Irrigation Crop Diversification Corporation

Vision

Through innovation, the Irrigation Crop Diversification Corporation stimulates and services the development and expansion of sustainable irrigation in Saskatchewan.

Objectives and Purposes of ICDC

a) to research and demonstrate to producers and irrigation districts profitable agronomic practices for irrigated crops;

b) to develop or assist in developing varieties of crops suitable for irrigated conditions;

c) to provide land, facilities and technical support to researchers to conduct research into irrigation technology, cropping systems and soil and water conservation measures under irrigation and to provide information respecting that research to district consumers, irrigation districts and the public;

d) to co-operate with the Minister in promoting and developing sustainable irrigation in Saskatchewan.

Irrigation Crop Diversification Corporation

Board of Directors

The following served as Directors of ICDC in 2009:

Name	Position	Irrigation District	Development Area Represented	Election Year (# terms)
Rick Swenson	Chairman	Baildon ID	SEDA	2009 (2)
Randy Bergstrom	Director	Luck Lake ID	LDDA	2010 (2)
Keith Forrest	Director	Private Irrigator	SIPA rep.	Appointed
Kevin Plummer	Director	Moon Lake ID	NDA	2009 (2)
Paul Heglund	Vice Chair	Vidora ID	SWDA	2010 (2)
Francis Kinzie	Director	Pike Lake	Non-District	2009 (2)
Neil Stranden	Alt. Vice Chair	SSRID	LDDA	2011 (2)
Jan Kőnst	Director	SSRID	SIPA rep.	Appointed
Rob Oldhaver	Director	Miry Creek ID	SWDA	2011 (2)
John Babcock	Director		SA rep.	Appointed
Abdul Jalil	Director		SA rep.	Appointed

The four Development Areas (DA), as defined in ICDC's bylaws, are:

Northern (NDA),
South Western (SWDA),
South Eastern (SEDA) and
Lake Diefenbaker (LDDA),

ICDC Directors are elected by District Delegates to the Annual Meeting. Each Irrigation District is entitled to send one ICDC Delegate per 5,000 irrigated acres or part thereof. Two Directors are elected from LDDA, two from SWDA, and one each from NDA and SEDA. Non-District irrigators elect one representative.

The Saskatchewan Irrigation Projects Association (SIPA) and the Saskatchewan Ministry of Agriculture (SA) appoint two directors each to the ICDC board.

The ICDC board must, by law, have irrigators in the majority.

Table of Contents

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Field Crops

Durum Wheat Fungicide Demonstration – Roy King

Project Lead

- Rory Cranston AAg, Provincial Irrigation Agrologist , Saskatchewan Agriculture, (current project agrologist)
- Lana Shaw PAg, Provincial Irrigation Agrologist, Saskatchewan Agriculture, (previous project agrologist)

Co-operators

- Roy King, Birsay, Sask.
- Tim Gardner, Bayer CropScience

Project Objective

To work with Bayer CropScience in evaluating a new fungicide product mixture effective against both fusarium head blight (FHB) and leaf diseases on an irrigated co-operator site.

Project Plan

The King demonstration site served as an evaluation of the efficacy of two different fungicide treatments in an irrigated durum wheat crop to control FHB and leaf disease. This demonstration had two treated areas and an untreated check area for comparison. Bayer CropScience donated 40 acres of Prosaro and Folicur to the project for trial and comparison. Yield was determined for the each of the treatments and was compared to the untreated area.

Demonstration Site

The demonstration site was located on the Luck Lake Irrigation District on a 130-acre pivot. This field has been under irrigation for three years and has been managed with minimum tillage for several years. See Table 1 for more details.

Table 1. King demonstration site characteristics.

Land Location	SW 29-24-07 W3
Soil Type	Clay loam
Previous crop	Canola
Irrigation System	Low pressure centre pivot

Project Methods and Observations

❖ ***Crop Management***

Strongfield durum was seeded on May 16, 2009, following a pre-seeding application of glyphosate and 2,4-D. Establishment was very good. Weed control was very effective with a post emergence application of Attain and Horizon. See Table 2 for agronomic management of the demonstration

Table 2. Agronomic management of King demonstration site.

Nutrients	Nitrogen (N)	Phosphorus (P)	Potassium (K)
Soil residual	28 lb./acre	58 lb./acre	1030 lb./acre
Applied	130 lb./acre	26 lb./acre	
Variety	Strongfield		
Seeding	May 16, 2009; 120 lb./acre		
Herbicide	0.75 l/acre, glyphosate, pre-seeding		
	0.77 l/acre, 2,4-D, pre-seeding		
	0.24 l/acre, Attain, June 20		
	93 ml/acre, Horizon, June 20		
Fungicide/Insecticide	Folicur, and Prosaro applied on July 21		
Available moisture from	May 26 to August. 20		
Irrigation	182 mm (7.1 inches)		
Rainfall	194 mm (7.7 inches)		
Harvest	November 6, 2009		

❖ ***Irrigation***

Soil moisture was monitored throughout the year with the use of a Watermark™ sensor installed at 12- and 22-inch depths. Rainfall and irrigation were recorded with the use of two rain gauges, one below the pivot and one in a dry land area. Water-use reports and recommendations were given to the co-operator throughout the irrigation season on a weekly basis. The co-operator maintained good moisture conditions for the crop through emergence, tillering, flowering and early grain development stages never letting it drop below 50 per cent available moisture. Irrigation was ended in first week of August to allow the crop to mature. The soil moisture reserve was drawn down through August and early September.

❖ ***Fungicide Evaluation***

The Folicur and Prosaro treatments were sprayed on July 21. Irrigation was managed to minimize frequency during the flowering period but without lowering soil moisture below 50 per cent. Leaf samples taken in the middle of August showed a visual difference between the fungicide treated areas and the untreated areas, see Figures 1 to 3. Prosaro-treated plants had the lowest disease presence followed by Folicur, and the untreated area.

Figure 1. Untreated flag leaves

Figure 2. Folicur treated flag leaves

Figure 3. Prosaro treated flag leaves

❖ ***Harvest***

Harvest yield measurements were completed on November 6, 2009, (Table 3). A 0.65 acre area sample was taken from the Prosaro and untreated area. A 0.69 acre area sample was taken from the Folicur treated area. These samples were weighed to determine the yield of each treatment. Both treatments showed a yield response compared to the untreated check. Prosaro had the highest yield response followed by Folicur. The percentage of wheat seeds infected with Fusarium was determined by Discovery Seed Labs by plating out seeds.

Table 3. Estimated harvest results for durum fungicide evaluation.

Fungicide	Prosaro	Folicur	Untreated
Estimated yield	101 bu./acre	97 bu./acre	86 bu./acre
Fusarium-infected kernels	9.5%	21%	21.5%

Final Discussion

All the treatments yielded very well this year. The economics show a positive return in each case (see Table 4).

Table 4: Economics, assuming a durum price of $6 per bushel.

Treatment	Prosaro	Folicur
Advantage bu./acre	15	11
Advantage $/acre	$90	$66
Application cost /acre*	$21	$15
Net gain	$69	$51
Return on dollar invested	$4.28	$4.40

*includes a $4/acre application fee

These two fungicides have proven effective and cost efficient in this demonstration and in previous demonstrations. The yield response of irrigated wheat in these demonstrations is consistent enough to give confidence that we are seeing a real effect of fungicide.

When fungicide is applied at flowering stage in wheat, the primary intent is to manage FHB and also Septoria glume blotch, another head disease. There is also an added benefit, of reducing leaf disease severity as well. This usually requires an application of fungicide between flag leaf emergence and flowering. A well-timed single application of fungicide may be able to reduce the leaf disease while still controlling FHB. This may be able to increase yields further and will be investigated in the future.

Durum Wheat Fungicide Demonstration – Dale Ewen

Project Lead
- Rory Cranston, AAg, Provincial Irrigation Agrologist, Saskatchewan Agriculture, current project agrologist.
- Lana Shaw, PAg Provincial Irrigation Agrologist, Saskatchewan Agriculture, previous project agrologist.

Co-operators
- Dale Ewen, Riverhurst, Sask.
- Tim Gardner, Bayer CropScience

Project Objective
The project objective was to work with Bayer CropScience in evaluating a new fungicide product mixture effective against both fusarium head blight (FHB) and leaf diseases on an irrigated co-operator site.

Project plan
The Ewen demonstration site served as an evaluation of the efficacy of Folicur, Prosaro, and Proline in an irrigated durum wheat crop to control FHB and leaf disease. This demonstration had three treated areas adjacent to each other and an untreated check area for comparison. Bayer CropScience donated 40 acres of Prosaro, Folicur, and Proline to the project for trial and comparison. Yield was determined for the each of the different treatments and was compared to the untreated area.

Demonstration site
The demonstration site was located on the Riverhurst Irrigation District under a 130-acre low pressure pivot. This field has been under irrigation for many years and has been managed with minimum tillage for several years. See Table 1 for more details.

Table 1. D. Ewen demonstration site characteristics.

Land Location	NE 14-23-07 W3
Soil Type	Loam top soil, clay loam sub soil
Previous crop	Flax
Irrigation System	Low-pressure centre pivot

Project Methods and Observations

❖ ***Crop Management***

Strongfield durum was seeded on May 15, 2009, following a pre-seeding application of glyphosate. Establishment was very good. Weed control was very effective with a post emergence application of Attain/Horizon on June 16. The field was swathed on September 18. See Table 2 for agronomic management of the demonstration site.

Table 2. Agronomic management of Ewen demonstration site.

Nutrients	N	P	K
Soil residual	50 lb./acre	44 lb./acre	653 lb./acre
Applied	129 lb./acre	43 lb./acre	
Variety	Strongfield		
Seeding	May 15, 2009; 120 lb./acre.		
Herbicide	0.75 l/acre, Glyphosate, preseeding		
	0.24 l/acre, Attain, June 16		
	93 ml/acre, Horizon, June 16		
Fungicide/Insecticide	Folicur, Proline, and Prosaro applied on July 21		
Available moisture from May 26 to August 20			
Irrigation	155 mm (6 inches)		
Rainfall	165 mm (6.5 inches)		
Harvest	September 28, 2009 (swathed on September 18)		

❖ ***Irrigation***

Soil moisture was monitored throughout the year with the use of a Watermark™ sensor installed at 12- and 22-inch depths. Rainfall and irrigation were recorded with the use of two rain gauges, one below the pivot and one in a dry land area. Water-use reports and recommendations were given to the co-operator throughout the irrigation season on a weekly basis. The co-operator maintained good moisture conditions for the crop through emergence, tillering, flowering and early grain development stages rarely letting it drop below 50 per cent available moisture. Irrigation was ended in first week of August to allow the crop to mature. The soil reserve was drawn down through August and early September.

❖ ***Fungicide Evaluation***

Folicur, Proline, and Prosaro were applied on July 21. Irrigation was managed to minimize frequency during the flowering period but without lowering soil moisture below 50 per cent. Leaf samples taken in the middle of August showed a visual difference between the fungicide treated areas and the untreated areas, see Figures 1 - 4. Prosaro-treated plants had the lowest disease presence followed by Folicur, Proline and untreated respectively.

Figure 1. Untreated flag leaves

Figure 2. Folicur treated flag leaves

Figure 3. Proline treated flag leaves

Figure 4. Prosaro treated flag leaves

❖ ***Harvest***

Harvest yield measurements were completed on September 28 (Table 3). Yields were taken from two different areas in each treatment and three separate areas in the untreated check. All three treatments showed a yield response compared to the untreated check. Prosaro had the highest yield response followed by Proline then Folicur. The percentage of wheat seeds infected with Fusarium was determined by Discovery Seed Labs by plating out seeds.

Table 3. Harvest results for durum fungicide evaluation.

Treatment	Prosaro	Proline	Folicur	Check
Yield	112 bu./acre	110 bu./acre	101 bu./acre	89bu./acre
% Fusaruim infected kernels	10%	10%	19%	22%

Final Discussion

All the treatments yielded very well this year. The economics show a positive return in each case (see Table 4).

Table 4. Economics assuming a durum price of $6 per bushel.

Treatment	Prosaro	Proline	Folicur
Advantage bu./acre	23	21	11
Advantage $/acre	$138	$126	$66
Application cost /acre*	$21	$25	$15
Net gain	$117	$102	$51
Return on dollar invested	$6.57	$5.04	$4.40

*****includes a $4/acre application fee

These fungicides have proven effective and cost efficient in this demonstration and in previous demonstrations. The yield response of irrigated wheat in these demonstrations is consistent enough to give confidence that there is seeing a real effect of fungicide.

When fungicide is applied at flowering stage in wheat, the primary intent is to manage FHB and also Septoria glume blotch, another cereal head disease. There is usually an added benefit, of reducing leaf disease severity as well, which requires an application of fungicide between flag emergence and flowering. A well-timed single application of fungicide may be able to reduce the leaf disease while still controlling FHB. This may be able to increase yields further and will be investigated in the future.

Winter Wheat Fungicide
and
Irrigation Scheduling Demonstration

Project Lead

- Rory Cranston, AAg, Provincial Irrigation Agrologist, Saskatchewan Agriculture, current project agrologist.
- Lana Shaw PAg, Provincial Irrigation Agrologist, Saskatchewan Agriculture, previous project agrologist.

Co-operators

- Gary Ewen, Riverhurst, Sask.
- Tim Gardner, Bayer CropScience

Project Objective

This demonstration has two objectives. The first is a fungicide evaluation and the second an irrigation scheduling demonstration.

The first component will evaluate the efficacy of a fungicide application for leaf-disease control by comparing disease development and yield with an untreated control. The second component will demonstrate irrigation scheduling on a winter wheat crop.

Project Plan

The Ewen demonstration site served as an evaluation of the efficacy of Folicur fungicide in an irrigated winter wheat crop to control Fusarium head blight (FHB) and leaf disease. The demonstration site had an untreated check area and adjacent Folicur treated areas. Bayer CropScience donated 40 acres of Folicur to the project. Yields were determined for the check area and the adjacent Folicur treated areas.

Watermark™ sensors, rain gauges, and an evapotranspiration gauge were installed at the site to monitor soil moisture, water use, rainfall, and irrigation applied. These instruments were checked on a weekly basis. Information collected from these instruments was put in to the Alberta Irrigation Management Model (AIMM). The information provided by the instruments and AIMM were used to make irrigation recommendations on a weekly basis to the co-operator.

Demonstration Site

The Ewen demonstration site was located in the Riverhurst Irrigation District on a 130-acre pivot. This field has been irrigated and managed with minimum tillage for several years. The field has a rolling topography. See Table 1 for more details.

Table 1. G. Ewen demonstration site characteristics.

Land Location	SW 22-22-07 W3
Soil Type	Clay loam
Previous Crop	Canola
Irrigation System	Low pressure centre pivot

Project Methods and Observations

❖ ***Crop Management***

Buteo winter wheat was seeded on September 17, 2008, following a pre-seeding application of glyphosate. Broadleaf weed control was very effective with a 2,4-D application in early spring. The agronomic management of the site is summarized in Table 2.

Table 2. Agronomic management of the Ewen demonstration site.

Nutrientrs	**N**	**P**	**K**
Soil residual	45 lb./acre	24lb./acre	802 lb./acre
Applied(fall)	40 lb./acre	20 lb./acre	
Applied (spring)	80 lb./acre		
Fertigated	25 lb./acre		
Variety	Buteo		
Seeding	September 17, 2008; 120 lb./acre		
Herbicide	Glyphosate 0.5 l/acre pre-seeding		
	2,4-D; 7 ounce rate on May 16, 2009		
Fungicide	Folicur on June 16, 2009		
Available moisture from	May 5 to August 11, 2009		
Irrigation	179 mm (7.3 inches)		
Rainfall	128 mm(5 inches)		
Harvest	August 31, 2009; straight cut.		

❖ ***Irrigation***

Soil moisture was monitored throughout the year with the use of a Watermark™ sensor installed at 12- and 22-inch depths. Rainfall and irrigation were recorded with the use of two rain gauges, one below the pivot and one in a dry land area. Water use reports and recommendations were given to the co-operator throughout the irrigation season on a weekly basis. Information was input into AIMM. Initially the spring soil moisture was below 40 per cent. After irrigation, soil moisture was increased to 50 per cent or more through tillering, flowering and early grain development. Irrigation concluded the second last weekend of July. The soil moisture reserves were drawn down through August with only a few rains to replenish them.

❖ ***Fungicide Evaluation***
The site was sprayed with Folicur on June 16, 2009. Irrigation was managed to minimize frequency during the flowering period, but without lowering soil moisture reserves. In July, there was an obvious visual difference in the amount of leaf disease between the treated and untreated areas.

❖ ***Harvest***
At two locations in the field, side-by-side treated and untreated areas were harvested and yield was determined on August 31. There was little difference in yield between the treated and untreated areas (see Table 3).

Table 3. Harvest results for winter wheat evaluation.

Treatment	Folicur Treated	Untreated
Yield	116 bu./acre	119 bu./acre

Final Discussion
The untreated areas yielded higher than the Folicur treated areas due to several different factors. The susceptible development stages of winter wheat occur prior to when FHB infection is an issue. Environmental conditions in the summer of 2009 were cold and wet. This was a poor environment for FHB and resulted in low disease infection. The field topography caused the low area in the check strip area to accumulate more moisture. Lack of disease pressure, combined with more available water than the Folicur treated areas, contributed to a higher yield in the untreated areas. The application of Folicur, including a $4 application fee, is $15. In conclusion, there was no benefit in applying Folicur to this demonstration site. Folicur was an unnecessary input for this winter wheat crop. This study will be replicated in subsequent years confirm this finding.

The AIMM program collected metrological data from a weather station in Outlook, Sask. The distance between the weather station and the demonstration made the model inaccurate. The Watermark™ sensors indicated there was increased moisture use for winter wheat in the early spring to mid-July, compared to spring wheat. Winter wheat used about two to three millimetres per day more of moisture in this time than did spring wheat. Irrigation scheduling of winter wheat will be investigated further in the future to better understand its water needs.

Crop Varieties for Irrigation

Principal Investigators
- Terry Hogg and Don David

Organization:
- Canada-Saskatchewan Irrigation Diversification Centre (CSIDC)
- Agriculture and Agri-Food Canada/Agri-Environmental Services Branch (AAFC/AESB)

Co-Investigators from Saskatchewan Ministry of Agriculture:
- Gerry Gross, PAg
- Sarah Sommerfeld, PAg
- Rory Cranston, AAg
- Gary Kruger, PAg

Objectives
(1) To evaluate crop varieties for intensive irrigated production.
(2) To update the *Crop Varieties for Irrigation* guide.

Research Plan
The Canada-Saskatchewan Irrigation Diversification Centre (CSIDC) as well as selected producer sites were used as test locations in 2009 for conducting variety trials under intensive irrigated conditions. The sites selected included a range of soil types (Table 1) and agro-climatic conditions. Crop and variety selection for the project were made in consultation with plant breeders from AAFC, universities and the private sector as well as associated producer groups. Trials were conducted for registered varieties of cereals (spring wheat, barley, corn), oilseeds (canola, flax, soybean) and pulses (pea, dry bean). Further, pre-registration co-op trials were conducted for selected crops to assess the adaptability of new lines to irrigated conditions. This project was conducted in collaboration with federal government, academic institutions, and industry partners including AAFC Research Centres, Crop Development Centre, University of Saskatchewan, etc. (Table 2). Data collection included days to flower and maturity, plant height, lodge rating, seed yield, protein (cereals), test weight and seed weight. All field operations including land preparation, seeding, herbicide, fungicide and insecticide application, irrigation, data collection and harvest were conducted by CSIDC staff. Irrigation applications were conducted by the farmer co-operator at the producer sites.

The trials consisted of small plots (ie. 1.2m x 4m; 1.2 m x 6 m; 1.5m x 4m; 1.5m x 6m) which were appropriately designed (RCBD, Lattice, etc.) with multiple replications (three or four reps) so that statistical analyses could be performed to determine differences among varieties and to determine the variability of the data.

Results

The 2009 variety trials were established within recommended seeding date guidelines for the selected crops (Table 2). The canola trials at the CSIDC and Pederson sites were seeded later than the other sites due to dry surface soil conditions. Climatic conditions in 2009 were cooler in May, June, July and August and warmer in September than the long term average. September in particular had very warm conditions resulting in above average temperature for the month. Precipitation was less than the long term average for May and June, greater than the long term average for July and similar to the long term average for August and September. May was particularly dry resulting in poor emergence for some of the canola and flax trials. However, timely irrigation applications rectified the poor emergence problem. The cool conditions during the growing season resulted in delayed maturity for all crops. Accumulated heat units were lower than the long term average due to the cooler than average growing conditions. The dry and warm conditions later in September allowed for excellent harvest conditions for those crops that reached maturity. The later maturing crops, in particular corn and soybean, did not reach physiological maturity prior to the first killing frost of -2^{0} C occurring on September 28. Poor harvest conditions in October delayed harvest of the later maturing crops.

Overall, yields were generally good for the 2009 trials. Disease and insect damage was minimal. The dry bean trials did have some white mold damage on specific varieties. Yields for the cereal and canola trials were excellent. One canola trial had reduced yield due to moisture stress in July. Wheat yields were high at all sites with highest yield occurring at the Weiterman site. The pea and flax yields, although high, varied among the sites probably affected by site management. For the warm season crops, dry bean had average to above average yields while the corn silage and corn grain had average to below average yields respectively. The soybean yields were average to above average even though some varieties did not fully mature.

The data from the trials was analyzed and only data that met minimum statistical criteria for variability were used to update the CSIDC variety database. The *Crop Varieties For Irrigation* guide will be updated with the addition of the new data collected and printed in time for distribution at the 2010 Crop Production Show. As well, the variety guide will be mailed to all irrigators early in 2010.

This work provides current and comprehensive variety information to assist irrigators in selecting crop varieties suited to intensive irrigated production conditions.

Table 1. Variety trial locations and soil type.

Site	**Legal Location**	**Soil Type**
CSIDC main	SW 15-29-08-W3	Bradwell very fine sandy loam
CSIDC off station	NW 12-29-08W3	Asquith sandy loam
Pederson	NE 20-28-07-W3	Elstow loam
Weiterman	SE 16-31-07-W3	Asquith sandy loam - fine sandy loam

Table 2. 2009 CSIDC variety trials and collaborators.

Trial	Collaborators	Location	Seeding Date
I. Cereals			
1. Irrigated Wheat Regional	ICDC	CSIDC – main CSIDC – off station Pederson Weiterman	May 12/09 May 11/09 May 12/09 May 12/09
2. SVPG CWRS Wheat Regional	Dr. R. Depauw, AAFC B. Recksiedler, Sask. Agriculture J. Downey, SVPG	CSIDC - main	May 12/09
3. SVPG High Yield Wheat Regional	Dr. R. Depauw, AAFC B. Recksiedler, Sask. Agriculture J. Downey, SVPG	CSIDC - main	May 12/09
4. SVPG CWAD Wheat Regional	Dr. R. Depauw, AAFC B. Recksiedler, Sask. Agriculture J. Downey, SVPG	CSIDC – main CSIDC – off station	May 12/09 May 11/09
5. Soft White Spring Wheat Coop	Dr. H. Randhawa, AAFC	CSIDC – main	May 12/09
6. Soft White Spring Wheat Regional	Dr. H. Randhawa, AAFC	CSIDC - main	May 12/09
7. Triticale Variety Trial	ICDC	CSIDC – main	May 12/09
8. SVPG Barley Regional (2-row & 6-row)	Dr. B. Rossnagel, CDC B. Recksiedler, Sask. Agriculture J. Downey, SVPG	CSIDC - main	May 20/09
9. Annual Cereal Forage (Barley, Triticale & Oats)	ICDC	CSIDC - main	May 20/09
10. ACC Hybrid Grain & Silage Corn Performance Trials	B. Beres, AAFC ACC	CSIDC - main	May 22/09
II. Oilseeds			
1. Irrigated Canola Regional	ICDC	CSIDC – main CSIDC – off station Pederson Weiterman	May 21/09 May 11/09 May 20/09 May 12/09
2. Canola Coop	R. Gadoua, CCC	CSIDC - main	May 21/09
3. Prairie Canola Variety Trial	R. Gadoua, CCC	CSIDC - main	May 21/09
4. Irrigated Flax Regional	Dr. G. Rowland, CDC B. Recksiedler, Sask. Agriculture J. Downey, SVPG ICDC	CSIDC – main CSIDC – off station Pederson Weiterman	May 11/09 May 11/09 May 20/09 May 12/09
5. Soybean Variety Adaptation Trial	B. Brolley, MAFRI ICDC	CSIDC – main	May 22/09

Table 2. Continued . . . 2009 CSIDC variety trials and collaborators.			
Trial	**Collaborators**	**Location**	**Seeding Date**
III. Pulses			
1. Irrigated Bean Variety Trial - Wide Row (Alberta)	Dr. P. Balasubramanian, AAFC ICDC	CSIDC – main CSIDC – off station	May 26/09 May 26/09
2. Dry Bean Wide Row Co-op	Dr. P. Balasubramanian, AAFC	CSIDC – main	May 26/09
3. Dry Bean Narrow Row Regional (Saskatchewan)	Dr. A. Vandenberg, CDC ICDC	CSIDC – main CSIDC – off station	May 26/09 May 26/09
4. Irrigated Bean Variety Trial – Narrow Row (Alberta)	Dr. P. Balasubramanian, AAFC ICDC	CSIDC – main CSIDC – off station	May 26/09 May 26/09
5. Dry Bean Narrow Row Co-op A&B	Dr. A. Vandenberg, CDC	CSIDC – off station	May 26/09
6. Irrigated Pea Regional	Dr. T. Warkentin, CDC ICDC	CSIDC – main CSIDC – off station Pederson Weiterman	May 11/09 May 11/09 May 12/09 May 12/09
7. Pea Coop A&B	Dr. D. Bing, AAFC Dr. T. Warkentin, CDC	CSIDC – off station	May 15/09
8. Faba Bean Co-op	Dr. A. Vandenberg, CDC	CSIDC – main	May 15/09

CSIDC Canada-Saskatchewan Irrigation Diversification Centre
ICDC Irrigation Crop Diversification Corporation
SVPG Saskatchewan Variety Performance Group
AAFC Agriculture and Agri-Food Canada
CDC Crop Development Centre, University of Saskatchewan
ACC Alberta Corn Committee
CCC Canola Council of Canada
MAFRI Manitoba Agriculture, Food and Rural Initiatives

Forage Crops

Evaluation of Commercial Pasture Blends

Project Lead
- Sarah Sommerfeld PAg, Provincial Irrigation Agrologist, Saskatchewan Agriculture

Co-investigators
- Charlotte Ward PAg, Regional Forage Specialist, Saskatchewan Agriculture
- Dr. Bruce Coulman PAg, University of Saskatchewan
- Brian Champion, Canada-Saskatchewan Irrigation Diversification Centre (CSIDC)

Industry Co-operators
- Neil Mcleod, Northstar Seeds Ltd.
- Chris Bettschen, Brett-Young Seeds
- Chad Keisig, Pickseed
- Shawn Keyowski, Viterra

Project Objectives
The objectives of this project are:
- to evaluate commercial and custom forage blends for overall yield, persistence and species composition;
- to monitor changes in forage yield, species composition and individual species persistence within each blend over time; and
- to determine if irrigation provides a yield benefit to justify increased costs and management in comparison to dry land.

Research Plan
A randomized, replicated plot design of six pasture-blends will be managed to simulate intensive grazing. Forage will be cut at the vegetative stage, corresponding to the three- or four-leaf stage or 20 to 25 cm (eight to 10 inches) in plant height. Data to be collected includes overall yield, persistence and species composition on a dry matter (DM) basis. Species persistence will be evaluated prior to clipping by counting the number of plants. Species composition and change in composition will be measured by hand harvesting a quarter meter square per plot and weighed by individual species on a DM basis. Overall plot yield will be determined by mechanical harvest in addition to the hand harvested yield. Harvest timing is dependent on forage regrowth.

Demonstration Site
This project is located at CSIDC, which provides the land and facilities to pursue this project.

Project Methods and Observations
❖ ***Variety Selection***
Pasture blend selection was made on the basis of selecting a blend suitable for intensive grazing under irrigated conditions. The four pasture blends provided by industry were selected at the company's discretion. Two blends were custom formulated at the recommendation of the project lead and co-investigator. Resulting from the selection process are simple or complex blends with different species and composition. Table 1 provides a breakdown of the forage species, forage varieties and proportion of species included in each blend.

Table 1. Summary of pasture-blend description and composition.

Species	Variety	Proportion in blend by seed weight
Custom Blend #1		
Alfalfa	AC Grazeland BR	20%
Meadow bromegrass	Fleet	80%
Custom Blend #2		
Cicer milkvetch	Oxley II	30%
Meadow bromegrass	Fleet	70%
Brett-Young Super Pasture Blend		
Meadow bromegrass	Fleet	50%
Crested wheatgrass	Fairway	25%
Tall fescue	Kokanee	15%
Alfalfa	Survivor	10%
Pickseed HayGraze Blend		
Alfalfa	AC Grazeland Br	60%
Meadow bromegrass	Fleet	30%
Orchardgrass	OKAY	10%
Northstar Custom Blend #1		
Meadow bromegrass	Fleet	40%
Smooth bromegrass	Carlton	10%
Tall fescue	Courtenay	15%
Orchardgrass	Early Arctic	15%
Alfalfa	Stealth	20%
Proven-Viterra Ranchmaster		
Meadow bromegrass	hps brand	50%
Intermediate wheatgrass		15%
Pubescent wheatgrass		15%
Tall fescue	hps brand	15%
Alfalfa	Spredor	5%

Establishment

The target plant population of each treatment reflects the soil characteristics and moisture conditions. The dry land treatment targets a plant population of 25 pure live seeds per square foot (PLS/ft.^{2}) and a target plant population of 35 PLS/ft.^{2} for the irrigation treatment. Table 2 describes the seeding rates recommended for the irrigation and dry land treatments, respectively. The seeding rate, expressed as pounds per acre, was calculated using the formula stated in the tables. The seeding rate was adjusted by percentage pure live seed for each forage variety.

Table 2. Recommended seeding rates of irrigation and dryland treatments.

ICDC Perennial Pasture Blend Trial - IRRIGATION and DRYLAND

Plot size = 1.2 m x 5 m = 6 m^2 = 0.001482632 acres

Seeding Rate Calculation:

$$\text{Seeding rate (lb./acre)} = \frac{\text{seeds/ft}^2 \times \text{ft}^2\text{/acre / PLS}}{\text{seeds/lb.}}$$

Species	Proportion in blend by seed weight	Recommended seeding rate (lb. per acre) - IRRIGATION	Recommended seeding rate (lb. per acre) - DRYLAND
Custom Blend #1			
Alfalfa	20%	1.86	1.33
Meadow bromegrass	80%	19.40	13.85
		21.26	**15.18**
Custom Blend #2			
Cicer milkvetch	30%	3.74	2.67
Meadow bromegrass	70%	16.97	12.12
		20.72	**14.80**
Brett-Young Super Pasture Blend			
Meadow bromegrass	50%	10.45	7.46
Crested wheatgrass	25%	2.48	1.77
Tall fescue	15%	1.07	0.77
Alfalfa	10%	0.97	0.69
		14.97	**10.69**
Pickseed HayGraze Blend			
Alfalfa	60%	5.53	3.95
Meadow bromegrass	30%	6.40	4.57
Orchardgrass	10%	0.30	0.21
		12.23	**8.74**
Northstar Custom Blend #1			
Meadow bromegrass	40%	8.36	5.97
Smooth bromegrass	10%	1.40	1.00
Tall fescue	15%	1.12	0.80
Orchardgrass	15%	0.39	0.28
Alfalfa	20%	1.77	1.27
		13.04	**9.31**
Proven-Viterra			
Meadow bromegrass	50%	11.62	8.30
Intermediate wheatgrass	15%	3.17	2.26
Pubescent wheatgrass	15%	2.79	1.99
Tall fescue	15%	1.23	0.88
Alfalfa	5%	0.46	0.33
		19.27	**13.77**

Seeding of both treatments occurred on June 2, 2009. Due to poor growing conditions in June, establishment of the dry-land treatment was not adequate and was removed and reseeded on August 11. Plot dimensions are 1.2 m by 5.0 m. Row spacing is 20.3 cm or eight inches.

Crop Management
Prior to seeding, each treatment received a broadcast fertilizer application of nitrogen and phosphorus as stated in Table 3. The nitrogen amounts may be adjusted and applied on an individual blend basis to better reflect the of legume proportion of each blend.

Table 3. Fertility management of irrigation and dryland treatments.

Treatment	Nitrogen (lb./acre)	Phosphorus (lb./acre)
Irrigated	35*	50**
Dryland	35**	35**

* application per cut
** annually

Data Collection
No data was collected from the dryland treatment.

Two clipping harvests of a quarter-metre square each were taken from each plot of the irrigation treatment on August 20. Individual species were separated, dried and weighed to determine the composition contribution and will serve as a benchmark for future data collection (Table 4). After the clipping harvest, plots were mechanically harvested to a height of 7.5 cm (3 inches). From the total plot harvest and clipping harvest weights, a DM yield and a yield at 15 per cent moisture were calculated (Table 5) and an average yield for each blend is shown in Table 6.

Table 4. Percent species composition at harvest.

Rep	Plot	Blend	Total Dry Wt (g)	Alfalfa	Meadow Brome	Smooth Brome	Cicer Milkvetch	Crested Wheatgrass	Tall Fescue	Orchard Grass	Intermediate Wheatgrass
1	1	Custom Blend #1	77.15	82.0%	18.0%						
	2	Northstar Custom Blend	145.3	86.1%	3.6%	3.5%			3.3%	3.4%	
	3	Custom Blend #2	30.95		56.8%		43.2%				
	4	Brett-Young Super Pasture Blend	74	79.9%	7.2%			5.8%	7.0%		
	5	Proven-Viterra Ranchmaster Blend	57.7	67.4%	13.1%				6.0%		13.5%
	6	Pickseed Haygraze Blend	128.75	89.9%	6.4%					3.7%	
2	7	Northstar Custom Blend	108.45	90.4%	2.5%	1.3%			0.3%	5.5%	
	8	Brett-Young Super Pasture Blend	71.95	65.4%	10.2%			16.0%	8.3%		
	9	Custom Blend #1	122.05	77.0%	23.0%						
	10	Pickseed Haygraze Blend	109.85	90.4%	3.3%					6.4%	
	11	Proven-Viterra Ranchmaster Blend	51.65	82.0%	4.9%				10.4%		2.7%
	12	Custom Blend #2	29.8		97.8%		2.2%				
3	13	Custom Blend #2	38.4		99.6%		0.4%				
	14	Brett-Young Super Pasture Blend	57.3	38.2%	17.8%			21.6%	22.4%		
	15	Custom Blend #1	99.7	60.2%	39.8%						
	16	Proven-Viterra Ranchmaster Blend	85.3	65.1%	9.5%				5.2%		20.2%
	17	Pickseed Haygraze Blend	171.15	93.5%	0.3%					6.2%	
	18	Northstar Custom Blend	102.3	61.4%	10.7%	8.8%			4.5%	14.7%	
4	19	Northstar Custom Blend	86.75	95.7%	0.4%	0.2%			0.4%	3.4%	
	20	Pickseed Haygraze Blend	118.3	92.1%	5.1%					2.8%	
	21	Custom Blend #1	74.2	74.6%	25.4%						
	22	Custom Blend #2	45.15		97.6%		2.4%				
	23	Proven-Viterra Ranchmaster Blend	75.55	83.2%	7.3%				3.6%		5.9%
	24	Brett-Young Super Pasture Blend	22.55	35.0%	24.5%			11.5%	29.0%		

Table 5. Irrigation treatment harvest yields.

Rep	Plot	Blend	Yield (ton DM/acre)	Yield (ton/acre) 15% moisture
1	1	Custom Blend #1	**1.96**	**2.26**
	2	Northstar Custom Blend	**1.72**	**1.98**
	3	Custom Blend #2	**0.72**	**0.83**
	4	Brett-Young Super Pasture Blend	**0.21**	**0.24**
	5	Proven-Viterra Ranchmaster Blend	**1.32**	**1.51**
	6	Pickseed Haygraze Blend	**2.33**	**2.68**
2	7	Northstar Custom Blend	**1.74**	**2.01**
	8	Brett-Young Super Pasture Blend	**0.99**	**1.14**
	9	Custom Blend #1	**1.46**	**1.68**
	10	Pickseed Haygraze Blend	**2.32**	**2.67**
	11	Proven-Viterra Ranchmaster Blend	**0.98**	**1.13**
	12	Custom Blend #2	**0.65**	**0.75**
3	13	Custom Blend #2	**0.48**	**0.55**
	14	Brett-Young Super Pasture Blend	**1.40**	**1.61**
	15	Custom Blend #1	**1.87**	**2.15**
	16	Proven-Viterra Ranchmaster Blend	**1.73**	**1.99**
	17	Pickseed Haygraze Blend	**2.41**	**2.77**
	18	Northstar Custom Blend	**1.67**	**1.92**
4	19	Northstar Custom Blend	**1.71**	**1.97**
	20	Pickseed Haygraze Blend	**2.32**	**2.67**
	21	Custom Blend #1	**1.84**	**2.12**
	22	Custom Blend #2	**0.48**	**0.55**
	23	Proven-Viterra Ranchmaster Blend	**1.52**	**1.74**
	24	Brett-Young Super Pasture Blend	**0.53**	**0.61**

Table 6. Average irrigation treatment harvest yields.

Blend	Average DM Yield (ton/acre)	Average Yield (ton/acre) 15% moisture
Custom Blend #1	1.78	2.05
Northstar Custom Blend	1.71	1.97
Custom Blend #2	0.58	0.67
Brett-Young Super Pasture Blend	0.78	0.90
Proven-Viterra Ranchmaster Blend	1.39	1.59
Pickseed Haygraze Blend	2.35	2.70

Discussion

The alfalfa contribution in each of the five of the blends was quite high. If the pasture blend was to be grazed, this high contribution of alfalfa could be a reason for concerns about bloat.

The alfalfa did provide suitable biomass production that allowed for the harvest of a respectable hay cut. In subsequent years of data collection, it will be interesting to note if the composition of the species changes dramatically after the grass production increases following establishment. Beginning in 2010, the collected data will be used to extrapolate potential cow grazing days per acre to provide reference for grazing purposes.

Perennial Forage Biomass Measurement for Ethanol Production

Project Lead

- Sarah Sommerfeld, PAg, Provincial Irrigation Agrologist, Saskatchewan Agriculture

Co-investigators

- Charlotte Ward, PAg, Regional Forage Specialist, Saskatchewan Agriculture
- Dr. Bruce Coulman PAg, University of Saskatchewan
- Brian Champion, Canada-Saskatchewan Irrigation Diversification Centre (CSIDC)

Project Objective

The objective of this research project is to measure the forage biomass production of 10 perennial grass species for cellulolytic ethanol production. The potential also exists for the use of the biomass in other renewable fuels production technology such as gasification and combustion. Debate exists as to whether or not it is ethical to produce renewable fuels with the use of a human food source. Biomass production offers as an alternative to renewable fuels produced by feed grains.

Research Plan

A randomized, replicated small-plot design of 10 perennial grass species will be managed to achieve a single cut harvest. Harvest timing will occur when the species reach physiological maturity or by September 15, 2009. Dry matter (DM) yield will be measured.

Demonstration Site

This project is located at CSIDC, which provides the land and facilities to pursue this project.

Project Methods and Observations

❖ ***Species Selection***

Nine cool-season perennial grass species were selected from assessment of yield data from previous forage biomass research by Dr. Bruce Coulman at Saskatoon and Melfort. One warm-season perennial grass was included to determine if its high yielding potential could be realized in the Saskatchewan climate. Table 1 outlines the selected species and the variety of each.

Table 1. Perennial grass species and variety.

Species	Variety
Tall wheatgrass	Orbit
Russian wildrye (diploid)	Swift
Switchgrass	Dakota
Intermediate wheatgrass	Chief
Smooth bromegrass	Signal
Crested wheatgrass (tetraploid)	AC Goliath
Hybrid bromegrass	AC Success
Slender wheatgrass	Adanac
Meadow bromegrass	Paddock
Western wheatgrass	Walsh

Establishment

The target plant population was 35 pure live seeds (PLS) per square foot. The seeding rate (lb./ac.) was calculated using the following formula:

$$\frac{\text{seeds/ft}^2 \times \text{ft}^2\text{/acre/PLS}}{\text{seeds/lb.}}$$

See Table 2 for the recommended seeding rates of this project.

Table 2. Recommended seeding rate of the Perennial Forage Biomass Trial.

Species	Variety	Recommended seeding rate (lb per acre)
Tall wheatgrass	Orbit	22.45
Russian wildrye (diploid)	Swift	10.25
Switchgrass	Dakota	5.64
Intermediate wheatgrass	Chief	18.24
Smooth bromegrass	Signal	11.80
Crested wheatgrass (tetraploid)	AC Goliath	9.17
Hybrid bromegrass	AC Success	17.66
Slender wheatgrass	Adanac	10.03
Meadow bromegrass	Paddock	20.06
Western wheatgrass	Walsh	14.59

Seeding occurred on June 2, 2009. Plot dimensions were 1.2 m by 1.5 m with row spacing of 20.3 cm (eight inches.).

Crop Management
Prior to seeding, nitrogen (46-0-0) and phosphorus (11-52-0) were broadcast on the plot area at rates of 112 kilograms per hectare (kg/ha or 100 lb./acre) and 56 kg/ha (50 lb./acre) actual, respectively.

Harvest Data
A single cut was harvested on September 17, 2009. Table 3 summarizes the harvest data as yield per ton of DM per acre and as yield per ton per acre at 15 per cent moisture. Table 4 summarizes the total average yield for each species.

Table 3. Single cut harvest data

Plot	Species	Yield (t DM/acre)	Yield (t/acre) 15% moisture	
1	Western Wheatgrass	0.22	0.26	
2	Slender Wheatgrass	0.72	0.83	
3	Crested Wheatgrass	0.84	0.96	
4	Hybrid Bromegrass	2.39	2.75	
5	Tall Wheatgrass	0.25	0.29	
6	Intermediate Wheatgrass	1.30	1.50	
7	Smooth Bromegrass	1.82	2.09	
8	Switchgrass	0.74	0.85	
9	Meadow Bromegrass	2.34	2.69	
10	Russian Wildrye	0.65	0.74	
11	Intermediate Wheatgrass	0.90	1.03	
12	Western Wheatgrass	0.13	0.15	
13	Smooth Bromegrass	2.06	2.37	
14	Switchgrass	0.72	0.83	
15	Meadow Bromegrass	1.60	1.84	
16	Slender Wheatgrass	0.88	1.02	
17	Hybrid Bromegrass	2.13	2.46	
18	Russian Wildrye	0.38	0.44	
19	Tall Wheatgrass	0.28	0.33	
20	Crested Wheatgrass	0.49	0.56	
21	Russian Wildrye	0.38	0.44	
22	Crested Wheatgrass	1.53	1.75	
23	Western Wheatgrass	0.26	0.30	
24	Slender Wheatgrass	1.76	2.03	
25	Hybrid Bromegrass	2.94	3.38	
26	Meadow Bromegrass	0.69	0.79	
27	Switchgrass	0.58	0.67	
28	Tall Wheatgrass	0.35	0.41	
29	Smooth Bromegrass	2.88	3.31	
30	Intermediate Wheatgrass	1.67	1.92	
31	Slender Wheatgrass	2.11	2.43	
32	Intermediate Wheatgrass	1.58	1.82	
33	Crested Wheatgrass	1.33	1.53	
34	Hybrid Bromegrass	2.43	2.80	
35	Meadow Bromegrass	2.06	2.37	
36	Tall Wheatgrass	0.71	0.82	
37	Smooth Bromegrass	2.74	3.15	
38	Switchgrass	0.93	1.07	
39	Western Wheatgrass	0.98	1.13	

Table 4. Total average yield of four replicates of each species.

Species	Average Yield (t DM/acre)
Western Wheatgrass	0.46
Slender Wheatgrass	1.58
Crested Wheatgrass	1.20
Hybrid Bromegrass	2.85
Tall Wheatgrass	0.46
Intermediate Wheatgrass	1.57
Smooth Bromegrass	2.73
Switchgrass	0.85
Meadow Bromegrass	1.92
Russian Wildrye	0.60

Discussion

After one harvest, the yield data from the hybrid, meadow brome and smooth brome grass indicate that these three species were the most productive in the establishment year. Not enough data has been collected to provide a recommendation as to which of the 10 species can produce the greatest biomass yield overall. Data collection will continue in 2010.

Alfalfa Management Trial

Project Lead
- Sarah Sommerfeld PAg, Provincial Irrigation Agrologist, Saskatchewan Agriculture

Co-Investigators
- Charlotte Ward PAg, Regional Forage Specialist, Saskatchewan Agriculture
- Barry Vestre, Canada-Saskatchewan Irrigation Diversification Centre (CSIDC) Field Operations

Industry Co-operators
- Neil Mcleod, Northstar Seeds Ltd.
- Ellis Clayton, Pioneer Hi-Bred
- Peter Novak, Proven Seeds
- Art Klassen, Brett-Young Seeds
- Kevin Dunse, Pickseed
- Nicole Tanner, Farm Pure Seeds*

*Since the establishment of this trial, Farm Pure Seeds has been acquired by Pickseed. Pickseed now has two varieties established in this trial.

Project Objective

The objective of this research project is to compare the yield performance of seven alfalfa varieties under an intensive three-cut management system.

Research Plan

A randomized, replicated field-scale plot design consisting of seven alfalfa varieties replicated three times will be managed to harvest on a three-cut system. Cut timing will be based on the calendar dates of June 15, August 1, and October 1. The fertility plan includes annual applications of phosphorus and potassium, at a rate of 75 pounds per acre (lb./acre) actual product per nutrient. Spring stand assessments, measured as plants per square metre (plants/m^2), will be performed annually to determine variety survivability and performance. Irrigation requirements will be scheduled weekly, under the recommendations of an irrigation agrologist. Harvest protocol requires the plots to be cut and weighed with a forage harvester. Stage of maturity will be measured at the time of cutting.

Demonstration Site

The project site is located at CSIDC, which provides land and staff to perform the field operations necessary to conduct this research trial.

Trial Methods and Observations

❖ *Variety Selection*

Variety selection was targeted at providing a fair market representation of current alfalfa varieties that were specific to intensive management under irrigation. These variety descriptions were taken from product information resource materials.

AC Blue J is a public variety that serves as the irrigated check for the trial.

Pioneer
53Q30 is a high performance variety exhibiting good forage quality and winter hardiness.

Proven Seed
Equinox alfalfa variety is suited for an intensive management system with rapid re-growth, high yield and winter hardiness characteristics.

Northstar Seeds Ltd.
Stealth SF is a multifolate variety with high overall feed quality. This variety carries the unique Standfast™ trait, a feature that is claimed to promote a faster recovery rate following cutting.

Brett-Young Seeds
Hybriforce 400 alfalfa features improved establishment, winter hardiness and rapid re-growth.

Pickseed
2065 MF is a multifolate variety that exhibits rapid re-growth, excellent winter hardiness and is persistent in the stand. The multifolate leaf expression provides for improved forage quality.

AC Longview has excellent re-growth capability, good stand longevity and winter hardiness.

Establishment and Crop Management

This field scale plot trial was direct seeded into stubble on June 4, 2008, with each variety seeded at a rate of 12.6 lb./acre. The Equinox variety was re-seeded on July 2, 2008, due to seeding equipment malfunction. A post-harvest and pre-seeding application of glyphosate was performed in August 2007 and May 2008. Soil tests in April 2009 indicated soil phosphorus and potassium levels of 28 and 410 lb./acre, respectively. In April 2009, fertilizer applications of 75 lb./acre actual phosphorus and actual 75 lb./acre potassium were broadcast on the trial area. No herbicide applications were performed in 2009.

Irrigation

Tensiometers were installed in the plot area at 30 and 60 centimetre (cm) depths (12 and 24 inches [inches]). A rain gauge was placed in the plot area to measure irrigation applications. The Environment Canada weather station on site at CSIDC served as the source for rainfall data. Soil was sampled at 30 cm (12 in.) increments, to the 1.2 m depth (48 inches) to determine spring soil moisture by gravimetric analysis (Table 1).

Table 1: CSIDC Field 12 spring soil moisture – May 27, 2009.

Texture	Depth		Available Moisture		
	cm	inches	%	mm	inches
Sandy loam	0-30	0-12	100	43	1.7
Fine sandy loam	30-60	12-24	100	48	1.9
Loam	60-90	24-36	100	51	2
Loam	90-120	36-48	75	51	2
			Total	193	7.6

Irrigation scheduling requirements were calculated from equipment readings, available soil moisture and crop water use. The project lead and CSIDC field operations staff worked together to schedule and apply water as required. Table 2 indicates the rainfall, irrigation and crop consumptive use of the site as recorded by the Alberta Irrigation Management Model (AIMM). The difference between crop consumptive use and the total of rainfall and irrigation is moisture that is stored in the soil.

Table 2. CSIDC Field 12 moisture data

	mm	inches
Rainfall (April 8 - September 26)	150	5.9
Irrigation (May 29 - September 21)	392	15.4
Total	**542**	**21.3**
Crop Consumptive Use	487	19.1

Data Collection

The three harvest dates occurred on June 25, August 11 and October 14. Just prior to harvest, stage of maturity and plant height was recorded. One yield measurement was taken for the first cut, but two measurements were taken for the remaining cuts. Two measurements were recorded for each plot and the average of these harvest weights for each variety per cut are reported in Table 3. The total average yield of each variety over three cuts is reported in Table 4.

Table 3. Average three-cut harvest data for each variety.

Cut 1	June 25	Cut 2	August 11	Cut 3	Oct-14
Variety	**DM Yield (t/a)**	**Variety**	**DM Yield (t/a)**	**Variety**	**DM Yield (t/a)**
Equinox	**1.97**	Equinox	**1.57**	Equinox	**0.88**
AC Longview	**2.20**	AC Longview	**1.57**	AC Longview	**1.07**
54Q30	**1.95**	54Q30	**1.65**	54Q30	**0.94**
AC Blue J	**2.00**	AC Blue J	**1.42**	AC Blue J	**1.03**
Stealth	**1.95**	Stealth	**1.57**	Stealth	**1.34**
Hybriforce 400	**2.08**	Hybriforce 400	**1.57**	Hybriforce 400	**1.03**
2065MF	**2.04**	2065MF	**1.61**	2065MF	**1.00**

Table 4. Total average yield of three replicates for each variety.

Variety	DM Yield (t/a)
Equinox	4.42
AC Longview	4.83
54Q30	4.54
AC Blue J	4.59
Stealth	4.87
Hybriforce 400	4.68
2065MF	4.65

Discussion

After one year of data collection, all varieties indicate good productivity with yields near or above four tons/acre. Future data collection and statistical analysis will indicate which variety performs the best under an intensive irrigated three cut system.

Ponteix Forage Demonstration — Andre Perrault

Project Lead

- Gary Kruger, PAg, Provincial Irrigation Agrologist, Saskatchewan Agriculture, current project agrologist.
- Korvin Olfert, PAg, Provincial Irrigation Agrologist, Saskatchewan Agriculture, previous project agrologist.

Co-Investigator

- Rory Cranston, AAg, Provincial Irrigation Agrologist, Saskatchewan Agriculture

Co-operators

- **Producer** Andre Perrault, Ponteix, Sask.
- **Industry** Miller Seeds, Milk River, Alta., and
  Viterra Grain – Vern Turchyn

Project Objective

The objective of this project is to compare AC Saltlander green wheatgrass to other common varieties of grass in an alfalfa-grass mixture on a field scale saline situation. AC Saltlander is a new species developed from a selection from a natural cross between bluebunch wheatgrass and quackgrass. The demonstration is addressed to irrigation farmers in the Ponteix area of Saskatchewan.

Project Plan

The project plan is to collect yield and forage quality data from the forage demonstration of three alfalfa/grass mixes on the Ponteix irrigation project. The demonstration consists of an alfalfa mixture of 75 per cent AC Longview and 25 per cent Rangelander mixed with AC Saltlander green wheatgrass, AC Rocket smooth brome grass, or AC Knowles hybrid brome grass. Each alfalfa grass mixture was sown on one border dyke in three separate plots of the Ponteix Irrigation District. There were three replications of the demonstration on Andre Perrault's farm.

Demonstration Site

The demonstration site is located west of Ponteix within the Ponteix Irrigation District on three fields affected by salinity. The fields selected for the project demonstration were plot 15 on NE 29-9-12 W3, plot 24 on SW 33-9-12 W3, and plot 27 on SW 33-9-12 W3. Each of these fields was flood irrigated. The border dykes on each of these fields were 15 to 17 metres wide.

Project Methods and Observations

❖ ***Establishment***

The fields were sprayed with two litres per acre (l/acre) glyphosate in fall 2008 to eliminate the alfalfa stand and control the dandelions on the fields. Seeding was conducted between April 21 and 23, 2009. The forage mixtures were planted with a 12-foot-wide Case IH 620 disk drill with six-inch row spacing placing the seeds at a half-inch depth.

Irrigation

The fields received a full irrigation following the completion of seeding. The growth was cut, soils were irrigated for the second time, and then left uncut during the fall to provide for a better snow catch. Water quality for the 2009 irrigation season was poor (Table 1).

Table 1. Water quality of Gouverneur Reservoir in late July, 2009

Conductivity	2280 uS/cm
pH	9.12
Calcium	48 mg/l
Magnesium	52 mg/l
Potassium	18 mg/l
Sodium	410 mg/l
Sulphate	732 mg/l
Chloride	14 mg/l
Bicarbonate	299 mg/l
Sodium Adsorption Ratio	9.8

Fertility and Herbicides

No herbicides were applied following seeding to eliminate the risk of the spray injuring the grass and alfalfa seedlings. No supplemental fertility was applied to the fields in 2009.

Plan for 2010

Stand establishment evaluated in fall 2009 is questionable. Very few grass seedlings emerged during the summer of 2009. The alfalfa seedlings have germinated. Some are fully established plants, while others are only seedlings in November 2009 and may not survive the winter. The grower is considering spraying the grasses out and keeping the alfalfa or eliminating the stand based on stand evaluation in spring 2010.

Val Marie Cereal Forage Demonstration — Lynn Grant

Project Lead

- Gary Kruger, PAg, Provincial Irrigation Agrologist, Saskatchewan Agriculture, current project agrologist.
- Korvin Olfert, PAg, Provincial Irrigation Agrologist, Saskatchewan Agriculture, previous project agrologist.

Co-Investigator

- Rory Cranston, AAg, Provincial Irrigation Agrologist, Saskatchewan Agriculture

Co-operators

- **Producer** Lynn Grant, Val Marie, Sask.
- **Industry** Ardell Seeds, Vanscoy, Sask.
  Chin Ridge Seeds, Taber, Alta.
  Mastin Seeds, Sundre, Alta.
  Reisner Seeds, Limerick, Sask.
  Silverthorn Seeds, Outlook, Sask.
  Spruce Grove Seeds, Rosthern, Sask.
  Viterra Grain, Regina, Sask.
  Wagon Wheel Seed Corp, Churchbridge, Sask.

Project Objective

The objective of this demonstration was to showcase 12 high performing annual cereals that could produce green feed during the transition year between successive stands of irrigated alfalfa. The demonstration was located in the Val Marie Irrigation District to demonstrate the potential of annual crops for forage when grown under irrigated field conditions.

Project Background

Annual cereals are a practical means of supplying forage while rotating from an older long term stand of alfalfa to a newly established stand. The cereal crop harvested for feed maintains the supply of forage for the livestock on the farm while providing opportunity for rejuvenation of the alfalfa stand.

Project Plan

To collect yield and forage quality data for six varieties of barley, three varieties of oats, and one variety of triticale grown on border dyke strips.

Demonstration Site

The project site was located on plot 255 at the Val Marie Irrigation Project on NW 17-3-13 W3, farmland operated by Lynn Grant. The demonstration site was capable of flood irrigation and had been in forages for a long time prior to being sown in 2009. The irrigated area had been leveled to facilitate irrigation during the 1940s. The soil texture is heavy clay.

Stand Establishment
The site was sown with a commercial Haybuster drill. Each of the varieties was sown at 2.3 bushels per acre (bu./acre) on May 20, 2009. Fertilizer as 29-14-0-7 was applied at 110 pounds per acre (lb./acre) at the time of seeding. The varieties selected for the demonstration are listed in the following table (Table 1). No pesticides were applied to the forage demonstration.

Table 1. Varieties of annual cereals demonstrated at Val Marie in 2009.

Variety	Type of Grain	Seed Supplier
CDC Baler	Forage Oats	Wagon Wheel Seed Corp
Pinnacle	Grain Oats	Ardell Seeds
AC Mustang	Grain Oats	Mastin Seeds
Comet	Triticale	Silverthorn Seeds
AC Rosser	Six-row Feed Barley	Spruce Grove Seeds
Sundre	Six-row Feed Barley	Mastin Seeds
Vivar	Six-row Feed Barley	Chin Ridge Farms
Champion	Two-row Feed Barley	Viterra
Xena	Two-row Feed Barley	Viterra
CDC Cowboy	Two-row Forage Barley	Spruce Grove Seeds
Legacy	Six-row Malt Barley	Viterra
Newdale	Two-row Malt Barley	Reisner Seeds

Irrigation
No irrigations were applied during the 2009 growing season. The grower was concerned about the impact on stand establishment of the annual crop from the irrigation and decided against applying the water to the field. The grower decided to forgo irrigation for the 2009 crop because he does not have control of the timing of irrigation and was concerned about its impact on crop establishment. This decision is also influenced by residual hay supply on the cooperator’s farm and the risk of losing the hay production for his entire operation.

Forage Harvest Sampling
Top growth samples were collected from one square metre of each demonstration strip on August 10, 2009, to estimate the forage yield for each variety. The samples were dried in a forced air dryer until the forage weights were stable.

Project Observations
The data collected from the dry matter (DM) yield samples is summarized in Table 2. The DM yields were calculated from the weight of the dried square metre samples. Forage material produced at the Val Marie site was highest for oat varieties, medium for barley varieties and lowest for triticale. This ranking agrees with that reported in the CSIDC Crop Varieties for Irrigation extension publication. Feed barley yields were higher than those of the malt barley varieties, but two row and six-row varieties had very similar forage yields. A summary comparison of the demonstration results with summarized results from CSIDC in Outlook is presented in Table 3.

Annual cereals are an important break crop in irrigated forage rotations. They provide an alternative source of forage during transition in irrigated rotations. They can be established with less risk than perennial forages. They do not have the loss of production associated with an establishment year. Their downfall, however, is that they need to be sown every year and they are not able to fix their own nitrogen.

Table 2. Forage yield of annual cereals.

Variety	Cereal Type	DM Yield (kg/ha)
AC Mustang	Oats	7260
Pinnacle	Oats	5580
Sundre	Six row Feed Barley	5440
CDC Cowboy	Two row Feed Barley	5130
Xena	Two row Feed Barley	4810
Vivar	Six row Feed Barley	4630
CDC Baler	Oats	4580
Champion	Two row Feed Barley	4540
AC Rosser	Six row Feed Barley	4450
Newdale	Two row Malt Barley	4130
Legacy	Six row Malt Barley	4080
Comet	Triticale	2810

Table 3. Comparison of forage yields of different crop types.

Crop Type	DM Yield (kg/ha)	Check Irrigated DM Yield [1] (kg/ha)
Oats	5810	14560
Barley	4650	15480
Triticale	2810	12670
Crop Type	**DM Yield (kg/ha)**	**Check Irrigated DM Yield [1] (kg/ha)**
Feed Barley	4830	15150
Malt Barley	4110	15330
Two Row Barley	4650	15330
Six Row Barley	4650	15050

[1]CSIDC 2009. *Crop Varieties for Irrigation.* Saskatchewan Ministry of Agriculture, Irrigation Branch.

Discussion

Precipitation recorded at the Val Marie weather site received 86 millimetres (mm) of rainfall and only 775 Growing Degree Days between the seeding and harvest dates. This represents only 66 per cent of the average rainfall received between the seeding and harvest dates. The impact of the below average rainfall experienced by Val Marie in 2009 was less significant because of the cooler growing season. Val Marie received only 90 per cent of its average normal growing degree days between the seeding and harvest dates during 2009. This is an important factor in explaining the good yields observed for the year in spite of the low rainfall.

The dry land yields reported for annual cereals at the Val Marie site are about one-third the yield reported for annual cereals harvested as green feed in the publication *Crop Varieties for Irrigation*. The lack of irrigation water indicates moisture as a major limiting factor compared to the yields reported for irrigated sites of annual cereal forages.

Waldeck Alfalfa Demonstration

Project Lead

- Gary Kruger, PAg, Provincial Irrigation Agrologist, Saskatchewan Agriculture, current project agrologist.
- Korvin Olfert, PAg, Provincial Irrigation Agrologist, Saskatchewan Agriculture, previous project agologist.

Co-Investigator

- Rory Cranston, AAg, Provincial Irrigation Agrologist, Saskatchewan Agriculture

Co-operators

- **Producer** Lane Willms, Waldeck, Sask.
- **Industry** Vern Turchyrn, Proven Seeds
  Kevin Dunse, Pickseed
  Peter Novak, Brett Young Seeds

Project Objective

The project objective is to demonstrate several of the latest, recommended alfalfa varieties on a field scale to irrigation farmers in the Swift Current area of Saskatchewan.

Demonstration Plan

The demonstration plan is to collect yield and forage quality data from a forage demonstration of 10 alfalfa varieties established in 2006 on the North Waldeck Irrigation Project. The demonstration consists of 10 varieties of alfalfa planted side-by-side, one each per border dyke.

Yield and forage quality results from the two cuts will be collected by weighing the bales harvested on each strip and sampling the bales for quality.

Demonstration Site

The demonstration site is located northeast of Swift Current in the Waldeck Irrigation District on NE 27-16-12 W3. Each of the variety treatments has only one replication. The field is a brown soil with clay texture.

Project Methods and Observations

The field demonstration was established in the spring of 2006 by seeding 10 alfalfa varieties from four different seed companies.

- Proven Seed varieties currently marketed under the Viterra label: Convoy, Equinox, Geneva, Gala, Ameristand 201+Z, and Spredor 4;
- Brett Young Seeds: HybriForce-400 and Magnum 3801+Z
- FarmPure seeds: AC Longview.

The plots were 12.2 metres wide and occupied one border dyke area. All varieties were sown at 12 pounds per acre (lb./acre). The first irrigation was applied to the field on May

12, 2009. The first cut of the field was mowed on July 8 and baled on July 15. The bales were weighed on August 5 and yields are reported in Table 1.

A second cut of the variety treatments was harvested by the grower on September 5, but the yield could not be determined and quality samples were not collected. Yields from the second cut were substantially lower as only seven bales in total were harvested from the 10 treatments for the second cut. This occurred because of infrequent rainfall.

Table 1. Hay yields in tonnes per hectare (t/ha) of alfalfa varieties at North Waldeck Irrigation District in spring 2009.

Variety	1st cut hay yield (t/ha)
AC Longview	4.24
Spredor 4	4.22
Starbuck	4.06
Ameristand	4.06
Equinox	4.04
Gala	3.94
Hybriforce	3.67
Geneva	3.49
Magnum	3.45
Conroy	3.20

Miry Creek Phosphorus Demonstration

Project Lead

- Gary Kruger, PAg, Provincial Irrigation Agrologist, Saskatchewan Agriculture, current project agrologist.
- Korvin Olfert, PAg, Provincial Irrigation Agrologist, Saskatchewan Agriculture, previous project agrologist.

Co-Investigators

- Rory Cranston, AAg, Provincial Irrigation Agrologist, Saskatchewan Agriculture.

Co-operators

- **Producer** Greg Oldhaver, Cabri, Sask.
- **Industry** Olynick Agro, Morse, Sask.
  Alpine Plant Foods, Aaron Fahselt, Shaunavon, Sask

Project Objective

The project objective is to compare the yield response of foliar phosphorus (P) application with the response obtained when broadcast P fertilizer is applied prior to irrigation of established alfalfa.

Project Background

The price of P fertilizer rose three- to four-fold in 2008. P promotes yield responses in alfalfa fields especially under irrigation. Alpine Plant Foods markets a liquid P fertilizer as a seed-row phosphorus source. This nutrient source is also promoted as a foliar P source. Although plant absorption of P through leaves is limited, foliar application avoids the risk of P immobilisation by soil colloids.

A new product, Avail™ has been developed to sustain the solubility of phosphorus fertilizer in the soil solution. This product binds soluble cations which precipitate P out of the soil solution. The product which is applied to the phosphate fertilizer maintains the dissolved phosphate fertilizer in a plant available form for a longer period of time.

Project Plan

The alfalfa field was broadcast sown in spring 2003 with a Valmar spreader with a blend of AC Longview alfalfa and orchardgrass followed by light harrowing to improve the seed to soil contact. Two cuts of alfalfa were taken each year following the establishment year. For the current demonstration, the broadcast and foliar P treatments were applied in spring on May 21, 2009 and after harvest of the first alfalfa cut on July 21, 2009. Avail was impregnated on broadcast 11-52-0 prior for the first fertilizer application only. A listing of the phosphorus treatments applied in the demonstration is shown in Table 1.

Table 1. P treatments applied to established alfalfa stand at Miry Creek in spring 2009.

Treatment	# Replications	Treatment	# Replications
Check	1	13.6 l/acre 6-22-2 (9 lb P_20_5/acre)	2
25 lb P_20_5/acre	1	27.2 l/acre 6-22-2 (17 lb P_20_5/acre)	4
25 lb P_20_5/acre (with Avail)	1	40.8 l/acre 6-22-2 (25 lb P_20_5/acre)	2
50 lb P_20_5/acre	1	-	-
50 lb P_20_5/acre (with Avail)	1	-	-

Demonstration Site

The demonstration was located on Plot 10 of the Miry Creek Irrigation District. The district is located north of Cabri on the south side of the South Saskatchewan River. The site was levelled for flood irrigation in 1977 and converted to wheel line irrigation in 1988. The soil at the Miry Creek site has a clay texture. Soil samples were collected from several of the fertilized strips prior to the application of nutrients and their analysis is reported in Table 2.

Table 2. Soil test P levels, P fertilization recommendations, and hay yields for the 2009 crop year.

Treatment	May 19 Soil Test P (lb./acre)*	P Fert. Rec. ALS Lab (lb P205/acre)	1st cut Yield (lb./acre)	2nd cut Yield (lb./acre)	2009 Total Yield (lb./acre)
Check	5	115	3160	2750	5910
25 lb P_20_5/acre	--		2570	3670	6240
25 lb P_20_5/acre (with Avail)	--		2800	3200	6000
50 lb P_20_5/acre	17	95	2860	4480	7340
50 lb P_20_5/acre (with Avail)	9	115	3220	3240	6460
One pass 6-22-2 (9 lb P_20_5/acre)	12	115	2860	3340	6200
Two pass 6-22-2 (17 lb P_20_5/acre)	9	115	3220	3280	6130
Three pass 6-22-2 (25 lb P_20_5/acre)	7	115	2860	3340	6060

*P analysis completed by ALS Laboratories, Saskatoon, using Modified Kelowna method (Qian et al., 1994).

Discussion

Granular P_2O_5 is normally between 30 to 40 cents per pound of actual P_2O_5. At this price level, the cost of the granular P_2O_5 is between $7.50 and $10 per acre at 25 lb P_2O_5 /acre and $15 to $20 at 50 lb P_2O_5 /acre.

For comparison, the liquid P_2O_5 applications cost about $12 for the one-time rate of 6-22-2 at 13.6 l/acre and $24 and $36 per acre for the two- and three-fold rates. The manufacturer does not promote higher rates of application of liquid phosphate than 13.6 l/acre. The increase in hay yield from fertilizer P ranges from one-quarter to three-quarters tonne of hay for a moderate rate of P fertilization.

With good quality hay valued at $75 per tonne, the fertilizer application would increase revenue between $20 and $50 per acre and provide a minimal return of two times the cost of the investment. Application of P fertilizer to this stand of hay on this soil is certainly profitable.

The demonstration also suggests that higher rates of foliar application beyond the minimum suggested by the supplier do not further increase hay yields. Hall et al. (2002) found that foliar application of various fertilizers had an effect on yield on only one site-year combination. In this particular case, the no-lime treatment had a lower yield than the other fertility treatments. When pH was at an optimum level, none of the foliar products increased stem density, yield, or quality of alfalfa for soils where the pH was 6.5 or higher.

The increase in value from the granular application is superior to the increase in value from the liquid application because the cost of liquid phosphate per lb of P_2O_5 is substantially higher and there is no further response to added phosphate beyond the minimal application rate. Granular applications seem to respond in hay yield to higher rates of P application. Root uptake of P increases hay yield more directly than does foliar P uptake.

The tested rates of phosphate applied to the alfalfa stand were substantially less than the recommended rates suggested by soil analysis. Doyle et al. (1992) reported demonstration strips established on an irrigated alfalfa field on Weyburn loam soil. His work showed alfalfa hay yields increased 20% from a broadcast application of 50 kg P_2O_5 per hectare (kg/ha) to an established alfalfa field. Application rates beyond 50 kg P_2O_5 /ha continued to increase hay yields but at a slower rate.

Koenig et al. (1998) found that, in Utah, two to three years of irrigated alfalfa production was sufficient to lower soil test levels of P. Low testing fields were prone to potassium (K) deficiency as well. Time of sampling was also found to influence soil test levels. Soil test levels peaked in early spring, decreased to their lowest point during the mid-season and increased again once the alfalfa became dormant in the fall.

Future work will evaluate both P and K on irrigated alfalfa fields that have been levelled to facilitate irrigation.

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New Crop Demos

Agroforestry Irrigation Scheduling Demonstration and Effluent Event

Project Lead

- Rory Cranston AAg, Provincial Irrigation Agrologist, Saskatchewan Agriculture current project agrologist.
- Lana Shaw PAg, Provincial Irrigation Agrologist, Saskatchewan Agriculture, previous project agrologist.

Co-Investigators

- Stacy Gutek, Provincial Irrigation Technician
- Bill King, Local Producer, Site Manager

Industry Co-operators

- Forest First, which was formerly managed by the Saskatchewan Forest Centre, and is now managed by the Saskatchewan Research Council.
- South Saskatchewan River Watershed Stewards Inc.
- Town of Outlook

Project Objective

The objective was to hold a field day at the Outlook Agroforestry Demonstration site at Outlook, Sask., to show the potential of irrigation of tree crops for the utilization of waste water.

Background

Forest First, in partnership with the Ministry of Agriculture and the Town of Outlook, began the agroforestry effluent irrgation project in 2007. The Town of Outlook provided the land for the project. Forest First developed the plot design and selected the tree species. Saskatchewan Agriculture, Irrigation Branch staff were involved with the irrigation system design. The Irrigation Branch Environmental Unit has collected moisture-use data over the 2008 and 2009 growing seasons.

There are four treatments of irrigation demonstrated in this project: effluent trickle, effluent microspray, canal trickle, and canal microspray.

Twelve tree species were planted in each treatment. Tree species include hybrid poplar, willow, green ash, Manitoba maple, balsam fir, red pine, lodgepole pine, and white spruce, black walnut, Siberian pine, bur oak, and Siberian larch.

Project Methods and Observations

❖ ***Irrigation and Soil Moisture Monitoring***

Irrigation applications were managed by site manager Bill King. Saskatchewan Agriculture Irrigation Branch staff monitored soil moisture levels of the hybrid poplar and willows throughout the growing season using Watermark™ sensors, and Time Domain Reflectometry (TDR) probes. Water uptake of the tree species varied widely due to the difference in growth rates of tree species. Each treatment received the same amount of irrigation. This resulted in over or under watering of tree species. Poplar and willow used much more water than the slower growing pines.

Irrigation was applied between June 10 and September 17. The micro-sprinkler treatments were irrigated for a longer period of time (see table 1) than the trickle irrigated plots.

Table 5. Summary of irrigation of the Outlook Agroforestry demonstration site.

	# of Irrigation applications	Total Irrigation Applied	Water per tree US gallons	Total water applied US gallons
Effluent				
Microspray	19	182 mm(7.2 inches)	792	195624
Trickle	12	25mm (1 inch)	128.8	23442
Canal				
Microspray	16	243mm(9.6 inches)	1054.8	260536
Trickle	16	50mm (2 inches)	177.1	43744

There is a visual increase in growth of most species in the irrigated blocks versus the non-irrigated block, but no visual difference between the fresh water and the effluent blocks. Data on growth amounts, either height or diameter, was not collected in 2009

Field day

A well-attended field day, promoting the potential of effluent irrigation, was hosted by the Ministry of Agriculture at the demonstration site on July 22, 2009. Bill King, site manager, provided information on the design and operation of the irrigation system. Water use of trees was discussed by John Kort of the Shelterbelt Centre, Agriculture and Agri-Food Canada (AAFC), and Larry White of Forest First. Ryan Evans of the Saskatchewan Ministry of Environment spoke about the effluent irrigation regulatory requirements. Kelly Farden, PAg, of the Irrigation Branch, Saskatchewan Ministry of Agriculture, provided information about irrigation suitability of soils. Maurija Skansen of the South Saskatchewan River Watershed Stewards Inc. discussed watershed protection and water conservation.

Summary

With pressure to go "green" and increasing urban populations, countries around the world are looking at agroforestry that utilizes effluent irrigation. The concept and practice are gaining interest among urban planners. The demonstration site at Outlook attracted a large crowd to a field day this past summer, and, more recently, drew international attention from an agri-business group from Ireland.

The purpose of this project has been achieved, the demonstration site has shown the potential of effluent irrigation on a tree crop. The future of the demonstration site now needs to be taken into consideration. There is a lot that can be learned from this site, but a research direction needs to be decided first.

Agroforestry offers a desirable option for effluent utilization as wood products are not consumed by humans or animal. In addition, wood products have profit potential. Agroforestry wood products can include construction-grade material or wood biomass, which is utilized for energy production. Also, agroforestry offers potential for carbon capture for use as carbon credits. Once the direction of the project is chosen, the irrigation system should be redesigned and modified to fit the purpose of the project.

Agronomic Trials

Dry Bean Variety Demonstration – Gordon Kent

Project Lead
- Rory Cranston AAg, Provincial Irrigation Agrologist, Saskatchewan Agriculture, current project agrologist.
- Lana Shaw PAg, Provincial Irrigation Agrologist, Saskatchewan Agriculture, previous project agrologist.)

Co-operators
- Gordon Kent, Riverhusrt, Sask.

Project Objective
The objective of this project includes a field-scale evaluation and demonstration of a new pinto bean variety produced by the AAFC Dry Bean breeding program in Lethbridge, Alberta. Maturity, disease development, and yield between three pinto bean varieties will be evaluated.

Project Plan
AC Island pinto beans were seeded on 20 acres under a 132-acre pivot. This variety was developed in the AAFC Dry Bean breeding program. AC Island has a five per cent yield advantage over Othello, with better plant structure and resistance to white mold. Winchester pinto beans were seeded on 20 acres. This pinto variety is commonly grown on irrigation acres in Saskatchewan because of its acceptable yield, and disease resistance characteristics. Othello was planted on the remaining acres. Othello has been grown widely throughout the prairies and has become a standard for acceptable yields. Othello and Winchester typically yield between 2,500 and 2,800 pounds per acre (lb./acre). Othello was planted as a check. Disease resistance, maturity, and ease of harvest were observed between the three bean varieties throughout the growing season. Yields were measured for each variety in the field.

Demonstration Site
The demonstration site was located on the Riverhurst Irrigation District on a 132-acre low-pressure pivot. This is the first year the field has been under irrigation. See Table 1 for more details.

Table 6. Kent demonstration site characteristics.

Land Location	NW 03-22-7 W3
Soil Type	Silty loam to sandy loam
Previous Crop	Wheat
Irrigation System	132-acre low-pressure pivot

Project Methods and Observations

❖ ***Crop Management***

All three varieties were seeded on May 30, 2009, following a pre-plant application of Edge. Establishment of Winchester at 5.8 plants per foot (5.8 plants/ft) was better than AC Island (2.6 plants/ft) and Othello (4.6 plants/ft). Weed control was effective in all three varieties. See Table 2 for site management details.

Table 7. Agronomic management of Kent demonstration site, 2009.

Nutrients	N	P	K
Soil residual	65 lb./acre	36 lb./acre	885 lb./acre
Soil Applied	60 lb./acre	30 lb./acre	
Foliar Applied	Zinc 20 lb./acre		
Variety	AC Island, Winchester, and Othello		
Seeding	May 30, 2009; 30-inch row-crop planter; 90,800 plants/acre		
Herbicide	Edge, 6.9 kg/acre, pre-seeding		
	Assure, 0.2 l/acre, June 3		
	Basagran, 0.91 l/acre, June 3		
	Merge, 0.07 l/acre, June 3		
Fungicide/Insecticide	Lance, 275 g/acre, August 1.		
	Parasol WP, 0.9 kg/acre, August 5		
Available moisture from May 26 to August 20			
Irrigation	178 mm (7.0 inches)		
Rainfall	168 mm (6.6 inches)		
Harvest	October 28 (undercut September 16)		

Irrigation

Soil moisture was monitored throughout the year with the use of a Watermark™ sensor installed at 12- and 22-inch depths. Rainfall and irrigation were recorded with the use of two rain gauges, one below the pivot and in a dry land area. Water use reports and recommendations were given to the co-operator throughout the irrigation season on a weekly basis. This was the first year the field had irrigation, so available moisture was low at the beginning of the season. Irrigation increased soil moisture to an acceptable level of 60 per cent or higher throughout the season. Irrigation concluded during the second week of August to allow the crop to mature.

Variety Comparison

Winchester had great emergence and better establishment than AC Island and Othello. There was a difference in maturity: Winchester matured about five days earlier than AC Island and Othello. Bacterial disease levels were low in all three varieties. White mold was more prevalent in the Othello. The co-operator noted the ease of undercutting for AC Island, comparing it with Winchester

Harvest

The field was undercut on September 16 and harvested on October 28. This left the crop in windrows for 42 days. Harvest was delayed due to untimely rain and snow. While in the field, the beans were exposed to wind, moisture and cold. Strong winds blew the rows and moved them causing harvest lost. AC Island and Othello seemed to be the most effected by the wind, where as Winchester was very durable in the wind. A 3.6-acre sample was harvested in each of the three areas. These samples were weighed to determine the yield of each variety. Winchester had the highest yield followed by AC Island and Othello (See Table 3).

Table 8. Dry bean harvest results.

Bean variety	AC Island	Othello	Winchester
Yield	2055 lb./acre	1522 lb./acre	2383 lb./acre

Final Discussion

The trial was affected by adverse weather conditions and poor moisture conditions.

This year, 2009, was the first year the field was irrigated and, since it was recently converted from dry land, the field had a very low soil-moisture profile. In addition, irrigation was delayed at the beginning of the season because there were problems with the irrigation equipment.

Rain and snowfall did not allow for a timely harvest. The crop was in windrows for a significant amount of time and exposed to strong winds, causing yield loss. Given these conditions, Winchester performed the best, followed by AC Island and Othello. These results do not agree with the *Crop Varieties for Irrigation* published by the Canada-Saskatchewan Irrigation Diversification Centre (CSIDC). It is suggested that this trial be reexamined in subsequent years to determine if these results were a situational case of poor performance.

Dry Bean Variety Demonstration – Lorne Jackson

Project Lead

- Rory Cranston AAg, Provincial Irrigation Agrologist, Saskatchewan Agriculture, current project agrologist.
- Lana Shaw PAg, Provincial Irrigation Agrologist, Saskatchewan Agriculture, previous project agrologist.

Co-operators

- Lorne Jackson, Riverhurst, Sask.

Project Objective

The objective of this project is to conduct a field-scale evaluation and demonstration of a new pinto bean variety produced by the Agriculture and Agri-Food Canada (AAFC) dry bean breeding program in Lethbridge, Alta. The project will examine maturity, disease development, and yield between two pinto bean varieties planted in a co-operators field.

Project Plan

AC Island pinto beans were seeded on 11 acres under a 22-acre pivot. This variety was developed in the AAFC dry bean breeding program. AC Island has a five per cent yield advantage over Othello with better plant structure and resistance to white mold. Winchester pinto beans were seeded on the other 11 acres. This pinto variety is commonly grown on irrigation acres in Saskatchewan because of its acceptable yield, and some disease resistance to white mold. Othello and Winchester yields can be expected to be 2,500 to 2,800 pounds per acre (lb./acre). Disease resistance, maturity, and ease of harvest were observed between the two bean varieties throughout the growing season. Yields were measured for each variety in the field.

Demonstration Site

The demonstration site was located on the Riverhurst Irrigation District under a 22-acre high pressure pivot. This field has been under irrigation for many years. See Table 1 for more details.

Table 9. Jackson demonstration site characteristics.

Land Location	NE 24-22-7 W3
Soil Type	Sandy loam
Previous Crop	Durum
Irrigation System	22-acre high pressure pivot

Project Methods and Observations

❖ ***Crop Management***

Winchester and AC Island were seeded on May 26, 2009 following a pre-plant application of Edge. Establishment of AC Island was very good, whereas Winchester had poor establishment at the start of the growing season. Chemical and physical weed control was effective in both varieties. See Table 2 for the agronomic management of the demonstration site.

Table 10. Agronomic management of Jackson demonstration site, 2009.

Nutrients	N	P	K
Soil residual	65 lb./acre	36 lb./acre	885 lb./acre
Applied	52 lb./acre	39 lb./acre	
Variety	AC Island (11 acres) and Winchester (11 acres)		
Seeding	May 26; 2009; 22-inch row crop planter; 85,000 plants/acre		
Herbicide	Edge, 6.9 kg/acre, pre-seeding		
	Basagran, 0.91 l/acre, June 27		
	Solo, 11.7 g/acre, June 27		
Fungicide/Insecticide	275 g/acre Lance July 28		
Available moisture from May 26 to August 20, 2009:			
Irrigation	217 mm (8.5 inches)		
Rainfall	168 mm (6.6 inches)		
Harvest	September 29, 2009 (undercut on September 12)		

Irrigation
Soil moisture was monitored throughout the year with the use of a Watermark™ sensor installed at 12- and 22-inch depths. Rainfall and irrigation were recorded with the use of two rain gauges, one below the pivot and one in a dry-land area. Water use reports and recommendations were given to the co-operator throughout the irrigation season on a weekly basis. The co-operator maintained good soil moisture conditions throughout the season, rarely letting it drop below 60 per cent available moisture. Irrigation was stopped in the second week of August to allow for proper crop maturity.

Variety Comparison
AC Island had a more uniform emergence and better establishment at the beginning of the season. There was a difference in maturity, with the AC Island maturing about five days later than Winchester. Bacterial disease levels appeared similar between the two varieties. White mold appeared more prevalent in the Winchester.

Harvest
The field was undercut on September 12 and harvested on September 29. The 17 days the beans were in windrows were warm and calm, allowing for good development. A 1.9-acre area was harvested in both varieties. These samples were weighed to determine the yield of each variety. AC Island had the higher yield (see Table 3).

Table 11. Dry bean harvest results.

Bean Variety	AC Island	Winchester
Yield	3116 lb./acre	2915 lb./acre

Final Discussion

After being undercut, the beans sat in the field for an acceptable amount of time (17 days) and had little harvest loss. AC Island performed very well this year compared to the commonly grown Winchester. Harvested yields were significantly higher in AC Island than in Winchester. This demonstration has shown that AC Island can be a viable bean variety for the prairies. This is the first year it has been demonstrated on a field size scale. AC Island will be used in future demonstrations to see how it performs in other situations as well as to compare it to other new varieties.

Canola Fungicide Demonstration

Project Lead
- Sarah Sommerfeld PAg, Provincial Irrigation Agrologist, Saskatchewan Agriculture

Producer Co-operator
- Kevin Plummer, Saskatoon, Sask.

Project Objective
The objective of this demonstration was to determine if a fungicide application on canola provided production and economic benefits.

Project Plan
To assess the efficacy of a Proline fungicide application for sclerotinia disease prevention, a check-strip comparison was performed. Sclerotinia disease severity and yield were recorded and compared between the fungicide-treated area and the untreated check area. To assess disease severity, a 100-plant survey was done within each treatment to count the number of main stem lesions and branch or pod lesions.

Demonstration Site
SW 23-35-6 W3
The field is located in the Moon Lake Irrigation District, southwest of Saskatoon and is irrigated by a low-pressure centre pivot. Soil texture on the field ranges from silty clay loam to clay over fine sandy loam to loamy sand. The field was cropped to Canadian Prairie Spring (CPS) wheat in 2008 and peas in 2007.

Project Methods and Observations
❖ ***Establishment and Crop Management***
The co-operator collected a spring soil sample and sent to ALS Laboratories for nutrient analysis. Round Up Ready Pioneer variety 45H28 was seeded on May 20, 2009. Fertilizer was applied at seeding with a double shoot system. Table 1 summarizes the agronomic management of the Plummer demonstration site.

Table 1. Agronomic management of Plummer site.

Nutrients	N	P	K	S
Residual (lb./acre)	35	40	>1080	>86
Applied (lb./acre)	84	22	0	0
Variety	45H28			
Seeding date	May-20			
Seeding rate (lb./acre)				
Field	5.5			
Herbicide	.33 L/acre Factor 540 at emergence and prior to canopy closure			
Fungicide	.126 L/acre Proline at 20 % bloom			

Irrigation

Tensiometers and Watermark™ sensors were installed at one location of the field at 30 and 60 centimeter (cm) depths (12 - 24 inches). A rain gauge was placed at the site to measure irrigation applications and rainfall. Soil was sampled at 30 cm (12 inches) increments, to the 1.2 meter (m) (48 inches) depth, to determine spring soil moisture by gravimetric analysis. Table 2 provides a summary of spring soil moisture.

Table 2: Spring soil moisture – May 26, 2009.

Texture	Depth		Available Moisture		
	cm	inches	%	mm	inches
Clay loam	0-30	0-12	100	56	2.2
Silty clay loam	30-60	12-24	100	51	2.0
Clay loam	60-90	24-36	100	56	2.2
Loamy sand	90-120	36-48	100	20	0.8
			Total	183	7.2

An irrigation scheduling recommendation was supplied to the co-operator weekly, calculated from equipment readings, available soil moisture and crop water use. Table 3 presents a summary of the rainfall, irrigation and crop consumptive use as documented by the Alberta Irrigation Management Model. Irrigation applications ended after August 5 based on available moisture stored in the soil profile, crop maturity and daily crop water use.

Table 3. Plummer site moisture data.

	mm	inches
Rainfall (April 8 - September 14)	169	6.7
Irrigation (May 29 - August 5)	103	4.1
Total	**272**	**10.8**
Crop Consumptive Use	327	12.9

Disease Assessment

A 100-plant survey from each treatment was inspected for sclerotinia infection on September 8 with the assistance of Dr. Randy Kutcher, Plant Pathologist with Agriculture and Agri-Food Canada (AAFC) in Melfort. A visual inspection of individual plants was performed to determine if the plant suffered from a main-stem lesion or if an upper branch or pod lesion was present. Results from the survey are shown in Table 4.

Table 4. Sclerotinia disease assessment results.

Treatment	Main stem lesions	Upper branch or pod lesions
Untreated	8	11
Fungicide applied	1	11

Harvest

The field was swathed on September 14 and harvest occurred on September 29. Harvest was completed with John Deere 9500 combines and yields measured with a weigh wagon. Yield data is shown in Table 5.

Table 5. Plummer yield data – September 29, 2009.

Treatment	Area (acres)	Weight (pounds)	Yield (bushels/acre)
Untreated	5.65	14 296	50.2
Fungicide applied	2.82	7 090	50.6

Discussion

The fungicide application was effective in reducing the number of main-stem lesions. The equal amount of upper branch or pod lesions may be attributed to a sclerotinia infection occurring outside the protection window of the fungicide. However, this demonstration did not exhibit a yield response from the application of Proline. With a product and application cost of $24/acre, a yield benefit of a least three bushels per acre (bu./acre), valued at $9 per bushel would be needed to cover the expenses. The rule of thumb often stated for canola is that a yield increase of at least 10 per cent is needed to justify the application of a fungicide, but this yield-increase number is greatly influenced by crop price.

Survey and assessment of canola diseases and severity in irrigated canola fields for the past two growing seasons, as part of the Saskatchewan Ministry of Agriculture's Canola Disease Survey, has indicated that sclerotinia is more prevalent in irrigated fields than growers realize. The inconclusive results from this demonstration and the information collected in the Canola Disease Survey are supporting the need for further fungicide work in irrigated canola.

Canola Seeding Rate Demonstration

Project Lead:
- Sarah Sommerfeld, PAg, Provincial Irrigation Agrologist, Saskatchewan Agriculture

Producer Co-operators:
- Grant Pederson, Outlook, Sask.
- Kevin Plummer, Saskatoon, Sask.

Project Overview

The current study entitled *Optimizing Agronomic Practices for Irrigated Grain and Oilseed Crop Production*, led by Dr. Ross McKenzie of Alberta Agriculture and Rural Development, indicates that achieving a seeding rate of 225 to 275 seeds per square metre (seed/m^2) in canola is optimal. The objective of this demonstration project is to document if a yield response is achieved by adjusting the seeding rate to these optimal rates. If an economically viable yield response can be achieved, producers can utilize this new knowledge to make simple agronomic changes to the management of canola to result in increased returns per acre.

Project Objective

The objective of this project is to determine if a positive yield increase is achieved by adjusting the seeding rate to 250 seeds/m^2 to obtain an established plant population of 15 plants/m^2.

Project Plan

The project plan was to calculate a seeding rate for the co-operator based on target plant density and thousand-seed weight (TKW). Seedling survival was estimated at 60 per cent. A designated area of the field was seeded at the increased rate. The remainder of the field was seeded at a rate of five lb./acre, typical of industry standard. Irrigation scheduling equipment was installed in each field to monitor soil moisture and to assist the agrologist in providing a scheduling recommendation. Plant populations from each treatment were counted to assess differences in plant density. Yield from each treatment were measured and compared.

Demonstration Site – Grant Pederson

NE 20-28-7 W3

The field is located in the South Saskatchewan River Irrigation District, south of Broderick, Sask., and is irrigated by a low pressure centre pivot. Soil texture throughout the field ranges from a loam to a clay loam. The field was cropped to potatoes in 2008.

Demonstration Site – Kevin Plummer

SW 23-35-6 W3

The field is located in the Moon Lake Irrigation District, south west of Saskatoon, and is irrigated by a low pressure centre pivot. Soil texture in the field ranges from silty clay loam to a clay over fine sandy loam to loamy sand. The field was cropped to CPS wheat in 2008 and peas in 2007.

Project Methods and Observations

❖ ***Establishment and Crop Management – Grant Pederson***

Round Up Ready Pioneer variety 45H28 was seeded on May 16, 2009, with a hoe drill in a conventional tillage system. Sulphur (0-0-0-90) was blended with the canola seed to try to achieve a seeding rate of five lb./acre for the field. The increased seeding rate area was seeded at 7.5 lb./acre. Table 1 summarizes the agronomic management of the field.

Table 1. Agronomic management of Pederson site.

Nutrients	N	P	K	S
Residual (lb./acre)	38	19	613	48
Applied (lb./acre)	45	25	0	5
Variety	45H28			
Seeding date	May-16			
Seeding rate (lb./acre)				
Increased SR	7.5			
Field	5			
Herbicide	Roundup Transorb HC at 0.5 L/acre			

Establishment and Crop Management – Kevin Plummer

A spring soil sample was collected and sent to ALS Laboratories for nutrient analysis. Round Up Ready Pioneer variety 45H28 was seeded on May 20, 2009, with an air drill into cereal stubble. Fertilizer was applied at seeding with a double shoot system. The increased seeding rate area was seeded at a rate of 10.5 lb./acre. Table 2 summarizes the agronomic management of the Plummer site.

Table 2. Agronomic management of Plummer site.

Nutrients	N	P	K	S
Residual (lb./acre)	35	40	>1080	>86
Applied (lb./acre)	84	22	0	0
Variety	45H28			
Seeding date	May-20			
Seeding rate (lb./acre)				
Increased SR	10.5			
Field	5.5			
Herbicide	.33 L/acre Factor 540 at emergence and prior to canopy closure			
Fungicide	.126 L/acre Proline at 20 % bloom			

Irrigation
Tensiometers and Watermark™ sensors were installed at one location in each field at 30 and 60 cm depths (12 and 24 inches). Two rain gauges were placed at each site to measure irrigation applications and rainfall. Soil was sampled at 30 cm (12 inches) increments, to the 1.2 m depth (48 inches) to determine spring soil moisture by gravimetric analysis. Tables 3 and 4 provide a summary of spring soil moisture for each site.

Table 3. Pederson spring soil moisture – May 28, 2009.

Texture	Depth		Available Moisture		
	cm	inches	%	mm	inches
Clay loam	0-30	0-12	38	20	0.8
Clay loam	30-60	12-24	69	39	1.54
Silty clay loam	60-90	24-36	100	56	2.2
Silty clay	90-120	36-48	100	63	2.5
			Total	178	7.04

Table 4. Plummer spring soil moisture – May 26, 2009.

Texture	Depth		Available Moisture		
	cm	inches	%	mm	inches
Clay loam	0-30	0-12	100	56	2.2
Silty clay loam	30-60	12-24	100	51	2.0
Clay loam	60-90	24-36	100	56	2.2
Loamy sand	90-120	36-48	100	20	0.8
			Total	183	7.2

An irrigation scheduling recommendation, provided weekly to the co-operators, was calculated from equipment readings, available soil moisture and crop water use. Tables 5 and 6 indicate the rainfall, irrigation and crop consumptive use for each site as recorded by the Alberta Irrigation Management Model (AIMM).

Table 5. Pederson moisture data.

	mm	inches
Rainfall (April 8 - September 15)	161	6.3
Irrigation (June 16 - September 15)	145	5.7
Total	**306**	**12**
Crop Consumptive Use	326	12.8

Table 6. Plummer moisture data.

	mm	inches
Rainfall (April 8 - September 14)	169	6.7
Irrigation (May 29 - August 5)	103	4.1
Total	**272**	**10.8**
Crop Consumptive Use	327	12.9

Data Collection

❖ ***Plant Counts***

A plant-density measurement occurred at each site approximately four weeks following seeding. Four random samples, each one-quarter of a square metre, were collected from each treatment were selected. Plants from each sample were counted and recorded. The data is presented in Tables 7 and 8.

Table 7. Pederson plant counts – June 18, 2009.

Plants/quarter m^2	
Increased Seeding Rate	Check
24	13
19	10
28	11
15	14
21.5	12
Plants/m^2	
86	48

Table 8. Plummer plant counts – June 16, 2009.

Plants/quarter m^2	
Increased Seeding Rate	Check
19	14
18	13
22	12
18	10
19.25	12.25
Plants/m^2	
77	48

The treatment areas did not achieve the target plant population of 150 plants/m^2.

Harvest – Grant Pederson

The cooperator's field was swathed on September 15 and the demonstration site was harvested on September 30. Yields were measured with a weigh wagon. The field was exposed to a severe, strong wind a few days prior to combining resulting in significant swath damage (Figure 1). The yield impact of the wind damage is not known, but should be considered. Yield data is shown in Table 9.

Table 9. Pederson yield data – September 30, 2009.

Treatment	Area (acres)	Weight (pounds)	Yield (bushels/acre)
Check	0.232	586	50.5
Increased SR	0.268	726	54.2

Figure 1. Wind damaged swaths at the Pederson site.

Harvest – Kevin Plummer

The field was swathed on September 14 and the demonstration project site was harvested on September 29. Yields were measured by weigh wagon. Yield data is shown in Table 10. This field did not suffer from wind damage.

Table 10. Plummer yield data – September 29, 2009.

Treatment	Area (acres)	Weight (pounds)	Yield (bushels/acre)
Check	5.65	14 296	50.6
Increased SR	2.82	7 034	49.8

Discussion

To determine if increasing the seeding rate provided an economic benefit to the producers, the increased costs were compared against the potential increased revenue to determine if a net gain resulted (Table 11). Assume the cost of seed to be $9 per pound ($9/lb.) and the price of canola to be $9 per bushel ($9/bu.).

Table 11. Economic evaluation of increased seeding rates.

Site	Treatment	Increased Revenue ($/acre)	Increased Cost ($/acre)	Net ($/acre)
Pederson	Increased SR	$33.30	$22.88	$10.42
Plummer	Increased SR	$0.00	$41.18	-$41.18

The Plummer site yielded well however did not show a yield response to the increased seeding rate. These inconclusive results have identified the need for further seeding rate evaluations under irrigation to be continued.

Organics

Organic Systems Evaluation

Project Lead
- Sarah Sommerfeld PAg, Provincial Irrigation Agrologist, Saskatchewan Agriculture

Industry Co-operators
- Jacob Vanderschaaf, Prairie Pride Organics
- Greg Sommerfeld, Elcan Forage Inc.

Project Objective
The objective of this project is to monitor fields within an organic crop rotation and identify agronomic practices that could be implemented to improve the productivity of crops. A main topic of discussion was determining the nitrogen mineralization potential from a previous alfalfa crop and the agronomic practices that would increase the nitrogen fixation and mineralization potential.

Project Plan
The project plan involved working in four organic fields, three of which grew potatoes and the fourth, wheat. Soil analysis was performed in each field, in spring and fall, to document the residual soil nitrogen.

To further increase the level of awareness of the project and the fertility potential of utilizing alfalfa in an irrigated organic crop rotation, the project lead assisted Prairie Pride Organics in the organization of a field event.

Demonstration Sites
All demonstration sites were located within the South Saskatchewan Irrigation District near Outlook, Sask. Each site is irrigated by a centre pivot.

SW 3-30-8 W3
Soil texture in the field ranges from sandy loam to a loam. This field produced organic potatoes in 2009 and was cropped to alfalfa from 2003 to 2008. The field also received an application of organic phosphorus and calcium, as rock phosphate, in the fall of 2008.

NW 25-30-8 W3
The soils are medium-textured ranging from silty loam to loam for the field. This field produced yellow peas in 2008 and potatoes in 2009.

The south half of SE 21-28-7 W3
The soil textures on the south half of the quarter are predominantly loam to silty loam. This field has been included in an organic farming system for numerous years by the land owner. In 2008, the south half of this quarter grew fall rye and in 2009 grew potatoes.

SW 27-27-7 W3
In 2008, this field was cropped to potatoes and in 2009 produced hard red spring wheat. The soil textures of this field are variable, but the predominant texture is a loam. In spring of 2009, the field received an application of rock phosphate at a rate of 300 pounds per acre (lb./acre).

Project Methods and Observations

❖ ***Spring Soil Sampling***

Two composite soil samples were collected from each demonstration site in May, prior to seeding, and submitted for analysis to ALS Laboratories in Saskatoon. Upon review of soil analysis results, a second sampling was done on three of the four sites in July. Results from each site are shown in Table 1.

Table 1. Spring soil sampling results.

Site	Crop	Date	Depth (cm)	N	P (lb./acre)	K
SW 3-30-8 W3	Potato	May-09	0-60	51	15	781
			0-60	56	13	783
		Jul-09	0-30	80	21	440
			30-60	47		
SE 21-28-7 W3	Potato	May-09	0-60	19	16	680
			0-60	24	18	719
		Jul-09	0-30	23	25	437
			30-60	30		
NW 25-30-8 W3	Potato	May-09	0-60	23	12	860
			0-60	28	12	794
SW 27-27-7 W3	Wheat	Jul-09	0-30	30	14	363
			30-60	38		

Fall Soil Sampling

A composite soil sample was submitted for analysis to ALS Laboratories in Saskatoon following harvest. Results are stated in Table 2.

Table 2. Fall soil sampling results.

Site	Crop	Date	Depth (cm)	N	P (lb./acre)	K
SW 3-30-8 W3	Potato	Oct-28	0-60 0-60	123 93	3 15	653 643
SE 21-28-7 W3	Potato	Nov-04	0-60	69	20	985
NW 25-30-8 W3	Potato	Nov-04	0-60	39	20	883

The results from the spring and fall sampling are inconclusive in determining the amount of nitrogen contributed to the soil through mineralization. The previous crop grown in rotation does affect mineralization potential, and the sampling indicates that a field previously cropped to alfalfa (SW 3-30-8 W3) mineralizes more nitrogen than the other sites.

Discussion

The premise for establishing an organic crop rotation for potato production is to utilize alfalfa as the base crop or nitrogen supply, as legumes can provide considerable amounts of nitrogen in the plant available form (Mohr et al., 1999). The number of years that the rotation can produce an annual crop before returning to alfalfa is the unknown factor of this production system. This project is an initial step forward in determining the number of years that alfalfa can be out of production within the rotation and what annual crops are suited for an intensive, irrigated rotation that includes potatoes.

An issue identified in this production season was that the nitrogen mineralization did not occur soon enough to provide the potato crop with sufficient nitrogen supply during tuber initiation and bulking. Previous studies have documented that if the rate of nitrogen mineralization is too slow, crop yield and quality can be negatively affected (Mohr et al., 1999).

A healthy, productive and adequately watered alfalfa stand has the potential to fix more nitrogen than a deficient or stressed plant. Timing of termination of the forage stand also determines the amount of nitrogen that will be available to the following crop (Manitoba Soil Fertility Guide, 2007). Terminating a forage stand during the growing season allows for micro-organisms to breakdown the organic material and release inorganic nitrogen into the soil for plant uptake. Early termination also allows the producer to irrigate and replenish soil moisture, to assist in the nutrient cycling process. When a forage stand is terminated during the fall months, the release of nitrogen from the organic form does not occur soon enough to meet following crop requirements (MAFRI, 2006).

If soil conditions are not favorable for micro-organism activity, such as depleted soil moisture, cool soil temperatures, or the carbon to nitrogen ratio in the soil is too high, the organic nitrogen compounds remain in the system longer and are not mineralized to the plant available nitrogen form as quickly.

Therefore, if the goal is to produce nitrogen then the method of choice may be to terminate the stand in July or August rather than October. Mid-season termination would also allow the producer to irrigate the stubble and improve soil moisture conditions for organic matter breakdown and nutrient mineralization. Further evaluation of these theories will be continued on through this project in 2010.

Extension

An organic field event was held the morning of August 19, 2009. The agenda included an in-field discussion with producers and agrologists on the processes involved in nitrogen fixation by alfalfa and the potential of alfalfa to supply nitrogen to succeeding crops. Much discussion also focused on the amount of residual nitrogen available in the second and following years after termination. This would affect the crop grown after potatoes, assuming that potatoes were grown in the first year following termination. This project is encouraging discussion among all involved regarding sustainable organic cropping systems in irrigation areas. Following the in-field discussion of alfalfa in organic cropping systems, a tour of True Potato Seed Technologies field research site at Broderick, Sask., was provided. The event concluded with a barbeque lunch in Broderick.

References

Manitoba Agriculture, Food and Rural Initiatives. 2006. Nitrogen Recommendations Following Legumes.

Manitoba Soil Fertility Guide. 2007.

Mohr, R., M. Entz, H. Janzen and W. Bullied. 1999. Plant-Available Nitrogen Supply as Affected by Method and Timing of Alfalfa Termination. Agron. J. 91: 622-630.

Technology Transfer

Ministry of Agriculture Agrologist Extension Events 2009

Field Days

- CSIDC Irrigation Field Day and Trade Show, July 16
    - Tour Leaders – Kelly Farden, PAg, and John Linsley, PAg
    - Forage field tour stop – Sarah Sommerfeld, PAg, and Gerry Gross, PAg
    - Tradeshow organization – Sarah Sommerfeld

- Outlook Effluent Agroforestry Demonstration Tour, July 22
    - Lana Shaw, PAg, and Rory Cranston, AAg.

- Irrigation Crop Tour –July 29
    - Lana Shaw, PAg, and Rory Cranston, AAg.

- Irrigated Forage Event – August 6
    - Sarah Sommerfeld, PAg, and Charlotte Ward, PAg.

- Irrigated Canola Field Tour – August 7
    - Sarah Sommerfeld, PAg.

- Organic Field Day – August 19
    - – Sarah Sommerfeld, PAg.

Booth Display

- Crop Production Week, Saskatoon, January 12-15

- CSIDC Irrigation Field Day and Tradeshow, Outlook, July 16

- ICDC/SIPA Annual Conference, Moose Jaw, November 9-10

Publications

- Management of Irrigated Dry Beans, Lana Shaw PAg

- Irrigation Economics and Agronomics, February 2009

- *The Irrigator*, March 2009

Ministry of Agriculture Agrologist Extension Events 2009

Fusarium Head Blight and Cereal Leaf Disease Survey
Sarah Sommerfeld PAg
Rory Cranston AAg
Ministry of Agriculture Provincial Specialists co-ordinate the annual Fusarium and Cereal Leaf Disease surveys. Ministry Irrigation Agrologists collect random samples from irrigated cereal crops across central Saskatchewan. Samples are submitted to the Crop Protection Lab in Regina or Agriculture and Agri-Food Canada Swift Current Research station for analysis and disease rating.

Canola Disease Survey
Sarah Sommerfeld PAg
The survey is co-ordinated by Ministry of Agriculture Provincial Specialists and AAFC Research Scientists. Survey and assessment of canola diseases and severity in irrigated canola fields is undertaken by the irrigation agrologists. The results are included into the provincial data.

Saskatchewan Advisory Council on Grain Crops
Sarah Sommerfeld, PAg
Rory Cranston, AAg
Regional crop variety testing occurs throughout different agro-climatic regions of Saskatchewan to collect performance data for various grain crops. The collected data is reviewed by the members of the advisory council and compiled into the Ministry's "Varieties of Grain Crops" publication. This publication provides producers with the ability to evaluate new grain crop varieties.

CSIDC Publications Committee
Gerry Gross, PAg
Sarah Sommerfeld, PAg
Rory Cranston, AAg
Gary Kruger, PAg
Agrologists participate in the review and update of CSIDC publications, as related to each person's specific areas of specialty.

Website Report 2009

Sarah Sommerfeld, PAg
The Irrigation Saskatchewan website at www.irrigationsaskatchewan.com has been redesigned to allow site visitors to irrigation topics related to ICDC, SIPA and the Minsitry of Agriculture. The new site will direct visitors to an ICDC subsection, a SIPA subsection or a link to an irrigation section of the Saskatchewan Ministry of Agriculture's website. The ICDC section includes ICDC reports, publications and events, as well as links to information relevant to irrigation crops.