Canada-Saskatchewan
Irrigation
Diversification
Centre

Annual Review

2005-2006

Past

Present

Future

Canada

ICDC Irrigation Crop Diversification Corporation

Saskatchewan

Canada-Saskatchewan Irrigation Diversification Centre

901 McKenzie St. S., Box 700
Outlook, Saskatchewan
S0L 2N0
Phone (306) 867-5400; Fax (306) 867-9656
e-mail: csidc@agr.gc.ca

Annual Review
April 1, 2005 to March 31, 2006

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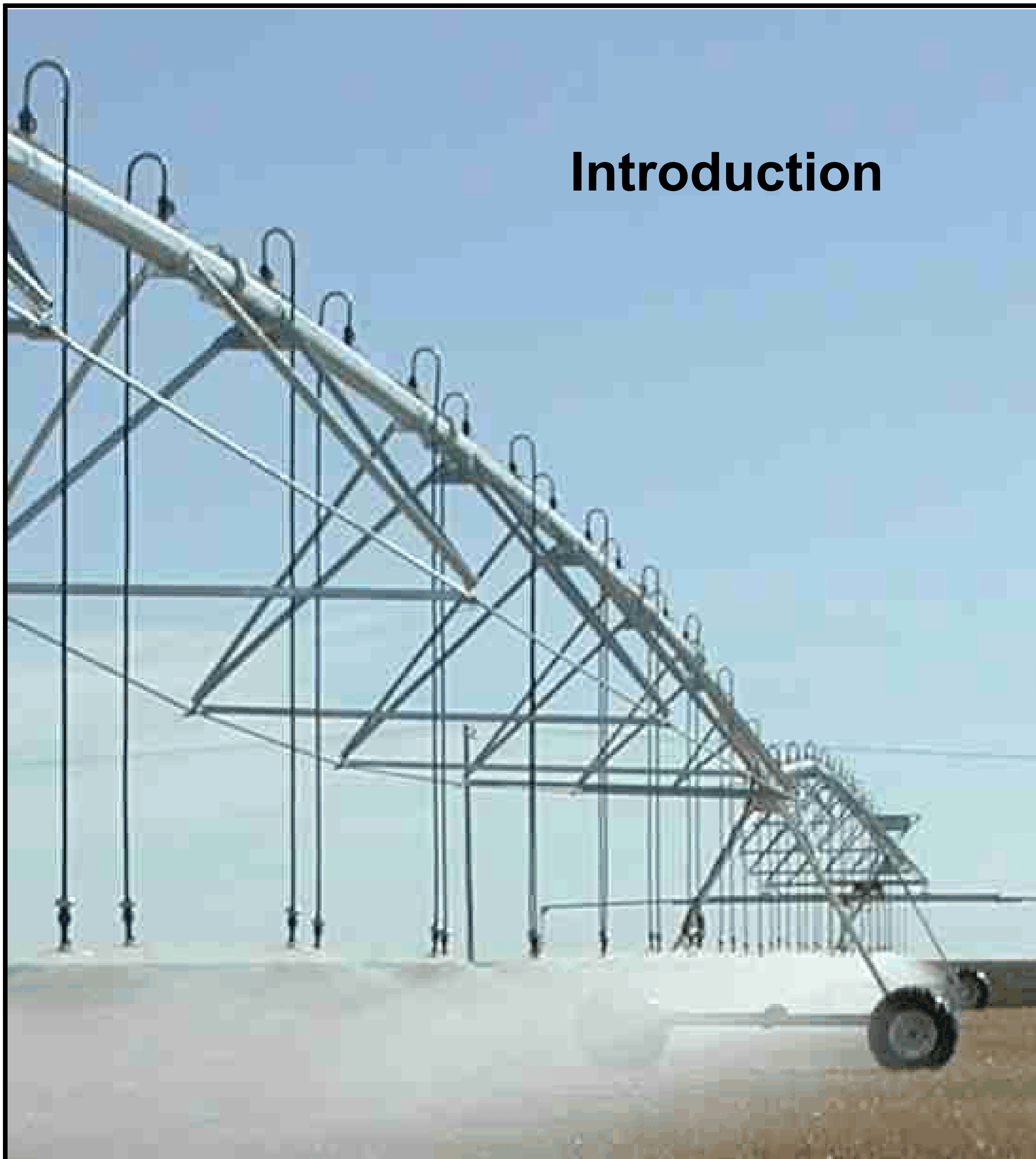
This report and other CSIDC publications are available at our internet address:
http://www.agr.gc.ca/pfra/csidc/csidc.htm

Introduction



Manager’s Report

Laurie Tollefson, Manager, CSIDC

On behalf of the Executive Management Committee (EMC) and the Centre staff, it gives me pleasure to present the Annual Report for the Canada-Saskatchewan Irrigation Diversification Centre (CSIDC). This report summarizes the activities conducted by the Centre during the period April 1st, 2005 to March 31st, 2006.

CSIDC was formed from a memorandum of understanding (MOU) signed in 1998. It includes Canada, represented by Agriculture and Agri-Food Canada (AAFC), the province of Saskatchewan, represented by Saskatchewan Agriculture and Food (SAF), and industry, represented by the Saskatchewan Irrigation Projects Association (SIPA) and the Irrigation Crop Diversification Corporation (ICDC). These groups are members of the Centre’s Executive Management Committee (EMC). The MOU provides a framework that enables Canada, Saskatchewan and industry to conduct applied research and demonstration and to extend these results in support of sustainable irrigation.

During the 2005 growing season, a wide range of projects were implemented to help achieve the Centre’s goals. These included screening and evaluating new and existing crops and cultivars under irrigated conditions, developing and refining best management practices for production of selected crops under irrigated conditions, evaluating irrigation and other water management practices to achieve production efficiency and technology transfer. A detailed outline of this work will be provided in the following report.

New initiatives included participation and input to the Irrigation Strategy currently being developed by AAFC/PFRA through a contract with the Brace Institute. This strategy will help provide useful future direction. In addition, the Prairie Irrigation Crop Diversification Group signed a MOU that will assist joint information sharing between the provinces of Alberta, Manitoba and Saskatchewan in areas related to irrigation and diversification. One result of this MOU was a most successful conference entitled “Sustainable Irrigation for the Prairies” held in Saskatoon on March 22nd and 23rd, 2006.

The existing CSIDC MOU will end in January 2007. Work continues among the partners to review and revamp the MOU into the future. All partners agree it is a useful means of co-ordinating our efforts in irrigation. CSIDC management also evaluated the use of ProGrid® software as a tool for priority setting in the work that is done at the Centre. Further development will continue on this useful tool.

In terms of staffing, we are pleased to welcome two new members to CSIDC. These individuals are Gail Dyck, who will work on the development of the National Agri-Environmental Health Analysis and Reporting Program (NAHARP) indicator for irrigation water quantity and use efficiency. Dr. Jacques Millette has returned from an assignment in Cairo, Egypt to join our team in the position as soil and water specialist at CSIDC.

Technology transfer is a major function at CSIDC. The Annual Field Day was held on July 14th, 2005. This event attracted approximately 250 participants. Several commodity-specific field days including the Potato Field Day and the Corn/Soybean/Flax/Sunflower Field Day were also conducted. All were well attended. Numerous field tours were given to students from the Outlook and district elementary and high schools with the idea of educating the younger generation about agriculture, agricultural research, and the work at CSIDC. These tours culminated in a visit to the corn maze that was specifically built to attract youngsters. The school tours were a major success and attracted about 300 students. Tours were also given to several community groups.

International support is another important part of the Centre's activities. This is largely through staff involvement in the Canadian Committee on Irrigation and Drainage (CANCID), the International Commission on Irrigation and Drainage (ICID), and through project involvement with the Canadian International Development Agency (CIDA). Good technical exchange and partnerships are developed through this activity.

The Executive Management Committee:

ICDC	Carl Siemens (Mar-Dec) Kevin Plummer (Jan-Mar)
SIPA	Larry Lee
SAF	Scott Wright Don Farrer John Linsley
AAFC	Peter Hicklenton Larry Lenton
CSIDC	Laurie Tollefson Jazeem Wahab

Objectives

The Canada-Saskatchewan Irrigation Diversification Centre (CSIDC) is a Federal-Provincial-Industry partnership between Agriculture and Agri-Food Canada; Saskatchewan Agriculture and Food; the Irrigation Crop Diversification Corporation (ICDC); and the Saskatchewan Irrigation Projects Association (SIPA). Its mandate is to provide irrigation based applied research and demonstration activities with the following objectives:

- To identify higher value cropping opportunities to help target the Centre's research and demonstration programs for maximum benefit;
- To conduct, fund, and support irrigated research and demonstration to meet the needs of irrigation producers and industry in Saskatchewan;
- To co-operate with other agencies to develop, test, and refine means of diversifying and intensifying irrigated crop production in a sustainable manner;
- To demonstrate sustainable irrigated crop management practices at the Centre;
- To extend and deliver information on sustainable irrigation management to producers and irrigation stakeholders;
- To determine the impact of irrigation on the natural and physical resources; and
- To promote a Western Canadian approach to irrigation sustainability by co-operating with similar institutions and with industry in support of increased crop diversification and value-added processing.

Staff

CSIDC

Laurie Tollefson
Manager, CSIDC (Jan-Mar)
Acting Manager, Irrigation & Diversification

Terry Hogg
Irrigation Agronomist

Gail Dyck
Irrigation Agrologist

Barry Vestre
Field Operations Supervisor

Allen MacDonald
Equipment Maintenance & Operator

John Harrington
Information Technology (Dec-Mar)

Judy Clark
Administrative Assistant

Jazeem Wahab
Acting Manager, CSIDC (Apr-Dec)
Horticultural Crops Agronomist

Greg Larson
Acting Horticultural Crops Agronomist (Apr-Dec)
Horticultural Crops Technician (Jan-Mar)

Jacques Millette
Soil & Water Specialist

Don David
Field Crops Technician

Darryl Jacobson
Irrigation & Equipment Operator

Marlene Martinson
Administrative Services Coordinator

Debbie Greig
Data Entry Clerk

ICDC

John Linsley
ICDC, Manager, Outlook

Korvin Olfert
ICDC Agrologist, Swift Current

Lana Shaw
ICDC Agrologist, Outlook

Les Bohrson
ICDC Senior Agrologist, Swift Current

Clint Ringdal
ICDC Agrologist, Outlook

Frances Thauberger
ICDC Summer Student, Swift Current (May-Aug)

Casual / Summer Staff

Reegan Dahl

Shirley Simonson

Natasha Wawaruk

Skylar Feltis

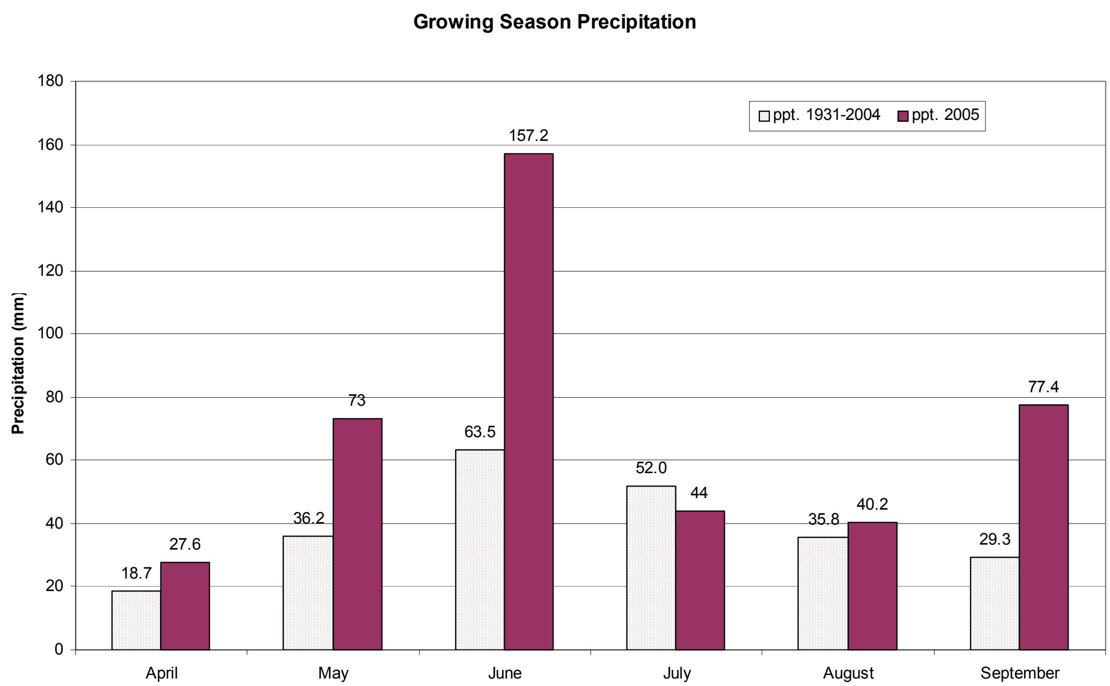
Paula Spigott

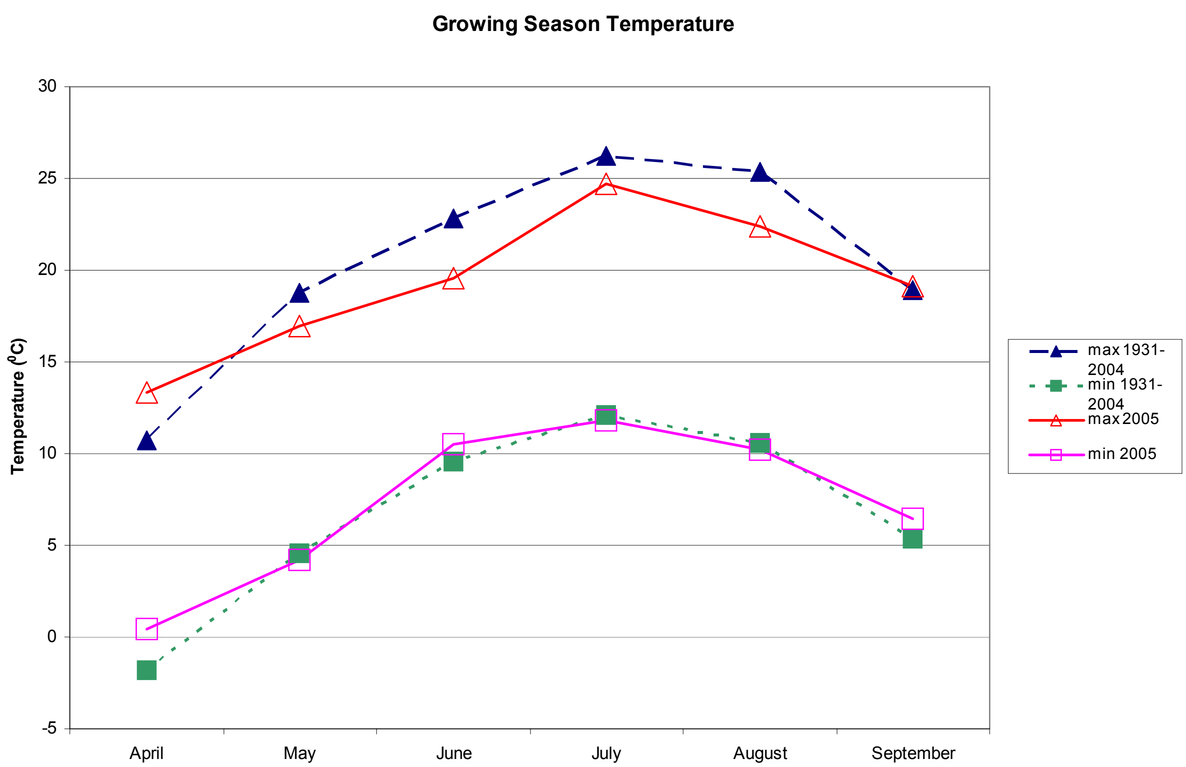
Varina Wawaruk

Brett Nixon

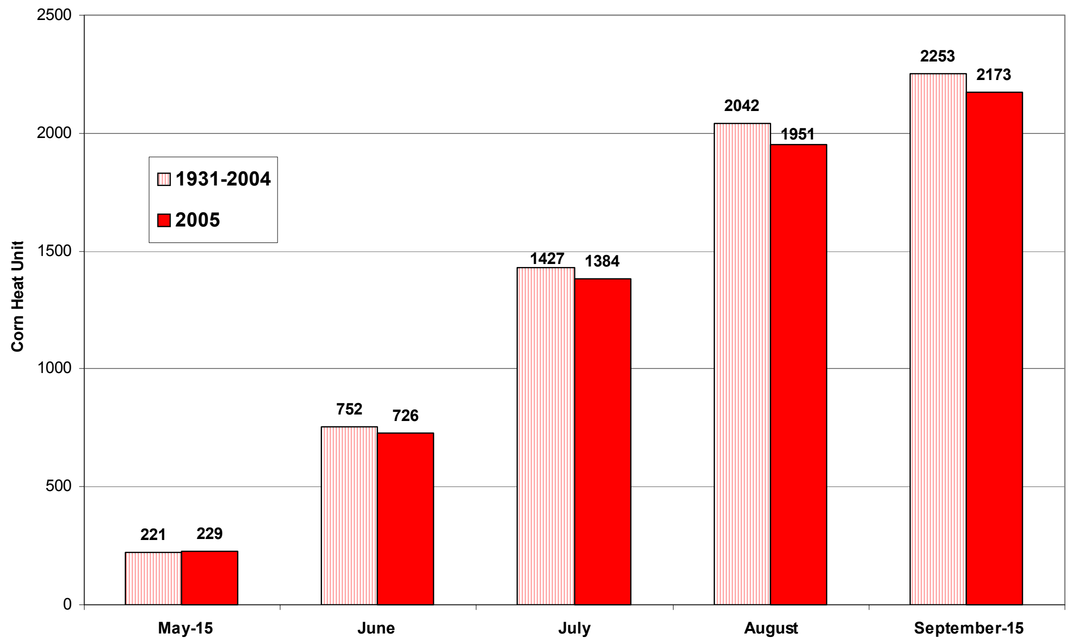
Richard Wagner

2005 Weather Summary

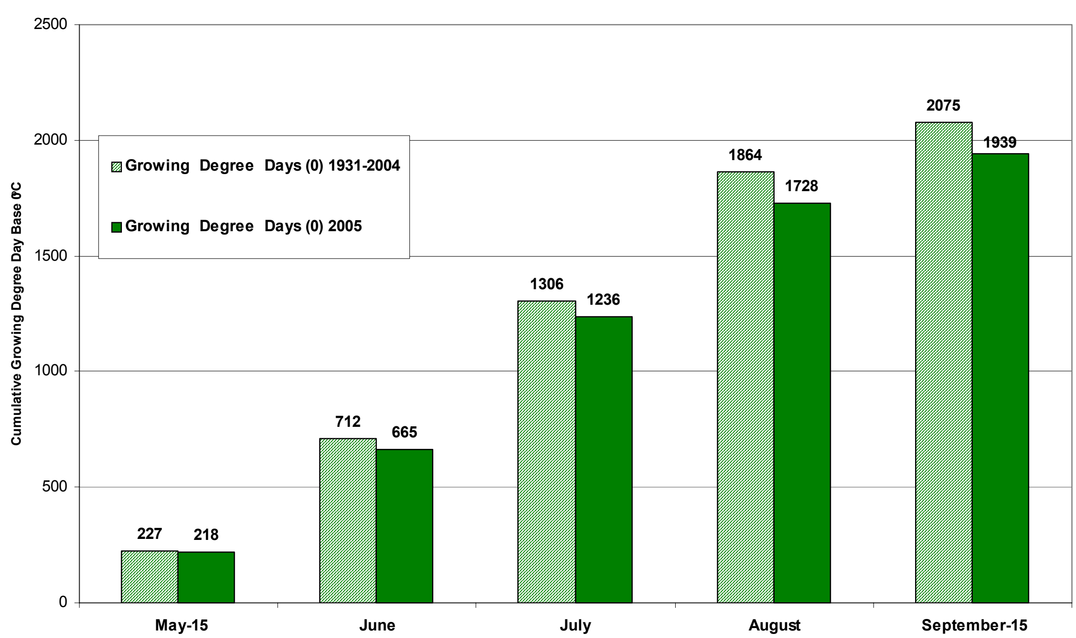




Cumulative Corn Heat Units



Growing Degree Days (Base 0 °C)



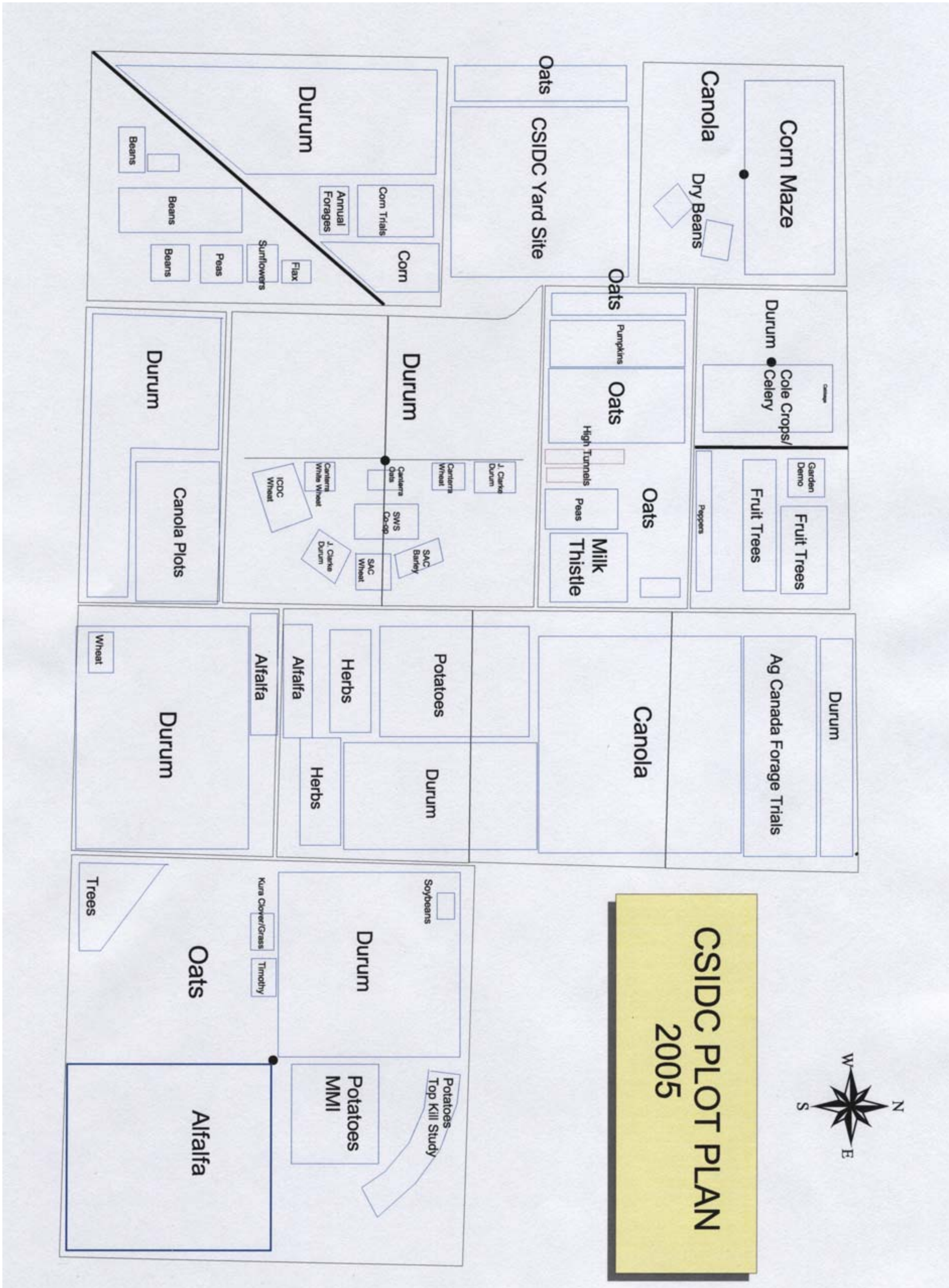
2005 Irrigation Summary

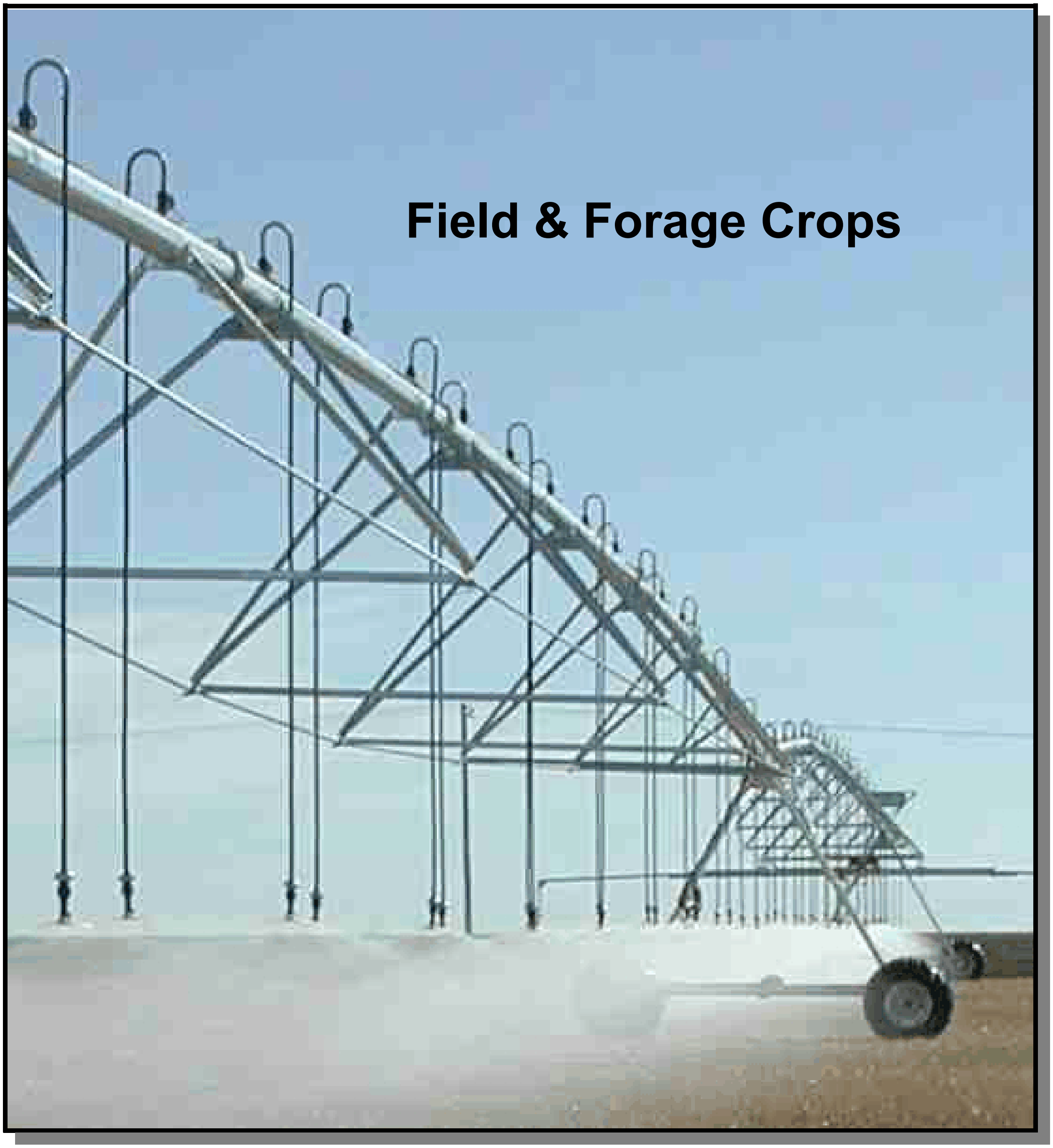
Table 1. Irrigation depth applied on fields 1 to 9 by crop, 2005 season, CSIDC, Outlook.

Field	Crop	Irrigation Depth Applied (mm)					Total Irrigation (mm)
		May	Jun	Jul	Aug	Sep	
1	Canola / Beans	0	0	55	15	0	70
1	Corn	0	0	90	0	0	90
2B	Cole Crops	15	0	45	30	15	105
2B	Celery	0	0	45	30	15	90
2B	Carrots	0	0	45	30	15	90
2B	Durum	0	0	11	0	0	11
3	Oats	0	0	0	0	0	0
4	Cereal Plots	0	0	70	25	0	95
5	Cereal Plots	0	0	70	25	0	95
6	Canola	0	0	75	15	0	90
6	Durum	0	0	45	0	0	45
7	Wheat - North Block	0	0	46	0	0	46
7	Wheat - South Block	0	0	65	0	0	65
7	Durum	0	0	40	0	0	40
8	Durum	0	0	15	0	0	15
8	Potatoes	0	0	97	60	0	157
8	Herb and spices	0	0	15	0	0	15
9	Canola	0	0	30	0	0	30

Table 2. Irrigation depth applied on fields 10 to 12 and off-station demonstration site by crop, 2005 season, CSIDC, Outlook.

Field	Crop	Irrigation Depth Applied (mm)					Total Irrigation (mm)
		May	Jun	Jul	Aug	Sep	
10	Grass / Alfalfa	0	0	42	15	0	57
11	Corn Trials	0	0	70	25	0	95
11	Annual Forages	0	0	45	15	0	60
11	Durum	0	0	55	15	0	70
11	Peas	0	0	55	0	0	55
11	Flax	0	0	55	0	0	55
11	Dry Bean	0	0	55	0	0	55
12	Durum (NW)	0	0	15	0	0	15
12	Potatoes (NE)	0	0	105	50	0	155
12	Alfalfa	0	0	35	0	0	35
12	Timothy	0	0	30	0	0	30
12	Oats (SW)	0	0	30	0	0	30
Demo	Cereal / Pulse Plots (NW)	0	0	105	45	0	150
Demo	Oats (NE)	0	0	45	15	0	60
Demo	Oats (SE)	0	0	45	15	0	60
Demo	Cereal / Oilseed Plots (SW)	0	0	105	45	0	150


CSIDC PLOT PLAN
2005
N
S
E
W
Corn Maze
Canola
Dry Beans
Oats
CSIDC Yard Site
Durum
Corn Trials
Annual Forages
Corn
Beans
Beans
Beans
Peas
Sunflowers
Flax
Durum
Cole Crops/ Celery
Oats
Pumpkins
Oats
High Tunnels
Oats
Peas
Milk Thistle
Garden Demo
Fruit Trees
Fruit Trees
Peppers
Durum
Durum
Canola Plots
J. Clarke Durum
Canterra Wheat
Canterra Oats
Canterra White Wheat
ICDC Wheat
SWS Co-op
SAC Barley
SAC Wheat
J. Clarke Durum
Durum
Ag Canada Forage Trials
Canola
Potatoes
Durum
Herbs
Herbs
Alfalfa
Alfalfa
Durum
Wheat
Soybeans
Durum
Kura Clover/Grass
Timothy
Oats
Trees
Potatoes Top Kill Study
Potatoes MMI
Alfalfa



Field & Forage Crops

Crop Variety Trials

Oilseeds

Cereals

Pulses

Agronomic Trials

Variety Development

Forage Crops

Crop Variety Trials

Western Canada Irrigated Canola Co-operative Test NI1

Funded by the Canola Council of Canada and Agriculture and Agri-Food Canada, PFRA.

The canola co-operative test was conducted on an irrigated site at CSIDC. The test was seeded on May 19. Plot size was 1.5 m x 6 m. Nitrogen was applied at 112 kg N/ha as 46-0-0 and phosphorus was applied at 56 kg P_2O_5/ha as 12-51-0. All fertilizer was side-banded at the time of seeding.

In the NI1 trial, all new lines had yield greater than the check variety 46A65 (Table 3). Three of the 25 new lines tested, PHS04-781, PHS04-785 and PHS04-786, had exceptionally high yield compared to the check variety. Most new lines had similar days to flower and maturity to the check and were similar in height or taller than the check. The majority of the new lines had a lodge rating either better than or equivalent to the check variety.

Prairie Canola Regional Variety Trial NL1 and NL2

Funded by the Canola Council of Canada, Irrigation Crop Diversification Corporation and Agriculture and Agri-Food Canada, PFRA.

The PCVT canola regional trials were conducted on an irrigated site at CSIDC. The NL1 and NL2 trials were seeded on May 19. Plot size was 1.5 m x 6 m. Nitrogen was applied at 112 kg N/ha as 46-0-0 and phosphorus was applied at 56 kg P_2O_5/ha as 12-51-0. All fertilizer was side-banded at the time of seeding.

In the NL1 trial, all of the entries except one (43A56) had high yield comparable to or greater than the check variety 46A65 (Table 4). Three entries, 45H21, Invigor 5070 and Z2409, had yield significantly greater than the check. All entries, except Invigor 5070, had a lodge rating equivalent to or greater than the check. In the NL2 trial, 8 out of 20 entries had yield significantly greater than the check variety 46A65 and lodge rating similar to the check (Table 5). Most entries in both tests had similar maturity to the check. In both trials plant height varied among the entries with only one entry in the NL1 trial (43A56) and one entry in the NL2 trial (1818) significantly shorter than the check and one entry in the NL2 trial (Nex 828CL) significantly taller than the check. The results from these trials are used to update the irrigation variety database at CSIDC and provide information to irrigators on the best canola varieties suited to irrigation conditions.

Table 3. Yield and agronomic data for the 2005 Irrigated Canola Co-operative test NI1.						
Entry	Yield (kg/ha)	Yield % of 46A65	Flower (days)	Maturity (days)	Height (cm)	Lodge rating 1=erect; 9=flat
46A65	4068	100	50	100	112	3.8
Q2	3765	93	52	101	119	5
03H091	4632	114	49	99	115	3.8
03H115	4310	106	50	100	118	4.5
03H136	4206	103	49	97	114	5.3
03H406	4193	103	50	99	112	5.5
03H631	4375	108	50	100	111	4.8
03N230R	4743	117	50	100	112	5.3
03N234R	4716	116	49	97	116	4.3
03N298R	4988	123	50	101	117	4.5
03N313R	4861	119	51	102	133	2.3
03N322R	4784	118	50	101	113	3.8
04N201I	4517	111	50	99	122	5
04N205I	4796	118	50	99	116	4.5
PHS03-626	4849	119	51	102	128	2.5
PHS04-690	5305	119	51	101	130	2
PHS04-691	4807	118	50	99	121	4
PHS04-780	4705	116	51	101	125	2.3
PHS04-781	5313	131	50	99	117	3.5
PHS04-785	5244	129	50	100	121	3.3
PHS04-786	5156	127	50	101	123	4.3
RHY03/016	5027	124	48	98	119	2.5
SW H5263 RR	4330	106	51	101	117	3.8
SW H5269 RR	4642	114	50	100	116	4.3
SW H5272 RR	4716	116	50	101	124	4
SW H5278 RR	4229	104	50	100	113	4.3
SW H5289 RR	4450	109	49	100	112	4.3
LSD (0.05)	499	-	1	2	9	1.1
CV (%)	7.61	-	1.12	1.14	5.14	19.03

Table 4. Yield and agronomic data for the 2005 PCVT Irrigated Canola Regional trial NL1.						
Entry	Yield (kg/ha)	Yield % of 46A65	Flower (days)	Maturity (days)	Height (cm)	Lodge rating 1=erect; 9=flat
46A65	3960	100	51	102	116	3.5
43A56	3253	82	49	99	102	7.3
45H21	4917	124	50	101	117	4
45H25	4483	113	49	101	119	3.5
45H72	4102	104	51	101	117	4
829 RR	3951	100	50	101	109	3.8
904 RR	3930	99	51	101	113	3.8
9550	3871	98	51	102	111	3.8
AV 9618	4258	108	49	99	107	5.5
CC504-03	3954	100	52	102	113	4.5
GLADIATOR	4454	112	49	100	119	3.8
Invigor 5070	4909	124	50	101	120	2.8
SP BANNER	3953	100	49	101	108	3.5
SW G5235 RR	4099	104	49	101	117	3.8
SW G5246 RR	4173	105	50	101	113	3.8
V1031	4357	110	51	101	110	5.3
Z2409	4914	124	50	98	105	4.8
LSD (0.05)	596	-	NS	2	11	1
CV (%)	10.01	-	2.53	1.24	6.8	16.68

Table 5. Yield and agronomic data for the 2005 PCVT Irrigated Canola Regional trial NL2.						
Entry	Yield (kg/ha)	Yield % of 46A65	Flower (days)	Maturity (days)	Height (cm)	Lodge rating 1=erect; 9=flat
46A65	3855	100	50	102	117	3.8
163-12	3933	102	50	102	109	5
1818	4740	123	48	100	99	5
1841	5161	134	50	101	126	3
292CL	4686	122	49	99	109	4
423 RR	3774	99	51	101	116	4.8
45H24	4556	118	50	101	116	4.3
46H23	4429	115	49	101	114	4.3
46H70	4478	116	49	101	115	4.3
624 RR	4241	110	50	102	120	3.5
AV 9514	4779	124	51	102	118	5.3
IMC209	3946	102	51	103	111	4
Nex 824CL	3847	100	52	103	120	4.3
Nex 828CL	3395	88	55	104	132	2
Nex 830CL	4031	105	51	104	118	4.5
RE 3040-02.4	4470	116	50	102	114	4.5
SP 451 RR	4279	111	48	99	113	4.8
SP Desirable RR	4355	113	49	99	113	3.5
SW G5251 RR	4529	117	49	102	122	3.8
V1030	4411	114	49	101	115	5.8
LSD (0.05)	594	-	1	1	9	1.1
CV (%)	9.77	-	1.19	0.84	5.42	18.06

Irrigated Canola Regional Variety Trial

Funded by the Irrigation Crop Diversification Corporation.

The irrigated canola regional trials were conducted at four locations in the Outlook area. Each site and soil type are as follows:

CSIDC (SW15-29-08-W3): Bradwell loam
CSIDC off-station (NW12-29-08-W3): Asquith sandy loam
Weiterman (SE16-31-07-W3): Asquith sandy loam - fine sandy loam
Pederson (NE17-28-07-W3): Elstow loam

Canola varieties were tested for their agronomic performance under irrigation. The CSIDC, Weiterman, CSIDC Off-station and Pederson sites were seeded on May 19, 19, 19 and 20, respectively. Plot size was 1.5 m x 4.0 m. All plots received 112 kg N/ha as 46-0-0 and 56 kg P_2O_5/ha as 12-51-0. All fertilizer was side-banded at the time of seeding. Yields were estimated by harvesting the entire plot. The Weiterman site was lost due to flea beetle damage and volunteer canola contamination. The Pederson site had a thinner stand than the two CSIDC sites.

Irrigated canola yield, height and lodge rating varied among the three remaining sites (Table 6). The majority of the canola varieties tested had higher yield than the check variety 46A65 averaged over the three test sites. The varieties 5020, 5030, 5070, 45H21, 45H24 and 1841 had exceptionally high yield compared to the check. Fortune RR, Nex824 and Millenium 03 were the only varieties that had yield lower than the check. Most varieties were similar in height to the check with only three varieties, 45H24, 5030 and Prairie 624RR, significantly taller than the check. Lodge ratings indicated that most varieties were as good as or better than the check.

The results from these trials are used to update the irrigation variety database at CSIDC and provide information to irrigators on the best canola varieties suited to irrigation conditions.

Irrigated Flax and Solin Regional Variety Trial

Funded by the Irrigation Crop Diversification Corporation
and the Saskatchewan Variety Performance Group, Saskatchewan Agriculture and Food.

The irrigated flax and solin regional tests were conducted at four locations in the Outlook area. Each site and soil type are as follows:

CSIDC (SW15-29-08-W3): Bradwell very fine sandy loam
CSIDC off-station (NW12-29-08-W3): Asquith sandy loam
Weiterman (SE16-31-07-W3): Asquith sandy loam - very fine sandy loam
Pederson (NE20-28-07-W3): Elstow loam

Flax and solin varieties were tested for their agronomic performance under irrigation. The CSIDC, CSIDC Off-station, Weiterman and Pederson sites were seeded May 20, 19, 19 and 20, respectively. The CSIDC site was re-seeded on June 6 due to problems with the seeder for the first seed date. Plot size was 1.5 m x 4.0 m. All plots received 112 kg N/ha as 46-0-0 and 56 kg P_2O_5/ha as 12-51-0. All fertilizer was side-banded at the time of seeding. Yields were estimated by harvesting the entire plot. The CSIDC Off-station site was lost due to wild life damage prior to harvest in the fall.

Irrigated oilseed flax and solin yield, height and lodge rating varied among the three sites (Table 7). All varieties had good lodging tolerance. All oilseed flax and solin varieties except FP2137 had yield lower than the check variety CDC Bethune averaged over the three test sites. FP2137 not only had high yield but also had good lodging tolerance and was one of the earliest maturing varieties. The lowest yielding entries were FP2112 oilseed flax and CDC Gold solin.

The results from these trials are used to update the irrigation variety database at CSIDC and provide information to irrigators on the best oilseed flax and solin varieties suited to irrigation.

Irrigated Sunflower Co-op LMTS and EMSS Variety Trial

Funded by Agriculture and Agri-Food Canada.

The Sunflower Co-op trial was conducted on an irrigated site at CSIDC. The test was seeded on May 20. The Late Maturing Tall Stature (LMTS) entries and the single Early Maturing Short Stature (EMSS) entry 63A21 were grown in a single trial with plant populations of 50,000 and 115,000 plants/ha, respectively. All varieties were seeded at a 60 cm row spacing with two rows/plot except for the EMSS entry 63A21 which was solid seeded at a 20 cm row spacing with six rows/plot. Plot size was 1.2 m x 6 m. Nitrogen was broadcast and soil incorporated at a rate of 112 kg N/ha urea (46-0-0) prior to seeding. Phosphorus was side banded at a rate of 56 kg P_2O_5/ha as 12-51-0 during the seeding operation. Yields were estimated by harvesting the entire plot.

All varieties except 63A21 yielded significantly higher than the check (Table 8). The variety 63A21 yielded significantly lower when seeded on a wide row spacing (LMTS) as compared to solid seeding (EMSS). All LMTS entries had plant height greater than the EMSS entry 63A21. All varieties except 63A21 had seed weight significantly less than the check. The variety 63A21 EMSS had a significantly lower seed weight when solid seeded compared to when seeded on a wide row spacing. Test weight varied from 32.9 to 39.1 kg/hl with all varieties except XF3424 significantly greater than the check. Test weight was higher for the variety 63A21 when solid seeded (EMSS) compared to when seeded on a wide row spacing. Two varieties, X6506 and 63A21, had significantly lower oil content than the check.

The results from these trials are used to update the irrigation variety database at CSIDC and provide information to irrigators on the best oilseed sunflower variety suited to irrigation conditions.

Table 6. Yield and agronomic data for the 2005 Irrigated Canola Regional Variety trial.

Variety	Pederson site				CSIDC site				CSIDC Off-station site				Mean yield	
	Yield (kg/ha)	Maturity (days)	Height (cm)	Lodge rating[1]	Yield (kg/ha)	Maturity (days)	Height (cm)	Lodge rating[1]	Yield (kg/ha)	Maturity (days)	Height (cm)	Lodge rating[1]	kg/ha	% of 46A65
46A65 (check)	1962	102	81	6.8	3752	100	109	4.5	3441	103	105	3.8	3052	100
1818	2143	101	77	6	4391	100	98	5.3	4721	101	99	3.8	3752	123
1841	3078	101	100	3.3	4904	99	116	3.8	5864	101	110	2	4615	151
45H21	3141	101	88	5.3	5204	98	114	5	5841	102	107	3	4729	155
45H24	2923	101	87	5	5163	98	113	4	5788	101	119	3.3	4625	452
45H72	2499	101	97	5	4742	100	110	4.8	5092	102	114	3.3	4111	135
46H02	2606	101	87	5.5	4802	99	106	4.3	5489	101	106	3.3	4299	141
46H23	1661	103	85	6.8	3752	100	103	5	4139	102	102	4	3184	104
46H70	2257	103	91	4.5	4084	100	113	3.8	4618	102	111	3.3	3653	120
5020	3322	99	88	3.8	4995	96	110	4.8	5317	99	99	3.8	4545	149
5030	3730	101	102	2.3	5515	99	121	2	5904	102	120	2	5050	165
5070	3184	101	91	3.3	5234	100	119	2.8	6145	102	116	2.8	4854	159
AV9514 (71-85 RR)	3352	101	100	4.5	4927	100	118	4.5	5797	102	116	4	4692	154
AV9525 (71-25 RR)	2449	100	84	5.8	4795	97	111	4	4997	99	112	2.8	4080	134
AV9618 (71-20 CL)	2864	100	89	6.3	4852	97	114	5.3	5111	101	103	4.5	4276	140
CS 7001J	2559	100	92	4.5	4449	99	114	4.3	4797	100	104	3	3935	129
Fortune RR	1054	103	80	5	2742	100	107	5	3041	102	102	4.5	2279	75
Gladiator RR	2301	101	86	5.3	4421	97	114	3.8	4826	100	108	3.3	3849	126
IMC 209RR	1740	103	90	4	3954	102	119	4.3	4474	103	110	2.8	3389	111
LBD612RR	2358	101	89	5.8	4516	97	115	4.3	4626	102	106	3.3	3833	126
Millenium 03	2012	102	83	8	2177	98	109	7.8	3787	101	105	4.8	2659	87
Nex 824	1823	104	87	5.5	2996	104	110	5.8	3197	103	97	4.5	2672	88
Nex 830	2161	103	88	4.3	3525	104	116	4	4358	103	109	3.5	3348	110
Prairie 624RR	2357	100	100	4.3	4294	97	114	3.8	4311	102	119	3.3	3654	120
Prairie 719RR	2075	103	79	1.8	4242	99	105	3.3	4516	101	101	3.5	3611	118
SP Desirable	2621	100	87	4.3	4345	96	108	2.5	4872	100	105	3.5	3946	129
SP451	2284	101	91	5.8	4290	97	108	5.3	5049	100	102	4	2874	127
v1030	2406	98	85	5	4822	99	117	5	5129	101	109	4.3	4119	135
V1031	2894	100	98	6.8	4804	99	117	6.3	5315	100	108	4.3	4338	142
X667	2680	98	87	6.3	4660	95	108	6	5504	97	108	5	4281	140
LSD (0.05)	456	2	8	1.2	619	1	8	1.4	616	1	11	0.9	-	-
CV (%)	13.07	1.12	6.68	16.62	9.99	0.9	5.19	22.98	9.01	0.62	7.1	18.44	-	-

[1] lodge rating (1=erect, 9=flat)

Table 7. Yield and agronomic data for the 2005 Irrigated Flax Regional Variety trial.

Variety	Pederson site				Weiterman site				CSIDC site				Mean yield	
	Yield (kg/ha)	Height (cm)	Maturity (days)	Lodge rating[1]	Yield (Kg/ha)	Height (cm)	Maturity (days)	Lodge rating[1]	Yield (kg/ha)	Height (cm)	Maturity (days)	Lodge rating[1]	kg/ha	% of CDC Bethune
Flax (brown linseed)														
CDC Bethune (FP1026)	4208	67	110	1	3893	72	112	1	4227	78	111	1	4109	100
CDC Mons (FP2044)	3444	64	115	1	4084	69	112	1	3737	71	114	1	3755	91
FP2112	3764	66	111	1	3791	75	111	1	3837	79	111	1	2657	65
FP2119	3835	64	110	2.7	3022	69	111	2.3	3644	72	109	1.3	3500	85
FP2137	4031	63	111	1	4962	70	110	1	4099	74	109	1	4364	106
CDC Sorrel (FP2141)	3566	69	115	2	2814	76	112	2.7	4103	82	115	1.3	3494	85
Prairie Blue (FP2024)	3672	67	117	1	4475	75	119	1	4024	77	118	1	4057	99
Solin (yellow linseed)														
2047 (SP2047)	3378	62	109	1	4053	72	112	1	3828	79	111	1	3753	91
2090 (SP2090)	3603	61	115	2.7	4041	66	114	2.7	3931	75	115	1.3	3858	94
2149 (SP2149)	3524	68	114	1	3497	74	113	1	3821	79	114	1	3614	88
CDC Gold (SP2100)	3013	60	111	1	3136	70	110	1	3424	76	109	1	3197	78
LSD (0.05)	NS[2]	5	1.7	0.4	794	2	2	0.5	NS	5	1.4	NS	-	-
CV (%)	11.16	4.3	0.87	16.75	12.27	1.77	0.94	19.71	6.82	4.08	0.76	27.64	-	-

[1] lodge rating (1=erect, 9=flat)
[2] not significant

Table 8. Yield and agronomic data for the 2005 Irrigated Sunflower Co-operative LMTS and EMSS Variety trial.							
Variety	Yield (kg/ha)	First Flower (days)	Maturity (days)	Plant Height (cm)	Seed Weight (mg)	Test Weight (kg/hl)	Oil (%)
LMTS							
63A70 (check)	3006	79	126	163	62.5	34.4	47.8
63M02	3473	77	124	155	49.9	39.1	48.5
XF3424	3824	79	126	151	58	32.9	48.3
X6506	3929	79	124	171	53.7	35.4	43.8
63A21	3272	69	116	137	63.2	36.1	42.3
EMSS							
63A21 EMSS	4256	69	116	143	52.5	38.8	45.8
LSD (0.05)	397	0.7	0.3	7.2	3.9	0.9	2.4
CV (%)	8.83	0.7	0.17	3.8	5.5	2.2	4.1

Western Canada Soft White Spring Wheat Co-operative Trial

Funded by Agriculture and Agri-Food Canada, PFRA.

Co-investigators: R.S. Sadasivaiah and R. Graf, Lethbridge Research Centre, Lethbridge, Alberta

The Soft White Spring Wheat co-operative trial was seeded May 14 in 1.5 m x 4.0 m plots. Nitrogen was applied at a rate of 112 kg N/ha as 46-0-0 and phosphorus was applied at a rate of 45 kg P_2O_5/ha as 12-51-0. All fertilizer was side-banded at the time of seeding. The entire plot was harvested for yield estimation.

Results for the trial are as presented in Table 9. All lines combine high yield comparable to or greater than the check variety with good lodging resistance and short stature. The lines 04PR-206, 04PR-220, 04F-7506, 04PR-219 and SWS349 had exceptionally high yield compared to the check variety AC Phil. Days to maturity was significantly greater for 50% of the new lines compared to the check indicating that many of the higher yielding new lines required a longer growing season to mature.

The results from this trial are used to assist in the registration decision process for Canada Western Soft White Spring Wheat (CWSWS) varieties.

Table 9. Yield and agronomic data for the 2005 Irrigated Soft White Spring Wheat Co-operative trial.					
Entry	Yield (kg/ha)	Yield % of AC Phil	Maturity (days)	Height (cm)	Lodge rating[1]
AC Phil (SWS89)	6533	100	110	81	3.3
AC Reed (SWS87)	6334	97	111	78	3.3
04-B005	7359	113	112	85	2.8
04-B006	6582	101	111	79	2.5
04-B049	7274	111	110	82	2.5
04-B071	7284	111	111	81	2.3
04-B072	7542	115	112	88	2.8
04-B080	8515	130	119	99	2.5
04F-6545	6492	99	110	95	3.3
04F-7506	7784	119	115	94	2.8
04F-7542	7296	112	120	101	2.8
04PR-118	6720	103	111	90	3
04PR-204	7343	112	113	92	3
04PR-206	7904	121	117	91	3
04PR-214	6973	107	116	86	3
04PR-219	7701	118	116	95	2
04PR-220	7918	121	117	94	2.3
SWS349	7721	118	118	88	3
SWS363	7646	117	117	88	2.3
SWS366	7104	109	120	84	2
LSD (0.05)	684	-	4	5	0.6
CV (%)	6.62	-	2.26	4.24	14.58

[1] lodge rating (1=erect, 9=flat)

Irrigated Wheat Regional Variety Trials

Funded by the Irrigation Crop Diversification Corporation.

The irrigated wheat variety trials were conducted at four locations in the Outlook area. Each site and soil type are as follows:

CSIDC (SW15-29-08-W3): Bradwell very fine sandy loam
CSIDC off-station (NW12-29-08-W3): Asquith sandy loam
Weiterman (SE16-31-07-W3): Asquith sandy loam - fine sandy loam
Pederson (NE17-28-07-W3): Elstow loam

Wheat varieties for the different market classes were tested for their agronomic performance under irrigation. The CSIDC, CSIDC Off-station, Weiterman and Pederson sites were seeded on May 13, 11, 16 and 16, respectively. Plot size was 1.5 m x 4.0 m. All plots received 112 kg N/ha as 46-0-0 and 45 kg P_2O_5/ha as 12-51-0 as a side band application during the seeding operation. Yields were estimated by harvesting the entire plot. The results are presented in Table 10.

Irrigated wheat yield, height and lodge rating varied among the four sites (Table 10). All varieties tested yielded higher than the check variety AC Barrie averaged over the four test sites. Exceptionally high yields were observed for AC Vista Canada Prairie Spring wheat; Strongfield, Commander and AC Avonlea Durum wheat; HY475 Canada Western Hard White Spring wheat; and Bhishaj and AC Andrew Canada Western Soft White Spring wheat. The highest yielding Canada Western Red Spring wheat was the newly registered variety Somerset. On average the Canada Western Soft White Spring, Canada Western Amber Durum and Canada Western Extra Strong market classes required a longer time to reach maturity than the other market classes. As well, the Canada Extra Strong market class varieties were taller and tended to lodge to a greater extent than varieties in the other market classes.

The results from these trials are used to update the irrigation variety database at CSIDC and provide information to irrigators on the best wheat varieties suited to irrigation conditions.

Table 10. Yield and agronomic data for the 2005 Irrigated Wheat Variety trial.

Variety	Pederson Site				Weiterman site				CSIDC Off-station site				CSIDC site				Mean yield	
	Yield (kg/ha)	Height (cm)	Maturity (days)	Lodge rating[1]	Yield (kg/ha)	Height (cm)	Maturity (days)	Lodge rating[1]	Yield (kg/ha)	Height (cm)	Maturity (days)	Lodge rating	Yield (kg/ha)	Height (cm)	Maturity (days)	Lodge rating	kg/ha	% AC Barrie
Canada Western Red Spring																		
AC Barrie	3683	98	106	1	3725	98	107	2.5	4932	96	111	2.8	4414	101	112	2.5	4189	100
5602HR	4932	97	109	2	5758	97	112	1.8	6125	97	115	1.5	5022	98	115	2.8	5459	130
CDC Go	4291	86	104	3.5	4315	87	104	1.5	5711	84	109	1	5402	87	110	1.8	4930	118
CDC Imagine	4427	96	107	2.3	5497	98	107	1	5753	95	112	1	5453	97	113	1	5283	126
CDC Osler	3847	96	104	3	4742	97	107	2	5278	93	111	1	5120	96	111	2	4747	113
Harvet	4243	95	105	3.3	4935	95	105	1.8	5438	93	108	1.3	5452	93	109	2	5017	120
Infifnity	5016	104	107	2	4557	100	107	2	5570	99	111	1.5	5404	100	113	2.3	5137	123
Journey	4128	93	106	2.8	4524	97	108	1	5329	93	112	1	5057	99	113	1.5	4760	114
Lillian	4979	100	106	3	5416	96	107	2.3	5928	97	111	3	5083	96	111	3.5	5352	128
Lovitt	4230	104	105	1.5	4051	103	106	3	5111	98	107	1.6	4555	103	111	2.3	4487	107
Peace	3577	96	105	3.3	4595	99	105	1.8	5245	97	109	1.8	4758	97	110	1.8	4544	108
Somerset	5176	105	105	2	5387	102	107	2.3	5958	100	110	1.8	5689	102	112	2	5553	133
Superb	4272	92	107	1.8	4242	91	108	1	5609	91	113	1	5318	93	113	1	4860	116
Canada Western Hard White Spring																		
HY475	6455	88	109	1.5	6498	88	109	1	6952	87	114	0.9	6905	89	115	1.8	6703	160
HY476	4618	86	109	2	5194	89	112	1	6343	84	112	1	5765	90	114	1.5	5480	131
Snowbird	3930	103	107	3.5	4748	102	107	2.3	5133	100	112	1.5	4963	99	112	1.8	4694	112
Canada Western Amber Durum																		
AC Avonlea	6100	97	112	1.5	6945	96	114	1.3	6410	94	116	1.3	5804	93	119	1.3	6315	151
AC Navigator	5821	82	111	3.3	6380	81	112	1	6820	80	117	1	5376	78	118	1	6099	146
Commander	6243	79	110	2	6925	80	112	1.3	7462	77	117	1.3	5398	75	117	1	6507	155
Strongfield	6793	96	112	3	7549	96	113	1.3	7010	94	116	1.8	6259	93	118	2.5	6903	165
Canada Prairie Spring - Red																		
AC Crystal	4475	101	106	2.5	3793	101	108	2.5	4887	98	112	3	4547	101	112	2.3	4426	106
5701PR	5628	86	109	4	6043	89	113	1	6387	84	114	1	5637	90	116	1.8	5924	141
Canada Prairie Spring - White																		
AC Vista	6898	90	108	2.5	7465	90	112	1.3	7355	85	112	1.3	6924	90	115	2.5	7161	171
Canada Western Extra Strong																		
Burnside	5253	104	108	2	5271	105	112	2.3	6066	101	116	3.3	5603	102	117	2.8	5548	132
CDC Rama	5542	106	108	1.3	5878	102	112	2.5	6570	100	116	1.8	5321	105	116	2.3	5828	139
CDC Walrus	5677	106	107	3.5	5713	104	112	2.5	6469	103	116	2.5	5021	106	118	3	4470	107
Canada Western Soft White Spring																		
AC Andrew	6890	89	112	2	5867	89	112	1	7201	87	115	1	6511	90	117	1	6617	158
AC Meena	5995	93	113	2	4652	91	112	1	6633	86	115	1	5410	90	117	1.5	5673	135
AC Nanda	5591	96	115	1.5	5044	94	114	1	6453	88	118	1.3	4780	93	120	3	5467	131
Bhishaj	6933	93	113	2.5	6492	91	113	1.5	7377	90	117	1	6393	88	118	2	6799	162
LSD (0.05)	645	3	1	1.3	720	3	1	0.7	616	4	2	0.8	789	4	1	1.1	-	-
CV (%)	8.85	2.58	0.63	39.44	9.47	2.51	0.89	31.79	7.16	3.13	1.19	38.4	10.31	3.27	0.89	39.74	-	-

[1] lodge rating (1=erect, 9=flat)

Saskatchewan Advisory Council
Irrigated Wheat and Barley Regional Variety Trials

Funded by the Saskatchewan Variety Performance Group (SAF), Agriculture and Agri-Food Canada, PFRA.

The Saskatchewan Advisory Council (SAC) wheat regional and barley regional trials were seeded on May 13. Plot size was 1.5 m x 4.0 m. All plots received 112 kg N/ha as 46-0-0 and 45 kg P_2O_5/ha as 12-51-0 as a side band application during the seeding operation. Separate tests were conducted for wheat (CWRS and CWHWS), durum (CWAD) and soft white (CWSWS) wheat market classes and 2-row and 6-row barley. Yields were estimated by harvesting the entire plot.

Results for the wheat test (CWRS and CWHWS) are shown in Table 11. All varieties in the trial showed good lodging resistance. Somerset was the tallest variety while HY475 and HY476 were the shortest varieties. All varieties except PT211 and PT425 had yield greater than the check variety AC Barrie. The highest yielding varieties were HY475 and HY476, from the CWHWS market class. Five varieties had seed weight significantly greater than the check with the highest seed weight observed for the CWHWS wheat variety HY475. The check variety AC Barrie had a significantly higher test weight than all other varieties except Infinity. The lowest test weights were observed for HY475 and HY476 CWHWS wheat varieties and Superb a CWRS variety.

Results for the durum wheat trial (CWAD) are shown in Table 12. Three durum varieties, AC Avonlea, Kyle and Strongfield, lodged to a greater extent than the check variety AC Barrie. Kyle was the tallest variety while all other durum varieties were significantly shorter than the check variety AC Barrie. All durum varieties had days to maturity significantly greater than the check with Kyle being the latest maturing variety. All durum varieties except AC Avonlea were significantly higher yielding than the check. AC Avonlea normally a high yielding durum performed poorly in this trial possibly due to poor seed quality resulting in poor stand establishment. All durum varieties had seed weight significantly greater than the check with highest seed weight produced for AC Navigator and Kyle. Test weight was similar for all varieties tested with only AC Avonlea having a significantly lower test weight than the check variety.

Results for the soft white spring wheat test (CWSWS) are shown in Table 13. All CWSWS varieties tested had shorter stature, similar lodge rating and required a longer time to mature than the check variety AC Barrie. High yield was obtained for all soft white spring wheat varieties with AC Andrew, SWS349 and Bishhaj producing the highest yields. AC Meena and AC Nanda had seed weight significantly lower than the check variety while all other varieties had seed weight similar to the check. All varieties except AC Nanda had test weight less than the check.

Results for the 2-row and 6-row barley trials are shown in Tables 14 and 15 respectively. AC Metcalfe, a 2-row barley, was used as the check for both the 2-row and 6-row barley trials. The 2-row test consisted of two malt varieties and eight feed varieties while the 6-row test consisted of four malt varieties and one feed variety. In the 2-row trial most varieties had plant height similar to the check except for the feed varieties CDC Cowboy and McLeod which were taller and shorter than the check respectively. CDC Cowboy was later maturing than all 2-row varieties tested while CONLON, Niobe and Rivers were the earliest maturing 2-row varieties. McLeod lodged to the greatest extent while TR03373 and CDC Trey stood up better than all other 2-row varieties. The 2-row feed variety TR03373 had exceptionally high yield. CDC Cowboy had the largest seed size while Niobe had the smallest seed size. CDC Trey and McLeod had the highest and lowest test weight respectively. In the 6-row test all entries tested had yields higher than the check variety. The malt variety CDC Laurence was the highest yielding 6-row variety tested. As well, all 6-row lines tested were shorter, had greater lodging resistance, smaller seed size and lower test weight than the check variety.

The results from these SAC wheat and barley trials are used to update the irrigation variety database at CSIDC and provide information to irrigators on the best wheat varieties suited to irrigation conditions.

Table 11. Saskatchewan Advisory Council 2005 Irrigated Wheat Regional Variety trial, Outlook.

Variety	Yield (kg/ha)	Yield % of AC Barrie	Height (cm)	Maturity (days)	Lodge rating[1]	Seed weight (mg)	Test weight (kg/hl)
AC Barrie (BW661)	4797	100	94	110	1	36.8	81.8
5602HR (BW297)	5640	118	93	112	1.3	40.8	80.2
CDC Alsask (BW301)	4994	104	97	108	2	38	80.2
HY475	6217	130	83	112	1	42.9	79.2
HY476	6214	130	82	112	1	41.9	79.8
Infinity (BW799)	5787	121	93	110	1	35.4	81.2
Lillian (BW776)	5668	118	96	109	1.8	41.6	80.8
PT211	4692	98	98	108	2	37.2	80.8
PT425	4341	90	94	102	2	37.7	80.1
Somerset (BW307)	5040	105	103	109	1.3	41.5	80
Superb (BW252)	5571	116	87	112	1	39.5	78.5
LSD (0.05)	343	-	4	1	0.4	2.8	0.9
CV (%)	4.43	-	3.14	0.61	19.45	4.84	0.76

[1] lodge rating (1=erect, 9=flat)

Table 12. Saskatchewan Advisory Council 2005 Irrigated Canada Western Amber Durum Wheat (CWAD) Regional Variety trial, Outlook.							
Variety	Yield (kg/ha)	Yield % of AC Barrie	Height (cm)	Maturity (days)	Lodging rating[1]	Seed weight (mg)	Test weight (kg/hl)
AC Barrie (BW661)	4840	100	94	111	2.5	37.4	77.2
AC Avonlea (DT661)	4534	94	84	114	5.8	46.2	75.1
AC Navigator (DT673)	6422	133	77	118	3	50.4	78.2
Commander (DT722)	6186	128	73	117	2.3	48.5	75.7
Kyle (DT375)	6765	140	110	120	4.8	50.3	78.8
Strongfield (DT712)	5425	112	85	116	4	45	76.6
LSD (0.05)	578	-	4	2	1.1	3	1.5
CV (%)	6.74	-	3.16	0.99	19.44	4.99	1.3

[1] lodge rating (1=erect, 9=flat)

Table 13. Saskatchewan Advisory Council 2005 Irrigated Soft White Spring Wheat (CWSWS) Regional Variety trial, Outlook.							
Variety	Yield (kg/ha)	Yield % of AC Barrie	Height (cm)	Maturity (days)	Lodge rating[1]	Seed weight (mg)	Test weight (kg/hl)
AC Barrie (BW661)	5330	100	96	111	2.5	36.4	77.6
AC Andrew (SWS241)	7294	137	84	118	2	35.6	74.9
AC Meena (SWS234)	6685	125	85	117	2.8	33.4	74.4
AC Nanda (SWS179)	6382	120	89	121	2.8	34	77.4
AC Reed (SWS87)	6025	113	78	116	3.3	34.9	74.8
Bhishaj (SWS285)	7173	135	87	114	2.5	36.9	75.5
SWS349	7301	137	86	120	2.3	36.3	76.7
LSD (0.05)	710	-	4	2	0.7	2	0.7
CV (%)	7.24	-	2.95	1.25	18	3.73	0.63

[1] lodge rating (1=erect, 9=flat)

Table 14. Saskatchewan Advisory Council 2005 Irrigated 2-Row Barley Regional Variety trial, Outlook.							
Variety	Yield (kg/ha)	Yield % of AC Metcalfe	Height (cm)	Maturity (days)	Lodge rating[1]	Seed weight (mg)	Test weight (kg/hl)
Malting							
AC Metcalfe (TR232)	6627	100	88	98	3.3	45.3	67.1
Calder (TR262)	7357	111	89	97	3	49.9	69.1
Feed							
CDC Cowboy (FB201)	6333	96	103	112	3.7	54.7	68.6
CDC Trey (TR359)	7086	107	91	95	2	50.3	71
CONLON (TR982)	6378	96	85	92	4	49.1	68.3
McLeod (TR710)	6837	103	81	98	4.7	46.6	66.2
Niobe (TR651)	6481	98	88	93	3	42.7	67.8
Ponoka (TR01656)	6784	102	84	98	4	44.8	67.9
Rivers (TR256)	6909	104	89	93	3	47.3	66.7
TR03373	7959	120	85	99	1	49.7	69
LSD (0.05)	NS[2]	-	5	1	1.8	3.8	1.5
CV (%)	10.05	-	3.22	0.43	32.56	4.6	1.3

[1] lodge rating (1=erect, 9=flat)
[2] not significant

Table 15. Saskatchewan Advisory Council 2005 Irrigated 6-Row Barley Regional Variety trial, Outlook.							
Variety	Yield (kg/ha)	Yield % of AC Metcalfe	Height (cm)	Maturity (days)	Lodge rating[1]	Seed weight (mg)	Test weight (kg/hl)
Malting							
AC Metcalfe (TR232)	6403	100	88	99	3	45.5	68.6
CDC Laurence (BT493)	8556	134	91	111	1.3	45.1	65.9
CDC Clyde (BT490)	8161	127	84	102	1	39.2	65.6
Tradition (BT954)	7843	122	89	108	1	39.3	67.7
Feed							
Manny (BT562)	7389	115	88	105	1.7	37	63
LSD (0.05)	626	-	NS[2]	4	1.3	2.8	1.5
CV (%)	4.34	-	3.02	2.2	42.7	3.65	1.24

[1] lodge rating (1=erect, 9=flat)
[2] not significant

Alberta Corn Committee Hybrid Performance Trials

Funded by the Alberta Corn Committee and Agriculture and Agri-Food Canada, PFRA.

Co-investigators: B. Beres, Lethbridge Research Centre, Lethbridge, Alberta;
L. Bohrson, ICDC, Swift Current, Saskatchewan

The Alberta Corn Committee grain and silage hybrid performance trials were established in the spring of 2005 at CSIDC located on the SW15-29-08-W3. The soil, developed on medium to moderately coarse-textured lacustrine deposits, is classified as Bradwell loam to silty loam.

All seeding operations were conducted using a specially designed small plot six row double disc press drill with two sets of discs. One set of discs was used for seed placement while the second set of discs allowed for side band placement of fertilizer. Treatments consisted of selected corn hybrids with varying corn heat unit maturity ratings. The corn was seeded on an 80 cm row spacing using single row cones. Two rows were seeded per pass. The grain corn plots consisted of four rows and measured 2.4 m x 6 m while the silage corn plots consisted of two rows and measured 1.2 m x 6 m. A seeding rate of 47 kernels/row (~59,000 plants/ha) and 56 kernels/row (~74,000 plants/ha) were used for grain and silage corn, respectively. Separate trials were established for grain and silage corn hybrids. All plots received a soil incorporated broadcast application of 112 kg N/ha applied as urea (46-0-0) prior to seeding and a side band application of 12-51-0 at a rate of 45 kg P_2O_5/ha during the seeding operation. The treatments were arranged in a randomized complete block design and replicated four times.

The trials were seeded on May 20 and harvested on October 3 and October 19 for the silage and grain trials respectively. Growing season rainfall (May 1 to September 30) and irrigation was 390 mm and 95 mm, respectively. Cumulative Corn Heat Units (CHU) were 2293 from May 15 until the first frost of -2^{0}C or greater which occurred on September 28. Growing season conditions in 2005 at CSIDC were wetter and slightly cooler than the long term mean. Soil analysis of samples collected in the spring prior to plot establishment indicated soil available NO_3-N (0-24") was 193 kg/ha and P (0-12") was 84 kg/ha. Current soil test recommendations indicated the requirement of 60-70 kg N/ha and 30-35 kg P_2O_5/ha for irrigated corn. An additional 50 kg N/ha applied as ammonium nitrate (34-0-0) was broadcast at the 6 leaf stage and watered in with an irrigation application.

Grain Corn

Six grain corn hybrids from five companies were tested with CHU maturity rating varying from 2,150 to 2,300 (Table 16). Plant stand varied among the hybrids ranging from a low of 66,012 plants/ha to a high of 74,201 plants/ha. All plots exceeded the targeted plant population of 59,000 plants/ha.

Days to 10% anthesis (range: 66-75 days), days to 50% silking (range: 75-82 days) and grain yield @ 15.5% moisture content (range: 3305-6968 kg/ha) showed no trend in relation to the CHU maturity rating. Corn grain test weight ranged from a low of 46.3 kg/hl to a high of 61.5 kg/hl but showed no specific trend in relation to CHU maturity rating or grain yield. The variety 2P050 did not fully mature resulting in a low yield with shrivelled kernels which was reflected in the low test weight.

Table 16. ACC 2005 Grain Hybrid Performance trial, Outlook.

Company	Hybrid	CHU Maturity Rating	Plant Stand (#/ha)	10% Anthesis (days)	50% Silking (days)	Harvest Grain Moisture (%)	Yield @ 15.5% moisture (kg/ha)	Test weight (kg/hl)
Mycogen	2P050	2300	74201	75	82	45.6	3305	46.3
La Coop federee	30A27RR	2300	66508	71	76	37.2	5946	57.3
MTI Maize	4MA15	-	68741	66	75	33.8	6968	61.5
MTI Maize	5MA01	-	71967	74	80	46.8	5524	57
Monsanto	DKC26-78	2150	69982	71	76	36.7	6818	59
Syngenta	N05-C7	2250	66012	73	77	37.6	5523	60
		LSD (0.05)	5178	2	2	4.7	578	2.4
		CV (%)	4.94	2.08	1.32	7.84	6.76	2.75

Silage Corn

Thirty silage corn hybrids from eight companies were tested with CHU maturity rating varying from 2000 to 2700 (Table 17). Plant stand varied among the hybrids ranging from a low of 72,464 plants/ha to a high of 86,857 plants/ha. All plots exceeded the targeted plant population of 74,000 plants/ha except one.

Days to 10% anthesis (range: 63-85 days) and days to 50% silking (range: 72-87 days) showed a general trend of increasing as the CHU rating increased. Dry yield (range: 11.8-16.7 t/ha) showed no trend in relationship to CHU maturity rating. The cobs did not mature properly for the higher heat unit varieties thus the full yield potential of these varieties was not obtained. Results from these trials are posted on the Alberta Corn Committee website at www.albertacorn.com.

Table 17. ACC 2005 Silage Hybrid Performance trial, Outlook.

Company	Hybrid	CHU Maturity Rating	Plant Stand (#/ha)	10% Anthesis (days)	50% Silking (days)	Harvest Whole Plant Moisture (%)	Dry Yield (t/ha)
Hyland	HL S007	2250	76683	73	80	69.7	13.1
	HL S009	2275	72464	84	83	67.8	14.6
	HL S011	2325	79909	85	87	70.9	14.3
	HL S014	2300	76186	82	80	66.7	16.7
La Coop federee	46T07 RR	2300	80157	74	79	67.6	13.6
Maizex	EX1015RR	2250	76931	77	81	71.2	13.1
	LF725	2250	79412	78	80	68.6	14.1
	LF753	2350	82142	80	80	68.5	14.9
	LF793	2400	83135	83	86	71	13.7
	MZ16-05RR	2450	86857	79	85	74.2	13.6
	MZ18-02RR	2450	80157	77	83	73.9	12.7
Monsanto	DKC26-78	2150	79909	67	75	63.9	13.9
	DKC27-12	2250	80901	72	78	67.1	13.5
	DKC30-02	2375	83879	77	80	70.2	11.8
	DKC33-10	2550	82638	77	81	72.9	14
Mycogen	2P050	2300	79412	75	82	74.6	11.8
Pioneer	39F45	2000	84872	63	72	59.1	12.2
	39F59	2200	81149	76	80	65.1	14.9
	39H83	2450	82142	76	81	68.8	14.5
	39P78	2050	79661	67	76	64.5	12.9
	39T67	2200	81894	74	79	67.7	15.7
	39T71	2250	73208	74	79	68	13.8
Pride Seeds	A4741HM	2475	74945	76	79	67.8	13.7
Syngenta	G4043	2600	83383	81	84	74	14.6
	N05-C7	2250	79909	74	79	65.7	13.4
	N11-F4	2475	79412	76	81	72.6	13.7
	N15-P6	2575	80405	78	80	69.2	15.4
	N16-N7	2600	79164	77	80	67.6	15.5
	N8905	2700	81894	85	86	74.7	12.8
	N8981	2600	79164	82	87	75.2	11.8
		LSD (0.05)	NS[1]	2	1	1.8	2
		CV (%)	6.47	1.7	1.28	1.84	10.45

[1] not significant

Short Season Narrow Row Dry Bean Cooperative Trials A & B in Western Canada

Co-investigator: A. Vandenberg, Crop Development Centre, Saskatoon, Saskatchewan

The Short Season Narrow Row Dry Bean Cooperative Trial in Western Canada consisted of Trial A (black and navy types) with 18 entries and trial B (great northern, pink, pinto, small red and other market classes) with 30 entries. For the pinto, black and navy market classes, both determinate and indeterminate checks were included. All trials had three replicates. All plots were grown at a row spacing of 30 cm. Poor emergence resulted in highly variable data for the trials.

Dry Bean Narrow Row Regional Variety Trial

Co-investigator: A. Vandenberg, Crop Development Centre, Saskatoon, Saskatchewan

The potential for development of the dry bean sector of Saskatchewan's pulse industry has been limited by the lack of adapted varieties. Adapted breeding lines from the Crop Development Centre (CDC), U of S, Saskatoon, Saskatchewan, are at the stage of recommendation for registration. The next step in the development process is regional testing of new varieties. Regional performance trials provide information on the various production regions available in Saskatchewan to assess productivity and risk. This information is used by extension personnel, pulse growers and researchers across Saskatchewan to become familiar with these new pulse crops.

A Dry Bean Narrow Regional variety trial was established in the spring of 2005 at the CSIDC and CSIDC Off-station sites. The varieties that were included were specifically bred for narrow row production systems (20 cm/8 in. row spacing).

Sixteen dry bean varieties consisting of three market classes (pinto, navy, black) were evaluated. Yields were variable between the two sites but tended to show similar trends (Tables 18 and 19). AC Black Diamond black bean produced the highest yield of all varieties while T9803 (Cirrus) navy bean produced the lowest yield at both sites.

Most bean varieties flowered within a range of 48 - 58 days. CDC Pintium and SC11745-3 pinto bean and CDC Expresso black bean were the earliest varieties to flower taking 48-49 days at each site.

CDC Pintium pinto bean was the earliest variety requiring 99-100 days to reach maturity. For all other varieties maturity ranged from 103 to 120 days. At the CSIDC Off-station site, some of the later maturing navy bean varieties froze prior to onset of maturity resulting in low yield and poor seed quality. Most of the later maturing varieties had some frost damaged seed.

Pod clearance was generally good among the varieties indicating the progress being made in dry bean breeding programs to produce varieties with upright structure and pods held high on the plant. The majority of the varieties tested had pod clearance greater than 70%.

Seed size varied among bean market classes and among varieties within a market class. Generally, seed weight was of the order pinto > black > navy. The highest seed weight was obtained for CDC Minto pinto bean. Smallest seed weight was obtained for T9808 navy bean. Plant height varied among the market classes as well as among varieties within a market class.

Generally, the shortest varieties were CDC Pintium and SC11745-3 pinto bean and CDC Expresso and CDC Rio black bean while the tallest varieties were Maverick pinto bean and AC Cruiser navy bean.

Cool wet conditions during the 2005 growing season extended maturity of some entries resulting in fall frost damage to some late lines. For this reason, all performance data for the Dry Bean Narrow Row Regional Irrigated Variety Trial should be interpreted with caution.

Short Season Wide Row Irrigated Bean Co-operative Registration Trial

Funded by Agriculture and Agri-Food Canada, PFRA.
Co-investigators: H. Mundel and J. Braun, Lethbridge Research Centre, Lethbridge, Alberta

This project evaluates dry bean germplasm for its adaptation to western Canada under irrigated row crop production conditions. The germplasm sources include advanced lines from the AAFC Lethbridge Research Centre and the Crop Development Centre, University of Saskatchewan. These lines are compared to registered varieties within each market class.

An irrigated site was conducted at CSIDC. Standard fertilizer, weed control and irrigation practices for irrigated dry bean production were followed. The test consisted of 25 entries in a 5 x 5 lattice design that included 7 checks from 4 standard market classes (Pinto, Small Red, Great Northern and Black) and 18 advanced breeding lines (14 from AAFC-Lethbridge and 4 from CDC-Saskatoon). Individual plots consisted of two rows with 60 cm row spacing and measured 1.2 m x 3.7 m. All rows of a plot were pulled to simulate under-cutting before being harvested to determine yield.

Cool wet conditions during the 2005 growing season extended maturity of some entries resulting in fall frost damage to some late lines. For this reason, all performance data for the Short Season Wide Row Irrigated Bean Co-operative Registration Trial should be interpreted with caution.

Generally, most pinto lines flowered earlier and matured earlier than Othello (Table 20). Only one line (L03B754) yielded higher than Othello. In the great northern market class, three lines (L03E398, L03E456 and L02E297) yielded higher than the check variety AC Polaris. In the black class, all new entries yielded higher than AC Black Diamond. The newly registered black bean CDC Rio had the lowest yield of all black entries. The two small red entries yielded higher than the check AC Redbond. The late maturity of some of the entries and checks, especially for the great northern market class, may have been affected by the cooler growing conditions later in the growing season thus compromising the performance data collected.

Table 18. 2005 Irrigated Dry Bean Narrow Row Regional Variety trial, CSIDC.

Variety	Yield (kg/ha)	Yield % of Pintium	Seed Weight (mg)	Days to Flower	Days to Maturity[1]	Plant Height (cm)	Lodge Rating (0=erect; 5=flat)	Pod Clearance[2] (%)
Pinto								
CDC Pintium	3317	100	391	49	99	34	1	82
Othello	2991	90	364	52	106	41	2	55
CDC Minto	3341	101	430	49	108	43	1.7	65
Maverick	3564	107	336	56	113	47	3.3	57
SC11745-3	3108	94	397	48	103	31	2	63
Navy								
AC Cruiser	1773	53	177	53	119	45	1.7	72
Envoy	2005	60	196	50	104	39	2	72
HR100	2382	72	172	52	105	39	1	68
T9803 (Cirrus)	1138	34	180	59	115	40	2.7	57
T9808	1781	54	162	59	112	42	2	68
T9903	3187	96	180	58	114	44	1.3	73
T2003	2723	82	175	53	112	42	2	67
Black								
AC Black Diamond	3767	114	283	54	105	41	1	73
CDC Expresso	1611	49	215	48	104	42	2	63
CDC Jet	1953	59	182	58	112	44	2	75
CDC Rio (316-13)	2492	75	198	55	109	36	2	70
LSD (0.05)	704	-	10	1	4	3	0.5	5
CV (%)	16.42	-	2.38	1.11	1.97	5.14	17.17	4.61

[1] 50% of pods at buckskin stage
[2] % of pods >5 cm above soil surface

Table 19. 2005 Irrigated Dry Bean Narrow Row Regional Variety trial, CSIDC Off-station site.								
Variety	Yield (kg/ha)	Yield % of Pintium	Seed Weight (mg)	Days to Flower	Days to Maturity[1]	Plant Height (cm)	Lodge Rating (0=erect; 5=flat)	Pod Clearance[2] (%)
Pinto								
CDC Pintium	3408	100	376	49	100	38	1	83
Othello	2921	86	337	54	111	44	2.7	55
CDC Minto	3081	90	402	51	112	46	2.3	60
Maverick	2622	77	291	56	116	52	4	65
SC11745-3	3224	95	382	49	105	39	2	65
Navy								
AC Cruiser	2021	59	160	53	-	53	2	72
Envoy	2502	73	190	51	108	42	2.3	70
HR100	2032	60	168	53	109	45	1.3	70
T9803 (Cirrus)	1064	31	177	59	-	46	2.3	63
T9808	1651	48	160	58	-	47	1.7	70
T9903	2271	67	164	58	116	52	2	73
T2003	2838	83	170	51	116	46	1.7	
Black								
AC Black Diamond	3585	105	255	53	108	47	1	75
CDC Expresso	2506	74	198	49	105	36	1	65
CDC Jet	1625	48	165	57	116	48	2.3	75
CDC Rio (316-13)	2640	77	183	54	116	45	1.7	72
LSD (0.05)	450	-	8	1	-	5	0.7	4
CV (%)	10.79	-	1.98	1.51	-	5.95	21.51	3.03

[1] 50% of pods at buckskin stage. Varieties with no data did not reach maturity prior to the first fall frost.
[2] % of pods >5 cm above soil surface

Table 20. 2005 Short Season Wide Row Irrigated Bean Co-operative Registration trial.

Variety	Yield (kg/ha)	Yield % of check	Seed Weight (mg)	Days to Flower	Days to Maturity[1]	Plant Height (cm)
Pinto						
Othello (check)	3412	100	369	54	111	43
CDC Pintium	2122	62	387	49	100	33
L02B662	3041	89	351	55	109	54
L03B688	3110	91	387	49	102	47
L03B694	3200	94	384	49	102	46
L03B748	3171	93	366	52	113	47
L03B754	3780	111	402	51	108	48
L03B756	3281	96	381	51	105	45
1236M-18	2750	81	405	53	109	50
1073M-32	3184	93	373	54	111	49
Small Red						
AC Redbond (check)	3363	100	332	53	105	46
L98D347a	3676	109	327	53	111	44
L98D347	3642	108	318	54	107	46
Great Northern						
AC Polaris (check)	2722	100	318	55	115	45
US1140	2616	96	327	51	117	38
L02E297	2816	104	313	54	112	40
L03E398	3146	116	332	52	111	43
L03E456	3002	110	352	51	114	42
1006S-1	1863	68	348	55	118	43
1389-3	1795	66	392	53	118	43
Black						
AC Black Diamond (check)	2757	100	279	55	111	43
CDC Rio (316-13)	2210	80	206	56	112	39
L03F238	3238	118	258	54	107	42
LO3F249	3265	119	274	55	108	40
L03F288	2941	107	289	55	108	40
LSD (0.05)	528	-	17	2	4	5
CV (%)	9.8	-	2.9	2.2	2.4	6

[1] 50% of pods at buckskin stage

Dry Bean Wide Row Regional Variety Trial

Co-investigators: H. Mundel and J. Braun, Lethbridge Research Centre, Lethbridge, Alberta

A Dry Bean Wide Row Regional variety trial was established in the spring of 2005 at CSIDC and CSIDC Off-station sites. The 2005 Wide Row Dry Bean Regional Trial (60 cm/24 in. row spacing) included mainly varieties that were specifically bred for wide row production systems.

Seventeen dry bean varieties consisting of five market classes (pinto, great northern, pink, black, small red) were evaluated. Yields were variable between the two sites but tended to show the same trends (Tables 21 and 22). Yield varied among the market classes and varieties within each market class. Othello pinto bean and AC Redbond small red bean were two of the highest yielding varieties at both sites while CDC Jet black bean was consistently one of the lowest yielding varieties at both sites.

All bean varieties flowered within a range of 49 - 59 days. Earlier flowering generally meant earlier maturity. Maturity varied from 101-102 days for CDC Pintium pinto bean to 115-117 days for the latest maturing varieties which varied between the two sites. US1140 great northern bean did not fully mature before the first fall killing frost at the CSIDC Off-station site. Maturity was delayed probably due to the cool conditions during the later part of the growing season.

Plant height varied between sites and among varieties within a market class within each site ranging from a low of 35 cm for CDC Pintium pinto bean to 55 cm for Alert great northern bean at the CSIDC Off-station site. Plant height for most other varieties was in the range of 40 to 45 cm.

Seed weight varied among the market classes and among varieties within a market class. The highest seed weights were observed for the pinto and great northern market classes while the lowest seed weighs were observed for the black market class. The overall largest seed weight was observed for CDC Minto pinto bean while the smallest seed weight was observed for CDC Jet black bean at both sites.

Due to the cool conditions experienced later in the 2005 growing season, all performance data for the dry bean wide row variety trials should be interpreted with caution.

Table 21. 2005 Irrigated Dry Bean Wide Row Regional Variety trial, CSIDC.						
Variety	Yield (kg/ha)	Yield % of Othello	Seed Weight (mg)	Days to Flower	Days to Maturity[1]	Plant Height (cm)
Pinto						
Othello (check)	3501	100	377	53	106	46
CDC Pintium	2589	74	397	49	102	40
CDC Pinnacle	2790	80	402	53	112	43
CDC Minto (958310)	3170	91	435	52	112	45
Winchester	3130	89	385	49	103	50
Great Northern						
US 1140 (check)	3086	88	355	52	116	40
AC Polaris	2845	81	322	56	112	42
Alert	1914	55	361	56	116	49
Resolute	2514	72	346	51	111	44
CDC Polar Bear	2770	79	368	55	113	39
Pink						
Viva (check)	3366	96	262	55	117	43
Early Rose (L94C356)	3205	92	321	53	104	43
Black						
AC Black Diamond (check)	3259	93	290	55	107	45
CDC Jet (315-18)	2424	69	186	59	112	47
Black Violet (L95F025)	2520	72	192	59	110	44
CDC Rio (316-13)	2721	78	211	56	112	44
Small Red						
AC Redbond (check)	3622	103	333	53	104	45
LSD (0.05)	367	-	14	1	3	5
CV (%)	8.87	-	2.99	1.51	1.66	7.71

[1] 50% of pods at buckskin stage

Table 22. 2005 Irrigated Dry Bean Wide Row Regional Variety trial, CSIDC Off-station site.

Variety	Yield (kg/ha)	Yield % of Othello	Seed Weight (mg)	Days to Flower	Days to Maturity[1]	Plant Height (cm)
Pinto						
Othello (check)	3827	100	347	53	111	45
CDC Pintium	2924	76	376	49	101	35
CDC Pinnacle	3027	79	374	55	114	45
CDC Minto (958310)	3368	88	413	54	115	43
Winchester	4086	107	368	50	106	49
Great Northern						
US 1140 (check)	3070	80	328	53	-	40
AC Polaris	3036	79	307	55	115	45
Alert	3103	81	325	56	115	55
Resolute	3167	83	325	51	108	45
CDC Polar Bear	3230	84	354	55	116	40
Pink						
Viva (check)	3506	92	241	53	116	39
Early Rose (L94C356)	3022	79	282	53	102	38
Black						
AC Black Diamond (check)	3393	89	262	56	109	42
CDC Jet (315-18)	2226	58	163	59	116	47
Black Violet (L95F025)	2971	78	168	59	110	45
CDC Rio (316-13)	2752	72	185	56	113	43
Small Red						
AC Redbond (check)	3749	98	312	53	105	49
LSD (0.05)	613	-	10	1	-	5
CV (%)	13.46	-	2.35	1.47	-	7.38

[1] 50% of pods at buckskin stage. Varieties with no data did not reach maturity prior to the first fall frost.

Field Pea Co-operative Registration Test A and Test B

Project Leads: T. Warkentin, Crop Development Centre, Saskatoon, Saskatchewan
D. Bing and D. Beauchesne, Lacombe Research Centre, Lacombe, Alberta
A. Sloan, Morden Research Centre, Morden, Manitoba

This project evaluates pea germplasm for growing conditions in western Canada. The germplasm sources included advanced lines from the AAFC Morden Research Centre; Crop Development Centre, University of Saskatchewan; Crop Diversification Centre North, Alberta Agriculture and private seed companies. Fifty candidate entries were divided into two tests, Test A with 24 entries and Test B with 26 entries. Each test had two yellow check varieties, Eclipse and Cutlass. Test A also had two green check varieties, CDC Striker and Cooper.

An irrigated site was conducted at CSIDC. Standard fertilizer, weed control and irrigation practices for irrigated pea production were followed. Each test was arranged as a randomized complete block design with three replicates. Individual plots measured 1.2 m x 3.7 m. All rows were harvested to determine yield.

In test A, all yellow lines and all but two green lines had yield higher than the check variety Eclipse (Table 23). Only three green lines had yield higher than the green check CDC Striker. All yellow lines except APCM9.71.07 had maturity equal to or greater than the yellow check Eclipse. All green lines except DS49519 and SWA6153 had maturity greater than the green check CDC Striker. Only two yellow lines (CEB4159 and CDC 1330-7) had lodge rating lower than the yellow check variety Eclipse while five green lines (CDC 1503-3, CDC 1434-20, MP1840, MP1841 and MP1842) had lodge rating less than the green check variety CDC Striker. All other yellow and green lines had lodge ratings higher than the respective checks. Highest seed weight was recorded for the yellow line APCM9.71.07 and the green line DS49519. Most other lines had seed weight that was less than the checks. The green line MP1842 had exceptionally low seed weight compared to the check.

In test B, all lines yielded greater than the check variety Eclipse (Table 24). Two lines CDC 1410-15 and MP1833 had exceptionally high yield. All lines had maturity less than or equal to the checks. Most lines tested had lodge rating greater than the check variety Eclipse. Most lines had seed weight less than the check variety Eclipse. The highest seed weight was recorded for line CEB4165. Line CDC 1400-8 had exceptionally low seed compared to the check.

Table 23. 2005 Pea Co-operative Registration Test A.						
Entry	Yield (kg/ha)	Yield % of check	Pre-Harvest Lodge Rating 1=erect ; 9=flat	Vine Length (cm)	Days to Maturity	Seed Weight (mg)
Yellow						
Eclipse (check)	3487	100	3.7	68	94	228
Cutlass	4197	120	3.7	70	93	221
CEB4158	3719	107	3.7	67	96	261
CEB4159	3826	110	3	68	94	260
CEB4163	4046	116	4	67	95	262
APCM9.71.07	3682	106	5	69	90	270
CDC985-23	4766	137	3.7	74	97	214
CDC1408-6	4763	137	4	72	97	197
CDC1330-7	5249	151	3.3	70	96	218
CDC1474-5	4737	136	3.7	77	95	189
Green						
CDC Striker	4585	131	3.3	72	94	218
Cooper	4602	132	3	69	97	276
CEB1093	3716	107	3.7	66	97	281
DS49519	3620	104	5	71	93	413
DS49620	3830	110	4	61	95	275
CDC1314-4	4096	117	4.3	73	96	186
CDC1312-14	4225	121	3.3	66	97	178
CDC1503-3	4794	137	2.3	75	99	188
CDC1434-20	4875	140	3	69	97	170
CDC1370-5	4178	120	3.3	78	97	186
SWA6141	3708	106	4.3	68	94	217
SWA6153	3354	96	3.3	63	93	184
SWC6185	3812	109	3.7	77	98	238
SWC6209	3618	104	4.3	73	93	235
MP1835	5227	150	3.3	74	95	239
MP1840	3268	94	2.7	74	95	197
MP1841	4552	131	3	77	98	181
MP1842	4351	125	2.3	77	99	157
LSD (0.05)	618	-	-	-	-	-
CV (%)	8.9	-	-	-	-	-

Table 24. 2005 Pea Co-operative Registration Test B.						
Entry	Yield (kg/ha)	Yield % of check	Pre-Harvest Lodge Rating 1=erect; 9=flat	Vine Length (cm)	Days to Maturity	Seed Weight (mg)
Yellow						
Eclipse (check)	2983	100	3.7	70	95	243
Cutlass	4401	148	4	72	94	236
CEB4148	4409	148	4	72	93	216
CEB4149	4350	146	3	77	95	242
CEB4152	3699	124	3.7	72	92	273
CEB4160	4141	139	3.7	82	92	270
CEB4164	3238	109	4	75	92	273
CEB4165	3276	110	4	68	91	323
APCM7.114.52	3602	121	4.7	64	92	268
CS9000U	3246	109	4.7	73	93	273
CS9000X	3753	126	4.7	67	93	289
CS9001N	4194	141	5	64	92	309
CDC1007-6	4514	151	4.3	68	94	233
CDC1308T-10	4402	148	4.3	67	93	237
CDC1400-8	4232	142	4	74	93	151
CDC1410-15	4713	158	4.3	70	92	223
SWA5126	4143	139	3.3	70	93	187
SWB5132	3633	122	4	69	94	206
SWC5050	4065	136	4	70	91	249
SWC5123	4119	138	3.7	69	95	212
MP1832	4606	154	4	69	93	189
MP1833	4743	159	4.3	71	94	253
MP1834	3433	115	4.3	68	92	204
MP1836	4055	136	4	74	94	168
MP1837	4164	140	3.7	77	94	234
MP1838	4100	137	5	67	92	229
MP1839	3151	106	3	70	90	210
MP1843	4523	152	3.3	73	93	249
LSD (0.05)	677	-	-	-	-	-
CV (%)	9.9	-	-	-	-	-

Irrigated Field Pea Regional Variety Trial

Funded by the Irrigation Crop Diversification Corporation
and the Crop Development Centre, Saskatoon, Saskatchewan.

Pea Regional variety trials were conducted at four locations in the Outlook irrigation area. Each site and soil type are as follows:

CSIDC (SW15-29-08-W3): Bradwell very fine sandy loam
CSIDC Off-station (NW12-29-08-W3): Asquith sandy loam
Weiterman (SE16-31-07-W3): Asquith sandy loam - fine sandy loam
Pederson (NE17-28-07-W3): Elstow loam

Pea varieties were tested for their agronomic performance under irrigation. The CSIDC, CSIDC Off-station, Weiterman, and Pederson sites were seeded on May 9, 10, 16 and 16, respectively. Plot size was 1.5 m x 4.0 m. All plots received 50 kg N/ha as 46-0-0 and 45 kg P_2O_5/ha as 12-51-0 as a side band application during the seeding operation. Yields were estimated by harvesting the entire plot. The results are presented in Table 25.

Irrigated pea yield, height and lodge rating (Table 25) as well as seed weight (Table 26) varied among the four sites. The Weiterman site generally had lower yields and lower seed weights possibly due to the higher incidence of foliar disease at this site. Lodge rating varied considerably among the sites possibly a function of environmental growing conditions. As well, there was considerable variation in lodging among the varieties within each site. Maturity showed a general trend of being slightly longer at the CSIDC Off-station site than the other three sites. The highest yielding yellow variety was CDC 728-8 while the highest yielding green varieties were CDC Striker and Cooper averaged over the four sites.

The results from these trials are used to update the irrigation variety trial database at CSIDC and provide recommendations to irrigators on the best pea varieties suited to irrigation conditions.

Irrigated Soybean Performance Evaluation Demonstration Trial

Funded by Agriculture and Agri-Food Canada and the Irrigation Crop Diversification Corporation.

A soybean performance evaluation demonstration trial was established in the spring of 2005 at CSIDC. Soybean varieties were tested for their agronomic performance under irrigation conditions at two sites (CSIDC and CSIDC Off-station) and under dryland conditions at one site (CSIDC). Plot size was 1.5 m x 4.0 m. All plots received 45 kg P_2O_5/ha as 12-51-0 as a side band application during the seeding operation. Granular inoculant of the appropriate *Rhizobium* strain specific for soybean was seed placed during the seeding operation. Yields were estimated by harvesting the entire plot.

Six core soybean varieties with a range in heat unit maturity ratings (2350-2600) were evaluated at each site with an additional five varieties included at the CSIDC irrigated site. Cumulative Corn Heat Units were 2293 from May 15 until the first frost of -2^{0}C or greater which occurred on September 28. Growing season conditions in 2005 at CSIDC were wetter and slightly cooler than the long term mean. Growing season rainfall (May 1 to September 30) was 390 mm. Irrigation applications for the CSIDC and CSIDC Off-station sites were 55 mm and 150 mm respectively. Yields for the two irrigated sites varied between the sites but showed similar trends among the varieties tested (Table 27 and 28). Yield showed a strong inverse relationship to heat unit rating for the varieties tested. The higher heat unit varieties did not fully mature and experienced extensive frost damage and thus reduced yield. Seed size was smaller for the higher heat unit varieties (90B11, 90A07 and OAC Prudence) with many frost damaged (wrinkled and shrivelled) and green seeds present. This was especially evident for the CSIDC Off-station site. The CSIDC Off-station site was more exposed and probably cooler, resulting in lower cumulative corn heat units than were received at the CSIDC site. For the CSIDC dryland site, yields were higher and showed different trends than for the irrigated sites (Table 29). Highest yields were obtained for the 2400-2500 heat unit varieties OAC Prudence, 90A01 and 90A07. The highest heat unit variety 90B11 had the lowest yield, however, the yield was still reasonable. The lowest heat unit variety OAC Vision had the second lowest yield. Seed weights varied among the varieties tested but the differences were not as dramatic as observed for the two irrigated sites. Growing conditions were different for the dryland site compared to the two irrigated sites. The dryland site was protected on the North and West sides by a mature shelterbelt and as well, the plot was surrounded by a cereal crop that created a micro climate for the dryland soybean plot. As a result the dryland soybean plot probably received higher heat units throughout growing season resulting in higher yields. Very little frost damage was observed on any of the varieties tested in the dryland plot.

The results from these trials clearly indicate the requirement for an adequate amount of heat in order for soybean to reach full maturity. It is important that a soybean variety be selected that will mature in the heat units received for a particular location.

Table 25. Yield and agronomic data for the 2005 Irrigated Field Pea Regional Variety trial.

Variety	Pederson site				Weiterman site				CSIDC Off-station site				CSIDC site				Mean yield	
	Yield (kg/ha)	Height (cm)	Maturity (days)	Lodge rating[1]	Yield (kg/ha)	Height (cm)	Maturity (days)	Lodge rating[1]	Yield (kg/ha)	Height (cm)	Maturity (days)	Lodge rating[1]	Yield (kg/ha)	Height (cm)	Maturity (days)	Lodge rating[1]	kg/ha	% of Alfetta
Yellow																		
Alfetta	3480	62	90	5.3	3710	72	93	8	3954	69	95	7.7	2218	56	93	6.7	3341	100
Carneval	2943	70	86	3	2752	86	87	3.7	3314	89	90	2	2877	69	92	4.3	2972	89
CDC 653-8	4537	79	91	3	3412	85	90	5.7	5449	81	95	4	4995	84	93	4	4598	138
CDC 728-8	4436	64	94	5	3971	78	93	7.3	5525	81	102	6	4957	75	95	7.3	4722	141
CDC 985-36	3967	68	98	3.7	2886	88	94	6.3	4683	79	103	4.7	4578	77	96	6	4029	121
CDC Bronco	3184	76	97	2.3	2977	95	95	4.3	4763	85	99	3.3	4459	74	95	4.3	3846	115
CDC Golden	4220	68	90	4.3	3055	84	88	6.3	5412	83	99	3.7	4881	80	93	5.3	4392	131
CDC Mozart	4242	63	96	4.3	2944	80	93	7	5669	77	100	6.7	3973	68	94	8	4207	126
Cutlass	3467	70	94	3.7	2897	86	91	6	4975	85	97	3.7	3343	70	93	6	3671	110
Eclipse	3984	67	96	3.3	3465	86	96	5	4737	87	102	3.3	3743	70	94	5	3982	119
SW Carousel	4053	78	99	3.7	3496	89	94	5.3	5528	78	99	5.3	4399	81	93	6.7	4369	131
SW Marquee	3749	74	93	3	2749	86	93	5	5557	85	102	3.3	3940	73	94	3.7	3999	120
SW Midas	4019	62	89	5.7	3694	83	89	6	5454	80	98	5.7	4302	73	92	6.3	4367	131
Tudor	4365	82	96	3.3	3206	105	93	3.7	5670	92	102	3.3	3895	91	96	3.7	4284	128
Green																		
Bluebird	2292	57	98	4	2769	68	96	7.7	4436	70	100	7.3	2489	54	95	8	2997	77
Camry	3247	49	98	4	3286	71	96	6.7	5644	75	102	5.7	3259	53	97	6.3	3859	116
CDC Montero	2808	82	100	2.3	2292	92	99	3.7	4073	85	103	4	1835	69	95	5.3	2752	82
CDC Sage	3736	83	98	3	3225	83	94	5	4211	82	100	4.7	3661	78	94	6	3708	111
CDC Striker	4072	68	95	2.7	4484	91	94	4.7	5455	75	98	5	4057	74	94	4.7	4517	135
Cooper	4223	76	100	2.3	3206	89	95	4.7	5999	84	103	2.7	4369	77	96	5.3	4449	133
Nessie	2156	56	92	4.3	3110	80	92	7	3693	74	96	5	2718	65	93	7.3	2919	87
Nitouche	3461	75	96	3.3	3113	91	93	5.7	5183	85	101	4.3	4011	73	97	5	3942	118
Stratus	3934	63	97	6	3683	76	95	8	5085	82	101	7	4454	68	97	7	4289	128
SW Prodigy	3680	78	98	3	3206	83	96	4.3	4855	82	97	4.3	3649	77	94	5.3	3848	115
Vortex	3488	66	93	5.7	3237	81	91	8	5168	79	95	7	2855	65	92	8.7	3687	110
Tan																		
CDC Dundurn	2069	63	93	5.3	2076	81	92	6	3425	71	99	5.7	2270	69	93	7.3	2460	74
LSD (0.05)	696	11	5	1.4	654	10	3	1.7	1057	12	3	1.4	888	13	2	1.6	-	-
CV (%)	11.76	9.86	3.04	22.7	12.51	7.44	1.88	17.59	13.1	8.8	1.86	17.25	14.63	10.91	1.03	16.15	-	-

[1] lodge rating (1=erect, 9=flat)

Table 26. Seed weight data for the 2005 Irrigated Field Pea Regional Variety trial.				
	Seed weight (mg)			
Variety	Pederson site	Weiterman site	CSIDC Off-station site	CSIDC site
Yellow				
Alfetta	259	243	264	255
Carneval	163	202	169	190
CDC 653-8	191	148	179	206
CDC 728-8	241	209	222	261
CDC 985-36	194	163	173	195
CDC Bronco	175	150	184	196
CDC Golden	205	150	182	208
CDC Mozart	213	163	196	236
Cutlass	213	164	198	211
Eclipse	222	192	208	240
SW Carousel	207	173	209	242
SW Marquee	184	146	167	197
SW Midas	205	157	168	208
Tudor	266	197	250	262
Green				
Bluebird	244	220	238	272
Camry	240	202	239	247
CDC Montero	196	178	190	193
CDC Sage	163	140	154	172
CDC Striker	202	196	216	238
Cooper	257	196	246	276
Nessie	247	229	252	262
Nitouche	210	194	225	249
Stratus	245	210	233	252
SW Prodigy	179	159	182	199
Vortex	150	147	174	204
Tan				
CDC Dundurn	170	157	170	184
LSD (0.05)	23	14	17.8	20
CV (%)	6.56	4.77	5.34	5.52

Table 27. Agronomic data for the 2005 Irrigated Soybean Variety Demonstration trial, CSIDC site.				
Variety	Heat unit rating	Plant height (cm)	Yield (kg/ha)	Seed weight (mg)
OAC Vision	2350	50	2440	154
OAC Prudence	2450	54	1117	154
90A01	2400	45	2638	143
90A07	2500	58	1208	133
90B11	2600	55	555	103
DKB005-51	2400	52	1649	160
Apollo RR	2375	56	2825	147
Gowan 3506	-	52	2276	162
Gowan 3513	-	51	2420	156
GG 469	-	59	870	141
Napean	-	43	1348	136
	LSD (0.05)	8	382	14
	CV (%)	8.87	12.76	5.67

Table 28. Agronomic data for the 2005 Irrigated Soybean Variety Demonstration trial, CSIDC Off-station site.				
Variety	Heat unit rating	Plant height (cm)	Yield (kg/ha)	Seed weight (mg)
OAC Vision	2350	56	2308	157
OAC Prudence	2450	63	408	95
90A01	2400	51	2340	151
90A07	2500	63	564	128
90B11	2600	59	274	75
DKB005-51	2400	50	772	179
Apollo RR	2375	60	1867	144
	LSD (0.05)	7	258	19
	CV (%)	6.74	11.88	8.1

Table 29. Agronomic data for the 2005 Dryland Soybean Variety Demonstration trial, CSIDC site.				
Variety	Heat unit rating	Plant height (cm)	Yield (kg/ha)	Seed weight (mg)
OAC Vision	2350	69	2891	162
OAC Prudence	2450	74	3426	156
90A01	2400	57	3384	147
90A07	2500	74	3272	142
90B11	2600	70	2746	140
DKB005-51	2400	58	2960	159
	LSD (0.05)	8	103	6
	CV (%)	6.73	4.04	2.31

Agronomic Trials

Soybean Plant Population Trials

Funded by Agriculture and Agri-Food Canada, PFRA.

A soybean plant population demonstration trial was established in the spring of 2005 at CSIDC. The plant population trials were conducted under irrigation conditions at two sites (CSIDC and CSIDC Off-station) and under dryland conditions at one site (CSIDC). Gaillard, a 2375 heat unit soybean variety, was grown at four target plant populations in six row plots measuring 1.2 m x 4.0 m. All plots received 45 kg P_2O_5/ha as 12-51-0 as a side band application during the seeding operation. Granular inoculant of the appropriate *Rhizobium* strain specific for soybean was seed placed during the seeding operation. Yields were estimated by harvesting the entire plot.

The yield response of soybean to plant population varied among the sites. For the CSIDC irrigated site, yield increased up to a plant population of 250,000 plants/ac but the yield increases above a plant population of 200,000 plants/ac were not significant (Table 30). For the CSIDC Off-station irrigated site, yield increased up to a plant population of 300,000 plants/ac but only the increases above 250,000 plants/ac were significantly higher than the 150,000 plants/ac treatment (Table 31). For the CSIDC dryland site, yield was increased up to a plant population of 200,000 plants/ac, however the increase was not significant (Table 32). There was no effect of soybean plant population on plant height or seed weight. These results indicate that the yield response of soybean to plant population showed a general trend of increasing up to a plant population of 200,000 plants/ac. Further work is required to verify these results so that recommendations on the proper seeding rate of soybean can be made to producers.

Table 30. Agronomic data for the 2005 Irrigated Soybean Plant Population trial, CSIDC site.

Target plant population	Plant height (cm)	Yield (kg/ha)	Seed weight (mg)
150,000 plants/ac	55	2233	138
200,000 plants/ac	53	2550	134
250,000 plants/ac	59	2709	138
300,000 plants/ac	60	2710	133
LSD (0.05)	NS[1]	242	NS
CV (%)	7.64	4.76	2.44

[1] not significant

Table 31. Agronomic data for the 2005 Irrigated Soybean Plant Population trial, CSIDC Off-station site.			
Target plant population	Plant height (cm)	Yield (kg/ha)	Seed weight (mg)
150,000 plants/ac	61	2168	136
200,000 plants/ac	58	2427	138
250,000 plants/ac	65	2576	131
300,000 plants/ac	68	2808	135
LSD (0.05)	NS[1]	414	NS
CV (%)	5.86	8.3	2.53

[1] not significant

Table 32. Agronomic data for the 2005 Dryland Soybean Plant Population trial, CSIDC site.			
Target plant population	Plant height (cm)	Yield (kg/ha)	Seed weight (mg)
150,000 plants/ac	74	3025	140
200,000 plants/ac	74	3348	142
250,000 plants/ac	75	3341	138
300,000 plants/ac	74	3365	143
LSD (0.05)	NS[1]	NS	NS
CV (%)	6.34	4.63	2.81

[1] not significant

Annual Cereal Forage Yield Potential Trials

Funded by Agriculture and Agri-Food Canada, PFRA and the Irrigation Crop Diversification Corporation.

A spring seeded annual cereal forage trial was established in the spring of 2005 at CSIDC. Treatments consisted of selected barley, oat and triticale varieties. A seeding rate of 250 seeds/m^2 was used for all crops. Separate trials were established for each crop. The entire plot area received a pre-seeding broadcast, soil incorporated application of urea (46-0-0) at a rate of 100 kg N/ha. All plots received a side band application of 12-51-0 at a rate of 45 kg P_2O_5/ha during the seeding operation. The treatments were arranged in a randomized complete block design and replicated four times. Each treatment measured 1.2 m x 6 m.

The trials were seeded on May 20 and harvested at the early flower growth stage for triticale and the soft dough growth stage for barley and oats. Harvest dates were August 3 (75 days after seeding), August 9 (81 days after seeding) and August 17 (89 days after seeding) for the triticale, barley and oats respectively.

Barley

Barley treatments consisted of ten varieties representing three types: malt (2), feed (4) and forage (4). Highest forage dry matter yield was obtained for CDC Copeland, a 2-row, rough awned, normal height malt barley and AC Ranger, a 6-row, smooth awned, normal height forage barley while the lowest forage yield was obtained for Dillon, a 6-row, awnless/hooded, normal height forage barley (Table 33). Overall, barley forage dry matter yield for all varieties tested was high ranging from 14,799 to 18,009 kg/ha.

Plant height ranged from a high of 100 cm for CDC Cowboy (forage) to a low of 79 cm for CDC Bold (semi-dwarf feed). There were significant plant height differences between barley varieties; however, the differences did not show any trend in relation to forage yield. Most varieties had plant height in the range of 80-90 cm.

Days to first head emergence varied from 52 to 55 days for the barley varieties tested; while, days to the soft dough growth stage for most varieties were in the range of 75-76 days.

Lodging resistance of the majority of the barley varieties tested was good. AC Hawkeye and Dillon had the highest lodge rating. AC Rosser and CDC Bold had the lowest lodging score of all varieties tested.

All barley varieties tested showed leaf disease incidence. The greatest extent and severity of leaf disease as indicated by the visual estimations was shown for CDC Bold. Trochu, Vivar, AC Rosser and Dillon had the lowest disease ratings.

Forage quality analysis for the barley varieties tested indicated that the feed barley variety AC Rosser had the best combination of CP, low NDF, low ADF and high TDN (forage quality indicators) desirable for feed. The feed barley variety Vivar had a good CP level but had the poorest combination of the other forage quality indicators. The two highest yielding varieties, CDC Copeland and AC Ranger, had the poorest CP level of all barley varieties tested. Overall the feed barley varieties had the best CP levels of all barley varieties tested.

Oat

Oat treatments consisted of five varieties representing three types: general purpose (1), milling/feed (2) and forage (2). Highest forage dry matter yield was produced by CDC Bell (forage type) while the lowest forage yield was produced by AC Morgan (milling/feed type) (Table 34). No significant differences in dry matter yield were observed among the oat varieties tested. Overall, oat forage dry matter yield for all varieties tested was high ranging from 15,740 to 16,302 kg/ha.

Plant height ranged from a high of 129 cm for Calibre (general purpose type) to a low of 117 cm for AC Morgan (milling/feed). There were significant plant height differences between oat varieties with the taller varieties producing the highest yields.

Days to first head emergence varied from 57 to 62 days for the oat varieties tested while days to the soft dough growth stage ranged from 85 to 89 days.

Lodging resistance of the oat varieties tested was good as indicated by the low lodging rating scores recorded for all varieties. This would indicate that growing conditions in 2005 were good for oat forage production.

All oat varieties tested showed leaf disease incidence. However, disease was minimal. The oat forage varieties CDC Bell and CDC Baler had the lowest disease levels of the varieties tested.

Forage quality analysis for the oat varieties tested indicated that the milling/feed barley varieties had the best combination of CP, low NDF, low ADF and high TDN (forage quality indicators) desirable for feed. All other varieties tested had similar CP, slightly higher NDF and ADF and lower TDN.

Triticale

Triticale treatments consisted of five varieties. Highest forage dry matter yields were produced by Viking and Banjo while the lowest forage yield was produced by AC Ultima (Table 35). However, no significant differences in dry matter yield were observed among the triticale varieties tested. Overall, triticale forage dry matter yield for all varieties tested ranged from 14,139 to 14,937 kg/ha. The triticale yields were lower than for the barley and oat forage yields probably due to cutting at the early flower growth stage for triticale compared to the soft dough stage for the barley and oats.

Plant height ranged from a high of 138 cm for Viking to a low of 112 cm for AC Ultima. There were significant plant height differences between triticale varieties with a trend of taller varieties producing higher forage yield.

Days to first head emergence varied from 54 to 57 days for the triticale varieties tested.

Lodging resistance of the majority of the triticale varieties tested was good as indicated by the low lodging rating scores recorded. The low lodging rating scores was probably due to the fact that the varieties were harvested at the early flower growth stage prior to kernel development.

All triticale varieties tested showed leaf disease incidence; however, the disease was minimal with little distinction between the varieties tested.

Forage quality analysis for the triticale varieties tested indicated that AC Ultima had the best combination of CP, low NDF, low ADF and high TDN (forage quality indicators) desirable for feed. Banjo had the highest CP level while Viking had the lowest CP level. Generally, there were only small differences in forage quality among the varieties tested.

Table 33. Agronomic data for the 2005 Irrigated Barley Forage trial.

Variety	2 or 6 row	Awn Type[1]	Straw[2]	Dry Matter Yield (kg/ha)	Height (cm)	Head Emergence (days)	Soft Dough (days)	Lodge rating (1=erect; 9=flat)	Disease		Forage Quality Analysis[3]			
									Extent (0-5)	Severity (0-5)	CP	NDF	ADF	TDN
Malt														
CDC Copeland	2	R	N	18009	91	54	79	2.3	3.5	2.5	9.5	53.1	31.9	63.9
CDC Battleford	6	S	N	16296	86	53	76	2.5	3	2.8	11	52.3	28.1	68
Feed														
Trochu	6	S	N	16568	81	52	76	2.5	2.8	1.3	12	55.2	33.9	61.8
Vivar	6	R	SD	16500	79	54	76	1.5	2.8	1.8	11.1	58.1	35.2	60.5
AC Rosser	6	S	N	16884	84	53	76	1	2.8	2	13	52.5	29.9	66.1
CDC Bold	6	R	SD	15917	79	54	75	1	3.8	3.3	12.1	54.2	30.7	65.2
Forage														
CDC Cowboy	2	R	N	16983	100	54	79	3.8	2.8	2	10.5	56.4	31.3	64.5
AC Ranger	6	S	N	17974	85	53	76	1.5	2.8	2.3	9.6	50.7	29.8	66.2
AC Hawkeye	6	S	N	16799	99	55	76	4	3	2.3	10.6	55.9	31.9	63.9
Dillon	6	A/H	N	14799	84	55	77	3.8	2.8	2	12.6	56.6	32.6	63.2
			LSD (0.05)	1524	4	1	1	1.7	0.6	0.9	-	-	-	-
			CV (%)	6.3	3.33	0.99	0.83	49.93	14.72	28.88	-	-	-	-

[1] R = rough; S = smooth; A/H = awnless/hooded.
[2] N = normal; SD = semi-dwarf.
[3] CP = crude protein; NDF = neutral detergent fibre; ADF = acid digestible fibre; TDN = total digestible nutrients.

Table 34. Agronomic data for the 2005 irrigated Oat Forage trial.

Variety	Dry Matter Yield (kg/ha)	Height (cm)	Head Emergence (days)	Soft Dough (days)	Lodge rating (1=erect; 9=flat)	Disease		Forage Quality Analysis[1]			
						Extent (0-5)	Severity (0-5)	CP	NDF	ADF	TDN
General Purpose											
Calibre	16197	129	57	88	1.8	2.3	2.3	10.7	54.3	35.5	60.1
Milling/Feed											
Pinnacle	15717	124	59	85	1	2.8	2.5	10.3	53.4	33.8	61.9
AC Morgan	15740	117	57	87	1	3	3	9	52.7	33.2	62.6
Forage											
CDC Bell	16302	126	62	89	1.3	2	1.3	11	57.3	35.6	60
CDC Baler	15783	123	62	89	1.5	2	2	10	55.2	33.4	62.3
LSD (0.05)	NS[1]	5	1	1	NS	NS	NS	-	-	-	-
CV (%)	9.49	2.76	1.05	0.51	33.68	31.13	45.64	-	-	-	-

[1] not significant
[2] CP = crude protein; NDF = neutral detergent fibre; ADF = acid digestible fibre; TDN = total digestible nutrients.

Table 35. Agronomic data for the 2005 Irrigated Triticale Forage trial.										
					Disease		Forage Quality Analysis[2]			
Variety	Dry Matter Yield (kg/ha)	Height (cm)	Head Emergence (days)	Lodge rating (1=erect; 9=flat)	Extent (0-5)	Severity (0-5)	CP	NDF	ADF	TDN
Viking[1]	14917	138	54	2	2	1	10.2	62.2	41.1	54.2
Banjo	14937	129	57	1	2.5	1	12.4	64.4	42.7	52.5
Comet[1]	14499	134	55	2.8	2	1	11.8	62.4	44.5	50.6
Pronghorn	14605	122	56	1	1.8	1	11.9	61.8	43	52.2
AC Ultima	14139	112	55	1	1	1	11.3	59.3	39.2	56.2
LSD (0.05)	NS[3]	5	1	1	0.6	-	-	-	-	-
CV (%)	13.94	2.52	0.99	43.28	19.74	-	-	-	-	-

[1] Varieties not registered in Canada. Available only for forage or feed production.
[2] CP = crude protein; NDF = neutral detergent fibre; ADF = acid digestible fibre; TDN = total digestible nutrients.
[3] not significant

Determining the Yield Potential of Dry Pea

Funded by Agriculture and Agri-Food Canada.
Principal: R.B. Irvine, Brandon Research Centre, Brandon, Manitoba

Dry pea yield potential was determined under conditions where disease is controlled by limiting canopy wetness without soil moisture stress. Thus the direct impact of temperature on crop yields can be determined. This will enable producers to limit fungicide applications to times where there is sufficient disease and yield potential to warrant application of fungicide.

Experimental Design

The following treatments were applied to plots of SW Parade dry pea planted at 100 seeds m^2 in a 4 replicate split plot design with early and late May seeding dates as the main plots.

1. Irrigation plus multiple fungicide applications, these applications began at the start of flowering and were weekly until the end of flowering. The fungicide used was Headline (pyraclostrobin) applied at the labelled rate as required to control disease.
2. Irrigation only.
3. No irrigation or fungicide.

The fungicide pyraclostrobin was applied at the start of flowering and two weeks later at 117 g ha^{-1} ai to control disease. The product was applied using 200 L ha^{-1} of water using air injection nozzles.

Results and Discussion

In 2004 and 2005, seed yields at Outlook were greater than at Brandon for early and late seeding dates. The early May seeding resulted in higher yields than the later seeding date in Outlook. In 2005 at Brandon, excess rainfall caused early seeded plots to yield less than the late seeded plots (Table 36). However, at Outlook there was a significant interaction between seeding date and the irrigation/fungicide treatments with the dry treatments having the lowest yields at the early seeding date and the highest at the later seeding dates in both seasons (Table 36). These high seed yields under dryland conditions are the result of rainfall and stored soil moisture.

Despite numerical differences there were no significant differences in biomass at flowering in either year (Tables 37 and 38). Similar results were found at maturity.

Plant disease at Outlook varied considerably due to seeding date but the impact of fungicide was not as large as that of seeding date (Tables 37 and 38). In both seasons it is clear that fungicide application is only partially effective in managing leaf or stem expression of disease in pea.

The Brandon seed yields from late planting were significantly lower than the early seeding by an average of almost 50% (Table 37). The flowering biomass yields of late seeded peas were only 64% of that of the early seeded crop which was 14% more than seed yields. There would seem to be some potential to predict yield based on biomass at flowering. Given the fact that the highest yields were obtained from the early seeded plots at Outlook, which had a low node number at flowering in 2004 but there were no differences in 2005, this trait holds less promise than biomass. Seed mass was greater when the crop was seeded early and treated with fungicide but this was not always significant.

Fungicide application significantly reduced both leaf and stem disease at early and late evaluation times in 2004 but there was little impact in 2005. However, despite the level of disease control this treatment did not significantly have higher yields at the late seeding date in either year. Disease continues to be a serious problem which cannot be fully managed with multiple fungicide applications.

The use of biomass and node number at flowering is not an effective means of predicting final yield and thus we are still unable to determine if fungicide should be applied. Despite significant disease levels the pea yields at Outlook were excellent at 6384 kg ha^{-1} and 6586 kg ha^{-1} averaged over all treatments for early seeding in 2004 and 2005 respectively. Even if edge effects resulted in overestimation by 25% these yields are economic.

Table 36. Yield over all site years.

Treatment[1]	Seed Date	Seed yield kg ha^{-1}				Yield as percent of early seeded fully irrigated with fungicide			
		Out04	Out05	Bran04	Bran05	Out04	Out05	Bran04	Bran05
Irrig + Fung	EAR	6971	6020	5554	1893	100	100	100	100
Irrig	EAR	7628	5075	4986	2836	109	84	90	150
Dry	EAR	4596	4832	5279	2061	66	80	95	109
Irrig + Fung	LAT	4751	3846	2544	2911	68	64	46	154
Irrig	LAT	4364	4883	2709	2331	63	81	49	123
Dry	LAT	5328	5108	2757	2718	76	85	50	144
ANOVA									
seed date		0.01	0.070	0.00	0.04				
Irrig + Fung		0.07	0.000	0.78	0.23				
Irrig x seed date		0.00	0.017	0.49	0.10				

[1] Irrig = irrigated; Fung = fungicide; Dry = not irrigated.

Table 37. Impact of seeding date and moisture plus fungicides on pea yield at Outlook in 2004.									
Treatment[1]	Seed Date	Plants m^{-2}	Biomass @ onset flower	# nodes @ flower $kg\ ha^{-1}$	Biomass @ maturity $kg\ ha^{-1}$	Leaf disease rating maturity (Xue)[2]	Stem disease rating maturity (Wang)[2]	Seed yield $kg\ ha^{-1}$	Seed mass (mg)
Irrig + Fung	EAR	71.7	3009	11.8	13846	4.6	4	6971	229
Irrig	EAR	69.4	2992	11.6	13013	5.8	5	7628	214
Dry	EAR	73.1	2689	11.9	10800	4.8	3.1	4596	186
Irrig + Fung	LAT	67.5	2445	12.8	12729	3.8	2.4	4751	183
Irrig	LAT	74.6	2436	13	11459	4.3	3.5	4364	161
Dry	LAT	72.3	2635	13.2	10289	4	3.2	5328	214
Seed date		0.98	0.12	0.03	0.07	0.06	0.04	0.01	0
Irrig + Fung		0.58	0.95	0.58	0.01	0.01	0.01	0.07	0.06
Irrig x seed date		0.33	0.43	0.75	0.79	0.36	0.03	0	0

[1] Irrig = irrigated; Fung = fungicide; Dry = not irrigated
[2] Disease rating scales

Table 38. Impact of seeding date and moisture plus fungicides on pea yield at Outlook in 2005.									
Treatment[1]	Seed Date	Plants m^{-2}	Biomass @ onset flower	# nodes @ flower $kg\ ha^{-1}$	Biomass @ maturity $kg\ ha^{-1}$	Leaf disease rating maturity (Xue)[2]	Stem disease rating maturity (Wang)[2]	Seed yield $kg\ ha^{-1}$	Seed mass (mg)
Irrig + Fung	EAR	71	3129	14.3	11932	4.6	4	6020	210
Irrig	EAR	66	30884	14.1	10340	4.8	3.1	5075	203
Dry	EAR	69	3339	14.3	11052	5.8	5	4832	200
Irrig + Fung	LAT	67	2208	14.7	9808	4.3	3.5	3846	181
Irrig	LAT	54	2027	15	9846	3.8	2.4	4883	207
Dry	LAT	63	2184	15.2	9463	4	3.2	5108	187
Seed date		0.17	0.12	0.17	0.13	0.06	0.038	0.07	0.186
Irrig + Fung		0.69	0.39	0.69	0.271	0.014	0.007	0	0
Irrig x seed date		0.38	0.67	0.24	0.578	0.362	0.031	0.017	0.07

[1] Irrig = irrigated; Fung = fungicide; Dry = not irrigated
[2] Disease rating scales

Variety Development

Evaluation of Durum Breeding Lines for Irrigation

Funded by Agriculture and Agri-Food Canada.
Plant Breeder: J.M. Clarke, Semiarid Prairie Agricultural Research Centre, Swift Current

The Durum Central ‘A’ and ‘A2’ tests were planted under irrigation at Outlook in 2005, in addition to an irrigated site at Lethbridge, Alberta, and non-irrigated tests at Brandon, Indian Head, Regina and Swift Current. These tests consisted of short and semidwarf durum lines with potential adaptation to irrigated and high rainfall environments. There were a total of 227 experimental lines and five check cultivars, replicated twice to make a total of 464 plots. Seventy-two lines were selected for further quality evaluation and potential advancement to the Durum B or the Durum Cooperative Test in 2006.

In addition, our irrigated testing at Outlook included two trials of F_6 breeding lines, consisting of a total of 540 lines. These experimental lines come from crosses with semidwarf parents, and have potential for improvement of yield, straw strength, disease resistance, and protein content compared to AC Navigator and Commander, the only registered semidwarf varieties. The best lines from these trials will be grown under irrigation in 2006. Testing of this material under irrigation permits selection for straw strength and leaf diseases, and increases the chance of identification of good semidwarf varieties.

Disease resistance and straw strength continue to be the major impediments to high yields in semidwarf durum wheat. We can select for leaf spots and kernel diseases such as red smudge and blackpoint in our Saskatchewan and Alberta test sites, and we select for Fusarium Head Blight resistance in nurseries in Manitoba. Three semidwarf lines resulting from previous testing at CSIDC were evaluated in the Durum Cooperative Test in 2005.

Pea Cultivar Preliminary Yield Trials

Funded by the Saskatchewan Agriculture Development Fund, the Saskatchewan Pulse Growers and the Crop Development Centre, University of Saskatchewan.

Plant Breeders: A. Vandenberg, T. Warkentin, S. Baniza and K. Bett, Crop Development Centre, University of Saskatchewan, Saskatoon

Field pea advanced breeding trials conducted at Outlook under irrigated conditions identified several high-yielding yellow, green and specialty field pea lines with improved lodging resistance and resistance to powdery mildew. Three elite and 15 advanced level two-replicate trials of 24 to 36 entries of mostly green and yellow types were grown. An additional 36-entry two-replicate trial of specialty pea types was also grown. Most lines were resistant to powdery mildew. Green-seeded lines were evaluated for tolerance to bleaching. Lines with the highest yield, best lodging tolerance, best disease tolerance ratings and above average quality profile will be advanced to registration recommendation trials for the 2006 season.

Dry Bean Cultivar Preliminary Yield Trials

Funded by the Saskatchewan Agriculture Development Fund, the Saskatchewan Pulse Growers and the Crop Development Centre, University of Saskatchewan.

Plant Breeders: A. Vandenberg, T. Warkentin, S. Baniza and K. Bett, Crop Development Centre, University of Saskatchewan, Saskatoon

Dry bean trials were conducted at Outlook under irrigated conditions to identify early-maturing, high yielding breeding lines in the pinto, black, navy, great northern, red, pink and specialty market classes for the narrow row production system. Four 36-entry two-replicate elite trials were grown along with nine 36-entry two-replicate advanced trials. Data from these trials were combined with those from other locations to decide which lines to advance to the 2006 registration and elite trials.

Forage Crops

Bruce Coulman[1], Tim Nelson[2], and Sarah Sommerfeld[3]
[1]University of Saskatchewan; [2]Saskatoon Research Centre, AAFC;
[3]Saskatchewan Agriculture and Food, Outlook.

Timothy Production Research

Three timothy trials were seeded in 2003: 1) a seeding rate trial; 2) a seeding date trial; and 3) a performance trial of most registered timothy varieties and a number of experimental lines. In addition, breeding nurseries were established in 2004 and 2005, to select new, adapted timothy lines for the compressed hay industry.

In the seeding date trial (Table 39), the late August seedings produced the highest yields and best stands of the three seeding times. The June seeding produced relatively high yields, but stands were poorer, due to weed competition in the year of seeding. Plots of the late October seeding were not harvested due to herbicide damage in spring, 2005; however, stands from this seeding time were poor, similar to those of the spring seeding. For both the late August and June seeding times, rates of 4 kg/ha produced higher yields than 2 kg/ha seeding rates.

Table 39. Timothy (Aurora Variety) Seeding Rate and Date trial.

			Dry matter yield (kg ha-1)[1]				
Seeding Date / Seeding Rate (kg/ha)	% Stand	Days from April 1st to 50% Heading	Cut 1 6 Jul 2005	Cut 2 29 Aug 2005	2005 Total	2004 Total	2 Year Mean Yield
August 26, 2003 / 4 (kg/ha)	91.2	73	6534	3505	10039	16488	13264
August 26, 2003 / 2 (kg/ha)	88.7	73.2	7016	3194	10210	13809	12010
June 5, 2003 / 4 (kg/ha)	33.7	73.2	4985	3513	8498	14256	11377
June 5, 2003 / 2 (kg/ha)	22.5	73.2	3558	2170	5728	13382	9555
October 29, 2003 / 2 (kg/ha)					N.H.	4026	-
October 29, 2003 / 4 (kg/ha)					N.H.	4929	-
MEAN	59.1	73.2	5523	3095	8618	14484	11551
CV (%)	9.3	0.7	21.4	24.2	12.9	7.4	5.9
LSD (0.05)	8.8	0.9	1892	1200	1790	1727	1104

[1] N.H. - not harvested in 2005 due to herbicide damage.

In the seeding rate trial (Table 40), there were no significant differences among 2, 4 and 6 kg/ha seeding rates of the varieties Joliette and Aurora. Good stands were obtained for all seeding rates. Joliette yielded higher than Aurora at all seeding rates.

Table 40. Timothy Seeding Rate Trial at 30 cm Row Spacing.								
			Days from					
			April 1st to	Dry matter yield (kg ha-1)				
Variety	Rate (kg/ha)	% Stand	50% Heading	Cut 1 6 Jul 2005	Cut 2 29 Aug 2005	2005 Total	2004 Total	2 Year Mean Yield
Joliette	4	100	74.5	8400	4215	12615	16712	14664
Joliette	2	92.5	74.2	9407	3700	13107	15940	14524
Joliette	6	97.5	74	8914	4206	13119	15563	14341
Aurora	6	87.5	74.2	7096	3079	10175	13680	11928
Auroroa	2	81.7	74	6746	2954	9701	11728	10715
Aurora	4	87.5	74	6065	2440	8504	12521	10513
MEAN		91	74	7771	3432	11204	14357	12780
CV (%)		5.6	0.4	15.6	18.1	12.0	10.3	10.1
LSD (0.05)		7.7	0.5	1834	937	2033	2236	1956

In the performance trial (Table 41), the highest yielding lines were SF9003A and SF8603, developed by the Ste-Foy Agriculture and Agri-Food Canada Research Centre in Québec. SF9003A, which has been released as AC Ovation, is early to medium maturing, has long heads, and good lodging resistance. These are characters which are valuable for the export timothy industry. Heading dates varied by nine days, with Grindstad the earliest, and Motim the latest, maturing varieties.

Table 41. Timothy Performance Trials.									
					Dry matter yield (kg ha-1)				
Variety	% Stand	Days from April 1st to 50% Heading	Lodging (*)	Head length (cm) 27 Jun 2005	Cut 1 7 Jul 2005	Cut 2 29 Aug 2005	2005 Total	2004 Total	2 Year Mean Yield
SF9003A (AC Ovation)	76.2	75	1	11.9	8386	2504	10890	15180	13035
SF8603B	68.7	74	1.5	9.6	8338	3063	11401	14042	12722
Grindstand	73.7	72	1.25	10.9	7826	2210	10036	15062	12549
Promesse	75	74	1.25	11.1	7565	1905	9470	15221	12346
SF9002A	66.2	77	1	10.5	7916	2410	10326	14029	12178
Colt	62.5	75	1	10	6605	1763	8368	15483	11926
SF9003B	68.7	75	1.25	11.5	6336	2634	8970	14734	11852
SF9000	57.5	74	1	10.8	7705	2309	10014	13400	11707
AC Alliance	71.2	74	1	9	6167	2510	8677	14160	11419
SF8301	62.5	75	1	11	7043	2216	9259	13213	11236
SWTT2528	61.2	73	1	10	8108	2459	10567	11411	10989
SWT142	60	74	1.25	10.6	7954	1959	9913	12048	10981
Joliette	47.5	74	1	10.9	7226	2091	9317	11601	10459
Drummond	57.5	76	1	12.3	7010	1531	8541	12265	10403
Jonaton	56.2	75	1.75	12.8	6904	1721	8625	11814	10220
SF8607B	51.2	77	1	10.7	5821	1881	7702	12455	10079
Richmond	55	76	1	10.7	5703	2004	7707	11539	9623
SF8607C	42.5	78	1	11.6	4690	1966	6656	11489	9073
SF9001A	38.7	74	1	10.3	5406	2012	7418	10708	9063
Climax	33.7	77	1	11.5	5531	1608	7139	10714	8927
Aurora	56.2	74	1	11.3	4729	1878	6607	11143	8875
Motim	48.7	81	1	11.5	5648	1258	6906	9603	8255
Parant	61.2	75	1	6.4	4765	808	5573	7864	6719
MEAN	58.4	75	1.1	10.7	6669	2030	8699	12573	10636
CV (%)	29.9	1.3	23.4	9.9	21.3	19.1	17.9	20	16
LSD (0.05)	24.7	1.4	0.4	1.5	2007	548	2205	3580	2446

* Lodge Ratings..1 = no lodging..10 = fully lodged

Forage Yield Trials

CSIDC Outlook is one of 12 sites across Saskatchewan, Manitoba and Alberta in the Western Forage Testing (WFT) System. New varieties produced by private companies or public institutions are seeded at the 12 sites and evaluated for yield and winter hardiness for three years following the year of seeding. Following the three years of testing, the varieties that are registered for sale in Canada are included in the CSIDC publication “Crop Varieties for Irrigation” along with their yields relative to check varieties from the Outlook site.

Table 42. Western Forage Testing - Orchardgrass (2002 seeded).				
	2005 Dry Matter Yield (kg ha^{-1})			
	Cut 1	Cut 2		% of
Variety	14 Jun 2005	9 Aug 2005	Total	Kay
AC Killarney	8658	3796	12454	103
Kay	7031	5008	12038	**100**
SOG01	7639	4333	11973	99
MEAN	7776	4379	12155	
CV (%)	23.1	19.2	19.4	
LSD (0.05)	3118	1462	4081	

Table 43. Western Forage Testing - Cicer Milkvetch (2003 seeded).				
	2005 Dry Matter Yield (kg ha^{-1})			
	Cut 1	Cut 2		% of
Variety	21 Jun 2005	18 Aug 2005	Total	Oxley
Oxley	4155	3913	8068	**100**
LRC94-1	4148	3488	7636	95
MEAN	4152	3700	7852	
CV (%)	24.2	20.5	21.7	
LSD (0.05)	2263	1707	3841	

Table 44. Western Forage Testing - Timothy (2003 seeded).				
	2005 Dry Matter Yield (kg ha^{-1})			
	Cut 1	Cut 2		% of
Variety	5 Jul 2005	7 Sep 2005	Total	Climax
Jonaton	13756	988	14744	115
Climax	11547	1316	12863	**100**
NS2TY	11490	1335	12824	100
Charlton	11191	1028	12218	95
45-214	9833	1584	11417	89
MEAN	11563	1250	12813	
CV (%)	21.1	29.3	18.4	
LSD (0.05)	3756	566	3648	

Table 45. Western Forage Testing - Alfalfa (2003 seed).					
	2005 Dry Matter Yield (kg ha^{-1})				
Variety	Cut 1 21 Jun 2005	Cut 2 2 Aug 2005	Cut 3 7 Sep 2005	Total	% of Beaver
DS 335	4060	5869	2558	12487	119
DS 337	4496	5679	2199	12375	118
DS 336	4128	5593	2261	11982	114
3M94	4109	5660	2066	11835	113
SW LU8407	4015	5381	1966	11361	109
AC Blue J	3612	5347	1863	10822	103
54V46	4118	4144	2281	10542	101
Beaver	3948	5257	1260	10465	**100**
Rangelander	3687	5323	1120	10130	97
Rambler	3796	4978	1089	9863	94
MEAN	3997	5323	1866	11186	
CV (%)	27.7	14.9	18.1	12.9	
LSD (0.05)	1609	1156	491	2102	

Table 46. Western Forage Testing - Tall Fescue (2003 seeded).				
	2005 Dry Matter Yield (kg ha^{-1})			
Variety	Cut 1 20 Jun 2005	Cut 2 7 Sep 2005	Total	% of Courtenay
Courtenay	11923	7857	19781	**100**
UMTF	12475	6165	18640	94
TF10111	10188	4498	14686	74
MEAN	11651	6325	17976	
CV (%)	16.5	16.4	13.3	
LSD (0.05)	3501	1894	4359	

Table 47. Western Forage Testing - Alfalfa (2004 seeded).					
	2005 Dry Matter Yield (kg ha^{-1})				
	Cut 1	Cut 2	Cut 3		% of
Variety	21 Jun 2005	3 Aug 2005	7 Sep 2005	Total	Beaver
AC Blue J	3195	8759	3540	15493	108
CW 83021	3153	8126	4021	15300	107
MS Sunstra 422	3195	8133	3638	14965	104
P435	3029	7783	4066	14877	104
FG-4G73	3394	7300	4162	14856	104
MS Sunstra 423	2551	8670	3481	14702	103
Beaver	2695	8431	3196	14321	**100**
CW 52044	3359	7896	2846	14100	98
Rangelander	4407	7458	1734	13597	95
SCL30001	3160	7449	2047	12655	88
SCL39801	3178	7430	1644	12253	86
Rambler	3233	7322	1524	12078	84
MEAN	3212	7896	2991	14100	
CV (%)	20.9	13.1	17.8	12.0	
LSD (0.05)	968	1487	769	2442	

Table 48. Western Forage Testing - Orchardgrass (2004 seeded).				
	2005 Dry Matter Yield (kg ha^{-1})			
	Cut 1	Cut 2		% of
Variety	14 Jun 2005	17 Aug 2005	Total	Kay
2000ABC	11970	7572	19542	105
Early Arctic	11892	7194	19086	102
Kay	11089	7537	18625	**100**
2000DEF	9386	6725	16112	87
MEAN	11084	7257	18341	
CV (%)	22.1	19.3	19.8	
LSD (0.05)	3926	2243	5828	

Table 49. Western Forage Testing - Meadow Bromegrass (2004 seeded).				
	2005 Dry Matter Yield (kg ha^{-1})			
	Cut 1	Cut 2		% of
Variety	14 Jun 2005	17 Aug 2005	Total	Fleet
S-9465	11026	5232	16258	110
SMB02	11222	5011	16233	110
SMB01	9842	5730	15573	106
Fleet	10098	4653	14751	**100**
MEAN	10547	5157	15704	
CV (%)	15.2	14.9	13.0	
LSD (0.05)	2568	1233	3271	

Table 50. Western Forage Testing - Meadow Fescue (2004 seeded).				
	2005 Dry Matter Yield (kg ha^{-1})			
	Cut 1	Cut 2		% of
Variety	20 Jun 2005	29 Aug 2005	Total	Mimer
Preval	9112	6021	15133	104
Mimer	9533	5069	14602	**100**
MEAN	9322	5545	14867	
CV (%)	16.5	13.1	7.7	
LSD (0.05)	3464	1634	2593	

Table 51. Western Forage Testing - Timothy (2004 seeded).				
	2005 Dry Matter Yield (kg ha^{-1})			
	Cut 1	Cut 2		% of
Variety	21 Jun 2005	29 Aug 2005	Total	Climax
SWTT2527	8254	5594	13848	107
Climax	7227	5714	12941	**100**
MEAN	7740	5654	13394	
CV (%)	12.9	14.8	8.2	

Table 52. Western Forage Testing - Italian Ryegrass (2005 seeded).			
	2005 Dry Matter Yield (kg ha^{-1})		
	Cut 1		% of
Variety	29 Aug 2005	Total	Maris Ledger
S04-I01	9694	9694	106
Maris Ledger	9125	9125	**100**
MEAN	9410	9410	
CV (%)	11.4	11.4	

Table 53. Western Forage Testing - Westerwold Ryegrass (2005 seeded).				
	2005 Dry Matter Yield (kg ha^{-1})			
	Cut 1	Cut 2		% of
Variety	17 Aug 2005	7 Sep 2005	Total	Aubade
Aubade	8252	3367	11619	**100**
Elunaria	6864	3471	10335	89
MEAN	7558	3419	10977	
CV (%)	6.9	17.8	7.8	
LSD (0.05)	1175	1373	1933	


Horticultural &
Medicinal Crops

Potato Research and Development

Medicinal Plants

Demonstrations

Potato Research and Development

Principals: Jazeem Wahab and Greg Larson, CSIDC, Outlook

Saskatchewan has become one of the leading seed potato producers and exporters in North America. This can be attributed to the phenomenon of 'Northern Vigour™' and disease-free status of seed tubers produced in this province. Saskatchewan is recognized as one of the few remaining areas in North America that can consistently produce high quality early generation seed potatoes. The major target markets include the U.S.A, Mexico, and several Canadian provinces. Quality characteristics of a superior seed stock include greater physiological vigour, freedom from tuber-borne diseases, and uniform tuber size of the seed lot as demanded by the target market.

The processing potato industry is also expanding in Western Canada. Multi-year research conducted at the University of Saskatchewan and the Canada-Saskatchewan Irrigation Diversification Centre (CSIDC) have shown that high quality processing potato can be grown in Saskatchewan. The irrigated area of southern Saskatchewan is ideally suited to the production of high quality processing potatoes. Superior cultivars, suitable production and storage management practices are also essential to produce and market high quality 'seed', 'table', or 'processing' potatoes.

CSIDC has expanded its potato research and development program to support the needs of this expanding industry. The main objectives include:

- identify superior cultivars for the 'seed', 'processing', and 'table' markets,
- develop cost-effective agronomic practices to suit the relatively short and cool growing season of Saskatchewan,
- Develop economically viable and sustainable potato-based crop rotations, and
- Identify physiological parameters responsible for superior vigour of seed lots and develop production and storage management practices to maintain productive superiority of seed-tubers.

These projects are conducted jointly with industry partners, the Saskatchewan Seed Potato Growers Association and Dr. Benoit Bizimungu (Lethbridge Research Centre, Agriculture and Agri-Food Canada). Partial funding for this project was provided by the Canada-Saskatchewan Agri-Food Innovation Fund, and Agriculture and Agri-Food Canada Matching Investment Initiative.

Field Trials:
The studies were conducted in the field plots of the CSIDC. The growing season received 365 mm of precipitation and 157 mm of irrigation was applied to maintain soil moisture above 60% Field Capacity.

Test plots were established May 20 through May 27, 2005. The crop was raised using standard management practices with treatments applied appropriately as required by the different tests. Eptam 8E was applied as pre-plant herbicide. Seed pieces were spaced 90 cm between-row and 30 cm within-row for all trials except for seed spacing studies. Nitrogen at 200 kg N/ha (half at planting and half at hilling), phosphorus at 60 kg P_2O_5/ha and potash at 50 kg K_2O/ha (at planting) were applied. Bravo 500, Dithane DG, Tattoo C, and Acrobat MZ fungicides were applied for disease control. No insecticides were used as the insect incidence was negligible. The test plots were top-killed with Reglone at different dates depending on the test. Tubers were harvested after adequate skin set. The harvested potatoes were graded based on tuber diameter according to Canadian Seed Standards. Tuber specific gravity and culinary characteristics (boiled, baked, chip, and french fry) were determined using recommended Prairie Regional Variety Testing protocols. Fry colour categories were based on USDA classification.

Cultivar Evaluation

National Advanced Early and Main Adaptation Trial

Co-Investigator: Benoit Bizimungu, AAFC, Lethbridge

The performance of 14 potato clones were evaluated in comparison with Russet Burbank, Shepody, and Atlantic potatoes under irrigated conditions. Test plots contained 50 hills with two replications. Superior clones will be advanced for further evaluation.

Advanced Adaptation Trial - I

Co-Investigator: Benoit Bizimungu, AAFC, Lethbridge

The performance of forty-eight potato clones were evaluated in comparison with commercial cultivars Russet Burbank, Shepody, Norland, Sangre, Atlantic, Snowden, Norvalley, Russet Norkotah, and Ranger Russet under irrigated conditions. Test plots contained 12 hills with two replications. Superior clones will be advanced for further evaluation.

Advanced Adaptation Trial - II

Co-Investigator: Benoit Bizimungu, AAFC, Lethbridge

The performance of nineteen potato clones were evaluated in comparison with commercial cultivars Russet Burbank, Shepody, Norland, Sangre, Atlantic, Snowden, Ranger Russet, Russet Norkotah, NorValley under irrigated condition. Test plots contained 12 hills with four replications. Superior clones will be advanced for further evaluation.

Prairie Early Replicated Trial

Co-Investigators: Benoit Bizimungu and Richard Tarn, AAFC, Lethbridge

The Prairie Early Replicated trial was conducted at CSIDC under irrigation. This test evaluated twelve advanced generation clones in comparison with industry standards Norland, Atlantic, AC Ptarmigan, NorValley, and Russet Norkotah. Field plots were flailed at 80 and 95 days after planting. The yield performance and culinary characteristics were determined for the harvested tubers. This information will be used to support registration of new cultivars.

Prairie Main Replicated Trial

Co-Investigators: Benoit Bizimungu and Richard Tarn, AAFC, Lethbridge

The Prairie Main Replicated trial was conducted at CSIDC under irrigation. Twenty-three clones and eight industry standards (Russet Burbank, Shepody, Snowden, Norland, Russet Norkotah, Sangre, Ranger Russet, Atlantic) were evaluated under irrigated production. The crop was flailed and desiccated 110 days after planting and harvested 16 days later. The yield performance and culinary characteristics were determined for the harvested tubers. This information will be used to support registration of new cultivars.

Western Seed Potato Consortium

Co-Investigator: Benoit Bizimungu, AAFC, Lethbridge

Promising table, french fry, and chipping clones offered to the Western Seed Potato Consortium and standard industry cultivars were grown in single-row plots under irrigated production. The crop was harvested and displayed to the participants during the Potato Field Day August 16, 2005.

Potato Variety Development for Saskatchewan (AAFC/MII)

Co-Investigator: Dermot Lynch, retired AAFC, Lethbridge

Potato clones CV95070-1, AV81292-2, V0931-9V+, CV89023-2, and CV89075-1 were grown on a large scale under irrigation at CSIDC. This is a joint project with industry partners. Operation such as planting, harvesting etc. were done by the cooperator. Harvested tubers were stored under 4, 7, and 10^{o}C storage conditions. Storage and culinary characters were recorded during the storage period. Market acceptance of these clones will be determined based on the performance of the various clones.

Effects of top-kill methods, top-kill dates, and growing condition of the seed crop, and seed-tuber grade on productivity of the progeny

Productivity of seed potato is a function of physiological vigour of the tuber and the presence/absence of tuber-borne diseases. Physiological vigour in turn is a combination of the inherent productivity of the seed-tuber and the influence of external conditions under which the seed crop is grown (environment and agronomic practices) and stored. Physiologically younger seed-tubers are considered to be more productive than physiologically old seed-tubers.

In this study, productivity of Dark Red Norland, Russet Burbank, Russet Norkotah, Ranger Russet, Shepody, and Atlantic seed potatoes raised under a variety of production conditions were evaluated under irrigation. Treatments included two top-kill methods (Flailing + Reglone chemical desiccation, i.e. two applications of Reglone), two top-kill dates (90, 104 days after planting), two growing conditions (irrigation, dryland), two seed grades (Canada Grade A, Canada Grade B).

Table 54 summarizes the effects of the agronomic practices applied during the seed production season on the productivity of the progeny for table, french fry and chipping potatoes. Cultivars responded differently to the effects of seed production agronomy on 'consumption' grade yields. The results are summarized as follows:

- Seed crops top-killed by flailing or chemical desiccation produced similar yields for all cultivars.
- Seed crops of Russet Burbank, Russet Norkotah, Ranger Russet, Atlantic, and Shepody raised under irrigation produced higher yields than the seed crop raised on dryland, but the yield differences for Shepody was not significant. By contrast the dryland seed crop of Dark Red Norland produced significantly higher consumption grade yield than seed from the irrigated seed crop.
- Top-kill date had no effect on productivity for DR Norland, Shepody, Russet Norkotah and Atlantic. However late top-killed seed crops of Russet Burbank and Ranger Russet, outyielded the early top-killed seed crop.

Yield responses for the different seed grade was variable. Significant top-kill date x seed grade interaction (Table 54) indicates variable productivity for Grade-A and Grade-B seed-tubers obtained from seed crops top-killed at 90 and 104 days after planting (Figure 1). For example, Grade-B (i.e. drop seed) seed from the seed crop top-killed at 90 DAP produced higher yields for all cultivars compared to the productivity of the crop raised from Grade-A seed (i.e. cut seed). By contrast, Grade-B seed-tubers Russet Burbank, Shepody, Russet Norkotah, and Ranger Russet obtained from the seed crop top-killed at 104 DAP produced lower yields than Grade-A seed. However, no significant top-kill date x seed grade interactions were observed for Dark Red Norland or Atlantic. The other first and second order interactions for the various cultivars did not show any logical trends.

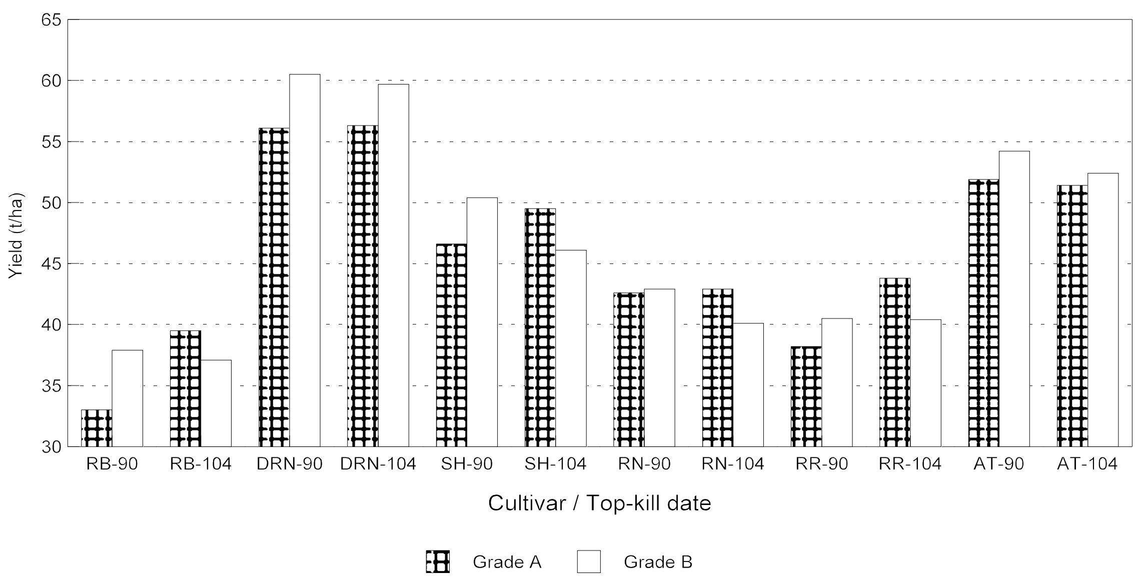


Figure 1. Productivity of Grade-A and Grade-B seed-tubers of Russet Burbank (RB), Dark Red Norland (DRN), Shepody (SH), Russet Norkotah (RN), Ranger Russet (RR), and Atlantic (AT) potatoes when the seed crop was top-killed at 90 and 104 days after planting.

Table 54. Effects of top-kill method, top-kill timing, growing condition, and seed-tuber grade on 'consumption' grade yield of the progeny for six commercial potato cultivars: 2005.

Treatment	Russet Burbank	Dark Red Norland	Shepody	Russet Norkotah	Ranger Russet	Atlantic
Top-kill method:	--- Tuber Yield (t / ha) ---					
Flail	42.3	55.5	44.9	47	44.4	41.8
Reglone	41.7	55.4	45.5	46.7	44.1	52
Top-kill date:						
90 DAP[1]	40.2	55.7	45.1	47.3	43.7	52.5
104 DAP	43.8	55.2	45.3	46.4	45.7	51.3
Growing condition:						
Dryland	40.7	56.5	44.6	45.9	42.4	50.9
Irrigation	43.3	54.3	45.7	47.8	46.1	52.9
Seed grade:						
Grade A	41.3	51.5	45.3	47.7	44.9	50.9
Grade B	42.8	59.4	45.1	46	43.5	52.9
Analyses of variance						
Source:						
Top-kill method (M)	ns	ns	ns	ns	ns	ns
Top-kill date (D)	***	ns	ns	ns	**	ns
Growing condition (G)	***	*	ns	*	***	ns
Seed grade (S)	ns	***	ns	*	ns	ns
M x D	ns	ns	ns	ns	ns	ns
M x G	ns	ns	ns	ns	ns	ns
M x S	ns	ns	ns	ns	ns	ns
D x G	ns	*	ns	ns	ns	ns
D x S	***	ns	*	*	**	ns
G x S	**	ns	*	ns	ns	ns
M x D x G	**	ns	ns	ns	ns	ns
M x D x S	ns	ns	ns	ns	ns	ns
M x G x S	ns	*	ns	*	ns	ns
D x G x S	ns	**	ns	ns	ns	ns
M x D x G x S	ns	ns	ns	ns	ns	ns
CV (%)	8.3	11.0	10.8	6.7	8.2	10.8

[1]Days after planting
*, **, *** indicate significance at P<0.05, 0.01, 0.001 levels of probability and not significant respectively.

Agronomic Practices for Maximizing Yields for Small Potato cvs. Piccolo, Baby Boomer, and HO-2000

Potato production is the major horticultural industry in Saskatchewan. Between 1993 and 2003, Saskatchewan's potato acreage grew from approximately 1800 to 5500 ha with estimated farm returns of $13 m to $60 m during this period. Highly competitive markets and increasing production costs have substantially reduced profit margins. This lead potato producers to seek alternate options and markets. Recent health issues associated with traditional potato products have forced the potato industry to seek healthier alternatives. 'Small' potatoes are fresh and non-fry alternatives with economic potential. Lower land cost, reduced disease pressures, and availability of irrigated land makes Saskatchewan a low cost producer with minimal risk. This study will develop cost-effective agronomic practices for producing 'small' potato under irrigation in Saskatchewan.

A study was conducted jointly with Solanum International, Broderick, Saskatchewan to develop suitable agronomic practices to optimize yields of small tubers for Piccolo (yellow flesh), Baby Boomer (yellow flesh), and HO-2000 (white flesh). Treatments included two tuber sizes (small and large) two ageing treatments (aged and non-aged) and three in-row spacings (10, 15, 20 cm). Seed-tubers were sorted into large and small size groups (Table 55) and artificially aged by storing them at 20°C for approximately 7-10 days prior to planting. Piccolo, Baby Boomer, and HO-2000 were planted on May 24, 26, and 27 respectively. The crop was planted in 90 cm rows and with appropriate within-row spacing. Standard management practices recommended for irrigated production were adopted to raise the crop.

Table 55. Average weight of seed-tubers of the two size categories for the various potato cultivars tested in the study.

Cultivar	Average weight of seed-tubers (g)	
	Large seed	Small seed
Baby boomer	71.3	22.3
HO-2000	91.3	31.2
Piccolo	78.8	28.3

Harvest dates were determined by performing test digs in the guard rows for the various cultivars/treatments. Plots were flailed and desiccated with Reglone when approximately two tubers in a hill reached approximately 40 mm in diameter or slightly larger. Growth characteristics were recorded during the growing season. The harvested tubers were graded according to tuber diameter. The size grades included < 20 mm, 20-30 mm, 30-40 mm, and >40 mm.

Emergence:
Emergence was recorded when approximately 50% of the seed-tubers emerged. Days to emergence in relation to the effects of seed-tuber size, seed-tuber ageing, and in-row spacing for the various cultivars are presented in Table 56.

The crop emerged approximately three weeks after planting.

Seed size had no effect of days to emergence for Baby Boomer and Piccolo. With HO-2000, the crop planted with large seed emerged approximately two days earlier than the crop from small seed.

Aged seed emerged faster than non-aged seed. For example, aged Baby Boomer and HO-2000 emerged three days earlier and aged Piccolo seven days earlier than the non-aged crop.

Seed planted with closer in-row spacing (i.e. 10 cm) emerged approximately one day later than the wider planted seed.

Days to first flower:
Days to flower were recorded when fully opened flowers were first observed.

Seed size had no effect on the flowering date (Table 57).

Artificial ageing of seed-tubers had no effect on days to flower for Baby Boomer and Piccolo. However, ageing delayed flowering of HO-2000 by approximately five days compared to non-aged HO-2000.

There was a tendency that the wider spaced crop flowered slightly earlier than the closer spaced crop.

Mainstems:
The cultivars tested produced two to three mainstems per hill (Table 58).

Larger seed-tubers produced more stems than smaller seed for all three cultivars.

Ageing had no effect on mainstem number for the three cultivars.

Closer in-row spacing produced fewer mainstems than wider in-row spacing.

Yield:
The small potato market demands smaller tubers to suit wide ranging recipes and cuisines. 'Consumption' grade or marketable tubers includes 20-30 mm and 30-40 mm size grades. Tubers larger than 40 mm in diameter are considered too large for this market. Therefore, they are considered oversize or unmarketable.

Results of analyses of variance examining the effects of seed-tuber size, seed ageing, and in-row spacing on yields of the different size grades for Baby Boomer, HO-2000, and Piccolo are summarized in Table 59. The average tuber yield of the various tuber size grades for the three cultivars as influenced by seed-tuber size, seed-tuber ageing, and in-row seed spacing are presented in Figures 2, 3, and 4 respectively.

Based on the top-kill and harvest method adopted, the average total tuber yield under irrigated production were 31 t/ha for Baby Boomer, 32 t/ha for HO-2000, and 21 t/ha for Piccolo. On the average, 36% of Baby Boomer, 44% of HO-2000 and 18% of Piccolo were graded oversize and rendered unmarketable for the purpose of the target market. The 20-30 mm size grade constituted 13% of the total yield for Baby Boomer, 9% for HO-2000, and 20% for Piccolo. Correspondingly, the 30-40 mm size grade constituted 50% for Baby Boomer, 47% for HO-2000, and 62% for Piccolo. Seed-tuber size, seed ageing, and seed spacing had variable effects on yield and tuber size distribution.

i. Seed size Effects:

Large seed-tubers produced significantly higher yields of marketable tubers than small seed for all three cultivars (Table 59, Figure 2). This yield increase was 29% for Baby Boomer, 27% for Piccolo, and 15% for HO-2000 in the 20-30 mm tuber grade (Figure 3 A) and 18%, 28%, and 14% respectively corresponding to the 30-40 mm tuber grade (Figure 3 B). Seed size had no effect on oversize tubers (Table 59, Figure 3 C).

The proportion of the various size grades between the crops raised from large and small seed were similar for the respective cultivars (Figure 5 A).

ii. Seed-tuber Ageing:

Ageing had no effect on tuber yields for the various cultivars except for the 20-30 mm grade of HO-2000 where non-aged seed outyielded aged seed (Table 5, Figure 3).

The proportion of the various size grades produced by the aged and non-aged seed were similar for the respective cultivars (Figure 5 B).

iii. In-row Seed Spacing

Spacing significantly affected tuber yields for the various size grades in all cultivars except for Piccolo >40 mm grade tubers (Table 5). Closer spacing produced higher tuber yields than wider spacing for all size grades in all cultivars except for Piccolo oversize tubers where the different spacings produced similar yields. For Baby Boomer, the yield difference between the 10 cm and the 20 cm spacings for the 20-30 cm , 30-40 cm, > 40 cm size grades were 40%, 18%, and 32% respectively. For HO-2000, the corresponding yield differences for the various size grades were 57%, 21%, and 26% respectively. For Piccolo, the corresponding yield differences for the various size grades were 39%, 13%, and 17% respectively.

For all cultivars, the proportion of oversized (i.e. unmarketable) tubers increased with increase in in-row spacing (Figure 5 C). By contrast, the proportion of 20-30 cm and 30-40 cm size grade tubers decreased with increase in in-row spacing.

This study showed that growth and tuberizing characteristics were different for the various cultivars tested. For example, 36% of Baby Boomer, 44% of HO-2000 and 18% of Piccolo were rendered unmarketable. Therefore, proper top-kill and harvest strategies are needed to minimize the unmarketable grades and maximize yields of appropriate size grades demanded by the target market.

Table 56. Seed tuber size, ageing and in-row spacing effects on days to 50% emergence for Baby Boomer, HO-2000, and Piccolo potato.

Treatment	50% emergence (days after planting)		
	Baby Boomer	HO-2000	Piccolo
Seed tuber size:			
Large	24	23	25
Small	24	25	25
Physiological ageing:			
Non-aged	25	25	29
Aged	22	22	22
In-row spacing:			
10 cm	24	24	26
15 cm	24	24	25
20 cm	24	23	25
Analyses of variance			
Source	Significance and LSD		
Seed size (S)	ns	***(0.4)	ns
Ageing (A)	***(0.3)	***(0.4)	***(0.6)
Spacing (P)	**(0.4)	*(0.5)	*(0.7)
S x A	ns	ns	ns
S x P	ns	ns	ns
A x P	ns	ns	ns
S x A x P	ns	*(1.07)	ns
CV (%)	2.4	3.2	3.7

*, **, ****, and ns indicate significance at P <0.05, 0.01, 0.001 levels of probability and not significant respectively. Values within parentheses are LSD estimates at 5.0% level of significance.

Table 57. Seed tuber size, ageing and in-row spacing effects on days to first flower for Baby Boomer, HO-2000, and Piccolo potato.			
Treatment	First flower (days after planting)		
	Baby Boomer	HO-2000	Piccolo
Seed tuber size:			
Large	59	58	68
Small	59	58	68
Physiological ageing:			
Non-aged	59	61	69
Aged	59	55	67
In-row spacing:			
10 cm	61	58	69
15 cm	59	57	68
20 cm	57	57	66
Analyses of variance			
Source			
Seed size (S)	ns	ns	ns
Ageing (A)	ns	***(1)	ns
Spacing (P)	*(3)	ns	**(2)
S x A	ns	ns	ns
S x P	ns	ns	**(2)
A x P	ns	ns	*(3)
S x A x P	ns	ns	ns
CV (%)	7.1	3.4	3.9

*, **, ***, and ns indicate significance at P <0.05, 0.01, 0.001 levels of probability and not significant respectively. Values within parentheses are LSD estimates at 5.0% level of significance.

Table 58. Seed tuber size, ageing and in-row spacing effects on the number of mainstems per hill for Baby Boomer, HO-2000, and Piccolo potatoes.

Treatment	Number of mainstems per hill		
	Baby Boomer	HO-2000	Piccolo
Seed tuber size:			
Large	3.18	3.11	3.23
Small	2.29	2.18	2.22
Physiological ageing:			
Non-aged	2.73	2.68	2.8
Aged	2.74	2.6	2.66
In-row spacing:			
10 cm	2.15	2.18	2.41
15 cm	2.67	2.72	2.7
20 cm	3.39	3.02	3.07
Analyses of variance			
Source	Significance and LSD		
Seed size (S)	***(0.21)	***(0.15)	***(0.19)
Ageing (A)	ns	ns	ns
Spacing (P)	***(0.26)	***(0.18)	***(0.24)
S x A	ns	*(0.21)	ns
S x P	ns	**(0.25)	*(0.34)
A x P	ns	ns	ns
S x A x P	ns	ns	ns
CV (%)	13.1	9.5	12.2

*, **, ***, and ns indicate significance at P <.0.05, 0.01, 0.001 levels of probability and not significant respectively. Values within parentheses are LSD estimates at 5.0% level of significance.

Table 59. Summary of analyses of variance on the effects of seed size, seed-tuber ageing, and in-row spacing on yields of different tuber size grades for Baby Boomer, HO-2000, and Piccolo potatoes.

Source	Baby Boomer	HO-2000	Piccolo
20 - 30 mm tuber yield	Significance and LSD		
Seed size (S)	***(0.5)	**(0.3)	***(0.5)
Ageing (A)	ns	*(0.3)	ns
Spacing (P)	***(0.6)	***(0.4)	***(0.6)
S x A	ns	ns	ns
S x P	ns	ns	ns
A x P	ns	ns	ns
S x A x P	ns	ns	ns
CV (%)	20.3	18.8	19.4
30 - 40 mm tuber yield	Significance and LSD		
Seed size (S)	***(0.9)	**(1.5)	***(1.0)
Ageing (A)	ns	ns	ns
Spacing (P)	***(1.0)	*(1.9)	**(1.3)
S x A	ns	ns	**(1.6)
S x P	ns	ns	ns
A x P	ns	ns	ns
S x A x P	*(2.1)	ns	*(2.7)
CV (%)	9.5	17.6	14.2
>40 mm tuber yield	Significance and LSD		
Seed size (S)	ns	ns	ns
Ageing (A)	ns	ns	ns
Spacing (P)	**(1.7)	*(2.4)	ns
S x A	ns	ns	ns
S x P	ns	ns	ns
A x P	ns	ns	ns
S x A x P	ns	ns	ns
CV (%)	28.2	23.8	28.2

***, **, *, and ns indicate significance at P <0.001, 0.01, 0.05 levels of probability and not significant respectively. Values within parentheses are LSD estimates at 5.0% level of significance.

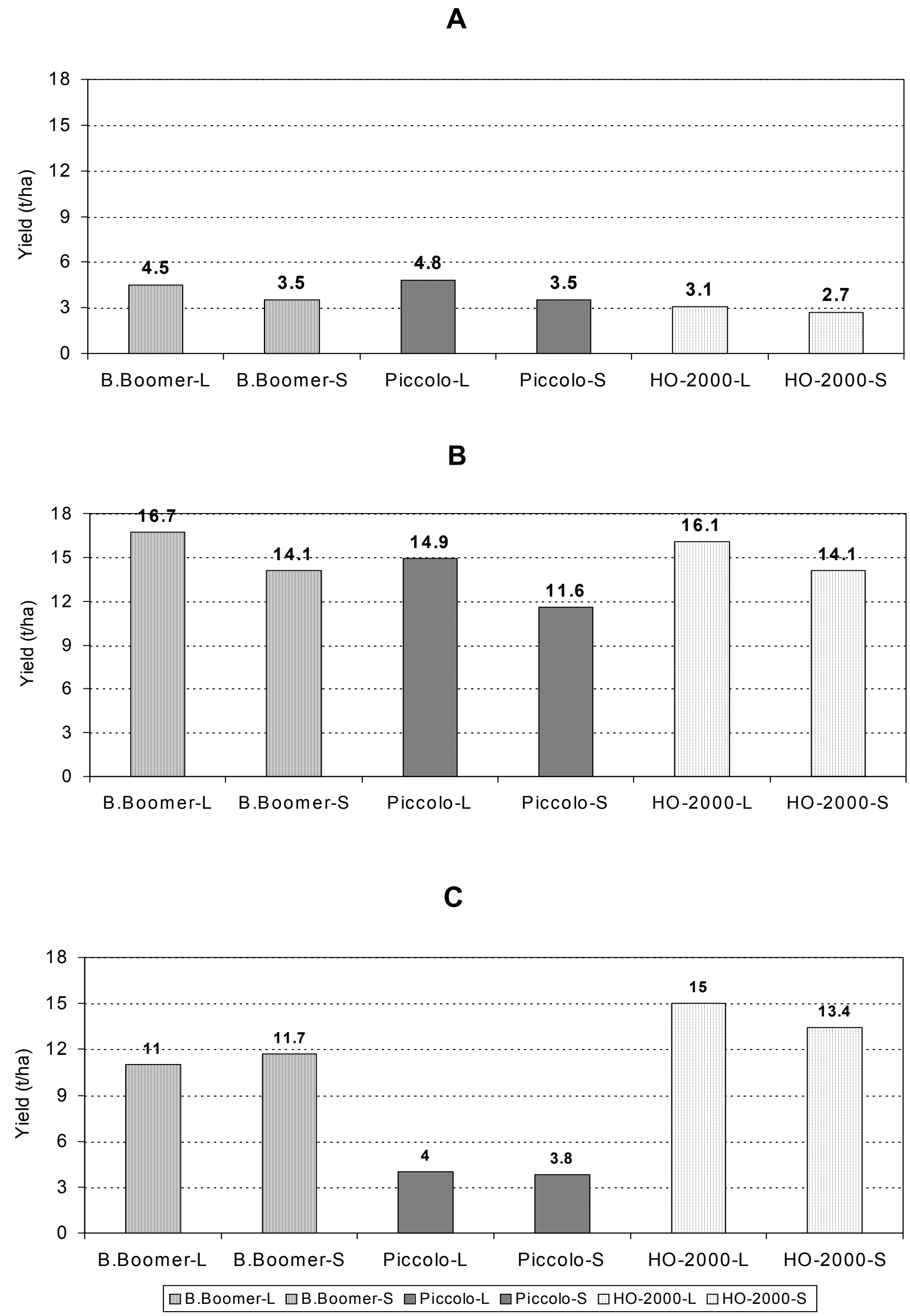


Figure 2. Effects of seed-tuber size on 20-30 mm grade (A), 30-40 mm grade (B), and >40 mm grade (C) tuber yields for Baby Boomer, Piccolo, and HO-2000 potato: (L = Large seed, S = Small seed).

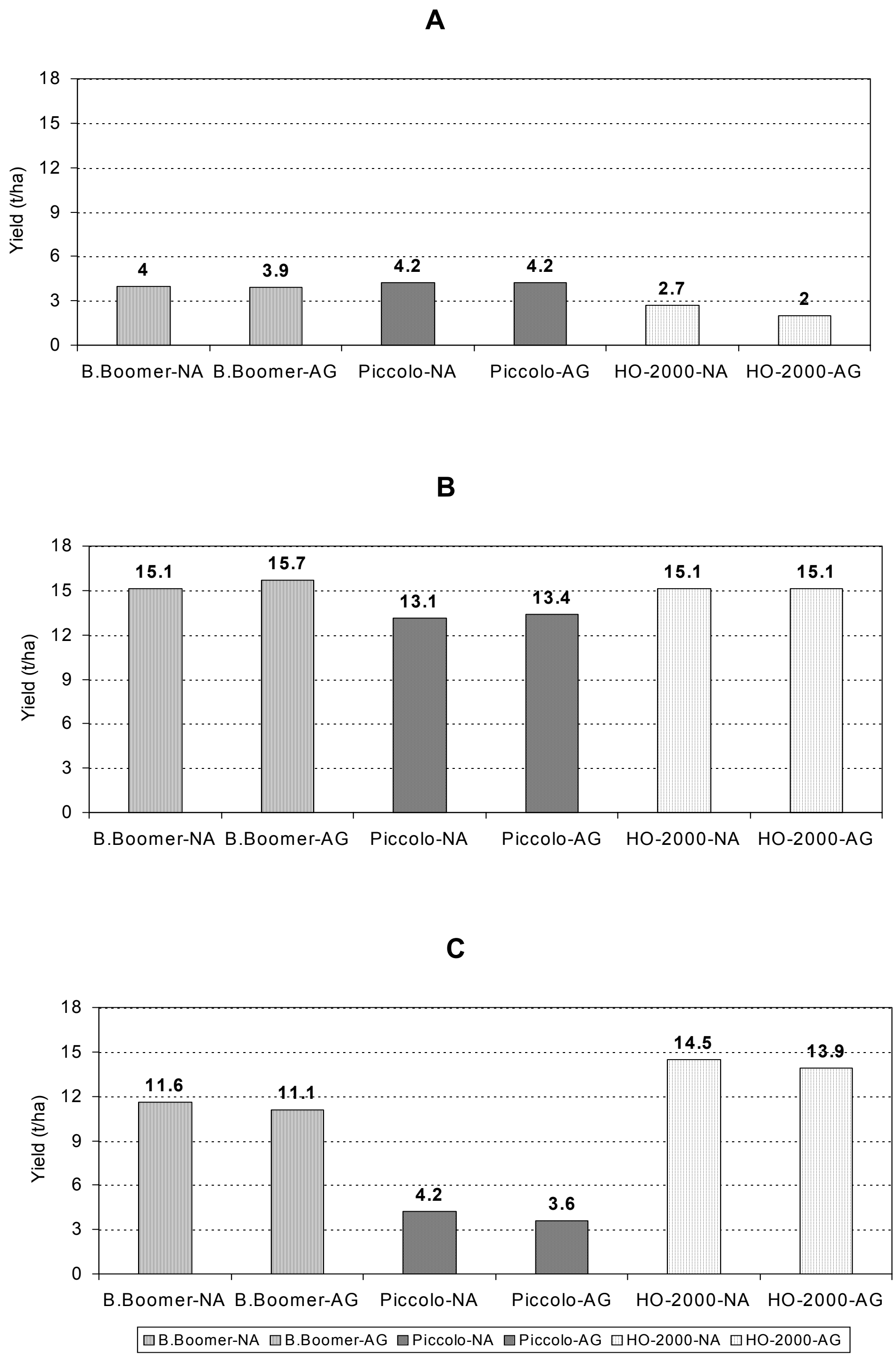


Figure 3. Effects of seed-tuber ageing on 20-30 mm grade (A), 30-40 mm grade (B), and >40 mm grade (C) tuber yields for Baby Boomer, Piccolo, and HO-2000 potato: (NA = Non-aged, A = Aged).

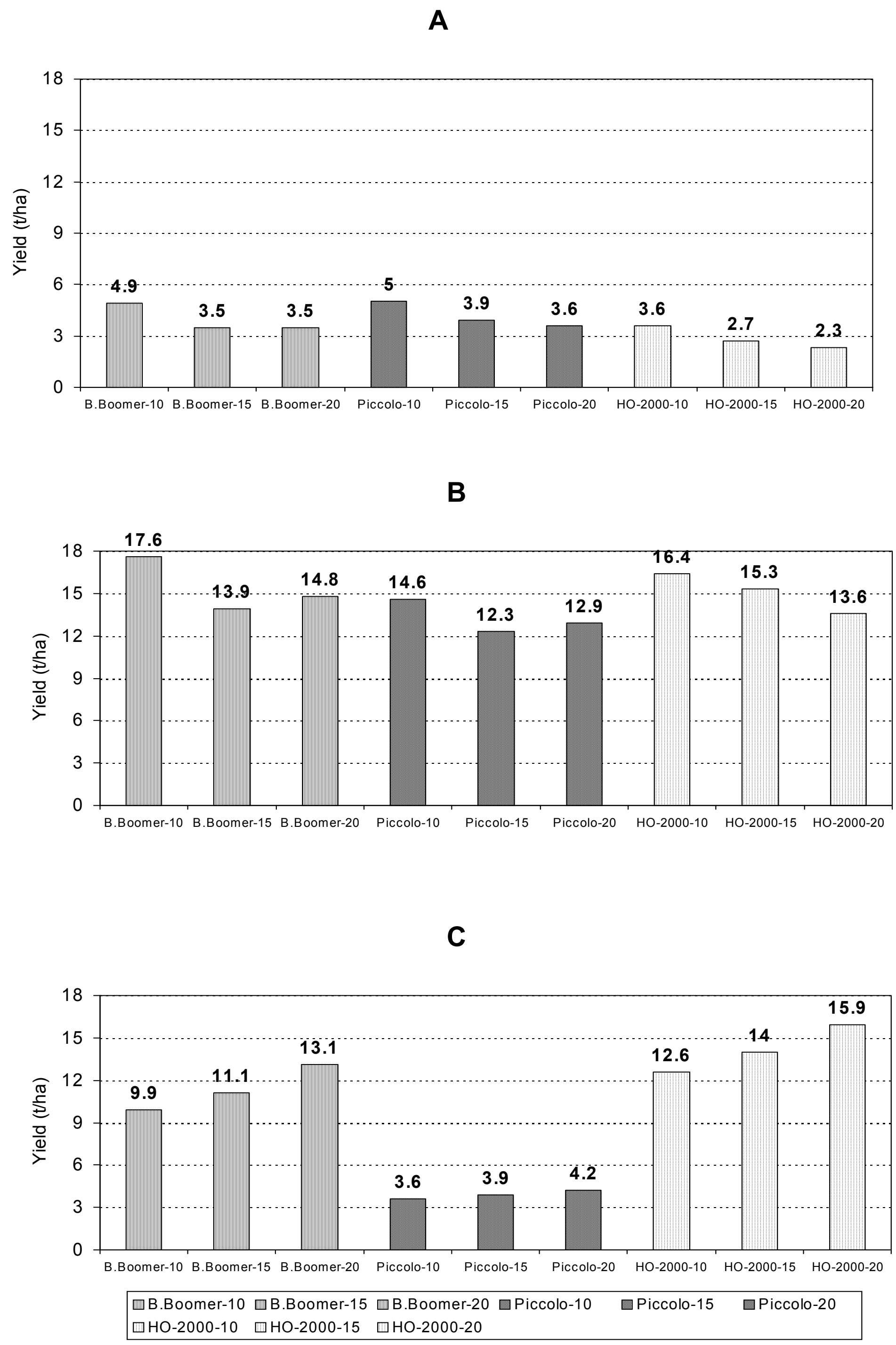


Figure 4. Effects of in-row spacing on 20-30 mm grade (A), 30-40 mm grade (B), and >40 mm grade (C) tuber yields for Baby Boomer, Piccolo, and HO-2000 potato: (10, 15, 20 indicate 10 cm, 15 cm, and 20 cm in-row spacing).

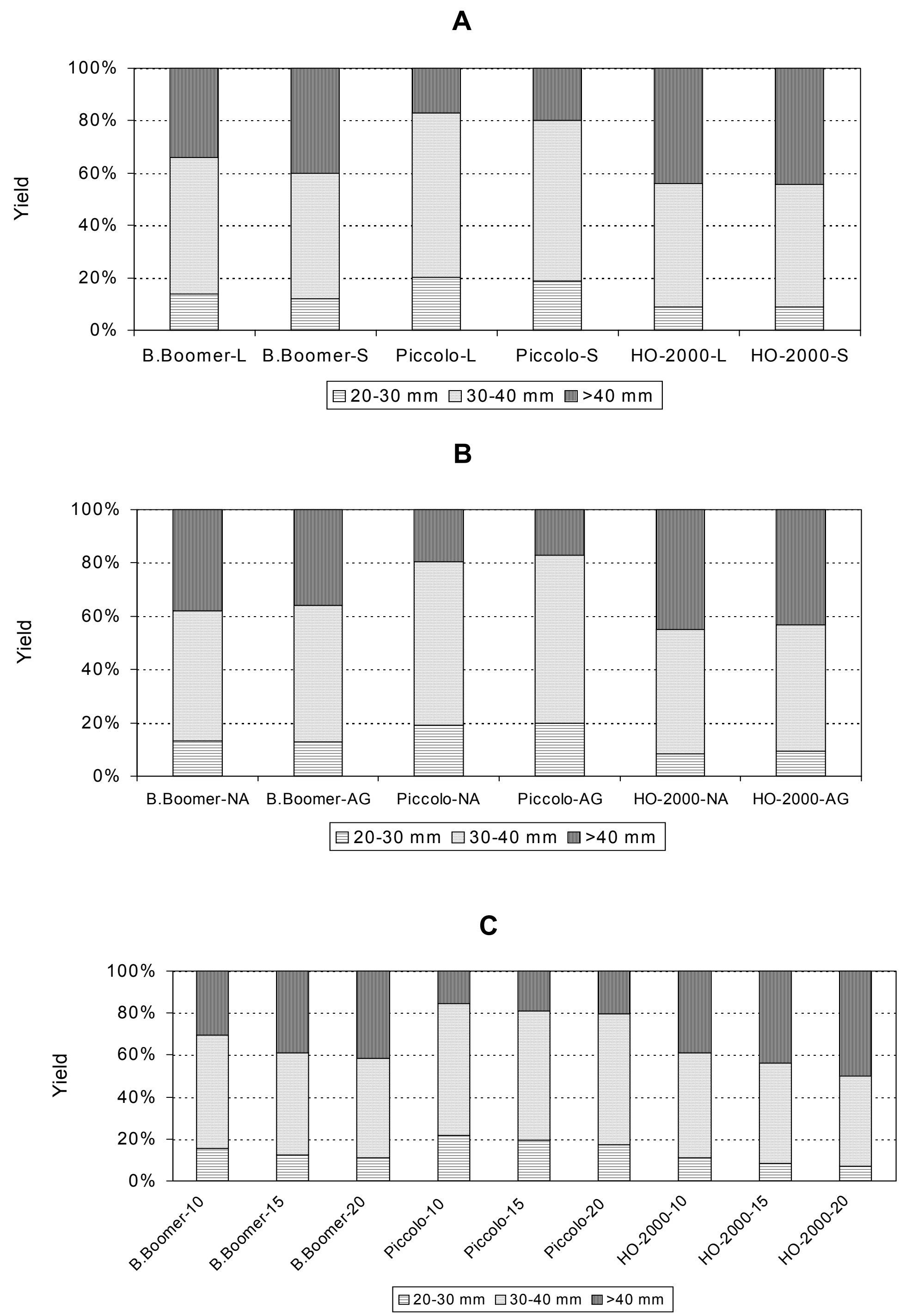


Figure 5. Effects of seed-tuber size (A), ageing (B), and row spacing (C) on tuber size distribution for Baby Boomer, Piccolo, and HO-2000 potato: (L = Large seed, S = Small seed; NA = Non-aged, A = Aged; 10, 15, 20 = 10 cm, 15 cm, and 20 cm in-row spacing respectively).

Medicinal Plants

Principals: Jazeem Wahab and Greg Larson, CSIDC, Outlook

Increasing health care costs, and individuals taking more responsibility for their own health, has lead consumers to seek alternate approaches to treat or prevent diseases. Consequently, natural products (nutraceuticals, functional foods, and dermaceuticals) represent one of the most rapidly expanding industries in the developed countries. To meet the demand of this growing industry, the medicinal and aromatic plant production and processing sectors are growing fast in Saskatchewan. Effective agronomic practices are essential to consistently produce superior yields of high quality herbs. Agronomic research for commercially important herbs were carried out at CSIDC. The focus of herb research includes:

- Evaluation of the adaptability of promising medicinal and culinary herbs for Saskatchewan conditions.
- Development of management practices for mechanized commercial production.
- Development of labour saving agronomic practices.
- Comparison of dryland and irrigated production in relation to yield and quality.
- Assessment of the feasibility of direct seeding and transplanting under dryland and irrigated conditions.
- Determination of stage and method of harvesting practices (primary processing) to increase recovery and to maintain quality.

St. John's Wort Agronomy

St. John's Wort is a perennial. Flowering tops are harvested for commercial use as the flowers and leaves are found to contain higher levels of hypericin. Success and sustainability of herb production depends on producing a high quality crop consistently and economically. The issues include mechanization to reduce labour cost, agronomics to maximize yield and improve quality as well as to minimize winter-kill. Plant growth characteristics and harvest height can affect yield and quality. Plant growth and flowering habit can be a function of many factors including genotype, population density, winter survival, and growing conditions. This project is designed to develop cost-effective agronomic practices for commercial scale production of St. John's Wort in Saskatchewan. Emphasis is placed on reducing manual labour through mechanization while maximizing yield and improving quality.

Effect of Nitrogen Application and Straw Mulching on Winter-kill and Productivity for St. John Wort's Cultivars Grown Under Irrigation and Dryland

Proper fertility management is an important criteria for successful crop production. Different crops/cultivars respond differently to the type (e.g. nitrogen, phosphorus, potassium), amount, and timing (crop stage) of fertilizer and this can be influenced by soil, climate, and growing conditions under which the crop is produced. There is no information on fertility management for commercial production of St. John's Wort in Saskatchewan or in Canada.

This study examines the response of nitrogen application on the incidence of winter-kill and herb yield for St. John's Wort biotypes Topas, Helos, Elixir, New Stem, and Standard. Treatments included three nitrogen rates (0, 100 and, 200 kg N/ha) and two mulching (straw mulch and no mulch). Separate irrigated and dryland trials were conducted for biotypes Topas, Helos, Elixir, New Stem, and Standard. The crop was established in 2003 and harvested during the summer of 2004 and 2005. The dryland crop suffered severe winter-kill, consequently the dryland component of this trial had to be abandoned. Results of the 2005 growing season are described in this report.

The irrigated crop showed less winter-kill than the dryland crop. Two years after establishment, Elixir and Helos retained the highest stand, i.e. 59% and 60% respectively from the original stand (Table 60). Helos, Standard, and New Stem recorded 48%, 37%, and 36% survival respectively from the original stand. Nitrogen application increased the incidence of winter-kill in all cultivars of St. John's Wort.

Straw mulching had no effect on dry herb yields for all St. John's Wort cultivars except for Helos where mulching produced higher yield than no mulch (Table 61). Nitrogen fertilization depressed herb yield for all biotypes (Table 61).

Effect of Straw Mulch, Harvest Height and Cutting Frequency on Dry Herb Yield for St. John's Wort Cultivars Grown Under Irrigation and Dryland

Flowering tops of St. John's Wort are harvested for commercial use as the flowers and leaves are found to contain higher levels of hypericin. Plant growth characteristics and harvest height can affect yield and quality. Plant growth and flowering habit can be a function of many factors including genotype, population density, winter kill, and growing conditions. This study examines the effects of mulching, harvest height, and harvest frequency on dry herb yield for St. John's Wort biotypes grown under irrigation and dryland. St. John's Wort biotypes Topas, Helos, Elixir, New Stem and Standard were examined under irrigated and dryland production. Treatments included two cutting heights (Top-1/3, Top-2/3), two cutting frequencies (one cut, two cuts), and two mulching treatments (no mulch, straw mulch). Test plots were established in 2002 and 2003, i.e. the 2005 results indicate yield responses for a two-year and three-year crop.

The effects of cutting height (Top-1/3 or Top-2/3), cutting frequency (one or two cuts per year), and mulching (straw mulch or no mulch) on the incidence of winter-kill, and herb yields for the crop established in 2002 and 2003 under dryland and irrigation were evaluated this season. The crop survival percent and yield responses for the dryland crop established in 2002 are summarized in Table 62 and Table 63 respectively. The corresponding data for the irrigation crop are presented in Table 64 and Table 65 respectively. Due to poor growth, only one cut was possible during this season. Cutting frequency was not taken into consideration for the statistical analysis as only one cut was possible in 2005.

2002 Establishment:
The dryland crops of Helos and Topas were completely winter-killed while about 66% to 70% of Elixir, 65% to 78% of New Stem, and 57% to 66% of Standard survived the winter (Table 62). Crop survival was not affected by cutting height or mulching.

Under dryland, dry herb yields ranged from 3.4 to 3.8 t/ha for Elixir, 3.4 to 4.3 t/ha for New Stem, and 2.8 to 4.5 t/ha for Standard (Table 63). Lower cutting (i.e. Top-2/3 harvest) produced higher yields than the higher harvest height (i.e. Top-1/3) and the yield difference reached significant proportion for Elixir and Standard but not for New Stem.

Under irrigation, all cultivars survived and the degree of survival varied among cultivars. The survival percentage was 19% to 25% for Topas, 32% to 39% for Helos, 43% to 47% for Elixir, 56% to 67% for New Stem, and 35% to 43% for Standard (Table 64). Cutting height or mulching had no effect of crop survival for all the cultivars.

Under irrigation, dry herb yields ranged from 0.6 to 1.0 t/ha for Topas, 2.2 to 2.6 t/ha for Helos, 2.8 to 3.3 t/ha for Elixir, 3.6 to 5.0 t/ha for New Stem, and 4.0 to 4.7 t/ha for Standard (Table 65). Cutting height or mulching had no effect of crop survival for all the cultivars.

2003 Establishment:
The dryland crop established in 2003 was abandoned as more than 90% of the crop (all cultivars) was winter killed. The effects of cutting height, cutting frequency, and mulching on the incidence of winter-kill, and herb yields for the irrigated crop established in 2003 are summarized in Table 66 and Table 67 respectively. Cutting frequency was not taken into consideration for the statistical analysis as only one cut was possible in 2005.

Under irrigation, all cultivars survived and the degree of survival varied among cultivars. The survival percentage was 71% to 76% for Topas, 69% to 75% for Helos, 69% to 81% for Elixir, 84% for New Stem, and 58% to 68% for Standard (Table 66). Cutting height had no effect of crop survival for all the cultivars. Straw mulch increased survival for Elixir but had no effect on other cultivars.

Under irrigation, dry herb yields ranged from 2.1 to 3.8 t/ha for Topas, 2.2 to 4.0 t/ha for Helos, 1.7 to 3.2 t/ha for Elixir, 2.0 to 2.9 t/ha for New Stem, and 2.0 to 3.4 t/ha for Standard (Table 67). Lower cutting height produced significantly higher yields for all cultivars. Straw mulch produced higher herb yields for Elixir relative to no mulch. Straw mulch had no effect on other cultivars.

Table 60. Effects of mulching and nitrogen application on crop survival for St. John's Wort biotypes under irrigated production: 2005.					
Treatment	Percentage of original plant stand (%)				
	Standard	New Stem	Elixir	Topas	Helos
Mulching:					
No mulch	37.5	33.3	55.2	57.3	44.4
Straw mulch	36.8	38.5	63.2	61.8	52.4
Nitrogen rate (kg N/ha):					
0	60.4	51	76.6	78.1	69.8
100	30.7	35.9	56.3	60.4	47.4
200	20.3	20.8	44.8	40.1	28.1
Analyses of variance					
Source:					
Mulch	ns	ns	ns	ns	ns
Nitrogen	***(14.0)	**(17.0)	**(17.9)	**(18.5)	***(14.8)
Mulch x Nitrogen	ns	ns	ns	ns	ns
CV (%)	35.5	44.5	28.4	29.2	28.7

, *, and ns indicate significance at P<0.01, <0.001 levels of probability and not significant respectively. Values within parentheses indicate significance at 5.0% level of probability.

Table 61. Effects of mulching and nitrogen application on herbage yield for St. John's Wort biotypes under irrigated production: 2003 planting and 2005 harvest.					
Treatment	Dry herb yield (t/ha)				
	Standard	New Stem	Elixir	Topas	Helos
Mulching:					
No mulch	2.16	3.35	3.02	3.19	3.36
Straw mulch	2.48	3.36	3.8	3.05	4.86
Nitrogen rate (kg N/ha):					
0	3.83	4.58	4.3	3.93	5.1
100	1.86	3.68	3.38	3.31	4.47
200	1.26	1.81	2.54	2.13	2.76
Analyses of variance					
Source:					
Mulch	ns	ns	ns	ns	**(1.14)
Nitrogen	***(0.98)	***(1.17)	*(1.40)	*(1.46)	**(1.40)
Mulch x Nitrogen	ns	ns	ns	ns	ns
CV (%)	39.7	32.64	38.7	44.0	31.9

*, **, ***, and ns indicate significance at P<0.05, <0.01, <0.001 levels of probability and not significant respectively. Values within parentheses indicate significance at 5.0% level of probability.

Table 62. Effects of cutting height and mulching on crop survival for St. John's Wort cultivars grown under dryland: 2002 planting and 2005 harvest.					
Treatment	Crop survival (Percentage of the original plant stand)				
	Topas	Helos	Elixir	New Stem	Standard
Cutting height:					
Top-1/3			71.1	71.4	62
Top-2/3	Total	Total	69.5	70.8	61.5
Mulching:	winter	winter			
No mulch	kill	kill	66.2	64.1	57.3
Straw mulch			74.5	78.1	66.2
Analyses of variance					
Source:					
Cutting height			ns	ns	ns
Mulching			ns	ns	ns
Cutting height x Mulching	-	-	ns	ns	ns
CV (%)			20.3	32.2	31.2
ns indicates non-significant treatment effects.					

Table 63. Effects of cutting height and mulching on herbage yield for St. John's Wort cultivars grown under dryland: 2002 planting and 2005 harvest.

Treatment	Dry herb yield (t/ha)				
	Topas	Helos	Elixir	New Stem	Standard
Cutting height:					
Top-1/3			3.11	3.37	2.8
Top-2/3	Total	Total	3.8	4.33	4.48
Mulching:	winter	winter			
No mulch	kill	kill	3.39	3.6	3.31
Straw mulch			3.51	4.09	3.98
Analyses of variance					
Source:					
Cutting height			*	ns	**
Mulching			ns	ns	ns
Cutting height x Mulching			ns	ns	ns
CV (%)			27.6	38.4	36.7

*, ** and ns indicate significance at P<0.05, 0.01 levels of probability and not significant respectively.

Table 64. Effects of cutting height and mulching on crop survival for St. John's Wort cultivars grown under irrigation: 2002 planting and 2005 harvest.					
Treatment	Crop survival (Percentage of the original plant stand)				
	Topas	Helos	Elixir	New Stem	Standard
Cutting height:					
Top-1/3	24	38.5	46.6	66.7	35.4
Top-2/3	19.3	31.5	44	55.7	43
Mulching:					
No mulch	18.5	36.2	47.9	63..0	38.5
Straw mulch	24.7	33.9	42.7	59.4	39.8
Analyses of variance					
Source:					
Cutting height	ns	ns	ns	ns	ns
Mulching	ns	ns	ns	ns	ns
Cutting height x Mulching	ns	ns	ns	ns	ns
CV (%)	69.0	47.3	30.0	23.8	27.4
ns indicates non-significant treatment effects.					

Table 65. Effects of cutting height and mulching on herbage yield for St. John's Wort cultivars grown under irrigation: 2002 planting and 2005 harvest.					
Treatment	Dry herb yield (t/ha)				
	Topas	Helos	Elixir	New Stem	Standard
Cutting height:					
Top-1/3	0.61	2.34	2.79	4.41	4
Top-2/3	0.95	2.43	3.29	4.16	4.67
Mulching:					
No mulch	0.79	2.58	3.22	3.62	4.29
Straw mulch	0.77	2.19	2.86	4.95	4.38
Analyses of variance					
Source:					
Cutting height	ns	ns	ns	ns	ns
Mulching	ns	ns	ns	ns	ns
Cutting height x Mulching	ns	ns	ns	ns	ns
CV (%)	65.13	54.6	25.0	61.5	28.6

ns indicates non-significant treatment effects.

Table 66. Effects of cutting height and mulching on crop survival for St. John's Wort cultivars grown under irrigation: 2003 planting and 2005 harvest.

Treatment	Percentage of original stand (%)				
	Topas	Helos	Elixir	New Stem	Standard
Cutting height:					
Top-1/3	72.4	71.6	72.6	84.4	66.9
Top-2/3	74.5	72.1	76.8	83.8	58.6
Mulching:					
No mulch	75.5	69	68.5	84.1	58.1
Straw mulch	71.4	74.7	81	84.1	67.5
Analyses of variance					
Source:					
Cutting height	ns	ns	ns	ns	ns
Mulching	ns	ns	*	ns	ns
Cutting height x Mulching	ns	ns	ns	ns	ns
CV (%)	17.6	26.2	22.4	13.3	32.3

* and ns indicate significance at P<0.05 level of probability and not significant respectively.

Table 67. Effects of cutting height and mulching on herbage yield for St. John's Wort cultivars grown under irrigation: 2003 planting and 2005 harvest.					
Treatment	Dry herb yield (t/ha)				
	Topas	Helos	Elixir	New Stem	Standard
Cutting height:					
Top-1/3	2.11	2.15	1.71	2.02	1.98
Top-2/3	3.81	3.99	3.22	2.9	3.37
Mulching:					
No mulch	2.93	2.97	1.98	2.13	2.57
Straw mulch	2.99	3.18	2.95	2.79	2.67
Analyses of variance					
Source:					
Cutting height	***	***	***	*	**
Mulching	ns	ns	***	ns	ns
Cutting height x Mulching	ns	ns	ns	ns	ns
CV (%)	30.4	33.2	30.6	40.1	40.6

*, **, *** and ns indicate significance at P<0.05, 0.01, 0.001 levels of probability and not significant respectively.

Milk Thistle Agronomy

Milk thistle (*Silybum marianum*) has been used since Greco-Roman times as a herbal remedy for a variety of ailments, particularly for liver problems. It is believed that the active ingredient in milk thistle (silymarin) protects the liver from damage caused by viruses, toxins, alcohol, etc.

Milk thistle is native to the Mediterranean, but is now widespread throughout the world. This stout thistle usually grows in dry, sunny areas. The stem branches at the top, and reaches a height of about 1.5 to 4 m. The leaves are spiny and wide, with white blotches or veins. The flowers are red-purple. The small, hard-skinned seed is brown, spotted, and shiny. Milk thistle is an easy to grow annual plant. It has an indeterminate growth and flowering habit, resulting in uneven development and maturity of flower heads.

Saskatchewan's relatively short growing season combined with uneven maturity of milk thistle is a major challenge for production and particularly once-over machine harvesting. The crop has to be desiccated to facilitate mechanical harvest. Reglone can be used successfully to desiccate milk thistle. However, the demand for organic milk thistle necessitates organic desiccants for top-kill. This project is designed to develop cost-effective agronomic practices for large scale mechanized production of milk thistle under Saskatchewan growing conditions utilizing Reglone as a conventional desiccant and vinegar as an organic desiccant. The objectives of this project include:

- Seeding rate and row spacing effects on yield and quality.
- Seeding date effects on growth characteristics and productivity.
- Nitrogen and phosphorus effects on productivity.
- Effectiveness of vinegar as a desiccant for machine harvest.

Studies were conducted at CSIDC. The soil characteristics at the test site are summarized in Table 68. Two desiccants, Reglone (2.7 l/ha @ 1000 l water/ha) and vinegar (14% acetic acid at 1000 l/ha) were sprayed for desiccation during the appropriate stages based on the trials. Field trials were seeded on May 13, 2005, desiccated appropriately according to test protocols, and harvested on September 19/20, 2005. The crop grew vigorously with the potential for a successful harvest. Heavy rain just prior to the harvest date caused considerable shattering that resulted in poor seed yields. As such, results of these studies should be viewed with caution.

Seeding rate and row spacing effects on yield for milk thistle desiccated with vinegar

Six seeding rates (25, 50, 75,100, 125, 150 seeds / m^2) and two row spacings (20, 60 cm) were evaluated. The crop was desiccated with Reglone on September 1, 2005 when 50%-60% of heads were mature.

Seeding rates and row spacing had no effect on seed yield (Table 69). Seed yields ranged between 318 kg/ha and 387 kg/ha for the various seeding rates tested. No identifiable trends were found for seeding rates on seed yield.

The two row spacings tested, i.e. 20 cm and 60 cm produced similar seed yields (Table 69). Although non-significant 20 cm spacing produced slightly higher yield than 60 cm spacing.

Table 68: Spring soil analyses (0-30 cm depth) at test site: 2005.	
Soil texture	Clay loam
Soil pH	8.3
E.C: 1S:2W (mS/cm)	0.3
E.C. Sat. Extract (mS/cm)	0.7
Salinity:	Non-saline
NO_3-N:	26
P (kg/ha)	>108
K (kg/ha)	511
SO_4-S (kg/ha)	>86

Effects of nitrogen, phosphorus on yield and quality of milk thistle when desiccated with vinegar and Reglone at two maturity stages

Three levels of pre-plant nitrogen (0, 50, 100 kg N/ha) and three levels of phosphorus (0, 60, 120 kg P_2O_5/ha) were examined in this study. Four similar trials were conducted to evaluate the combination of the two desiccants (vinegar and Reglone) and two stages of desiccation (30% and 60% maturity). First desiccation (30% maturity) was carried out on August 27, 2005 and the second desiccation (60% maturity) on September 1, 2005 for both vinegar and Reglone.

The yield response to rates of nitrogen and phosphorus application in combination with the type of desiccant (vinegar, Reglone) and desiccation timing (30% and 60% maturity of flower head) is summarized in Table 70.

Nitrogen application in a few instances tended to produce slightly higher yields than the no nitrogen control (Table 70). Phosphorus application rate had no effect on seed yield.

Comparison of Vinegar and Reglone as Desiccants and Timing of Desiccation:

Sufficient dry down occurred with one application of Reglone. Vinegar was not an effective means of top-kill. Even after two applications, the dry-down was insufficient for proper machine harvesting.

Desiccation with vinegar resulted in 15% higher seed yield than desiccation with Reglone. This is likely due to greater shattering loss in the drier Reglone treated crop as a result of the untimely pre-harvest rainfall compared to the greener crop desiccated with vinegar.

When desiccated with Reglone, delaying desiccation resulted in 26% lower yield. The yield loss is likely due to greater loss of mature seed after that untimely rain. With vinegar desiccation, late desiccation out yielded early desiccation by 20% in 2005.

Fall Seeding:

Fall seeding was attempted for milk thistle with the objective of achieving early crop establishment. A seeding rate x row spacing study similar to the spring test was seeded on October 21, 2005. Treatments included six seeding rates (25, 50, 75,100, 125, 150 seeds/m^2) and two row spacings (20, 60 cm). Stand establishment and yield potentials will be evaluated in the 2006 growing season.

Table 69. Seeding rate and row spacing effects on seed yield for milk thistle.

Treatment	Seed yield (kg/ha)
Seeding rate:	
25 seeds/m^2	387
50 seeds/m^2	447
75 seeds/m^2	370
100 seeds/m^2	364
125 seeds/m^2	417
150 seeds/m^2	318
Row spacing:	
20 cm	416
60 cm	352
Analyses of variance	
Source:	
Seeding rate (R)	ns
Row spacing (S)	ns
R x S	ns
CV (%)	38.6

ns indicates non-significant treatment effects.

Table 70. Nitrogen and phosphorus rate effects on milk thistle seed yield when desiccated with vinegar and Reglone at two different stages: 2005.

Treatment	Method of desiccation			
	Vinegar		Reglone	
	30% Mature	60% Mature	30% Mature	60% Mature
Nitrogen (kg N/ha):	--- Tuber Yield (t/ha) ---			
0	281	364	316	212
50	304	328	317	212
100	281	353	324	288
Phosphorus (kg P_2O_5/ha):				
0	294	397	358	248
60	281	350	301	237
120	291	298	297	227
Analyses of variance				
Source:				
Nitrogen (N)	ns	***(132)	ns	ns
Phosphorus (P)	ns	ns	ns	ns
N x P	ns	ns	ns	ns
CV (%)	21.1	32.8	20.7	48.6

*** and ns indicate significance P<0.001 level of probability and not significant respectively. Values within parentheses are LSD estimates at 5.0% level of probability.

Cole Crop and Celery Production Demonstrations

Principal: Barry Vestre, CSIDC, Outlook

Cole Crop Demonstration

The cole crop demonstration was conducted on Field 2 with Lennox and Bravo cabbage as the main crops. Small observational plots of Arcadia broccoli, Freedom cauliflower, and Jade Cross Brussels sprouts were also grown. The crops were planted in the greenhouse on April 28 in 162 seedling flats. Fields were cultivated, disced, roto-tilled, and fertilized with nitrogen, phosphorus, and potassium (110 kg/ha each). The crops were transplanted into the field on May 20th with a water wheel transplanter. Row and plant spacings were 60 cm and 45 cm respectively. Weed control consisted of a pre-plant incorporated application of Trifluralin, a post-emergent application of Poast, and hand roguing. Insect control consisted of a soil drench application of Lorsban to control root maggots, and alternating applications of Decis and Sevin for the control of flea beetles and cabbage butterflies. Irrigation was applied with a solar powered center pivot irrigation system.

Harvest of Bravo cabbage began in late August and continued into early September. Harvest of Lennox, a late maturing cultivar, began in early September and continued into early October. The cabbage was stored for a short period, packed, and marketed as fresh cabbage. Harvest of the broccoli and cauliflower began in late July and continued into early August. The Brussels sprouts were harvested in late September to early October.

Cole crops are cool season crops and in the cooler and wetter than normal summer of 2005, yield and quality was high. Yields of cabbage were 75,868 kg/ha and 45,928 kg/ha for Bravo and Lennox respectively. Typically Lennox would out yield Bravo, but harvest of the Lennox occurred before the heads had reached their full size. Both cabbage varieties were sold into the fresh market. Prices received for the cabbage ranged from a low of $.33/kg to a high of $.65/kg depending on the time of sale and type of market. This translates into gross returns of $37,000.00/ha for Bravo and $18,000.00/ha for Lennox. This large difference in returns is attributed to the yield difference and the fact that the Bravo was marketed earlier than the Lennox when prices were higher. Previous work estimated production costs for cabbage at $17,500.00/ha. This would result in net returns of $19,500.00 for Bravo and $500.00/ha for Lennox.

The observational crops of broccoli, cauliflower, and Brussels sprouts performed well. Due to low volume and special packaging requirements, the produce was not weighed and marketed.

Celery Crop Demonstration

The celery crop demonstration was conducted in Field 2. Utah 52-70 celery was planted in the greenhouse on April 14th in 72 seedling flats. Field soil preparation and fertilization was identical to the cole crop demonstration. The celery plants were transplanted in the field on June 6th with a water wheel transplanter. Row and plant spacings were 60 cm and 30 cm respectively. Weed control consisted of a post-emergent application of Linuron and hand roguing. Foliar applications of

Calcium nitrate were applied on July 18th, 25th, and August 5th at a rate of 2.3 kg/ha. No insect control was required. Irrigation was applied with a solar powered center pivot irrigation system.

Harvest of the celery began on September 7th and continued into early October. The celery was stored for a short period, packed, and marketed to local wholesalers. Results from the celery production demonstration were mixed. Total yield was 1500 cases/ha, but marketable yield was 910 cases/ha (one case equals 24 celery hearts). Black Heart, a disease that affects quality of celery, was quite prominent resulting in 40% of the crop being unmarketable. Black heart is caused by a combination of calcium deficiency and local growing conditions. Foliar applications of calcium nitrate were applied in an attempt to minimize black heart incidence, but were not effective.

The price received for the marketable celery ranged from $14.00/case to $47.00/case. The average price received was $15.00/case. A few cases were packed as "single" stalk celery commanding a premium price as compared to the standard pack of 24 hearts. Gross return for the demonstration was $16,000.00/ha. Previous work projects cost of production for celery at $20,000/ha resulting in an estimated loss of $4000/ha. This loss can be attributed to reduced marketable yield due to the black heart incidence.

High Tunnel Production Demonstrations

Principals: Barry Vestre and Jazeem Wahab, CSIDC, Outlook

In 2005, the Canada-Saskatchewan Irrigation Diversification Centre conducted two demonstrations utilizing a "season extension" technology commonly referred to as high tunnels. They are essentially plastic covered greenhouses constructed in the field with no artificial heating or ventilation. Ventilation is provided by rolling up the sides of the high tunnel. They have the ability to significantly increase the Growing Degree Days available to a crop as compared to outside conditions. This technology is used for the production of warm season crops such as peppers and melons that normally cannot be grown in Saskatchewan's short growing season.

The high tunnel demonstrations included a pepper type and variety demonstration, and a melon type demonstration. The pepper demonstration consisted of six sweet and six hot pepper cultivars. The melon demonstration consisted of one cantaloupe, two honeydew, and two watermelon cultivars.

Pepper Variety Demonstration

The pepper variety demonstration was conducted in high tunnel #3. The six hot pepper cultivars were Chili Grande, Fogo, Golden Cayenne, Habanero, Jalapeno, and Explosive Ember. The six sweet cultivars were Whopper Improved, Key West, Tequila, Sweet Spot, Orange Sun, and Blushing Beauty. The peppers were seeded on April 12th and 13th in 72 square seedling flats and placed in the greenhouse. The seed bed was prepared, and four lengths of evenly spaced black plastic mulch were laid down the six metre wide tunnel. The peppers were transplanted on May 20th in a randomized design with four replications. Row spacing was 18 cm and plant spacing was 15 cm for each variety. The peppers were fertigated on July 6th and 11th with 20-20-20 water

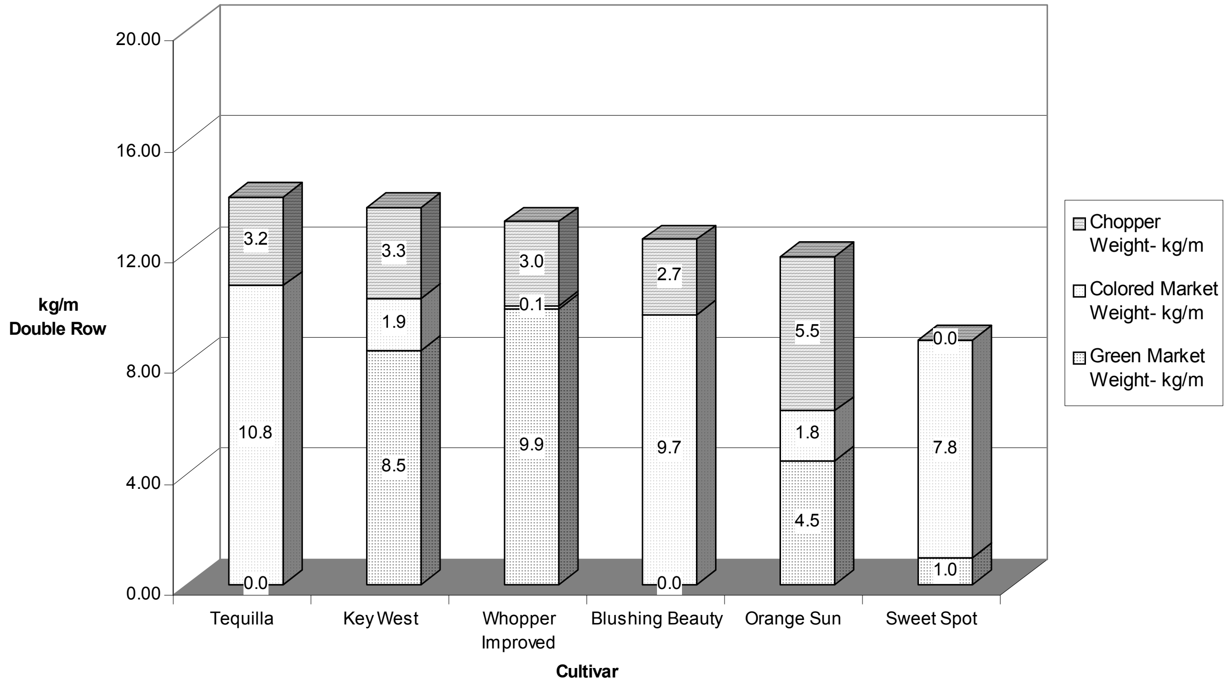


Figure 6. Market Class Yields of Sweet Peppers Inside High Tunnel 2005

soluble fertilizer, each applying 35 kg/ha equivalent of Nitrogen, Phosphorus, and Potassium. Irrigation was provided using trickle tape under the plastic mulch.

Maturity differences within the cultivars resulted in two harvests. Tequila, Blushing Beauty, and Sweet Spot were harvested on August 31st. The remaining cultivars were harvested on September 15th. The peppers were graded and the count and weight of each market class or grade was recorded.

The overall yield of the sweet cultivars were similar with Sweet Spot being significantly lower than the others (Figure 6). There were significant differences in marketable green and marketable colored peppers. Tequila (10.78 kg/m double row) and Blushing Beauty (9.71kg/m double row) were significantly higher yielding than the other four varieties (Figure 6). This is significant because the price of red or colored market peppers tends to be much higher than that of green market peppers. Therefore, the cultivars with the highest percentage of colored market fruit such as Tequila and Blushing Beauty, also had the highest gross return per double row (Table 71). Based on a typical 29m x 6m (96 feet x 20 feet) high tunnel with four mulch rows (116 meters of double row), the net economic returns ranged from just over $200.00 for Whopper Improved to $4000.00 for Tequila (Table 71a).

Yield of the hot cultivars varied, with Chili Grande, Fogo, and Jalapeno significantly higher yielding than Golden Cayenne and Explosive Ember (Figure 7). There were no Habanero peppers harvested. As with the sweet cultivars, there were significant differences in green and colored peppers. Chili Grande and Golden Cayenne colored yields were significantly higher than the other four cultivars (Figure 7). Again this is significant as colored peppers demand higher prices than green. Therefore, the cultivars with the highest percentage of colored fruit such as Chili Grande had the highest gross return per double row (Table 72). Unfortunately, total yields of hot peppers, whether colored or green, are not enough to cover costs. Although the total number of hot peppers was reasonable, they are smaller in size and weigh much less than sweet peppers. Based on a typical 29m x 6m (96 feet x 20 feet) tunnel with four mulch rows (116 meters of double row) the net economic losses ranged from -$322.00 for Chili Grande to $-2000.00 for Habanero (Table 71a).

Variety choice is critical for consistent and successful high tunnel sweet pepper production. A warmer than normal summer may result in all varieties maturing to their final color, but to consistently maximize economic potential early maturing cultivars are essential. The price difference between mature green and mature colored peppers, whether it be red, orange, purple, etc., is large and therefore has a major impact on the net economic potential. The cost of producing a colored pepper inside a high tunnel as compared to a green does not change so the goal will be to always produce colored peppers.

Marketing is also critical. Prices used in this study are wholesale prices. Returns may be much higher if alternate marketing techniques are used such as farm gate sales or farmer's markets.

Hot pepper production in high tunnels does not look promising. Despite a reasonable pepper count and the maturing of some varieties to a colored pepper, they weigh little and hence the returns are negative. Even with increased management and marketing, it still may be very difficult to realize returns that would compare to the sweet peppers.

Table 71. Gross returns per metre double row for sweet peppers grown in high tunnel.

Cultivar	Green Market Weight kg/m	Wholesale Price $/kg	Colored Market Weight kg/m	Wholesale Price $/kg	Chopper Weight kg/m	Wholesale Price $/kg	Total $/m
Tequilla	0	$1.65	10.8	$4.73	3.2	$1.00	$54.18
Blushing Beauty	0	$1.65	9.7	$4.73	2.7	$1.00	$48.67
Sweet Spot	1.0	$1.65	7.8	$4.73	0	$1.00	$38.72
Key West	8.5	$1.65	1.9	$4.73	3.3	$1.00	$26.12
Orange Sun	4.5	$1.65	1.8	$4.73	5.5	$1.00	$21.49
Whopper Improved	9.9	$1.65	0.1	$4.73	3	$1.00	$19.91

Table 71a. Economic analysis for sweet pepper varieties grown in a 29 m x 6 m (96' x 20') high tunnel.

	Cultivar					
	Tequilla	Blushing Beauty	Sweet Spot	Key West	Orange Sun	Whopper Improved
Revenue $/m	$54.18	$48.67	$38.72	$26.12	$21.49	$19.91
Total Meters	116	116	116	116	116	116
Total Revenue	$6,285	$5,646	$4,491	$3,030	$2,493	$2,310
Total Costs	$2,075	$2,075	$2,075	$2,075	$2,075	$2,075
Net Economic Return	**$4,210**	**$3,571**	**$2,416**	**$955**	**$418**	**$235**

Table 72. Gross returns per metre for hot peppers grown in high tunnel.							
Cultivar	Green Market Weight kg/m	Wholesale Price $/kg	Colored Market Weight kg/m	Wholesale Price $/kg	Chopper Weight kg/m	Wholesale Price $/kg	Total $/m
Chili Grande	4.3	$1.65	3.2	$2.50	0.0	$1.00	$15.12
Fogo	6.4	$1.65	0.0	$2.50	0	$1.00	$10.64
Golden Cayenne	2.8	$1.65	2.2	$2.50	0.0	$1.00	$10.05
Jalapeno	2.8	$1.65	0.1	$2.50	2.5	$1.00	$7.39
Explosive Ember	1.3	$1.65	0.0	$2.50	0.0	$1.00	$2.10
Habanero	0.0	$1.65	0.0	$2.50	0.0	$1.00	$0.00

Table 72a. Economic analysis for hot pepper varieties grown in a 29 m x 6 m (96' x 20') high tunnel.						
	Cultivar					
	Chili Grande	Fogo	Golden Cayenne	Jalapeno	Explosive Ember	Habanero
Revenue $/m	$15.12	$10.64	$10.05	$7.39	$2.10	$0.00
Total Meters	116	116	116	116	116	116
Total Revenue	$1,753	$1,234	$1,166	$857	$243	$0
Total Costs	$2,075	$2,075	$2,075	$2,075	$2,075	$2,075
Net Economic Return	**-$322**	**-$841**	**-$909**	**-$1,218**	**-$1,832**	**-$2,075**

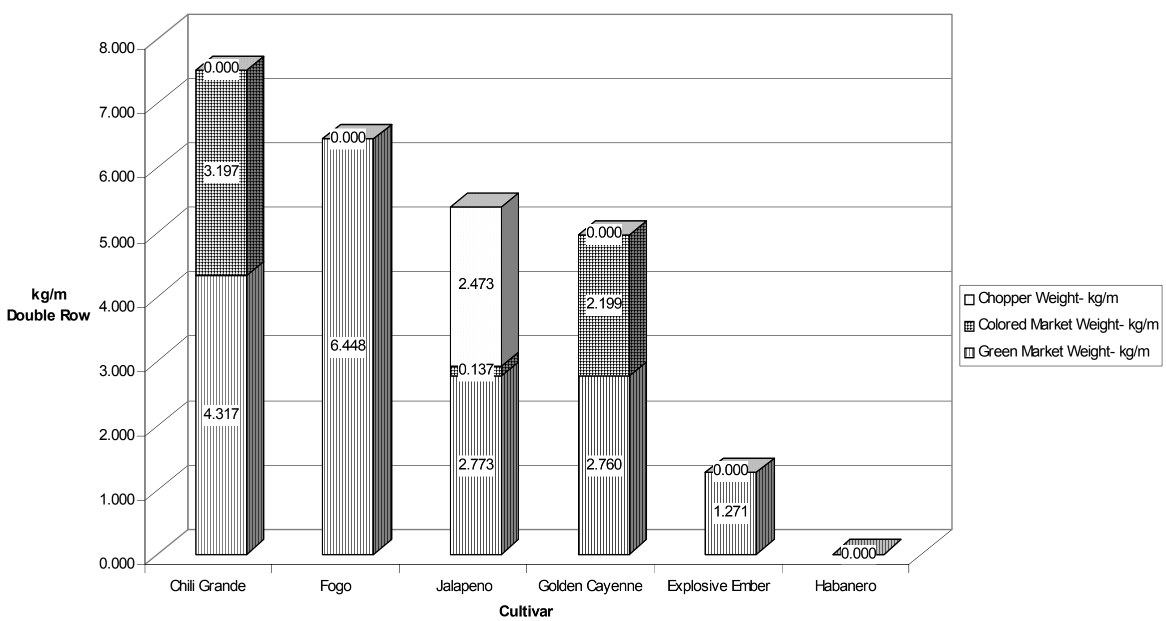


Figure 7. Market Class Yields of Hot Peppers Inside High Tunnel 2005

Melon Variety Demonstration

The melon variety demonstration was conducted in high tunnels #1 (4 m x 29 m) and #2 (6 m x 29 m). Constitution and Solid Gold watermelons were grown in tunnel #1. Earligold cantaloupe, and Earlidew and Honey-I-Dew honeydews were grown in tunnel #2. The seed bed was prepared and 2 and 4 lengths of evenly spaced black plastic mulch were laid down both tunnel #1 and tunnel #2. Soil tests indicated no fertilization was required. The melons were direct seeded on May 17th through the plastic mulch. Rows were 6 m long with a row spacing of 18 cm and a plant spacing of 60 cm. The individual area planted of each cultivar was 37 m². Irrigation was provided using trickle tape under the plastic mulch. One hive of honey bees was placed in tunnel #2 in mid-June for pollination.

Harvest of mature honeydew melons began on August 23rd, mature cantaloupe on August 30th, and the watermelons on October 3rd. Harvest continued every two to three days with the last fruit being picked on October 3rd. The harvested melons were counted and weighed, and sugar content was measured on a sub-sample of melons.

Yields of honeydews were similar, with Earlidew and Honey-I-Dew producing total counts of 80 and 69 mature melons respectively. Earligold cantaloupe yield was lower with a total count of 49 mature melons (Table 73). This translates into 2.2, 1.9, and 1.3 melons/m^2 for Earlidew, Honey-I-Dew, and Earligold respectively. Sugar contents ranged from 10 to 14 percent for both the honeydews and the cantaloupe. This level of sugar in the fruit results in a sweeter and tastier melon as compared to imported melons that typically have a sugar content of less than 10%.

The prices used for this demonstration were wholesale prices of approximately $2.00/melon. At this price, gross returns were $2.65, $4.32, and $3.73 per m² for Earligold, Earlidew, and Honey-I-Dew respectively. On a standard 6m x 29m high tunnel, the gross revenues were $471.46, $769.73, and $663.89 respectively. The cost of production for melons produced in high tunnels are $1715.00 for a standard tunnel resulting in net losses of $1254.00, $963.00, and $1066.00 for Earligold, Earlidew, and Honey-I-Dew respectively.

There were 19 Constitution watermelons harvested. They had not matured and were not marketable. No Solid Gold watermelons were harvested.

Significant economic losses were incurred for all melon cultivars in 2005. Plant growth was abundant but this did not translate into fruit production. Agronomic factors such as soil fertility, temperature control, and cultivar choice need to be addressed in order to maximize fruit set and to make melon production inside high tunnels viable.

Table 73. Melon count and gross return in the high tunnels 2005.			
	Cultivar		
	Earligold Cantaloupe	Earlidew Honey Dew	Honey-I-Dew Honey Dew
Number Harvested	49	80	69
Price/melon	$2.00	$2.00	$2.00
Gross Return	$98.00	$160.00	$138.00
Area- (m^2)	37	37	37
Gross Return ($/$m^2$)	$2.65	$4.32	$3.73
Gross Return/Tunnel (178m^2)	**$471.46**	**$769.73**	**$663.89**

Table 74. Economic analysis for melon production in a 29 m x 6 m (96' x 20') high tunnel.				
		Earligold	Earlidew	Honey-I-Dew
Revenue	$/$m^2$	$2.65	$4.32	$3.73
	Total m^2	174	174	174
	Total Revenue	$461	$752	$649
Expenses				
	High Tunnel ($7000/20yrs)	$350		
	Fertilizer & Chemical	$50		
	Mulch and Drip Tape	$25		
	Seed and Transplants	$20		
	Tillage	$50		
	Labour	-		
	Soil Prep	$100		
	Seeding and Planting	$20		
	Weeding	$100		
	Harvesting and Packing	$300		
	Bees/Miscellaneous	$200		
	Marketing	$400		
	Packaging	$100		
	Total Expenses	$1,715	$1,715	$1,715
	Net Return	**-$1,254**	**-$963**	**-$1,066**

Pumpkin Irrigation Scheduling Demonstration

Funded by the Agri-Food Innovation Fund and Agriculture and Agri-Food Canada.

Principal: Terry Hogg, CSIDC, Outlook
Co-investigators: Jazeem Wahab, Don David, Barry Vestre and Laurie Tollefson, CSIDC, Outlook

A pumpkin irrigation scheduling trial was established in the spring of 2005 at CSIDC. The soil at the site is classified as Bradwell loam to silty loam. The site received a broadcast application of phosphorus applied as 12-51-0 at a rate of 100 kg P_2O_5/ha and potassium applied as 0-0-60 at a rate of 100 kg K_2O/ha. The fertilizer was incorporated to a depth of 8 cm.

Infrared Transmissible (IRT) plastic mulch and T-Tape (TSX 506-08-670) trickle irrigation tape (20 cm emitter spacing) were applied in a single operation in strips 135 m in length and on three m centers using a commercial mulch/trickle tape applicator. To make most efficient use of the mulch, pumpkin was seeded in a double row configuration along the outer edges with the drip tape running between the two rows and below the plastic mulch. Pumpkin (cv Spirit) was hand seeded (two seeds/hill) through the plastic mulch at a 0.9 m in-row spacing and 0.6 m between row spacing on each mulch strip. Areas with poor plant emergence were re-planted using pumpkin transplants in order to maintain a uniform plant stand.

Soil moisture monitoring was conducted with a neutron moisture meter at four locations (subsamples) in each pumpkin water treatment strip (Figure 8). Aluminum neutron access tubes were installed to a depth of 120 cm and readings conducted at 15 cm intervals except for the 0-15 cm interval. The moisture content of the 0-15 cm interval was measured by the time domain reflectometry technique using a TDR 300 soil moisture meter. Soil moisture was measured at the time of installation, just after seeding, at varying intervals throughout the growing season and at harvest.

Total water use for any given time period was calculated by adding rainfall for the time period, irrigation for the time period and the difference between the soil profile (0-120 cm) water content at the beginning and the end of the time period (profile moisture change). Total water use over the growing season (seeding to harvest) was calculated by summing the water use for each individual time period.

At harvest, yield estimates were obtained by weighing each individual pumpkin from an area 10 m x 2 rows centered on each neutron access tube.

Analysis of variance with subsamples was used to determine the significance of differences among the water treatments for total water use, yield, pumpkin number and mean pumpkin weight.

Results

The average overall water application rate was 1.236 l/hr/emitter when operating at a system pressure of approximately 8 psi. This flow rate was used to calculate the quantity of water applied at each irrigation time.

Field capacity (100% available water (A.W.) for the 0-30 cm depth ranged from 0.1834 to 0.3173 g/g with a mean value of 0.2278 g/g, while permanent wilting point (0% A.W.) for the 0-30 cm depth ranged from 0.0754 to 0.0894 g/g with a mean value of 0.0801 g/g. Using these values, the estimated water potential for Water Treatment 1 (85% A.W.) and Water Treatment 2 (70% A.W.) were determined to be 21 cb and 36 cb respectively. In order to maintain soil available water above these levels, irrigation was initiated to maintain the soil water potential as indicated by the tensiometers at the 30 cm depth in the range of or below 10-20 cb for Water Treatment 1 (85% A.W.) and in the range of or below 30-40 cb for Water Treatment 2 (70% A.W.).

Tensiometer readings for the two water application treatments indicated that the soil moisture tension was maintained below the targeted levels throughout the growing season (Figures 9a and 9b). Deep tensiometer readings also indicated that the soil moisture tension was maintained within the targeted levels lower in the rooting zone and that the proper quantity of irrigation water was applied.

The timing and quantity of irrigation water applied to the pumpkin varied for the two water treatments. Water Treatment 1 received a total of 45 mm irrigation water while Water Treatment 2 received 8 mm of irrigation water. In addition, all plots received 226 mm of precipitation from plant emergence to harvest. Limited irrigation water was required to maintain the soil water tension within the targeted levels due to the higher than normal precipitation and below normal temperatures during the growing season. This resulted in conditions of lower than normal potential evapotranspiration (data not shown).

Total water use at the various time intervals throughout the growing season indicated that in most cases water use was of the order Water Treatment 1 > Water Treatment 2 > Dryland Treatment. Cumulative water use throughout the growing season followed the same trend (Figure 10). Water Treatment 1 used significantly more water than Water Treatment 2 and the Dryland Treatment. There was no significant difference in water use between Water Treatment 2 and the Dryland Treatment (Table 75). Overall water use was similar to 2004 and lower than in 2002 and 2003 due to the cooler than normal growing conditions.

Pumpkin yield was high and showed no relationship to the quantity of water applied (Table 75). Yields were 26.95 kg/m double row, 27.11 kg/m double row and 25.35 kg/m double row for Water Treatment 1, Water Treatment 2 and the Dryland Treatment respectively.

There were no significant yield differences due to the water treatments. The number of pumpkins produced per unit area, the mean pumpkin weight and the fruit size distribution also showed no significant differences among the water treatments. A greater percentage of pumpkins were in the 5 - 10 kg weight class than the < 5 kg weight class (Figure 11). More than 20% of the pumpkins produced were in the > 10 kg weight class. The lack of yield response to the addition of irrigation water was probably due to the cool growing conditions. The high number and large size of the pumpkins produced resulted in high yield. However, the majority of pumpkins that were produced did not mature but remained green late into the growing season. As a result, the high yield would be considered a potential yield rather than a marketable yield. The low amount of mature fruit produced was probably due to a combination of the cool and wet growing season.

Pumpkin yield showed no response to water use. As a result, water use efficiency (kg pumpkin produced/mm water use) showed little response to the different water application treatments (Figure 12).

It is clear from these results that adequate heat is required for optimum pumpkin production. Without adequate heat there will be no response to irrigation water applications.

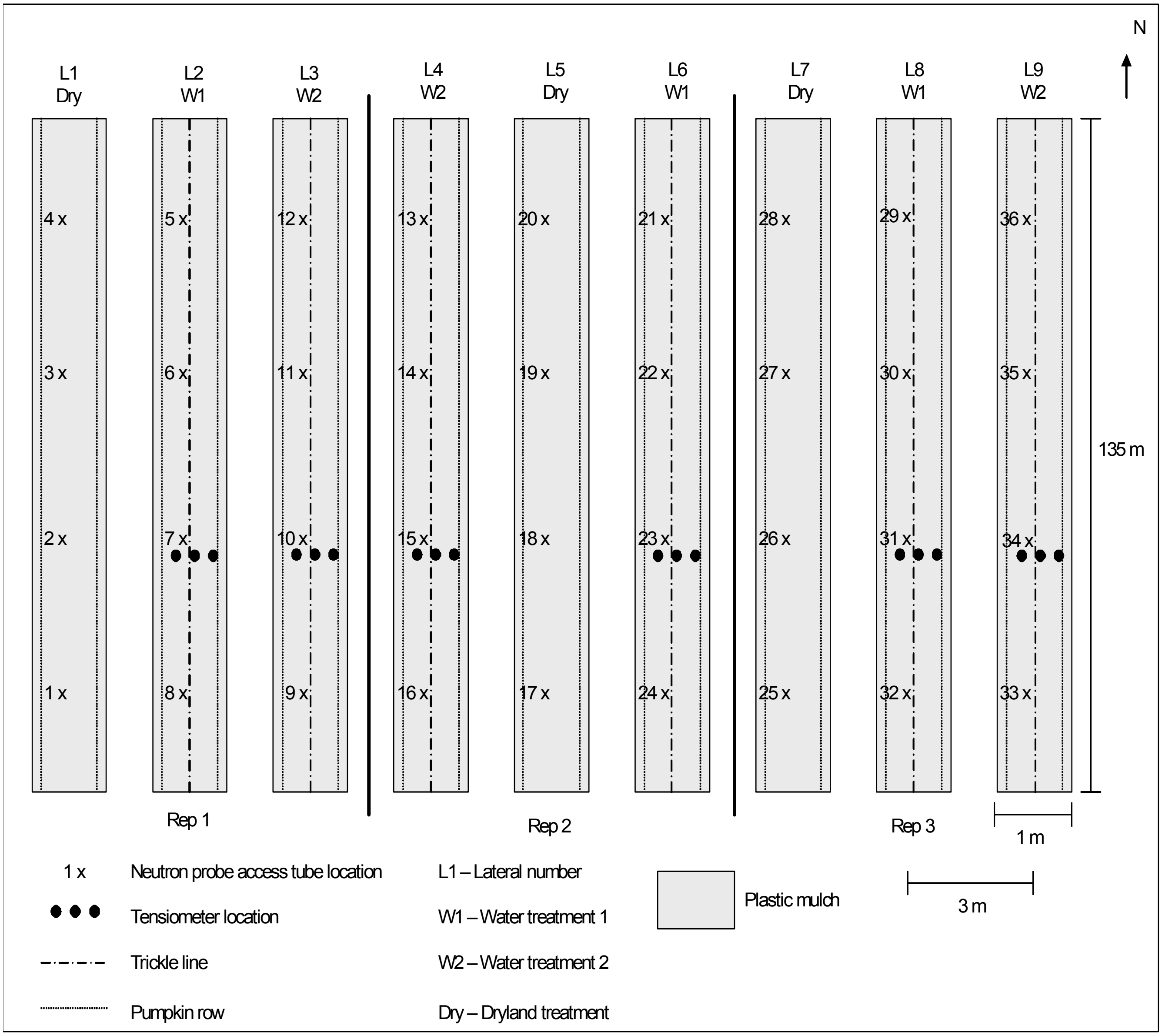


Figure 8. Pumpkin irrigation scheduling trial field layout (2005).

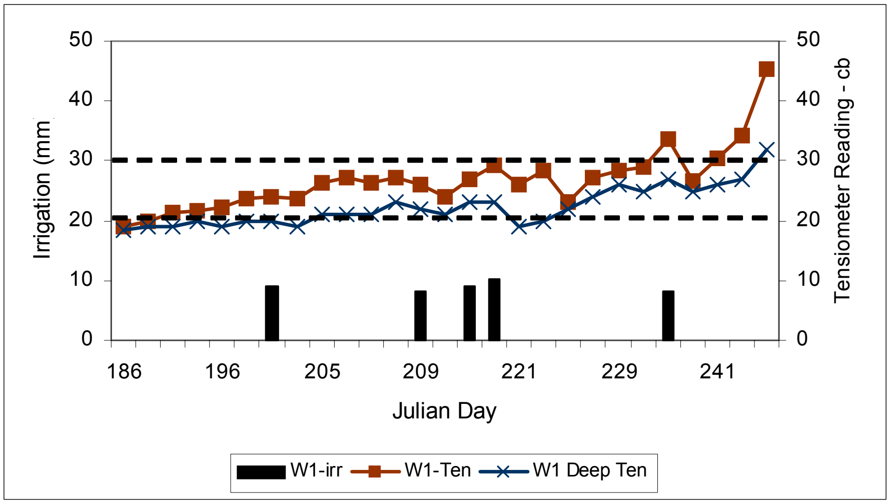


Figure 9a. Water Treatment 1 (W1) tensiometer readings and irrigation applications for the pumpkin trickle irrigation scheduling trial.

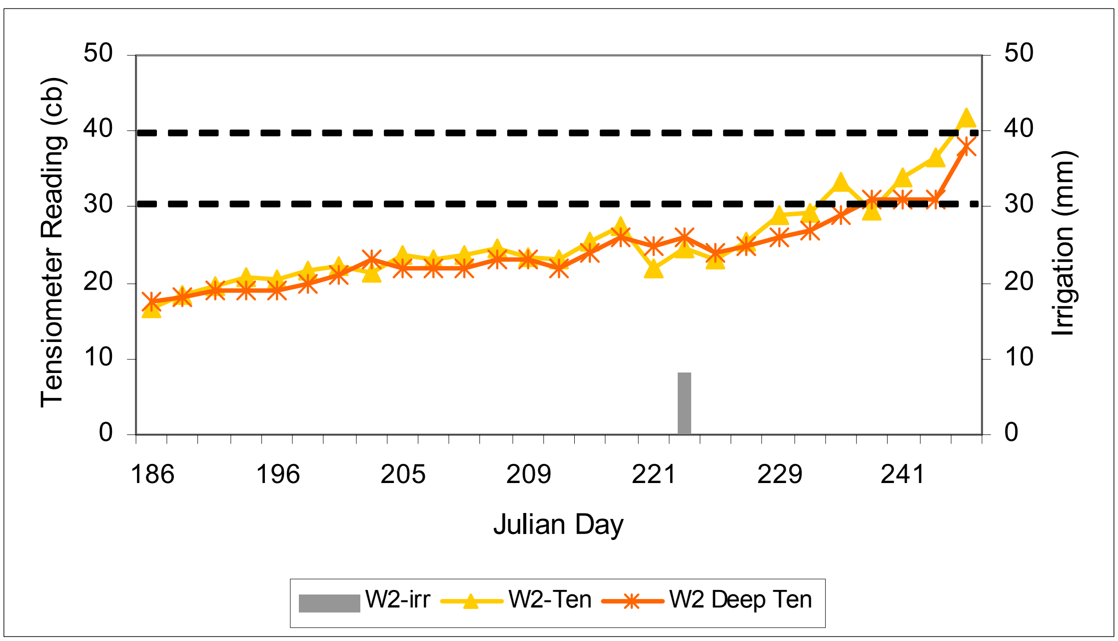


Figure 9b. Water Treatment 2 (W2) tensiometer readings and irrigation applications for the pumpkin trickle irrigation scheduling trial.

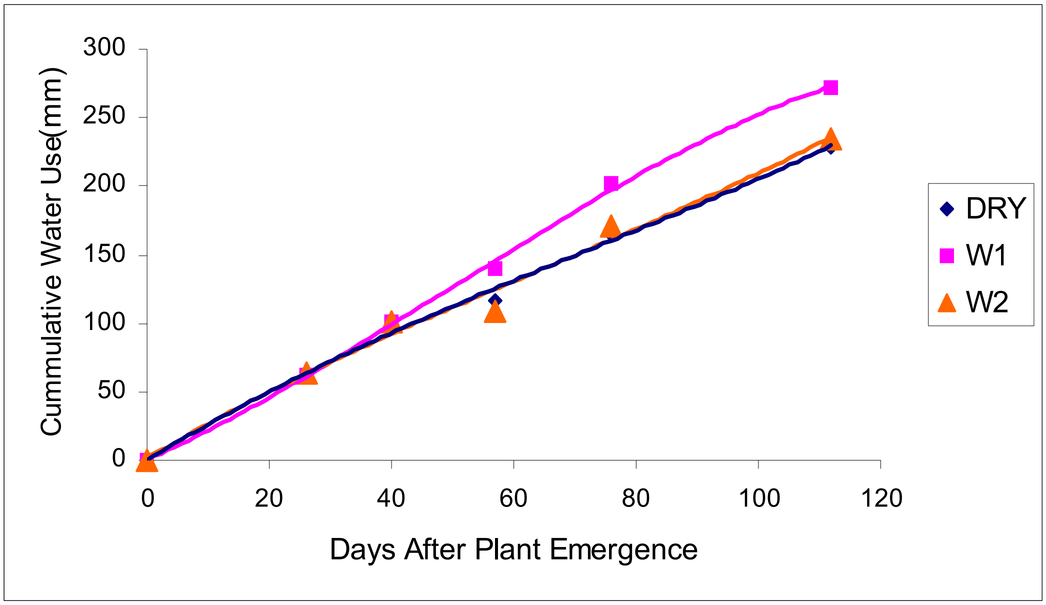


Figure 10. Water treatment effect on seasonal cumulative water use for trickle irrigated Spirit pumpkin.

Table 75. Effect of water treatment on yield, number of pumpkins, mean weight and total water use for trickle irrigated Spirit pumpkin (2005).

Water Treatment	Yield (kg/m double row)	Pumpkin Quantity (#/m double row)	Mean Pumpkin Weight (kg)	Total Water Use (mm)
W1	26.95	3.78	7.13	273
W2	27.11	3.71	7.31	235
Dry	25.35	3.57	7.09	229
LSD (0.05)	NS[1]	NS	NS	17
CV (%)	10.1	6.9	9.6	7

[1] not significant

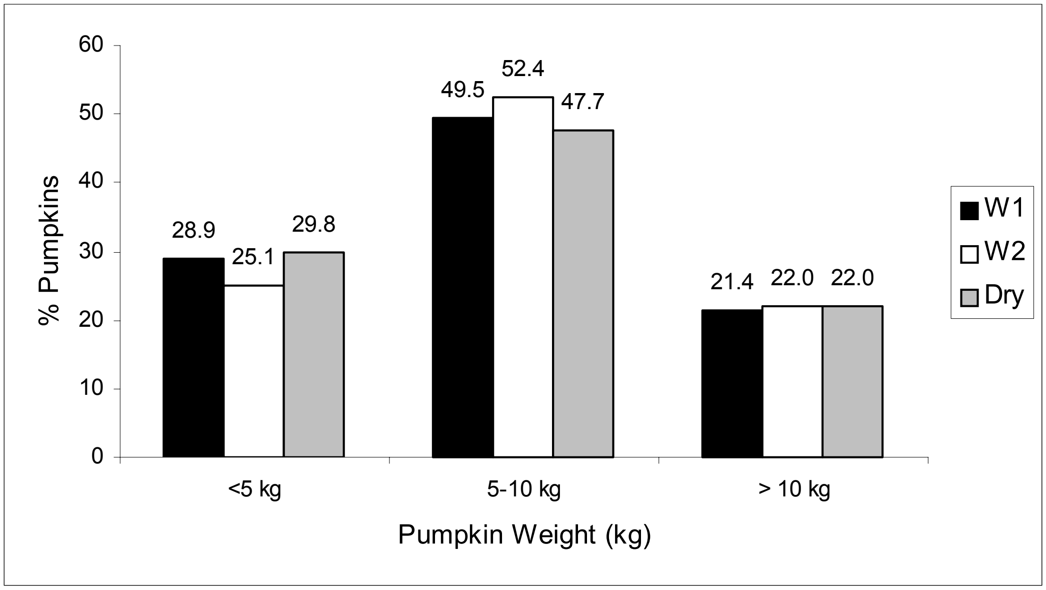


Figure 11. Water treatment effect on fruit size distribution of trickle irrigated Spirit pumpkin.

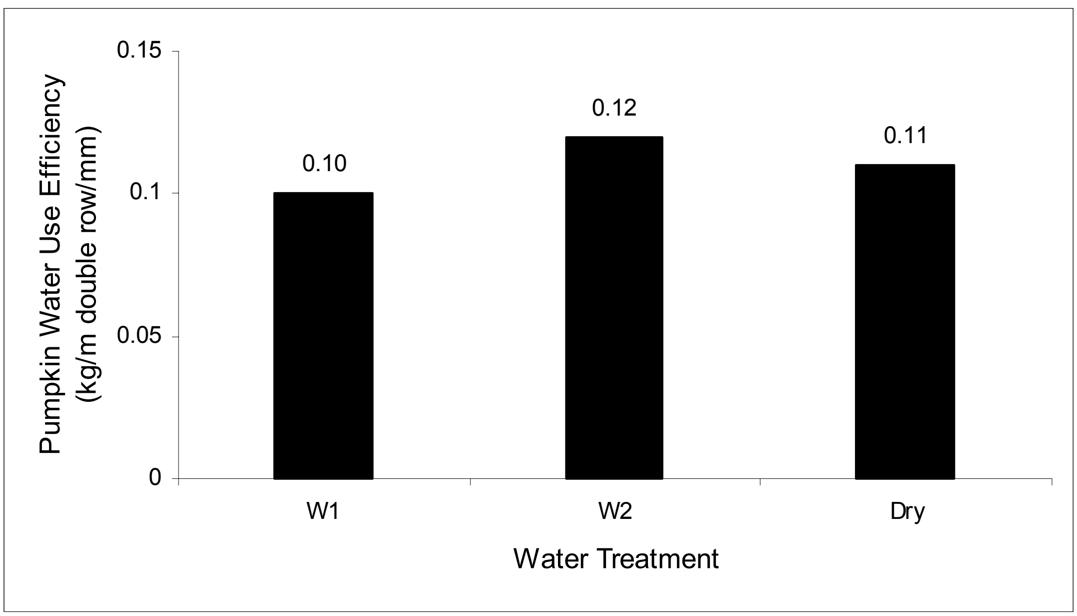


Figure 12. Water treatment effect on water use efficiency of trickle irrigated Spirit pumpkin.

Environment

Solar Pivot

Evan Derdall, M.Sc. graduate student, University of Saskatchewan, Dept. of Engineering.

The introduction of solar panels, also known as photovoltaic cells, has created a valuable alternate energy source to cope with the strain on the fossil fuel sector. Photovoltaic (PV) cell efficiency has increased significantly over the past few decades with the average cost being reduced from $300 per Watt in 1973 to $9 per Watt in 2002. This increased efficiency has broadened the potential use for these panels greatly. Although cost and efficiency of solar panels still makes irrigation of many commercial crops unjustified due to the return on investment, the potential lies in the production of high valued vegetable and fruit crops which have a large value per acre ratio.

Currently, 3-phase power is the primary source for irrigation systems and the producer is limited to irrigation where power lines exist or are in close proximity. Where these sources do not exist, diesel/gasoline generators are common, but are time consuming and detrimental to the environment. By replacing diesel/gasoline generators with solar panels to operate an irrigation system, producers are helping to reduce this greenhouse gas production as well as reducing the strain placed upon today's energy sector. With growing concerns for the environment, escalating fuel costs and the increasing efficiency of photovoltaic cells, solar power is becoming a more realistic option for producers.

The objective of this research project is to develop an optimum management practice for the irrigation of high value vegetable crops utilizing a solar powered mini-pivot, as well as to learn more about the relatively new technology now available for use. Through monitoring of soil moisture content, plant biomass production and how battery discharge/recharge rates are affected by environmental conditions, an optimum management practice will be developed. The resulting irrigation management practice will look at altering water application rates, time of application and sprinkler nozzle layout while maintaining a soil water content of 60-70 percent of field capacity, optimum for most vegetable crops. This will aid vegetable producers throughout Saskatchewan and across Canada as the demand for alternate power supplies increases.
The field located at CSIDC is a 1.8 acre irrigated field under a Greenfield Mini-pivot equipped with low energy drop hoses and Nelson Irrigation D3000 spray nozzles. The field was sub-divided into two identical fields, each containing a variety of high value vegetables that include, cabbage, celery, cauliflower, broccoli and Brussels sprouts. The difference between each field is the management practices being utilized.

This project will span two growing seasons, commencing in the spring of 2005 and ending in the fall of 2006. During the 2005 growing season, the primary goal of the study was to: a) properly identify potential improvements in the water management aspect of the irrigation system, and b) identify soil and plant characteristics that adequately supply sufficient levels of water to the crop while minimizing water losses through runoff and evaporation. This season was historically a very wet season, so the irrigation requirements were low and not as frequent as preferred for an experiment of this type. Nevertheless, results did show that the reduction in application rate did produce the same yields as the higher application rate while minimizing the amount of water lost to runoff, evaporation and leaching from the plant root zone. Phase two, starting in spring 2006, will look more at using the information and optimized schedule from season one, and combining it to maximize the capabilities of the solar panels that operate the center pivot. This will be accomplished by looking at frequency of applications, temperatures at which the panel operates, and time of day when irrigation occurs. At the conclusion of this project, an optimized management practice will be obtained to aid producers in the future to get the most out of this newly available technology.

National Agri-Environmental Health Analysis and Reporting Program (NAHARP)

Principal: Laurie Tollefson, CSIDC, Outlook
Co-investigators: Gail Dyck and John Harrington, CSIDC, Outlook

Agriculture and Agri-Food Canada has developed a set of agri-environmental indicators (AEIs) specific to the agriculture and agri-food sector in order to: a) assess how well agriculture and agri-food systems manage and conserve natural resources, and b) how compatible they are with the natural systems and processes of the broader environment. These AEIs are a practical means of assessing environmental sustainability by combining current scientific knowledge and understanding with available information on resources and agricultural practices. The intent is to provide an objective, science-based assessment of the overall environmental sustainability of agriculture. Three fundamental questions the indicators attempt to answer are:

1. To what extent do farmers and food processors use environmentally sound management practices?

2. How are environmental conditions and trends within agriculture changing over time?

3. What areas and resources remain at significant environmental risk?

The first set of AEI results was published in 2000 covering a 15-year period (1981-1996). Building on this initial work, and in light of current and future needs for this kind of information, AAFC established NAHARP to strengthen its capacity to develop AEIs and tools to integrate them with policy development.

Development of an indicator focusing on irrigation water use efficiency began in 2003. The agriculture sector faces increasing competition from other water users for water resources. The greatest use of agricultural water is for irrigation. The indicator being developed quantifies the use of freshwater resources for irrigation and to assess the efficiency of this practice. The Water Use Efficiency Indicator for Irrigation is comprised of three sub-indicators: Water Use Intensity, Water Use Technical Efficiency and Water Use Economic Efficiency. These are defined as:

Water Use Technical Efficiency (WUTE):

The mass of agricultural production per unit volume of water diverted and extracted for irrigation, in units of kg/m^3;

Water Use Economic Efficiency (WUEE):

The value of agricultural production per unit volume of water diverted and extracted for irrigation, in units of $\$/m^3$; and

Water Use Intensity (WUI):

The annual abstraction for irrigation relative to renewable fresh water resources, given as a percentage.

A preliminary step in the indicator proposal was an examination of data availability, specifically for the pilot project on the South Saskatchewan River Irrigation District. This was undertaken during 2005-2006. For comparison, calculations were also made with data from other jurisdictions in Saskatchewan, Manitoba, and Alberta. The advisory committee for the indicator, comprised of external irrigation and water experts from across Canada, was convened at the end of March 2006 to discuss the desktop study and further refine plans for data collection.

Soil and Water

Jacques Millette, CSIDC, *Outlook*

In November 2005, Dr. Jacques Millette joined the team at CSIDC as a Soil and Water Specialist. Jacques returned to Canada after having spent the past six years in Egypt working on the National Water Quality and Availability Management (NAWQAM) project funded by CIDA (Canadian International Development Agency). He is currently developing programs to evaluate and demonstrate best management practices under irrigated conditions (i.e. soil conservation issues, water quality, soil drainage and salinity problems, etc.).


ICDC Activities

ICDC Vision and Objectives

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

Objective 1: Strengthen the linkages in profitability and risk between production capacity, processing and market opportunities.

- Develop a 'gap-analysis' process to identify market opportunities for branded and commodity products from irrigated production systems.
- Partner with SAF in the identification of key supports required to move market opportunities forward.
- Partner to facilitate and offer service for formation of co-op, marketing alliances and other strategic services for the development of irrigation expansion and sustainability.

Objective 2: Enhance the production of profitable, sustainable irrigation based crop and livestock products**.**

- Sustain and grow the partnerships with the AAFC, producers, and SAF for the delivery of economic and agronomic packages for market oriented irrigated crop and livestock production systems.
- Establish an Irrigation Knowledge Network that captures and validates best management practices, knowledge and experience in irrigation from across the Great Plains and makes it available to Saskatchewan growers and industries.
- Expand targeted partnerships on the development of crop varieties for irrigated cropping systems.

Objective 3: Create a public awareness of the economic, social and environmental returns to investment in irrigation.

- Establish the Saskatchewan benchmark for the state of environmental sustainability opportunities arising from water development, and irrigated agriculture.
- Establish and communicate the Saskatchewan benchmarks for the economic impact of irrigation to Saskatchewan.
- Develop a communication package that explores the competitive advantages for irrigated products from Saskatchewan, and targets potential processing and market opportunities.

Strengthening Linkages

A steering committee was established to do a competitive analysis study for irrigated crops. The committee included ICDC, The Food Centre, SAF's Crop Business Unit, CSIDC and SAF's Outlook Ag Business Centre. After reviewing several categories of crops to consider for competitive analysis study, the category "vegetables" was selected.

Vegetables

What are the challenges?

- Saskatchewan banks are not equipped to finance vegetable production equipment.
- Successful operations are usually third generation farms and few Saskatchewan residents have commercial vegetable growing experience.
- A quota system that regulates supply may need to be set up as in Manitoba.
- Labor shortages, possibly to be filled with migrant seasonal workers.
- A central organization with solid leadership must be in place. This organization must ensure a six-month supply of produce to retailers to be competitive.
- Supportive policies and programs may be required by government.
- Lack of marketing skill amongst Saskatchewan growers.
- Small food service market and restaurants that do not like to deal with a supplier that can only supply a few items.

What are the next steps?

- Identify gaps in the market place and find out who needs our production.
- Meet with local processors and retailers to discuss local supply options.
- Try to attract experienced vegetable producers from outside Saskatchewan and Canada.
- Assess feasibility of one centralized storing and packing facility.
- Consider single desk selling.
- Explore niche markets and target specific clients.
- Explore supporting policies and programs and financial requirements.
- Advertise key market garden areas.
- Expand our migrant worker population and availability.

Details of the vegetable data, consumer trends and challenges are included in the steering committee report along with recommendations and actions.

Investment Attraction

SAF has been involved in immigration attraction to the hog and dairy industry and to farming in Saskatchewan through the Saskatchewan Immigrant Nominee Program. ICDC has been able to add irrigation to the province's immigration attraction portfolio.

ICDC is working with SAF, the Saskatchewan Immigrant Nominee Program and with Mid Sask REDA around Lake Diefenbaker to align its resources for investment attraction and immigration. SIPA's and ICDC's website www.irrigationsaskatchewan.com has been redesigned to provide the information required by prospective investors and immigrants.

Since 2000, approximately 5% of the irrigated land around Lake Diefenbaker has been purchased by people moving from Alberta. This trend will continue and grow if irrigation “infill” and expansion plans currently being studied under The Canada Saskatchewan Water Supply Expansion Program are implemented.

The Prairie Irrigated Crop Diversification Group

Irrigation has many common interests in the three prairie provinces. Research and demonstration resources are limited and collaboration between provinces will help to avoid duplication of studies and “reinventing the wheel”. A new memorandum of understanding (MOU) has been prepared to reflect today’s research and demonstration priorities. Parties to this MOU are:

- The Canada-Manitoba Irrigation Diversification Centre
- The Canada-Saskatchewan Irrigation Diversification Centre (ICDC industry co-chair)
- The Canada-Alberta Crop Development Initiative and the Crop Diversification Centre South

The purpose of the MOU is to assist the irrigation industry across the prairies to address economic and environmental issues through:

- The sharing of information on research and development initiatives
- The identification and development of joint projects
- The exploration of joint funding opportunities
- The enhancement of joint visibility through a shared communications plan
- The provision of a mechanism for addressing operational issues that impact on cooperation
- The coordination of prairie-wide conferences, seminars and workshops

ICDC supports The Prairie Irrigated Crop Diversification Group and its push for collaboration on irrigation R&D between the three prairie provinces.

Increasing Crop Profits

Irrigation Scheduling with your Computer (IMCIN)

ICDC continued working with Alberta Agriculture’s Irrigation Division staff to field check a decision support system based on climate data. This system, known as Irrigation Management Climate Information Network, (IMCIN) utilizes the nearest meterological station data to assist with irrigation scheduling. The meterologic (met) data is used in the Alberta Irrigation Management Model, AIMM, and with input by the producer, helps determine appropriate times for irrigating. The model requires input on seeding date and beginning soil moisture content. It then tracks moisture use based on the met data. The moisture use curve can be corrected to measured values if desired throughout the season. AIMM will also predict moisture use for an upcoming period based on historic record for the selected met site. This allows a producer to forecast an irrigation requirement.

Irrigated crops were monitored for moisture use utilizing tensiometers, rainfall and irrigation rain gauges, gravimetric soil moisture, and in field moisture determination by the feel method. Irrigation timing and amounts were controlled by the co-operator and the water use tracked with the model. The crops monitored included three regional variety sites where cereals, canola, flax and peas were grown.

Overall, the AIMM program provided reasonable agreement with what we saw for consumptive use in the field. There were differences with some sites slightly over or under estimating use. These differences could be due to the soil texture profiles chosen to run in the program or from errors in the model due to another relatively cool year. We will continue to collaborate with our counterparts in Alberta and are working to see more Saskatchewan stations added for 2006. This would allow producers in other parts of the province to use the program and assist them with their irrigation decisions. Take the time to check out the IMCIN web site located at www.imcin.net to learn more about this powerful tool.

Corn

ICDC's 2005 corn demonstration included forty fields with thirteen varieties ranging from early 2100 CHU to full season 2450 CHU varieties. Most 2005 corn focused on 2200 CHU varieties for silage production.

During the second week of August, corn leaf tissue analysis and field observations were taken. Silk stage was achieved in all of the corn fields. Cob formation was observed in 15% of the fields. The corn field height ranged from eight to nearly ten feet. The desirable concentration of 2.75% nitrogen in the leaf tissue after silk was demonstrated in 67% of the fields. The micro nutrient tissue concentration in the corn leaf was higher where soil organic matter is higher and especially where manure is regularly incorporated. Potash, copper, zinc and boron continue to raise nutrient management questions.

Corn grain samples, collected, shelled and analyzed at mid September, indicated that 41 pounds per bushel and 83% TDN would be typical. The average grain yield estimate of 74 bu/ac dropped from 80 bu/ac in 2003, but was much improved over 38 bu/ac in 2004. Corn heat unit accumulation through the 2005 growing season roughly ended about normal to 100 CHU or 4% short of the long term average on the northern prairies. Corn silage quality and yield reflected a small short fall. On a dry matter basis, our corn silage objective is to deliver over 70% TDN. Corn silage averaged 67% TDN up from 63% TDN in 2004.

For the third year the Alberta Corn Committee (ACC) tested both grain and silage corn varieties at CSIDC in Outlook (2300 CHU). These tests also located at Bow Island (2400 CHU), Vauxhall (2300 CHU), Brooks (2250 CHU), Lethbridge (2100 CHU) and Lacombe. Silage entries were harvested for whole plant yield and moisture content. Grain varieties were harvested for grain yield, moisture content and test weight. In both cases, great cob development is required to deliver top results. The corn heat unit rating of the 36 corn entries was from 2150 to 2700 CHU. Brian Beres, heads the Agronomy Unit, Lethbridge Research Centre, and is the Corn Hybrid Trial Coordinator for the Alberta Corn Committee and Terry Hogg supervised the corn trials at CSIDC.

CSIDC topped all the ACC corn test sites in 2003, but is positioned in the middle of the 2005 results. This ACC trial was the starting point for the September 13th Saskatchewan Fall Crops Field Day. The silage plots averaged 18 tons per acre and the grain plots averaged 90 bu/ac. The ACC website at www.albertacorn.com displays the detailed corn variety comparisons. ICDC supports the independent irrigated variety testing at CSIDC and in Alberta.

CSIDC and SPARC hosted the ACC "Minor Use Registration Initiative – Liberty 200SN for corn". A testing protocol for weed control efficacy and crop tolerance was coordinated by Doug Billett, SAF Production Technology Manager. The results were favorable and registration became official on August 30, 2005 as is the case already in B.C., Manitoba and Ontario. Four companies have at least a dozen Liberty Link corn varieties for the Saskatchewan market.

Osler Dairy Forage Center

In the spring of 2003, a randomized replicated trail was established at Osler with 14 different varieties of alfalfa and 14 different varieties of grasses. The purpose of this trial was to highlight the potential production of forages under irrigation with an intensively managed system and to compare how the varieties responded to this intensive management. This site was cut three times during 2004 (June 22, August 5, and October 6) and three times during 2005 (June 24, August 10, October 6).

Alfalfa Results

The average relative feed value (RFV) for first cut was 143, but the second cut was much higher at 170. Higher yields were obtained from AC Nordica, a branched tap root species. Geneva and Gala are two multifoliate tap rooted varieties. Gala is more winterhardy with a fall dormancy rating of two compared to Geneva's rating of four. Geneva is faster at regrowing and second cut yielded higher than first. Gala had the lowest average fibre over both cuts. Ameristand has a deep set crown and is more tolerate to heavy traffic. Ameristand has a fall dormancy rating of two and had the highest average crude protein (CP) over the two cuts.

PS8925MF and PS2065MF are both quick regrowing varieties. PS8925MF has a slightly higher fall dormancy rating (3.7 vs 3) so over time winterkill may lower the yield potential. PS8925MF had the lowest CP in second cut. AC Grazeland was bred to have a lower initial rate of digestion and is the first alfalfa to have a lower bloat incidence. Although it is not completely bloat safe, with proper management it can be successfully grazed. AC Grazeland had the highest fibre levels in both cuts.

54V54 significantly outyielded 53Q60 in spite of 54V54 has a higher fall dormancy rating (four vs three). 54V54 had the highest CP on first cut. 53Q60 yielded unusually low this year. Last year it did well in third cut. As a result of the scheduling error and missed third cut, its total yield may have been reduced relative to other varieties.

AC Longview and Hornet were in the middle of the pack for quality and yield. Stockwell, like AC Nordica, is a branched tap root, although it yields slightly less (but not statistically different).

With only two cuts, the average yield was 2.58 t/a, but a third cut would have added about 1.3 t/a to bring the average up to about 3.88 t/a. This was lower than last year's average of 5.24 t/a. There was some evidence of winterkill, with some winter annual weeds showing up in the empty spaces.

Grass Results

In the past, grass has not usually been recommended under intensive irrigation because it is generally lower yielding and lower quality when compared to alfalfa. When it was recommended it was usually in a mix with alfalfa to lengthen the life expectancy of the stand. However, in these plots, several grasses out yielded the alfalfa.

The top yielding grass was the Paddock meadow brome. Meadow brome grass has mostly basal growth with the leaves initiating from the ground and is more suited to pasture situations, while smooth brome is more suited to making hay. The hybrid, AC Knowles, is intermediate in most growth characteristics. It regrows slower than meadow brome, but faster than smooth brome. AC Knowles yielded less than both the smooth and meadow brome, although not statistically different. Paddock had the highest average acid detergent fibre (ADF) over both cuts. Bravo on the other hand, had the lowest average neutral detergent fibre (NDF). AC Knowles had the lowest CP in the first cut and the highest in the second cut.

Tall wheat grass is known for its tolerance to salinity and flooding but not drought. It was the top yielding grass last year and came in second this year. The problem with Tall wheat grass is that the quality drops off quite quickly. It had the lowest CP in second cut.

Chief Intermediate wheat grass is not a long lived grass under intensive management; however, it was the fourth highest yielding this year. It is slow maturing and combines well with alfalfa.

AC Parkland Crested wheat grass is the only crested wheat grass in this trial. Crested wheat grass is known for its early growth in the spring and very long life span. It is very drought tolerant, but not flood tolerant. It had the second highest second cut yield. Garrison Creeping Foxtail is well suited to flooding areas as it has excellent flood tolerance. It also is long lived and strongly creeping rooted.

Orchardgrass is a highly palatable bunchgrass with excellent regrowth and midseason production. Arctic Orchardgrass had the highest average protein and the highest average RFV of the grasses. Unfortunately, it is not very winter hardy. Arctic is a variety bred to have more winter hardiness, which is very evident in our trials. Kay died after the first winter with virtually no production last year. Arctic, although it did not produce much, survived. Even after removing the dry matter from the weeds, the Arctic orchard grass out yielded the timothy.

Timothy has been one of the more profitable crops to grow under irrigation. The two varieties tested yielded over 4 tons/ac. Timothy loves water and is tolerant to spring flooding but not drought or salinity. This year Aurora yielded higher than Joliette although not statistically different.

Revenue Slender wheat grass is the only native species that was included in this trial. It is a short lived, but quite productive native species. In this trial under irrigation and intensive management, it out yielded the alfalfas last year. This year, it is beginning to see the end of its life and the yield has dropped off.

Arthur Dahurian Wild Rye is another productive short lived grass. It is a shallow-rooted bunch grass, easy to establish and adapted well to saline conditions. It also is towards the end of its life and the yield is dropping.

The other grass suffering winter kill was Courtenay Tall Fescue. Tall fescue is a pasture grass tolerant to saline, acidic and alkaline soils. It is also drought tolerant, but not winter hardy. Some varieties have high alkaloids which can cause animal health problems.

These results only reflect this year's data. As such they should not be used for variety recommendations, particularly since there was a block interaction with the alfalfa yields. For variety recommendations, please check the "Crop Varieties for Irrigaion, 2006" published by ICDC and CSIDC. All of the data presented in this article is included in the dataset used for that publication.

Alfalfa Demonstration at Swift Current

The purpose of this demonstration was to highlight the production capability of alfalfa under a two cut system destined for the beef market. This field scale demonstration northeast of Swift Current was established in the spring of 2003 with seven of the top varieties from two seed companies.

The average RFV for first cut was 112 with second cut at 155. Second cut met the dairy quality standard of 150, although first cut is easily sufficient for maintaining beef cows over winter. Geneva topped out the demonstration with the highest two year yield. It had the lowest RFV and CP in first cut and was the tallest in second cut, which shows its rapid growth habit.

Spreador 3 came in second in the two year yield. It also had the highest CP in both first and second cut.

Ameristand is a variety with a sunken crown which makes it more tolerant of heavy traffic or trampling. It was in third place for yield, but was the highest yielding this year.

54V54 and 53Q60 had similar yields. 53Q60 has a lower fall dormancy rating (3 vs 4) which should make it more winter hardy. 53Q60 was the least mature but the tallest in first cut and had the lowest RFV in second cut.

Gala yielded the least of the treatments (excluding Absolute, the check). Gala had the highest MSC and RFV in first cut.

On a previous demonstration on this site Absolute was the highest yielding and with the newer varieties it is the lowest. This indicates how much varieties have improved in the last five years.

This demonstration shows the high yields that can be achieved under irrigation. With a two cut system you can get similar yields to three cuts, although the quality is more suited for a beef cow rather than a dairy cow. With some conflicting results, it also shows the limitations of demonstrations, compared to randomized and replicated research trials. Although it does verify the yield estimations from research trials on a large field scale.

SeCan Cereal Forage Demonstration

Our plots included the two highest yielding varieties from "Crop Varieties for Irrigation, 2005", AC Meena and AC Andrew. AC Meena is bred for increased end use quality for premium quality markets. AC Andrew is a higher yielding variety geared to price driven export markets. AC Andrew has been documented as the highest yielding wheat grown in Saskatchewan and is also being suggested for ethanol production.

The durum included in this trial, is high yielding AC Strongfield. The two oats included were AC Morgan and CDC Baler. CDC Baler has very wide large leaves and is supposed to remain green longer once it is dry and is suitable for greenfeed. AC Morgan is more of a milling oat. It is susceptible to rust, but is well adapted to high moisture.

Viking was the highest yielding triticale from the trials at CSIDC last year. Triticale yields similar to barley or oats, although the quality is typically lower.

Included are five standard six row feed barleys in this trial - AC Rosser, Trochu, Vivar, Dillon and Manny. CDC Battleford is being tested for malt. It is a six row high yielding variety with good lodging resistance. CDC Copeland, CDC Cowboy and Ponoka are the two row barleys in the trial. CDC Copeland is a new high yielding barley also being tested for malt. CDC Cowboy and Ponoka are two row feed barleys.

Prairie Blue and Bethune were the two flax varieties included at the Baildon site. They were the top two yielding varieties in "Crop Varieties for Irrigation, 2005".

Red Fife and Marquis Wheat Demonstration

In honor of Saskatchewan's Centennial year, ICDC seeded two 100-year-old wheat varieties in the variety trials at Baildon and Osler – Red Fife and Marquis. Generally the plants were taller and had more kernels per head compared to our current wheat varieties. It was noticeable that Red Fife matured later than Marquis, but it was difficult to see a difference in maturity between Marquis and the other varieties. Many of our varieties today are actually descendants of Marquis and Red Fife.

Silage Cereal Varieties

Again in 2005, ICDC agrologists in Swift Current had the opportunity to host a site for the variety trials from CSIDC. This included the barley, triticale and oat trials. By hosting a site off station, CSIDC was able to collect two site years of data in one year. As usual, barley was higher quality than the oats or triticale. Yields were similar between all three. Results are included in the the "Crop Varieties for Irrigation, 2006".

Phosphorus Rate Trial

The purpose of this trial was to determine the amount of phosphorus required for Timothy Production. Established in May, 2004 with 'Colt' as the variety, applications were made in 100 lb increments, from 0 to 300 lbs actual Phosphorus, in various combinations. Nitrogen was constant across the plot at 100 lbs actual N per cut. Harvesting occurred on August 27, 2004, July 8, 2005, and September 20, 2005, in this year two of three project.

The least significant difference was greater than the difference between most of the treatments, and those treatments that were significantly different (100,0 vs 300,100 and 300,0 vs 300,100) did not seem to make any sense.

Last year there was no difference between applying 0 lbs P and applying 300 lbs P to a soil with 32 lbs P already in it. In the second year there was also no detectable difference between applying 300 lbs P in each year vs the check.

Timothy Drying Rate

One of the most difficult problems with growing timothy is the drying process. Hay sealed in shipping containers, sitting for a few months on a ship, has to be around 12% moisture so as not to spoil. ICDC started a project to estimate the drying rate of timothy hay using a prediction equation.

Two fields of timothy were sampled near Lucky Lake for two cuts. This provided four cases in which to evaluate the prediction equation. First cut took about four days to dry, while second cut took about 14 days to dry. Adjacent to one of the timothy fields lays an alfalfa field. Since the third cut of the alfalfa was taken at the same time as the second cut of timothy, this alfalfa field was also sampled to provide a fifth case.

The case that corresponds most closely to the experience of the prediction equation authors was the fifth case, the alfalfa. The timothy moisture also seemed to be predicted fairly well with the equation. With only five cases, this is not enough information to truly evaluate the moisture prediction equation, however this preliminary data looks very encouraging.

Timothy Hay Crop Insurance Pilot Program

In November 2004, Saskatchewan Crop Insurance was invited to the ICDC timothy hay production seminar and made a presentation to producers and processors in the Outlook area. Crop Insurance presented information on the New Crops program which provides coverage options on non-traditional crops grown in Saskatchewan and introduces insurance on crops where there is limited historic production information available. Continuing to work with industry representatives, Crop Insurance designed a pilot program to address the production risks of this specialized crop, launching in March 2005.

The Timothy Hay Pilot Program covers irrigated pure timothy hay stands intended for export grown in designated rural municipalities in the Outlook area. Exported to Asia for feed, timothy hay's high quality fibre is desirable for dairy and beef herds. The Outlook area was targeted because of the concentration of producers and processing facilities.

To be marketable, export quality hay must have a good green colour and not contain any weeds or other crop contaminants. Therefore, quality coverage was the key to any timothy hay program introduced. Since these acres are irrigated, yield losses are not considered the crop's primary risk. Under the 2005 pilot program, enrolled acres are covered for one or two-cut coverage for yield and quality losses below the Choice grade.

The program was selected by 15 producers representing almost 7,000 acres of irrigated timothy hay and approximately $2.6 million of insurance coverage. Premium contributions were approximately $133,000 from producers and $222,000 from federal and provincial governments.

Microwave Drying - Moisture Content of Feed

ICDC performed trials using a microwave to determine the moisture content of hay. Overall, the method was successful. It takes about 20 minutes to dry a 100-200 g sample from 60% moisture to zero, and the moisture contents obtained were close to those from the drying ovens at the research station in Swift Current. Producers could use this method if they would like to double-check the moisture content of their feed before baling, formulating rations, or making silage. A scale accurate to 1 g is needed, and care must be taken not to run the microwave with a dry sample alone or there is risk of fire. It should also be noted that this drying method can produce a strong odor.

To test the accuracy of this method, 14 alfalfa samples were taken from our plots, seven dried with the microwave and seven dried with the oven. The samples ranged from 76 to 83% moisture. Surprisingly, the moisture content calculated from microwave-dried samples was 77.6%, while the average from the oven-dried samples was 80.1%. This would suggest that the microwave was not drying the samples completely. However, when the seven microwaved samples were then put in the oven to see if they would dry further, they came out unchanged. Anyone who uses this method should allow for several percentage points of error.

Potato Variety Research

ICDC contributes in-kind support to an Agriculture and Agri-Food Canada Matching Investment Initiative (MII) for potato novel trait variety research. Jazeem Wahab and Greg Larson at CSIDC conduct potato variety and agronomy research. The MII project is titled Commercial Scale Evaluation of Advanced Clones. There were five advanced clones from the Lethbridge Research Station evaluated for storage and culinary practices. This seed will be utilized for field-scale multiplication in a commercial field.

Soybean Variety Testing

ICDC has been looking to answer producer's questions on soybeans and has again teamed up with CSIDC to demonstrate the potential of new soybean varieties in Saskatchewan. Terry Hogg of CSIDC has been growing a soybean variety trial at CSIDC for the past two seasons and has demonstrated the large differences in soybean varieties. 2004 was as poor a year as one can expect for soybeans due to the early frost and as a result no varieties provided acceptable yields. One year should not discourage farmers as many crops commonly grown were also destroyed by the early frost. Six varieties were grown this year on two irrigated sites. 2005 demonstrated how much more suited the early varieties were for Saskatchewan than the longer season varieties. Varieties requiring 2400 heat units or less were generally yielding above 30 bu/ac. Varieties requiring 2450 and higher were generally yielding less than 20 bu/ac.

Irrigated Variety Testing

ICDC has continued funding in 2005, to CSIDC for on going variety testing. The results each year are added to a database that consists of close to 15 years of trials and this information is used to produce the annual CSIDC/ICDC publication, "Crop Varieties for Irrigation". In 2005 there were again four ICDC funded sites for flax, canola, wheat and peas. Many other crops are to be added to the database including soybeans, sunflowers, corn, dry beans, alfalfa, timothy, potatoes and annual cereal forages.

Dry Bean White Mold Survey

A survey of white mold severity was performed to determine best management practices for managing this disease in irrigated beans. ICDC has collected information from dry bean growers regarding their production practices that influence white mold severity. Information about crop rotation, bean variety, row spacing, N fertilizer rate, fungicide application, and yield was collected. Fields were rated for disease severity between August 22 and September 7. Some fields were rated twice over that period. The goal was to rate them close to maturity – at buckskin stage. Sixty plants were rated in each field and the result is an average rating for the field (0 to 100 scale). In total, 29 fields were included in the survey, which includes most but not all of the irrigated dry bean acres in Saskatchewan.

Two factors were found so far that influenced the severity of white mold in the beans. Variety was one of them – the new upright varieties generally had less white mold than the older prostrate varieties. The other was bean rotation. Fields with short bean rotations (0 or 1 year break between beans) had a higher average DSI than those fields with two or more years. While there was not a tremendous amount of white mold this year, there was enough disease development to find some interesting differences that could potentially help bean growers to manage white mold more effectively and efficiently. Contact Lana Shaw at 867-5512 for full survey results.

Fusarium and Leaf Disease Survey

Fusarium Head Blight

The SAF Provincial Plant Disease Specialist, Penny Pearse, and the Crop Protection Lab co-ordinate and produce the Fusarium and Cereal Leaf Disease surveys. The objectives of the survey are to determine the prevalence of FHB, to monitor its spread within the province, and to determine the Fusarium species responsible. ICDC agrologists have included irrigated acres in the survey for the past three years. In 2005, Sask Crop Insurance adjustors and ICDC Agrologists collected heads from commercial wheat, durum, barley and oat fields during the early dough stages of development.

For 2005, average overall infection was very low (0.3% for barley and 0.02% for wheat). The average FHB severity for irrigation in Saskatchewan was 0.2%, which is comparable to the provincial average. In 2005, 23 cereal fields were surveyed in irrigated areas from Bradwell to Consul, including 15 fields of wheat, six fields of barley and two fields of oats. Fourteen of the 23 fields were found to have some amount of FHB, but the severity of infection was generally negligible. The FHB severity value, which is the percentage of infected kernels in the collective grain sample, ranged from 0 to 2.4 % infected kernels. The field with the highest severity was durum, but some durum fields also had no infection. Some of the barley samples had FHB, and the two oat samples were clean. In 2005, F. graminearum was found in six of the 23 irrigated fields surveyed, including four fields of wheat and two fields of barley. Other Fusarium species were also present.

Public Awareness

- ICDC's booth was on display at several high-profile events, including the Crop Production Show in January, the Alberta Irrigation Projects Association Annual Conference, the CSIDC Irrigation Field Day, EnviroForum in Swift Current, and the Saskatchewan Cattle Feeders Association Annual.

- ICDC held a joint meeting with SIPA in January to coordinate the irrigation agenda. Both organizations share irrigation promoting as part of their mandates under *The Irrigation Act, 1996*. The website and advertising and promotion are coordinated through a joint SIPA-ICDC committee. SIPA has been the lead agency to monitor SWA's water conservation plan as SIPA has a representative on SWA's Advisory Committee.

- ICDC participated in the Lake Diefenbaker regional tour and barbeque for the Honourable Mark Wartman, Minister of Saskatchewan Agriculture and Food.

- SIPA and ICDC participated in the survey that was part of The Brace Institute's National Study on irrigation opportunities, being done for PFRA.

- ICDC continues to promote the installation of a centre pivot irrigation system on SPARC, Swift Current to demonstrate intensively managed sprinkler irrigation in southwest Saskatchewan. ICDC is also continuing to lobby for co-location of SAF staff at CSIDC, Outlook.

- ICDC has lobbied SaskTel for increased access to high-speed internet in rural Saskatchewan as part of its website project.

- Both SIPA & ICDC were sponsors and on the organizing committee of the Saskatchewan Agrivision Corporation Inc's conference in North Battleford in November: Water Mainstream of the Economy.

- Both Carl Siemens, ICDC Chair, and Roger Pederson, SIPA Chair, participated in the Regional Consultation on the Science and Innovation Strategy of AAFC and were able to represent irrigation's interests to this diverse group.


Technology Transfer

Activities

Extending information developed through the applied research programs and promoting sustainable irrigation are two of the key objectives for CSIDC. Knowledge gained only becomes valuable once it is disseminated to individuals who can make use of it. Staff use on-site and off-site activities to transfer information and technology to farmers and the general public. This includes both written literature, verbal discussion and hands-on demonstration.

Corn Maze

Gail Dyck, Judy Clark, and Richard Wagner, CSIDC, Outlook

For the second year, CSIDC hosted tours for Outlook and district school classes that ended with the challenge of a corn maze. Over 300 elementary and high school students attended throughout the 2005 fall season. Other community and youth groups also participated. The corn maze, situated along Highway #15, not only created interest within the community about CSIDC activities, but provided a fun incentive for school children to attend tours. The students were introduced to many aspects of irrigated agriculture, including new crops, improved crop production practices, and the latest irrigation methods. The value of water and the environment was also emphasized. The visual impact of the tours was highly effective in teaching the children about an industry that occurs, literally, outside their back doors. The students themselves also pass this learning on to family members, which increases the overall awareness of the Centre and its work.

Tours

Groups from across Canada and overseas tour the facilities throughout the spring to fall season. In 2005, these included:

- REDA and federal rural development staff - April 21st
- NAWQAM Egyptian study tour - May 31st
- Ukrainian extension staff - June 20th
- Australian 4-H alumni - June 28th
- Eastern Canadian conservation group - July 8th
- Prairie Malt agronomist and South African agronomist - July 27th
- Agricultural engineering division, India - August 31st
- Chinese delegation (Bernie Sonntag) - September 8th
- Chinese delegation (Bruce Coulman) - September 26th
- Ag-Water Directorate tour - September 28th

Field Days

Annual Field Day

Over 250 visitors attended the annual field day on July 14th, which focused on the "wealth from water" in our past, present and future. Tour highlights included field crops (corn, beans, forage) and specialty crops (herbs, potatoes, vegetables) plus commodity-specific tours in the afternoon. The trade show displayed booths from industry and government agencies. To celebrate the province of Saskatchewan's 100th anniversary and the Prairie Farm Rehabilitation Administration (PFRA) 70th anniversary, guest speakers included Mr. Bob Kohlert (past CSIDC manager), Mr. Carl Neggers (PFRA Director General) and the Honourable Mark Wartman (Saskatchewan's Minister of Agriculture).

Potato Field Day

Although potato research was touched upon at the annual field day, a smaller commodity-specific tour held on August 16th allowed for more in-depth discussion on the latest potato research and production practices. Dr. Benoit Bizimunga, AAFC Lethbridge, and Greg Larson, CSIDC Outlook, discussed variety and agronomic trials being conducted. Scott Anderson, Barrich Seed Potatoes, demonstrated the 'Red Dragon' flamer used to top-kill potatoes. The Saskatchewan Seed Potato Grower's Association meeting was held in conjunction with the tour.

Corn/Soybean/Flax/Sunflower Field Day

Silage and feed corn varieties were displayed and grazing opportunities discussed at the field day on September 13th. Researchers and industry reps were on hand to answer questions on this evolving and rapidly expanding feeding option. Earlier maturing soybeans were demonstrated and opportunities discussed. Recent surges in flax and sunflower markets have also created a renewed interest in these crops and the most current varieties were available for viewing.

Presentations

Staff gave presentations at conferences, workshops and meetings, including:

- Production Research for Feverfew and St. John's Wort. Annual Western Canadian Research Update, presented by Saskatchewan Herb and Spice Association and Plant Biotechnology Institute, Saskatoon - June 8th
- Canadian Water Resources Association, Banff - June 13th - 17th
- Nitrogen and phosphorus placement effects on tuber yield for commercial potato cultivars. Potato Association of America, Annual Meeting, Calgary - July 17th
- Rotary Club meeting, Saskatoon - August 29th
- Mediterranean conference, Bari, Italy - September 6th - 11th
- Medicinal Plants: 2004 Research and Development. Saskatchewan Herb and Spice Association Annual Conference, Saskatoon - January 13th
- NAHARP indicators workshop, Ottawa - January 31st - February 1st
- Faba bean research producer meeting , Canora - March 15th
- ACC Hybrid Performance trials producer meeting, Outlook - March 20th
- NAHARP advisory committee meeting, Saskatoon - March 21st
- CANCID "Sustainable Irrigation for the Prairies" workshop, Saskatoon - March 22nd - 23rd

Booth Display

Although much of the transfer of information to the public occurs at the Centre, the CSIDC booth is displayed at numerous trade shows and conferences. This tool allows staff to provide written information to the public, answer questions and increase awareness of irrigation in Saskatchewan. Events where the booth was displayed, included:

- CSIDC Field Day, Outlook - July 14th
- Potato Association of America conference, Calgary - July 17th - 20th
- Shelterbelt Field Day, Indian Head - July 21st
- Hemp Festival, Craik - August 20th
- Sask. Agrivision Corp. Water Conference, North Battleford - November 4th
- Western Potato Council & Saskatchewan Seed Potato Growers Association conference, Saskatoon - November 29th - December 1st
- SIPA / ICDC annual conference, Swift Current - December 5th & 6th
- CANCID "Sustainable Irrigation" workshop, Saskatoon - March 22nd & 23rd

International Work

For many years, staff from CSIDC have been involved in international development projects. They have used their expertise in irrigation, agronomics and management to ensure the success of projects in underdeveloped countries.

- NAWQAM project meetings, Cairo, Egypt - May 22nd - 29th; September 12th - 15th
- PEC and PSC meetings, Cairo, Egypt - November 25th - December 5th
- Irrigation agronomy training for the 'CIDA / Water Harvesting and Institutional Strengthening for Tigray' project and agricultural research methodology training for the 'Water Harvesting and Institutional Strengthening for Tigray' project, Mekelle, Ethiopia - February 11th - 22nd and March 20th - 21st

Factsheets

The following factsheets are available from CSIDC. Please contact the Centre at (306) 867-5400 for copies, or visit the website at *www.agr.gc.ca/pfra/csidc/csidc.htm*.

Cereals:

Decision Guide for Foliar Disease Control in Irrigated Wheat
Early Seeding of Irrigated Cereals

Forages:

Alfalfa Establishment under Irrigated Conditions
Alfalfa Seed Production under Irrigation

Herbs and Spices:

Agronomic Practices for Commercial Scale Production of *Echinacea angustifolia*
Agronomic Practices for Commercial Scale Production of Feverfew
Agronomic Practices for Commercial Scale St. John's Wort Production
Agronomic Practices for Commercial Scale Stinging Nettle Production
Agronomic Practices for Mechanized Production of Milk Thistle in Saskatchewan
Herbs, Spices and Essential Oils Research & Demonstration
Production Practices for *Echinacea angustifolia*
Production Practices for Feverfew

Oilseeds:

Crop Management for Sclerotinia Control in Canola
Date of Seeding, Seed Rate, and Row Spacing of Irrigated Flax
Seeding Rate and Row Spacing for Irrigated Canola

Potatoes:

Agrochemicals in Soil and Groundwater under Irrigated Potato Production
Cultivar Specific Fertility Management
Irrigation Scheduling for Potatoes
Micronutrients in Potato Production
Processing Potato in Saskatchewan: Potential and Opportunities
Northern Vigor™ in Seed Potato

Pulse Crops:

Dry Bean - Fertility Management under Irrigation
Dry Bean - Optimum Seeding Rate and Row Spacing
Faba Bean Trials at CSIDC
Field Pea - Optimum Seeding Rates
Field Pea - Do Field Peas Respond to Micronutrient Fertilizer?
Field Pea - Rate & Placement Effects of Phosphorus & Potassium Fertilizer
Field Pea - How Effective are Granular Inoculants on Irrigated Pea?
Irrigated Chickpea Trials at CSIDC
Management of Field Pea under Irrigation
Management of Irrigated Lentil

Soils and Fertilizers:

Canola Fertilization Trials at CSIDC
Fertility Management of Irrigated Alfalfa
Rate and Placement Effects of P and K Fertilizer on Peas
Reclamation of a Saline Field using Subsurface Drains

Vegetables:

- Cabbage: Post-harvest handling and Storage
- Carrots: Post-harvest handling and Storage
- Demonstration of Improved Vegetable Production Techniques in Saskatchewan
- Melons: Post-harvest handling and Storage
- Onions: Post-harvest handling and Storage
- Peppers: Post-harvest handling and Storage
- Pumpkin Production
- Vegetables: A Growing Industry

Other:

- CSIDC Annual Review
- CSIDC Brochure
- Crop Varieties for Irrigation
- ICDC Irrigation Economics and Agronomics
- Irrigation in Saskatchewan (SAF)
- Prairie Province Trickle Irrigation Manual