THE IRRIGATOR

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ICDC 2013 Board Report

18th Annual Irrigation Conference held in Moose Jaw

The 2013 Annual General Meeting of the Irrigation Crop Diversification Corporation (ICDC) was held in Moose Jaw on December 4, 2013.

Staff from the Ministry of Agriculture and ICDC presented reports on the projects implemented and funded by ICDC in 2013. For those unable to attend, the *ICDC Research and Demonstration Program Report* is available at ww.irrigationsaskatchewan.com.

The major changes in 2013 were that the new MOU with the government took effect and saw ICDC receive $25,000 in additional funding from the government through the AgriARM system—funding will be $75,000 annually. This increase will help cover ICDCs costs of having its own staff and maintaining its own accounting and administration functions. Garry Hnatowich continued as research scientist at CSIDC along with Harvey Joel as research technician. Gerry Gross who had been appointed by the board to supervise the ongoing activities of the contracted services retired on March 15, and Garth Weiterman was appointed to replace him.

Twenty projects were implemented during 2013. Four projects were carried forward from 2012. A total of $13,390.00 was allocated for projects in 2013.

Staff organized and facilitated an irrigation agronomy workshop, supported the CSIDC field day and Crop Diagnostic School, and organized the Forage Field day at CSIDC. Staff prepared ten articles for publication in *AgriView* that featured ICDC projects or activities. Staff also prepared the 2013 edition of *The Irrigator*, updated the *Economics and Agronomics* publication and displayed the booth at three events, including the Crop Production Show.

Members at the AGM approved the 2014/2015 Work Plan Budget and passed a resolution to increase the acreage levy to $1.00/acre for 2014. The budget is detailed on page 24 of this newsletter.

The board is open to any suggestions from irrigators for new projects and invites irrigators to share their ideas with staff or with ICDC directors.

In this Issue

Introducing ICDC's Board of Directors

ICDC directors are elected at its annual general meeting by delegates from Saskatchewan's various irrigation districts. Each irrigation district (ID) is entitled to send one ICDC voting delegate per 5,000 irrigated acres, or part thereof to the annual general meeting.

The four ICDC development areas defined by ICDC's bylaws are represented on ICDC's board of directors by: Lake Diefenbaker Development Area (LDDA), two directors; South West Development Area (SWDA), two directors; Northern Development Area (NDA), one director; and South East Development Area (SEDA), one director. Non-district irrigators elect one director. In addition, two ICDC directors are appointed annually by the Saskatchewan Irrigation Projects Association (SIPA) and two by the Saskatchewan Ministry of Agriculture. By law, the majority of the board must be comprised of irrigators.

At the time of publication, the current ICDC board includes:

Name and Position	Irrigation District	Development Area	Year Term Concludes
Jay Anderson, Vice-Chair	SSRID #1	LDDA	2014
Greg Oldhaver, Alt Vice-Chair	Miry Creek ID	SWDA	2014
David Bagshaw, Director	Luck Lake ID	LDDA	2013
Ryan Miner, Director	Riverhurst ID	SEDA	2015
Colin Ahrens, Director	Individual	Non-District	2015
VACANT		NDA	
VACANT		SWDA	
Joel Vanderschaaf, Director	SSRID #1	SIPA representative	Appointed
Rob Oldhaver, Director	Miry Creek ID	SIPA representative	Appointed
Garth Weiterman, Director	Sask. Ministry of Agriculture, Irrigation Branch		Appointed
Doug Pjachek, Director	Sask. Ministry of Agriculture, Crops Branch		Appointed

Staff

Support staff for ICDC is provided by the Saskatchewan Ministry of Agriculture, along with ICDC contract positions. Staff members who assist ICDC include:

Garth Weiterman PAg
Manager, Agronomy Services
Crops and Irrigation Branch
Ministry of Agriculture
(306) 867-5528

Specialty Area: ICDC program and administration

Garry Hnatowich, PAg
ICDC Research Scientist
(306) 867-5400

Specialty Areas: irrigation research & demonstration program, variety testing, and agronomy

Sarah Sommerfeld, PAg
Regional Forage Specialist
Regional Services Branch
Ministry of Agriculture
(306) 867-5559

Specialty Area: annual and perennial forage crops

Gary Kruger, PAg, CCA
Provincial Irrigation Agrologist
Crops and Irrigation Branch
Ministry of Agriculture
(306) 867-5524

Specialty Areas: South West program, soil fertility, and crop rotations

Rory Cranston, PAg
Regional Crop Specialist
Regional Services Branch
Ministry of Agriculture
(306) 867-5506

Specialty Areas: cereals, pulses, horticulture, and agro-forestry

Jeff McEwen AAg
Provincial Irrigation Agrologist
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Ministry of Agriculture
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Specialty Areas: pulses, oilseeds, specialty crops, yield mapping, and irrigation scheduling

Winter Wheat for SW Irrigators

Melissa Standford
Winter Wheat Agronomist
Ducks Unlimited

Many of the agronomic principles that apply to profitable winter wheat production in dryland cropping systems also apply to irrigated situations. High yielding, profitable winter wheat crops are ideally:

1) Seeded early,
2) Seeded into standing stubble, and
3) Seeded at a shallow depth.

Winter wheat seedling growth near the end of October at Ponteix Irrigation District

In 2012, winter wheat yield was 31.7% higher than average durum, hard red, and spring wheat crops on the Canadian prairies.[1] With the high yield potential of winter wheat and the even higher yield potential in irrigated production systems, factors such as variety selection and fertility do warrant special consideration.

Agronomics

Variety Selection

Winter wheat varieties with short straw and good to very good straw strength are recommended for irrigation, as are varieties with appropriate resistance to foliar diseases. Stem and leaf rusts can be particularly problematic in high moisture conditions. The varieties AC Gateway, Moats, and Emerson offer some level of resistance to rusts. Emerson also has resistance to Fusarium head blight (FHB). Provincial seed guides provide up-to-date information on available and new varieties.

Fertility

As with dryland production, fertility management for irrigated winter wheat should be made based on soil test results and appropriate yield targets. Knowledge of available nutrients and yield expectations can be combined to create specific fertility plans.

Nitrogen should be applied consciously to maximize yield, quality, and product efficiency, because it is within the soil. Some nitrogen should be applied, along with phosphorus, at the time of seeding to provide good nutrition to seedlings. The balance of the nitrogen should be plant available by early tillering, regardless of product type applied, so the crop can convert the N to yield. Delayed N application will contribute to protein, not yield. If available nitrogen is excessive later in the growing season and is coupled with abundant moisture, losses due to crop lodging can occur.

When winter wheat is grown under a center pivot, fertilization at appropriate growth stages can be achieved by applying product directly through the pivot.

Disease Management

The dense canopy and moist conditions prevalent in irrigated wheat production systems can favour disease development. Variety selection and timely scouting for fungicide application helps protect yield. Crop rotation, seed treatment, and good fertility can also reduce disease incidence.

Scheduling irrigation to fill the root zone (100 cm) to field capacity prior to heading, along with ap-

[1] Source: Statistics Canada, http://www5.statcan.gc.ca/cansim/pickchoisir?lang=eng&p2=33&id=0010017

Soil texture-based estimation of total available water and water amounts per irrigation event for winter wheat during the winter wheat growing season.				
	50 cm root zone (vegetative or pre-flower growth stages)		100 cm root zone (flowering, fruit formation, and maturation growth stages)	
Soil Texture	Total available water (mm)	Water required to replenish soil to field capacity at 50% allowable depletion (mm)	Total available water (mm)	Water required to replenish soil to field capacity at 40% allowable depletion (mm)
Loamy Sand	57	28	114	46
Sandy Loam	70	35	140	56
Loam	90	45	180	72
Sandy Clay Loam	76	38	152	61
Silt Loam	100	50	200	80
Clay Loam	100	50	200	80
Silty Clay Loam	110	55	220	88
Sandy Clay	86	43	172	69
Silty Clay	106	53	212	85
Clay	96	48	192	77

(Source: Alberta Agriculture and Rural Development, Agdex 112/561-1)

propriate fungicide applications, can reduce the severity of FHB. Irrigation or precipitation during flowering increases the risk of FHB. Irrigation should therefore be avoided during this crop stage. Irrigation may resume after flowering is complete, approximately 10 days after the first flowers appear.

Elevated seeding rates help reduce tiller formation and shorten the flowering phase of the crop, thus reducing the time that irrigation must be avoided.

Irrigation Management

Awareness of soil type and crop water use needs at various stages contributes greatly to the production of high yielding, high quality winter wheat. Crop water use by winter wheat has two peak periods: in fall, prior to dormancy, and in the spring, from the boot stage through to heading and flowering.

In the fall, winter wheat will germinate and grow quickly when soil moisture levels are 60–100 per cent of field capacity. Field capacity is the maximum amount of water that the soil can retain. Water use will peak prior to dormancy at 1.5 to 2 mm per day. If conditions are dry in the fall, irrigating the field to bring moisture levels to 60 per

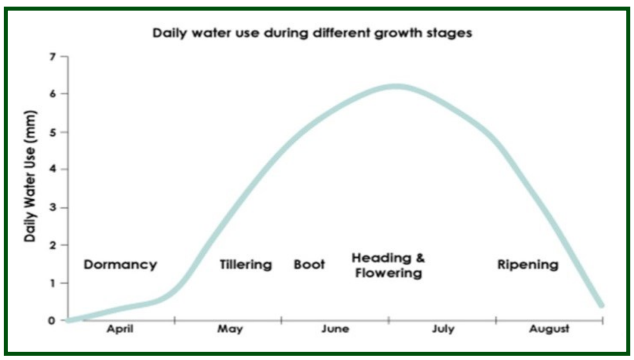

Figure 1. Daily water use by irrigated winter wheat during various growth stages. (Source: Alberta Agriculture and Rural Development, Agdex 112/561-1)

cent or greater prior to seeding is recommended. Irrigation is best applied before seeding to minimize crusting and maximize emergence. Insufficient moisture can delay emergence and reduce plant populations, ultimately impacting yield.

Crop water use gradually increases in the spring as the winter wheat crop emerges from dormancy and begins to green up. Peak water use occurs shortly after the boot stage, where approximately 7 mm of water is consumed per day during heading and flowering. Adequate soil moisture is critical for winter wheat during vegetative, flowering, and fruit-formation stages.

Winter wheat extracts 70 per cent of its water requirements from the upper 50 cm of its 100 cm active root zone. To ensure ample moisture is available to the crop from tillering to late boot, soil water should not be depleted to less than 50 per cent of field capacity in the upper 50 cm of the root zone. Irrigation to address depletion should begin when soil water is around 60 per cent. This will prevent exhaustion, which occurs when soil water is less than 50 per cent. This can generally be achieved by regular light irrigation.

Irrigation applications should be planned to fill the entire active root zone to field capacity at late boot/ early heading to meet immediate crop needs and increase moisture to meet peak demand, which occurs during flowering. Insufficient water during flowering can result in flower abortion; however, irrigation during flowering is not recommended, as susceptibility to FHB is high. Consequently, building up moisture reserves prior to heading is important.

A final irrigation to replenish the root zone may be applied between the soft dough and hard dough stages, depending on soil type. Once the winter wheat heads turn brown, irrigation is not required, as the crop has reached physiological maturity and yield is set.

Harvest Management

At harvest, the higher yields associated with irrigated winter wheat will also culminate in greater volumes of straw. Care should be taken to manage straw and chaff to prevent difficulties in subsequent crops. Ideally, residues should be spread the width of the header cut.

Summary

Frequent monitoring of soil moisture conditions, along with knowledge of soil type will assist in the prevention of water stress to winter wheat crops under irrigation. This will help maximize yield, as will the selection of an appropriate variety, a good fertility package, and on-going pest monitoring.

For further information, please refer to the website: www.growwinterwheat.ca or contact Gary Kruger by phone at 306-867-5524 or by email at gary.kruger@gov.sk.ca.

Can Winter Wheat Fit into the Flood Irrigated Crop Rotation in the Southwest?

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Winter wheat provides an opportunity to diversify the cropping rotation under flood irrigation in southwest Saskatchewan. If a winter wheat crop can be sown in August, it should be sufficiently advanced to tolerate a spring flood in April or early May. Two challenges when growing this productive crop under flood irrigation are to fit its growth period (mid-September through July) into the flood projects and to provide adequate stubble for snow catch so the growing point of the winter wheat seedlings is protected from frost injury. This crop strategy was attempted previously, but did not result in a significant increase in productivity.

The 2014 ADOPT ICDC winter wheat sites were sown into early-harvested cereal stubble or chemfallow. Stubble from early harvested cereal crops can work well for collecting snow cover for winter wheat seedlings. The risk for this strategy, however, is the potential for cereal second growth to act as a green bridge for the wheat streak mosaic virus. The virus can be spread by physical rubbing of wheat leaves, but is more commonly spread by the wheat curl mite. Control of the green bridge risk is achieved by spraying a nonselective herbicide to eliminate green growth in the field prior to seeding the winter wheat.

Winter wheat seedling development in durum stubble at Ponteix Irrigation District

Winter wheat responds well to adequate fertility, especially nitrogen. Many flood irrigated fields are depleted in soil fertility because of long standing forage rotations that are not intensively fertilized. Forage crops have high rates of nutrient removal as nearly all of the production is removed from the field each season.

Is the fertility of flood irrigated fields limiting the potential production of winter wheat? If legumes are a significant proportion of the forage crop that is taken out of production, the decomposing roots will supply sufficient nitrogen and other nutrients for two to three years. Alfalfa is generally fertilized with broadcast phosphorus (P) each spring. Some of this broadcast P will remain and be available for subsequent crops. Nutrients that are likely to limit winter wheat yields on the flood projects are potassium and zinc. The current ADOPT projects located at Ponteix, Eastend, and Consul demonstrate seeding rate and seeding depth to emphasize that winter wheat needs to be sown at a shallow depth and at an adequate seeding rate to improve the chances of success. Plant tissue samples at the flagleaf stage will be collected from the crops next summer to evaluate the fertility plan on the fields. The goal of the project is to identify future fertility research for this productive crop under flood irrigated conditions.

Winter wheat seedlings growing on chemfallow at Eastend Irrigation

Alfalfa Weevils – A Pest to Watch For

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Alfalfa weevils are becoming a pest of increasing concern to forage producers. Ministry of Agriculture regional forage specialists recently conducted surveys of alfalfa fields. Their data shows that the alfalfa weevil can be found throughout Saskatchewan, with the exception of the northwest area of the province. Pure alfalfa stands or fields with a high percentage of alfalfa are impacted the most.

Adult alfalfa weevils over-winter in plant debris and alfalfa stubble. Adult weevils emerge in the spring and begin feeding on alfalfa leaves. Through mid to late May, female adult weevils lay eggs in alfalfa stems. Within one to three weeks, the eggs hatch, and the larvae begin feeding on new plant growth.

Adult alfalfa weevil

A mature alfalfa weevil larva can be up to eight millimetres in length. They are green in colour with a white stripe on the back and have a black head capsule. Mature larvae chew on developing buds and leaves, giving the leaves a skeletonized appearance. Feeding damage stunts plant growth and the field takes on a silvery sheen appearance. When there is extensive damage, some fields may not flower. This is important to remember, as the recommended cutting time for alfalfa is at 10–20 per cent bloom. If a producer fails to realize that the delay in flowering is being caused by alfalfa weevil feeding, the end result will be a significant negative impact on forage yield and quality.

Larvae primarily feed from late May to July, with peak feeding activity occurring from mid-June to mid-July. After larvae have completed several development stages, they move down the plant to ground level and pupate. Adult weevils emerge one to two weeks later and continue feeding through late summer.

Mature alfalfa weevil larvae

To determine weevil populations, field scouting is necessary. Field monitoring should begin in early June and should be checked every three to four days. Begin scouting by walking in a W-shaped pattern in the field. Carefully grab a handful of stems and cut. Slap the stems on a hard surface to dislodge any larvae. Care must be taken, because larvae are difficult to count on the stems, and often drop to the ground when plants are disturbed. Use of a sweep net is very effective, as the net sweeps ahead of any disturbance.

The most effective method of control in alfalfa crops grown for hay is early cutting. If early cutting is not feasible and the estimated yield and quality loss will be substantial, an insecticide application is recommended. Yield and quality loss depends on the vigor of the stand, weevil population, life cycle stage, and expected number of days until cutting. In areas

Damage to plant caused by larvae feeding where weevil damage has been extensive, larval populations have remained high after cutting, damage to crop regrowth has been significant, and chemical control was recommended.

Economic thresholds for chemical control in hay crops are based on the number of larvae per stem and plant height. If plant height is less than 30 cm, the threshold is one larva per stem. If plant height is less than 40 cm, the threshold is two larvae per stem. When finding three or more larvae per stem, immediate control is required, regardless of plant height. For a complete list of products registered for chemical control of alfalfa weevil and more information on thresholds, please refer to the Ministry of Agriculture's publication *2014 Guide to Crop Protection*, available at your local regional office.

For more information on the alfalfa weevil and possible control options, contact the Regional Forage Specialist at (306) 867-5559, visit the Ministry of Agriculture website at www.agriculture.gov.sk.ca, watch the web video, *Monitoring Alfalfa Weevil*, or contact the Agriculture Knowledge Centre at 1-866-457-2377.

Larvae feeding on plant with damage

Irrigated alfalfa field at CSIDC

Irrigated Canola Seeding Rate Trial 2011–2013

Garry Hnatowich, PAg
ICDC Research Agronomist, Outlook

Canola is a staple in Saskatchewan production. Its net returns are among the highest, but so is its cost of production. Unfortunately, one of the greatest inefficiencies in canola production is stand establishment. The Canola Council of Canada has established a recommended target canola stand of 70–140 plants/m^2. However, plant stand is not the same as planting rate. Desired seeding rate is an estimate for final plant stand, allowing for germination, seed weight, and seedling mortality losses. Canola seed survivability ranges from 30 to 70 per cent; a typical value usually associated with canola is 50 per cent. Therefore, a desired target plant stand of 70–140 plants/m^2 would require a seeding rate of 140–280 seeds/m^2. Recent research on irrigated canola in Alberta indicated a recommended plant population range of 175–275 seeds/m^2, which equated to a seeding rate of 6 lbs/ac (Alberta Agriculture and Rural Development – Agdex 100/561-2. May 2011).

Flowering canola

Present irrigated canola recommended final plant stand is 110 plants/m^2. This study was initiated to evaluate the agronomic implications of seeding canola at rates both below and above present suggested seeding rates for irrigation production. This project was located at CSIDC from 2011 to 2013 on soils classified as very fine sandy loam to a loam. The seeding density rate of each treatment is shown in Table 1, along with the approximate corresponding weight of seed planted.

Mean yield response of canola to seeding rates over the three years of evaluation is summarized in

Table 1. Plant density treatments and seeding rates.

Seeding Rate (plants/m^2)	Seeding Rate kg/ha (lb./acre)
50	2.7 (3.0)
75	4.0 (4.5)
100	5.4 (6.0)
150	8.0 (9.0)
200	10.7 (12.0)
250	13.4 (15.0)
300	16.1 (18.0)

Figure 1. The vertical bar represents the present recommended target plant population of 110 plants/m^2. As seeding rate increased, so did yield up to the 150 plants/m^2 treatment. No statistical yield benefit occurred for seeding rates above this treatment. Increasing seeding rate from a target of 100 to 150 plants/m^2 resulted in a 5.6 bu/ac yield gain. However, actual plant/m^2 established for each target plant population was never achieved (actual plant stands varied between years and are missing for one year). In this trial it is estimated that we achieved approximately 65–70 per cent establishment of the target population at each seeding rate. Therefore, the curved yield response illustrated

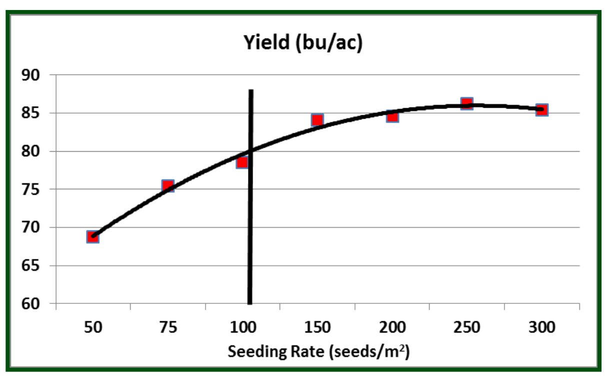

Figure 1. Effect of Increasing Seeding Rates on Seed Yield of Irrigated Canola.

would "shift" to the left. This suggests that our present desired plant population of 110 plants/m^2 is appropriate for irrigated canola production, but actual seeding rates of approximately 5.0 lbs/ac may be less than desirable for establishing this final plant stand in the field. Yield response to an additional 1.0 lb./ac of canola under irrigated production would offset the additional seed cost.

The impact of higher seeding rates on canola lodging is illustrated in Figure 2. Results indicate that higher plant establishment had little effect on plant lodging. It was apparent that higher seeding rates did tend to contribute to crop uniformity, and depending on the growing season, crop maturity. Higher seeding rates were also beneficial in terms of weed competition.

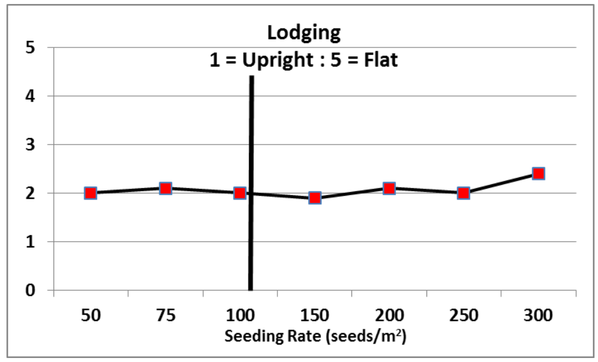

Figure 2. Effect of Increasing Seeding Rates on Lodging of Irrigated Canola.

Irrigated canola field

Fertigation: Adapting Fertilizer Application to Irrigation

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Fertigation is the injection of liquid fertilizer through an irrigation system. Requirements for setting up an injection system are relatively minimal. An injection system requires four things:

- a non-corroding holding tank, usually plastic, that holds between 500 and 2,000 gallons, depending on application needs;
- an injection pump that is highly accurate and adjustable for different application amounts;
- an injection check valve to prevent backflow from the pressurized water; and
- most important, a backflow prevention valve, which is installed on the water line upstream of the injection point to prevent fertilizer-treated water from flowing back to the pump or contaminating the water source.

Different requirements may exist in different irrigation districts. Check with your district before proceeding. Figure 1 illustrates each of the mentioned components.

The point of injection is normally at the pivot point to allow easy access to power for the pump and where the pivot can be programmed for fertilizer application. This location also means that less pipe will be exposed to potentially corrosive fertilizer and provides easy access to the control panel of the pivot. The fertigation pump and irrigation pump need to be interlocked so that if one or the other fails, they will both shut down. Alternatively, the injection point could be at the turnout or irrigation pump. This allows placement of the fertilizer holding tank at an out-of-the-way location and can provide easy access for refilling. A downside for choosing the turnout or pump point location is that the pivot must be programmed for fertilizer application at the control panel located at the pivot point.

Fertigation can save both time and money. Fertigation improves seeding efficiency by reducing the quantity of fertilizer handled at seeding. When you delay the application of fertilizer until later in the growing season, the chance of fertilizer loss is reduced, but only if the fertilizer application is in the right form and applied in time to maximize uptake by the crop. Coarse-textured soils can see benefits

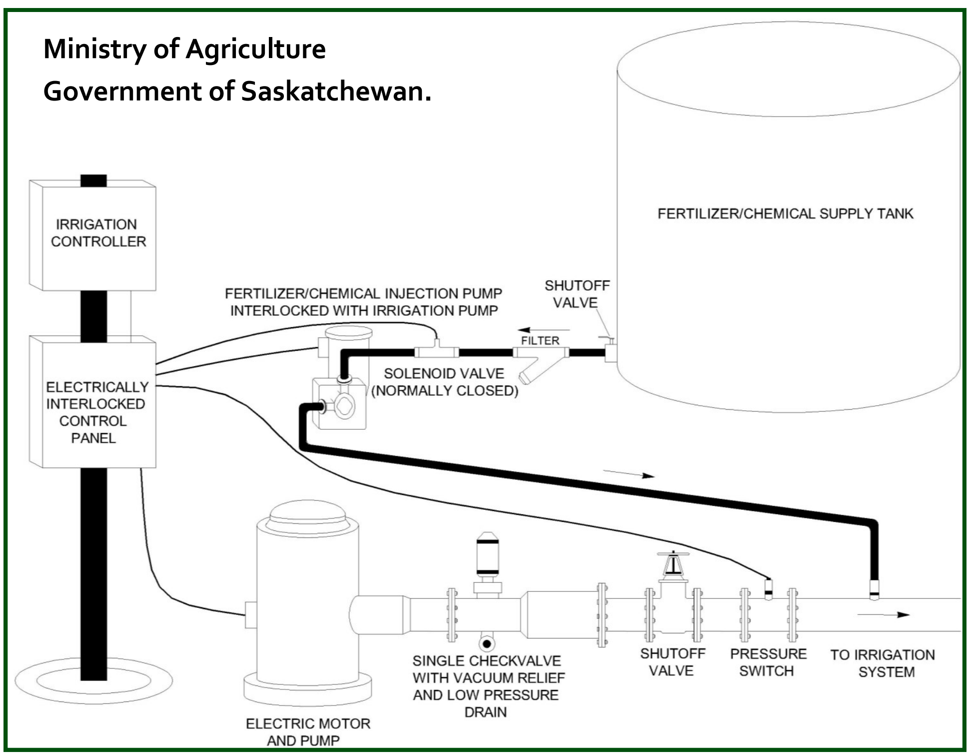


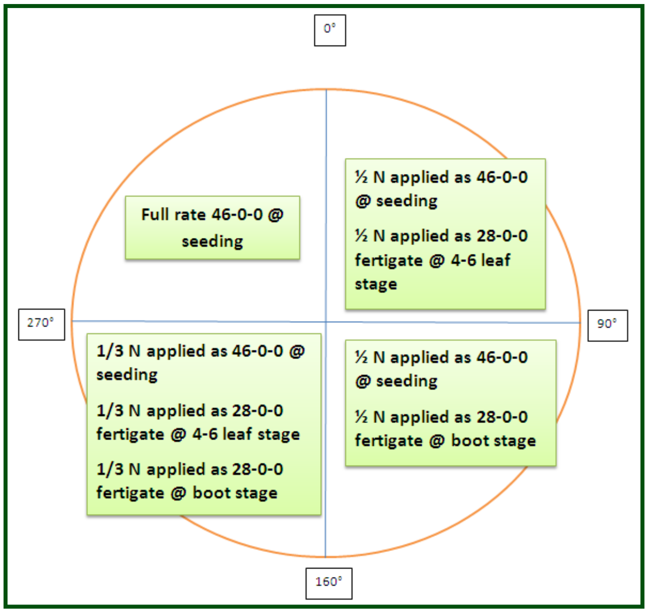
Figure 1. Fertigation setup

with fertigation, as leaching is a significant risk when applying high rates of mobile nutrients such as nitrogen at seeding time. Fertigation allows nutrients to be applied as the crop needs it and over several applications if required. Fertigation removes the operator from the field and damages less crop compared to a mechanical spreading application. Application of nutrients with water allows the nutrients to be carried to the active rooting zone, where the plant can more readily absorb them. Over-irrigation or a heavy rain event, however, can leach the nutrients below the root zone or promote runoff from the field. Irrigation scheduling to track crop water use and to manage application timing for fertigation is recommended.

Generally, only 20–30 per cent of a crop's nitrogen requirements should be applied through fertigation. This application should be completed by late June through mid-July, depending on crop, soil and weather conditions, and crop staging. Research has shown that cereal crops take up 75 per cent of their nitrogen requirement by the 4–5 leaf stage. Keep in mind that 7–10 days are required to convert the majority of the urea and ammonium nitrogen in 28-0-0 to nitrate-nitrogen for uptake by the crop. To prevent yield reduction, fertigation must be completed before the crop shows nitrogen stress.

In 2014, a demonstration will compare application timings for fertigation on irrigated durum to determine the best fertigation timing to produce the highest yield and protein. In this demo, a 130-acre center pivot will be divided into four 33-acre quadrants. The first quadrant will be fertilized with 120 lbs N/ac as granular urea at the time of seeding. The second quadrant will be fertilized with 60 lbs N/ac of granular urea at the time of seeding and fertigated with 60 lbs N/ac of UAN at the 4–6 leaf stage. The third quadrant will be fertilized with 60 lbs N/ac of granular urea at the time of seeding and 60 lbs N/ac of UAN at the boot stage. The last quadrant will have 40 lbs N/ac as granular urea at seeding, 40 lbs N/ac of UAN at the 4–6 leaf stage, and 40 lbs N/ac of UAN at the boot stage. The diagram below illustrates the proposed applications.

Soil sampling from each quadrant will be carried out before seeding to determine nutrient content. A leaf tissue test will be taken from each application area at early boot to determine nutrient content in the plant. At harvest, yield will be determined using a calibrated yield monitor to produce a yield map and a weigh wagon will also be used for verification. Grain protein and quality will be tested in grain samples taken from each application area to determine whether a later application of nitrogen affects grain protein. Post-harvest soil samples will be taken to determine whether excess nitrogen had been applied. Aspects of this demonstration step outside the current guidelines for fertigation: the plan is to apply more than 20 per cent of the nitrogen through fertigation, and, for some treatments, the application will be later in the growing season than is generally recommended.



Layout of demonstration plan

Cabbage Seedpod Weevil … Are You in the Dark?

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The cabbage seedpod weevil is a pest that you may have heard of but not likely one you are too concerned about. That will likely soon change, as 2013 surveys across the province showed numbers are on the increase and spreading north and east from the south west portion of the province. Increasing counts may be due to the expansion of canola acres in the southwest. Canola is the crop most heavily impacted by cabbage seedpod weevil, although damage and yield loss can occur in brown and oriental mustard. Last year, threshold numbers necessitated spraying in areas of west central Saskatchewan, notably within the Riverhurst Irrigation District. Cabbage seedpod weevils were also observed in the Outlook area in 2013, but not in threshold numbers; they were most noticeable in first flowering fields of canola. It is worth noting that producers in Alberta consider control of cabbage seedpod weevil as a component of their annual integrated pest management (IPM) strategy.

The life cycle of the cabbage seedpod weevil begins with an adult that over-winters. Adult cabbage seedpod weevils are gray in color, are approximately 3-4 mm long, and have a distinct curved snout. Adults feed on early germinating weeds, such as stinkweed and flixweed, in spring before canola has established. The adults then move to the established canola crop, where the adults feed on buds. This can result in yield loss. Adults pierce the developing canola pods and lay their eggs inside. Once the larvae have hatched, they feed on the developing seeds inside, causing 15 to 20 per cent yield loss in the pod. When the larvae are mature they chew a hole through the pod wall and exit, dropping to the ground to pupate. Exit holes can provide an entrance for disease. About 10 days later, adults emerge and feed on immature canola or other green cruciferous plants until late in the season, when they enter over-wintering sites. The cabbage seedpod weevil only has one lifecycle per year.


Adult cabbage seedpod weevils. Courtesy Ministry of Agriculture .

Larval damage to canola pod

A sweep net is used to monitor cabbage seedpod weevil infestations in canola. It is recommended that ten sweeps be taken from ten sites in the field. Monitoring is best conducted from the first bud stage through to the flowering stage. Cabbage seedpod weevils keep close to the ground during windy days, so it is important to scout for the insect during calm periods. The economic threshold for the cabbage seedpod weevil is three to four adult weevils per sweep. The first fields to flower are most likely to have the cabbage seedpod weevil, but later-seeded fields should still be monitored. Once thresholds are reached, chemical control with registered insecticides is recommended. Consult the most recent *Guide to Crop Protection* for a list of products; be sure to follow label guidelines for application instructions. Cabbage seedpod weevils do migrate in at field edges, but trying to control weevils on field edges is not an effective strategy and will negatively affect beneficial insects. Optimum timing for insecticide application is at 10–20 per cent flower, before the adults have laid their eggs. Chemical control is best applied later in the day to avoid harming beneficial insects with non-selective insecticides.

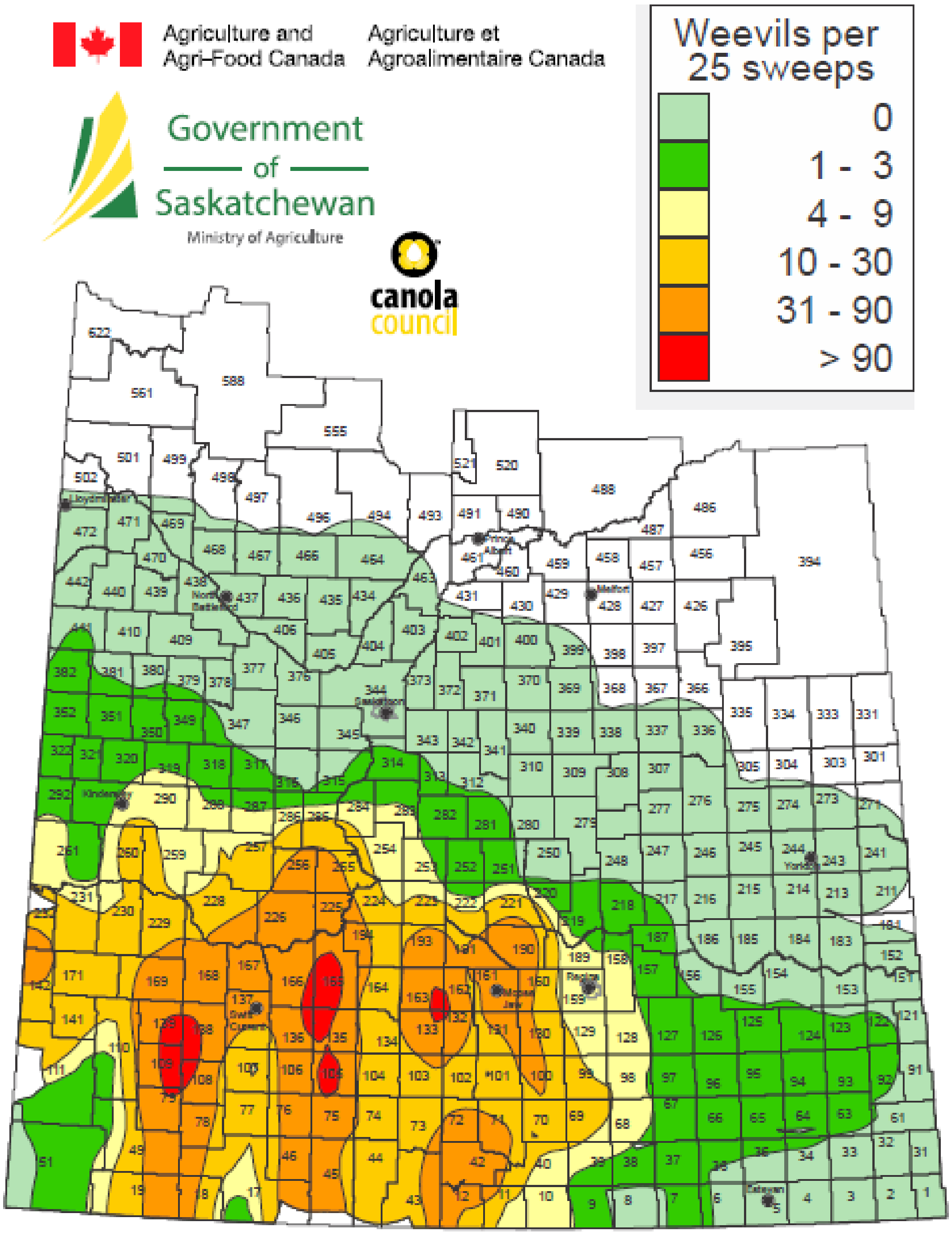

Figure 1. Cabbage seedpod weevil populations from 2013 survey.

Growing Forward 2 Funding for Non-District Irrigation Development under The Farm and Ranch Water Infrastructure Program (FRWIP)

Adapted from an article originally published in the March edition of *Agriview.* Adapted and used with permission.

Under the Agricultural Business Development component of the Farm and Ranch Water Infrastructure Program (FRWIP) established under Growing Forward 2, non-district irrigators can now access funding to expand irrigated acres (minimum 10 acres) outside of irrigation districts. Rebates are available for eligible infrastructure items, including pumps, screens, pipelines, power installation, and turnouts, that are needed to develop a secure water supply to the edge of the irrigated land parcel. Land parcel irrigation equipment (eg., irrigation pivots) is NOT eligible under this program. Rebates are calculated as the lesser of 50 per cent of eligible costs **or** $1,000 per irrigable acre developed, to a maximum rebate of $150,000. Projects MUST be completed, including receipt of all necessary permits and approvals, within 18 months from written FRWIP project approval or February 15, 2018, whichever is earlier. Because several approvals are required to develop agricultural land for irrigation, the steps of the process are outlined below to help applicants meet the FRWIP project completion timelines.

STEP ONE: Complete a Request for Technical Assistance Form.

An applicant must contact the Crops and Irrigation Branch (306-867-5500) to discuss the viability of the project. At that time, a Request for Technical Assistance form will be completed to request that a technical assessment* of the project be conducted. The technical assessment will include an assessment of potential infrastructure, a review of the regulatory requirements that must be met, and a site inspection. A sketch plan of the project will be developed and will outline the project components and estimated cost.

STEP TWO: Obtain an Irrigation Certificate.

The Irrigation Act, 1996 requires that all land must be certified before irrigation development begins. As part of the Request for Technical Assistance* (step one above), the Crops and Irrigation Branch will conduct a soil/water compatibility investigation of the land parcel to determine whether the soil and water are suitable for irrigation. If they are, an Irrigation Certificate will be issued by the Branch for the land parcel. Once a parcel has been certified for irrigation, a detailed preliminary plan showing the irrigation development will be prepared.

* Funding for technical assistance related to irrigation certification can be obtained through the Farm Stewardship Program (FSP), under the Irrigation Management Planning BMP. This is a separate step not covered in this list.

STEP THREE: Apply for Licence and Approval to Construct and Operate Works.

The applicant must now apply to the Water Security Agency (WSA) for a Water Rights Licence and an Approval to Construct and Operate Works. When submitting the WSA application, you will need to include a copy of the preliminary plan developed in step two.

STEP FOUR: Apply to FRWIP for Funding Approval for the Project.

When submitting your FRWIP funding application, be sure to include copies of the Irrigation Certificate (step two) and Approval to Construct Works (step three), if you have already obtained these.

STEP FIVE: Proceed with Construction.

Once the WSA has issued an Approval to Construct Works and project approval has been provided by FRWIP, construction can proceed. Interim claims can be submitted to FRWIP prior to the project being completed (minimum rebate is $25,000).

STEP SIX: Obtain a Final Survey and Inspection.

Once the project is completed, a final survey and inspection must be conducted and an As-Constructed Plan completed. This plan will be sent to the WSA to obtain a Water Rights License and Approval to Operate Works. Once obtained, copies of these approvals must be submitted with the final project rebate claim to FRWIP.

For More Information:

FRWIP and FSP – 1-877-874-5365
Crops and Irrigation Branch – (306) 867-5500
Water Security Agency – (306) 694-3900

Growing Forward 2

A federal-provincial-territorial initiative

Economics & Agronomics Calculator 2014

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A long standing handbook for agronomic and economic decision making for an irrigator, the *Irrigation Agronomics and Economics* booklet, has been one of the most highly demanded publications produced by the Irrigation Crop Diversification Corporation (ICDC). The booklet shows the producer the potential return for each crop, along with valuable agronomic advice, all in a simple one-page per crop format. The assumptions for the guide are based on the most common scenarios for intensive irrigation. Factors such as fertilizer price, fuel price, and grain price are always changing. The publication is a great start for a producer, but the assumptions need to be modified to personalize the costs for each farming operation.

Upon realizing that the "My Farm" column in the majority of *Irrigation Agronomics and Economics* booklets was not being fully utilized, ICDC saw that another approach was needed to help the producer benefit fully from the information. In this day and age, everything has gone digital, mobile, and paperless. ICDC wanted to produce an easy-to-use calculator to allow a producer to personalize the *Irrigation Agronomics and Economics* publication for their own use. This required building formula sheets that a producer could fill out with their own numbers. Once the costs are entered, the spreadsheets will auto fill with valuable information specific to the producer's own operation.

Although this process may sound intimidating, the chart is really very simple to complete. The calculator has specific step-by-step instructions regarding the information that needs to be entered. A second column for all the assumptions is produced alongside the original numbers from the publication. Yellow highlighting shows the areas that require input so the numbers register in the spreadsheets. The example below shows one of the formula sheets from the calculator.

The spreadsheets can be saved and filed on the computer for later reference, or printed and filed. Below is an example of the spreadsheet that has incorporated farmer input.

SEEDING RATES AND SEED COST

CROP	Plants per sq m	TKW (g)	Seeding Rate per acre	Seeding Rate per acre	Seeding Rate Units	Seed Cost $/Unit	Seed Cost $/Unit
Hard Wheat	250	42	110		lb	$0.21	
Durum	250	45	120		lb	$0.22	
CPS Wheat	250	42	110		lb	$0.21	
Soft Wheat	250	39	110		lb	$0.18	
Malt Barley	270	41	110		lb	$0.21	
Feed Barley	320	41	130		lb	$0.20	
Oats	300	41	120		lb	$0.22	
Canola	110	5	5		lb	$11.25	
Soybean	45	Variable	180,000		cost/acre	$110.00	
Flax	500	5	40		lb	$0.45	
Pea	80	240	180		lb	$0.21	
Fababean	40	440	180		lb	$0.23	
Red Lentil	120	40	45		lb	$0.36	
Dry Bean	25	345	75		lb	$1.00	
Grain Corn	7	380	32,000		cost/acre	$70.00	
Corn Grazing	7	380	32,000		cost/acre	$70.00	
Corn Silage	7	380	32,000		cost/acre	$70.00	
Cereal Silage	320	41	130		lb	$0.20	
Alfalfa Seedling	30 to 40		10		lb	$4.20	
Alfalfa (2 and 3 cut)							

The digital format allows the worksheet to be modified many times and easily shared with accountants, crop advisors, and others. It gives you the ability to change or add updated values. For example, it is unlikely that fungicide will be purchased when seed is, so a number can be estimated to produce a budget and replaced when a real cost is known. The calculator can also be used throughout the year as grain prices fluctuate. Simply input the changes and follow the possible returns. The breakeven price and yield have been added to provide targets needed to realize a return.

The agronomic and economics calculator is set to be released by March 31, 2014. It will be found at http://www.irrigationsaskatchewan.com/ICDC. If there are any questions or comments please contact Jeff Ewen, Irrigation Agrologist at jeff.ewen@gov.sk.ca.

ECONOMICS

CROP: HARD WHEAT

Item		Unit	$/ac	Rate	My Farm $/ac
Seed			$23.10		$21.60
Seed treatment			$9.36		$8.75
Soil test			$0.65		$0.65
Fertilizer: N	135	lb	$78.56	150	$90.25
P_2O_5	45	lb	$20.42	50	$22.57
K_2O	15	lb	$4.94	10	$3.51
Herbicide			$20.25		$17.00
Insecticide *			$0.00		$0.00
Fungicide			$18.00		$15.00
Equipment fuel			$18.53		$18.53
Equipment repair			$6.22		$6.22
Custom work			$7.00		$0.00
Irrigation power	12	inches	$20.40	10	$20.00
Irrigation repair			$11.28		$11.28
Irrigation service/water charge			$34.34		$30.84
Crop insurance †	52	bu/ac	$4.78	52	$4.78
Hail insurance			$7.80		$7.80
Hired labour	0	hr/ac	$0.00		$0.00
Other			$0.00		$0.00
Farm overhead			$9.20		$9.20
Operating interest	4.2	%	$6.19	4.2	$6.05
Total Cash Costs			**$301.02**		**$294.03**
Farm Equipment & Buildings			$51.57		$51.57
Irrigation System			$28.03		$29.07
Specialized Equipment			$0.00		$0.00
Land			$42.19		$42.19
Total Non Cash Costs			**$121.79**		**$122.84**
Total Costs			**$422.80**		**$416.86**
Returns		**AVG**	**Target**		**Target**
Yield bu/ac		70	80		85
Price $/bu (#1 13.5%)			$4.43		$5.00
Gross Return		**$310**	**$354**		**$425.00**
Net Return		**-$113**	**-$68**		**$8**
Specialized Equipment			$/ac/yr		
TOTAL			$0.00		
Break Even using Target Returns and Total Costs					
Break Even Price		**$/bu**	**$5.29**		**$4.90**
Break Even Yield		**bu/ac**	**95**		**83**

More Information:
Call an Irrigation Agrologist at (306) 867-5500 or check our website: www.irrigationsaskatchewan.com.

AGRONOMICS

Variety Selection:
Vesper VB, Unity, and CDC Utmost are wheat midge tolerant varieties. Vesper VB, 5604HR CL, and CDC Kernen are high yielding varieties. Carberry is resistant to fusarium head blight. Select an irrigated variety on the basis of high yield, lodging resistance and disease resistance. See 'Crop Varieties for Irrigation' publication.

Seeding:

Plant population	250.0	plants/sq m.
TKW	42.0	grams
Seeding Rate	110.0	lb/ac

Seed before May 15th.

Fertilization:
Apply 120-135 lb/ac N, 30-45 lb/ac P_2O_5 and 10-15 lb/ac K_2O.

A soil test will give recommendations for fertilizer application based on soil nutrient levels and crop needs.

Crop Water Use and Irrigation:
Total seasonal crop water use: 460 mm
Emergence to Tillering: 1.0 to 4.5 mm/day
Stem Extension to Heading: 3.5 increasing to 6.5 mm/day
Flowering to Late Milk: 5.5 to 7.5 mm/day
Early Dough to Maturity: 6.5 mm/day
Critical stages for moisture are tillering and flowering. Maintain soil at >50% available moisture. Use a soil probe to check moisture status.† Allow the canopy to dry between irrigations to minimize disease pressure and lodging.

Harvest:
Swath or desiccate at a kernel moisture content of 30%. The kernel will dent with pressure. In some years the straw may still be green. Decide on the basis of grain firmness and

Handling, Storage and Grading:
Dry 14.5%; Tough 14.6%; Damp 17.0%

Rotations and Crop Protection:
Fungicide seed treatment recommended. Wheat on wheat stubble will yield at least 15% less than wheat on broadleaf stubble due to disease build-up. Break from cereals for one year. Fusarium head blight is a concern on irrigation. Hard wheat is less susceptible than durum, but a fungicide application is recomended for control.

* Wheat midge may require control.
† Crop Insurance rates currently under review.
† Refer to the Saskatchewan Ministry of Agriculture Irrigation Scheduling Manual

Sample of a completed calculator

The Tall and the Short of Plant Growth Regulator Use in Irrigated Wheat

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Lodging can be an issue in irrigated wheat production. With adequate or excess water, a wheat crop can lodge and yield and quality will go down with it. Producers often limit their fertility and irrigation application to avoid lodging, which will also limit yield potential. Plant growth regulators (PGR) can potentially reduce wheat crop height, which may make it less prone to lodge. This would allow irrigators to increase fertility and irrigation, which could increase yield.

Figure 1. Plant samples taken on July 19 Left: Treated with a PGR. Right: Untreated.

PGRs are common in Europe, other grain growing regions of Canada, and in horticulture production. PGR application in grain crops in the western prairies has been tried, but with limited success. Some older PGR products can negatively affect the crop and cause yield loss. These potentially negative effects prevented wide-spread adoption of their use. However, new products have eliminated many negatives associated with PGR application.

PGRs affect growth by inhibiting or promoting production of certain plant hormones. There are two specific types of hormones that are related to PGRs: ethylene and gibberellins.

Ethylene

The function of ethylene in most plants is to inhibit cell expansion. If an ethylene product is applied at the right growth stage of wheat, it can decrease upward growth and increase stem thickness. Ethylene is also involved with the release of dormancy, leaf and fruit abscission, flower opening, and fruit ripening.

There are very strict regulations and a small, difficult window of application for current products that use ethylene. The ideal time to apply an ethylene-based PGR is after the flagleaf is fully developed and before the heads emerge. In Saskatchewan's hot summers, this can be an extremely short window. If applied too early, the growth of the flag will be reduced, and this will limit photosynthetic ability and impact yield. If it is applied too late and comes into contact with wheat heads, it will negatively affect the grain growth, which will reduce yield and quality. ICDC has not performed any recent studies on ethylene-based PGRs.

Figure 2. Plant samples taken on August 14. Left: Treated with a PGR. Right: Untreated.

Gibberellins

The function of gibberellins is to stimulate plant stem cell division and elongation. They also have a role in seed dormancy, enzyme production, and fruit development.

PGR related to gibberellins are commonly referred to as anti-gibberellins. These products will temporarily inhibit natural plant production of gibberellins. This inhibits cell elongation, which can result in shorter crop height. The application window of anti-gibberellins products for wheat is much earlier and longer than ethylene-based products. This application window begins when there is a main shoot and one tiller and continues until the first node is detectable (Zadoks Scale 21–31). When applied at this stage, cell elongation will be inhibited. After a short period, the PGR will be metabolized by the plant and regular growth will resume with no negative effects.

In 2013, ICDC, in partnership with Engage Agro, ran a field-scale demonstration of a PGR that inhibited gibberellins. The active ingredient is chlormequat, which goes by the product name of Manipulator. When applied to an irrigated wheat crop, a 13 cm height reduction (Figures 1 and 2) and a 9 bu/ac yield benefit was observed when compared to the untreated check. The co-operating producer also noted that the untreated area looked like it would lodge if another heavy water event were to occur. The area treated with a PGR did not look prone to lodging (Figures 3 and 4).

Manipulator will not be commercially available until the 2015 growing season. ICDC intends to expand demonstrations with Manipulator in 2014. ICDC will be investigating application timing as well as increasing fertility and irrigation amounts in PGR-treated wheat in an attempt to maximize yield.

Figure 3. Untreated area - individual plants beginning to fall over.

Figure 4. Treated with PGR - does not appear to be prone to lodging.

Update on Copper Fertility for Irrigated Soils

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Copper deficiency in irrigated soils is not widespread but can significantly reduce yield where it does occur. Sandy soils are most prone to copper deficiency because the minerals that comprise this texture contain less copper. Production of high copper-demanding crops, such as wheat, barley, oats, alfalfa, corn, flax, and canaryseed, remove more copper from the soil and gradually stress the copper-supplying power of the soil. A 60 bu crop of wheat removes 5–14 grams of copper per acre. Rotating high and low copper-demanding crops is a temporary solution that may delay the need to apply copper fertilizer.

Irrigation extends profitable annual cropping to sandy soils that would otherwise be limited to pasture or hay. High yields on these soils under irrigation removes more nutrients from the soil reserve, and after several decades, draws down the soil's copper-supplying power.

An ICDC project conducted on sandy irrigated wheat fields during the 2013 growing season found yield response of 4–6 bu/ac to foliar copper at two of six demonstration sites. The foliar copper was tank mixed with fungicide and applied at the flagleaf stage to minimize the number of field passes with the sprayer. Previous work in the 1980s showed dramatic reduction of head bending and lodging for wheat grown on copper deficient soils with foliar application of 0.2 lb Cu/ac at early flagleaf stage. Correction of lodging with the copper application is an indicator of low copper fertility status of the soil and the potential for yield response.

Visual correction of head bending and lodging associated with copper deficiency was not achieved with the foliar application of copper in the ICDC demonstrations. Fungicides, which are routinely applied to irrigated wheat to control disease, contain adjuvants, which intensify the damage of the copper fertilizer to the flagleaf. This risk of injury to the flagleaf limits the rate of copper that can safely be applied with fungicide. Sufficient copper could not be applied in a fungicide tank mix to fully correct copper deficiency on responsive wheat fields.

Control of bacterial blight in dry bean production is achieved with fungicide that contains copper. This disease control treatment effectively acts as copper fertilizer for crops grown in the irrigated rotation. This coming season, ICDC will have a demonstration on some low copper testing irrigated fields. Copper will be applied at several rates and timings in an attempt to correct head bending and lodging.

Wheat that has been treated with copper. Note that the stalk is straight.

Wheat not treated with copper. Note the bend in the upper stalk.

ICDC Publications

ICDC Research and Demonstration Program Report 2013 Detailed descriptions of the projects undertaken and funded by ICDC.

Irrigation Economics and Agronomics An annual ICDC budget workbook designed to assist irrigators with their crop selection process. Irrigators can compare their on-farm costs and productivity relative to current industry prices, costs and yields.

Crop Varieties for Irrigation A compilation of yield comparison data from irrigated yield trials managed by CSIDC. It is useful as a guide for selecting crop varieties suitable for irrigation.

Irrigation Scheduling Manual Provides technical information required by an irrigator to effectively schedule irrigation operations for crops grown under irrigation in Saskatchewan.

Irrigated Alfalfa Production in Saskatchewan Provides technical information regarding the production practices and recommendations for irrigated alfalfa forage production.

Management of Irrigated Dry Beans This factsheet provides a comprehensive overview of agronomic management requirements for producing dry beans under irrigation.

Corn Production This factsheet provides information on corn heat units, variety selection and an overview of agronomic management requirements for producing grain, silage and grazing corn under irrigation in Saskatchewan.

Copies of these publications are available from the Ministry of Agriculture's Crops and Irrigation Branch office in Outlook , SK, or from the ICDC website at www.irrigationsaskatchewan.com

2014 Proposed Projects

- Demo of Perennial Forage Crops
- P K & S Fertilization of Alfalfa
- Saline Tolerant Forage Demonstration
- Corn Variety Demo for Silage & Grazing
- Forage Yield and Quality of New Annual Forage Varieties
- Corn Weed Control Demonstration
- Corn Variety Demo for Silage and Grazing
- Field Demonstration of Plant Growth Regulator Application on Irrigated Wheat Production
- Demo of Hilling in Wide Row Dry Bean Production
- Demo of Using Single and Multiple Modes of Action for a Double Fungicide Application System in Irrigated Canola
- Demo of Plant Growth Regulator Application in Irrigated Wheat production
- Winter Wheat
- Flood Tolerance of Selected Pulse Crops
- Reclamation of Sodium Affected Soil
- Nitrate Analysis of Green Feed Oats on Irrigated Alfalfa Breaking
- Copper Fertility on Sandy Soil under Irrigation
- Vertical Tillage under Irrigation
- Maximum Economic Yield under Irrigation
- Fertigation Application Timing
- Winter Wheat Variety Evaluation for Irrigation
- Chickpea Flax Intercropping
- Irrigation and Fertilization Practices for Irrigated Production Systems
- Cultivar development and evaluation Trials
- Irrigated Crop Variety and Agronomy Technology Transfer
- Administration and Project Management
- Crop Cultivars for Irrigation in Saskatchewan
- Irrigation and Fertilization Practices for Irrigated Production Systems in Saskatchewan

ICDC Workplan Budget for 2014–2015

Income & Expenses

Projected Income		
Member Levies	100,000.00	
Operating Grant	100,000.00	
Interest		
Project Funding	20,000.00	
AgriArm Funding	75,000.00	
TOTAL Projected Income		**295,000.00**
Projected R&D Expenses		
R & D Projects	22,000.00	
Field Supplies/Soil Testing	1,500.00	
Contract Researcher/Technician	140,000.00	
Students & Tech Assistants	8,000.00	
Conferences & Reporting	0.00	
Total Projected R&D Expenses		**171,500.00**
Projected Admin Expenses		
Communications	10,000.00	
Audit/Insurance/Legal	10,000.00	
Administration & Bookkeeping	5,000.00	
Website	500.00	
Advertising	2,000.00	
Meeting Expenses	10,000.00	
Computer & Telephone	10,000.00	
Licence of Occupation	13,546.50	
Total Projected Admin Expenses		**61,046.50**
TOTAL Projected Expenditures		**232,546.50**
PROJECTED SURPLUS		**62,453.50**

2014 Events

Irrigation Agronomy Update

March 18, 2014 – Heritage Centre, Outlook

March 20, 2014 – Community Hall, Riverhurst

CSIDC Irrigation Field Day

July 10, 2014

SIPA/ICDC Annual Conference & AGMs

Temple Gardens Spa, Moose Jaw, SK

December 9 & 10, 2014

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