Irrigation Crop Diversification Corporation

ICDC
Research and Demonstration Program Report
2011

ICDC – Delivering "value for money R&D" to Saskatchewan irrigators

www.irrigationsaskatchewan.com

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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

Directors of ICDC in 2011 were:

Name	Position	Irrigation District	Development Area Represented	Election Year (# terms)
	Vacant		SEDA	
David Bagshaw	Director	Luck Lake ID	LDDA	2013 (1)
Larry Lee	Director	Macrorie	SIPA rep.	Appt.
Kevin Plummer	Vice Chair	Moon Lake ID	NDA	2012 (1)
Russell Swihart	Director	Vidora ID	SWDA	2013 (1)
Colin Ahrens	Director	Rosetown	Non-District	2012 (1)
Neil Stranden	Alt. Vice Chair	SSRID	LDDA	2011 (2)
Jan Kőnst	Director	SSRID	SIPA rep.	Appt.
Rob Oldhaver	Chair	Miry Creek ID	SWDA	2011 (2)
John Babcock	Director		SA rep.	Appt.
Doug Billett	Director		SA rep.	Appt.

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.

Irrigation Crop Diversification Corporation

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Saskatchewan Ministry of Agriculture

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Field Crops

Dry Bean Irrigation Scheduling

Project Lead

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

Co-investigators

- Dr. Jazeem Wahab, CSIDC
- Sarah Butler, ICDC summer student

Co-operator

- CSIDC

Industry Co-operators

- Keg Agro
- Viterra

Project Objective

This project demonstrated two irrigation strategies for dry beans.

Project Plan

Dry beans do not perform well in wet soils. For this reason some farmers will not irrigate through the vegetative stage, effectively drought stressing the plant. Recent research from Viterra bean division in Bow Island Alberta, has suggested that adequate irrigation during the vegetative stage can provide a higher yield. The objective of this project was to demonstrate differences between the deficit and the adequate irrigation strategies.

The adequate irrigation strategy maintained soil moisture above 60 per cent of field capacity during the vegetative, flowering, and pod filling stages. The deficit irrigation strategy did not irrigate during the vegetative growth stage. Rather the crop was irrigated to raise and keep soil moisture levels above 60 per cent field capacity through flowering and pod filling. Both strategies were compared to a dry land check.

The two irrigation strategies were compared on six varieties of pinto dry beans. The dry bean varieties used in the demonstration were White Mountain 2, Winchester, AC Island, Othello, Medicine Hat and Maya. Plot size was three rows wide (60cm row spacing) and Four metres long. The plots were replicated four times.

Demonstration Site

This project was located at the Canada-Saskatchewan Irrigation Diversification Centre (CSIDC), which provided the land, facilities and staff to conduct this project. The soil at the site was a very fine sandy loam. The plots were seeded on June 2. Establishment was good. See Table 1 for agronomic management of the site.

Table 1: Agronomic management of the demonstration site

Nutrients (0-12")	N	P	K
Soil residual	30 lb. /acre	35 lb. /acre	>800 lb./acre
Applied		100 lb./acre	75 lb./acre
Varieties	White Mountain 2, Winchester, AC Island, Othello, Medicine Hat, Maya		
Herbicide	Poast Ultra June 23 Basagran / Assure II July 6 Bravo 500 July 21		
Fungicide	Lance July 28 Headline Aug. 13		
Seeding	June 2, 2011		
Available Moisture from May 1 to Oct. 1			
Irrigation	Adequate irrigation 112.5 mm (4.5 inches) Deficit irrigation 62.5 mm (2.5 inches)		
Rainfall	204 mm (8.2 inches)		
Harvest	Oct. 4		

Irrigation

The adequately irrigated treatment received its first irrigation on June 15 and received nine irrigation events throughout the season for a total of 112.5mm of water applied. The deficit irrigation treatment received its first irrigation on July 27, and received five irrigation events throughout the season for a total of 62.5 mm of water applied.

Harvest

At the time of publishing, yield results were not available.

Final Discussion

As there was limited yield information at the time of publishing, no conclusions on which irrigation strategy performed better for dry beans can be determined at this time.

White Mold Disease Survey

Project Lead

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

Co-investigator

- Sarah Butler, ICDC summer student

Co-operators

- Dale Ewen, RID, Riverhurst, SK
- Gordon Kent, RID, Riverhurst, SK
- Rodney Kent, RID, Riverhurst, SK
- Grant Carlson, SSRID, Outlook, SK
- Garth Weiterman, SSRID, Outlook, SK

Project Objective

The purpose of this project was to determine the critical control period for white mold in dry beans in the Lake Diefenbaker Development Area (LDDA) by surveying several irrigated dry bean fields and recording disease levels.

Project Plan

White mold is a serious disease for all dry bean producers throughout the Prairies. In the past, producers have had trouble identifying when they need to apply fungicide in dry beans. In many cases producers will apply a fungicide after the crop has been infected which is too late to prevent a yield loss. This project surveyed white mold incidence and severity in six dry bean fields in the South Saskatchewan River and Riverhurst Irrigation districts. This project used the equation listed below, as stated by Roland et al., to determine severity.

$\sum$ ((severity class x number of plants in class) x 100) / number of plants

Severity classes
0 = No disease
1 = Small lesions less than 5cm in the longest dimension
2= Expanding lesions on branches or stem
3= Up to half of branches or stem colonized
4= More than half of the branches or stem colonized and/or plant dead

At the beginning of July and until late August, each field was surveyed once a week. One hundred plants were inspected for white mold in each survey.

Demonstration Sites

The survey sites are listed in Table 1.

Table 1: Survey sites for white mold disease survey

Riverhurst Irrigation District		South Saskatchewan Irrigation District	
Site 1	SE 21-22-7 W3M	**Site 4**	SW 16-31-7 W3M
Site 2	SW 15-22-7 W3M	**Site 5**	W1/2 8-31-7 W3M
Site 3	N1/2 9-22-7 W3M	**Site 6**	SE 28-30-7 W3M

Irrigation

Soil moisture was monitored throughout the year with the use of Watermark™ sensors that were installed at six and 18-inch depths at each site.

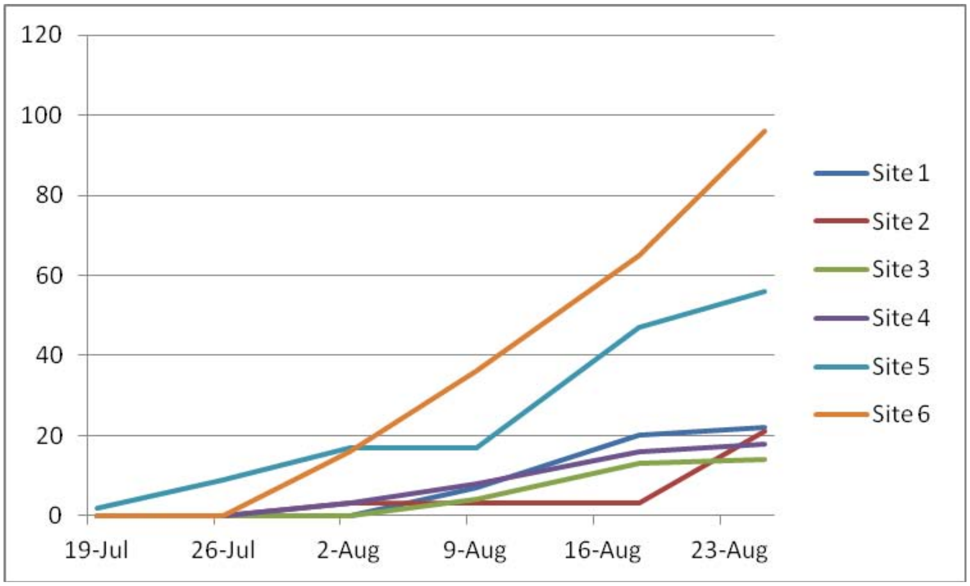
Disease Survey

Complete survey results can be seen in Table 2 and Figure 1.

Table 2: 2011 white mold disease severity at all sites

Date	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
19-Jul	0	0	0	0	2	0
26-Jul	0	0	0	0	9	0
2-Aug	1	3	1	3	17	16
9-Aug	7	3	4	8	17	36
18-Aug	20	3	13	16	47	65
25-Aug	22	21	14	18	56	96

Figure 1: 2011 white mold disease severity at all sites



White mold presence was lower in 2011 than 2010. In the White Mold Fungicide Demonstration project completed by ICDC in 2010, the minimum disease severity at the end of the season was 59 and the maximum was 233. In 2011 across all fields the minimum at the end of season was 14 to a maximum of 96.

In 2011, white mold was first observed at Site 5 on July 19 and was present at all sites by Aug. 9 .

Disease severity was higher in Sites 5 and 6. These sites were planted earlier and received more water than the other four sites. It was observed that Sites 5 and 6 had early canopy closure. The combination of early canopy closure and more water created a favorable environment for white mold infection.

Graphs of disease severity in individual sites can be seen in Figures 2-7; the vertical red line represents a fungicide application to control white mold.

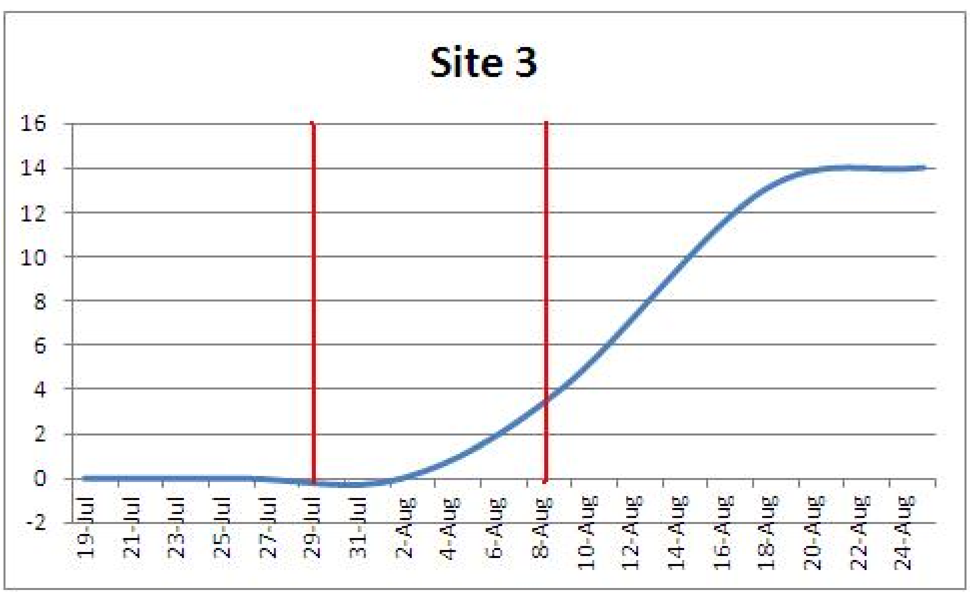
Figure 2: Disease severity on Site 1

An application of Lance on July 18 kept the field free of white mold until late July. Allegro was applied Aug. 3 to control white mold through August. There was an increase in disease severity in early August.

Figure 3: Disease severity on Site 2

White mold was first noticed at Site 2 on Aug. 2. An application of Lance on Aug. 3 stopped disease development until mid August. There was an increase of disease severity at the middle of August when the fungicide application lost its efficacy.

Figure 4: Disease severity on Site 3



Lance was applied July 29 and Aug. 8. White Mold was observed in the field on Aug. 2 and severity slowly increased throughout the rest of the season.

Figure 5: Disease severity on Site 4

Lance was applied on July 21 and Aug. 8. A small amount of white mold was observed on Aug. 2 when the first application of fungicide was losing efficacy; disease severity increased the rest of the season.

Figure 6: Disease severity on site 5

Allegro was applied on July 11 and 28 and Lance was applied on Aug. 13. White mold was first observed in this field on July 19. There was a slow increase in severity from the middle of July till the second application of fungicide on July 28. The second application slowed white mold infection until the middle of August.

Figure 7: Disease severity on site 6

Allegro was applied on July 11 and 28 and Lance was applied on Aug. 13. White Mold was first observed in this field on Aug. 2. The first application of fungicide prevented infection until late July. An infection occurred prior to the second application of fungicide and severity increased for the rest of the season.

Final Discussion

White mold is a disease that thrives in cool moist conditions and once it infects a dry bean crop there are no practices to remove it. All fungicides available to control white mold will only prevent an infection. A fungicide application will not cure the disease once it has established itself in a susceptible crop.

The 2011 dry bean crop year had a relatively low and late disease infection period when compared to previous years. This is mainly due to a warm summer and very few rain events in July and August. These conditions are not favorable to a white mold infection. White mold was present at all sites by August and showed up as early as July 19.

A fungicide application in the middle of July was found to be effective in preventing an early infection. An application of fungicide after infection occurred, stopped further development of white mold only in two cases, sites 2 and 5. From the observations in this survey in 2011, a fungicide application during the middle of July followed by another application 10 days later was effective in controlling white mold in dry beans. If the crop was planted prior to the fourth week of May or had more water, a third application in early August was beneficial.

To improve on this survey in the future, fields should have a one-acre minimum untreated check area and yields should be determined at the end of the year. This will demonstrate how severe the disease would have been without control and will help determine a yield loss per unit of disease severity

References

Roland, G.J. and Hall, R., 1987. "Epidemiology of White Mold of White Bean in Ontario". *Canadian Journal of Plant Pathology 9*, 218-224.

White Mold Control in Dry Beans

Project Lead
- Rory Cranston, PAg, Provincial Irrigation Agrologist, Saskatchewan Agriculture

Co-investigator
- Sarah Butler, ICDC summer student

Co-operator
- Craig Millar, LLID, Birsay, SK

Industry Co-operators
- BASF
- Syngenta

Project Objective
The purpose of this project was to demonstrate the best combination of fungicides in a two-fungicide application system for the control of white mold in high-yielding dry beans under irrigation conditions.

Project Plan
White mold is a serious disease concern for all dry bean producers throughout the Prairies. Over the past years the only fungicide available for control was Lance. In 2010, Allegro was registered for use in dry beans.

This project compared the two available fungicides in different combinations in a two-application system to control white mold in dry beans. White Mountain 2 pinto beans were planted on May 26. The treatments were: Lance – Allegro, Allegro - Lance, and Allegro -Allegro. On July 21 the field was treated with the first set of fungicides. On Aug. 2, the field was treated with its second set of fungicides. Yield and disease severity were measured and recorded.

Demonstration Site
The demonstration site was located on the S½ 27-24-8 W3M in the Luck Lake Irrigation District on a field with a 130-acre high pressure pivot. This field has been under irrigation for many years. The soil texture is clay and the field was cropped to wheat the previous year.

Irrigation
Soil moisture was monitored throughout the year using Watermark™ sensors and gravimetric analysis. Watermark™ sensors were installed at 12- and 24-inch depths. Soil samples for gravimetric analysis were taken every two weeks. Rainfall and irrigation were recorded with the use of rain gauges and a WeatherBug station in the area. Irrigation recommendations were provided on a weekly basis to the co-operating producer.

Crop Management

White Mountain 2 pinto dry beans were seeded on May 26. Establishment was very good. Wild mustard was a problem, but control was effective with a pre-seeding application of Edge, two post-seed applications of Basagran, and inter-row tillage. See Table 1 for agronomic management of the site.

Table 1: Agronomic management of C. Millar demonstration site

Nutrients (0-12")	N	P	K
Soil residual	20 lb./acre	35 lb. /acre	800 lb. /acre
Applied	60 lb./acre	40 lb. /acre	00 lb. /acre
Variety	White Mountain 2		
Seeding	May 26, 2011, 96000 plants/acre		
Herbicide	Edge May 23 Basagran June 20 Basagran & UAN 28-0-0 July 15		
Available Moisture from May 1 to Sept 1			
Irrigation	50 mm (2 inches)		
Rainfall	152 mm (6 inches)		
Undercutting	Aug. 28		
Harvest	Sept. 11		

Disease Severity

Disease severity was determined on Aug. 24 by the equation provided in Table 2 (Roland et al.). One hundred plants were sampled from each of the treatments.

$\sum$ ((severity class x number of plants in class) x 100) / number of plants

Severity classes
0 = No disease
1 = Small lesions less than 5cm in the longest dimension
2 = Expanding lesions on branches or stem
3 = Up to half of branches or stem colonized
4 = More than half of the branches or stem colonized and/or plant dead

Table 2: White mold disease severity on Aug. 24

Treatment	Lance-Allegro	Allegro-Lance	Allegro-Allegro
Disease rating	20	21	15

Harvest

The site was harvested on Sept. 10, an acre sample was taken from each treatment and measured for yield. See Table 3 for harvest results.

Table 3: Harvest results for Sept. 10

Treatment	Lance-Allegro	Allegro-Lance	Allegro-Allegro
Yield (lb./acre)	2154	2211	2995

Final Discussion

White mold presence was lower in 2011 than in 2010. In the White Mold Fungicide Demonstration project completed by ICDC in 2010, the minimum disease severity at the end of the season was 59 and the maximum was 233. In this project the minimum was 15 and the maximum was 21. White mold thrives in a cool moist environment and 2010 was a wet and cool year. 2011 was a warm year with very few rain events in July and August. This could be a reason for the lower disease presence in 2011.

There was a small difference in disease severity among the treatments. The Allegro-Allegro treatment had the lowest disease severity followed by the Lance-Allegro and the Allegro-Lance treatments.

The Allegro-Allegro treatment produced the highest yield followed by the Allegro-Lance and the Lance-Allegro treatments. The Allegro-Lance and the Lance-Allegro treatments had similar yields with a 57 lb./acre difference. The Allegro-Allegro treatment yielded 784 lb./acre more than the other treatments.

With similar disease severities among the treatments, it is difficult to determine the causes of the yield results from this project. Further investigation is required to determine the best combination of fungicides to control white mold in dry beans. However, all treatments successfully controlled white mold and aggressive treatments such as those demonstrated in this project are necessary for control of white mold in the Lake Diefenbaker Development Area.

References

Roland, G.J. and Hall, R., 1987. “Epidemiology of White Mold of White Bean in Ontario”. *Canadian Journal of Plant Pathology 9*, 218-224.

Fungicide Application Timing on Wheat

Project Lead

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

Co-investigator

- Sarah Butler, ICDC summer student

Co-operator

- Grant Pederson, SSRID, Outlook, SK

Industry Co-operators

- Bayer CropScience
- Syngenta

Project Objective

The purpose of this project is to demonstrate the best timing for a fungicide application to control diseases in high yielding wheat under high management irrigation conditions.

Project Plan

This project was designed to compare three fungicide application treatments for disease control in high-yielding irrigated wheat. This project compared a single fungicide application at the flag leaf stage to control leaf disease, a single application of fungicide at flowering to control Fusarium Head Blight (FHB), and a combination of the two treatments. Twenty liters of Quilt were provided by Syngenta. Quilt is a fungicide that is designed to be applied at the flag leaf stage and controls leaf disease. Twenty liters of Prosaro were provided by Bayer CropScience. Prosaro is a fungicide that is applied at flowering and is used to control FHB.

On July 8, Quilt was applied to a 40-acre area on a field of irrigated hard wheat. On July 16, Prosaro was applied to a 40-acre area, half of which was previously treated with Quilt. This created three 20-acre treatments. A 10-acre area was left untreated for comparison.

Yield, grade, and fusarium infection were determined for each of the treatments and compared to the untreated area. The samples were graded by Gardiner Dam Terminal (GDT) and levels of fusarium were determined by Discovery Seed Labs.

Demonstration Site

The demonstration site was located at NE 20-28-7 W3M in the South Saskatchewan River Irrigation District on a field with a 130-acre high pressure pivot. This field has been irrigated for many years. The soil texture is a loam and the field was cropped wheat the previous year.

Crop Management

Kane Hard Red Spring Wheat was seeded on May 16. Establishment was very good. There were some areas that had high populations of wild oats. See Table 1 for agronomic management of the site.

Table 1: Agronomic management of G.Pederson demonstration site

Nutrients (0-12")	N	P	K
Soil residual	30 lb./acre	50 lb. /acre	800 lb. /acre
Applied	112 lb./acre	36 lb. /acre	00 lb. /acre
Variety	Kane		
Seeding	May 16, 2011, 120 lbs/acre		
Herbicide	Thumper June 15 Puma June 15		
Fungicide	Quilt, July 8 Prosaro, July 16		
Available Moisture from May 1 to Sept. 1			
Irrigation	99 mm (4 inches)		
Rainfall	204 mm (8 inches)		
Harvest	Sept 10		

Irrigation

Soil moisture was monitored throughout the year with the use of Watermark™ sensors and gravimetric analysis. Watermark™ sensors were installed at 12- and 24-inch depths. Soil samples for gravimetric analysis were taken every two weeks. Rainfall and irrigation were recorded with the use of rain gauges and a WeatherBug station in the area. Irrigation recommendations were provided on a weekly basis to the co-operating producer.

Fungicide Evaluation

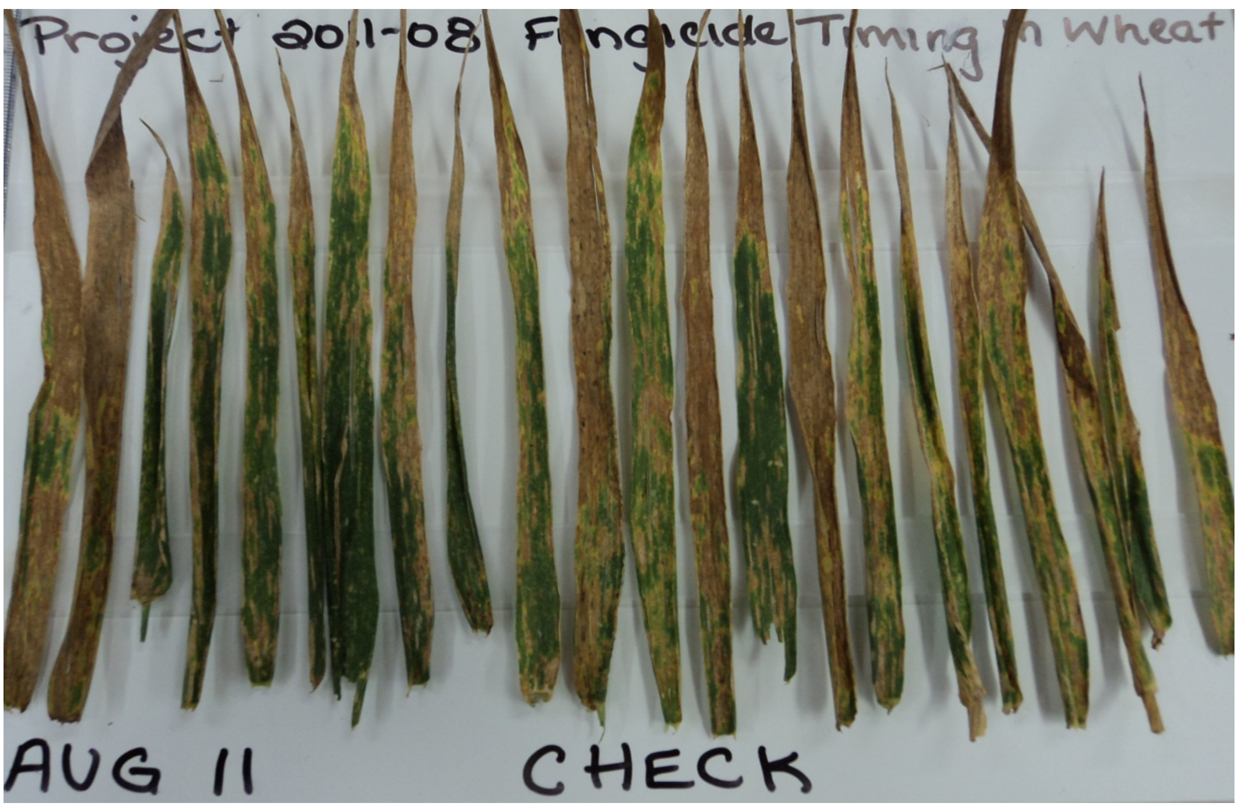
Quilt was applied July 8 and Prosaro was applied July 16. Irrigation was managed to minimize frequency of water application after fungicide application but without lowering soil moisture below 50 per cent of field capacity. Leaf samples taken on Aug. 11 showed visual differences between the fungicide treated areas and the untreated areas, see Figures 1- 4. The fungicide application at flowering produced the lowest disease presence on the leaf samples followed by the combination treatment, the flag leaf timing and untreated respectively.

Figure 1: Fungicide application at flowering - treated flag leaves

Figure 2: Combination treated flag leaves

Figure 3: Fungicide application at flag leaf timing - treated flag leaves

Figure 4: Untreated flag leaves



Harvest

Harvest yield measurements were taken on Sept. 10 (see Table 2). Yields were determined from samples taken from the three treatment areas and the untreated area. All three treatments showed a yield response compared to the untreated check. The fungicide application at flowering demonstrated the greatest yield benefit followed by the fungicide application at flag leaf timing and the combination treatment.

Table 2: Harvest results on Sept. 10

Treatment	Flowering timing	Flag leaf timing	Combination	Untreated
Yield (bu./ac.)	72	60	59	55
Fusarium graminearum	4%	7.5%	4%	2.5%
Total Fusarium	5%	10.5%	7%	3%
TKW	34.68	33.42	32.20	32.88
Grade	2	2	2	2

Final Discussion

All treatments increased yield. The application of fungicide at flowering had the largest yield benefit followed by the application at flag leaf. The combination treatment produced the least yield benefit. Fursarium levels were lowest in the untreated check followed by the fungicide application at flowering, the combination treatment and the application of fungicide at flag leaf timing treatment.

A yield benefit from the treatments was expected. The yield benefit realized from the fungicide application at flowering timing was higher than expected. In the 2010 FHB Fungicide Efficacy Demonstration project, hard wheat treated with Prosaro had an average yield benefit of four to six bu./acre. This year the wheat treated with Prosaro at flowering had a yield benefit of 17 bu./acre. The yield benefit from the combination treatment was expected to be the highest as it had the most protection throughout the season.

The untreated area had the lowest amount of fusarium infected kernels followed by the area treated with fungicide at flowering, the combination treatment, and fungicide application at flag leaf timing. Fusarium levels were expected to be lower in the flowering and combination treatments because these treatments had a fungicide application to protect from FHB infection. The results of the fusarium testing are difficult to interpret. When the samples were graded no fusarium damage was detected on any treatments. Each treatment and the check was graded a 2.

ICDC has implemented several projects on fungicide applications on durum and soft wheat that have shown fungicides will deliver yield benefits. This is the second year that ICDC has used a fungicide application to control disease in hard wheat. In both years and at all sites, a fungicide application on irrigated hard wheat has demonstrated a yield response. The greatest yield was realized when the fungicide application occurred at flowering to control FHB.

Canola Fungicide Demonstration

Project Lead

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

Co-investigator

- Sarah Butler, ICDC summer student

Co-operator

- Mark Gravalle, RID, Riverhurst, SK

Industry Co-operators

- Bayer CropSciences
- Syngenta

Project Objective

The purpose of this project was to demonstrate and compare the efficacy of a single application of fungicide with two applications of fungicides to control *Sclerotinia sclerotiorum* in high yielding canola under high management irrigation conditions.

Project Plan

This project compared a single fungicide application treatment to control *Sclerotinia sclerotiorum* against a treatment of two fungicide applications in high-yielding irrigated canola. On July 5, 65 acres of canola were treated with the fungicide Astound. On July 15, 40 acres of canola that was previously treated with Astound received an application of the fungicide Proline. This created a 40 acre area which was treated with two fungicide applications and a 25 acre area that received one fungicide application. Sixty-five acres were left untreated and used for comparison. Disease severity and yields were recorded to determine efficacy of the treatments.

Irrigation

Soil moisture was monitored throughout the year using Watermark™ sensors and gravimetric analysis. Watermark™ sensors were installed at 12- and 24-inch depths. Soil samples for gravimetric analysis were taken every two weeks. Rainfall and irrigation were recorded with the use of rain gauges and a WeatherBug station in the area. Irrigation recommendations were provided on a weekly basis to the co-operating producer.

Demonstration Site

The demonstration site was located on the SW 26-22-7 W3M in the Riverhurst Irrigation District. The field was developed for irrigation in 2011 and is irrigated with a 130-acre low pressure pivot. The soil texture was fine sandy loam and the field was cropped to wheat the previous year.

Crop Management
Canola variety invigor 5440 canola was seeded on May 10. Establishment was very good. Weed control was effective with two application of Liberty and Centurion. See Table 1 for agronomic management of the site.

Table 1: Agronomic management of M. Gravale demonstration site

Variety	5440
Seeding	May 10, 2011
Herbicide	Two applications of Liberty and Centurion
Fungicide	Astound July 5
	Proline July 15
Available Moisture from May 1 to Sept 1	
Irrigation	139 mm (5.56 inches)
Rainfall	155 mm (6.2 inches)
Undercutting	Aug. 28
Harvest	Sept. 12

Disease Severity
Disease severity was observed on Aug. 17 (see Table 2). Disease severity is ranked on a scale of 0-5 with 0 being no disease and 5 being high. Disease severity was determined by following the protocol below (Kutcher et al.).

One hundred plants were collected at random from the treated and check areas. Each plant was then rated on the presence of scleortinia stem rot. The ratings were as follows:

0 – No symptoms
1 – Infection of pods only
2 – Lesions situated on main stem or branches with potential to affect up to ¼ of seed formation and filling on plant
3 – Lesions situated on main stem or branches with potential to affect up to ½ of seed formation and filling on plant
4 – Lesions situated on main stem or branches with potential to affect up to ¾ of seed formation and filling on plant
5 – Main stem lesion with potential effects on seed formation and filling of entire plant

The severity rating is then calculated by using the following equation:

$$\frac{\text{Sum of the rating of all infected plants}}{\text{The number of infected plants}} = \text{Disease severity}$$

Table 2: Disease severity on Aug. 17

Treatment	Disease Severity
Check	4.3
One application of fungicide	2.2
Two applications of fungicide	1.6

Prior to swathing there was a visual difference between the treated areas and the untreated area. On the left half of Figure 1 is the untreated area, on the right is the area that received two fungicide application. The tan color plants are ones that have been affected by Sclerotinia. Figure 1 shows there are more affected plants in the untreated area on the left.

Figure 1: Untreated area on the left, two applications of fungicide treatment on the right

Harvest

The site was harvested on Sept. 10. A two-acre sample was taken from each treatment and measured for yield and thousand kernel weight. See Table 3 for harvest results

Table 3: Harvest results for Sept. 12

Treatment	Yield	Thousand kernel weight
Check	47 bu./acre	2.953g
One application of fungicide	52 bu./acre	3.193g
Two applications of fungicide	62 bu./acre	3.165g

Both treatments demonstrated a yield benefit. Two application of fungicide provided the largest yield benefit of 15 bu./acre while the single application of fungicide provided a yield benefit of four bu./acre. Part of the single application treatment area was located on a sandy knoll in the field where the crop was visually thinner. As a result, the yield data favors the two-fungicide application treatment.

The producer noted that swathing was easier in treated areas than in the check. Plants affected by sclerotionia, especially those with main stem lesions, will have a much weaker stem and will be more prone to lodging. Since the check had a higher disease incidence, and therefore more plants with weak stems, it could have caused the crop to lodge more and become harder to swath.

Final Discussion

Both treatments were successful in lowering disease severity, delivering a yield benefit and increasing thousand kernel weight. It was also noted that the fungicide treatments increased the ease of swathing. Treating the canola with fungicide twice had the largest yield benefit of 15 bu./acre. The single application of fungicide had a yield response of five bu./acre. The single application treatment had a topography issue that reduced the yield within that treatment, however it still yielded more than the check area. With a product and application cost of roughly $25-$30/acre and a yield benefit of at least three bu./acre, a value of $10 per bushel would be needed to cover the expenses of each fungicide application. The single application of fungicide resulted in an economic benefit of $20/acre. The two fungicide application treatment resulted in an economic benefit of $90/acre.

The Saskatchewan Ministry of Agriculture has conducted annual canola disease surveys. These surveys found an increase in *Sclerotinia sclerotiorum* incidence and severity. The results from this demonstration and the information collected in the canola disease surveys indicate that irrigated canola production can benefit from increased disease control through the use of fungicide.

References

Kutcher, H.R and T.M. Wolf. 2006. "Low-Drift Fungicide Application Technology for Sclerotinia Stem Rot Control in Canola". *Crop protection 25*. 640-646.

Crop Varieties for Irrigation – CSIDC 2011

Principal Investigators

- Garry Hnatowich, PAg, CSIDC/ICDC
- Don David, CSIDC

Organizations

- Canada-Saskatchewan Irrigation Diversification Centre (CSIDC)
- Agri-Environmental Services Branch (AESB) of Agriculture and Agri-Food Canada (AAFC)
- Irrigation Crop Diversification Corporation (ICDC)

Objectives

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

Research Plan

The CSIDC locale (on-station and Knapik fields) was used as test locations in 2011 for conducting variety evaluation 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, the private sector and associated producer groups.

Trials were conducted for registered varieties of cereals (spring wheat, barley, triticale, corn), oilseeds (canola, flax, soybean, sunflower) and pulses (pea, dry bean, faba 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, the Crop Development Centre, University of Saskatchewan, among others (see 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.

The trials consisted of small plots (1.2 m x 4 m; 1.2 m x 6 m; 1.5 m x 4 m; 1.5 m x 6 m) 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 at each site.

Results
The 2011 variety trials were established within recommended seeding date guidelines for the selected crops (Table 2). Climatic conditions in 2011 were favorable during the growing season (May – September) with respect to precipitation and accumulated heat units. As such, crops were excellent and developing well until two storm events occurred, one on July 13, the second on Aug. 6. Both the CSIDC and Knapik locations were affected.

The first hail event coincided with flower initiation of many of the crops under test. Crops suffered considerable petal drop or spike breakage as a consequence. Further, close to four inches of rainfall occurred over approximately 36 hours; field soil moisture had been raised to field capacity through irrigation just prior to the rainfall. Consequently, many trials were adversely affected by saturated conditions with some trials being under standing water for greater than two days. Remedial fungicide applications were conducted where appropriate. The second hail event was unfortunately far more damaging than the first. Most crops had progressed into reproductive development and sustained extensive damage to pods or spikes. For example with canola, pods were lost entirely from the plant or were visibly damaged by the appearance of punctures to the pods. Most damage occurred to the top two-thirds of canola plots. Field peas were severely damaged. Cereal heads were stripped or if still intact, the glumes were stripped exposing bare developing kernels. Along with the hail occurred high winds resulting in non-variety specific lodging. Consequently, harvest maturity and lodging ratings were unobtainable in many cases. Once again, fungicide applications were applied where appropriate.

Overall, yields were generally good for most of the 2011 trials, surprisingly so considering the weather damage sustained. Insect damage was minimal. Disease varied among the crops and locations but was not deemed overly yield-limiting. The dry bean trials had some white mold damage on specific varieties.

At the time of this document printing, quality analysis and data interpretation is still underway. The data from these trials will be 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 2012 Crop Production Show. As well, the variety guide will be mailed to all irrigators early in 2012.

A list of projects conducted in 2011 is outlined in Table 1. This work provides current and comprehensive variety information to assist irrigators in selecting crop varieties suited to intensive irrigated production conditions.

Table 1: 2011 variety trial locations, soil type and trial title and collaborators

Site	Legal Location	Soil Type
CSIDC main	SW15-29-08-W3	Bradwell very fine sandy loam
CSIDC off station (Knapik)	NW12-29-08W3	Asquith sandy loam

Cereal Trials	**Collaborators**	**Location**
1. Irrigated Wheat Regional	ICDC	CSIDC - main CSIDC - off station
2. SVPG CWRS Wheat Regional	Dr. R. Depauw, AAFC B. Recksiedler, SA S. Piche, SVPG	CSIDC - main CSIDC - main
3. SVPG High Yield Wheat Regional	Dr. R. Depauw, AAFC B. Recksiedler, SA S. Piche, SVPG	CSIDC - main
4. SVPG CWAD Wheat Regional	Dr. R. Depauw, AAFC B. Recksiedler, SA S. Piche, SVPG	CSIDC - main CSIDC - off station
5. Soft White Spring Wheat Coop	Dr. H. Randhawa, AAFC	CSIDC - main
6. Durum Wheat Salinity Screen	Dr. H. Randhawa, AAFC	CSIDC - main
70. Historical Durum Wheat Variety Trial	Dr. D. Singh, AAFC	CSIDC - main
8. SVPG Barley Regional (2-row & 6-row)	Dr. A. Beattie, CDC B. Recksiedler, SA S. Piche, SVPG	CSIDC - main
9. Annual Cereal Forage (Barley, Triticale & Oats)	ICDC	CSIDC - main
10. ACC Hybrid Grain & Silage Corn Performance Trials	B. Beres, AAFC	CSIDC - main
11. Durum Wheat Seeding Rate Trial	ICDC	CSIDC - main
12. Switch Grass & Big Bluestem Biomass Variety Trial	Dr. B. Coleman, CDC	CSIDC - main
Oilseed Trials		
1. Irrigated Canola Regional	ICDC	CSIDC - main CSIDC - off station
2. Canola Coop	R. Gadoua, CCC	CSIDC - main
3. Prairie Canola Variety Trial	Dr. R. Gjuric, Halpotech	CSIDC - main
4. Canola Seeding Rate Trial	ICDC	CSIDC - main
5. Flax Regional Trial	ICDC	CSIDC - main CSIDC - off station
6. Soybean Variety Adaptation Trial	B. Brolley, MAFRI ICDC	CSIDC - main

Trial	Collaborators	Location
Pulse Trials		
1. Irrigated Bean Variety Trial - Wide Row (Alberta)	Dr. P. Balasubramanian, AAFC ICDC	CSIDC - main CSIDC - off station
2. Dry Bean Wide Row Co-op	Dr. P. Balasubramanian, AAFC	CSIDC - main
3. Dry Bean Narrow Row Regional (Saskatchewan)	Dr. K. Bett, CDC ICDC	CSIDC - main CSIDC - off station
4. Irrigated Bean Variety Trial – Narrow Row (Alberta)	Dr. P. Balasubramanian, AAFC ICDC	CSIDC - main CSIDC - off station
5. Dry Bean Narrow Row Co-op	Dr. K. Bett, CDC	CSIDC - off station
6. Dry Bean Germplasm Advanced Yield Evaluation Trial	Dr. K. Bett, CDC	CSIDC - off station
7. Irrigated Pea Regional	Dr. T. Warkentin, CDC ICDC	CSIDC - main CSIDC - off station
8. Pea Coop A&B	Dr. T. Warkentin, CDC	CSIDC - off station
9. CDC Pea Germplasm Advanced Yield Trial	Dr. T. Warkentin, CDC	CSIDC - off station
10. Faba Bean Co-op A&B	Dr. A. Vandenberg, CDC	CSIDC - off station
11. CDC Faba Bean Germplasm Advanced Yield Trial	Dr. T. Warkentin, CDC	CSIDC - off station

Abbreviations:

CSIDC = Canada-Saskatchewan Irrigation Diversification Centre;
ICDC = Irrigation Crop Diversification Corporation;
SA = Saskatchewan Agriculture;
SVPG = Saskatchewan Variety Performance Group;
AAFC = Agriculture and AgriFood Canada;
CDC = Crop Development Centre;
U of S; ACC = Alberta Corn Committee;
CCC = Canola Council of Canada;
MAFRI = Manitoba Agriculture, Food and Rural Initiatives.

Forage Crops

Evaluation of Commercial Pasture Blends

Project Leads
- Sarah Sommerfeld, PAg, Regional Forage Specialist, Saskatchewan Agriculture
- Sarah Butler, ICDC summer student

Co-investigators
- Rory Cranston, PAg, Provincial Irrigation Agrologist, Saskatchewan Agriculture
- 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.
- Art Klassen, BrettYoung 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 dryland production.

Research Plan

A randomized, replicated plot design of six pasture blends is managed to simulate intensive grazing. Forage is cut at the vegetative stage, corresponding to the three-to four-leaf stage or 20 to 25 cm (eight to 10 in.) in plant height. Data collected includes overall yield and composition on a dry matter (DM) basis. Forage blend composition and change in composition is measured by hand harvesting a quarter-metre quadrant, separating the vegetation according to species, drying the sample and weighing the dry sample of each individual species. Overall plot yield is determined by mechanical harvest in addition to the hand-harvested yield. Harvest timing is dependent on forage growth.

Demonstration Site

CSIDC provides the land and facilities to accommodate 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 supplier's discretion. The custom blends were developed by the project lead and co-investigator.

The selection process provided a combination of simple and complex pasture blends with varying composition for comparison. Table 1 provides an overview of the forage species, varieties and proportion of species within 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%
Viterra Ranchmaster Blend		
Meadow bromegrass	hps brand	50%
Intermediate wheatgrass		15%
Pubescent wheatgrass		15%
Tall fescue	hps brand	15%
Alfalfa	Spredor	5%

Establishment

The target plant population for each treatment was designed to reflect the soil characteristics and moisture conditions of the trial area. Seeding of the irrigated and dryland treatments occurred on June 2, 2009.

The irrigation treatment targeted a plant population of 35 pure live seeds per square foot (PLS/ft^2). The dryland treatment targeted a plant population of 25 PLS/ft^2, but failed to successfully establish and was later removed from the trial.

Table 2 describes the seeding rate for the irrigation treatment. The seeding rate was calculated using the formula stated in the table which adjusts for the percentage of PLS for each forage variety. Plot dimensions are 1.2 m by 5.0 m with row spacing of 20 cm or eight inches.

Table 2: Recommended seeding rate of irrigation treatment

ICDC Perennial Pasture Blend Trial - IRRIGATION

Plot size = 1.2 m x 5 m = 6 m^2 = 0.0015 acres

Seeding Rate Calculation:

Seeding rate (lb./acre) = seeds/ft^2 x ft^2/acre / PLS seeds/lb.

Species	Proportion in blend by seed weight	Recommended seeding rate (lb. per acre) - IRRIGATION
Custom Blend #1		
Alfalfa	20%	1.86
Meadow bromegrass	80%	19.40
		21.26
Custom Blend #2		
Cicer milkvetch	30%	3.74
Meadow bromegrass	70%	16.97
		20.72
BrettYoung Super Pasture Blend		
Meadow bromegrass	50%	10.45
Crested wheatgrass	25%	2.48
Tall fescue	15%	1.07
Alfalfa	10%	0.97
		14.97
Pickseed HayGraze Blend		
Alfalfa	60%	5.53
Meadow bromegrass	30%	6.40
Orchardgrass	10%	0.30
		12.23
Northstar Custom Blend #1		
Meadow bromegrass	40%	8.36
Smooth bromegrass	10%	1.40
Tall fescue	15%	1.12
Orchardgrass	15%	0.39
Alfalfa	20%	1.77
		13.04
Viterra Ranchmaster Blend		
Meadow bromegrass	50%	11.62
Intermediate wheatgrass	15%	3.17
Pubescent wheatgrass	15%	2.79
Tall fescue	15%	1.23
Alfalfa	5%	0.46
		19.27

Crop Management
Phosphorus fertilizer was broadcast, as 11-52-0 at 50 lb. P_2O_5/acre, on Oct. 22, 2010. Potassium fertilizer, as 0-0-62 at a rate of 15 lb. K_2O/acre, was broadcast May, 2011.

Nitrogen fertilizer was applied to the cicer milkvetch and meadow bromegrass plots. These plots received 46-0-0 broadcast at 50 lb. N/acre on June 3, June 24, July 21 and Aug. 25. No herbicide applications were done.

A total of 224 mm of rainfall was received from April 17 to Sept. 18 and 112 mm of irrigation was applied to the trial area.

Data Collection
Two quarter-metre harvests were clipped from each plot on May 25. The species were separated, dried and weighed to determine the composition and contribution for each pasture blend (Table 3). Following the clipping harvest, a total plot harvest was completed to a height of 7.5 cm. Total plot harvest was performed on May 30, June 23, July 21 and Aug. 19. Dry matter (DM) yield (Table 4) and grazing days per acre (Table 5) were calculated for each blend.

Discussion
The 2011 data in Table 3 shows that the alfalfa contribution is declining and that a lower total DM yield, as shown in Table 4, was produced in comparison to the 2010 and 2009 data (ICDC Program Report 2010 and ICDC Program Report 2009). The decline in total DM yield resulted in fewer grazing days per acre, as shown in Table 5. The yield decrease may be attributed to the decline in alfalfa contribution consequently resulting in less biomass production but also to no irrigation applications in May and June due to equipment malfunction. Data collection will continue in 2012.

Table 3: Percent species composition at clipping harvest May 25, 2011

Plot	Blend	Total Dry Wt (g)	Alfalfa	Meadow Brome	Smooth Brome	Cicer Milkvetch	Crested Wheatgrass	Tall Fescue	Orchard Grass	Intermediate Wheatgrass
1	Custom Blend #1	52.75	62.0%	38.0%						
2	Northstar Custom Blend	46.65	48.0%	1.7%	0.2%			4.5%	45.5%	
3	Custom Blend #2	31.85		98.1%		1.9%				
4	BrettYoung Super Pasture Blend	63.65	60.1%	12.3%			3.9%	23.7%		
5	Viterra Ranchmaster Blend	35.6	36.0%	14.4%				39.7%		9.9%
6	Pickseed Haygraze Blend	45.75	23.3%	1.6%					75.1%	
7	Northstar Custom Blend	39.5	18.7%	4.0%	6.4%			11.9%	59.0%	
8	BrettYoung Super Pasture Blend	36.4	57.8%	9.0%			8.2%	24.9%		
9	Custom Blend #1	28.8	44.6%	55.4%						
10	Pickseed Haygraze Blend	25.25	12.6%	4.3%					83.1%	
11	Viterra Ranchmaster Blend	22.35	46.8%	12.3%				29.7%		11.3%
12	Custom Blend #2	33.35		99.7%		0.3%				
13	Custom Blend #2	40.5		94.9%		5.1%				
14	BrettYoung Super Pasture Blend	54.9	22.0%	10.5%			2.7%	64.7%		
15	Custom Blend #1	52.75	53.4%	46.6%						
16	Viterra Ranchmaster Blend	37.45	30.5%	20.8%				43.3%		5.4%
17	Pickseed Haygraze Blend	70.8	22.3%	2.1%					75.6%	
18	Northstar Custom Blend	49.8	45.8%	3.9%	1.0%			6.5%	42.8%	
19	Northstar Custom Blend	80.05	26.3%	0.3%	0.1%			7.2%	66.0%	
20	Pickseed Haygraze Blend	58.65	37.2%	5.8%					57.0%	
21	Custom Blend #1	55.35	40.0%	60.0%						
22	Custom Blend #2	45.75		99.0%		1.0%				
23	Viterra Ranchmaster Blend	31.4	29.4%	24.4%				40.5%		5.6%
24	BrettYoung Super Pasture Blend	51.3	7.3%	18.1%			2.6%	72.0%		

Table 4: 2011 irrigation treatment harvest data

Blend	Average DM Yield (ton/acre)				Average DM Yield per Cut (ton/acre)	Total DM Yield (ton/acre)
	Cut 1 May-30	Cut 2 Jun-23	Cut 3 Jul-21	Cut 4 Aug-19		
Custom Blend #1	1.20	0.75	1.27	0.61	0.96	3.84
Northstar Custom Blend	1.61	1.25	1.21	0.84	1.23	4.91
Custom Blend #2	1.02	0.52	1.15	0.64	0.83	3.32
Brett-Young Super Pasture Blend	1.02	1.66	1.50	0.72	1.22	4.89
Proven-Viterra Ranchmaster Blend	1.17	1.12	0.97	0.66	0.98	3.93
Pickseed Haygraze Blend	1.38	0.95	1.03	0.59	0.99	3.96

Table 5: Calculated grazing yields

Blend	Total DM Yield (ton/acre)	Total DM Yield (lb./acre)	Total DM Pasture Yield (lb./acre)	Grazing days (AUM/ac)	Grazing days (AU days/acre)
Custom Blend #1	3.84	8453	5917	6.5	197
Northstar Custom Blend	4.91	10811	7568	8.3	252
Custom Blend #2	3.32	7317	5122	5.6	171
Brett-Young Super Pasture Blend	4.89	10785	7550	8.3	252
Viterra Ranchmaster Blend	3.93	8654	6058	6.6	202
Pickseed Haygraze Blend	3.96	8729	6110	6.7	204

Assumptions:
Pasture yield calculated as total DM yield with a 70 per cent utilization rate.
3 per cent of body weight DM requirement = 30 lb. DM/AU/day * 30.5 days = 915 lb. DM/AUM.
1 AU = one 1,000 lb. cow with or without calf.

Acknowledgements

The project lead would like to acknowledge Rory Cranston, PAg and Sarah Butler for their assistance with trial management and data collection in the 2011 program year. Their efforts are greatly appreciated.

References

Irrigation Crop Diversification Corporation. 2009. *ICDC Research and Demonstration Program Report 2009*.

Irrigation Crop Diversification Corporation. 2010. *ICDC Research and Demonstration Program Report 2010*.

Perennial Forage Biomass Measurement for Ethanol Production

Project Leads

- Sarah Sommerfeld, PAg, Regional Forage Specialist, Saskatchewan Agriculture
- Sarah Butler, ICDC summer student

Co-investigators

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- 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 using a human food source. Biomass production offers an alternative to producing renewable fuels utilizing feed grains.

Research Plan

A randomized, replicated small plot trial including 10 perennial grass species is managed to achieve a single cut harvest. Harvest timing occurs when the species reach physiological maturity or by Sept. 15. Total plot yield is recorded and a dry matter (DM) yield is calculated.

Demonstration Site

CSIDC provides the land and facilities to accommodate this project.

Project Methods and Observations

Species Selection and Establishment

Nine cool season perennial grass species and one warm season perennial grass were selected for this trial. Seeding occurred on June 2, 2009, with a target plant population of 35 pure live seeds (PLS) per square foot. Plot dimensions are 1.2 m by 5.0 m with row spacing of 20 cm (eight inches). Table 1 summarizes the selected species, variety and seeding rates.

Table 1: Perennial grass species, variety and seeding rate

Species	Variety	Recommended seeding rate (lb per acre)
Tall wheatgrass	Orbit	22.4
Russian wildrye (diploid)	Swift	10.2
Switchgrass	Dakota	5.6
Intermediate wheatgrass	Chief	18.2
Smooth bromegrass	Signal	11.8
Crested wheatgrass (tetraploid)	AC Goliath	9.2
Hybrid bromegrass	AC Success	17.7
Slender wheatgrass	Adanac	10.0
Meadow bromegrass	Paddock	20.1
Western wheatgrass	Walsh	14.6

Crop Management

The trial area received broadcast application of 11-52-0 on Oct. 22, 2010, at 50 lb. P_20_5/acre. In May 2011, 46-0-0 and 0-0-62, were broadcast at rates of 100 lb. N/acre and 15 lb. K_20/acre. The total rainfall received from April 17 to Sept. 18, was 224 mm and 112 mm of irrigation was applied. A herbicide application of dicamba and 2,4-D was done Oct. 2011 for broadleaf weed control.

Harvest Data

A single total biomass cut was harvested on July 25, 2011. Average dry matter yields for each species are reported in Table 2.

Table 2: Average DM yield data collected on July 25, 2011

Species	Yield (t DM/acre)
Western wheatgrass	3.74
Switchgrass	4.81
Russian wildrye	4.96
Crested wheatgrass	5.71
Slender wheatgrass	6.30
Meadow bromegrass	6.54
Hybrid bromegrass	6.80
Tall wheatgrass	7.31
Intermediate wheatgrass	7.89
Smooth bromegrass	8.60

Discussion

The 2011 yield data indicates that tall wheatgrass, intermediate wheatgrass and smooth bromegrass were the three most productive perennial forage species in this production year. In comparison to the 2010 data, the average yield increased or stayed constant for eight of the 10 grass species (ICDC Program Report 2010). Data collection will continue in 2012.

Acknowledgements
The project lead would like to acknowledge Rory Cranston, PAg, and Sarah Butler for their assistance with trial management and data collection in the 2011 program year. Their efforts are greatly appreciated.

References

Irrigation Crop Diversification Corporation. 2010. *ICDC Research and Demonstration Program Report 2010*.

Alfalfa Management Trial 2011

Project Leads

- Sarah Sommerfeld, PAg, Regional Forage Specialist, Saskatchewan Agriculture
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Co-Investigators

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- 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, Viterra
- Art Klassen, BrettYoung Seeds
- Kevin Dunse, Pickseed
- Nicole Tanner, FarmPure Seeds*
  **Since the establishment of this trial, FarmPure Seeds has been acquired by Pickseed. Pickseed now places two varieties 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 field-scale trial of seven alfalfa varieties replicated three times is managed to harvest three cuts. Cut timing is based on calendar dates of June 15, Aug. 1, and Oct. 1. Fertility management includes annual applications of phosphorus and potassium, at 75 lb. /acre actual nutrient. Irrigation applications are scheduled through weekly monitoring of soil moisture and daily crop water use by an agrologist. Harvest protocol requires the plots to be cut and weighed with a forage harvester.

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.

Project 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. All varieties, except AC Blue J, were provided by industry. These variety descriptions were taken from product resource materials.

Secan
AC Blue J is a taprooted variety, suited for hay or pasture use, that also serves as the irrigated check for the trial.

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

Viterra
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 multifoliate 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. Multifoliate varieties exhibit a proportion of leaves with five to eleven leaflets per leaf rather than the three leaflets per leaf in trifoliate varieties. Multifoliate leaf expression provides for higher forage quality.

BrettYoung Seeds
Hybriforce 400 alfalfa features improved establishment, winter hardiness and rapid re-growth. It is the only hybrid alfalfa variety available on the market.

Pickseed
2065 MF is a multifoliate variety that exhibits rapid regrowth, excellent winter hardiness and persistence in the stand.

AC Longview has excellent regrowth 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, at a seeding rate of 12.6 lb./acre for each variety. The Equinox variety was re-seeded on July 2, 2008, due to a seeding equipment malfunction.

A broadcast application of 11-52-0 was applied on Oct. 22, 2010, at 75 lb. P_20_5/acre. A fall soil analysis in Nov. 2010 showed 11 lb. NO_3-N/acre, 20 lb. P/acre and 462 lb. K/acre available in the 0-30 cm depth.

On April 20, 2011, 0-0-62 was applied at 75 lb. K_20/acre. No herbicides were applied. Site rainfall was recorded at 224 mm from April 17 to Sept. 18 and 125 mm of irrigation was applied from May to September.

Data Collection

Forage harvest occurred on June 20, Aug. 4 and Sept. 22, 2011. Two yield measurements were recorded for each plot per cut. The average dry matter (DM) yield per cut for each variety is reported in Table 1. The total average DM yield is summarized in Table 2.

Table 1: 2011 average dry matter (DM) yield per cut

Cut 1	Average DM Yield (t/acre)	Cut 2	Average DM Yield (t/acre)	Cut 3	Average DM Yield (t/acre)
AC Longview	1.45	53Q30	1.14	53Q30	1.18
Equinox	1.91	AC Longview	1.23	Equinox	1.26
Hybriforce 400	1.93	Equinox	1.25	Hybriforce 400	1.28
AC Blue J	2.06	AC Blue J	1.77	AC Blue J	1.28
Stealth	2.13	Stealth	1.79	2065MF	1.31
53Q30	2.15	2065MF	1.82	Stealth	1.33
2065MF	2.31	Hybriforce 400	1.84	AC Longview	1.42

Table 2: 2011 total dry matter (DM) yield

Variety	3 Cut Total DM Yield (t/acre)
AC Longview	4.09
Equinox	4.42
53Q30	4.47
Hybriforce 400	5.04
AC Blue J	5.11
Stealth	5.25
2065MF	5.43

Final Discussion

There was a slight decline in the total dry matter yield in comparison to the 2010 harvest data, as reported in the ICDC Program Final Report 2010, but overall productivity was still very good. At the time of publishing, a statistical analysis of the three years of collected harvest data was not available. This was the final year of data collection and a variety recommendation factsheet based on the analysis of collected yield data will be available in Jan. 2012.

Future utilization of this trial area for forage fertility demonstrations is being considered for the 2012 program.

References

Irrigation Crop Diversification Corporation. 2010. *ICDC Research and Demonstration Program Report 2010*.

Irrigated Salt-Tolerant Alfalfa Variety Demonstration

Project Lead

- Gary Kruger, PAg, Provincial Irrigation Agrologist, Saskatchewan Agriculture

Co-Investigators

- Dr. Harold Steppuhn, PAg, Salinity Hydrologist, Semiarid Prairie Agricultural Research Centre (SPARC), Agriculture and Agri-Food Canada, Swift Current, SK
- Garth Weiterman, PAg, Senior Irrigation Agrologist, Saskatchewan Agriculture

Co-operators

- Barry Vestre, Field Operations Supervisor, Canada-Saskatchewan Irrigation Diversification Centre (CSIDC)

Industry Support

- Don Miller, Producer's Choice Seeds, Nampa, Idaho, USA
- Jonathan M. Reich, Cal/West Seeds, Woodland, California, USA

Project Objective

The objective of this project is to demonstrate the performance of several alfalfa lines which offer improved salt tolerance.

Project Background

Alfalfa is grown on many acres in Saskatchewan because of its ability to tolerate salinity and to produce excellent quality forage where other crops struggle to survive. Preliminary testing done at the Semiarid Prairie Agricultural Research Center (SPARC) by Dr. Harold Steppuhn identified three varieties with superior salt tolerance:

1) Bridgeview;
2) Halo; and
3) CW064027.

These varieties along with AC Blue J as the control were grown in the field demonstration at CSIDC. AC Blue J is a proven forage alfalfa variety widely grown under irrigation. It is rated at 104 -per cent the yield of Beaver in the 2011 CSIDC Crop Varieties for Irrigation publication.

Bridgeview has received registration in 2011. The research line was known as L4039 SC Salt and was developed at Agriculture and Agri-Food Canada, Lethbridge from salt-tolerant selections of Apica, AC Blue J, Barrier, Beaver, Heinrichs, Rangelander and Roamer alfalfa.

Halo was developed by Calwest Seeds based in Woodland, California and is currently marketed by Viterra Seed. As a research line, it was known as CW 34024.

CW064027 is a research line developed by Calwest Seeds which has not yet been registered for production in Canada. Of the four varieties, it has the most rapid regrowth after cutting and is the tallest alfalfa variety in the demonstration.

Demonstration Plan

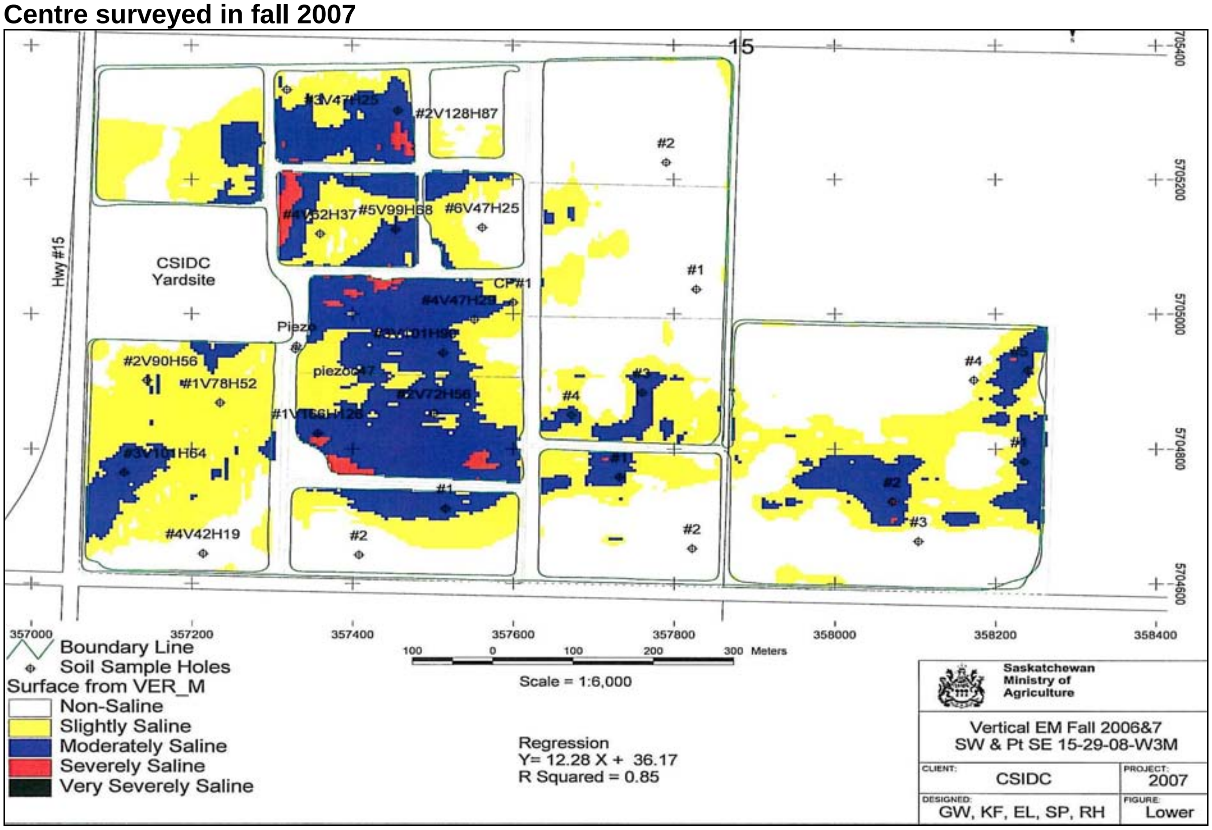
The salt-tolerant alfalfa demonstration is located at CSIDC. The site for the demonstration was selected using a Global Positioning System (GPS) referenced soil salinity reconnaissance map prepared by the Irrigation Environmental Unit of Saskatchewan Agriculture in 2007 (Figure 1).

Demonstration Site

The site was located on Field 12 at CSIDC and was irrigated with a Valley pivot system. The field had been planted to triticale for green feed for two years prior to planting to alfalfa in June 2010. Soil samples were collected in spring 2010 and submitted for analysis to Western Ag Labs. The analysis with interpretation for alfalfa recommended only potassium for the heavier textured north side and only sulphur for the lighter textured south side.

A preliminary salinity survey using a hand-held EM38 was conducted in spring of 2010. In Oct. 2010, the site was mapped by the Irrigation Environmental Unit to record changes in the soil salinity over time. This survey was used to prepare a salinity contour map of the plot area as shown in Figure 1.

Figure 1: Salinity reconnaissance map of Canada-Saskatchewan Irrigation Diversification Centre surveyed in fall 2007



Project Methods and Observations

The alfalfa varieties were seeded June 29, 2010, with a six-row research drill. The four varieties were sown in long narrow strips 1.5 m wide x 600 m long across the field. The strips were sown in two blocks of the four varieties with the restriction that each variety be adjacent to each of the other varieties between the two blocks. The seeding rate was 9 kg seed/ha and the seeding depth was 1.5 cm. The germination rate of the research lines were 75 per cent for Bridgeview, 95 per cent for Halo and 87 per cent for CW064027. The 1,000-kernel weight for these three lines was 2.180g, 2.024g and 2.4281g, respectively. The demonstration area was sprayed with Cobutox 400 at 1 L/ac. on July 30, 2010, to control redroot pigweed and shepherd's purse and other broadleaf weeds on the site. The site was cut for hay following frost on Sept. 18, 2010. A salinity investigation was conducted on Oct. 21 to prepare a map showing the variation in salinity classes over the plot.

Yield data was collected in 2011 to evaluate the salt tolerance of the varieties. A series of eight transects were selected using the results of the salinity gradient map to identify areas representing the different salinity ratings. One nonsaline, five moderately saline and two severely saline transects were selected to determine the forage yield of the varieties. Forage quadrats were harvested at early bloom stage of the alfalfa on June 23, Aug. 4 and Sept. 15. (Table 2) Soil samples from the 60-90 cm depth were collected from each transect plot at the time of the June harvest.

One of the difficulties of evaluating varietal performance in relation to soil salinity is the extent to which salinity varies over distance and with time. The salinity present at the first sampling date was determined at the 60-90 cm depth.

The field verification technique developed by Dr. Harold Steppuhn places each variety adjacent to the other varieties in the demonstration between the two replications. This technique allows visual evaluation of different forage cultivars for their tolerance to salinity. The salinity of each sampling point was determined for the June 23 sampling date.

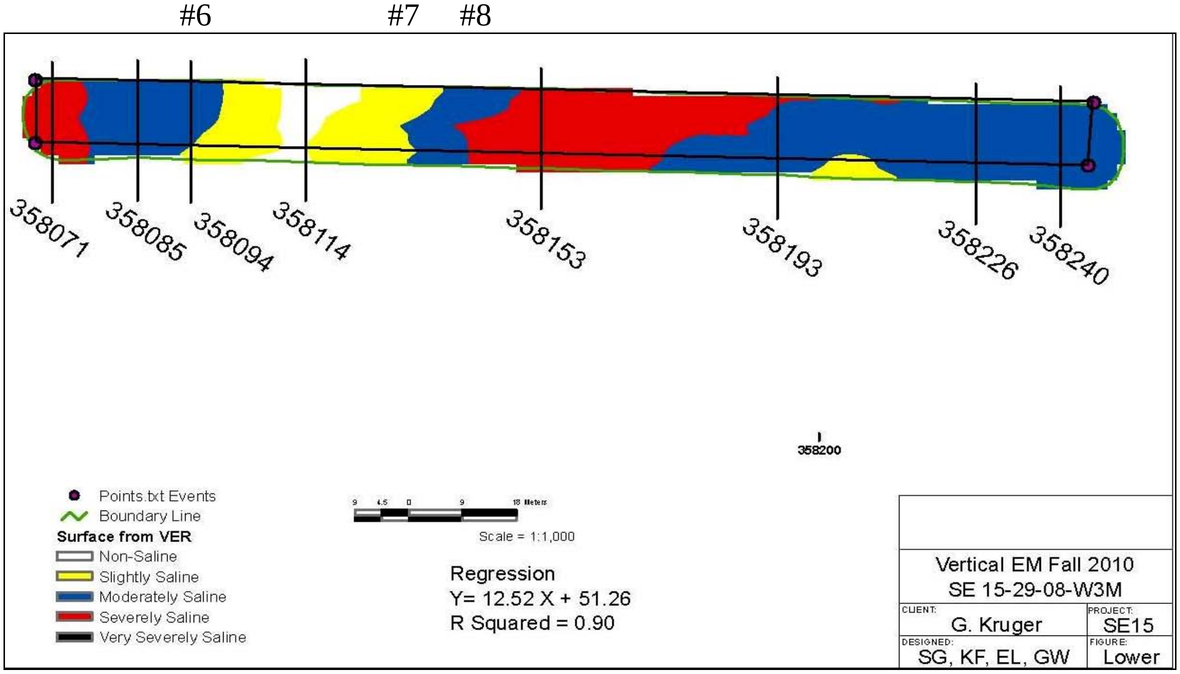
The yields determined by quadrat sampling are summarized in Table 1. Although the demonstration attempted to show an improvement in forage yield for some of the newer alfalfa varieties under saline conditions, the data collected showed some of the lowest yields from the nonsaline area of the demonstration. The nonsaline area, which should have shown the highest alfalfa yields, had the lowest forage yields. Waterlogging of the soils in the low-lying nonsaline area decreased the growth and forage yield of alfalfa from this section of the demonstration. The waterlogging was caused by the combination of frequent and heavy rainfall in June and early July 2011 and overly aggressive irrigation scheduling. The growth of the alfalfa in the nonsaline area was among the lowest average yield among the eight transects.

Table 1: Summary of transect salinity measurements, alfalfa regrowth, and yield data collected in 2011

	Average Electrical Conductivity (mS/cm)	Salinity Rating (June soil EC)	Salinity Rating (Oct 2010 EM38)	Regrowth Height on Aug. 30 (cm)	1st Cut Yield (t/ac.) June 23	2nd Cut Yield (t/ac.) Aug. 4	3rd Cut Yield (t/ac.) Sept. 15	2011 Yield (t/ac.)
1	7.6	Moderate	Severe	47	2.26	1.88	1.53	5.64
2	6.6	Moderate	Moderate	47	1.98	1.99	1.33	5.30
3	5.1	Moderate	Moderate	48	1.49	1.50	1.29	4.28
4	1.7	Nonsaline	Nonsaline	46	1.31	2.00	1.17	4.48
5	9.3	Severe	Severe	43	2.35	1.84	1.39	5.58
6	6.0	Moderate	Moderate	49	2.17	1.82	1.41	5.40
7	6.4	Moderate	Moderate	49	2.54	1.60	1.53	5.67
8	5.4	Moderate	Moderate	47	2.62	1.60	1.25	5.47

Figure 2: Variation of soil salinity at depth of 0.75 m over the demonstration site in Field 12 at CSIDC

Transect Number#1 #2 #3 #4 #5
#6 #7 #8



Two replications of the four varieties were planted in narrow strips 1.5 m wide from the west end to the east end of the mapped area. The lines across the mapped strip represent transects chosen for the sampling points for the quadrats and soil samples.

The top-yielding variety was Halo, with CW064027 close behind. These two varieties demonstrate rapid regrowth following alfalfa harvest. This trait in our climate may predispose these alfalfas to greater risk of winter injury and reduced persistence within an alfalfa stand.

Table 2: Plant height and yield measurements in 2011 for variety demonstration in Field 12 at CSIDC

Variety	Plant Height Aug. 30 (cm)	1st cut Yield June 23 (t/ac.)	2ndcutYield Aug. 4 (t/ac.)	3rd cut Yield Sept. 15 (t/ac.)	2011Yield 3 cuts (t/ac.)
Halo	50	2.36	2.05	1.50	5.91
CW064027	56	1.97	1.99	1.48	5.44
Bridgeview	40	1.99	1.41	1.11	4.51
AC Bluejay	43	2.03	1.66	1.36	5.05

A yield assessment was conducted using the mechanical harvester from the larger areas of moderately and severely saline soil within the plot area for the first and third cuts. The average of the forage samples from the moderately saline area was 0.5 t/ac. greater than the average of the samples from the first cut of the severely saline area. The average salinity at this time in the moderately saline area represented by Transect #5 was 9.3 mS/cm compared to 6.0 mS/ac. for the moderately saline area represented by Transect #6.

This difference in forage yield harvested from the same areas was not observed for the third cut.

Final Discussion

The forage yields harvested from the field demonstration confirm the relative yield ratings for the varieties as determined at the Salt Laboratory at SPARC Swift Current. The two higher-yielding varieties, Halo and CW064027, have quicker regrowth after cutting and may be more prone to injury during the winter. The salinity, based on electrical conductivity of the soil samples, agreed with the rating assessment using EM 38 measurements obtained by the Irrigation Environmental Unit of the Irrigation Branch of the Ministry of Agriculture.

Acknowledgements

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P and K Fertilization of Irrigated Alfalfa Demonstration 2011

Project Lead

- Gary Kruger, PAg, Irrigation Agrologist, Saskatchewan Agriculture

Co-operator

- Greg Oldhaver, producer, Cabri

Industry Co-operators

- Dr. Rigas Karamanos, PAg, Agronomy Manager, Viterra (fertilizer)
- Dale Hicks, Western Ag Labs, Outlook, Sask. (soil analysis)
- ALS Laboratories, Saskatoon

Project Objective

To evaluate the nutrient needs of newly seeded and established alfalfa for improved yield, stand longevity, and competition with weeds (dandelion).

Project Background

Soil testing of established, heavy-textured, irrigated alfalfa fields indicates different fertilization priorities depending on how the soil is analyzed. Conventional soil testing suggests established alfalfa fields require predominantly phosphorus application while Western Ag Labs' plant root simulator analysis recommends application of potassium.

Project Plan

The established alfalfa stand was divided into four strips for application of the fertilizer treatments during the summer of the final year of alfalfa production. These treatments included phosphorus alone, potassium alone, phosphorus and potassium together, and a control.

Production of established alfalfa on the selected field was poor during second cut in 2010. The grower decided to spray glyphosate to terminate the stand in fall, 2010. The field was sprayed with glyphosate again in spring 2011, and seeded to Morgan oats on June 10, 2011. This established alfalfa portion of this report summarizes harvested oat grain yields and quality collected from the site in 2011 as no additional expenditure was required other than collecting the information.

The new seeding of alfalfa evaluated alfalfa yield with balanced application of fertilizer. The demonstration field was divided into six strips testing the following fertilizer treatments: a west control, phosphorus alone, potassium alone, phosphorus, potassium and zinc together; phosphorus and potassium together, and an east control. Since this was the establishment year and oats were sown as a cover crop, the annual forage yield was collected from the fertilizer strips.

Demonstration Site

The established alfalfa demonstration was located on Plot 10 of NE 19-21-18-W3 of the Miry Creek Irrigation District. The soil is clay textured. This field was leveled for flood irrigation in 1977 and converted to wheel-line irrigation in 1988. This switch provided improved timing of water applications. The fertilizer strips were oriented east and west to minimize the impact of land leveling on soil variability.

The new seeding demonstration was located on Plot 13 of SE19-21-18-W3 of the Miry Creek Irrigation District. The soil is clay textured. The field had been sown to annual cereals for several years to improve the soil tilth for seeding alfalfa. Irrigation over the year was three inches.

Project Methods and Observations

Soil samples were collected from Plot 10 in spring 2009 for analysis at ALS Laboratories and in fall 2009 for analysis at Western Ag Labs. The fertilizer treatments were broadcast July 26, 2010. Table 1 describes the nutrient treatments. The forage yield in fall 2010 was poor and the grower wished to take the forage crop out of production. The co-operator terminated the hay stand in the fall with an application of 2 L glyphosate/ac. The field was sprayed with 1 L/ac glyphosate the following spring and seeded to Morgan oats on June 10, 2011. Table 2 shows the results of the two methods of soil analysis. The two methods are based on different principles of measurement with different sampling depths, and are, therefore, not directly comparable. The conventional soil test measures the concentration of nutrients in the soil to a depth of 12 inches. The plant root simulator probe measures the rate of diffusion of nutrient to a root surface in a topsoil sample.

Table 1: Schedule of treatments and fertilizer applications made to Plot 10 at Miry Creek Irrigation Project on July 26, 2010

Treatment	Nutrient Applied(lb. /acre)	Product Application
P_2O_5	21-100-0-0	11-52-0 at 192 lb./ac.
K_2O	0-0-120-0	0-0-60 at 200 lb./ac.
$P_2O_5 + K_2O$	21-100-120-0	5-26-31-0 at 392 lb./ac.
Control	Control	0-0-0-0

Table 2: Soil analysis of samples collected from Field 10 at Miry Creek Irrigation District (lb. nutrient/ac.)

Soil Analysis (lb./ac.)	N	P	K	S	Ca	Mg	Cu	Zn	Mn	Fe	B
Conventional – P strip (Spring 2009)	22	5	784	82+	-	-	-	-	-	-	-
PRS Probe – Field sample – (Fall 2009)	4	88	30	230	1994	246	0.66	0.47	43	15	3.7
PRS Probe – P strip East side – (Fall 2010)	8	402	40	20	1901	290	0.60	0.72	58	9	2.3
PRS Probe – K strip East side – (Fall 2010)	17	90	47	17	1964	275	0.54	0.31	20	4	0.6

The site on Plot 10 of Miry Creek was seeded to Morgan oats on June 10, 2011. The fertilizer applied with the seed was 145 lb./ac of 36.5-14.5-0-0. The urea in this blend was ESN. Alpine liquid with analysis 6-22-6 was also applied to the seedrow at 3 gal./ac. Buctril M was sprayed to control broadleaf weeds. The weed spray was tank-mixed with 2 L/ac of CRNS (controlled-release nitrogen solution) and 1 L/ac of Alpine liquid 6-22-6. At flagleaf, another 2 L/ac of CRNS was applied to the field.

The oats were harvested on Sept. 22, 2011. The grain yield and quality are reported in Table 3.

Table 3: Oat grain yields from residual fertilizer at Miry Creek Irrigation District

Treatment	Nutrient Applied (lb./ac.)	Blend Analysis	Grain Yield[1] (bu./ac.)	Bushel Weight (lb./bu.)	Oat Protein Content (%)
P_2O_5	21-100-0-0	11-52-0	132	36.2	13.3
K_2O	0-0-120-0	0-0-60	122	36.9	13.7
$P_2O_5 + K_2O$	21-100-120-0	5-26-31-0	132	37.2	13.0
Control	0-0-0-0	None	125	37.2	13.7

[1]Grain yield using measured bushel weight for each treatment

On the basis of the observed yields, there was no impact of the residual K fertilizer, but the demonstration showed a 7 bu./ac. yield response to the residual P fertilizer for the following growing season. The oat yields were determined from the more productive soils (east side) in the field.

For the new seeding of alfalfa, the grower chose oats as a cover crop. The fertilizer treatments were banded with a John Deere airdrill on Nov. 6, 2010. Table 4 describes the nutrient treatments and their layout on Field 13, Miry Creek Irrigation District.

Table 4: Fertilizer treatments banded in fall 2010 for new seeding of alfalfa at Field 13, Miry Creek Irrigation District

Treatment	Nutrient Applied (lb. /acre)	Blend Analysis
Control	None	
P_20_5	21-100-0-0	11-52-0 @192 lb/ac
K_20	0-0-120-0	0-0-60 @ 200 lb/ac
$P_20_5 + K_20$ + Zn	21-100-120-0 + 4 lb. Zn/ac	5-26-31-0 @ 392 lb/ac + 11 lb Zn fertilizer /ac
$P_20_5 + K_20$	21-100-120-0	5-26-31-0 @ 392 lb/ac
Control	None	0-0-0-0

A 0-6inch soil sample was collected from the plot area in fall 2010 prior to fertilization. The soil was analyzed at Midwest Laboratories, Calgary (Table 5).

Table 5: Soil analysis from plot 13, Miry Creek Irrigation District

pH (1:1 soil:water)	8.5		Soluble Salts (1:1 soil:water)	0.6 mmhos/cm		
Organic Matter (%)	**2.2**		Excess Lime M			
CEC (meq/100g)	32.8					
Nitrate-N (0-6”) (ppm)	17	L				
Bicarbonate P (ppm)	12	M	Base Saturation %	Micro Analysis		
1 N NH4OAc K (ppm)	**322**	**H**	**2.5**	**Zn**	**1 ppm**	**L**
1 N NH4OAc Mg (ppm)	1061	VH	27.0	Mn	2 ppm	VL
1 N NH4OAc Ca (ppm)	4476	H	68.1	Fe	15ppm	M
1 N NH4OAc Na (ppm)	**183**	**H**	**2.4**	Cu	2.3ppm	VH
Sulphate S (ppm)	**12**	**L**		B	19 ppm	VH

Fertilizer recommendations based on a target yield of three tons alfalfa/ac from this analysis 40 lb. P_20_5, 23 lb. S, 1.8 lb. Zn, 2.3 lb. Mn and 20 lb. elemental S/ac.

The site on Plot 13 at Miry Creek was seeded to Morgan oats on June 10, 2011. The fertilizer applied with the seed was 145 lb./ac of 36.5-14.5-0-0. The urea in this blend was ESN. Alpine liquid with analysis 6-22-6 was also applied to the seedrow at 3 gal./ac. The Stealth alfalfa was sown by splitting the seed in half and double-seeding the field at 45 degrees to the direction the cover crop was sown. The alfalfa had excellent emergence and establishment in 2011. Many of the alfalfa plants were blooming by the time the green feed was cut.

The cover crop was cut for green feed on Sept. 6, 2011, and the yields are summarized in Table 6. An interesting observation from the strips after the field was harvested in fall was that fertilization of the cover crop, especially with phosphorus, stressed the alfalfa seedlings. A strongly fertilized cover crop competes more with the undersown forage and reduces its vigour. The unfertilized headlands and control areas contained more vigorous alfalfa seedlings in fall.

Table 6: Oat green feed yields observed at Field 13, Miry Creek Irrigation District

Treatment	Rate of Nutrient (lb./ac.)	Green Feed Yield (t/ac.)	Yield Increase to Control 1 (%) (West)	Yield Increase to Control 2 (%) (East)
Control West	None	2.84		
Phosphorus	100 P_2O_5	3.12	10	31
Potassium	120 K_2O	3.19	12	33
Phosphorus & Potassium	100 P_2O_5 + 120 K_2O	3.40	20	43
Phosphorus, Potassium, & Zn	100 P_2O_5 + 120 K_2O + 4 Zn	3.04	7	27
Control East	None	2.39		

Yield response to banded fertilizer of the green feed crop of oats ranged between 0.3-0.6 t/ac. on the better portion of the field.

Final Discussion

Banding of P and K prior to seeding forages is an effective method of boosting soil fertility prior to establishment of a forage crop but this technique helps the competiveness of the cover crop more than the forage crop in the year of establishment. Oats produced high yields on the glyphosate-terminated alfalfa stand with a relatively late seeding date and no tillage. The crop was assisted by the frequent spring and summer rainfall. The crop yielded very well but the bushel weight was low for the milling market, likely due to the June seeding date. The relatively high fertilizer treatments applied the previous year were only marginally evident in the grain yields. The P treatment increased grain yield by 5 per cent and the K treatment had no effect.

P and K were not limiting factors for oat production on these soils. The release of nutrients from the breakdown of the alfalfa residues was not large enough to promote lodging of the oat crop on this field. Oats are an excellent crop choice for terminated alfalfa stands.

Irrigated Annual Forage Demonstration 2011

Project Lead
- Gary Kruger, PAg, Provincial Irrigation Agrologist, Saskatchewan Agriculture

Co-operator
- Pat Hayes, Val Marie, SK

Industry Co-operators
- Trawin Seeds
- Shaun Fraser
- Ardell Seeds

Project Objective
To evaluate the forage yield and quality of annual cereals on flood irrigated fields of the Val Marie Irrigation District.

Project Background
Annual cereals are an important component of crop rotation for flood-irrigated districts. Annual forages are grown to maintain feed supply for cattle production while long-term perennial forage stands are being re-established.

Project Plan

Four varieties of annual cereals were to be sown on individual border dikes (Table 1). Environmental conditions in spring of 2011 were very wet, as they were in 2010. To avoid poor emergence again this year, the demonstration was not sown until the grower was comfortable with the soil condition at Val Marie.

Table 1: Varieties included in the annual cereal demonstration

Variety	Crop Type	Seed Supplier
CDC Cowboy	Two-row feed barley	Ardell Seeds
Gazelle	Spring rye	Trawin Seeds
Pinnacle	Feed oats	Ardell Seeds
Tyndal	Spring triticale	Scott Frazer

Demonstration Site
The demonstration site was located on SW29-3-13-W3 on Plot 100 of the Val Marie Irrigation District. Twelve border dikes were broken, removing a perennial bromegrass/alfalfa mixture during the fall of 2009. The soil was fertilized according to soil analysis for the 2010 growing season. The heavy clay soil was very difficult to manage because it was too wet.

Project Methods and Observations
The soil was fertilized in fall 2010 with manure. Due to continual precipitation during May and June of 2011, the demonstration was not sown. The soil was too wet to permit

seeding in 2011. The seed has been placed in storage for use in spring 2012 at the same site.

Final Discussion

This demonstration highlights the difficulties faced by producers farming the heavy clay soils on the southwestern irrigation projects. These soils have suitable tilth and structure for field operations within a narrow range of soil moisture. The difficulty experienced in establishing this demonstration over the course of two years highlights one challenge faced by growers working these soils. It re-enforces the level of risk taken by growers who attempt to rejuvenate their stands by reseeding forages.

Conclusion

Farmers on the flood irrigation projects in southwestern Saskatchewan are reluctant to remove established forage stands due to re-establishment difficulties. Unlike sprinkler irrigation projects, operators on gravity projects do not have the option of irrigating a crop as an establishment aid. On gravity fields, the soil is exposed to risks of erosion and crusting when the surface is not protected by an established crop.

In 2010 and 2011, this project demonstrated the difficulty farmers face re-establishing crops on the heavy textured soils. The objective of this project to evaluate forage yield and quality of annual cereals still has merit. The project will be re-established in 2012.

Selected Soil Fertility Demonstration

Project Lead
- Gary Kruger, PAg, Provincial Irrigation Agrologist, Saskatchewan Agriculture

Co-operator
- Andy Perrault, Ponteix

Project Objective
The objective was to identify and resolve nutrient issues on flood-irrigated fields in the irrigation districts of Saskatchewan

Project Plan
This demonstration intended to increase barley grain and alfalfa forage yield through balanced fertilizer application. Soil analyses of portions of the field that yielded poorly in the past were compared to those from better-yielding areas. The hypothesis was that soil scalping had artificially eroded the topsoil. Through testing soils to identify the missing nutrient, these poorly yielding areas could be improved.

Demonstration Site
The demonstration is located on SE32-9-12-W3 and is irrigated by flood irrigation. The crop rotation on this field has been wheat in 2009 followed by barley in 2010. The soil results for the poor and good portions of the barley field are shown in Tables 1-3. For the alfalfa field, only the poor portion of the field was sampled.

Table 1: Soil analysis of poor production area on Field 21 at Ponteix Irrigation District

pH (1:1 soil:water)	**9.3**		Soluble salts(1:1 soil:water)	0.8 mmhos/cm		
Organic Matter (%)	3.3		Excess Lime	L		
CEC (meq/100g)	23.7					
Nitrate-N (0-6”)(ppm)	2	L				
Bicarbonate P (ppm)	22	H	Base Saturation %	Micro Analysis		
1 N NH4OAc K (ppm)	**304**	**VH**	**3.3**	**Zn**	**1.2 ppm**	**VL**
1 N NH4OAc Mg (ppm)	869	VH	30.6	Mn	5 ppm	L
1 N NH4OAc Ca (ppm)	2569	M	54.0	Fe	27 ppm	VH
1 N NH4OAc Na (ppm)	**661**	**VH**	**12.1**	Cu	1.7ppm	H
Sulphate S (ppm)	46	VH		B	3.7 ppm	VH

Fertilizer recommendations based on a target yield of 4 t alfalfa/ac from this analysis:
2.2 t gypsum/ac. or 380 lb. elemental S per ac., 1.9 lb. Zn/ac. and 2.2 lb. Mn/ac.

Table 2: Soil analysis of poor production area on Field 16 at Ponteix Irrigation District

pH (1:1 soil:water)	**9.0**		Soluble Salts(1:1 soil:water)	0.8 mmhos/cm		
Organic Matter (%)	2.6		Excess Lime	L		
CEC (meq/100g)	24.8					
Nitrate-N (0-6")(ppm)	19	M				
Bicarbonate P (ppm)	15	M	Base Saturation %	Micro Analysis		
1 N NH4OAc K (ppm)	**321**	**VH**	**3.3**	**Zn**	**0.9 ppm**	**VL**
1 N NH4OAc Mg (ppm)	1029	VH	34.6	Mn	3 ppm	VL
1 N NH4OAc Ca (ppm)	2441	M	491	Fe	25ppm	H
1 N NH4OAc Na (ppm)	**743**	**VH**	**13**	Cu	1.6 ppm	M
Sulphate S (ppm)	46	VH		B	3 ppm	VH

Fertilizer recommendations based on a target yield of 4 t alfalfa/ac. from this analysis 2.2 t gypsum/ac. or 380 lb. elemental S per ac., 1.9 lb. Zn/ac. and 2.2 lb. Mn/ac.

Table 3: Soil analysis of good production area on Field 16 at the Ponteix Irrigation District

pH (1:1 soil:water)	**8.6**		Soluble Salts(1:1 soil:water)	0.5 mmhos/cm		
Organic Matter (%)	2.3		Excess Lime	M		
CEC (meq/100g)	21.1					
Nitrate-N (0-6")(ppm)	13	L				
Bicarbonate P (ppm)	8	L	Base Saturation %	Micro Analysis		
1 N NH4OAc K (ppm)	**238**	**VH**	**2.9**	**Zn**	**0.5 ppm**	**VL**
1 N NH4OAc Mg (ppm)	717	VH	28.3	Mn	3 ppm	VL
1 N NH4OAc Ca (ppm)	2683	M	63.4	Fe	20 ppm	H
1 N NH4OAc Na (ppm)	**260**	**VH**	**5.4**	Cu	1.2 ppm	M
Sulphate S (ppm)	46	VH		B	2 ppm	VH

Fertilizer recommendations based on a target yield of 100 bu. barley from this analysis 110 lb. elemental S per ac., 115 lb. N/ac., 45 lb. P_2O_5, 30 lb. K_2O, 1.9 lb. Zn/ac. and 2.2 lb. Mn/ac.

Project Methods and Observations

The barley field was sown to the variety Copeland on May 22 with a Bourgault midrow banding seeding implement. The fertilizer application was 100 lb. 46-0-0 through the midrow bander and 100 lb. 13-25-14-7 placed with the seed. Zinc fertilizer was not able to be disk-banded into the seeded field while the crop was young because of heavy rains during the spring.

Applications of gypsum or elemental sulphur were not practical for this project because of time constraints and cost. Small test strips of these soil amendments are planned for 2012.

The barley was harvested during the third week of September and yielded only 35 bu./ac. The yield was hampered by disease during the 2011 growing season but could not be sprayed with fungicide because the spray plane was busy elsewhere. Stripe rust was severe in the field and was responsible for hurting cereal yields in the area.

Final Discussion

The analysis suggested application of 2.2 t/ac. of gypsum or 380 lb./ac. of elemental sulphur. Gypsum supplies calcium to displace sodium from the soil colloid exchange. If the sodium is removed from the soil profile through leaching, the soil structure will improve and water will be able to percolate through the soil profile. For the second recommendation, elemental sulphur oxidizes to sulphate over the course of 10 to 20 years and produces the same effect. Gypsum is available from oil patch fertilizer suppliers and costs about $1,000 per acre at the rate suggested on the soil report. Elemental sulphur is also available as a slow release fertilizer and the cost is more economical at about $400 per acre, but the time required for oxidation of the elemental sulphur limits the practicality of the approach for most growers.

For long-term correction of poor infiltration problems created by sodium on the soil exchange complex, flushing the sodium out of the soil profile is essential once sodium has been displaced from the soil exchange by the calcium. For most of the flood-irrigated soils in southwestern Saskatchewan, this mechanism is not practical for several reasons. The availability of these products is limited and therefore, their cost is relatively high. The rate of application is also high. The elemental sulphur must be dispersed and solubilized to form gypsum, which displaces sodium from the exchange complex of the soil. The solubilized sodium must then be flushed from the soil profile to eliminate the risk of sodium again dispersing the clay particles, which would reestablish the dense impervious layer in the soil. The heavy texture of these soils limits potential for leaching of the released sodium. This soil process takes years.

Conclusion

The demonstration showed that soil fertility on many of the flood-irrigated soils is more complex than simply applying the most appropriate blend for the crop. Soil structure is damaged by high sodium in the soil profile which limits water infiltration and curtails root growth. Solutions to this challenge are very difficult for heavy textured soils because of the slow water infiltration.

Timing and Placement of P Fertilizer on Flood-Irrigated Alfalfa

Project Lead

- Gary Kruger, PAg, Provincial Irrigation Agrologist, Saskatchewan Agriculture

Co-operator

- Russ Swihart, Vidora Irrigation District

Project Objective

The objective was to determine the most efficient approach to timing and placement of P application for flood-irrigated established alfalfa.

Project Background

Soil testing on flood-irrigated fields using the traditional approach indicates phosphorus is required for profitable yields of alfalfa forage. Growers want to know if the current application method of broadcasting 11-52-0 prior to the flood is the most efficient means of applying this nutrient.

Demonstration Plan

The goal of this demonstration was to increase alfalfa yield through phosphorus fertilizer application. Different timings of P fertilization were tested. The demonstration field was divided into four fertilizer treatments: broadcast phosphorus prior to flood, broadcast phosphorus as soon as possible after flood, disk-band phosphorus prior to flood, and a control with no fertilizer.

Demonstration Site

The demonstration was located on NW34-4-26-W3 on the Vidora Irrigation District. The soil texture is clay. The alfalfa stand on this field is about eight years old and has never been fertilized or sprayed.

A 0-6-inch soil sample was collected from the plot area in spring 2011 for analysis at Midwest Laboratories, Calgary (Table 4).

Table 4: Soil analysis of demonstration site at the Vidora Irrigation District

pH (1:1 soil:water)	7.9		Soluble Salts(1:1 soil:water) 1.7 mmhos/cm			
Organic Matter (%)	1.8		Excess Lime L			
CEC (meq/100g)	31.6					
Nitrate-N (0-6”)(ppm)	5	L				
Bicarbonate P (ppm)	7	L	Base Saturation %	Micro Analysis		
1 N NH4OAc K (ppm)	284	H	2.3	Zn	0.5 ppm	VL
1 N NH4OAc Mg (ppm)	895	VH	23.6	Mn	3 ppm	VL
1 N NH4OAc Ca (ppm)	4629	H	7.4	Fe	16 ppm	M
1 N NH4OAc Na (ppm)	54	L	0.7	Cu	1.4 ppm	H
Sulphate S (ppm)	627	VH		B	1.7 ppm	H

Fertilizer recommendations based on a target alfalfa yield of 4 t/ac. from this analysis 80 lb. P_20_5, 3.6 lb. Zn and 2.8 lb. Mn.

Project Methods and Observations

Fertilization was applied to groups of border dykes according to the following regimen:

1) 50 lb. P_20_5/ac. surface broadcast prior to application of irrigation water;
2) 50 lb. P_20_5/ac. surface broadcast as soon as possible after application of irrigation water;
3) 50 lb. P_20_5/ac. disk-banded prior to application of irrigation water; and
4) Control with no fertilizer application.

Irrigation water is applied once annually in late May.

The treatment schedule was not implemented as planned. The post-irrigation P treatment was applied to only a portion of a border dike because the fertilizer spreader became stuck in the mud. The disk-banded treatment was not applied in spring because a suitable disk implement was not locally available. As this is a three-year project, the missing treatments were applied in Oct. 2011.

The bales in the field were weighed using a truck-mounted Elias bale scale. The area represented by each weighed bale was measured with a metering wheel. Hay yields from the treatment areas were calculated for each weighed bale and the average yield is reported in Table 2.

Table 2: Hay yields for timing and placement of fertilizer demonstration at the Vidora Irrigation District

Treatment	# of Bales Recorded	Average Yield (t/ac.)	Yield response relative to control
50 lb. P_20_5/ac. broadcast prior to irrigation	4	2.54	53%
50 lb. P_20_5/ac. broadcast after irrigation	1	2.04	23%
Control (no P_20_5 applied)	6	1.66	----

The observed yield response of 0.9 t/ac. would easily cover the cost of applying 50 lb. P_20_5 at current fertilizer and hay prices. This conclusion, however, will need re-evaluation as market prices of fertilizer and hay respond to the dynamics of the marketplace.

Several other considerations are important in responding to this demonstration. First, the response is specific to this field. The historical lack of fertilization prior to this year predisposes the alfalfa to a larger response when phosphorus fertilizer is applied to the field. The available pool of phosphorus was drawn down by crop uptake over the years. Second, as P is applied to the field, the yield response will moderate or possibly even disappear over a period of years, as the background phosphorus fertility improves. With

P fertilizer applications to a soil, a significant portion of the applied nutrient is not removed by the crop and remains in the soil in chemical and biological forms to increase the residual level of phosphorus in the field. Thirdly, as the status of P fertility improves in the soil of this field, another nutrient will likely become the limiting factor for yield. The key message is this: each field is affected by the circumstances of its creation (land leveling, fertilization history, cropping sequence erosion and soil texture) and management.

A soil test is a simple tool to guide management decisions. It does not need to be followed completely to be an effective investment. It will point out steps that can improve the productivity on your field. Small steps in the right direction are more productive than random steps.

Final Discussion

The field used for this demonstration does not have a history of fertilization. The yield response of 0.9 t/ac. in 2011 is unique to the field and the year. The demonstration clearly shows that early spring fertilization is important to maximize the benefit from the P fertilizer for alfalfa.

P, K, B and S Fertilization of Older Established Alfalfa Stands

Project Lead

- Gary Kruger, PAg, Provincial Irrigation Agrologist, Saskatchewan Agriculture

Co-operator

- Scott Sanderson, Consul Irrigation District

Project Objective

The objective was to determine the impact on yield of balanced fertilizer application for flood-irrigated established alfalfa.

Project Background

Soil testing on flood-irrigated fields is seldom practised. Most fields are fertilized with the traditional approach: either 50 lb. of 11-52-0 or nothing. Some growers have observed improved crop growth with application of sulphur to their dryland cereal crops. The growers want to know if an application of other nutrients such as sulphur provides an economic return from their investment.

Project Plan

Broadcast applications of potassium and sulphur to identify the potential benefit of balanced fertilization for irrigated alfalfa were applied to irrigated alfalfa. A key component of this strategy is soil testing to target input resources.

Demonstration Site

The demonstration was located on NW13-4-27-W3 on the Consul Irrigation Project. The soil texture is clay. The Beaver alfalfa stand on this field is eight years old. It has been fertilized some years with 50 lb. P_20_5 in spring.

A 0-6-inch soil sample was collected from the plot area in spring 2011 for analysis at Midwest Laboratories, Calgary (Table 1).

Table 1: Soil analysis of demonstration site at the Consul Irrigation District

pH (1:1 soil:water)	8.2		Soluble Salts(1:1 soil:water) 0.9 mmhos/cm			
Organic Matter (%)	2.9		Excess Lime L			
CEC (meq/100g)	25.6					
Nitrate-N (0-6")(ppm)	20	L				
Bicarbonate P (ppm)	10	L	Base Saturation %	Micro Analysis		
1 N NH4OAc K (ppm)	467	VH	3.4	Zn	0.7 ppm	L
1 N NH4OAc Mg (ppm)	1331	VH	31.2	Mn	3 ppm	VL
1 N NH4OAc Ca (ppm)	4558	M	64	Fe	22 ppm	H
1 N NH4OAc Na (ppm)	111	L	1.4	Cu	1.9ppm	VH
Sulphate S (ppm)	15	M		B	2.6 ppm	VH

Fertilizer recommendations based on a target alfalfa yield of 4 t/ac. from this analysis 50 lb. P_20_5, 9 lb. S, 3.1 lb. Zn and 2.8 lb. Mn.

Project Methods and Observations
The treatment schedule could not be implemented in spring 2011. Heavy and frequent rainfall in early May and June prevented field traffic. The project was delayed until fall for application of the fertilizer. The treatments were broadcast October 17, 2011, to groups of border dikes according to the following treatment schedule (Table 1). Each treatment was applied to five acres of border dike.

Treatments applied to evaluate balanced nutrient application to forage stands:

1) Check;
2) 75 lb. P_20_5/ac. surface broadcast;
3) 75 lb. P_20_5/ac. + 75 lb. K_20/ac. surface broadcast;
4) 75 lb. P_20_5/ac. + 75 lb. K_20/ac. + 15 lb. S/ac surface broadcast; and
5) 75 lb. P_20_5/ac. + 15 lb. S/ac surface broadcast.

Table 2: Schedule of treatments and fertilizer applications at the Consul Site (fall 2011)

Treatment	Product Applied	N	P_20_5	K_20	S
		Lb. nutrient/ac.			
Check	None	0	0	0	0
P Broadcast	17-34-0 at 173 lb./ac.	29	75	0	0
PK Broadcast	10-25-25-0 at 298 lb./ac.	29	75	75	0
PKS Broadcast	9-23-22-4 at332 lb./ac.	29	75	75	15
PS Broadcast	14-36-0-7 at 207 lb./ac.	29	75	0	15

Ammonium sulphate also supplies nitrogen. Although alfalfa fixes its own supply of nitrogen and is not generally fertilized with this nutrient, the blends were adjusted for the nitrogen supplied by the sulphur fertilizer. All treatments received equal rates of nitrogen so the benefit of adding an additional nutrient could be observed.

Boron was initially considered as an additional fertilizer treatment for this demonstration. Soil test results from another laboratory had suggested the need for boron for alfalfa production at this site. Soil test results from Midwest Labs in spring 2011 did not indicate a need for boron. Montana field research with soils testing low in boron observed minimal forage yield response from boron. As such, boron treatment was omitted from the demonstration for 2011.

Irrigation water was applied once in early May 2011 to the established alfalfa stand. The plot area yielded 3.6 t/ac. in 2011, which was an exceptional yield for single-cut alfalfa hay. Yield data along with plant tissue analysis will be collected in 2012 to monitor the demonstration.

Final Discussion
Balanced fertilization of irrigated alfalfa has potential to stabilize yields of hay and improve the quality of the forage produced on the irrigated hay fields.

Irrigated Annual Forage Fertility Demonstration

Project Lead

- Gary Kruger, PAg, Provincial Irrigation Agrologist, Saskatchewan Agriculture

Co-operator

- Larry Verpe, Eastend Irrigation District

Project Objective

The objective was to determine the benefit on yield of balanced fertilizer application for flood-irrigated annual cereal forage production.

Project Background

Soil testing on flood irrigated fields is seldom practised. Most fields are fertilized with the traditional approach – either 50 lb. of 11-52-0 or none. A soil analysis from the field at Eastend indicated application of sulphur for barley.

Project Plan

The field at Eastend was split into two sections with one fertilized according to tradition with 100 lb. 27-27-0 applied. The second section was fertilized according to recommendations from Western Ag Labs using the modeling program known as the Forecaster. The analysis suggested 60 lb. /acre of N and 40 lb. /acre of K_20 in addition to the P and S nutrients. This rate of fertilization was very high relative to the rates of fertilization practiced by Eastend farmers. Using the Forecaster computer model, the fertilization rate was adjusted to 40 lb. N, 14 lb. P_20_5, 40 lb. K_20, and 10 lb. S for a target grain yield of 72 bu./ac. This equated to an application of 200 lb./ac. of the blend 20-7-20-5.

Demonstration Site

The demonstration was located on SE 31-6-21-W3 on the Eastend Irrigation project. The soil texture is sandy loam. The field was taken out of alfalfa production in fall of 2009 and is currently under a rotation of annual crops (oats 2010, barley 2011) to control perennial weeds, predominantly dandelion. Tillage between forage crops and delayed seeding are the predominant cultural tools practised to bring the dandelions under control.

A 0-4-inch soil sample was collected from the plot area in fall 2010 for analysis using the PRS – probe at Western Ag Labs, Saskatoon. Fertilizer recommendations based on a target yield of 72 bu. barley /ac. from this analysis were 60 lb. N, 14 lb. P_20_5, 43 lb. K20, and 10 lb. S (Table 1).

The field was irrigated only once in mid-May 2011. Heavy rains fell in late May and early June delaying seeding. The field was rain-fed for the remainder of the growing season.

Table 1: Nutrient analysis and recommendations

	Measured	Barley	Recommendations for:	
pH (1:2 soil:water) 6.9	Soil Supply	Nutrient	Opt. Yield 72 bu.	Max. Yield 126 bu.
PRS Probe Analysis	**(lb. nutrient)**	**Rating**	**lb. nutrient**	**lb. nutrient**
NO3-N + NH4-N	32	L	60	189
Phosphate	18	M	12	63
Potassium	35	L	43	151
Sulphur	1.5	L	11	23
Calcium	632	H	---	38
Magnesium	100	H	---	32
Copper	0.11	M	---	0.13
Zinc	0.31	M	0.32	0.63
Manganese	1.93	H	---	0.75
Iron	1.25	H	---	0.63
Boron	0.79	H	---	0.08

Project Methods and Observations

The blends were prepared at the Viterra outlet in Shaunavon, SK, and banded to the field through the grain boxes of a double disk IH drill on June 30. Once the fertilizer had been banded, the field was sown to CDC Cowboy barley at the rate of 72 lb./ac. The barley emerged evenly and quickly. Visual differences in growth between the two treatments were small. During a field visit on Aug. 11, barley yellow dwarf virus (BYDV) was identified within both sections of the Eastend field. BYDV is a virus spread by aphids that occurs infrequently on fields sown later in the growing season. The infection was evident on only 1-2 per cent of the plants in the field but the disease does reduce the size and vigour of affected plants.

The field was cut with a haybine on Sept. 8. Because the field size was small and the shape was irregular, the fields were measured with a Garmin GPSmap76S hand-held device to determine the area of each treatment. The forage from each area was baled and weighed with a truck-mounted Elias bale scale.

Forage samples were collected from each bale. The samples from each treatment were composited and analyzed for forage quality at a forage testing laboratory (Table 2).

Table 2: Comparison of forage yield with alternate management strategy at Eastend

	Conventional Fertility	Balanced Fertility
Fertility Program	27-27-0 at 125 lb./ac.	20-7-20-5 at 185 lb./ac.
Nutrients Applied	33 N-33 P_20_5 -0 K_20 -0 S (lb./ac.)	37 N -13 P_20_5 -17 K_20 - 9 S lb./ac.
Total Forage Yield	9.9 ton forage (6 bales)	11.04 ton forage (7 bales)
Treatment Area	2.3 acres	3.2 acres
Forage Yield /Ac	4300 lb./ac.	3450 lb./ac.
Program Cost	$38.48	$49.77

Final Discussion

Soil analysis with the PRS probe and fertilization using balanced soil fertility principles did not increase the forage yield of barley on this flood-irrigated field. The conventional strategy using 125 lb./ac. of 27-27-0 produced a greater yield of feed than a balanced approach using N, P, K and S. This was unexpected as the addition of K and S should not have reduced yield. What we may be seeing is a response to the additional P supplied by the conventional treatment. Aside from the usual challenges of field demonstration, seeding of this site was delayed until the last day of June by wet weather. The cost of the balanced program was $11/ac. greater and the yield was about 0.4 t/ac. lower. Early or at least timely seeding may be essential to capturing benefit from balanced fertility for irrigated annual forage production. More experimentation is necessary to truly understand the fertility requirements of forages at this site.

Forage Establishment Demonstration

Project Lead

- Gary Kruger, PAg, Provincial Irrigation Agrologist, Saskatchewan Agriculture

Co-operators

- Lynn Grant – Val Marie, SK
- Darren Steinley – Rush Lake, SK
- Robert Stuart – Cabri, SK

Project Objective

The objective of this project was to demonstrate an alternate approach for re-establishing forages on flood-irrigated soils.

Project Plan

A forage stand was terminated with glyphosate in fall. Annual crop will be sown directly into the sod this following spring using a single disk opener drill. Following two years of annual forage production, the field will be sown to alfalfa using a low disturbance drill. Trash will be conserved on the soil surface using low disturbance tillage tools. Three co-operators will be identified.

Demonstration Site

The demonstrations were located at Plot 220 at Val Marie, Plot 46 at Rush Lake, and Plot 7 at Miry Creek Irrigation District near Cabri, SK. The Val Marie site was heavy clay texture on barley stubble. The Rush Lake site was heavy clay texture on two-year-old alfalfa hay that had been replaced with a wild barley infestation. The Miry Creek site had been sprayed with glyphosate eight days prior to tillage with the Conservation Tillage System (CTS) implement. All three sites were very wet.

Project Methods and Observations

Each site has been worked with the Salford CTS tillage tool with an unworked portion left for comparison to see whether the deep tillage had an impact on forage production. The fields were tilled during the week of Oct. 18-20.

The project sites will be sprayed with glyphosate and sown to an annual cereal or to alfalfa without a cover crop in spring 2012. The impact of the tillage treatment on the growth of the cereal or alfalfa will be evaluated by the forage yields during next summer.

Fall P and K Alfalfa Fertilization

Project Lead

- Gary Kruger, PAg, Irrigation Agrologist, Saskatchewan Agriculture

Co-operator

- William Coventry- Mantario, SK

Project Objective

The purpose of the fertilization was to improve the yield and quality of the forage stand so as to enhance the vigor of the alfalfa plants and compete more effectively with weeds.

Demonstration Plan

This demonstration will increase alfalfa yield through balanced fertilizer application. The demonstration field was divided into six fertilizer treatments: control, broadcast phosphorus, broadcast phosphorus and potassium, banded phosphorus, banded potassium, and banded phosphorus and potassium together. A 5 ton/ac alfalfa crop removes 70 lb. P_2O_5 and 300 lb. K_2O. The rates applied to the demonstration were considered more than adequate.

Demonstration Site

The demonstration was located on Plot 11A on EH8-23-27-W3 of the Chesterfield Irrigation District. The soil is sandy loam texture.

Project Methods and Observations

The original plan was to band the fertilizer in the fall using a disk-banding implement to minimize the disturbance to the established alfalfa and move the field operation to a less busy time of year. Unfortunately, no disk-banding equipment was identified during fall, 2010, to allow application of the phosphorus and potassium. A 0-6-inch soil sample was collected from plot 11A in spring of 2011 for analysis at Midwest Laboratories (Table 1).

Table 1: Soil analysis of the demonstration site at plot 11A at the Chesterfield Irrigation District

pH (1:1 soil:water)	8.1		Soluble Salts (1:1 soil:water)	0.3 mmhos/cm		
Organic Matter (%)	3.3		Excess Lime	L		
CEC (meq/100g)	19					
Nitrate-N (0-6")(ppm)	6	L				
Bicarbonate P (ppm)	10	L	Base Saturation %	Micro Analysis		
1 N NH4OAc K (ppm)	8	L	1.2	Zn	1.7 ppm	M
1 N NH4OAc Mg (ppm)	92	L	21	Mn	3 ppm	VL
1 N NH4OAc Ca (ppm)	478	VH	77.2	Fe	36 ppm	VH
1 N NH4OAc Na (ppm)	2940	H	0.6	Cu	1.1 ppm	M
Sulphate S (ppm)	26	L		B	0.6 ppm	L

Fertilizer recommendations based on a target yield of 4 t alfalfa/ac. from this analysis 75 lb. P_20_5, 180 lb. K_20, 14 lb. S, 0.7 lb. Zn, 2.8 lb. Mn and 1.2 lb. B.

No sulphur and boron were applied because the irrigation water was assumed to supply more than adequate quantities. Zinc and manganese application were also ignored for this demonstration.

Irrigation

The plots at Chesterfield Irrigation District are irrigated by a single flood irrigation using water from the South Saskatchewan River west of Leader, SK.

Project Methods and Observations

The treatments applied to the site, as listed in Table 2, were applied on May 2, 2011. Broadcast treatments were applied with a Willmar ground driven dual spin spreader and banded treatments were applied with a John Deere LL24 6A 12 ft double disk press drill. The disks penetrated 1.5 cm into the loamy soil.

Table 2: Schedule of treatments and fertilizer applications made to Plot 11A at Chesterfield Irrigation Project near Leader

Treatment	Application Method	N	P_20_5	K_20	1^{st} Cut Hay Yield (t/ac.)
Check	None	0	0	0	2.49
6-28-28 at 270 lb./ac.	Broadcast	16	75	75	3.08
6-28-28 at 270 lb./ac.	Band	16	75	75	3.33
11-52-0 at 144 lb./ac.	Broadcast	16	75	0	3.48
11-52-0 at 144 lb./ac.	Band	16	75	0	3.29
10-0-47 at 160 lb./ac.	Band	16	0	75	3.40

The yield of hay did not vary consistently with either phosphorus or potassium fertilization. Hay yields increased between 0.5 - 0.9 ton/acre through fertilization, but which nutrient provided the most increase is not evident. No advantage was attributed to banding fertilizer as compared to broadcasting. On the basis of this demonstration, the extra cost and effort associated with banding is not warranted. Fertilization increased yield, but all fertilization regardless of nutrient applied was beneficial.

Forage samples were collected from the first cut hay in swath and submitted to ALS Laboratories for plant nutrient analysis. Results are summarized in Table 3.

Table 3: Plant tissue analysis of hay in swath

Treatment	N (%)	P (%)	K (%)	S (%)	Ca (%)	Mg (%)	Cu ug/g	Fe ug/g	Mn ug/g	Zn ug/g	B ug/g
Check	2.73	0.15	2.00	0.13	0.53	0.14	8.3	144	17	22	13
75 K_20 Band	3.00	0.14	2.09	0.14	0.48	0.11	7.0	68	18	24	12
75 P_20_5 Band	2.30	0.18	1.63	0.09	0.38	0.11	6.7	112	31	16	11
75 P_20_5 + 75 K_20 Band	2.25	0.19	2.10	0.10	0.40	0.13	6.6	72	23	15	9

Table 4: Sufficiency levels of nutrients in alfalfa and grass plant tissue (Sask. Soil Testing Laboratory, 1992)

Crop	N (%)	P (%)	K (%)	S (%)	Ca (%)	Mg (%)	Cu ug/g	Fe ug/g	Mn ug/g	Zn ug/g	B ug/g
Alfalfa	2.5	0.25	2.0	0.25	0.5	0.3	8	30	25	20	30
Grass	2.0	0.25	1.5	0.15	0.2	0.15	5	20	15	15	5

The tissue analysis of the hay within the treatments is a mixture of alfalfa and grass. Interpretation of the nutrient adequacy would be intermediate between the two levels indicated in Table 4 for grass or alfalfa. According to the tissue analysis, phosphorus, sulphur and magnesium are not taken up by the crop in sufficient quantities. Nutrient uptake is a confusing issue because of the interactions of the various nutrients. Suppose, for example, low availability of sulphur in the soil limits uptake of phosphorus. The level of phosphorus in the hay increased in response to a large application of phosphorus fertilizer, but not to a level considered adequate. This hypothesis will be tested in this demonstration for 2012. A blanket application of 24 lb. S/ac as 21-0-0-24 was made to the site in late fall, 2011, to test if sulphur was a limiting factor which prevents applications of P and K from increasing the forage yield.

The check variety in CSIDC Crop Varieties for Irrigation publication (three cut system) yielded 5.13 ton/ac./year and the top yielding variety at CSIDC is rated at just over 6.0 ton/ac./year. The yields observed at Chesterfield for one cut of a two-cut irrigated system are relatively good.

Final Discussion

The project was supported by the Agricultural Demonstration of Practices and Technologies (ADOPT) initiative under the Canada-Saskatchewan Growing Forward bi-lateral agreement.

Agronomic Trials

Canola Seeding Rate Trial

Project Leads
- Garry Hnatowich, PAg, CSIDC/ICDC
- Don David, CSIDC

Project Objective
The objective is to determine the appropriate seeding rates of canola under irrigation production.

Project Plan
This study was initiated to evaluate the agronomic implications of seeding canola at rates both below and above present suggested planting rates for irrigated production. Present guidelines for canola suggest a target population of 110 plants per square meter (plants/m^2). The trial was seeded at planting rates of 50, 75, 100, 150, 200 and 300 plants/m^2. Plant-stand densities at the three- to five-leaf stage and harvest yield were measured.

Demonstration Site
This project was located at CSIDC to limit field and equipment variation and to allow for greater ease of management. CSIDC staff assisted in the design and seeding of the trial; pesticide and irrigation applications; and collection of harvest data. Soils on the project site are classified as a very fine sandy loam to a loam.

Project Methods and Observations

Establishment and Crop Management
The seeding rate for each treatment was calculated using the formula:

$$\text{Seeding rate (lb./acre)} = \frac{\text{Target plant density/m}^2 \times \text{TKW (g)}}{\text{Seedling survival (\%)}}$$

Where TKW = thousand kernel weight

Pioneer Roundup Ready canola variety 45H28 was chosen for the test. The TKW of the variety measured 4.4 g and seedling survival was estimated to be 70 per cent. The seeding rate of each treatment is shown in Table 1.

The trial was seeded on May 19 at a 1.3 cm seeding depth. Plot size was 1.5 m by 6.0 m with 20 cm row spacing. Seed was treated with Helix XTra. Nitrogen fertilizer was applied as 46-0-0 at 100 lb. N/acre broadcast plus 55 lb. N/acre side-banded. Phosphorus as 11-52-0 at 40 lb. P_20_5/acre was also side-banded at seeding. Plots were maintained weed-free with chemical herbicide applications and hand weeding. A fungicide application of Proline was applied on July 5.

Table 1: Plant density treatments and seeding rates

Treatment (plants/m^2)	Seeding Rate (lb./acre)
50	2.0
75	3.0
100	4.0
150	6.0
200	8.0
250	10.0
300	12.0

Data Collection

Plant Stand Density Measurement
Plant stand density of each plot was measured at the 3 to 5 leaf stage on June 8. Table 2 summarizes the average plant density of each treatment.

Harvest
Plots were harvested on Sept. 12 by CSIDC staff.
Yields are summarized in Table 3.

Table 2: Average plant density as measured on June 8, 2011

Treatment (plants/m^2)	Average Density (plants/m^2)	% Density Achieved
50	36	72%
75	56	75%
100	88	88%
150	120	80%
200	168	84%
250	216	86%
300	256	85%

Table 3: Harvest data collected Sept. 12, 2011

Treatment (plants/m^2)	Average Plant Height (cm)	Lodge Rating 1=erect 5=flat	Average Yield (kg/ha)	Average Yield (bu./acre)
50	137	2.0	3828	68.3
75	133	2.2	3963	70.7
100	142	2.3	4185	74.7
150	138	2.5	4722	84.2
200	140	2.8	5054	90.2
250	138	3.0	4796	85.6
300	136	3.7	5062	90.3

Final Discussion

Present recommendations suggest that producers target a plant density of 110 plants/m^2. Preliminary results from this study suggest that there is a benefit from increasing the target density when seeding canola. However, it is premature to assume that increasing the seeding rate beyond current recommendations would be economical. It is suggested that this trial be repeated in 2012 but increase the number of varieties to three or four with a wider genetic diversity.

Producers should assess the growing conditions and equipment of their individual farms to determine what seeding rate works best for their farming operation. Choosing a lower seeding rate may reduce seed costs but does expose a producer to a higher level of risk. There are fewer plants in the field to compensate for risks such as poor seeding conditions, seeding equipment malfunctions, weed competition, disease or insects, poor irrigation management or frost. Lower plant density can also result in uneven or delayed crop maturity, making harvest operations difficult.

For irrigators, the risks to consider when seeding canola are seeding date relative to spring frosts, soil temperature relative to rapid emergence and seed placement dependent upon the seeding equipment used. Producers should adjust seeding rates based on the TKW and seed at a rate which addresses the conditions of their farms each spring.

Durum Seeding Rate Trial

Project Leads

- Garry Hnatowich, PAg, CSIDC/ICDC
- Don David, CSIDC

Project Objective

The objective is to determine the appropriate seeding rates of durum wheat under irrigation production.

Project Plan

This study was initiated to evaluate the agronomic implications of seeding durum wheat at rates both below and above present suggested planting rates for irrigated production. Present guidelines for durum suggest a target population of 250 plants per square meter (plants/m^2). The trial was seeded at planting rates of 100, 200, 300, 400 and 500 plants/m^2. Plant stand densities at the three-leaf stage and harvest yield were measured.

Demonstration Site

This project was located at CSIDC to limit field and equipment variation and to allow for greater ease of management. CSIDC staff assisted in the design and seeding of the trial; pesticide and irrigation applications; and collection of harvest data. Soils on the project site are classified as a very fine sandy loam to a loam.

Project Methods and Observations

Establishment and Crop Management

The seeding rate for each treatment was calculated using the formula:

$$\textbf{Seeding rate (lb./acre)} = \frac{\textbf{Target plant density/m}^2 \textbf{ x TKW (g)}}{\textbf{Seedling survival (\%)}}$$

Where TKW = thousand kernel weight

Durum variety cv. Strongfield was chosen for the test. The TKW of the variety measured 46 g and seedling survival was estimated to be 90 per cent. The seeding rate for each treatment is shown in Table 1.

The trial was seeded on May 12 at a 3.0 cm seeding depth. Plot size was 1.5 m by 4.0 m with 20 cm row spacing. Nitrogen fertilizer was applied as 46-0-0 at 100 lb. N/acre broadcast plus 20 lb. N/acre side-banded. Phosphorus as 11-52-0 at 55 lb. P_20_5/acre was also side-banded at seeding. Plots were maintained weed free with chemical herbicide applications and hand weeding. A fungicide application of Proline was applied on July 5.

Table 1: Plant density treatments and seeding rates

Treatment (plants/m^2)	Seeding Rate (lb./acre)
100	48
200	96
300	144
400	192
500	240

Data Collection

Plant Stand Density Measurement
Plant stand density of each plot was measured at the 3- leaf stage on June 6. Table 2 summarizes the average plant density of each treatment.

Harvest
Plots were harvested on Sept. 8 by CSIDC staff.
Yields are summarized in Table 3.

Table 2: Average plant density as measured on June 8, 2011

Treatment (plants/m^2)	Average Density (plants/m^2)	% Density Achieved
100	78	78%
200	141	71%
300	169	56%
400	229	57%
500	289	58%

Table 3: Harvest data collected Sept. 8, 2011

Treatment (plants/m^2)	Average Plant Height (cm)	% Protein	Average Yield (kg/ha)	Average Yield (bu./acre)
100	87	14.8	5208	77.4
200	93	14.8	6026	89.6
300	94	14.9	6104	90.7
400	93	15.1	6130	91.1
500	94	15.0	6055	90.0

Discussion

Present recommendations suggest that producers target a plant density of 250 plants/m^2. Preliminary results from this study suggest that there was no apparent benefit from increasing the target density when seeding durum. However, this trial experienced two hail events during the season and visual observations suggested that the higher seeding rates experienced greater damage. Full statistical analysis on this year's trial is still underway. It is suggested that this trial be repeated in 2012 but increase the number of varieties to three or four with a wider genetic diversity.

Irrigation Water Management Practices 2011

Project Lead

- Rory Cranston, PAg, Irrigation Agrologist, Saskatchewan Agriculture

Co-investigator

- Sarah Butler, ICDC summer student

Co-operators

- Randy Bergstrom, LLID, Birsay, SK
- Gary Ewen, RID, Riverhurst, SK
- Roy King, LLID, Birsay, SK
- Craig Langer, RID, Riverhurst, SK

Project Objective

The objective of the project was to compare the current on-farm irrigation water management practices of irrigators by documenting actual crop-water use, irrigation application volumes and irrigation management to optimal production recommendations that could be obtained by using the Alberta Irrigation Management Model (AIMM).

Project Plan

This project builds on a similar project from 2010. This project was conducted on producer fields in the Riverhurst and Luck Lake Irrigation districts. Three fields were selected in each irrigation district in 2010. The same fields were used in 2011. A weather station was assembled in each district to collect appropriate weather data required for use within AIMM. Weather data was downloaded weekly into the model.

Fields were monitored weekly. Each field was equipped with dryland and irrigation rain gauges and two Watermark™ sensors at the depths of 30cm (12in) and 60cm (24in). Soil moisture content was determined following seeding and every second week after by taking soil samples for gravimetric analysis. Actual crop water use was calculated using the Water Balance formula (Figure 1). The actual irrigation management and crop water use data was compared to a modeled optimum irrigation management scenario for the fields as determined through AIMM.

Figure 1: Water balance formula

$ET = (P + I) - R - D \pm \Delta S$
Where ET = actual crop water use or evapotranspiration
P = precipitation
I = effective irrigation
R = runoff
D = deep percolation
ΔS = change in soil moisture

Demonstration Site
Crops monitored in the Luck Lake district were durum, hard spring wheat and flax. Soil textures of these fields range from clay loam to silty clay. Seeding occurred on May 10 for durum, May 19 for hard spring wheat and May 21 for the flax.

In the Riverhurst district durum, canola and flax were planted on the selected field sites. The soil texture of these sites ranges from sandy clay loam to sandy clay. Seeding dates of these crops were May 21 for durum, May 12 for canola and May 15 for the flax

Project Methods and Observations
Spring soil moisture levels were determined by gravimetric analysis for all field sites. Samples were collected as close to seeding as possible and then every second week after that. Fields were monitored on a weekly basis following seeding to check soil moisture levels, irrigation application amounts, rainfall and crop development.

Field and crop information and moisture-use for each field were tracked. The actual crop water use for each field was calculated using the water balance method stated in Figure 1.

Actual crop water use, or evapotranspiration, was calculated from the date of spring soil sampling to the date of fall soil sampling. Effective irrigation, runoff and deep percolation were calculated in AIMM. Soil moisture change was determined as the difference between spring and fall soil moisture levels. Effective irrigation is the irrigation water that is available for crop use and is affected by the irrigation system type and efficiency rating. Graphs generated by the AIMM model depicting moisture-use based on producer irrigation management practices can be seen in Figures 2 and 4.

The optimum irrigation scheduling plan was developed in AIMM based on the field, crop, and local weather information. Irrigation events were added to the model as required to keep available soil moisture at an optimum level of 70 per cent or greater. Irrigation applications were added in increments of 25 mm effective irrigation (30.2 mm total irrigation), with a minimum of three days between applications. Graphs generated by the AIMM model depicting moisture-use based on optimum irrigation management can be seen in Figures 3 and 5.

Figure 2 is a graph of the moisture-use curve for durum based on actual producer irrigation management. Figure 3 is a moisture-use curve of durum based on optimum irrigation management. The optimum irrigation management curve predicted a need for irrigation in the middle of May. The first actual irrigation did not occur until the end of June. AIMM predicted the optimum amount of irrigation required was 300 mm, the actual amount applied was 182 mm.

Figure 4 is a graph of the moisture-use curve for canola based on actual producer irrigation management. Figure 5 is a moisture-use curve for canola based on optimum irrigation management. The optimum irrigation management curve predicted a need for irrigation in the end of May. The first actual irrigation did not occur until the middle of

June. AIMM predicted the optimum amount of irrigation required was 225 mm, the actual amount applied was 140 mm.

Figure 2: AIMM moisture-use curve of durum based on actual producer irrigation management

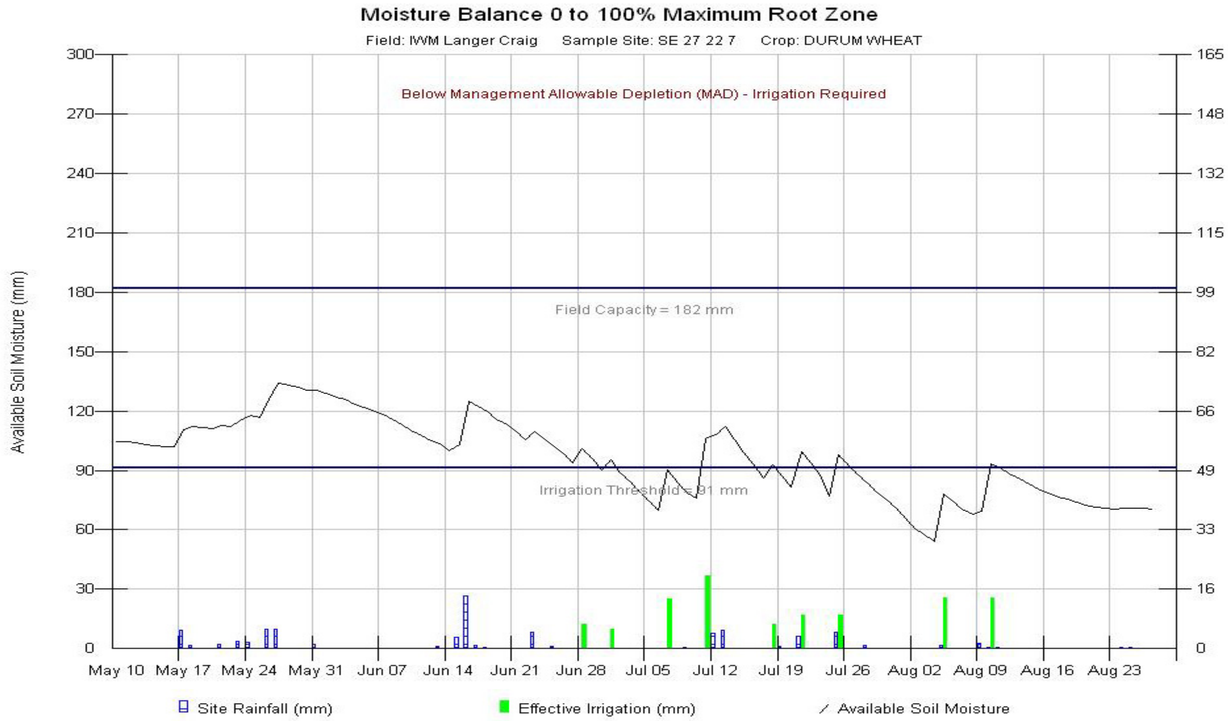


Figure 3: AIMM moisture-use curve of durum based on optimum irrigation management

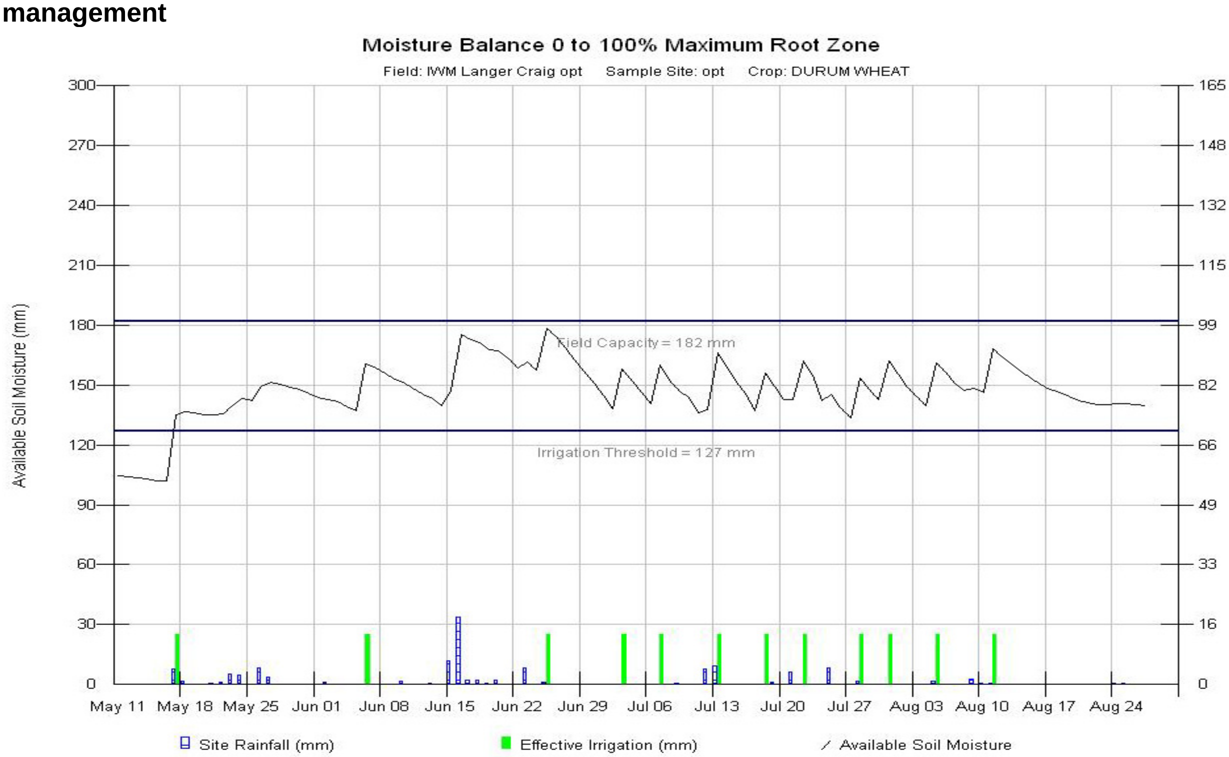


Figure 4: AIMM moisture-use curve of canola based on actual producer irrigation management

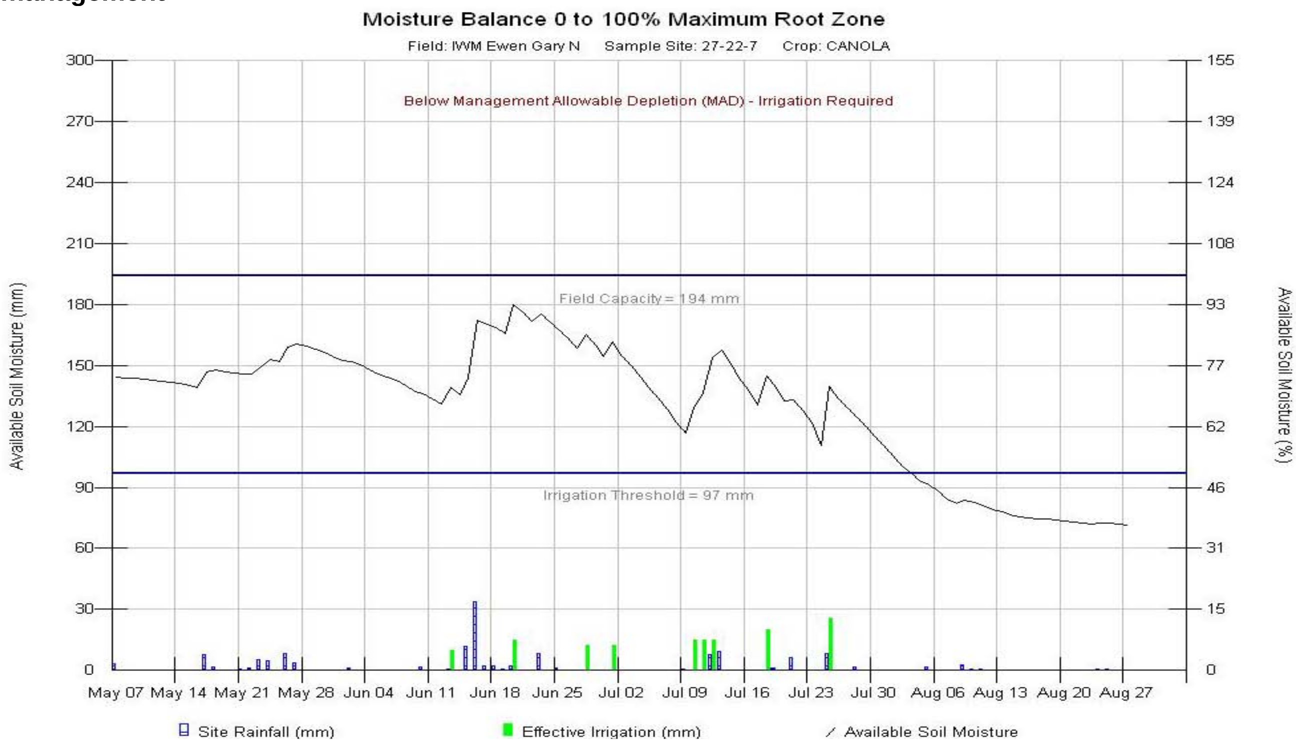
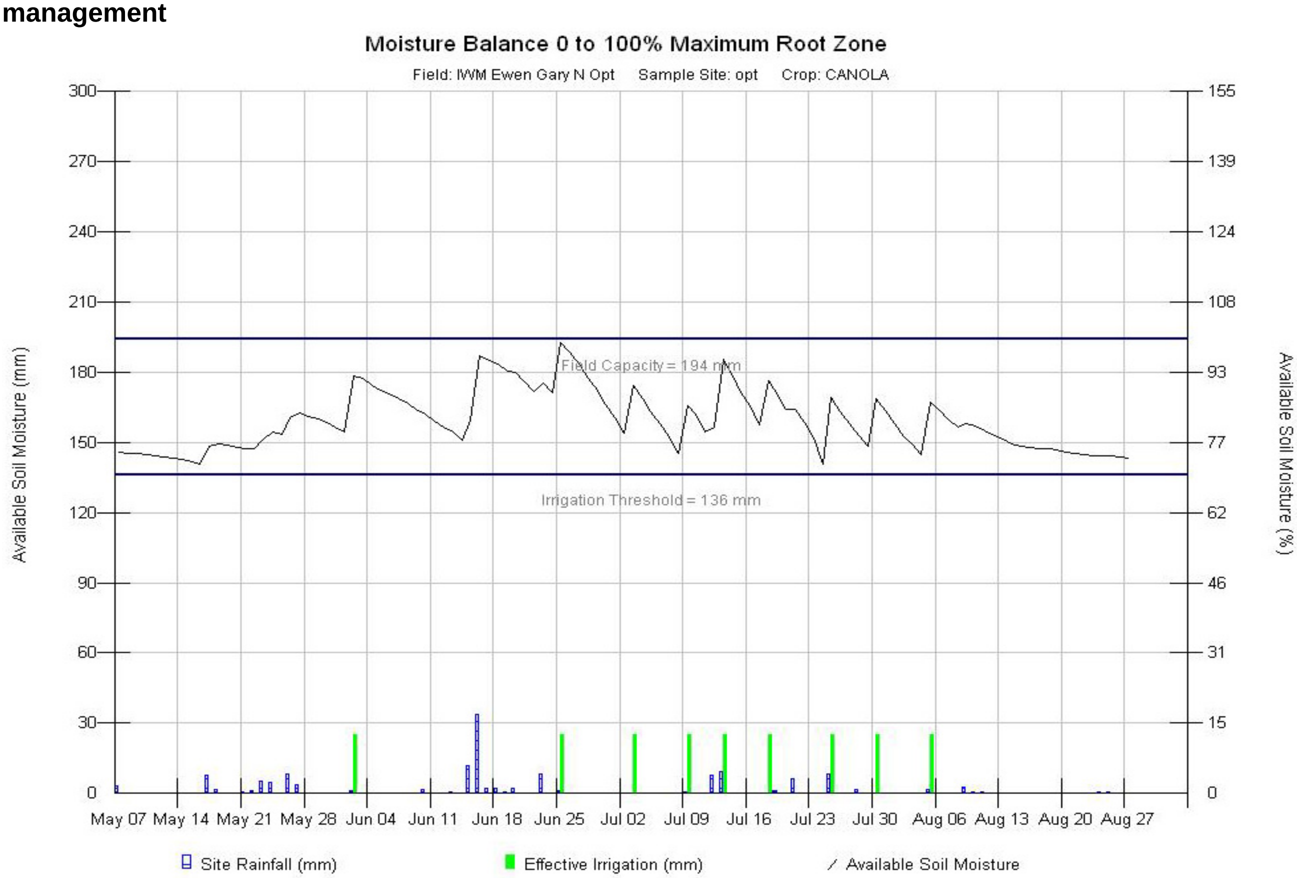


Figure 5: AIMM moisture-use curve of canola based on optimum irrigation management



Final Discussion
The actual crop water use for all fields was lower than the optimum crop water use modeled in AIMM indicating that total season crop water use was not met (Table 1).

Irrigators only applied 49 per cent of the optimum effective irrigation requirement that was predicted by AIMM (Table 2).

The AIMM-modeled fields were managed to maintain a soil moisture level of 70 per cent field capacity throughout the growing season to simulate optimal production levels. The difference between actual and optimal effective irrigation requirements demonstrates that farmers typically irrigate less than what is required by the crop for maximum production.

Table 1: Actual crop water use compared to AIMM-modeled optimum crop water use

District	Crop	Crop Water Use		Act/opt
		Actual (mm)	Optimum (mm)	
Riverhurst	**Durum**	345	405	85%
	Canola	353	367	96%
	Flax	372	393	95%
Luck Lake	**Durum**	339	380	89%
	HSW	339	383	89%
	Flax	314	363	87%
All sites average		344	382	90%

Table 2: Actual effective irrigation compared to AIMM- modeled optimum effective irrigation

District	Crop	Effective Irrigation		Act/opt
		Actual (mm)	Optimum (mm)	
Riverhurst	**Durum**	182	300	61%
	Canola	140	225	62%
	Flax	129	250	52%
Luck Lake	**Durum**	98	225	44%
	HSW	91	280	33%
	Flax	101	225	45%
All sites average		124	251	49%

Conclusions and Recommendations
The results of this project indicate that there is a difference between the optimal irrigation management practices predicted by AIMM and the actual on farm irrigation practice. AIMM indicates that producers are not irrigating enough and are irrigating late.

This project will continue on the same fields in 2012. The project will be modified to deliver information provided by AIMM to producers on a weekly basis so they can begin to implement this software as an on farm tool.

Herbert Scheduling Project

Project Lead

- Gary Kruger, PAg, Provincial Irrigation Agrologist, Saskatchewan Agriculture

Co-operator

- Ken Falk, Herbert, SK

Project Objective

The objective of this project was to monitor the irrigation applications and provide scheduling recommendations for three pivots in the Herbert Irrigation District.

Demonstration Plan

Three field sites were selected in the Herbert Irrigation District. A weather station had been established by ICDC to collect the appropriate weather parameters required for use within the Alberta Irrigation Management Model (AIMM). Weather data was downloaded to the model. Each field was equipped with rain gauges both in a dryland corner and under the irrigation system to determine actual amounts of irrigation. Fields were visited on a weekly basis. Soil moisture was determined following seeding and was monitored weekly using the feel method to determine available moisture.

Demonstration Site

The fields monitored included durum on SW 11-17-10 W3, canola on SW 14-17-10 W3 and canola on NE 14-17-10 W3. The fields are managed under a direct-seeded minimum tillage system.

Project Methods and Observations

Soil moisture status was monitored weekly. Soil moisture was determined using the feel method. Rainfall and irrigation were measured with rain gauges. One rain gauge was under the irrigation pivot inside the second tower, the other was placed on the dryland corner at the field. The difference between the two rain gauges is effective irrigation delivered to the field.

Soil moisture status at seeding time was estimated for the purpose of operating the model. The project lead made weekly visits to each field to record rainfall, irrigation and estimate available soil moisture. Irrigation recommendations were given to the co-operator on a weekly basis. A fall soil sample was collected for gravimetric analysis to determine fall soil moisture levels.

The weather data was input into the AIM Model to evaluate the management of this year's irrigation scheduling. The goal was to maintain the soil available moisture above 50 per cent of field capacity. This objective was achieved for the two canola fields, but the available moisture status of the durum field fell below the wilting point of the soil toward the end of July. Some yield potential will have been lost as a result.

The available moisture levels of a soil should be increased to or maintained near field capacity to ensure the crop has readily available water during the peak water use period in July and early August.

Table 1: Crop management practices for the irrigated fields involved in the Herbert Scheduling Project

Field	**S H 11**	**SW 14**	**NE 14**
Crop	Durum	Canola	Canola
Variety	Strongfield	Dekalb 7140	Invigor hybrid
Seeding Date	May 5, 2011	May 3, 2011	May 4, 2011
Fertilizer Applied (lb. nutrient/ac.)	87-42-15-15	87-42-15-15	87-42-15-15
Topdress Fertilizer (lb. nutrient/ac.)	None	15-0-0	15-0-0
Herbicide Treatment	Horizon + Buctril M	Odyssey	Liberty
Harvest Date	Sept. 9, 2011	Aug. 17, 2011	Aug. 18, 2011
Rainfall	246 mm	217 mm	231 mm
Irrigation	50 mm	128 mm	65 mm
Yield	42 bu.	55 bu.	55 bu.

The following charts summarize the moisture status of the root zone during the growing season for the crops: Figure 1 – durum SH11; Figure 2 – canola SW14; Figure 3 – canola NE14.

Figure 1: Moisture balance during the growing season for the durum crop grown on SW 11-17-10 W3.

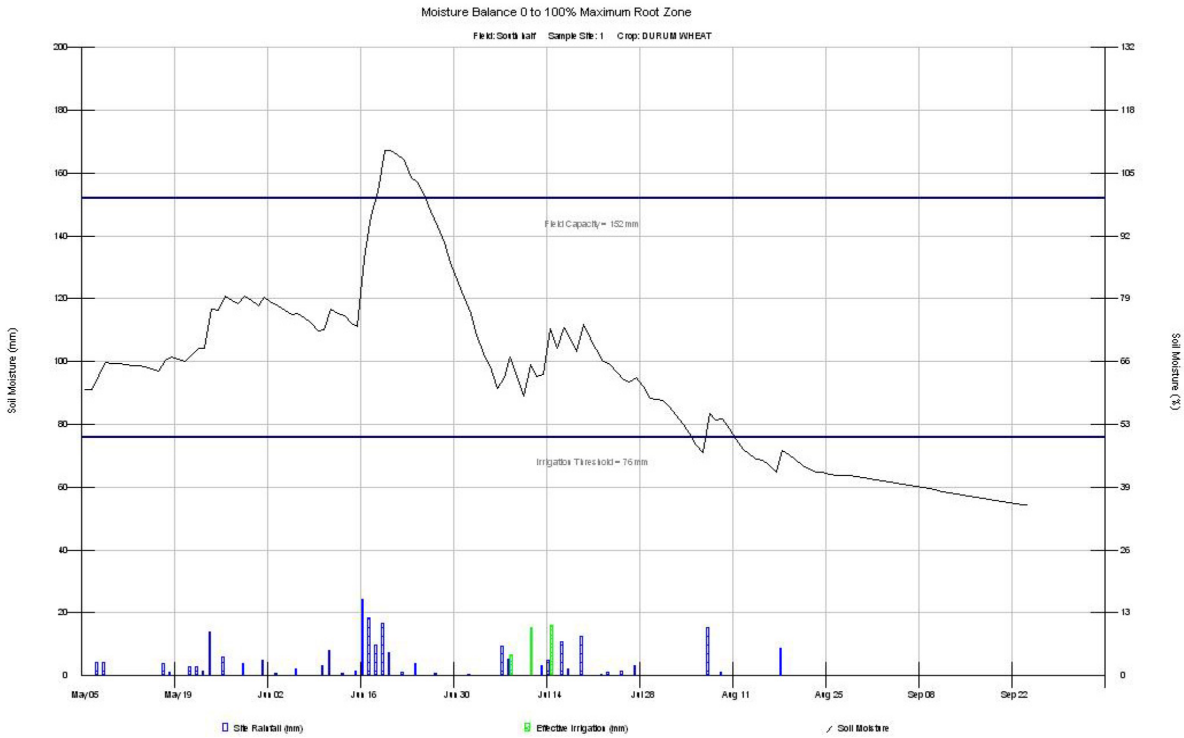


Figure 2: Moisture balance during the growing season for the canola crop grown on SW 14-17-10 W3.

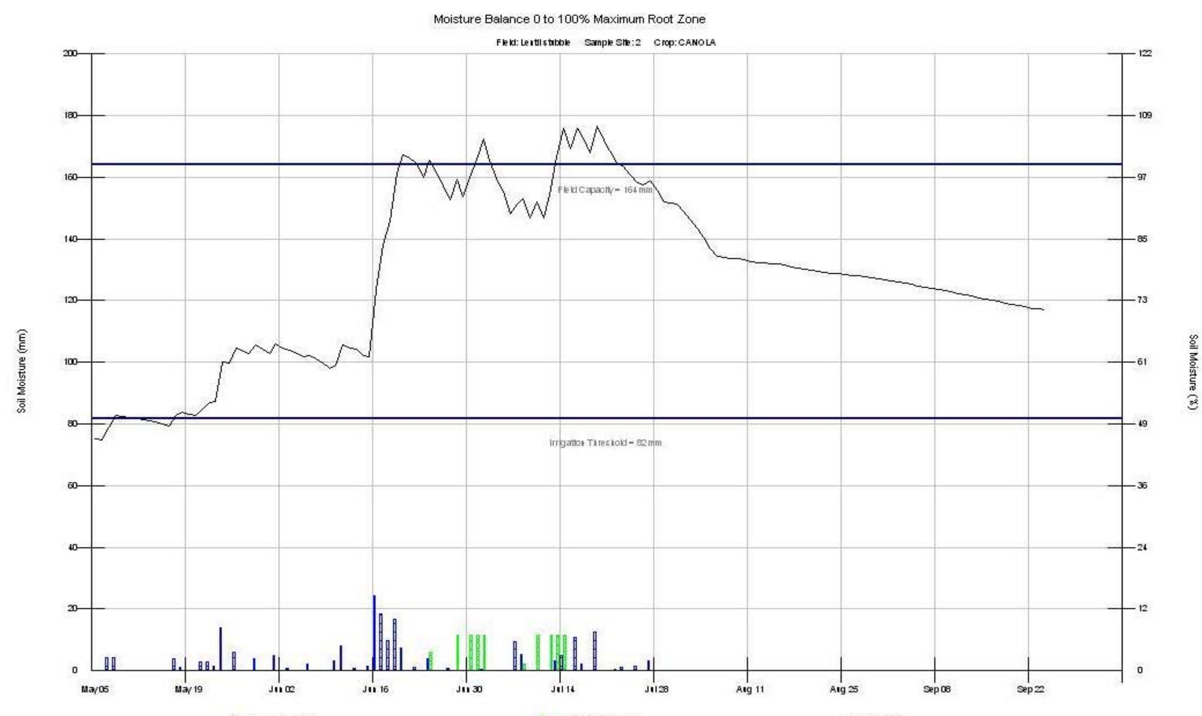
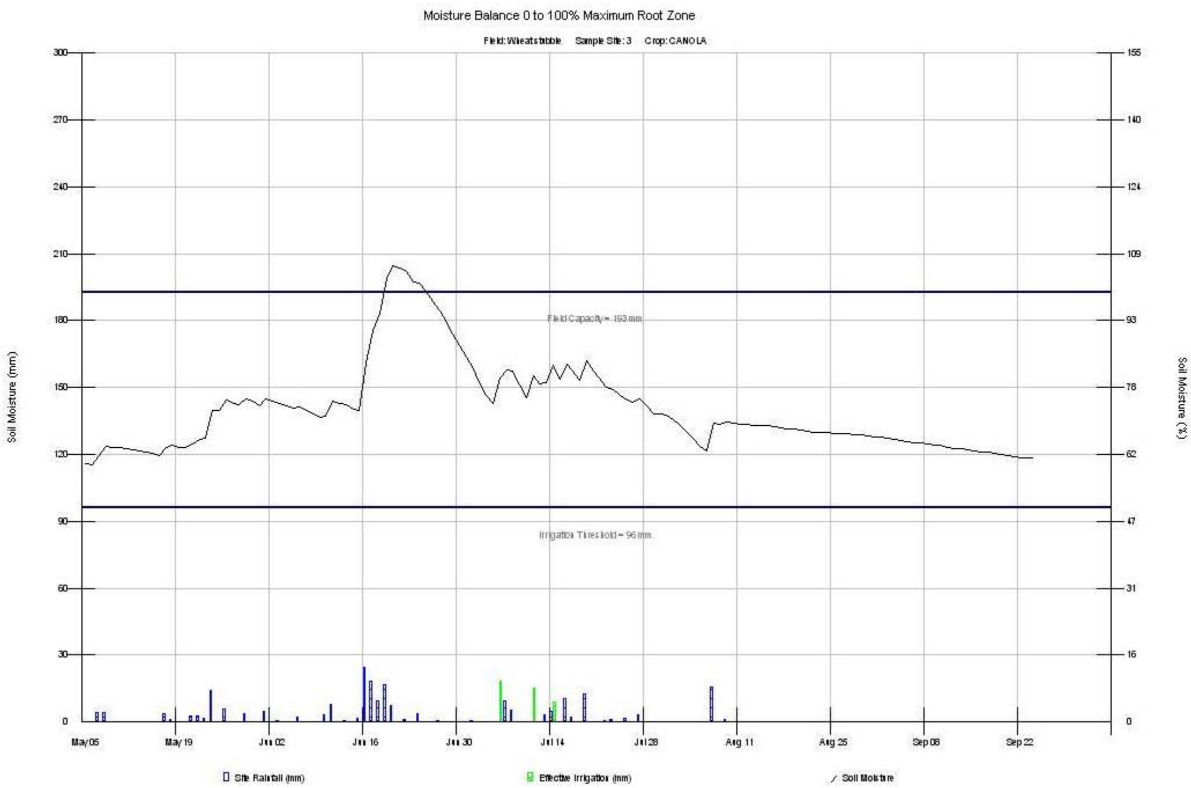


Figure 3: Moisture balance during the growing season for the canola crop grown on NE 14-17-10 W3



Final Discussion

Irrigation scheduling requires monitoring of available soil moisture throughout the entire growing season. Early season monitoring of available soil moisture is imperative to ensuring that adequate soil moisture is available in the profile to meet peak crop water use demands during critical-use periods of the growing season. The demonstration at Herbert served as a training exercise for both the project lead and the farmer for improving the scheduling of water for irrigated crops.

Technology Transfer 2011

Ministry of Agriculture Agrologist Extension Events

Field Days

- CSIDC Irrigation Field Day and Tradeshow, July 14, 2011.
    - Tours: morning led by Gerry Gross; afternoon led by John Linsley, Ministry of Agriculture.
    - New Oilseed Varieties stop, Gary Hnatowich, CSIDC.
    - Cereal Varieties, Alfalfa Demonstration and Irrigation Scheduling stop, Gary Hnatowich, CSIDC; Gary Kruger and Rory Cranston, Ministry of Agriculture.

Booth Display

- Crop Production Week: Saskatoon, Jan. 10-14, 2011.
- CSIDC Irrigation Field Day and Tradeshow: Outlook, July 14, 2011.
- ICDC/SIPA Annual Conference: Moose Jaw, Dec. 6-7, 2011.

Publications

- Crop Varieties for Irrigation, 2011.
- Irrigation Economics and Agronomics, Feb. 2011.
- The *Irrigator*, March 2011.
- Intensive Irrigation Kicks-Out $800/acre, dryland $180 Fact Sheet, July 2011.

Presentations

Gary Kruger

- Miry Creek Irrigation District annual meeting presentation, April 5, 2011.
- Rush Lake Irrigation District annual meeting presentation, April 12, 2011.
- Farmgate interview on South West ICDC projects, April 16, 2011.
- North Waldeck Irrigation District annual meeting presentation, April 19, 2011.
- Ponteix Irrigation District annual meeting presentation, April 20, 2011.

Rory Cranston

- Cereal leaf disease and fusarium head blight management at Biggar, Jan. 27, 2011.
- Fungicide application in dry beans at Outlook, Jan. 30, 2011.
- Riverhurst Irrigation District annual meeting presentation, March 15, 2011.
- Luck Lake Irrigation District annual meeting presentation, March 29, 2011.
- Cereal leaf disease and fusarium head blight management at Outlook, April 15, 2011.
- Radio spot on CJWW on Irrigation scheduling, June 15, 2011.
- Irrigation Scheduling at the CSIDC Field Day, July 14, 2011.

- Cereal leaf disease and fusarium head blight management at Beechy, Aug. 12, 2011.

Gerry Gross

- SSRID#1 Annual meeting presentation, March 2011.
- ICDC program presentation at the provincial specialists meeting, May 2011.
- Radio spot on CJWW on CSIDC field day and the irrigation industry in Saskatchewan, June 2011.
- ICDC discussion at the CSIDC Field Day and at the SIPA South Saskatchewan River Showcase Tour, Aug. 2011.
- Video developed on Irrigation Technology Advances, Aug. 2011.

Agriview Articles 2011

Gary Kruger, PAg

- New Salt Tolerant Alfalfa Varieties, March 2011.
- What does Liebig's Law mean for Southwestern Saskatchewan, March 2011.
- Alfalfa Suited to Saline Soils, Oct. 2011.

Rory Cranston, PAg

- Irrigation Scheduling Software Available, March 2011.
- Minimizing Late Blight Damage in 2011, March 2011.
- Horticulture Crops Under Irrigation, April 2011.
- Irrigation Publication Release Dates, Dec. 2011.

Gerry Gross, PAg

- Irrigation Crop Varieties for 2011, Feb. 2011.
- CSIDC Field Day, July 2011.
- SIPA/ICDC 2011 Conference.

Other Articles 2011

Gary Kruger, PAg

- ICDC 2011 Field Program – AAFC Irrigation Project Transition Newsletter, May, 2011.

Surveys (2011)

- **Fusarium head blight and cereal leaf disease survey**
  Rory Cranston, PAg
  Gary Kruger, PAg

- **Canola disease survey**
  Rory Cranston, PAg
  Gary Kruger, PAg

- **Bertha army worm survey**
  Rory Cranston, PAg

- **Diamond back moth survey**
  Rory Cranston, PAg

www.irrigationsaskatchewan.com report 2011

The Irrigation Saskatchewan website at www.irrigationsaskatchewan.com is designed so that visitors can have access to irrigation topics related to ICDC, SIPA and the Ministry of Agriculture.

The new site directs visitors to an ICDC subsection, a SIPA subsection or a link to the 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. All 2011 activities and publications were uploaded to the site.

Abbreviations

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
SPARC	Semiarid Prairie Agricultural Research Centre
bu.	bushel or bushels
ac.	acre or acres
lb.	pound or pounds
m	metre
cm	centimetre
mm	millimetre
L	litre
t	tonne
FHB	Fusarium head blight
DM	Dry matter
GPS	Global Positioning System

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