith	106	8	127	106	99	101	XX	127	XX	102
Canmore	103	8	111	99	98	104	XX	111	XX	102
Champion	105	8	116	97	109	105	XX	116	XX	104
Tr12733	106	8	125	102	105	103	XX	125	XX	103
Tr13740	104	8	109	92	112	106	XX	109	XX	103
Varieties tested in the 2012 - 2014 trials (Yield and agronomic data only directly comparable to VIVAR)										
VIVAR (t/ac)	**8.9**		**8.5**	**10.2**	**5.9**	**10.3**	**6.3**	**6.1**	**9.5**	**10.8**
VIVAR (t/ac)	**100**	**19**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
Busby	101	19	96	100	91	105+	96	96	97	105
CDC Coalition	99	19	97	95	115	94	108	104	90	97
CDC Cowboy	111+	19	106	106	134	112+	109+	115+	111	109
Chigwell	98	19	84	97	112	94-	106	103	84	98
Conlon	92-	13	72	92	XX	88-	103	96	76	94
Gadsby	110+	19	115	110	122	107	112	116+	110	107
Muskwa	95	13	106	90	XX	91-	101	97	93	95
Ponoka	105	19	95	103	129	105	104	108	96	104
Ranger	100	13	114	99	92	99	98	98	100	101
Seebe	105	19	100	106	118	104	103	107	98	104
Sundre	97	19	99	95	106	95	102	95	95	99
Trochu	96	18	XX	93	94	99	93	92	88	99
Xena	103	19	92	104	108	100	108	107+	92	102

OATS

Variety	Overall Yield	Overall Station Years of Testing	Area (t/ac)					Yield Category (% Murphy)		
			2	3	4	5	6	Low < 7.0 (t/ac)	Medium 7.1 - 10.0 (t/ac)	High > 10.1 (t/ac)
Varieties tested in the 2015 trials (Yield, significant differences and agronomic data only directly comparable to CDC Baler)										
CDC BALER (t/A)	**9.9**		**7.9**	**10.7**	**7.8**	**11**	**6.4**	**5.6**	**9.1**	**12.6**
CDC BALER	**100**	**27**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
AC Morgan	101	26	101	100	90	98	129	114	95-	101
AC Mustang	100	27	101	97	95	102	105	98	100	101
CDC Haymaker	99	22	110	96	98	97	100	108+	94	100
CDC SO-I	95-	27	84-	102	82-	95	103	96	96	94-
Previously tested varieties: 2012 - 2014 (Yield, significant differences and agronomic data only directly comparable to MURPHY)										
MURPHY (t/A)	**9.5**		**8.7**	**9.2**	**6**	**11.2**	**5.4**	**5.9**	**9.1**	**12.2**
MURPHY	**100**	**22**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
AC Juniper	95	18	99	97	XX	86-	125	112	83	96
Everleaf	89	5	XX	98	106	67-	XX	104	68	67
Foothills	97	22	99	95	101	96	97	95	94	100
Jordan	97	21	103	92	88	97	112	96	100	96
Waldern	100	21	100	104	94	100	104	98	105	98

TRITICALE

Variety	Overall Yield	Overall Station Years of Testing	Area (t/ac) 2	3	4	5	6	Yield Category (% Taza) Low < 8.0 (t/ac)	Medium 8.1 - 12.0 (t/ac)	High > 12.1 (t/ac)
Varieties tested in the 2015 trials (Yield and agronomic data only directly comparable to TAZA)										
TAZA (t/ac)	**10.6**		**9.7**	**12.3**	**8.5**	**10.7**	**8.9**	**6.4**	**10.8**	**14.2**
TAZA	**100**	**30**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
AAC Chiffon	111	8	124	123	118	92	126	105	113	114
AAC Innova	104	8	121	119	123	83	102	95	107	107
AAC Ryley	97	8	108	104	87	87	110	86	100	101
Pasteur	94	8	110	96	97	84	103	91	99	91
Sadash	102	8	111	102	109	91	121	101	108	97
Sunray	98	23	93	100	101	99	96	95	100	96
Tyndal	98	29	97	105	109	95-	96	101	98	98
Varieties tested in the 2012 - 2014 trials (Yield & agronomic data only directly comparable to PRONGHORN)										
PRONGHORN (t/ac)	**10.4**		**11.9**	**11.5**	**5.2**	**10.5**	**8.2**	**6.6**	**10.7**	**14.5**
PRONGHORN (t/ac)	**100**	**21**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
Bunker	98	21	89	92	101	102	98	98	99	94

Conservation







Soil Health Demonstration Using Cocktail Cover Crop and Humalite

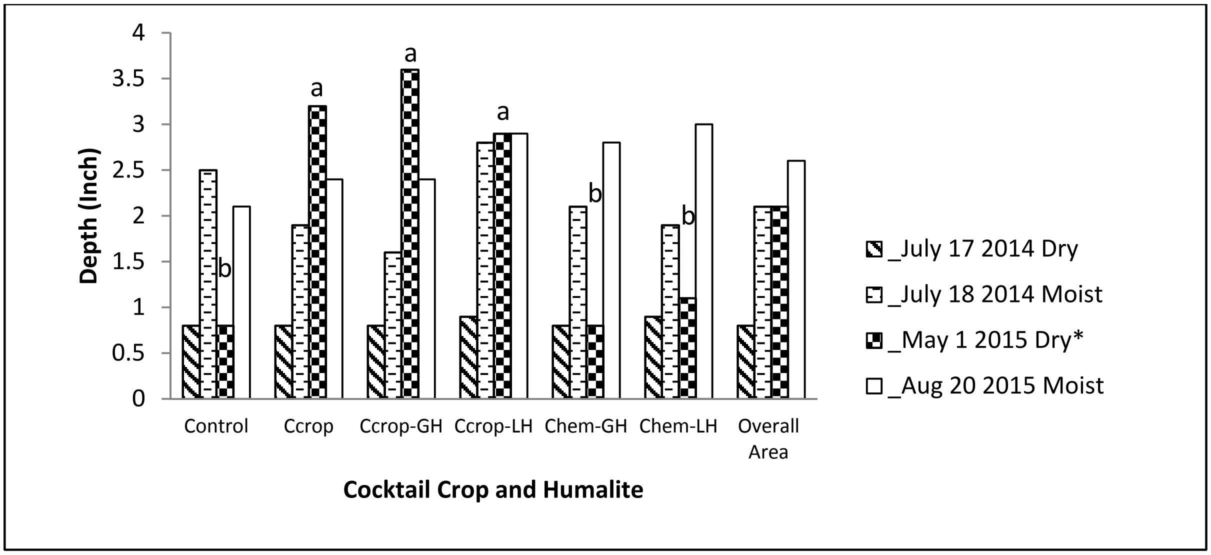
Cooperator: Charles Schmidt, Chinook SE 13-28-09-W4

Summary

A small plot was selected near Chinook to evaluate the effect of a cocktail cover crop (CCC) mix, chemfallow and different levels and types of humalite on the soil health condition. Granular (500 lb/A) and liquid (4 gallons/A) applications of humalite (weathered product of subbituminous coals and carbonaceous shales enriched with humic and other organic acids) were broadcasted onto the soil surface before seeding the CCC. The CCC mixture contained proso millet, field peas, fababean, oats, triticale and tillage radish. It was planted on August 11, 2014 at a rate of 30 lb/A on chem-fallow of 2013 canola. The cocktail mixes are typically seeded in mid-summer to give the crops growth opportunity before a killing frost but not long enough to set seed. Killing frost was not received until later in the fall, giving the plants 3 months of growth in 2014. During this period, it was expected that soil biological activities might be enhanced considering the different crop species involved in the mix.

The soil was very compacted according to penetrometer measurements taken before seeding. Two PSI (pound per square inch) measurements were taken at 2 dates in 2014: 200 and 300 PSI at two soil moisture contents, dry (July 17) and after rain (1 cm rain, July 18). At 200 PSI, the penetrometer was only able to enter into 0.8 inch into the dry soil but reached 2.1 inch into the wet soil. At 300 PSI, the penetrometer measured 1.8 inch and 4.5 inch respectively. Only 70% of plant roots are able to exert force equivalent to 200 PSI. Roots stop growing when the soil requires 300 psi to push through it. Therefore at this site, only 70% of the roots would go deeper than .8 inch into the dry soil and would stop growing at 1.8 inches. When the soil was wet, 70 % of the roots would reach 4.5 inches.

During 2015, evaluations of soil compaction were done to assess the impact of 3 months of CCC growth. Figure 1 shows the rooting depth compaction at the 200 PSI measured at different dates and soil moisture conditions.

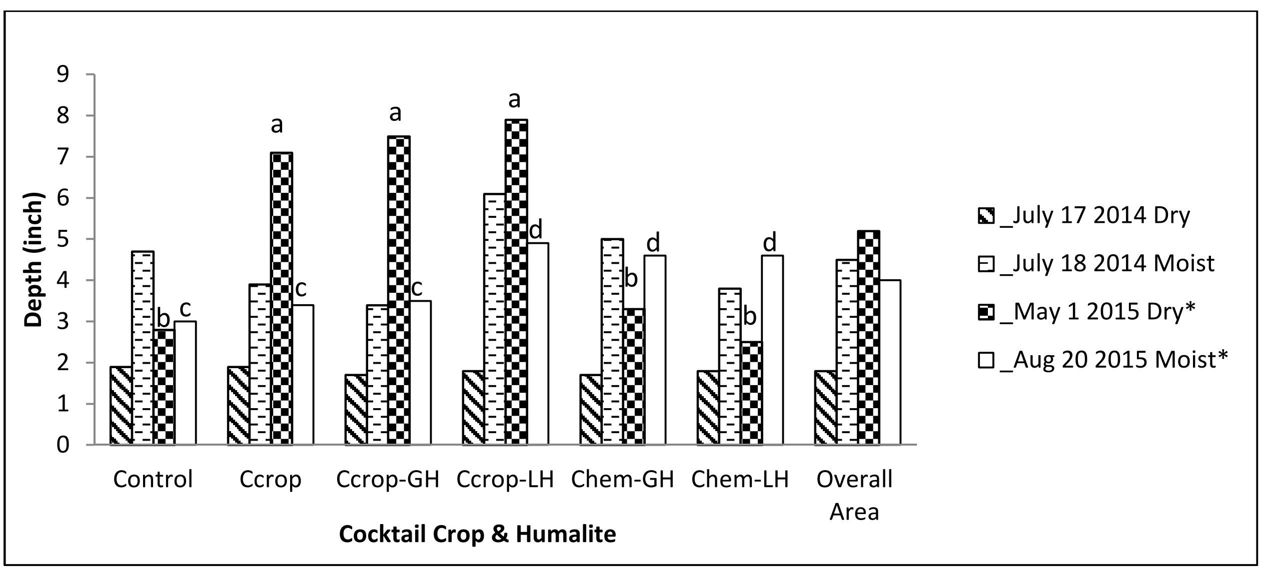


Ccrop=cocktail cover crop, GH=granular humalite, LH=Liquid Humalite, Chem=Chem fallow *Statistical significant different

Figure 1. Cocktail Cover Crop-Humalite effect on Soil depth Compaction at 200 PSI

Measurements of soil compaction done in 2014 and August 2015 were not statistical significant different. However, 3 months of cocktail crop growth, regardless of the humalite application (letter a), improved the rooting depth by more than 2 inch (~3.5 inch) when compared with the chem fallow and control (letter b) at the starting of the growing season (May 1, 2015).

Figure 2 shows the rooting depth compaction at the 300 PSI measured at the same time than the 200 PSI.



Ccrop=cocktail cover crop, GH=granular humalite, LH=Liquid Humalite, Chem=Chem fallow *Statistical significant different

Figure 2. Cocktail Cover Crop-Humalite effect on Soil depth Compaction at 300 PSI

The same trend is observed at the 300 PSI compaction measurements where the cocktail crop improved the rooting depth up to 8 inches when compared with chem-fallow at the start of the 2015 cropping season.

More years of evaluations are needed to further validate these findings. In addition, soil health assessments need to be done to evaluate the influence on microbial activity and/or aggregation stability that humalite may have had on the soil with CCC. However, at this point, these measurements indicate that cocktail cover crops have a positive impact on the soil health regardless of the humalite application. The significance of this impact on soil health is that subsequent crops have more rooting area available for the starting of the cropping season.

Weed evaluation was also measured (April 30, 2015) based on foxtail percentage: Chem fallow granular humalite (80%, **Picture 1**) >Chem fallow liquid humalite (70%) > Cocktail cover crop liquid humalite (40%) > Cocktail cover crop granular humalite (8%, **Picture 2**) = Cocktail cover crop alone (8 %).

Picture 1. Chem fallow granular humalite weed evaluation (Foxtail 80% April 30, 2015)

Picture 2. Cocktail Cover crop granular humalite/no humalite weed evaluation (Foxtail 8 %, April 30, 2015)

Another evaluation done in this demonstration was the visual evaluation of aggregate formation with cocktail cover crop and chem fallow. Pictures 3 and 4 show soil aggregation conditions (May 23, 2015) after being seeded with wheat. The chem fallow area (Picture 3) showed no indication of formation of soil aggregation. On the contrary, the cocktail site (Picture 4) presented lots of aggregates.

Picture 3. Chem fallow aggregate evaluation

Picture 4. Cocktail Cover Crop aggregate evaluation

Pictures 5 and 6 show a close up of the structure types of the soil after being under chemfallow (Picture 5) and CCC (Picture 6)

Picture 5. Chem fallow massive/platy structure

Picture 6. Cocktail cover crop granular (aggregated) structure

These preliminary findings show that with only 3 months of growing a cocktail crop allowed the biological component of this soil to start functioning properly. This is the first step for improving soil health. More evaluations need to be done not only to measure the stability of those aggregates but also the additive effect that humalite may have on microbial activity in this soil. This site will be monitored one more year.

CARA Shelterbelt Demonstration

CARA continues to maintain and monitor a Shelterbelt Demonstration site adjacent to the CARA Centre at Oyen. It was initially developed in the summers of 2003 with seedlings obtained from the PFRA Shelterbelt Enhancement Program. There were eight tree species planted in 2004, including Colorodo Spruce, Green Ash, Mountain Maple, Chokecherry, Villosa Lilac, Hawthorn, Sea Buckthorn and Silver Buffaloberry.

Once the seedlings were planted, a drip tape irrigation system was laid out at the base of the trees and then covered with a black plastic mulch. The black plastic mulch, which comes in rolls four feet wide, was placed along the entire length of the row and secured to the ground using an applicator pulled by a small tractor. Two discs, one on each side of the unit, cut a small trench in the soil when the machine moves forward. As the mulch unrolls, discs near the back of the unit throw soil over each edge of the plastic, securing it to the ground. A small hole is then cut where each seedling has been planted and the tree is gently pulled upright. The drip irrigation system consists of a plastic tape which has outlets at regular intervals that allow a slow trickle of water to be delivered directly to the root systems of the seedlings. At the CARA Centre, the water source includes two 1250 gallon water tanks on either side of the equipment storage shop.

Rain water is collected from the roof of the shop and then piped to the trees. Rainfall was very scarce in early 2015 so the drip tape system was only used once when there was enough water collected. Another source of water was applied directly to the heat stressed trees. The rain in August and September provided sufficient moisture for the remainder of the growing season.

Adequate precipitation during the past few years has limited the need for direct watering or by the drip tape. The progress of all species included in the demonstration has been maintained and monitored. Few losses have occurred and most species are showing good growth for our prairie climate. The plastic mulch has become weathered in places, particularly where it was not held firmly to the soil. Deer hooves have broken the plastic in several places. Damage from wildlife has also caused leaks in the drip tape.

Shelterbelt Mulch Demonstration

Applying mulch suppresses weeds, keeps soil warm in the winter and cools it in the summer. It also conserves moisture, supports and encourages numerous beneficial organisms such as earthworms and reduces stress in shallow-rooted plants. Mulch improves soil structure and drainage and can provide aesthetically pleasing and beneficial effects. Overall, the healthiest plants are those that have access to a consistent supply of water and nutrients and mulch helps with this. Mulches allow for moisture retention, weed reduction as well as increased competitiveness and survival in shelterbelts.

Objectives:

To demonstrate the benefits of various mulches for weed reduction and moisture retention in new shelterbelts.

Summary of mulch application and weed control:

Mulch	Application	Weed Reduction	Comments
Landscape Fabric/ Large Rock	High Labour	Medium	Fabric can be costly for long lengths of shelterbelts; good
Landscape Fabric/ Large Rock with Gravel	High labour	High	Can be costly for long lengths of shelterbelts; good
Landscape Fabric/ Gravel	Medium	High	Can be costly for long lengths of shelterbelts
Wood Chips	Medium	Low*	Cost depends on availability
Hay	Easy	High	Low cost
Straw	Messy/Medium	Medium	Low cost
Grass Clippings	Easy	Medium	Low cost
* Flax Straw	Easy	Undetermined	Low cost

*buckwheat seed came along with the chips

*Flax straw was applied in the summer of 2015

Observations:

Weed growth was monitored in 2015:

- Perennial sow thistle was a huge issue this year in the straw, hay and grass mulches. We had to pull back the majority of the mulches to remove the creeping root system to prevent further weed spread
- The most weed growth appeared in the rototilled area & the straw mulch
- The landscape fabric and rock had minimal to no weed production
- Buckwheat weed seeds were inadvertently imported with the wood chips when they were replaced in 2013, demonstrating the importance of knowing where the mulches are coming from and what may come along with it.
- The hay & straw mulches have deteriorated over the past two years, so a portion of the straw mulch was replaced with flax straw in the summer of 2015
- Moisture retention in the mulched strips was significantly better than that of the rototilled area. The trees required watering only once after planting and twice during the summer of 2013.

Bio-Control of Canada Thistle With the Stem Mining Weevil

Background

Canada thistle (*Cirsium arvense*) is a competitive noxious weed that is widespread across Alberta and much of North America. This perennial herb can grow up to 4 feet tall, has prickly leaves and urn-shaped purple flowers. It causes intensive crop losses from its extensive, horizontal creeping root system. Canada thistle is attracted to sites that have had disturbance and moisture, either by overgrazing, tillage and/or earthmoving. It is listed under the Alberta Weed Control Act as noxious. Canada thistle has a high tolerance to many different environmental conditions and is highly competitive with other vegetation. It is prevalent in many locations such as riparian areas that do not allow for chemical or mechanical control methods. Biological control agents, such as the weevil are of interest in controlling Canada thistle in sensitive areas.

There are 4 beetles that are considered as potential biocontrol agents for Canada thistle including the Stem-mining weevil, scientifically known as *Hadropontus litura* (formerly *Ceutorhynchus litura*). *H.litera* has one generation per year with 3 distinct stages of life: larva, pupa and adult. The adult lifespan is approximately 10 months as they overwinter in the soil and leaf litter, emerging in the spring to feed on rosette leaf foliage and stem tissue. Eggs are laid in May and June in the mid vein of the leaf and hatch 9 days later. The larva tunnel down the stem into the root collar consuming plant tissue and when several larva are present the stem turns black from tunneling and dies several days later. Early summer, once fully fed, the larva will emerge from the thistle shoot. This is the where the main damage happens to the thistle because it opens up holes to where secondary invaders, such as nematodes, parasite and fungi enter and further damage the stems. They then enter the soil, and the papal stage begins, in which they transform into adults. A few weeks later (late June and July) these new adults emerge from the soil and feed on the thistle foliage until heavy frost occurs in fall.

Reported success of the weevils seem to vary according to geographic locations. Research in the Eastern States, California and British Columbia have indicated that *h.litura* provides poor to moderate control when used alone; however, integrating additional tactics may enhance its efficacy. Research carried out in the mid-western states (i.e. Idaho and Montana) and Alberta indicate higher incidences of impact on Canada thistle populations. This could be open to a number of different interpretations but conjecture on the part of some researchers is that stronger winter conditions could be a factor in the geographic locations where Canada thistle are being negatively impacted by the stem mining weevil. Other biological factors, such as rust, might also be more readily apparent in these regions and so add to Canada thistle decline when the stem mining weevil is introduced.

The weevils we initially imported from Montana for this project in dishes of 105 individuals at $125 (US). The weevils do procreate every year and while some documentation indicates that they will migrate, as long as they have a food source they remain rather sedentary and populations expand within a thistle stand. As they reproduce and feed on Canada thistle, an absence of this habitat will eliminate their existence. Adults can fly very well and are active on warm summer days, however they are content to stay among the thistle patch.

Weevils are not '*a be all and end all'* for the eradication of Canada thistle but may have a place in controlling the weed in sensitive areas of the environment. CARA is working with other ARECA member groups to evaluate establishment, survival and impact of the *h.litera* at several locations in Alberta.

Objective:

To evaluate establishment, survival and affect of the Stem mining weevil on Canada thistle.

Project Description:

CARA, along with other ARECA member groups, introduced the Stem-Mining Weevil as a biological control agent to help control Canada thistle populations at various points in Alberta. The purpose of this project is to decrease and control Canada thistle populations in sensitive areas such as riparian zones, organic farms and native pasture. It is hoped the weevil may be a tool to reduce the use of chemicals to control weeds in sensitive areas.

The *h.litera were* imported from Montana and introduced to two sites in September of 2012 and again in September 2014, one in the MD of Acadia and to the second in Special Areas 4. Weather conditions and thistle stand qualities were recorded. The sites were visited in June 2015 to investigate winter survival rate of the weevils. Although no stem mining weevils (*Hadropluntus litura*) were observed, damage was found in the plants at the MD of Acadia site, so there is optimism that the stem mining weevils are living and reproducing in this stand. Definitive identification of the stem mining weevils were not observed in 2014 either.

A release of more weevils was planned for September of 2015. However, because of moisture conditions during August and early September in Montana the weevils could not be harvested. We will continue to monitor the survival and impact of the weevils and hope to release more in the fall of 2016.

Insect Forecast for 2016

CARA participated in the provincial pest monitoring program by monitoring bertha army worm, cabbage seedpod weevil, wheat midge and wheat stem sawfly populations. The following summaries were compiled by Scott Meers, Provincial Entomologist with Alberta Agriculture and Food. (http://www.agric.gov.ab.ca/app21/loadmedia)

Bertha Armyworm

Bertha armyworm larva
Shelley Barkley, Alberta Agriculture and Forestry

Bertha armyworm adult
Shelley Barkley, Alberta Agriculture and Forestry

Bertha armyworm (*Mamestra configurata*) was monitored in 2015 using a network of pheromone-baited traps placed in 265 locations throughout Alberta.

Pheromone traps are used to determine the density and distribution of moths. This network of pheromone traps is organized by Alberta Agriculture and Forestry and individual traps are managed by a wide range of cooperators. Without dedicated and willing cooperators such a comprehensive monitoring system would not be possible. Our cooperators can submit their trap counts using their smart phones with a web based application.

The bertha armyworm population in Alberta has mostly collapsed in 2015, especially in central Alberta. This is likely due to the impact of diseases and parasitism in the areas that previously had high populations.

There was very little need for spraying of bertha armyworm in Alberta in 2015 with the exception of a small area in the northern Peace Region. This small bertha armyworm outbreak unfortunately occurred in an area not covered by the pheromone trapping system.

It is difficult to accurately predict the 2016 bertha armyworm population based on the 2015 moth catch, but the trend appears to be lower populations in almost all regions of the province. The slightly elevated traps of southern Alberta, however, could also signal a potential for increasing bertha armyworm populations. Also experience has taught us that areas of small outbreaks such as the one in the northern Peace often get larger in the second year. In addition research has clearly shown that snow covers encourages successful overwintering. Once again it will be critical to have very good coverage of pheromone traps in 2016 to develop an early warning of potential problems during the coming growing season.

Bertha armyworm populations are normally kept in check by such factors as weather and natural enemies. Generally parasitism rates of 50 - 60 per cent in bertha larval populations have indicated the end of a local outbreak in the following year. As we saw in 2013 epizootic events (disease outbreaks) can have a major impact on the bertha armyworm populations. Only by continuing the monitoring program will we be properly prepared each season. In addition, maintaining the monitoring even in low flight years allows us to pick up trends and better predict when new major outbreaks are starting.

Potential damage from bertha armyworm may be more or less severe than suggested by the moth count data depending on weather and crop conditions and localized population dynamics. An insecticide application is recommended when the larval numbers meet the economic threshold .The Alberta Bertha armyworm forecasting program has been done since 1995. Provincial government personnel, industry agronomists, Applied Research Associations, Agricultural Fieldmen and cooperating growers maintain the pheromone trap network. The cumulative moth count maps are maintained by Alberta Agriculture and Forestry.

During the monitoring season the map is a Google map which means you can move around, zoom in and click on the individual balloons. By clicking on a balloon it will show the organization that looked after that trap, what municipality the trap is in, the weekly count and cumulative count (all counts displayed are the average between the two traps at a site). During the trapping season the information is updated as the entries are made into the data collection website. The resolution is not accurate enough to pinpoint the exact location of individual traps.

The objective of the monitoring is to increase the awareness of canola producers to the damage potential of bertha armyworm. Forecast maps DO NOT replace field scouting. No field should be treated for bertha armyworm control without proper field scouting. Moth catches indicate the potential for damage but the actual populations must be assessed. Experience from 2012 has shown us that adjacent fields or even different parts of the same field can have greatly different bertha armyworm numbers.

Cabbage Seedpod Weevil

Cabbage seedpod weevil was first found infesting canola in southern Alberta in 1995. Since then, the weevil has spread to south-central Alberta and southwestern Saskatchewan. The distribution and abundance of the cabbage seedpod weevil has been monitored yearly in western Canada since 1997.

Predictive models based on climate data indicate that this pest will eventually disperse to all regions of canola production in western Canada, including the Peace Region.

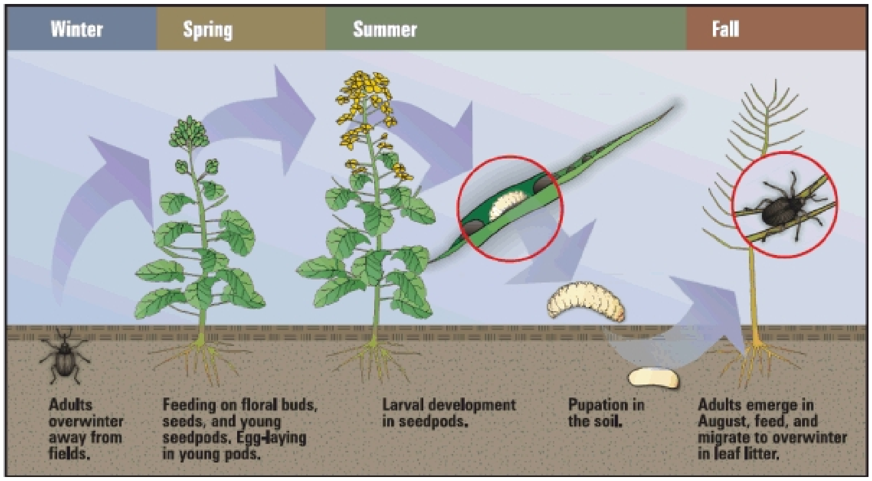
The 2015 survey covered all the canola growing areas of Alberta with 273 fields sampled in 49 municipalities and 56 calls from our online reporting tool.

The cabbage seedpod weevil was once again found at economic levels in southern Alberta including the Municipal District of Pincher Creek. In addition economic levels of cabbage seedpod weevil was found well north of Highway 1 into central Alberta. It will now be important to scout to make control decisions in central Alberta.

The range of economic levels did expand in 2015 and the northern range pushed even further into Lacombe County and well into Stettler, Paintearth Counties and the Municipal District of Provost. This expansion is further north than any range expansions in other years. Other northern range expansions in the past did not persist so it will be important to watch the population over the next couple years.

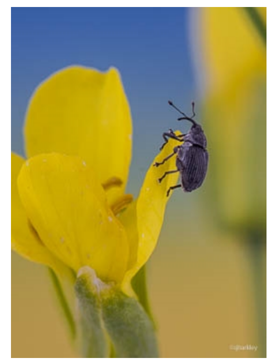
While this is not a true forecast, the numbers of weevils found through this survey in southern Alberta and the southern counties of central Alberta indicate a potential of economically damaging populations in the next growing season. Any producers growing canola in southern Alberta and into the south portion of central Alberta will have to check their canola crops as they come into flower.

The earliest flowering canola crops tend to have the highest risk from cabbage seedpod weevil and should be monitored very closely.



Cabbage seedpod weevil overwinters as an adult so the risk of infestation is further indicated by the adult population of the preceding fall. High numbers of weevil adults in fall will likely mean significant infestation levels in the following spring. This map does not adjust for the emergence of the new generation in the fall or overwintering conditions, although cooler temperatures and rainfall in August favors the development of the new weevil generation and may lead to higher numbers in the following year.

Cabbage seedpod weevil adult abundance is best monitored by using sweep net sampling. Sampling should begin when the crop first enters the bud stage and continue through the flowering period. Select ten locations within each field, and at each location count the number of weevils from ten 180 degree sweeps. Sampling locations should include both the perimeter and interior of the field to obtain a representative estimate of weevil numbers throughout the field.



This monitoring procedure will also give an indication of the number of lygus bugs present and may serve as an early warning for lygus damage, provided that the same fields are monitored into the early pod stage.

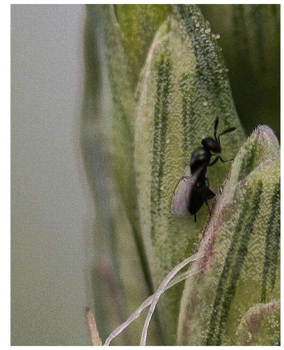
Wheat Midge

The wheat midge forecast for 2016 shows an overall lower level of wheat midge across Alberta. There has been a slight bounce back from the collapse of the extreme populations in the eastern Peace Region. Although wheat midge has not followed our forecasts very well in the Peace region it is important to note that there are likely sufficient populations of midge in the eastern Peace to fuel a resurgence if conditions are in the insects favor. (specifically delayed crops and higher than normal rainfall). Central Alberta has some areas of east of Edmonton with high numbers of wheat midge. The population has remains low in much of southern Alberta with the exception of some irrigated fields. Producers should pay attention to midge downgrading in their wheat samples and use this as a further indication of midge risk in their fields. Over the past several years the field to field variation has been very considerable throughout the province, especially in those areas with higher counts. Individual fields throughout Alberta may still have economic levels of midge. Each producer also needs to assess their risk based on indicators specific to their farm.

This forecast is not intended to take the place of individual field monitoring. The forecast for Alberta shows areas of risk for midge damage in 2016. It is important to note that over such a wide range, populations in individual fields can be and often are highly variable. Producers should plan to monitor their fields when the midge adults are flying and their wheat is in the susceptible stage. In all areas of the province growers are urged to monitor their wheat fields from wheat head emergence to anthesis for the presence of midge adults. Regular field scouting on multiple nights in succession is important in understanding the population in a particular field.

Although a number of factors influence the overwintering survival of the midge, the survey and map provide a general picture of existing densities and the potential for infestation in 2016. Weather conditions, specifically temperature and moisture will ultimately determine the extent and timing of midge emergence during the growing season. Temperature and wind also play critical roles in egg laying activities of the adult female wheat midge. **The level of damage from wheat midge is determined by the synchrony of wheat midge emergence and wheat and the number of wheat midge present.** Look for the results of our wheat midge pheromone trapping in June and July to help track the emergence of adult midge.

Parasitism



Parasitism of midge larvae by a small wasp species (*Macroglens penetrans)* has been important in keeping wheat midge populations below the economic threshold in many areas. These beneficial wasps tend to thrive in warm, dry conditions. Parasite populations increase and decrease with changes in the midge population and are very important in moderating population levels in Alberta.

It is important to understand that once midge has established in an area it unlikely to ever completely disappear. Low lying and moist areas in a field provide a refuge, enabling the population to survive even when conditions are not favorable in the rest of the field. These low population levels, however, also help sustain a population of natural enemies.

Wheat midge larva compared to canola seed

How the survey was done

The 2015 fall survey included wheat growing areas throughout Alberta. In total 337 samples were taken from 61 counties. The survey involves taking soil samples from wheat fields after harvest using a standard soil probe. Larval cocoons are washed out of the soil using a specialized series of screens. Larvae are counted, and then dissected to determine if they are parasitized. The midge density displayed on the forecast map is based on viable (live, non-parasitized) midge larvae.

Wheat Stem Sawfly

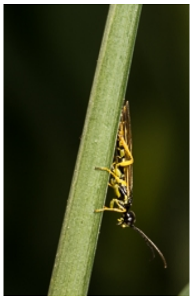
The area at risk of economically significant sawfly populations in 2016 will be limited to only a few areas. The 2015 field margin survey shows low populations in most of the area surveyed including the traditional sawfly areas in the Special Areas and the Forty Mile county.

The damage ratings are based on 93 fields in 20 municipalities. One field was found with a moderately elevated sawfly infestation in the MD of Willow Creek. Thirteen other fields were found with elevated but still low sawfly numbers in Willow Creek, Warner, Lethbridge, Vulcan, Forty Mile, Cypress, Newell, Special Areas 3 and (surprisingly) Flagstaff municipalities.

Overall the sawfly concern remains very low although there were more fields with elevated numbers and they were spread out throughout southern Alberta. This may represent the beginning of population resurgence in sawfly if dryer conditions continue.

Despite the low level of sawfly in the survey, individual fields may still have higher wheat stem sawfly populations than are indicated in the map. Overall there were zero or very low sawfly numbers in 79 of 93 (84%) of fields surveyed. (Field locations denoted by a black dot had zero sawfly found in the survey.) Thank you to Wayne Spurrill who reported sawfly damage in the Flagstaff county, as a result the survey was expanded further north to ensure this area was properly represented.

The Wheat Stem Sawfly Map is based on cut stem counts conducted after the 2015 harvest. The percent of stems cut by sawfly gives an indication of the number of reproductive adult sawflies that will emerge in late June through early July. Winter conditions have very little impact on sawfly populations and a high proportion of wheat stems cut in the fall will produce adults. Producers in areas with moderate to high levels of cutting should consider using solid stem wheat as a control strategy.



Wheat Stem Sawfly

Wheat stem sawfly damage

Wheat stem sawfly larva in stem

Female sawflies lay eggs inside grass and grassy crop stems; the eggs hatch and tunnel inside stems until the crop starts to dry down near harvest. As the crop starts to ripen the sawfly larva migrates to the stem base and cuts a notch most of the way through the stem. Feeding damage from the tunneling can result in hidden yield losses of 10 to 15 percent. Further yield losses can occur from lodging at harvest. More information can be found at wheat stem sawfly life cycle.

Parasitism can reduce populations and reduce the level of cutting. A parasitic wasp, *Bracon cephi*, has been shown to have significant impact on sawfly populations. The use of solid stem wheat varieties and the increase in parasitism are the major factors in lower sawfly populations in Alberta.

Soil Health






Soil Health Initiative

Background:
Soil history shows that many civilizations have collapsed from unsustainable land use. The impact of soil disturbance has been very much underestimated. Soil modification has been taking place indirectly through changes in the vegetative cover, with the forest clearance, natural cycle processes have been interrupted. The United Nations estimates that 2.5 billion acres have suffered erosion since 1945 and that 38% of global cropland has become seriously degraded.

Here in east central Alberta, some of the soils have been farmed for over 115 years. Organic matter levels have deteriorated from production and harvesting of crops as well as natural wind and water erosion events. While soil health is becoming more of a priority among producers, there is considerable *'ground'* to make up. With this in mind, it is time that we start giving the land more attention.

On December 5, 2014 the 68th UN General Assembly declared 2015 the International Year of Soils (IYS) (A/RES/68/232). The Food and Agriculture Organization of the United Nations has been nominated to implement the IYS 2015, within the framework of the Global Soil Partnership and in collaboration with Governments and the secretariat of the United Nations Convention to Combat Desertification.

The IYS 2015 aims to increase awareness and understanding of the importance of soil for food security and essential ecosystem functions.

The specific objectives of the IYS 2015 are to:
- Raise full awareness among civil society and decision makers about the profound importance of soil for human life;
- Educate the public about the crucial role soil plays in food security, climate change adaptation and mitigation, essential ecosystem services, poverty alleviation and sustainable development;
- Support effective policies and actions for the sustainable management and protection of soil resources;
- Promote investment in sustainable soil management activities to develop and maintain healthy soils for different land users and population groups;
- Strengthen initiatives in connection with the SDG process (Sustainable Development Goals) and Post-2015 agenda;
- Advocate for rapid capacity enhancement for soil information collection and monitoring at all levels (global, regional and national).

What is a healthy soil?
Soil health has been defined as:
"The continual capacity of soil to function as a vital living system, within ecosystem and land-use boundaries, to sustain biological productivity, promote the *quality of air and water environments and maintain plant, animal and human health" (Pankhurst* et al., 1997).

A more recent definition by FAO members (2008) is a more broad explanation of soil health:

"*Soil health is the capacity of soil to function as a living system, with ecosystem and land use boundaries, to sustain plant and animal productivity, maintain or enhance water and air quality, and promote plant and animal health. Healthy soils maintain a diverse community of soil organisms that help to control plant disease, insect and weed pests, form beneficial symbiotic associations with plant roots; recycle essential plant nutrients; improve soil structure with positive repercussions for soil water and nutrient holding capacity, and ultimately improve crop production. A healthy soil does not pollute its environment and does contribute to mitigating climate change by maintaining or increasing its carbon content.*"

What are the benefits of a healthy soil?
Healthy soils have many benefits. One of the most important benefits is that healthy soil holds more water (by binding it to organic matter (OM)), improves water use efficiency, and loses less water to runoff and evaporation. As OM increases, it will holds up to 20 times its weight in water.

What are the basic soil health principles to build soil health?
Five principles have been reported to be the most important components to accomplish healthy soils:

1. Minimize mechanical soil disturbance
2. Keeping the soils covered at all times (armor the soil)
3. Growing a living root year around
4. Increase plant diversity above ground to increase diversity below
5. Incorporate livestock grazing

1. **Minimize mechanical soil disturbance**
   Physical soil disturbance such as tillage and overgrazing can result in significant disturbance of the soil physical, chemical and biological properties. Soil microbial activities are disrupted and limit their capacity to promote crop development.

2. **Keeping the soils covered at all times (armor the soil)**
   Bare soil increases soil temperature. It can decrease and kill soil biological activities. Vegetation, plant residue and organic mulch protect the soil surface and feed billions of micro-organisms which recycle nutrient and combat pest infestation to plant roots. Those micro-organisms also create soil pores where more roots can find air, nutrients and water.

3. **Growing a living root all year**
   Living roots will provide a food source for soil microbes (beneficial bacteria and micorrhizal fungi). They also contribute to the formation of soil aggregates.

4. **Increase plant diversity above ground to increase diversity below**
   Increasing plant diversity is connected with soil root diversity. Studies have shown that specific soil microbes require specific plant types. Soils are more productive

when there are more diverse microbial activities in the soil. Plant diversity through rotation and cocktail cover crops will support balanced and diverse soil populations that might reduce weed and pest infestations

5. **Incorporate livestock grazing**
   Land responds positively to the presence of livestock, provided management is appropriate. Farmers have found that using rotational grazing is the fastest and most economical way of improving the soil health. Microbial population also increase and stimulate nitrogen fixing bacteria activities. Addition of manure and urine to the soils recycles nutrients. It is important that the grazing system will allow adequate rest for the plants between periods of grazing.

One of the primary goals to improve soil health is to increase more organic matter in the soil for feeding the microbes. These microbes will help to improve soil organic matter which captures and holds more water and nutrients, growing more and larger plants that can gather more sunlight to power the process. This constant recycling is dependent on management of the land. Following these five principles will allow the site production to increase its productivity.

CARA Promotes Soil Health

CARA promoted the International Year of Soil and soil health in general during 2015 in several ways.

- Dianne Westerlund and Dr. Yamily Zavala are members of ARECA's Soil Health Team that led a provincial soil health initiative which included development of a website highlighting relevant soil information, coordination of several soil focused extension events, showcased progressive producers across the province (Soil Health Producer Highlights Series, see the end of Soil Health section) and finished the year with an impressive Western Canada Soil Health Conference in Edmonton.
- Dr. Yamily Zavala wrote articles for the Soil Health Initiative (see the end of Soil Health section).
- Dr. Yamily Zavala presented an interactive soil health presentation to 7 local schools and three schools in the Peace region during March and April.
- Dr. Yamily Zavala presented the basics of soil health to producers in Manning, Hawk Hills, Grimshaw, High Prairie and Sexsmith during a trip to the Peace region.
- CARA hosted a soil carbon field day and established a site for monitoring soil carbon change with Peter Donovan of the Carbon Challenge.
- CARA held a Soil Health and Crop Field Day featuring a presentation by Dr. Christine Jones and a demonstration by Soil Ecologist of Australia and Dr. Yamily Zavala.
- CARA established and monitored demonstrations of humalite and cocktail cover crops (see Conservation section).
- Dr. Yamily Zavala consulted one-on-one with several producers regarding interpretation and understanding of their soil test results and options for improving soil health in their operations.
- CARA is in the process of developing a basic soil health monitoring lab to assist local producers with evaluating the effect of various management practices on soil health (see following page for more information).

CARA's Soil Health Laboratory (CARA-SHealth) Initiative

CARA is starting a new adventure which is going to allow us to understand what is affecting the soils of central eastern Alberta. The main goal of CARA's Soil Health Lab is to allow producers to have access to biological and physical assessments to build the bridge for improving their soil health base on localized and side specific constraints.

Main reasons for CARA's SHealth initiative:

- ❖ Understand the real status of the soil constraints beyond nutrient limitation and excesses
- ❖ Create awareness on soil biological driving forces to improve physical and chemical soil properties
- ❖ Create bridges between producer practices and improving soil health
- ❖ Identify and evaluate soil management strategies to target soil site specific constraints
- ❖ Measure, monitor, suggest and calibrate management strategies to improve soil health in producer fields.

CARA-SHealth initiative will need to:

- ❖ Determine soil health Indicators.
    - o Build on soil health indicators data base
- ❖ Create soil health producer partnerships
- ❖ Target management practices to address soil constraints
    - o Evaluate management practices to quantify improvement and/or modify those in needs
    - o Compare soil health management practices for field specific farmer partnerships
- ❖ Provide quality data for applied research activities

CARA-SHealth indicators to be measured:

- ❖ Physical Indicators
    - o Aggregation stability
    - o Surface and subsurface compactions
    - o Texture
- ❖ Biological Indicators
    - o SOM
    - o Active carbon
    - o Potentially mineralized nitrogen
    - o Soil microbial respiration
    - o C:N Ratio

CARA-SHealth Farmer-Led Partnership:

- ❖ Collect and share information (farmers to farmers)
    - o Soil health demonstration farms
- ❖ Testing new methods to mitigate drought, erosion, compaction and nutrient efficiency uptake.
- ❖ Evaluating the economics involved on soil health and beyond

. . . .More to be discussed with farmers . . . .

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ARECA Soil Health Initiative

This article is part of a series to promote better understanding of our agricultural soil resources along with practices that can influence soil health.

August 2015

Understanding Soil Health: WHAT SHOULD WE KNOW ABOUT IT

Yamily Zavala, Ph.D. Crop and Soil Health Management Specialist
Chinook Applied Research Association (CARA), Oyen, Alberta

The terms “soil quality” and “soil health” are often used synonymously. Although they are used interchangeably, it is important to distinguish the differences between them. Soil quality has been defined as *“the capacity of a soil to function, within natural or managed ecosystem boundaries, to sustain plant and animal productivity, maintain or enhance water and air quality, and support human health and habitation.”* Soil health is defined as “*the continued capacity of soil to function as a vital living system, within ecosystem and land-use boundaries, to sustain biological productivity, promote the quality of air and water environments, and maintain plant, animal, and human health*”. Soil health recognizes soil resilience (“the continued capacity of”) and the biological properties ("as a vital living system”). They reflect the importance of the soil being able to continue to function over time by self-regulation, stability and by maintaining its biological integrity. Soil quality is related to the soil’s inert capacity to function. It is mainly used to evaluate a soil’s physical and chemical properties related to soil formation factors in support of plant growth. Soil health better addresses more the interactions among those properties with emphasis on the biological. These interactions are indivisible, interdependent interactions within the soil ecosystem. When one of these properties is off balance (by human intervention for example), it will adversely impact the rest, reducing the potential contribution to ecosystem service for food production.

For the purpose of understanding soil health, basic information on composition and properties of soil as well as their intrinsic interactions in creating a healthy soil environment needs to be discussed.

Soils differ widely and they are formed by many processes. They have developed over thousands of years and are also highly influenced by environmental conditions, parent material, interactions among microorganisms and plants, management, as well as the topography where they were formed. Ideal distribution of soil components have been reported to be 50% pore space (air & water) and 50% solid material (mineral particles & organic matter). Soils have physical, chemical and biological properties. Interactions among these properties play an important role on soil health stability, having consequences for the ecosystem sustainability. Figure 1 shows the main soil property interactions with their most reliable soil health indicators.

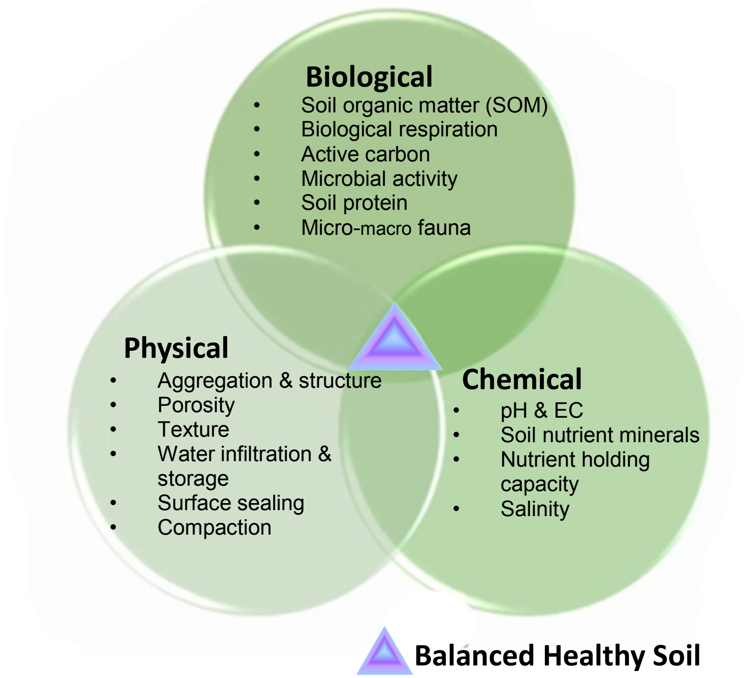

Figure 1. Properties and Indicators of Soil Health

Soil physical properties relate to the composition and proportion of the soil components, described as the texture (silt, clay and sand), structure (patterns of large aggregates) and porosity (pore space). These aspects will influence soil water infiltration, storage and air movement, all of which are important for soil health.

Figure 2 shows different soil structures with their respective water infiltration movements (cited by Colorado State University-Extension). Management practices can negatively impact soil structure.

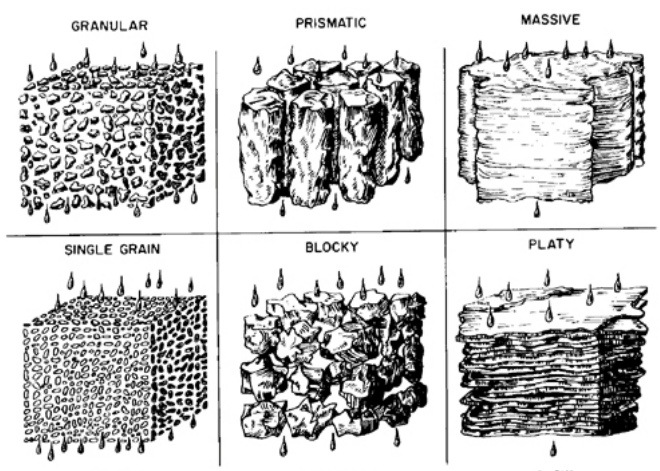

Figure 2. Soil water infiltration movement affected by soil structure

Soil porosity refers to the amount of pores or open spaces between/within the soil aggregate. Aggregates are very important for soil stability against water and wind erosions, and maintaining soil porosity for water along with oxygen supply for roots and microbial communities. Aggregation can occur in different patterns, influenced by chemical and biological soil properties along with the cropping system, resulting in different soil structures.

Knowing the type of soil structure can tell us something about soil health. For example, soils with a platy structure indicate a compaction and poor soil aggregate stability issue. Picture 1 shows a platy soil structure and water infiltration pattern (Figure 3). Here, water infiltration rate will be reduced and surface run off may increase, contributing to water erosion risks. There will be less pore space for water storage and air exchange due to aggregate destruction, diminishing growth and interactions of plant roots and microbial communities. Also, nutrients uptake will be impaired and microbial community diversity will also be reduced over time, compromising soil health.

Picture 1. Platy structure and **Figure 3**. soil water infiltration movement pattern

Biological interactions maintain soil life and they are considered the most important soil activities. Many different types of organisms are involved: plants (flora), animals (microfauna, mesofauna and macrofauna) and microorganisms (bacteria and fungi). Most of these organisms are so small that they are only visible using specialized microscope (Picture 2).

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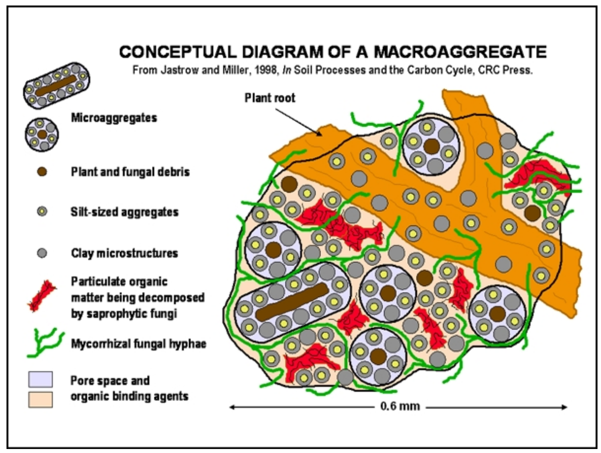
Picture 2. Soil acari's diversity

The role of soil organisms is to keep the soil healthy by improving and maintaining soil aggregation. Plants provide food for microbial communities by root exudates and soil organic matter (SOM) from shoot and root residue. Root decay creates an avenue for water and air movement through the soil profile. The rhizosphere, the soil zone surrounding plants roots, contains the most biological active area of the soil (Picture 3). Figure 4 shows where lots of the aggregates start forming; it contains secreted chemicals (sugar, organic acids), soil particles and fungal hyphae, among other organic materials.



Picture 3 and Figure 4. Soil rhizosphere and aggregate formation

Why are aggregates important?

They are important because soil pores exist between and within aggregates. They are occupied by water and air providing a favorable habitat for soil organisms and plant roots to grow into them. Aggregates are the site where many important biological soil interactions takes place, which in turn contribute to aggregate stability to help prevent run off, erosion, surface crusting and to improve overall soil health. Well-aggregated soils are best suited for supplying crops with oxygen, water and nutrients. They have enough macropores to provide drainage and aeration during wet periods, but also have adequate amounts of micropores to store water for crops and organisms during drought conditions.

Importance of soil biological activities

A few of the main biological activities are:
1) Soil organisms decompose plant residuals, soil organic matter (SOM). They use the carbon and mineral nutrients present in the SOM for their growth. They then release those minerals into the soil when they die.
2) Some microorganisms fix nitrogen (bacteria, rhizobia) from the atmosphere through a symbiotic relationship with legume plant roots. Rhizobium makes nitrogen (N) available to the roots in exchange for carbon (sugar) from the legume. Other microorganisms such as the arbuscular mycorrhizal (AM) fungi are able to increase phosphorus (P)

availability to the majority of plants but not Brassica species (for example, canola). The hyphae of AM fungi extend from plant roots into soil and have access to P, water and other minerals making them available for the plant.
3) Most of the bacteria and fungi in the soil produce compounds during the breakdown of plant residues. These compounds physically and chemically bind soil particles into micro-aggregates. They will form, maintain and stabilize aggregates, improving soil structure.
4) Some microorganisms can produce enzymes that will break down or help in the degradation of agricultural pesticides or other toxic substances added to the soil,
5) Soils with a high diversity of organisms have the ability to help control plant pathogens through predator and prey relationships with every organism either eating or being eaten by another organism. This is thought to be an important mechanism to reduce soil borne diseases in healthy soils.

Summary

Having a better knowledge of soil components, properties and their interactions is the basis for understanding soil health. Soil health indicators can be assessed separately as chemical, physical and biological properties, but what it is important to know is their interactions. They are the driving force to create and sustain healthy soils. In a healthy soil, all the soil properties are interacting without being detrimental to each other. Healthy soils have good tilth, adequate root depth, enough nutrients, good water storage and drainage, low soil borne disease pressure and quick recovery from adverse climatic events (resilience).

Basic principles reported to build soil health in a cropping system are: minimize soil disturbance, keep soil covered all the time, maintain a living root system for as long as possible during the year, use plant diversity to increase soil biological diversity and integrate livestock into the cropping system. Increasing plant diversity above ground will result in greater biological diversity below ground. This biological diversity will help to improve SOM turn over, soil aggregation, water use efficiency and nutrient release, among others. Soil health will improve the plants ability to gather more sunlight to continue powering vital soil interactions that are highly influenced and dependent on good land management. Following the above principles will allow the ecosystem to increase its productivity by improving and sustaining the soil health.

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ARECA Soil Health Initiative

This article is part of a series to promote better understanding of our agricultural soil resources along with practices that can influence soil health.

November 2015

Soil Health Assessment: An introduction to farmers

Yamily Zavala, Ph.D. Crop and Soil Health Management Specialist
Chinook Applied Research Association (CARA), Oyen, Alberta

The more you know about your soil, the better you can care for it. Standard soil tests have primarily focused on the soil chemical composition. Recommendations generated from these analyses have been for applying soil amendments (fertilizers, gypsum, lime, etc.) for increasing crop yields, but not for improving intrinsic soil conditions. The biological and physical conditions of the soil are often overlooked. Soil is a living biological ecosystem (habitat for microbes) and the impacts of some soil management activities negatively affect its physical and chemical conditions. Soil biological functions are related to nutrient cycling, soil aggregation and soil water fate, among other soil properties.

Soil health assessments (SHA) provide us with information about soil constraints beyond nutrient deficiency or excess. They measure soil degradation or improvement from targeted management practices. SHA will create awareness as farmers get answers to several important questions: What is their soil condition? Are the soil properties functioning properly? What can be done for improvement? These questions not only take into consideration the most important soil health "indicator" constraints, but also their interactions for understanding the actual soil conditions. SHA does not only give soil amendment recommendations, it also allows farmers to select the best available soil management practices to significantly boost productivity and quality of their cropping systems while improving their soil health. As a consequence, their farmlands will then be monitored for farming system risks and their farms will be more valuable.

Soil management practice contributions to improve soil health were learned in the '30s through the '60s but were then forgotten with the use of soil chemical amendments. SHA is a relative new approach when compared with the standard soil analytical evaluations. Indicators measured by soil health protocols should be those soil properties which are representative of key soil processes necessary for the proper functioning of the soil. They should provide information about the status of a specific important soil process that can be managed to improve crop quality and yields, reduce risk to the environment as well as to secure agroecosystem long term sustainability.

Soil Health Assessments and Tests

Many Laboratories are now moving beyond standard soil nutrient testing. Recently, there have been several different soil health assessments and tests developed. Many have not been standardized but have still shown improvement of the soil health in many farmlands. The most well-known soil health approaches are: soil respiration tests (such as the Solvita Test), the Cornell Soil Health Assessment and the Haney Test. They report information that has been used to suggest and/or recommend soil health managements to improve soil overall condition.

Soil Respiration

Soil respiration is considered an indicator of soil health and is measured as carbon dioxide (CO2) emissions from the soil. It is directly correlated to soil biological activities: microbial biomass, carbon sequestration and nitrogen (N) mineralization rates. As soil organic matter (SOM) residues are incorporated into the soil, microbial activity will increase. Microbes then break down SOM, building up humus and emission of CO2. On the contrary, when the incorporation of organic residue declines in the soil, microbes will starve for food and respiration declines, SOM turnover decreases and the soil's ability to sustain humus content is inhibited. Declining CO2 respiration rates are also associated with soil compaction as well as intensive tillage, which compromise soil humus accumulation. The overall soil health might be improved or jeopardized depending on microbial activity. The relationship between these processes is an important indicator of soil health.

> **The Solvita® Test**, (Solvita is Latin for "soil life"), was developed for measuring soil's natural biological functioning as soil respiration (CO2). It is reported that with this test, CO2 respiration can be easily measured and be used to quantify soil microbial activity and potential mineralized N. The rate of CO2 measured is generally regarded as an indicator of soil health. This method needs to be standardized, taking into consideration cropping systems, environmental conditions, soil sampling and laboratory analysis protocols. Information generated as CO2 emissions per surface area have been used for developing soil management strategies for improving soil health conditions with practices such as cover crops. It has also been reported that this test gives results which are typical of actual field conditions but tend to be inherently more variable than lab results. Consequently, further field based evaluation is required. The Solvita Test has been gaining momentum; it has been offered in more than 30 commercial labs around the world (US, South Africa, Australia and the UK).

Cornell Soil Health Assessment

The Cornell Soil Health Assessment evaluates soil health indicators for biological constraints: soil respiration, soil protein, organic matter, and active carbon; physical constraints: available water capacity, sub and surface hardness, and aggregate stability; chemical constraints (Modified Morgan or Melich III extractant): pH, P, K, and minor elements; and other soil constraints for site specific condition not included in their standard assessment. Data generated are reported on a "color-coded scale" (red, yellow and green in a 0-100 scale). Low values are in red and/or values with yellow colours providing very important information about soil processes that are not functioning optimally. The reports generated on targeted soil constraints include mineral recommendations based on standard soil test. For addressing physical and biological constraints and/or for maintaining soil functionality, suggestions for short and long term management are given.

The Haney Test

The Haney Test considers the measurement of biological and chemical indicators of soil properties as follows: chemical (weak acid (H3A) extractant): N, P, K, Ca, Fe, Al; and biological: soil respiration (Solvita Test), soil water extractable organic C and N and Carbon to Nitrogen (C to N) ratio. The information generated from these tests report a “Soil Health Calculation Number” which varies from 1 to over 50. This score indicates where the soil health condition is now. It is used as soil health baseline data that over time, and with different management might quantify improved soil health of a given cropping system over the years.

The Haney Test uses a different approach but still considers many of the same soil nutrients as the standard soil test, but incorporates soil microbial activities. This test brings in and considers a very important concept of biological activity as something influencing nutrient availability and therefore what should be fertilized for. What the Haney test does, is to consider the C to N ratio. This information is considered for providing NPK fertilizer recommendations and suggesting cover crop ratios of legumes to grasses.

What should be known about C to N ratio?

Soil Health raises a lot of N management related issues. The C to N ratio is very important, especially for N fertility managements. If it is very high, the soil is unlikely to mineralize N from soil residue because the microbes will utilize all N to decompose that SOM. The carbon will be used for respiration and the N will be tied up in their cellular structure, unavailable for mineralization. If the C to N ratio is low, the microbes will use all C and not the N so the N will be mineralized into plant available forms. This interaction is also affected by the rate of respiration. If respiration rate is high, this interaction will happen faster. But if there is low respiration, it will be a slow process.

How does the Cornell Health Assessment compare with the Haney Test?

The Cornell assessment includes chemical, physical and biological constraints while the Haney test does not test for the physical constraints.

They have different biological constraints identified: Cornell identifies the active carbon fraction and soil protein while the Haney Test measures water-extractable organic C. They have similar respiration assays, but the Haney test (Solvita) measures the CO2 burst in a 24 hours period while Cornell’s test measures it in a 4 day period. The Haney nutrient recommendations are based on biological and chemical protocols, but Cornell’s mineral recommendations are generated using standard soil testing protocols.

Cornell suggests management strategies to address constraints identified in physical/biological/chemical measurements and in connection to the USAD Natural Resources Conservation Service (NRCS) practices. Haney recommends soil management for nutrient applications and cover crops (%legume / % grass) generated by biological processes and C to N ratios, respectively.

The Haney approach of considering indicators of SOM quality (C to N ratios) and biological activities is a very important component to include in any soil health evaluation to provide better nutrient recommendation for the cropping system.

Chinook Applied Research Association (CARA) Initiative for Soil Health Testing in Alberta

At CARA, we will be exploring which soil health indicators will provide vital information on how soil components are interacting for farmers to have a better understanding of their soils to improve them now and for future generations.

Soil health testing could be a challenge for us considering that we currently don't have all the necessary instruments to evaluate all of the soil health biological, physical and chemical indicators. However, a cost-effective soil health testing package will be developed to bridge the gap between standard soil testing and biological and physical soil constraints.

The approach will be to use currently available soil health assessments taking into consideration the need to adjust and to integrate key soil aspects. Emphasis will be given to manage the soil in a way to improve its biological properties. Some researchers have suggested that by simply knowing a soil indicator value such as soil organic matter (SOM) or respiration rate for example, they can predict other soil health process such a microbial respiration, aggregate stability and nitrogen mineralization. Other researchers have found that when SOM data is combined with soil respiration and soil protein there is a better estimate of potential N mineralization. These findings will provide good baseline information for our soil health lab initiative, but once local farmers get their soil tested, the values generated will be used for engaging in a long term adaptive management strategy for measuring, managing, monitoring and calibrating (correlating) our soil health protocols and management tools to improve soil health in the province.

Summary

Although experts have been debating and discussing which soil test provides the best information for fertilizer recommendations, they all agree on one thing: soil health is a priority. Starting to look at interdependent soil interactions such as C to N ratios with the microbial activity influences on nutrient release will not only create awareness among farmers but also within the soil science community to understand and manage soil health properly. Soil health is a long term investment. For this reason, an initiative to assess soil health conditions in Alberta needs to look at different strategies to find the best combination of approaches for the generation of good data for standardization and calibration in soil health testing methodology for Alberta's soil environmental conditions.

Soil Health Producer Highlights Series

My Farm, My Soil, My Story

Ron & MaryAnn Barnett, Barnett Family Farm—Oyen, AB

* What does "Soil Health" mean to you and why is it important?

Soil Health is important to us. Soil Health on our farm is one of the main elements helping us towards having profitable cropping results with grains, hay and pasture

* What management practices have you used to improve soil health on your operation?

Ron has fenced out numerous grazing fields to rotate stock so controlled grazing occurs. We have dugouts built strategically around the land and with this have also seen an increase in bird populations. We have always liked seeing the trees and brush around sloughs and have never done clearing. This provides outstanding wildlife habitat.

We have used re-grassing cropped/cultivated fields on a rotation of 6 – 8 years, depending on conditions. Ron has found packing fields with a roller after seeding has improved the seed bed for alfalfa and forage catches. As it turned out the 160 acre field that was in mustard last season (2014) was planted this spring (2015) with alfalfa and seems to be the very best catch ever. Our brother in law, Pat Kuhn and his son Drew, rent our cultivated land and tried to harvest the volunteer mustard but the alfalfa is still growing so much they could only catch the tops of the mustard plants with their reel. Even into October the alfalfa seems to be still growing.

We have used chem-fallow for the last 8 – 10 years and prior to that we used tillage for weed control and moisture preservation. Chem-fallow seems much better in both cases. Diversity in crop rotations (eg. alfalfa, cereals, pulses and oilseeds) has contributed to improved soil condition as well.

Ron & MaryAnn operate near Oyen, AB and incorporate diversity in crop rotation to achieve healthy land.

* What changes have you seen?

We have seen improved tilth and yields on cropped fields following alfalfa or other forages in the rotation. We have tried varied forage mixes. In August (2015) we were checking our fields and were interested in seeing how a little corner of 4 or 5 acres was producing. It had been native grass and was worked up to square up and combine two fields and was seeded this spring. We could see the line and difference so took a photo and you can clearly see the extra growth and color on the new land. When we stepped on the new area from walking from the old part you could feel the new soil had more of a spongy feel to it and the straw was more flexible as we walked through.

The Chinook Applied Research Association (CARA) is a driven by farmers and ranchers in east central Alberta to bring innovative and profitable practices to the local agricultural industry.

* What are the biggest challenges for soil health in your area?

The biggest challenge we have in this area is retaining and using the moisture we get to the best possible results. That is why we found the Field Day, July 24/15 put on by CARA with Dr. Christine Jones of Australia so interesting. It is amazing how they are bringing back tracts of land to productivity that became desert like from abusive practises. She had powerful slides to help us see what she meant. Dr. Jones gave us an understanding of the fundamentals of soils, as she sees it, and how fertile soil is a function of photosynthesis and microbial re-synthesis and the relationship between healthy soil and the quality and quantity of food it produces.

* How do you advocate for soil health?

We advocate for soil health mostly by example, but also bring up the importance of looking after the land to almost anyone who is interested – especially to younger people. We feel it is never too late to learn – mixing practical experience with science and research.

* Do you have any future plans for improving the Soil Health on your operation?

The Barnett's are always open to looking at new ideas and Ron reads many publications on farming in general. They participate in programs such as the ones CARA puts on. Planting cocktail cover crops looks very interesting and Ron has taken our nephew, Drew Kuhn, over to the CARA plots at Oyen to observe. Young farmers have to be armed with knowledge so they can draw their own conclusions and decisions. The young farmers have to be able to handle increased pressures and manage the environmental, social and economic issues. Our girls and partners are not farming now but we forward much of the information onto them and discuss with them so they are aware of how we operate and manage our farm. This is part of our Succession Planning.

* How has improving your soil health improved other aspects of your operation?

As much as we may love the land and take pride in looking after it, it comes down to economics. We are seeing profits and consciously want to leave the land in better/best condition for future generations.

Soil Health Producer Highlights Series

My Farm, My Soil, My Story

Marj Veno—Hanna, AB

* What does "Soil Health" mean to you and why is it important?

Soil health compares to your personal health. Whenever everything works the way it should, you feel good. Soil is much the same. When all things are working in balance, our grazing season is much longer, cattle gain better, and the general appearance of the prairie is healthy.

* What management practices have you used to improve soil health on your operation?

Have stockpiled native forages to be used for winter grazing, swath grazed, bale grazed, grazed tame pastures in spring to allow native pasture to set seed, built dugouts so there is a good water source on every quarter of land we own.

* What changes have you seen?

Much evener grazing so some areas that were traditionally overgrazed because they were close to water are healthy stands of native grass. Have trees growing along riparian areas and bluffs of trees growing on some prairie that was burned off in the early 1900's.

* What are the biggest challenges for soil health in your area?

Rainfall or the lack of it.

* How do you advocate for soil health?

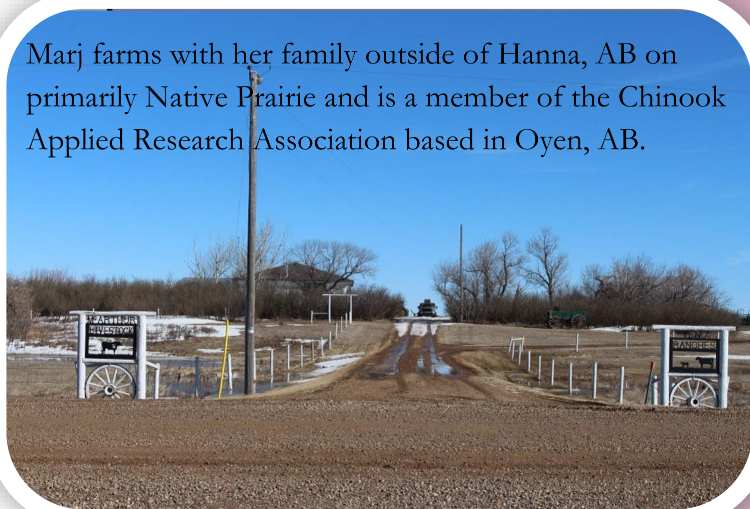
Share our experiences with other producers at meetings etc. Show our winter grazing and how we make it work. Mother Nature is still the boss and we do have sufficient feed on hand if snow gets too deep.

* Do you have any future plans for improving the Soil Health on your operation?

Getting and keeping invasive weeds under control, continued vigilance reading the grass and being flexible to change a grazing rotation if it will improve soil health and consequently the grass quality and amount.

* How has improving your soil health improved other aspects of your operation?

Stockpiling native grass has put a good layer of thatch on the ground that keeps the moisture in the ground. Have seen a much thicker, healthier and more diverse prairie plant stand. I think it all starts with good management of what's on top of the soil and consequently the soil given a chance will improve quickly and directly affect your bottom line.



Marj farms with her family outside of Hanna, AB on primarily Native Prairie and is a member of the Chinook Applied Research Association based in Oyen, AB.

The Chinook Applied Research Association (CARA) is a driven by farmers and ranchers in east central Alberta to bring innovative and profitable practices to the local agricultural industry. Our program of applied research, demonstration and extension projects provides a link in the transfer of knowledge and technology between research and the producer. Producers, industry, government and others can access reliable data on crop, livestock, soil and water projects that is relevant to the area and its soil and climatic conditions.

CHINOOK APPLIED RESEARCH ASSOCIATION

CARA

Extension Program

2015 Extension Highlights

Newsletters

Nine editions of CARA's '*Grain, Grass and Growth'* newsletters were mass-mailed to approximately 1700 producers.

Cooperator Appreciation Evening *February 5, Cereal*

CARA hosted projects cooperators, local funders and other supporters to a banquet on February in Cereal to show appreciation for contributors to our program during the past year. Guest speaker was Leona Dargis who provided a very inspiring presentation on dealing with adversity.

Farm Succession Planning Workshops *January 12-15*

Spondin, Oyen, Buffalo and Delia

85 east central producers took advantage of the opportunity to learn more about the succession process by attending one of four seminars with Reg Shandro, Farmacist Advisory Services Inc., during the week of January 12 – 15. Reg is a highly regarded succession coach and mediator. During his seminars, he shared real life examples to illustrate the necessary steps required to prepare a successful succession plan. He focused on the importance of communication amongst all family members as an exit plan is developed. Understanding everyone's perspective of the farm operation, the need to make decisions and fair may not mean equal were other key points in his discussion.

Ladies Calving Clinic *February 23, Hanna*

Dr. Tamara Quaschnick of Steadfast Veterinary Services (www.steadfastvet.com) instructed 120 ladies from east-central Alberta on the finer points of calving on Monday February 23rd at the Hanna Legion Hall. This first-of-its-kind event for the area was overwhelmingly supported by women from Hanna, Byemoor, Veteran, Consort, Oyen, Pollockville, Brooks and everywhere in between. Dr. Quaschnick demonstrated techniques for dealing with various calving problems using very unique teaching tools — UFA's life size calving models named 'Lucy' & 'Lou'.

CARA's Annual Meeting & Project Review *February 26, Cereal*

CARA staff reviewed results of CARA's 2014 program and plans for the 2015 at the February 26 meeting. Sarah Weigum, Three Hills, led a discussion on grain marketing options.

This Business of Farming *March 2, Oyen*

Land Investments, Succession Planning, Marketing and What to Expect From the Weatherman were the topics of CARA's This Business of Farming Seminar on March 2nd in Oyen. 25 producers joined a discussion with farm business advisor Merle Good, who provided some guidelines on determining the level of land payments a farm can sustain. Merle also shared his tax management expertise regarding succession planning and land transfer. Storm Hunter Mark Robinson shared his insight into what to expect regarding weather patterns for east central Alberta in 2015. Mark is a severe weather expert based out of Toronto and is featured on the Weather Network. His passion for storm chasing and extreme weather events was very obvious in his presentation and a hurried exit to track a weather event destined for Ontario.
Neil Blue, ARD Marketing Specialist, explained why the cattle market is currently so strong and how these conditions contribute to maintaining strength for the cow/calf operator in the near future. Well known Crop Market Consultant Lee Melvill then provided a market forecast for several cereal, oilseed and pulse crops.

Crop Strategy Seminar *March 12, Provost*

In collaboration with ARECA groups, the MD of Provost and several of the commodity commissions, CARA brought renown meteorologist, founder and president of World Weather Inc, Drew Lerner, from Kansas, USA to Provost on March 12th. Lerner's visit was part of a Crop Strategy Seminar which also included discussion of pest forecasts (Scott Meers, AF), grain market outlooks (Neil Blue, AF), seeding tips for a successful canola crop (Dan Orchard, CCC), managing pulses (Neil Whatley), soil health (Yamily Zavala) and a pulse producer panel to help farmers prepare for the quickly approaching crop year. Note: Lerner's presentation from the Crop Strategy Seminar in Provost is available on CARA"s website (www.chinookappliedresarch.ca) for viewing.

Classroom Ag Program *March/April*

Dr. Yamily Zavala delivered an interactive soil health presentation to students at the Prairieview and Acadia Colonies and elementary students in Hanna, Oyen ARC., Warren Peers (Acadia Valley), Consort and Veteran schools.

Kurt Pate Cattle Handling Clinc *June 19, Big Stone*

In partnership with ARECA groups, CARA brought Kurt Pate from Montana to discuss and demonstrate principles of cattle handling to local cattlemen. Tim Andrews, Andrews Ranching, provided yearling heifers for the demonstration. Approximately 25 producers attended the event was held at the Big Stone Hall and rodeo grounds.

Soil Carbon Challenge Field Day *June 30, Chinook*

Peter Donovan led 20 producers in a discussion regarding the importance of soil carbon and his

work establishing bench mark sites in fields across North America. He demonstrated how the sites are set up and what he is monitoring. Dr. Yamily Zavala also focused attention on the soil pit established in 2014 and characteristics of the soil profile.

Invasive Weed Control Field Day *July 9, Veno Ranches*

Approximately 20 producers joined Marj Veno, Murray MacArthur, CARA staff and Shawn Keyowski (Dow AgariSciences) to view a field demonstration of absinth control at Veno Ranches north of Richdale. They saw they effect of chemical and mowing treatments made in 2014 to control the invasive weed. Barry Yaremcio, AF, joined the group and led a discussion of meeting feed requirements during drought conditions.

Soil Health and Crop Field Day *July 24, Oyen*

Soil Health was the focus of a very interesting Field Day held at the CARA Center July 24th. Approximately 35 people participated in the day. Dr. Christine Jones, a highly regarded soil ecologist from Australia, was the keynote for the morning session. Her presentation provided an understanding of the fundamentals of soils, how fertile soil is a function of photosynthesis and microbial re-synthesis and the critical relationship

between a healthy soil and the quality of food it produces. CARA's Dr. Yamily Zavala added to the understanding of soil health by using a soil pit to illustrate soil features specific to this site next to the CARA Center. She also demonstrated differences in soil characteristics between samples from several sites within the Special Areas and MD of Acadia. A demonstration of cocktail cover crops was another highlight of the material she shared with producers. The Field Day also included brief presentations from Keith Gabert (Canola Council) on managing canola and Dr. Manjula Bandara (AF) on pulse options for annual crop rotations.

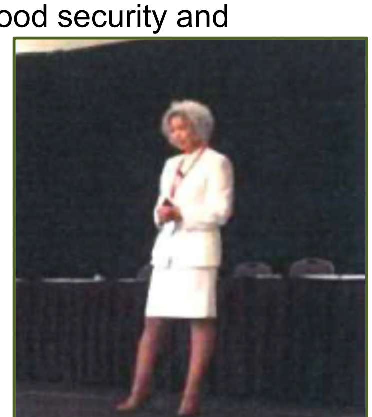
Crop Walks *July 21, Hanna and 28, Consort*
Farmers had the opportunity for one-on-one consultations with Crop Specialist Neil Whatley (AF) and Canola Agronomist Justine Cornelson (Canola Council) during a visit to CARA's crop trials at the Robinson site and adjacent fields of Blake's. Neil also met with farmers (and a future farmer) at CARA's Redel crop site and nearby lentil and pea fields.

Alberta Sheep Symposium *October 15, Red Deer*
Dianne Westerlund presented '*Surviving and Thriving in Next Year Country'* to Alberta Sheep Breeders at their annual conference in Red Deer in October.

6th Annual Cattlemen's Clinic *November 17, Oyen*

Over 85 Cattlemen and women took part in several interesting discussions at the CARA's 6th Annual Cattlemen's Clinic in Oyen. Barry Yaremcio, AF Beef and Feed Specialist, shared information on making suitable feed from the various feeds available for the coming winter. Dr. Cec Ruschkowski and her husband John led a discussion on cattle handling equipment. A highlight of their presentation was a visit to their handling set-up near Oyen. Brenda Schoepp began the afternoon agenda with her thoughts on the top 10 beef industry game changers. Dr. Les Byers then explained what genomics means to a cow/calf operation.

Western Canada Conference on Soil Health *December 9-10, Edmonton*
With 2015 being declared the International Year of Soils (IYS), ARECA and its nine member associations across the province launched a soil health initiative to increase the awareness and understanding of the importance of soil for food security and essential ecosystem functions. Over the past year several workshops and activities focused on various aspects of soil health were held at points throughout Alberta, concluding with the very first Western Canada Conference on Soil Health.



The inaugural conference delivered an agenda packed full of a variety of speakers, including international researchers and provincial producers. The sold out crowd contained over 400 producers, students and industry representatives. CARA's Crop and Soil Health Management Specialist, Dr. Yamily Zavala, kicked off the conference with '*What is Soil Health*?', setting the stage for understanding what a healthy soil is all about.

Winter Grazing Video Series

Local producers Calvin Bishell, James Madge, Colt Peterson and Ed Rosenau joined several other cattlemen in the province in hosting video-graphers and discussion with specialists in the development of videos addressing the risks associated with extending the grazing season. CARA staff are assisting in the editing of the videos which will be ready for circulation in 2016.

Green Certificate Testing

CARA hosted testing days for the Green Certificate Program at the CARA Center in March, May and December.

Environmental Farm Plans

CARA staff assisted producers with understanding and completing EFP's for their operations.

Growing Forward

Many producers were assisted with applications to various Growing forward programs during the year, including Grazing & Winter Feeding Water Management, Crop, Manure, Energy, Animal Welfare, Health and Biosecurity.

Feed, Seed and Soil Analysis

CARA continued to provide producers with information, use of bale sampling probes and/or facilitation of analysis of feed, seed, plant, soil and water samples in 2015.

Website, Facebook, Twitter and Email

CARA's website (www.chinookappliedresearch.ca) has received over 80,000 hits during the past three years. Information is also distributed to producers via Facebook, Twitter and email contact lists.
Twitter: @CARAresearch
Visit us on Facebook
Email: cara-1@telus.net

Appendix

Definitions of Common Feed Nutrient Terms

ADF Acid Detergent Fibre - consists of lignin and cellulose and is the least digestible portion of roughage. ADF content of forages is used for determination of digestibility and energies.

ADIN Acid Detergent Insoluble Nitrogen – the portion of total nitrogen bound to the fibre in a feed.

AIP Available Insoluble Protein – the portion of the total available protein which is not soluble in rumen fluid, but is still available to the cow. Available insoluble protein which escapes degradation in the rumen is almost completely digested in the lower digestive tract (rumen undegraded insoluble protein).

AP Available Protein (AP = CP – ADIP) – the portion of the total protein which is available to the animal if the animal could completely digest the feed (ie. not bound to the fibre in a feed).

BP Bypass Protein – ingested protein that is not degraded in the rumen (also referred to as “undegradable” or “escape” protein).

CP Crude Protein - The total protein contained in feeds as determined by measuring nitrogen content. %CP = %N x 6.25.

DE Digestible Energy – the amount of energy consumed minus the amount of energy lost in the feces. DE is calculated based on ADF analysis.

FATG Fat Analysis by Acid Hydrolysis – determines level of fixed fat in expanded or cooked products, milk and milk products.

GE Gross Energy – measure of total caloric energy of a feedstuff.

IP Insoluble Protein – the portion of protein which digestive juices or similar solutions cannot dissolve.

ME Metabolizable Energy – equal to DE minus energy lost in urine, feces and in methane for ruminants.

NDF Neutral Detergent Fibre – commonly called “cell walls”. NDF measures cellulose, hemi-cellulose, lignin, silica, tannin and cutin; used as an indicator of feed intake.

NEF Net Energy for fat production.

NEG Net Energy for Gain – based on the ADF; it is used for balancing rations for ruminants.

NEL Net Energy for Lactation – based on the ADF; it is used for dairy ration balancing.

NEM Net Energy for Maintenance – amount of energy required to maintain an animal with no change in body weight or composition. It is based on the ADF and is used in ruminant ration balancing.

NFE Nitrogen Free Extract – estimate for crude starches and carbohydrates.

NPN Non-Protein Nitrogen - nitrogen from non-protein sources (urea, ammonia, nitrates or amides); NPN is used by rumen microbes to build protein.

NSC Non-Structural Carbohydrates – content of feedstuffs comprised mainly of starches (in grains) and sugars (in forages). NSC is used in dairy ration formulations and it is suggested the NSC of a diet be 30-40% of the DM.

PP Pepsin Protein – typically used for protein digestion of animal products such as meat meal and fish meal.

RFV Relative Feed Value – it is an index for assessing quality based on the acid detergent and neutral detergent fibre levels. As the fibre values increase the RFV of forages decreases.
RFV = [(88.9 – (0.78 x %ADF)) x (120/%NDF)]/1.29

SP Soluble Protein – the portion of protein which digestive juices of ruminants (or similar solutions) can dissolve, soluble protein is rapidly attacked by bacteria.

TDN Total Digestible Nutrients – a term which is estimated from the ADF content and is used to describe the digestible value of a feed.

UIP Undegradable Intake Protein (also called undegradable protein – UPD or rumen bypass protein) – the portion of consumed protein that is not degraded in the rumen; i.e., it “by-passes” the rumen and is usually degraded in the small intestine.

Table 7 **Nutrient Requirements for Beef Cattle**

	Daily Gain (lb)	Dry Matter Intake (lb)	Crude Protein		TDN		Ca (%)	P (%)
			lb/day	% of DM	lb/day	% of DM		
600 lb **Calves**	1.5	13.8	1.32	9.5	9.4	68.5	0.32	0.21
950 lb **Bred Heifers**	0.9	19.0	1.5	8.0	10.3	54.1	0.27	0.02
1200 lb **Cows Mid pregnancy**	-	20.8	1.4	6.9	10.1	48.8	0.19	0.19
1200 lb **Cows Late pregnancy**	0.9	22.3	1.7	7.8	11.8	52.9	0.26	0.21
1000 lb **2 yr Heifer With calf**	0.5	20.8	2.1	10.2	12.9	61.9	0.31	0.23
1200 lb **Cow Nursing Calf** (1st 3 - 4 months)	-	23.0	2.1	9.3	12.1	55.5	0.27	0.22
1800 lb **Bull** Regain condition & maintenance	0.5	30.9	2.1	7.0	16.1	52.0	0.20	0.20

Source: NRC.1984. Nutrition Requirements of Beef Cattle (6th Ed.) National Academy Press, Washington, D.C.

Table 8 **Nutrient Requirements for Nursing Cows**

Nutrient	Recommended Range	Required	Maximum
Protein %	10 – 12	-	-
Digestible Energy Mcal/kg	2.5 – 3.3	-	-
Total Digestible Nutrients %	56 – 63	-	-
Calcium (Ca) %	0.16 - 1.53	0.27	2
Phosphorus (P) %	0.17 - 0.59	0.22	1
Sodium (Na) %	0.04 - 0.25	0.08	1.57
Salt %	0.20	0.25	4
Magnesium (Mg) %	0.05 - 0.25	0.10	0.5
Potassium (K) %	0.50 - 0.70	0.65	3
Sulphur (S) %	0.08 - 0.30	0.10	0.4
Iron (Fe) ppm	50 - 100	50	1000
Copper (Cu) ppm	4 - 10	8	100
Cobalt (Co) ppm	0.07 - 0.11	0.10	10
Iodine (I) ppm	0.20 - 2.0	0.5	50
Manganese (Mg) ppm	20 - 50	40	1000
Molybdenum (Mo) ppm	N/A	N/A	5
Zinc (Zn) ppm	20 - 40	30	1000
Selenium (Se) ppm	0.05 - 0.30	0.20	2

Adapted from NRC Nutrient Requirements for Dairy Cattle and Feedstuffs

Table 9 **Nutrient Composition of Typical Feed Sources**

Feedstuff	Percent of Dry Matter Basis								
	DM*	CP*	ADF*	Ca**	P**	K**	TDN*	Mg**	Na**
Alfalfa Hay Early	90	18	35	1.41	0.24	2.40	59	0.33	0.14.
Alfalfa Hay Late	89	16	41	1.30	0.22	1.7	54	0.20	0.05
Alfalfa Silage	40	17	37	1.40	0.29	2.6	55	0.33	0.14
Barley Silage	35	12	37	0.41	0.32	2.3	59	0.13	0.01
Barley Straw	90	3	55	0.33	0.08	2.1	46	0.23	0.14
Barley Grain	89	12	7	0.08	0.41	0.6	83	0.20	0.03
Brome Grass Hay	89	10	41	0.33	0.25	1.9	55	0.09	0.02
Sweet Clover	91	16	38	1.27	0.25	1.8	53	0.49	0.09
Corn Grain	88	9	3	0.02	0.30	0.4	87	0.13	0.02
Grain Screenings	90	14	15	0.25	0.34	0.9	65	0.15	0.05
Grass Hay	91	12	40	0.70	0.25	2.0	58	0.18	0.03
Grass Silage	40	12	39	0.70	0.25	2.1	61	0.18	0.03
Oat Hay	90	10	39	0.38	0.28	1.8	59	0.26	0.18
Oat Silage	35	12	39	0.53	0.31	2.8	60	0.20	0.37
Oat Grain	89	13	16	0.09	0.40	0.5	76	0.14	0.08
Oat Straw	90	4	48	0.25	0.08	2.4	48	0.18	0.42
Peas Grain	89	26	10	1.30	0.47	1.4	83	0.03	0.05
Wheat Hay	90	10	36	0.25	0.23	1.6	57	0.12	0.21
Wheat Silage	35	12	37	0.38	0.28	2.0	60	0.20	0.03
Wheat Straw	91	3	58	0.16	0.05	1.3	44	0.12	0.14
Wheat Grain	89	14	4	0.05	0.42	0.5	88	0.16	0.08

* Refer to Definitions of Common Feed Nutrient Terms
** Refer to Table 8
Note: The above figures are averages from a wide range of samples and should be used as a guide only.
To best understand if a feed is meeting the nutritional needs of a specific group of cattle, a lab analysis is recommended. Nutrient levels each year are influenced by growing conditions, plant stage, timing and weather conditions at harvest.

Table 10 **Agronomic and Tolerance Information for Perennials**

Grasses	Optimum pH Limits	Acidity Tolerance	Alkalinity Tolerance	Salt Tolerance	Winter Hardiness	Drought Tolerance
Colonial Bentgrass (browntop)		Moderate		Low	Moderate	Low
Creeping Bentgrass		High	Low	Low	Moderate-high	Low-moderate
Velvet Bentgrass	5.5 - 7.5	Moderate		Low	Moderate-high	Low
Kentucky Bluegrass	6.0 - 7.5	Moderate	Moderate	Low	High-very high	Low-moderate
Meadow Bromegrass	6.0 - 7.5	Moderate	Moderate	Low-moderate	Moderate	Moderate-high
Smooth Bromegrass		Moderate	Moderate	Low-moderate	Moderate-high	Moderate-high
Reed Canarygrass		High	Moderate	Moderate-high	Moderate-high	Low-moderate
Chewings Fescue		High	Moderate	Moderate	High-very high	Moderate-high
Creeping Red Fescue		High	Moderate	Moderate-high	High very high	Moderate high
Hard Fescue		Moderate	Low	Low	Very high	Moderate-high
Meadow Fescue				Moderate	Moderate	Low
Sheep Fescue		Moderate	Low	Low	Very high	Moderate-high
Tall Fescue	5.5 - 6.5	High	Moderate	Moderate-high	Moderate	Moderate
Creeping Foxtail		High	Low	Low	High-very high	Low-moderate
Meadow Foxtail		Moderate		Low	High	Low
Orchardgrass	6.0 - 7.5	Moderate	Low	Low-moderate	Moderate	Moderate
Redtop		High		Low	Moderate	
Italian Ryegrass (annual)	5.5 - 7.5	High	Low	Moderate	Low	Low
Perennial Ryegrass	5.5 - 7.5	High	Low	Moderate	Low	Low
Timothy	5.6 - 7.3	Very high	Low	Low	Moderate	Low
Turf Timothy	5.6 - 7.3	Very high	Low	Low	Moderate	Low
Crested Wheatgrass (Fairway)			Moderate	Moderate	Very high	Very high
Crested Wheatgrass (Standard)			Moderate	Moderate	Very high	Very high
Intermediate Wheatgrass		Low	Moderate	Moderate	Moderate	Moderate

Table 10 **Agronomic and Tolerance Information *continued***

Grasses	Optimum pH Limits	Acidity Tolerance	Alkalinity Tolerance	Salt Tolerance	Winter Hardiness	Drought Tolerance
Northern (Thickspike) Wheatgrass		Moderate	High	Moderate	Moderate	Very high
Pubescent Wheatgrass		Low-moderate	Moderate	Moderate	Moderate	Moderate-high
Slender Wheatgrass			High	Moderate-high	High	Moderate
Streambank Wheatgrass		Low	Moderate	Moderate	Moderate-high	High
Tall Wheatgrass			Very high	Very high	Moderate	High
Western Wheatgrass		Moderate	Moderate	Very high	Moderate	Moderate-high
Altai Wildrye				High	High	Very high
Dahurian Wildrye				High	Moderate-high	Moderate-high
Russian Wildrye		Low	Moderate	High	High	Very high
Legumes						
Alfalfa	6.0 - 7.8	Moderate	High	Moderate	Moderate-high	Very high
Cicer Milkvetch		Low	Moderate	Low-moderate	Very high	Moderate-high
Alsike Clover	5.7 - 7.0	Moderate	Moderate	Low	High	Low-moderate
Red Clover	5.5 - 7.5	Low	Moderate	Low	Moderate-high	Low-moderate
White Clover	5.5 - 7.0	Moderate	Low	Low	Moderate-high	Low
Crownvetch	6.0 - 7.0			Moderate	Moderate	High
Sainfain		Low	Low	Low-moderate	Moderate	Moderate
Sweetclover (white)	6.5 - 7.5	Low	High	Moderate	Moderate	Moderate-high
Sweetclover (yellow)	6.5 - 7.5	Low	High	Moderate	Moderate	Moderate-high
Birdsfeet Trefoil	6.2 - 6.5	High	Moderate	High	Low-moderate	Moderate

2015 Report from ARECA

Janette McDonald, Executive Director

ARECA is the provincial arm of CARA. The Board of ARECA is made up of representatives from our 9 member organizations, one of them being CARA. ARECA's goal is to help CARA serve farmers. Your rep is Ann Rafa. Dianne Westerlund also sits on the ARECA Board as a Manager rep.

Some highlights in 2015:

ARECA worked with our team (9 associations) to deliver a Soil Health Initiative with the Alberta Crop Industry Development Fund. This initiative enabled our members to deliver over 20 meetings and programs across Alberta. It also funded www.albertasoilhealth.ca. On this site we added short articles about soil quality and soil health in Alberta. We interviewed producers across Alberta and created **Producer Highlights**. CARA featured Marj Veno at Hanna and Ron and MaryAnn Barnett of Oyen. CARA's Dianne Westerlund and Yamily Zavala were leaders on the Soil Health Initiative.

ARECA enabled the delivery of successful Regional Variety Trials across Alberta. Together, we tested 78 new cereal varieties and 76 new pulse varieties. CARA ran trials at Acadia Valley, Consort, Hanna and Oyen.

ARECA enabled the delivery of the Provincial Pest Monitoring program funded and operated Alberta Agriculture and Forestry. Together, ARECA associations monitored 9 important insect pests.

ARECA started a Connections newsletter, designed to "connect" our 9 member organizations. Each month, we develop a highlight sheet of one association and distribute to each Board member of each association. CARA was featured in February.

ARECA also delivers the provincial Environmental Farm Plan (EFP). ARECA has over 10 technicians from the member associations delivering EFPs. Lacey Gould and Olivia Sederberg work with producers in CARA's area.

The ARECA team hosted the Western Canada Soil Health Conference in Edmonton. This was attended by 425 people and was sold out! Soil health has become a hot topic across North America. CARA, and your partners through ARECA, is delivering information to farmers in the field.

ARECA enabled the inaugural Verticilium Wilt Survey, funded and operated by the Canadian Food Inspection Agency, in co-operation with the canola industry. Together, ARECA associations surveyed 83 fields on a very short timeline. CARA collected samples from 11 fields.

The ARECA Board developed a new process that aims to differentiate provincial programs from local programs. Our goal is to develop over-arching programs that fit for all or most of our 9 member associations; while supporting the independent, local programs of each individual association. So far, the process is working well and will be reviewed in 2016.

Late in 2015, ARECA decided it was timely to renew their Environment Team. This team will help guide ARECA's programming and policies regarding environmental issues.

CARA's program includes projects located within the Special Areas and the MD of Acadia in east-central Alberta. Although results are drawn from this area, we anticipate many of the projects may be applicable to other areas as well.

ARE YOU A CURRENT MEMBER OF CARA? A membership ensures you are on the mailing list to receive all reports, monthly newsletters, and admission discounts at CARA workshops/seminars. To become a member or renew a membership, simply complete the form below and send along with the appropriate fee.

Name: ____

Address: ____

________________________Postal Code___________

Phone: ___________________________

Fax: ______________________________

Email: ____

Enclosed is: ___$20.00 1 year membership (2016)

___ $80.00 5 year membership

Would you like to receive the annual report on a computer memory stick ____ Yes

____ No—Send me a paper copy

____ Yes I would like a receipt ___ No receipt please

Please add me to CARA's email contact lists______ Crop

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Make Cheque payable to: CARA

Mail to: CARA, Box 690, Oyen, AB T0J 2J0

Thank You for your support of CARA!