Mackenzie Applied Research Association

2010 Annual Report

Box 646 Fort Vermilion, AB T0H 1N0
Phone (780) 927-3776

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Mackenzie Applied Research Association

The Mackenzie Applied Research Association is a non-profit, producer-driven organization that conducts applied agricultural research, demonstration trials and rural extension in Mackenzie County.

Our Mission

To serve producers within Mackenzie County by meeting the special needs that result from our unique climatic, geographic and soil conditions and to facilitate the transfer of best management practices to producers on reducing production costs, marketing strategies, alternative practices and environmental sustainability.

2010 Staff

Dr. Nasar Iqbal
Research Coordinator

James Giesbrecht
Research Technician
(May-November 2010)

#1, River Road
AAFC Experimental Farm
Box 646
Fort Vermilion, AB T0H 1N0

(780) 927-3776 phone
(780) 927-4747 fax
mara3@telus.net
www.mara.areca.ab.ca

2010 Board of Directors

John Simpson (President)
Box 556 Fort Vermilion, Alberta T0H 1N0
Phone: 780-927-4535

Al Toews (Secretary-Treasurer)
Box 400 Fort Vermilion, Alberta T0H 1N0
Phone: 780-927-3491

Manfred Gross
Box 707 Fort Vermilion, Alberta T0H 1N0
Phone: 780-927-4684

Raymond Dyck
Box 682 La Crete, Alberta T0H 2 H0
Phone: 780-928-2382

Kelly Friesen
Box 890 Fort Vermilion, Alberta T0H 1N0
Phone: 780-927-3058

Richard Marshall (MD Rep)
Box 116 High Level, Alberta T0H 1Z0
Phone: 780-927-3828

Joe Unruh (Ag-Canada)
Box 126 Fort Vermilion, Alberta T0H 1N0
Phone: 780-927-3253

Jake Martens (Neufeld Petroleum Rep)
Box 1397 La Crete, Alberta T0H 2H0
Phone: 780-821-9672

MACKENZIE APPLIED RESEARCH ASSOCIATION

MARA MEMBERSHIP

Are you current member of MARA ? Your membership will ensures that you are on the mailing list to receive annual report, newsletters, invitation to field tours etc. from MARA. To become the member simply complete the form below and send with the fee.

Name :————————————————

Address:————————————————

———————— Postal Code:————

Phone :————————Fax:————————

Email : ————————————————

Enclosed is : ——$20.00 Individual membership
—— $100.00 Corporate membership

Make cheque payable to: MARA
Box 646, Fort vermilion, Ab.
T0H 1N0

Thank you for your support of MARA!

President's Message

Another Year has come and gone and it is time to reflect on what has been accomplished. I would like to thank Nasar for his dedication to agriculture and his efforts to help MARA to succeed. You the producers showing up for the field days and other events certainly makes our efforts seem worthwhile and important. We do need your input to make the program relevant to your needs and I know Nasar is willing to try and put your suggestions into a program.

Last year our program included regional cereal, pulse trial, phosphate inoculums on peas, organic weed management trial, organic versus conventional economical trials, dugout water test program and headline on flax and peas. We are trying to do the trials that will help to answer questions of economic return of various management practices. Some of these trials are longer term to see how they work out. They and others are written up in this booklet for you to consider their merits.

For MARA to survive and be able to do research work and give information back to you we need you to attend our field days and other functions. Numbers speak volumes to our funding agencies.

I would like to acknowledge the contribution that the Government of Canada given by allowing us to use the Research Station at Fort Vermilion. Their employee *Joe Unruh* has contributed his knowledge of the farm equipments and research plot work to MARA. This has been very valuable, thank you *Joe.*

Thank you to the board for your input and ideas and especially Manfred Gross who has worked diligently behind the scenes for MARA. He is also our representative on ARECA which involves trips to meeting down south.

Thank you!

John B. Simpson
MARA President

Research Coordinator's Message

2010 has gone passed and it brought stability at MARA in terms of research program execution, improving financial position and staff retain ability. We got our funding increased from Agriculture Opportunity Fund , Alberta Environmentally Sustainable Agriculture Program although it was less than our expectation and will be working vigorously to diversify our funding sources. ARECA supplemental grant was very helpful in delivering program and staff professional training.

We were able to bring most of our projects to completion except few glitches. We seeded all the trials, managed well, collected data, harvested and reports were sent to all the funding agencies. On basis of feed back one can say MARA has another fruitful program this year.

On extension front MARA sign boards were prepared and fixed on 88 Highway and River Road. Organized water quality workshop and sustainable grazing workshop. Arranged MARA Annual Field in July in collaboration with the Mackenzie County . We brought Minister Frank Oberle and two subject specialist to speak on the occasion. More than 100 producers attended Annual Field Day and this indicates interest and confidence of the local producers in what we are doing. I take this opportunity to thank ASB members of Mackenzie County for their continuous financial and moral support and we will be making sincere efforts on our part to strengthen interactive relation with- producers of the County.

Scope of dugout water testing program was broadened this year and total of 41 dugouts from Fort Vermilion , La Crete, Rocky Lane and High Level area were tested for water quality at free of cost and results were made available to producers. To achieve objective of Peace Country Strategy articles were published in a newsletter "Peace Country Agriculture and Extension Update" and delivered to rural boxes of Peace region.

Our board of directors provided valuable advice to staff on MARA business. We appreciate all their hard work at board meetings and travelling as when required to advance the cause of MARA. Thanks to *James Giesbrecht* who as summer staff put efforts to have this program a success.

I would like to thank *Joe Unruh* from Agriculture Canada for his help. critical insight and it is always pleasure to work with him as team at experimental farm . I would like to express my appreciation for our members, board of directors, cooperating producers, government (federal, provincial and municipal), industry partners, ARECA staff, and all other those worked and contributed to the success of our association.

MARA Research Coordinator

A year in review...

Message from the Executive Director

2010 was a weather event for Alberta producers and particularly those in the Peace River area with a severe drought. That posed a significant challenge for our Associations serving farm clients in the Peace. Early fall moisture provided additional stress with getting the crop harvested.

The **ARECA Board** of Directors was restructured at the AGM in March, 2010 to a seven member Board with two non-voting representatives from the Associations and a non-voting Alberta Agriculture and Rural Development representative. The **Governance structure**, bylaws and policy manual were ratified by the Board as well as the vision, mission and mandate. Our Board is now seven directors with 2 representatives from the Managers and an ex -offico Alberta Agriculture representative.

The **ARECA website** was revamped and launched this past summer. Our readership has continued to grow especially since it includes important announcements from Associations. about emerging agricultural issues in Alberta. You are now able to easily each Association's web site by typing "brrg.areca.ab.ca".

Close to 300 participants from across western Canada gathered in Vermilion Regional Centre December 1 and 2, 2010, to participate in the **Western Canadian Grazing Conference** and Trade Show. Keynote presentations, select-a-sessions, and a tradeshow and hands-on lab sessions across the road from Lakeland College were featured.

Advanced Agronomy Conference attracted Crop Advisers, farmers and industry partners for the latest crop production ideas and techniques in the agriculture industry today

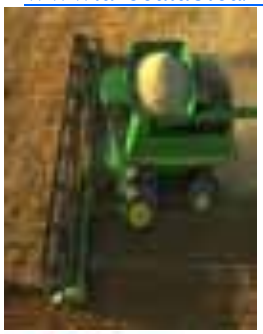
Participants learned what it takes to be the Guinness World Record holder for wheat yield, find out how
Australian farmers are getting the most out of their challenging soils, and the latest research from our Associations (presentations and posters) in Western Canada and on Alberta farms.

Cattle producers grow ever increasing amounts of annual crops for feed (silage, greenfeed and swath grazing). The **Regional Silage Variety Trials** are in their second year and the results will be posted in the Alberta Seed Guide and the ARECA web site. Six nutritional categories were reported including Crude Protein and Total Digestible Nutrients which is an estimation of energy. The trial is sponsored by the Alberta Beef Producers.

The **Sustainable Grazing Mentorship Program** assists producers in improving their forage operations through training. Experienced grazing mentors work directly with producers to develop a grazing plan tailored to the needs of the producer. Funding provided by the Growing Forward initiative with Alberta Agriculture and Rural Development.

The **Alberta Forage Industry Network (AFIN),** a unified voice for Alberta's forage industry, is now embarking on a membership drive. Current membership fees range from $50 to $250. The first Annual Meeting of AFIN will be held at the Lacombe Research Centre on March 15, 2011. For more information, contact Doug Wray, AFIN Chair, 403-935-4642 or visit AFIN's website at www.albertaforages.ca.

This past winter ARECA and its Associations offered **Variable Rate Technology (VRT)** training workshops to Alberta farmers at Lethbridge, Coronation and Peace River. These workshops and a **VRT Resource Manual** were made possible by funding (http://www.areca.ab.ca/images/stories/Files/vrt%20resource%20manual%202010.pdf)

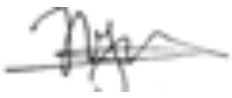


provided by Growing Forward through Alberta Agriculture and Rural Development.

Precision Tools for On Farm Research is a study being collaborated with six Associations who work with producers to do field scale research to assess the influence of topography on phosphorus and nitrogen nutrients. On farm research needs to be understood and documented so producers can implement field-scale research and data collection with modest training.

Farmers in Alberta used **70 million litres less diesel fuel** in 2006 than in 2001. That means a **reduction in CO_2 emissions** equivalent to **taking 35,000 cars off the road.** Alberta farmers, the Government of Alberta and ARECA are committed to improving fuel efficiency and reducing CO_2 emissions through the adoption of direct seeding on all acres of Alberta; improved management of precision farming and VRT; improved equipment design; and improved match between tractor and equipment. Sod and interrow seeding demonstrations and fuel meter recordings were initiated by BRRG, CARA, GRO, LARA, PCBFA, PARDA, SARDA, SARA MARA and NPARA.

With the dedication of the ARECA Board and Associations, we are able to bring sound science and sustainability to Alberta farms. As we go forward in 2011, I wish to thank everyone for their enthusiasm and hard work in 2010.



Ty Faechner, Executive Director

Regional Variety Trials: Cereals and Field Peas

RVT is an applied research tool that provides Alberta farmers with regional crop performance information on newer crop varieties, compared to well-established, widely grown varieties. Under the RVT program, different varieties of cereal grains and pulses and were grown at experimental farm to determine which thrives best in local agro-climactic conditions. Selecting variety is an important component of production process because it effects yield, time of maturity and resistance to diseases.

Before selecting a crop variety it is beneficial to look into data from field trial in your particular area, reason behind is certain varieties behave differently in different set of agro-climatic conditions. The varieties that perform better in adverse conditions may perform better in optimum growing conditions.

The Regional Variety Trials are conducted throughout Alberta and British Columbia. Each site is subject to different soil and climate conditions, therefore, the data is useful to local producers. The data is collected by Coordinator RVT, Alberta Agriculture and Rural Development and compiled for print in seed.ab.ca. MARA has been involved with the Regional Variety Trials since 1995.

The yield from small plot trial is generally higher than the field scale production level. In small plot trial effort is made to select a uniform and productive patch of land with ultimate objective of achieving a uniform crop stand. Input are also provided to produce optimum crop yield for specific soil properties but the relative performance of different varieties is likely to be similar under small plot and field scale conditions.

Objectives

- To collect agronomic data on yield, bushel weight, plant height, maturity and 1000 kernel weight of newly registered and existing varieties of Cereal and Pulse
- To publish the data for use by local producers.
- To familiarize producers with the newer varieties available to them.

Materials and Methods

The 2010 Regional Variety Trial consisted of 11 lines of utility wheat, 24 lines of hard red spring wheat, 19 lines of 2- row barley, 7 lines of 6-row barley, 5 triticale, 7lines of oat, 10 lines of

of yellow peas and 4 lines of green pea. For each crop, the seeding rate was determined from the 1000 kernel weight of each variety. The site selected was summer fallow and soil samples were collected from the site and fertilizers were applied as soil test recommendations. Plots were seeded using a Fabro small plot seeder. Plots were planted at 6.5 meters in length with four rows 12 inches apart. Seeding depth for cereals varied from 1—1.5 inches, seeding . Soil nutrient analysis of 0-12" sample showed that NPKS was 24, 24, 12 and 8 ppm, respectively. A fertilizer mix of 43-37-52 was banded at a rate of 132 lbs/acre. Table 1 summarizes the crop management details.

Table 1: 2010 Regional Variety Trial Management Information

Crop	Seeding Date	Harvest Date	Previous Crop	Fertilizer NPK (lb/ac)	Herbicide
Utility Wheat	May 11	September 14	Summer fallow	43-37-52 132 lbs/ac	Buctril M/Achieve
HRS Wheat	May 11	September 14	Summer fallow	43-37-52 132 lbs/ac	Buctril M/Achieve
2-Row Barley	May 11	September 14	Summer fallow	43-37-52 132 lbs/ac	Buctril M/Achieve
6-Row Barley	May 11	September 14	Summer fallow	43-37-52 132 lbs/ac	Buctril M/Achieve
Triticale	May 11	October 8	Summer fallow	43-37-52 132 lbs/ac	Buctril M
Oat	May 11	September 23	Summer fallow	43-37-52 132 lbs/ac	Buctril M
Field Pea	May 12	September 14	Summer fallow	0-24-58.5	

Cereal trials were replicated three times and flax and pea trials were replicated four times in a randomized complete block design. After plants were established, all plots were cut back to 5.5 meters in length by roto-tillage to ensured equal length of harvest. Throughout the growing season, field notes were recorded on height, maturity and lodging. Weed control consisted of combination of herbicides and hand rouging. Lodging of each plot was rated on a scale of 1-9 (1= Erect and 9 = Flat) prior to harvesting

Harvesting was done using a straight cut, small plot combine. Samples were air dried and sent through a clipper seed cleaner and then evaluated for yield, test weights and 1000 kernel weights.

Statistical Analysis

Crop yield averages (or means) of agronomic data are listed throughout the body of the data tables. The least significant difference (LSD) and the coefficient of variation (CV) are listed at the bottom. The LSD is given at the 5 percent error level and is an aid in comparing varieties. If the measured values of any two varieties differ by the LSD value or greater, they may be considered different with a confidence level of 95%. If the measured values are less than the LSD value, the differences may be due to random error rather than real differences.

Coefficient of variation (CV) is also included in the tables. This is given as a general measurement of the accuracy of each experiment. Lower CV percentage values indicate less experimental variation and greater reliability in results. Also this indicates that environmental conditions were uniform during the experiment and that the differences among varieties are due to treatment characteristics. High CV values indicate that non-treatment conditions are affecting the results of the replications, therefore making the experiment less statistically accurate. According to some statisticians a CV greater than 15 % is questionable and may not be accepted as statistically sound.

Table 2: SWS/Utility Wheat Agronomic Data

Varieties	Maturity (days)	Height (cm)	Lodging (1-9)	KWT (1000 gm)	KGHL	Protein (%)	Yield (bu/ac)
AC SADASH	93.71	66.91	1	41.53	74.23	10.2	58.07
ACANDREW	93.17	65.16	1	40.06	73.02	10.9	53.33
MINNEDOSA	88.63	66.05	1	39.03	71.05	13	34.59
AC TABER	92.91	61.08	1	33.02	72.43	13.8	35.72
GP003	90.69	65.05	1	33.66	71.46	13.2	42.33
CDN BISON	90.55	65.05	1	49.94	72.08	13.9	43.73
HY985	46.55	66.05	1	51.04	51.02	13.6	39.73
GPO10	94.99	72.05	1	47.03	71.26	12.5	48.19
AC BARRIE	90.03	70.83	1	34.09	74.00	14.9	41.49
HY682	89.39	70.25	1	46.00	72.07	14.6	41.00
AC CRYSTAL	91.27	64.33	1	48.06	73.03	15.1	39.46
						CV	11.76
						LSD at 0.05	8.70

SWS/Utility wheat plots

HRS wheat Plots

Table 3: HRS Wheat Agronomic Data

Varieties	Maturity (days)	Height (cm)	Lodging (1-9)	KWT (1000 gm)	KGHL	Protein (%)	Yield (bu/ac)
PT 575	86.93	71.58	1	40.46	52.06	13.5	37.46
BW 878	84.95	68.41	1	35.04	51.56	13.8	39.93
BW 883	90.75	44.33	1	39.04	73.05	14.8	41.89
BW 881	90.48	73.75	1	41.06	73.83	14.4	37.30
KATEPWA	89.65	48.75	1	36.00	51.01	14.2	36.48
CARBERRY	89.51	67.00	1	41.73	75.16	14.5	42.20
AC BARRIE	90.44	72.91	1	37.49	74.33	14.3	43.55
UNITY VB	88.39	73.83	1	27.26	75.36	14.1	41.53
GLENN	90.27	72.00	1	40.26	77.66	14.5	48.15
5603HR	91.22	79.05	1	36.00	73.93	14.4	47.08
MUCHMORE	52.45	62.23	1	41.53	74.63	13.6	47.11
HARVEST	87.25	71.58	1	40.33	74.07	14.7	37.14
WR859CL	48.38	61.08	1	37.26	74.36	13.1	44.11
WASKADA	86.50	80.66	1	41.93	75.03	13.1	47.42
CDC ABOUND	49.57	68.91	1	47.13	75.06	14.1	47.09
SHAW	86.13	78.33	1	40.13	74.08	12.1	44.14
GOODEVE VB	86.75	72.75	1	40.86	73.07	12.9	44.49
BW880	87.13	68.05	1	34.46	73.06	12.2	44.30
BW415	86.24	70.00	1	42.26	74.07	16.8	37.41
CDC GO	46.71	67.25	1	40.26	74.33	16.7	36.25
STETTLER	89.37	69.41	1	41.93	74.73	14.2	50.77
ALVENA	86.96	71.05	1	39.02	73.01	14.4	40.13
FIELDSTAR VB	85.48	71.41	1	34.06	73.09	12.8	43.68
SUPERB	50.02	71.25	1	47.46	75.33	12.5	49.98
						CV	10.88
						LSD at 0.05	7.67

Table 4: 2 Row Barley Agronomic Data

Varieties	Maturity (days)	Height (cm)	Lodging (1-9)	KWT (1000 gm)	KGHL	Yield (bu/ac)
BUSBY	82.17	66.16	1	35.30	63.88	106.05
CDC CARTER	51.81	58.66	1	41.76	75.23	81.21
TRO6294	81.77	53.41	1	48.73	59.67	98.31
AC METCALFE	81.45	58.16	1	50.26	61.75	94.11
BENTLEY	82.84	62.08	1	51.06	61.66	84.39
CDC RESERVE	80.28	59.75	1	49.43	61.93	91.75
NORMAN	79.06	57.58	1	46.63	59.08	86.39
TO8684	81.70	62.83	1	57.53	61.63	69.30
XENA	84.77	56.83	1	49.08	62.91	98.70
TRO5671	87.59	57.00	1	52.13	42.33	83.92
TRO7728	85.37	57.08	1	50.02	62.96	94.10
CDC MEREDITH	84.15	59.58	1	50.06	60.88	88.83
TRO7114	80.34	58.25	1	46.06	60.56	87.27
MAJOR	82.06	52.66	1	47.06	60.03	89.33
TRO8732	88.37	56.33	1	46.53	62.06	96.84
MERIT57	90.55	57.83	1	45.83	61.01	95.09
CDC EXPLUS	91.09	68.15	1	47.63	71.08	
CDC AUSTENSON	85.29	66.16	1	51.08	62.92	94.42
CHAMPION	85.51	54.91	1	50.66	63.69	93.52
					CV	12.92
					LSD at 0.05	19.46

6-Row barley plots

Triticale plots

Oat plots

General View of Cereal

Table 5: 6-Row Barley Agronomic Data

Varieties	Maturity (days)	Height (cm)	Lodging (1-9)	KWT (1000 gm)	KGHL	Yield (bu/ac)
CDC MAYFAIR	77.77	58.67	1	45.13	48.93	85.52
STELLAR ND	79.92	60.67	1	41.00	56.06	78.90
CELEBRATION	79.04	63.50	1	43.93	59.02	87.13
VIVAR	81.02	55.33	1	44.13	58.06	102.88
AC METCALF	81.99	60.67	1	51.00	63.00	94.79
CDC KAMSACK	80.52	56.08	1	44.73	57.76	91.41
CHIGWELL	81.20	65.83	1	37.07	59.08	105.81
					CV	5.26
					LSD at 0.05	8.63

Table 6: Triticale Agronomic Data

Varieties	Maturity (days)	Height (cm)	Lodging (1-9)	KWT (1000 gm)	KGHL	Yield (bu/ac)
PRONGHORN	99.14	91.66	1	47.63	66.26	82.55
T198	95.28	96.66	1	49.06	66.43	92.73
AC UL TIMA	95.21	91.75	1	49.53	68.03	84.31
BUMPER	95.91	82.66	1	48.00	67.06	89.73
T204	95.65	87.08	1	45.33	67.56	83.63
					CV	6.43
					LSD at 0.05	10.49

Table 7: Oat Agronomic Data

Varieties	Maturity (days)	Height (cm)	Lodging (1-9)	KWT (1000 gm)	KGHL	Yield (bu/ac)
OT3044	90.22	79.25	1	39.5	48.62	126.00
CDC MINSTREL	91.07	85.75	1	40.21	48.02	137.28
SW TRIACTOR	92.65	81.91	1	43.18	48.50	136.18
BRADLEY	89.88	87.08	1	54.18	46.09	163.19
OT 3037	89.73	89.83	1	43.04	49.18	138.29
CDC DANCER	87.38	89.75	1	80.43	48.69	131.78
OT 3039	88.91	86.83	1	40.33	45.25	137.17
					CV	7.34
					LSD at 0.05	18.09

Table 8: Field Peas Agronomic Data

Varieties Yellow Peas	Height (cm)	Lodging (1-9)	KWT (1000 gm)	Yield (bu/ac)	Stand
CDC MEADOW	76.31	5	223.3	53.84	96.25
CDC 1749-8	87.68	3.75	233.35	63.30	71.25
CANSTAR	81.05	4.75	261.02	56.99	88.75
ARGUS	75.87	5	238.075	55.52	71.25
CDC TREASURE	78.56	4	221.15	57.59	76.25
STELLA	92.75	4	246.85	55.10	80.00
CUTLASS	70.62	6.4	241.75	59.74	65.00
HUGO	62.31	7	256.75	61.20	90.00
CDC PROSPER	69.62	4.75	171.00	60.65	58.75
CDC 1897-14	64.81	5.75	223.95	64.07	80.00
				CV	8.47
				LSD at 0.05	7.45
Varieties Green Peas	**Height (cm)**	**Lodging (1-9)**	**KWT (1000 gm)**	**Yield (bu/ac)**	**Stand**
MENDEL	88.56	6.75	206.5	40.70	41.25
COOPER	56.62	5.75	290.15	53.85	66.25
CDC PATRICK	81.31	5.05	198.09	52.90	95.00
CDC 1932-201	57.06	6.75	215.47	54.74	100.00
				CV	5.76
				LSD at 0.05	4.80

Green Peas RVT

Yellow Peas RVT

Comparison of Lentils and Other Pulse Crops to Field Peas (Project #E10-01)

Background:

Lentils are one of the most profitable crops in Saskatchewan, but due to a variety of reasons are not as popular in Alberta. The BRRG has had good success in producing good quality Lentils at its Castor location. However weed control was a challenge, as limited herbicides were available for lentil production in the past. The recent development of early maturing Clearfield tolerant lentils improves their potential for growth in Alberta. BASF estimates that 50 % of the red lentils and 10% of the green lentils will be planted to Clearfield varieties in Saskatchewan and Alberta in 2010.1 Areas suitable for this crop need to be refined.

With increasingly high fertilizer prices; interest may increase in Fababeans, as it has the best nitrogen fixing potential of Alberta pulse crops. Soybeans are gaining in popularity in the eastern prairies and producers in Alberta are interested in seeing how early maturing lines do here.

According to the Alberta Pulse Growers, Alberta now produces 5% of Canada's lentils, much higher than in past years. A recent article in the Western Producer2, reports that Statistics Canada has documented 3.48 million acres of lentils sown in 2010 up 14% from previous estimates. 2010 produced a record 1.95 million tonne crop, up 29% from last year. This will likely affect prices, especially with red lentils which were 55% of Canada's crop. Red Lentils face stiff competition in world markets. Another problem in 2010 is that only 18 per cent of Red Lentils graded in the top 2 classes. This leaves a lot of poorer quality lentils to market. At the time of this report, it is expected that acreage will fall back to lower levels in 2011.

This project will be a valuable extension tool for in illustrating how other pulse crops compare to field peas in terms of production risk, economic risk, and fit into a crop rotation.

Four research associations participated in the project for 2010. They are: Battle River Research Group (BRRG), North Peace Applied Research Association (NPARA), McKenzie Applied Research Association (MARA), and Peace Agriculture and Demonstration Association (PARDA)

Objectives

1. To evaluate the adaptation of Clearfield Lentils and Fababeans in different regions
2. To evaluate early maturity soybeans instead of Lentils at the NPARA site
3. To compare economics with Field Peas where Lentils and Fababeans have been successfully harvested. This will be a three year project, 2009 to 2011. One season could bias the results.

Methods

At least 3 passes of each crop was sown as early as possible in May at each location. The middle pass was to be used for harvest; with competition on each side, yields should be similar to those expected in a producer's field. Only a single rep was sown for demonstration purposes. Plot length was to be at least 10 meters long. With plots this size, producers will be able to visualize how the crop would look in the field.

1. Clearfield lentil varieties gaining dominant position, Western Producer, Dec 17,2009, page 3
2. "Jump in Lentil Acres may send prices down", Western Producer, page 6, Dec 9, 2010

Land Preparation:
The land will be prepared for seeding. For direct seeded sites, the sites were sprayed with a pre-seed application of glyphosate.
Soil Type by site
BRRG: Castor: Dark brown chernozemic soil with some solonetzic properties, OM 4, pH 5.5
Stettler: Thin Black chernozemic soil, OM 5.4, pH 5.8
Viking: Thin Black chernozemic soil, OM 5.5, pH 6.0
MARA: Fort Vermillion: Grey Woooded, OM 2.1, PH 6.6
PARDA: Fairview: Transition soil zone from Black to Grey wooded, OM 4%, pH 5.9
NPARA: Manning: Dark Gray, OM 4.2, pH 6.4
Seeding:
Crops sown at the BRRG, MARA, and PARDA sites will be:
1. Yellow Field Peas, Eclipse sown at 204 lbs/acre
2. Green Field Peas, Patrick sown at 130 lbs/acre (Patrick is a small seeded pea cultivar)
3. Clearfield Tolerant Lentils – Red – v. Impact, seed rate 60 lbs/acre (200 plants/m2)
4. Clearfield Tolerant Lentils Green – v. Imperial, seed rate 100 lbs/acre (135 plants/m2)
5. Fababeans – v. Snowbird, seed rate 235 lbs/acre

At the NPARA site near Fort Vermillion, soybeans were substituted for lentils. There is little interest in lentils in this area. Agassiz yellow peas and Cooper Green Peas were sown.
Buffer strips around plots were sown if wildlife damage was a risk
BRRG, MARA and PARDA sowed three passes of each cultivar, the middle plot was harvested.
BRRG : The funding supplied by the Pulse growers was for one site, 3 other demos were also sown **Castor,** sown May 13; **Killam**, sown May 10; **Viking,** sown May 12 **Stettler:** sown May 19
All sites were sown with a Fabro plot drill equipped with Technotill openers at 9 inch spacing.
The Killam site was lost due to flooding in mid July, thus no results are available.
MARA: Fort Vermillion, Sown with a Fabro small plot drill, 6 feet wide with 12 inch spacing on May 15
PARDA: Fairview, Sown with a double disk small plot cone seeder (7 row, 7 inch spacing) on May 7. Plot size was 4 by 15 metres.
NPARA: **Manning**, Sown with a Seed Hawk seed drill, plot size 17.8 X 50 feet,
Peas (Yellow, Agassiz at 216 lbs/acre; Green, v.Cooper at 330 lbs/acre),Snowbird Fababeans at 266 lbs/acre on May 11. Soybeans at 53 lbs/acre on May 28.
Spray dates and method:
The lentils and peas were sprayed with Odyssey, Solo (PARDA), Viper (NPARA) or Pursuit + Poast (BRRG). The fababeans were sprayed with Basagram followed by Poast or a similar product. The plots with MARA were hand weeded.
Harvest dates and method:
Castor: Field Peas and Lentils, October 14
Stettler: Field Peas Lentils and Fababeans, October 6
Viking: Field Peas, September 27, Lentils and Fababeans, October 7
MARA: Red Lentils and Field Peas, Green Lentils, , Fababean, September 14
PARDA: Field Peas, Lentils and Fababeans harvested on Sept 18th, and then dried
NPARA: Field peas, August 15, 2010, Fababeans, Sept 5, Soybeans did not reach maturity
Results
There was good stand establishment at all sites, except for Ft. Vermillion. Here germination was poorer for lentils, this may have been due to soil crusting. No herbicide injury symptoms were observed at any of the sites.

Table 9: Yields by crop, cultivar and site 2010.

	Castor	Stettler	Viking	MARA	PARDA	NPARA
Yellow Field Peas (bu/acre)	42	XX	44	36	4.3	XX
Green Field Peas (bu/acre)	40	32	45	32	3.4	24
Red Lentils (lbs/ acre)	490	470	1400	805	101	XX
Green Lentils (lbs/acre)	640	320	1140	768	115	XX
Fababeans (bu/ acre)	<5	29.5	XX	29	6.3	<5
Soybeans	XX	XX	XX	XX	XX	0**

Conditions were extremely wet and cool in 2010 at the BRRG sites
-The lentils at the Castor and Stettler site did not set seed until August. Some of the seed was immature when a killing frost occurred in mid September. Fababean yield was very poor at Castor, and comparable to peas at Stettler.
- The Viking site was located on better drained land. Here the lentils reached maturity by September.
- The MARA site at Fort Vermillion had fair yields of peas in the 30 bushels/acre range and poorer yields of lentils at 760 to 800 lbs/acre.
- At the PARDA site at Fairview there was considerably less precipitation than the 30 year average. Total rainfall was only 111 mm from May to August at the site. The plots here performed very poorly.
- The yellow peas at the NPARA site at Manning suffered some wildlife damage.
** The soybeans froze before reaching maturity at the NPARA site. The yellow peas yielded poorer at this site due to some wildlife damage and some shattering before harvest.

Table 10: Precipitation (mm) by location, April to August, 2010

	Castor	Stettler	Viking	MARA	PARDA	NPARA
April	73	62	45	44	8	4
May	75	68	87	34	62	44
June	68	92	65	37	9	48
July	85	142	86	47	16	37
August	24	40	53	78	25	27
Total	325	404	335	241	120	161

Discussion

These demonstrations illustrate the relative risk of production in the challenging 2010 year. The PARDA site at Fairview was suffering from 3 years of dry weather. The NPARA site near Manning and the MARA site near Fort Vermillion were also drier than normal. In much of the rest of the province, wetter and cooler than normal weather conditions, also resulted in variable production.

It was noted in the region that the Battle River Research Group covers in East Central Alberta that crops were delayed due to higher than normal amounts of rainfall and the lack of heat units in the late summer. Due to these conditions, field peas were attempting to flower into late July. Lentils did set seed but were later in maturity than in past years. They were especially late in the Stettler and Castor regions. At these locations the lentils froze in mid September before seed set was complete. The result was less than 500 lbs of lentils harvested at these locations. A producer in this area realized yields of only a few hundred lbs with very poor germination. Field peas yielded 32 to 44 bushels per acre under these same conditions. This area has soil with solonetzic properties. Many of these soils become saturated with heavy precipitation due to poor drainage.

Results were better at the Viking location with similar precipitation to Castor (Table 10). Here Red Lentil yields were around 1400 lbs/acre. A producer near here realized 27 bushels. Field peas yielded less than expected at 45 bushels per acre. This site was on better drained soil.

At the MARA location near Fort Vermilion, field peas yielded 32 to 36 bushels per acre under drier than normal conditions. Lentils had poor yields of around 800 lbs per acre.

At the PARDA location near Fairview yields of all of the pulse crops were extremely low due to dry conditions. The combining of very short lentils proved to be challenging. A significant percentage of yield was lost. Field peas yielded less than 5 bushels per acre, showing the effect of drought like weather.

At Manning, LS 0028 and LS 0036 RR soybeans were evaluated by NPARA. The plots here also performed poorly here due to the dry weather. Field peas carried the least risk of production with yields of 24 bushels of Cooper peas realized. There was no yield realized from the soybean plots, these cultivars require 2400 heat units. This area of Alberta had about 1820 heat units from May to September. Some producers near Killam tried this crop as well with the same poor results as at Manning.

With good yields, Lentils can be more profitable than field peas. A 40 bu/acre crop of field peas on dryland at $4.50/bu has a gross return of $180/acre. In comparison a good lentil crop of 2000 lbs/acre at 12 cents per pound would return $240/acre. Lentil prices have ranged much higher than this. Prices were ranging around 18 to 25 cents/lb in December of 2010. For a 1400 lb/acre crop (as at Viking) this price could return $252-336/acre, depending on quality. But, yellow peas at 45 bushels/acre at $6.00/bu could return $270 at considerably less risk. In considering which pulse crop to grow, producers have to balance production risks, expected yields and prices and many other factors.

It should be noted that some varieties of soybean are more sensitive to day length and will mature more quickly than is indicated by heat units alone, based on experience in Manitoba. So it may be good to note that though soybeans were not successful this year, there could be different results in a warmer and drier year. Producers should not grow large acreages of this crop until more positive results are achieved.

Extension:

These plots were featured on summer tours sponsored by the association. More than 100 producers came out to the tour at Fort Vermillion.

Figure : These pictures taken at MARA site on July 21 shows the height of the Eclipse Fields peas (85 cm) on the left compared to the Impact red lentils (38 cm). Complete ground cover with Lentils was not achieved due to poor germination. A heavy rainfall before emergence may have crusted the soil. The Fababean (below) were 70 cm in height.

Pea Inter node Length Trial and Comparative Advantage of Different Inoculants in Yellow Peas Trial

Both of these trial were seeded on patch of field which was kept summer fallow last season and fertilizer was applied as per soil test recommendations. But we were very surprised that germination was less than 20% and trials were discarded. Just beside the trial site where we set the combine for changing the seed depth germination was really good as shown in underneath photos. The seed source was same which we use for seeder setting. We also look for insect we were unable to find any. Another thing it rained after seeding, there is possibility of some sort of crusting but it should have effected the side patch where we have normal germination. Other possibility is some residual effects from some herbicide use on that patch of land but as per our investigation of previous crop record that is remote possibility. Take home message is one should be very careful for selecting the trial site in order to avoid situation like we were in.

Pea Germination at seeder Setting Place

Poor Germination at Trial Site

Precision Tools for On Farm Research

Ken Coles, SARA; Alvin Eyolfson, BRRG; Andrea Fox-Robinson, GRO; Keith Kornelsen, LARA; JP Pettyjohn, SARDA; Nasar Iqbal MARA; Ty Faechner, ARECA; Darren Smith, Novozymes

Introduction

There is a significant interest by farmers in utilizing agronomic information that addresses spatial variability in Western Canada. This strong interest is due to rising input costs and the application of Variable Rate Technology (VRT) to optimize inputs for fields. Consequently, farmers are asking questions about how crops respond when inputs are varied across a landscape according to topography. This project will provide an opportunity to assess the influence of topography on phosphorus and nitrogen nutrients.

The method by which these questions can be answered on a practical, field-scale basis needs to be understood and documented so that producers can implement these methods on their farm. We have chosen to implement this research using farm-scale equipment and data collection techniques that with modest training can be applied by Alberta farmers.

Another benefit to Alberta's agriculture industry is the collection of applied, field-scale research from sites across different soil and climatic zones. The opportunity is that each of the co-applicants has a local/regional connection to extend the research information at a local and provincial level.

Objectives

This project has five objectives and they are:

1.Develop a sound understanding of the use of Global Positioning Systems (GPS) and Geographical Information Systems (GIS) in Precision Agriculture for performing field-scale experiments

2.Explore useful methods for analyzing and modeling variability of crop yield on a field-scale basis

3.Understand and document the options for precision agriculture in on-farm experimentation

4.Develop and deliver information about a new method of doing field-scale trials to producers through a variety of communication mediums

5.Assess agronomic inputs for spatial and temporal effects on crop yield related to topography

Materials and Methods

Experimental Design, Location and Treatments

Each Association that participated in the project contacted interested farm co-operators with the appropriate equipment. For this project, it was essential that farm co-operators own a combine with a crop yield monitor and functional global positioning system. Combines equipped with these devices are able to record variables such as geographical coordinates, grain flow rate, time, logging interval, distance traveled, swath width, grain moisture, and header status in intervals of one to several seconds.

Precision agriculture is a combination of three technologies including a combine, global positioning system receiver, and crop yield monitoring system. While harvesting the crop, the crop yield monitor on the combine tracks and stores the geographic locations determined with a GPS receiver. The yield monitor also records the grain weight, flow rate, travel speed and harvest area. Crop yield data are collected every second with latitude and longitude as harvest occurs to produce a geo-referenced map. The crop yield data is analyzed with GIS software to evaluate the responses of a crop to agronomic treatments.

MARA Results:

MARA participated in this research project , we have three cooperator namely Raymond Dyck, George Krahn and Frank Friesen and data obtained from yield monitor about effect of different treatments are presented in table 11.

Table 11: Use of Precision Tools For On Farm Research

Treatments (Canola)	Yield Monitor (bu/ac) Raymond Dyck	Yield Monitor bu/ac George Krahn
Zero Nitrogen	35.00	26.40
50 % less NPS	42.00	35.30
Soil Test Recommen-dation	43.00	39.40
150 % of Soil Test Recommendation	44.00	44.70
Producer's Rate	45.00	41.20
Field Peas Frank Friesen		
30 lbs/ac fertilizer (11-52) + 5 lbs/ac Soil Implant		44.72
5 lbs/ac Soil Implant with out fertilizer		45.25
TagTeam @3.3 lbs/ac+ 19lbs less phosphate		44.39

Precision Canola Trial at La Crete

Effects of Different Sources of Nitrogen on Yield and Quality of Wheat and Canola

Background

Stabilized nitrogen technology uses urea-based fertilizers treated with a nitrogen stabilizer to improve their efficacy. Typical losses from urea use are reduced. Available stabilized nitrogen products include ESN and Agrotain coated urea. ESN is a controlled release fertilizer consisting of polymer coated urea. The polymer coating allows water to diffuse into granule, dissolving nitrogen within. The rate of N release is governed by the soil temperature. Because the N release is slower when seed placed in single shoot system, there should be less seedling damage while Agrotain treated urea prevents seedling damage by slowing the conversion of urea to ammonia through use of urease inhibitor and ammonia is a form of Nitrogen that causes seedling damage.

Some farmers do not have access to seeders that can place nitrogen at a reasonable distance from the seed because they have single shoot openers on their seed drill. Single shoot openers have benefits, such as lower draft and lower maintenance cost but they also cap seed placed fertilizer rates. These farmers are left with options like lower the nitrogen rates to avoid seed burn or either make a second pass to put down fertilizer or move to double shoot openers.

Objectives:

1. To demonstrate the effects of different nitrogen fertilizers (placed with seed and banded away from seed) yield and quality of wheat and canola.
2. To demonstrate to farmers alternative nitrogen sources that can obtain optimum yield without the purchase of an expensive seed drill.
3. Communicate information from the project to the producers and others.

Materials and Methods

Trial was laid out single replication trial and plot size was 24' X 100'. Wheat variety Intrepid seeded @ 98 lbs/ac and canola (5020) 5.36 lbs/ac at 9" with Conservapack disc seeder. Treatment for wheat include T1 (Urea blend 43-37-52 placed with seed@ 131.86 lbs/ac, T2 (ESN blend 45-37-52 placed with seed @ 133.15 lbs/ac, T3 (Urea blend placed away from seed @ 131.20 lbs/ac and T4 (ESN blend placed away from seed @ 130.57 lbs/ac).While treatments for canola included T1 (Urea blend 22-35-48-92 placed with seed@ 201.52 lbs/ac), T2 (ESN blend 23-35-48-92 placed with seed @ 200.12 lbs/ac), T3 (Urea blend placed away

from seed) @ 202.40 lbs/ac and T4 (ESN blend placed away from seed) @ 199.31 lbs/ac). Canola plots were sprayed with Reglone at recommended rates and both wheat and canola were straight combined with small plot combine.

Results and Discussion

Results regading wheat response to different sources of Nitrogen are presented in Table 12. ESN placed awayfrom seed have significantly less yield as compared with other treatments. Reults of Canola response are presented in Table 13. It seems that ESN nirtogen has pontential to be used espacially if you have single shoot seeder. It will worth mentioning that cost difference between stable nitrogen sources (ESN) and urea is about 5-6 cents/lb or about 5 dollars/ acre more than urea. It is still early to make a recommendation on the basis of these results and trial it will be repeated next year.

Table12 : Wheat Response to Different Sources of Nitrogen

Treatments	Height (cm)	Yield (bu/ac)	KWT (1000 gm)	KGHL	Protein %	Lodging (1-9)
(T1) Urea placed with seed	80.00	41.42	79.80	75.10	15.4	1
(T2) ESN placed with Seed	83.43	43.80	73.00	74.10	15.00	1
(T3) Urea placed away from seed	81.75	43.86	58.40	74.40	14.80	1
(T4) ESN placed away from seed	80.13	33.19	80.40	72.70	16.80	1

Table13: Canola Response to Different Sources of Nitrogen

Treatments	Height (cm)	Yield (bu/ac)	KGHL	KWT 1000gm	Oil %	Lodging (1-9)
(T1) Urea placed with seed	118.83	42.12	64.1	9.4	45.90	1
(T2) ESN placed with Seed	113.67	42.96	63.3	6.6	45.50	1
(T3) Urea placed away from seed	120.67	49.68	62.9	5.2	46.60	1
(T4) ESN placed away from seed	105.67	45.05	62.7	5.4	45.70	1

Conventional vs Organic Crop Management Trial

Background

According to Statistic Canada (2006) out of total 647 farms there are 21 certified organic producer, 4 in transition and 33 uncertified organic producers. Input cost (fertilizer, chemical and fuels) are rising dramatically. The combination of these factors as well as decreasing margins over the year has many producers questioning to which farm approach has the best potential to reduce risks and or increase profits on sustainable basis. Present study was designed to see which system has comparative advantage.

Material and Methods

Patch of land was selected which was under grass for more than 5 years and divided into three blocks measuring 370x82 feet. Seeding was done on 27 May and Canola5020@ 5.36lbs/ac was seeded with Conservapack seeder and fertilizer NPKS (185-71-51-142) was applied @ 448lbs/ac as per soil test recommendation. The other plot was seeded as organic oat (Waldern) @121.89 lbs/ac with no fertilizer application. The third block was seeded with organic Flax (Prairie Thunder) @ 45.90 lbs/ac. Half of the both organic Oat and flax was harrowed before six leaf stage. Data were collected on yield, 1000 KWT. KGHL, height and lodging. Trial will continue for four years.

Results and Discussion

Results obtained are presented in the table 14. Yield results showed that conventional canola was 41.30 bu/ac. It was interesting to note that harrowing has positive effect on Oat yield and it was increased by 11.87 bu/ac in harrowed Oat as compared with non harrowed one. The test weight was also more in harrowed as compared with non harrowed. Harrowing don't have significant impact on the yield of Flax. No lodging was observed in all three farming systems. Next year a one more treatment that is Intensive farming with maximum use of inputs will be added and complete economic analysis will be carried out.

Table 14: Organic Vs Conventional Crops Management

Crop type	Yield bu/ac	KWT 1000 gm	KGHL	Height cm	Lodging (1-9)
Conventional Canola	41.30	4.60	63.50	124.50	1
Organic Oat harrowed	108.00	53.40	47.40	108.25	1
Organic Oat (without harrowing)	96.13	41.00	45.30	107.37	1
Organic Flax (harrowed)	27.10	5.60	64.90	67.13	1
Organic Flax (without harrowing	27.04	6.20	65.00	64.75	1

Organic Oat Plot

Conventional Canola Plot

Organic Flax Plot

Demonstration Trial on Different Weed Management Practices in Organic Wheat Production
(Funded by Canadian Wheat Board)

Background

Organic agriculture is demand driven and consumer demand is key reason for growth of organic sector. Besides being nature friendly and there is strong demand and steady growth in the consumption of certified organic products and at the same there is less research based information available to producers. The organic producers in different geographic and environmental conditions have different issues and these issues need localized solution. As per Agriculture Census (Statistics Canada 2006) there are 230 organic producers in Alberta and 52 of them are in the Mackenzie County and out of these 21 are certified producers, 4 are transitional and 33 are uncertified organic producers. Farmers of the peace region and especially Mackenzie county are always looking for more value added cereal crops. Various studies on the weed control have done in various areas such as Manitoba, Saskatchewan and Southern Alberta but the producers of the Peace region are still looking to towards various options about weed management. Present demonstration is designed to demonstrate various weed management practices and how much they can effect ultimate crop yield.

Materials and Methods

Our organic producer of the area Frank Bueckert provided land which is already under organic agriculture for many years. Treatments include increasing seed rate from 1.5(T1) to 2 fold (T2), tillage before or during seeding (T3), rod weeding (T4), harrowing (T5) and combination of rod weeding and harrowing (T6), using cleaned and graded seed (T7) and farmer's weed control method(T8). Each treatment was seeded one seeder width to length of 100 ft. Data on weed intensity was collected on per meter square basis and reported as mean of two randomly selected quadrates. Yield samples were collected by small plot combine by taking 5 feet strip in the center of the each plot and after cleaning the samples yield in bushels/acre was calculated. Protein % was determined from representative samples drawn from each treatment. Data was also collected for test weight and11000KWT.

Results and Discussion

Results on effect of different weed management practices on wheat yield and quality are presented in Table 15. It is evident from the results that rod weeding after seeding (before emergence) and harrowing at 4-5 leaf stage gave the maximum yield and it was 9.17 and 9.24 bushels/ac more than the producers weed control method. While maximum protein content of 12.10 % was obtained by using clean and graded seed. Maximum 1000KWT was attained by rod weeding.

Results regarding effect of different weed management practices are presented in Table 16. Although it is very early to decide on the basis of one time intervention effect on weed control but even then combination of rod weeding and harrowing was the most efficient treatment in controlling weeds and this was closely followed by harrowing. It is expected that producers of the county will make good use of these findings by conducting small trials on their own that which of the weed control methods works best under their field conditions.

Extensions

MARA organized field day which attended by more than 100 producers and got the chance to see this demonstration trial. Professor Brenda Frick from Saskatchewan University also gave very informative presentation to producers about different weed management option available.

Table15:Effect of different weed management practices on yield and quality of wheat

Treatments	Yield bu/ac	Protein %	KWT 1000 gm	KGHL	Lodging (1-9)
T1) 1.5 times seed rate	27.18	11.50	47.20	70.50	1
T2) Double seed rate	24.79	12.00	46.20	71.20	1
T3) Tillage before or during seeding	29.93	11.40	41.60	71.10	1
T4) Rod weeding	34.62	11.20	64.40	71.00	1
T5) Harrowing	34.69	11.20	46.00	71.60	1
T6) Combination of rod weeding & harrowing	30.51	10.80	54.20	72.10	1
T7) Using clean & graded seed	27.89	12.10	54.20	70.7	1
T8) Farmers weed control method	25.45	10.60	44.00	71.30	1

Table16: Effect of different weed management practices on weed intensity

Treatments	Horse-tail	Buck-wheat	Tansy	Shep-herd's Purse	Oat	Lamb's quarter
T1) 1.5 times seed rate	13	-	-	1.00	1.50	1
T2) Double seed rate	22.50	5.0	-	-	2.50	-
T3) Tillage before or during seeding	13.50	6.0	-	0.50	2.50	-
T4) Rod weeding	15.50	2.0	-	-	2.50	-
T5) Harrowing	12.00	3.0	-	1.50	3.00	-
T6) Combination of rod weeding & harrowing	10.00	1.50	0.5	-	-	-
T7) Using clean & graded seed	52.50	7.0	-	3.00	3.00	-
T8) Farmers weed control method	19.00	3.50	-	2.00	1.00	1

General View of Weed Management Trial

Effect of Headline Application on Flax Yield

Background:

One of our producer was interested in assessing potential benefits associated with spray of fungicide Headline on Flax because he got information that a considerable yield increase can be attained by the spraying fungicide on Flax. Field scale study was designed to find out that how much yield increase was possible by fungicide application.

Material and Methods

Flax variety Harley was seeded on May18, 2010 @ 33lbs/ac. Fertilizer 32-19 was applied @ 160 lbs/ac. Herbicide Buctril M + Poast was sprayed at recommended rate for weed control and then Headline was sprayed at recommended rate 1/2 mile length of field in two replications. Other part of field was left un sprayed for control purpose. Combining was done on 12 October 2010 and one replication consisted of two passes of 34ft wide combine header.

Results and Discussion

Yield data was obtained with way wagon and results obtained are presented in Table 17. Results presented in the table showed that there was yield increase of 0.76 bu/ac with Headline spraying as compared with unsprayed Flax. It looks like this yield increase hardly covers the cost of fungicide application and it does not seem feasible in economic sense to apply fungicide in present case. Further studies will be carried out to see how results turnout in coming years under different field and climatic conditions.

Table 17: Effect Fungicide Application on Flax Yield

Treatments	Yield bu/ac R1	Yield bu/ac R2	Mean
Headline sprayed	27.11	24.00	55.56
Unsprayed	26.52	23.09	24.81

Effect of Spraying Fungicides on Field Peas Productivity

Background: There is general perception among the producers community of the county that fungicide application in most cases is responsible for increased yield. Last year a small scale study conducted by the MARA revealed that there was no economic benefit of fungicide application after emergence unless crop situation in certain field warrants that. To ascertain facts whether there is yield increase after fungicide application in field peas a field scale study was designed.

Material and Methods

One of the producers seeded Admiral peas as per genral recommendation and then sprayed two passes along the whole length of field with the Headline as per lable instructions. Beside this two passes were left unsprayed. Combining was done on September 2, 2010 with combine having a yield monitor and data on yield was recorded for both sprayed and unsprayed. Each pass of combine was about 2.5 acres and trial has two replication.

Results and Discussion

Results obtained are presented in table 18. It is evident from data obtained that there was 1.5 bushles/ac less yield in peas sprayed with the fungicde as comared with unsprayed ones.In present case it can be said that producer does not gained anything financialy and in actual sense suffered loss in terms of time, fungicide cost and application cost. Keeing these observations in view, it is suggested that producers should apply the fungicide only when investment cost is much less as compared with financial benefits interms of yield by closely monitoring the crop disease situation. It is still immature to say on the basis of these results that there is no benfit in spraying fungicide under local conditions and trial will repeated next year.

Table 18. Headline Effect on Pea Productivity

Treatments	Yield bu/ac R1	Yield bu/ac R2	Mean
Headline sprayed	56	55	55.5
Unsprayed	58	56	57

Effect of Different Pulse Stubbles on Yield and Quality of Wheat

Background

During 2009 canola, yellow pea, green pea, red lentil, green lentil and fababean were seeded side by side to see their comparative efficacy and nitrogen fixing potential. In 2010 HRS wheat was seeded on those plots to see how much nitrogen has been fixed and will be contributed to following year crop.

Material and Methods

Wheat was seeded on different kind of pulse stubbles and canola stubble for check purpose in plots measuring 36x 40 feet. All the cultural operations were carried by the cooperator as per general recommendations but rate of NPK fertilizer applied was reduced by 25%. Direct combining was done with small plot combine by taking one pass in the center of the plots and data were collected on height, lodging yield, protein %, bushel weight and 1000 kernel weight.

Results and Discussion

Perusal of data presented in table 19 indicated that maximum yield 61.43 bu/ac was obtained on yellow pea stubble which was 24.71 bu/ac more than canola stubble. This was followed by 60.08,59.83, 55.46 and 51.20 bu/ac yield in descending in fababean, green lentil, red lentil and green peas, respectively. Highest protein % was also achieved in Yellow Pea stubbles . This indicates that amongst various kinds of pulses, the yellow peas have higher nitrogen fixing capacity and that was reason that nitrogen flow rate was greater in yellow peas as compared with other pulses and that ultimately translated into higher yield and higher protein contents. This reflected that producers should try to keep peas in crop rotation to benefit from the natural nitrogen fixing capacity of peas, decreasing input cost and to improve the general health of the soil.

Table 19: Effect of Different Pulse Stubbles on Wheat Yield and Quality of HRS Wheat

Different Stubbles	Yield bu/ac	Protein %	KWT 1000 gm	KGHL	Height cm	Lodging (1-9)
Canola 7130	36.72	10.20	61.20	71.00	89.25	1
Yellow Pea Admiral	61.43	11.10	59.20	71.70	105.83	1
Green Pea Cooper	51.20	11.00	59.40	71.70	96.67	1
Red Lentil Impact	55.46	10.10	55.00	71.8	96.17	1
Green Lentil Imperial	59.83	10.60	55.20	71.60	95.20	1
Fababean Snowbird	60.08	10.50	56.00	71.30	96.25	1

Alberta Pest Monitoring Network (APMN)

MARA participated in the provincial Pest monitoring Program Supported by AOF and Alberta Agriculture and Rural Development. Insect monitored include wireworms, Bertha Army Moth and Diamond Back Moth.

Objectives

1. To participate in pest monitoring program that covers whole Alberta.
2. To provide the most recent information to producers of the Mackenzie County
3. To help the network by providing baseline data and meet international trade demands

Methods and results

MARA conducted Diamondback moth and Bertha Armyworm survey in five canola fields selected in different parts of the county. These traps were set at the edge of the field and checked once a week and as data entered at AAFRD's Ropin website, the pest risk map will change to reflect that information. This data is used to predict risk of pests to certain crops from daily forecast to overtime projections. Producers can see if there is an outbreak in there are and take appropriate actions.

Results and Discussion

Results obtained are presented in table 20 on next page. The Bertha Armyworm overwinter as pupa and adults emerges from mid June until August. The larvae are normally pale green color and turn brown to black with yellow strips. Canola is the food of choice but also feed on flax, alfalfa, peas and corn. Diamondback moth does not overwinter in Canada but migrate in on southerly winds in may June. Female lay eggs on the upper surface of the leaves. Larvae are pale green and actively wriggle when they drop from on silken thread when disturbed. Diamondback moth are mainly found in Canola and Mustard field. Observation during last two year indicated that so far this not very serious pest for our county but continuous monitoring is key to check any outbreak. Pest survey are very important for producers because these serve as base for forecasting maps. These pests and diseases have significant impact on crop productivity. It is very important to have knowledge of proper time of year when scouting need to done and to know what you need to look far when you are out in fields. Other factors such crop rotation , selection of crop variety and weather play significant role in determining expected outbreaks.

Results portrayed in table showed that Bertha Armyworm population increased significantly during first fortnight of July and then it started declining because most of the producers start spraying after these dates. To make decision about spraying one should keep in mind the economic threshold level which ranges from 11-34/m^2 larvae for Bertha Armyworm and 200-300 larvae/m^2depending upon cost of spraying and price of canola.

Table 20: Alberta Pest Survey 2010

Observation Date	Legal land location	Bertha Armyworm		Diamondback Moth	
		Trap 1	Trap 2	Trap 1	Trap 2
28 JUN 2010	NW3 108 12 W5	16	18	0	0
28 JUN 2010	SW32 10812 W5	53	31	0	0
28 JUN 2010	NE11 106 15 W5	65	0 *	0	0
28 JUN 2010	SW30 106 14 W5	48	11	0	0
28 JUN 2010	NW14108 13 W5	27	36	0	0
05 JUL 2010	NW3 108 12 W5	59	65	0	0
05 JUL 2010	SW32 10812 W5	107	65	0	0
05 JUL 2010	NE11 106 15 W5	92	37	0	0
05 JUL 2010	SW30 106 14 W5	80	31	0	0
05 JUL 2010	NW14108 13 W5	112	178	0	0
12 JUL 2010	NW3 108 12 W5	21	29	0	0
12 JUL 2010	SW32 10812 W5	83	76	0	0
12 JUL 2010	NE11 106 15 W5	89	62	0	0
12 JUL 2010	SW30 106 14 W5	99	28	0	0
12 JUL 2010	NW14108 13 W5	70	74	0	0
19 JUL 2010	NW3 108 12 W5	21	09	0	0
19 JUL 2010	SW32 10812 W5	35	50	0	0
19 JUL 2010	NE11 106 15 W5	26	13	0	0
19 JUL 2010	SW30 106 14 W5	21	05	0	0
19 JUL 2010	NW14108 13 W5	29	32	0	0
26 JUL 2010	NW3 108 12 W5	03	03		
26 JUL 2010	SW32 10812 W5	06	04		
26 JUL 2010	NE11 106 15 W5	17	05		
26 JUL 2010	SW30 106 14 W5	14	03		
26 JUL 2010	NW14108 13 W5	7	02	Took down all traps	

*Zero moths due to no lure, replaced lure

Biennial Wormwood Post Emergence Control

Background

Biennial wormwood (*Artemisia biennis*) is an aggressive and prolific seed producing plant that has become a problem in many parts of Canada. According to one expert there is one weed coming along farmers in some province should watch. Biennial wormwood has been appearing in more fields in recent years[1]. The biennial produces the vegetative growth in the first year, and then sets seed in the second year. Seedlings that germinate in the fall are relatively easy to control with Glyphosate, however if these seedling overwinter and grow again the next spring they are bigger and harder to control. The weed which was more common in southern Alberta and Saskatchewan favors road side, rangeland, forage crops and hay fields, but also appearing more in zero till cropping system. It is one of the emerging weed of our county.

Objective

To find the most suitable herbicide, application rate and make these information available to the producers.

Materials and Methods

The trial was laid out on patch of land that was known for biennial wormwood infestation. We waited by July13, so there is early summer flush of 1-2" tall wormwood. Other weeds present at site included flex weed, lamb quarter, dandelion and horse tail etc. Ten different herbicides were tested for their efficacy to control wormwood. Treatments included T1 (Odysey @ 17 gm/ac), T2(Glyphosate Transorb @ 0.33 l/ac), T3 (Glyphosate Transorb @ 0.66 l/ac), T4 (2,4-D Amine 500 @ 300 ml/ac), T5 (2,4-D Amine 500 @ 600 ml/ac), T6 no spray, T7 (Frontline A+B @ 40+280 ml/ac , T8 (Refine SG @ 12 gm/ac), T9 Basagran @910 ml/ac and T10 Prestige A+B 320+800 ml/ac. Each treatment was sprayed in 15 feet wide strip to a length of 60 meter with ATV mounted sprayer. Observations on weed mortality were recorded on July 30th.

Results and Discussion

The most effective herbicide seems to be Glyphosate @ 0.66 l/ac and it not only gave more than 90 percent control of wormwood and controlled all other weeds as well. The next best treatment

was also Glyphosate @ 0.33 l/ac. The results corroborate with the findings of other studies.

[1] Grainnews

Worm wood along with many common weeds such as sow thistle and dandelion can be controlled with fall glyphosate treatment. As thumb rule for many of these winter annuals and perennial weeds fall is the best time for effective control.

Over wintered Biennial Wormwood Plant

Manure Management Trial

Background

Livestock is an important component of the farming historically as well as in the present day farming. Manure management that includes composting have some advantages. If we compare the raw manure with bedding material with the compost, compost is more stable product since almost all the nutrient are in organic form and material is semi decomposed. Plants take up majority of nutrients in an inorganic form. Composting is good method of producing a more nutrient stable soil amendment with a lower moisture content and less volume compared with raw manures. The composted material can be hauled longer distances at less cost. It has less odor when applied, pathogens and weed seed are killed during the composting process if the temperature generated during the process were high enough.

Objective

To reduce odour, decrease haul able volume, accelerate decomposition and demonstrate benefits to local producers.

Material and Methods

One of the livestock producers of the area (Kelley Friesen) was Cooperator for this trial. Raw manure with bedding material was taken out from the pile and wind rowed them with help of tractor mounted blade. The manure smelled very badly and there was high amount of bedding material and very high moisture level. Material was windrowed in three rows. Cooperator turned upside down after 15-20 day time period. Samples from composted and raw manure pile were collected on November and got tested from the lab for their nutrient value.

Results

Observations of the wind rows piles showed that volume was reduced to about one third of orgional volume and data about the nutrient value of two types of manure are presented in Table 21. It can be noted from table that there is some loss of nutrients espacially nitrogen but there are nutrients which are readily available, odour has been reduced and there is considerable decrease in volume which makes the hauling process cost effective and easier.

Table 21. Comparison of Composted and Raw Manure Sample

Parameter	Units	MRL	Compost Sample	Raw Sample
Electrical Conductivity	mS/cm	0.05	3.34	4.66
Moisture	%	0.1	70.5	67.7
N-NH3 (Ammonia)	ppm	1	101	125
N-NO3 (Nitrate)	ppm	1	1100	2170
pH			8.3	7.5
Total Phosphorus	%	0.08	0.37	0.56
Calcium	ug/g	100	19500	32300
Magnesium	ug/g	100	4050	5790
Potassium	ug/g	100	7740	19100
Sodium	ug/g	100	351	599
Arsenic	ug/g	1	3	1
Cadmium	ug/g	0.5	<0.5	<0.5
Chromium	ug/g	1	12	5
Cobalt	ug/g	1	3	<1
Copper	ug/g	1	18	39
Lead	ug/g	1	4	1
Mercury	ug/g	0.1	<0.1	<0.1
Molybdenum	ug/g	1	2	4
Nickel	ug/g	1	10	4
Selenium	ug/g	1	<1	<1
Zinc	ug/g	2	115	148
Total Organic carbon	% dry weight		25.0	36.1

Windrowed pile from last year

Windrowed piles 2010

Extension Events 2010

The Mackenzie Applied Research Association organized various events in its efforts to be better connected with the producers and business community of the county. Following activities were organized during 2010-11.

- Annual General Meeting was organized on March 15, 2010.A guest speaker Martin Reichelt (From Germany) talked about how one can increase efficiency of combine and lower the grain losses . Producers were appraised of results of the MARA 2009 research program and extension activities carried out in Mackenzie County.
- Water Quality Workshop was organized in La Crete on 14 April 2010 and 18 producers attended that workshop. Presentation included water health and water testing from Alberta Health Services, Growing Forward from Alberta Agriculture and Rural Development, Water quality, treatments and solar livestock watering systems from Randy Ehman - The Dugout Dude.
- MARA held its annual field day on July 29th in collaboration with Mackenzie County, AAFC and local businesses exhibited their line of equipments as well. More than 100 producers attended field day. Honorable Frank Oberle (minister for home security) was guest of honor. First the presentation was given by the research coordinator about current MARA program and then the guest speaker Maureen Vadnais (AARD) spoke about weed identification and new weed control act. Prof Brenda Frick (Uni. Of Sask.) talked about organic weed management options. Producers were then taken to field and got visited all the trials. Feedback and comments we got were quite encouraging.
- Organized Combine Clinic by bringing expert from Germany at SARDA, NPARA, BRRG and SACA and in our county and 39 producers attended these clinics.
- MARA organized a sustainable grazing workshop on 1Feb.2011 and Terry Gompert from Nebraska was guest speaker. Livestock producers and Student of Rocky Lane High School attended the workshop.

Extension Events Glimpses 2010

Water Quality Workshop

Guest Speaker at Water Quality Workshop

Guest Speaker at Water Quality Workshop

Guest Speaker at Water Quality Workshop

Extension Events Glimpses 2010

MARA Field Day

Guest Speaker at MARA Field Day

Guest Speaker at Field Day

Producers Enjoying Lunch at MARA Field Day

AESA Dugout Water Quality

Background

Dugout are earthen excavations designed to collect runoff and store it for use during drier times. Dugouts are water sources of necessity, not choice because of the uncertainty of filling caused by annual variation in precipitation , and the problem of maintaining water quality. Runoff water often bring dissolved and suspended material that are detrimental to water quality, including disease causing organisms, plant nutrients, pesticides, decomposed plant, algae material, suspended sediment, fuels, solvents, paints and soil minerals. The net result is of contaminated—loaded runoff is poor quality, dugout water. However, dugout water quality can be managed, improved and treated to meet farm needs[1]. It should be always kept in mind that surface water are unsafe for drinking unless treated. Some water born diseases and disease causing organisms include cholera, typhoid, E. coli and cryptosporidium.

Objective

Present studies were designed with following objectives

- Improve awareness of local water quality in dugouts as dugouts are major source of water in the area.
- To promote importance of water testing and establish a baseline data for water quality issues in the county.

Materials and Methods

To improve awareness of dugout water quality, tested 41 dugouts during August 2010 from areas of Fort Vermilion, High Level and La Crete and all collected samples were put out in coolers and sent out to Exova laboratory in Edmonton next day for analysis of various pathogenic organisms, metals and routine analysis. The S1, S2, S3,... stands for sample 1,2,3….. and so on. Terms MAC stands for maximum acceptable concentration, AO as aesthetic objective and OG mean operational guidelines for water treatment plants.

Results and Discussion

Results pertaining to different parameter are presented in Table 1-7. Water samples from 41 dugouts showed that 7 samples have Aluminum above operational guidelines and 1 sample have Arsenic above MAC. 0ut of total 32 have Total coliforms above MAC limit while 26 have E.coli above MAC. Color was above esthetic objective in 35 samples and Turbidity above OG in 40 samples. pH was above AO in 20 samples, Sodium in 3 and Iron in 10 samples above AO.

[1]Quality Farm Dugouts

Manganese was above AO in 11, Chloride in 2 and Sulfate in 2 samples respectively. The total dissolved solids were above AO in 4 samples out of total. .

Dugout Management Practices

There are a great number of dugout mangement practices[1]. Many are known to be highly effective. Some techniques are common sense and donot require special or highly processed products or services. Other treatments involve chemicals and make use of commercial products. Some of the established practices include;

Continuous Aeration

Continous injection of supplementary oxygen is the single most effective practicefor maintaing and improving the water quality.

Sediment Control

Excavation of sediments from dugout, every five to ten years, is an effective technique for improving water quality and extending the life of dugout.

Vegetation Control

The routine maintenance of the area around dugout is important for maintaining water quality. Grass buffers and runways surroundings dugout should be mowedregularly. This prevents long grass from lying down and becoming ineffective as a sediment trap. Proper setback of shelterbelts ensures that the amount of fallen leaves is at minimum. If possible aquatic plats should be removed from dugout before they die and decompose. Annual cutting and removing of willows and volunter saplings every fall can make significant contribution to protecting dugout water.

Removel of Animals

Animals such as muskrat can create problem in dugouts by burrowing , house building and foraging for plant roots.This disturb the sediments and keep the water contantly turbid. The most effective way to remove muskrat is trapping or hunting.

Copper Sulphate

Copper sulphate, also known as blue stone, is perheps the most common chemical used to treat dugouts.Although copper is an essential elements for both plants and animals but at high concentrations, it can be toxic. Copper treatment can be very effective in controlling cyanbacteria. Copper sulphate treatment are most effective when done in early summer before large population develop. One should consult expert for proper application and dose.

Herbicides

Some herbicides are registered for use by the Canada Peat Management Regulator Agency to control aquatic weeds and algae. These compounds may only be used on privately owned reservoir where water does not flow in to other water bodies. Always follow the lable direction and use safe handling practices.

Fish

Fish are sometime added to dugout to improve water quality by eating aquatic plants. However, they may often compound dugout, water quality problems by making it difficult to use other chemical methods of algae and plant control.

Well managed dugout

Poorly managed dugout

Table1 1: Dugout Water Samples

	S1	S2	S3	S4	S5	S6	S7	Guide-line
Orthophos-phate-P	1.82	0.01	0.01	0.01	0.01	0.01	0.01	
Mercury	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.001
Aluminum	0.045	0.022	0.012	0.028	0.019	0.158	0.005	0.1
Antimony	0.0004	<0.0002	<0.0002	<0.0002	<0.0002	0.0003	<0.0002	0.006
Arsenic	0.0184	0.0025	0.0038	0.0023	0.0025	0.0053	0.0019	0.01
Barium	0.069	0.145	0.155	0.056	0.072	0.023	0.122	1
Boron	0.027	0.030	0.063	0.047	0.030	0.038	0.037	5
Cadmium	0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.005
Chromium	0.0060	0.0007	0.0011	0.0005	<0.0005	0.0007	0.0006	0.05
Copper	0.003	<0.001	<0.001	0.008	0.001	0.001	<0.001	1
Lead	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	0.0003	<0.0001	0.01
Selenium	0.0016	<0.00002	<0.0002	<0.0002	0.0002	0.0002	<0.0002	0.01
Silver	0.00003	<0.00001	<0.00001	<0.00001	<0.00001	0.00002	<0.00001	0.02
Uranium	0.0065	<0.0005	0.0042	<0.0005	0.0012	0.0022	<0.0005	5
Zinc	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0
T.coliforms	4	8	41	6	15	<1	33	15
E-coli	3	4	2	<1	<1	<1	29	0.1
Colour	>60	35	35	35	45	55	45	15
Turbidity	5.3	4.2	1.8	3.6	2.2	13.2	5.4	0.1
pH	8.72	8.19	7.90	8.61	9.30	10.2	8.17	6.5—8.5
E-cond.	3170	207	418	206	18.5	318	254	
Calcium	73.3	26.0	53.1	20.5	172	20.2	30.5	
Magnesium	154	6.9	17.4	7.8	17.6	21.3	7.3	
Sodium	385	0.4	4.0	7.9	6.9	10.0	3.9	200
Potassium	86.2	15.2	16.1	8.0	3.0	14.1	16.8	

 (Continued on next page)

Table 1: Dugout Water Samples

	S1	S2	S3	S4	S5	S6	S7	Guideline
Iron	0.41	0.41	0.35	0.16	0.06	0.28	0.28	0.3
Man-ganeese	0.077	0.042	0.029	0.032	0.022	0.031	0.028	0.05
Chloride	497	3.0	6.9	7.5	4.0	13.0	8.6	250
Fluoride	<0.2	0.14	0.16	0.22	0.11	0.22	0.07	1.5
Nitrite-N	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	10
Nitrate-N	<0.02	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	1
Nitrate & N-N	<0.07	<0.01	<0.01	<0.01	<0.01	<0.001	<0.01	10
Sulfate (SO4)	582	<0.09	26	20	16	31.1	4.3	500
Hydroxide	<5	<5	<5	<5	<5	<5	<5	
Carbonate	45	<6	<6	<6	13	58	<6	
Bicarbon-ate	453	132	246	91	59	26	144	
P-alkalinity	38	<5	<5	<5	11	49	<5	
T-alkalinity	447	109	202	75	70	119	118	
Total dis solids	2050	117	240	120	100	181	142	
Hardness	817	93	204	83	72	138	110	
Ionic Bal-ance	101	101	98	104	100	105	101	

Table 2: Dugout Water Samples

	S8	S9	S10	S11	S12	S13	S14	Guideline
Orthophos-phate-P	<0.01	0.02	0.02	0.01	<0.01	0.02	<0.01	
Mercury	<0.0001	<0.0001	<0.0001	<0.0.0001	<0.0001	<0.0001	<0.0001	0.001
Aluminum	0.017	0.005	0.011	0.472	0.017	0.078	0.018	0.1
Antimony	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.006
Arsenic	0.0012	0.0024	0.0023	0.0019	0.0024	0.0030	0.0010	0.01
Barium	0.035	0.071	0.042	0.039	0.039	0.087	0.044	1
Boron	0.042	0.070	0.024	0.028	0.033	0.028	0.033	5
Cadmium	<0.00001	<0.00001	0.00001	<0.00001	<0.00001	0.00001	<0.00001	0.005
Chromium	0.0008	<0.0005	0.0006	0.0005	<0.0005	0.0005	<0.0005	0.05
Copper	0.028	0.001	0.003	0.001	0.003	0.003	0.001	1
Lead	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.01
Selenium	0.0003	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0002	0.01
Silver	<0.00001	<00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00004	0.02
Uranium	0.001	<0.0005	0.0011	<0.0005	<0.0005	<0.0005	0.0019	5
Zinc	<0.001	0.003	<0.001	<0.001	<0.001	0.002	<0.001	0
T.coliforms	53	6	<1	28	1400	18	21	0
E-coli	5	1	<1	2	4	4	8	<1
Colour	30	55	5	12	15	20	>60	15
Turbidity	1.8	15.4	2.1	3.7	2.5	8.7	1.9	0.1
pH	8.84	8.09	9.56	9.07	9.55	8.73	8.26	6.5—8.5
E-cond	308	174	294	152	113	201	629	
Calcium	28.1	14.0	39.9	17.1	11.5	28.5	78.4	
Magnesium	13.9	5.3	5.4	1.8	4.5	4.0	27.6	
Sodium	4.4	1.5	3.0	0.9	0.8	1.3	7.1	200
Potassium	13.0	22.0	14.1	17.0	7.5	14.3	9.2	

(Continued on next page)

Table 2: Dugout Water Samples

	S8	S9	S10	S11	S12	S13	S14	Guideline
Iron	0.03	0.33	<0.01	<0.01	0.05	0.15	0.01	0.3
Man-ganeese	0.006	0.087	<0.005	<0.005	0.008	0.008	0.007	0.05
Chloride	10.7	4.4	3.9	2.7	1.6	2.3	5.3	250
Fluoride	0.11	0.32	0.1	0.08	0.13	0.09	0.11	1.5
Nitrite-N	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	10
Nitrate-N	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	1
Nitrate & N-N	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	10
Sulfate (SO4)	88.8	8.7	97.8	19	<0.9	4.0	236	500
Hydroxide	<5	<5	<5	<5	<5	<5	<5	
Carbonate	<6	<6	11	7	16	8	<6	
Bicarbo-nate	53	89	18	52	33	106	110	
P-alkalinity	<5	<5	9	6	13	6	<5	
T-alkalinity	44	73	33	54	53	100	90	
Total dis. solids	185	100	184	91	58	114	417	
Hardness	127	57	120	50.3	47	87	310	500
Ionic Balance	102	100	104	95	110	101	98	

Table 3: Dugout Water Samples

	S15	S16	S17	S18	S19	S20	S21	Guide-line
Orthophos-phate-P	0.04	0.34	0.03	0.02	0.02	0.02	<0.01	
Mercury	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.001
Aluminum	0.320	0.002	0.005	0.401	0.006	0.003	0.009	0.1
Antimony	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.006
Arsenic	0.0042	0.0008	0.0012	0.0011	0.0017	0.0011	0.0006	0.01
Barium	0.096	0.064	0.082	0.098	0.066	0.040	0.031	1
Boron	0.027	0.008	0.027	0.041	0.007	0.102	0.122	5
Cadmium	0.00002	<0.00001	0.00011	0.0002	<0.00001	<0.00001	0.00001	0.005
Chromium	0.0008	0.0006	0.0005	0.0013	0.001	0.0009	0.0008	0.05
Copper	0.004	<0.001	0.154	0.005	<0.001	0.064	0.006	1
Lead	0.0004	<0.0001	<0.0001	0.0002	<0.0001	<0.0001	<0.0001	0.01
Selenium	<0.0002	<0.0002	0.0012	0.0002	<0.0002	<0.0002	<0.0002	0.01
Silver	<0.00001	<0.00001	<0.00001	<0.00001	0.00003	<0.00001	<0.00001	
Uranium	0.001	<0.0005	<0.0005	0.0010	<0.0005	<0.0005	<0.0005	0.02
Zinc	0.005	<0.002	0.001	0.002	<0.001	<0.001	0.001	5
T.coliforms	500	37	28	11	23	<1	<1	0
E-coli	<1	15	1	7	<1	<1	<1	0
Colour	35	>60	50	45	>60	35	20	15
Turbidity	25.4	8.4	12.1	2.0	3.0	1.0	0.6	0.1
pH	8.32	7.32	8.27	8.29	7.58	8.40	7.95	5.6-8.5
E-cond	219	282	224	290	312	543	802	
Calcium	27.4	34.2	27.0	33.0	39.3	46.8	72.9	
Magnesium	5.4	7.2	5.0	8.4	9.2	20.0	38.4	
Sodium	0.8	5.1	5.7	11.7	11.6	44.0	51.1	200
Potassium	14.6	18.0	14.5	12.2	11.5	6.3	9.3	

 (Continued on next page)

Table 3: Dugout Water Samples

	S15	S16	S17	S18	S19	S20	S21	Guideline
Iron	0.54	0.34	0.33	0.47	0.39	0.02	0.01	0.3
Man-ganeese	0.054	0.156	0.028	0.007	0.128	<0.005	<0.005	0.05
Chloride	2.2	6.7	3.5	3.6	14.4	8.5	2.6	250
Fluoride	0.08	0.06	0.07	0.12	0.08	0.14	0.67	1.5
Nitrite-N	0.06	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	10
Nitrate-N	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	1
Nitrate & N-N	0.06	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	10
Sulfate (SO4)	22	4.3	7.8	19	4.1	142	326	500
Hydroxide	<5	<5	<5	<5	<5	<5	<5	
Carbonate	<6	<6	<6	<6	<6	<6	<6	
Bicarbon-ate	105	162	128	159	179	163	134	
P-alkalinity	<5	<5	<5	<5	<5	<5	<5	
T-alkalinity	86	133	105	130	147	133	110	
Total dis solids	120	156	126	160	178	348	567	
Hardness	91	120	88	120	140	199	340	500
Ionic Bal-ance	99	102	101	102	103	103	102	

Table 4: Dugout Water Samples

	S22	S23	S24	S25	S26	S27	S28	Guide-line
Orthophos-phate-P	<0.01	<0.01	0.07	<0.01	0.02	0.07	0.01	
Mercury	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.001
Aluminum	0.098	0.015	0.077	0.003	0.112	0.130	0.013	0.1
Antimony	<0.0002	<0.0002	<0.0002	<0.0002	0.0003	<0.0002	<0.0002	0.006
Arsenic	0.0010	0.0026	0.0014	0.0027	0.0074	0.0043	0.0013	0.01
Barium	0.028	0.040	0.022	0.022	0.030	0.074	0.082	1
Boron	0.064	0.056	0.033	0.588	0.123	0.057	0.055	5
Cadmium	0.00005	<0.00001	<0.00001	<0.00001	0.00002	<0.00001	<0.00001	0.005
Chromium	<0.0005	0.0010	0.0008	<0.0005	<0.0005	0.0009	0.0011	0.05
Copper	0.001	<0.001	0.030	0.001	0.002	0.006	0.109	1
Lead	<0.0001	<0.0001	<0.0001	<0.0001	0.0002	0.0002	<0.0001	0.01
Selenium	0.0004	<0.0002	<0.0002	<0.0002	<0.0002	0.0002	<0.0002	0.01
Silver	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	
Uranium	0.0007	0.0006	<0.0005	0.0006	0.0030	0.0016	0.0007	0.02
Zinc	0.002	<0.001	<0.001	0.002	0.006	0.002	<0.001	5
T.coliforms	<1	4	<1	12	32	15	4	0
E-coli	<1	4	<1	2	7	12	1	0
Colour	8	55	22	18	>60	45	32	15
Turbidity	1.1	1.2	1.2	0.8	31.8	6.3	1.3	0.1
pH	8.41	8.79	9.10	8.17	9.67	8.02	7.96	5.6-8.5
E-cond	640	445	250	2440	1130	579	347	
Calcium	68.6	18.0	26.4	100	40.8	50.2	36.1	
Magnesium	23.2	17.9	5.9	78.7	43.8	15.1	11.5	
Sodium	30.4	58.9	17.4	362	142	52.4	25.0	200
Potassium	8.6	10.6	11.4	11.0	11.0	8.6	6.5	

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Table 4: Dugout Water Samples

	S22	S23	S24	S25	S26	S27	S28	Guideline
Iron	0.02	0.04	0.01	0.01	0.10	0.41	0.04	0.3
Man-ganeese	0.007	0.011	0.007	0.007	0.035	0.161	0.011	0.05
Chloride	5.6	14.1	7.8	206	100	31.6	5.0	250
Fluoride	0.47	0.15	0.09	0.63	0.32	0.12	0.10	1.5
Nitrite-N	<0.01	<0.01	<0.01	<0.05	<0.01	0.06	<0.01	10
Nitrate-N	<0.005	0.010	<0.005	<0.02	<0.005	0.014	<0.005	1
Nitrate & N-N	<0.01	<0.01	<0.01	<0.07	<0.01	0.07	<0.01	10
Sulfate (SO4)	292	44.9	26	877	350	120	39.4	500
Hydroxide	<5	<5	<5	<5	<5	<5	<5	
Carbonate	<6	18	22	<6	42	<6	<6	
Bicarbon-ate	42	182	88	174	33	172	173	
P-alkalinity	<5	15	19	<5	35	<5	<5	
T-alkalinity	35	179	110	143	97	141	142	
Total dis solids	450	272	160	1720	746	363	208	
Hardness	267	119	90	575	282	188	137	500
Ionic Bal-ance	99	106	96	102	100	100	105	

Table 5: Dugout Water Samples

	S29	S30	S31	S32	S33	S34	S35	Guide-line
Orthophos-phate-P	0.02	<0.01	0,02	0.01	0.03	0.02	0.12	
Mercury	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.001
Aluminum	0.068	0.008	0.174	0.069	0.007	0.006	0.096	0.1
Antimony	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.006
Arsenic	0.0014	0.0027	0.0008	0.0015	0.0023	0.0033	0.0062	0.01
Barium	0.019	0.059	0.028	0.020	0.028	0.068	0.051	1
Boron	0.036	0.074	0.048	0.085	0.049	0.031	0.038	5
Cadmium	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.005
Chromium	0.0010	0.0008	0.0008	0.0007	<0.0005	<0.0005	0.0009	0.05
Copper	0.013	0.002	0.023	0.021	<0.001	<0.001	0.002	1
Lead	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.01
Selenium	0.0002	<0.0002	0.0003	<0.0002	<0.0002	<0.0002	<0.0002	0.01
Silver	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	
Uranium	<0.0005	0.0016	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.02
Zinc	0.001	0.002	0.001	<0.001	<0.001	<0.001	<0.001	5
T.coliforms	<1	29	<1	<1	15	18	600	0
E-coli	<1	1	<1	<1	8	<1	600	0
Colour	38	30	10	10	55	>60	20	15
Turbidity	6.4	1.4	3.6	2.3	8.6	26.1	3.3	0.1
pH	9.70	8.19	9.14	9.31	9.41	9.01	8.08	5.6-8.5
E-cond	170	1020	335	201	256	247	271	
Calcium	18.8	95.7	54.2	14.7	19.3	22.9	36.5	
Magnesium	4.7	32.9	1.6	3.9	10	11.1	7.4	
Sodium	3.2	92.8	3.3	14.5	18.1	6.0	4.3	200
Potassium	12.6	8.2	14.4	11.2	8.5	17.6	15.7	

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Table 5: Dugout Water Samples

	S29	S30	S31	S32	S33	S34	S35	Guideline
Iron	0.04	0.04	0.03	<0.01	0.02	0.14	0.22	0.3
Man-ganeese	0.008	0.0067	<0.005	0.006	0.033	0.064	0.190	0.05
Chloride	6.6	7.3	3.3	2.5	9.8	9.3	10.0	250
Fluoride	0.07	0.26	0.12	0.10	0.07	0.08	0.06	1.5
Nitrite-N	0.25	<0.01	<0.01	<0.01	<0.01	<0.01	0.09	10
Nitrate-N	0.061	<0.005	<0.005	<0.005	<0.005	<0.005	0.018	1
Nitrate & N-N	0.31	<0.01	<0.01	<0.01	<0.01	<0.01	0.10	10
Sulfate (SO4)	25	424	126	44.7	41.6	18	12	500
Hydroxide	<5	<5	<5	<5	<5	<5	<5	
Carbonate	30	<6	<15	18	28	18	<6	
Bicarbon-ate	<5	149	<5	20	49	107	143	
P-alkalinity	26	<5	13	15	23	15	<5	
T-alkalinity	52	122	29	47	86	119	117	
Total dis solids	100	734	220	120	159	160	160	
Hardness	66	374	142	53	89	103	120	500
Ionic Bal-ance	100	102	103	100	97	92	105	

Table 6: Dugout Water Samples

	S36	S37	S38	S39	S40	S41	Guideline
Orthophos-phate-P	0.04	0.01	0.20	0.01	0.01	0.09	
Mercury	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.001
Aluminum	0.004	0.014	0.035	0.014	0.020	0.068	0.1
Antimony	<0.0002	<0.0002	<0.0002	<0.0002	0.0002	<0.0002	0.006
Arsenic	0.0022	0.0019	0.0043	0.0033	0.0037	0.0022	0.01
Barium	0.027	0.051	0.050	0.045	0.059	0.026	1
Boron	0.112	0.051	0.006	0.085	0.054	0.088	5
Cadmium	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00001	0.005
Chromium	0.0008	0.0009	0.001	<0.0005	0.0006	0.0012	0.05
Copper	0.075	0.088	<0.001	0.001	0.010	0.151	1
Lead	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.01
Selenium	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0003	0.01
Silver	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	
Uranium	<0.0005	0.0012	<0.0005	0.0017	0.0006	<0.0005	0.02
Zinc	<0.001	<0.001	<0.001	0.001	0.002	0.002	5
T.coliforms	20	<1	24	200	5	18	0
E-coli	1	<1	9	6	1	1	0
Colour	17	45	50	40	20	55	15
Turbidity	1.1	9.2	i.7		3.6	11.2	0.1
pH	8.09	8.60	7.86	8.39	9.42	9.03	5.6-8.5
E-cond	855	369	295	1820	389	302	
Calcium	88.1	41.1	35.9	88.8	18.9	28.4	
Magnesium	33.6	13.1	7.5	67.1	28.2	7.9	
Sodium	58.4	20.2	15.2	203	20.6	23.8	200
Potassium	10.1	9.4	8.3	10	14.4	13.1	

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Table 6: Dugout Water Samples

	S36	S37	S38	S39	S40	S41	Guideline
Iron	0.02	0.07	0.13	0.07	0.02	0.11	0.3
Man-ganeese	0.066	0.057	0.028	0.022	0.031	0.051	0.05
Chloride	32.5	11.7	9.2	317	12.7	6.9	250
Fluoride	0.17	0.09	0.09	0.11	0.12	0.12	1.5
Nitrite-N	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	10
Nitrate-N	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	1
Nitrate & N-N	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	10
Sulfate (SO4)	252	50.3	24	350	64.0	37.1	500
Hydroxide	<5	<5	<5	<5	<5	<5	
Carbonate	<6	10	<6	<6	34	21	
Bicarbon-ate	219	141	158	152	87	109	
P-alkalinity	<5	9	<5	<5	29	17	
T-alkalinity	180	133	130	125	129	124	
Total dis solids	583	226	180	1110	236	192	
Hardness	358	157	120	498	163	100	500
Ionic Bal-ance	102	106	98	102	106	100	

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George Krahn
Frank Friesen
Frank Bueckert
Bill Bose
Kelly Friesen
John Simpson
Manfred Gross

MACKENZIE COUNTY

Agricultural Service Board Chairman, Bill Neufeld
Agricultural Fieldman, Grant Smith

AGRICULTURE AND AGRI–FOOD CANADA (AAFC)

George Clayton
Bob Elliott
Kevin Falk
Rob Graf
Lance Lewis
John O' Donovan
Joe Unruh

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Fred Young (AOF Program Supervisor)

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Gayah Sieusahai (RVT Coordinator)
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CIAM RADIO

Michael Sandstrom
Rose
Phil Peters
Kevin Wiebe

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ARECA Agricultural Research and Extension Council of Alberta

The Agricultural Research and Extension Council of Alberta (ARECA) is a not-for-profit, producer-driven organization working to enhance and improve agricultural operations through increased access to field research and new technology.

Made Up of 16 member Associations, ARECA acts as a strong, united voice for producers by speaking on their behalf to industry leaders and government representatives. Each member Association delivers programs and develops projects that address the concerns and priorities of producers in their specific regions.

ARECA's member Associations include:

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- Chinook Applied Research Association (CARA)
- Foothills Forage and Grazing Association (FFGA)
- Gateway Research Organization (GRO)
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- The Alberta Forage Industry Network (AFIN) and the Forage Agronomy Update
- Workshops on age verification, riparian health assessment, ranching and marketing for women, crop strategy, energy efficiency, and more…
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