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Understanding Canada's Agricultural Sink Policy

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Canada has ratified the Kyoto Protocol and has released its Climate Change Plan. Kyoto's intention is to reduce greenhouse gas levels in the atmosphere. There are two methods to do this. The first is to reduce emission levels and the second is to remove and store (sequester) CO_2 as carbon in forests and ag soils (carbon sinks). We must give the Canadian government full credit for the efforts they made in getting international recognition for ag sinks.

The challenge we face as farmers is to see that the value accrues to the farmers who use the Best Management Practices (BMPs) that sequester carbon. To explain, this let's use a 'garage' analogy. Farmers that employ BMPs such as zero-till, direct seeding and seeding permanent cover remove and store CO_2 in the soil. (In terms of our analogy farmers create carbon storage "garages".) These ag sinks (or carbon garages) were recognized in the Marrakech round of the Kyoto negotiations as RMUs (emission removal units) and create tradable offsets. RMU offsets and ERU (emission reduction units) offsets will be tradable internationally. These may both translate into ERC, (emission reduction credits) in domestic markets. We will talk about market structures later.

Our federal government has complicated this RMU offset market by proposing that there be two pools of offsets. One pool is called business as usual (BAU) offsets and the other pool is tradable offsets. Both pools will be used to meet the nation's Kyoto commitments. Let's for the sake of our analogy call the BAU offsets RED garages and the tradable offsets GREEN garages. The difference in the market place is that the RED garages are to be owned by the Federal government and the offsets will be used to lower the Nation's emission targets. The GREEN garages are the property of farmers and have value in the Emission trading market place. Farmers will only be able to use GREEN garages in emission markets. RED garages will have no value for the farmer.

This is difficult to comprehend since both the red and green garages are created as a result of individual farmers' actions and will be maintained by those same farmers. The question farmers now need answered is "Are the garages on my farm RED ones (the property of Canada) or GREEN ones (have value to me)?"

The Canadian plan at this time does not offer a clear definition of what makes a garage RED or GREEN but until told differently we can assume that the color of the garage is dependent on when the farmer adopts the BMPs that build the garages. This is to say that if you started BMPs like zero till, direct seeding or seeded permanent cover any time before 2008, all your garages are RED and are the property of the Federal government. If you start the same BMPs like zero

till, direct seeding or seed permanent cover after 2008, your garages are all GREEN. This will become extremely complicated.

In Saskatchewan, with nearly half of Canada's cropland and a large adoption rate of BMPs, a very large proportion its garages will be RED. It stands to reason then that farmers will want GREEN garages in order to receive value for their efforts.

If you are not presently direct seeding or are planning to seed permanent cover in the near future, this Federal plan is telling you that if you want to benefit from the offsets created, it would be prudent not to start until 2008. BAU offsets will discourage ag sink creation.

What if you already have "RED garages"? Presumably you could burn them all down through the use of lots of tillage and then at a later date replace the valueless RED garages with GREEN ones starting in 2008. Why would Canada implement a policy that results in a perverse incentive to preserve ag soil sinks? Whether the carbon is stored in a RED or a GREEN garage is irrelevant as far as the greenhouse gas concentration in the atmosphere is concerned. The intent of Kyoto is that CO_2 be removed from the atmosphere be stored in the soil and not be released back into the atmosphere.

How should farmers approach the (tradable offset) market place? There will be domestic markets (where the color of your garage seems to matter) and an international market, which presumably will be colorblind. Perhaps farmers should ignore domestic markets and insist on participating in International markets that have no bias.

The existence of RED garages may eliminate or at least severely impact the market for GREEN ones. An emitter needing some place to store surplus emissions may not be willing to lease a GREEN garage from a farmer if it could turn into a RED garage. The two offset pools will certainly delay the development of any market system until the definition of what is RED and what is GREEN is clear.

Likely farmland that has only RED garages (no market value) will be worth less than land with GREEN garages. ***Not only will the early adopter be denied a potential revenue source afforded only to the adoption laggard the value of his land will also diminish.***

Let us now forget about color and explore market mechanisms. There have been a few offers to buy ag sink offsets. These offers have been put together by Emitters that want to purchase offsets, and traders that want to be middlemen hoping to profit from the transactions. They treat RMUs as a commodity and appear to involve carbon or conservation easements.

We all must recognize that sinks are a biological process and can be lost as well as created, sometimes by default and sometimes by intent. For example a forest sink could be lost by fire (default) or harvesting the trees (intent). Ag soil sinks can be destroyed by employing tillage (don't like red garages) or any one of many factors like drought, increased summer fallow or tillage to control weeds. The first example is intent; the rest are by default. Selling Ag sink offsets would be the same as expecting farmers to provide a carbon storage garage with a perpetual maintenance contract. Will the Federal government provide perpetual maintenance for

the RED garages? It is unfair to expect farmers to both provide the RED garages and expect perpetual maintenance with no recognition. Regardless of color, preserving these garages is an issue.

Hopefully the RED/GREEN garage debate will leave the farmer with some GREEN garages. Clearly using garages as a commodity (selling them) with a perpetual maintenance contract would require farmers to assume an unreasonable level of risk (Bennett and Mitchell 2000). A more sensible approach would be to lease the garages. To explain this concept we will borrow an analogy from a paper (Marland et al).

In this analogy, a party (someone with surplus emissions) can lease a garage (hopefully painted GREEN) to park his car (surplus emission). At the end of the contract he can renew the lease. Or find another place to park his car. The party may have used the lease term to find a better lease agreement else where, built his own garage, or has decided to park his car on the street and suffer the regulatory consequences. The party may have found another mode of transport (reduced emission levels), and may no longer need the garage. Then it would be available again for lease to another party. There is also a possibility that the garage owner (farmer) may need to use the garage himself.

A lease arrangement was signed between the PNWDSA (Pacific Northwest Direct Seed Association) and an energy consortium, Entergy. This agreement leased RMU offsets supplied by farmers to Entergy for a fixed time period for an agreed on price. This agreement spelled out the maintenance obligation assumed by the farmer as well as the term of the agreement.

The most sensible way to approach the ag soil sink issue is to use a contractual agreement for both BAU and tradable offsets that works like a storage lease. Farmers should get recognition and value for creating, and preserving all the ag soil sink offsets Canada uses to meet its Kyoto commitments.

The current Federal plan will act as a perverse incentive for farmers to continue current BMPs that preserve ag soil sinks. This plan will also discourage farmers not currently practicing BMPs from adopting them and adding to ag sink potential. The decisions determining Ag sink creation and maintenance will be made by individuals on a farm by farm basis. ***A plan that does not support good current BMP practices and delays their future adoption would not be in farmer's or the Nation's best interest.***

If the maximum contribution that ag soil sinks can make towards Canada's Kyoto targets is not achieved it will, by default, lead to higher cost emission reduction measures domestically and a greater reliance on international credits purchased offshore.

We should all keep in mind the "Little Red Hen" story, substituting the carbon storage, for the making of the bread. The farmer after all makes the decisions, buys the machinery, purchases the inputs, supplies the management and does all the work that creates the carbon sink as well as providing for its future maintenance. The Federal government is like the Little Red Hen's friends who provided none of the work and very little of the investment to make the bread but want a large share of the loaf.

It is only fair that farmers receive recognition and value for their investment, and efforts in creating, and maintaining the emission storage garages (ag sinks) that Canada will need to address Kyoto.

President's Message: SSCA Board Working to Ensure Carbon Credits Credit the Producer

Don Horsman,

President SSCA

As I sit down to write this article in mid-January, there is "some" snow on the ground and it is -25 degrees C. We all wish for a nice deep blanket of snow across the prairies before spring. There has been so much talk about drought and grasshoppers that it seems to consume the agricultural press and the industry as a whole. It is important to remember that there are a number of positives--prices are up and for those who had just an average crop, it will be a very good year.

In the longer term we should be proud of our industry, one that has gone through many changes in the past 20 years, probably more than any other industry. The changes in this industry have been achieved by producers who are industrious, innovative and visionary. The livestock industry has new management systems and types of livestock unheard of a few years ago. The grains industry has more crops, improved and varied cropping systems and more efficient equipment. There are processing plants and equipment manufacturers all across this province. This adds to the diversity of our agricultural industry, the province, and the nation. Most of these innovations in agriculture were started by some individual(s) with a good idea. SSCA was organized by a group of such individuals. SSCA as a soil conservation group gives us the opportunity to feel positive about soil conservation and the ability to produce a crop under difficult conditions. The important thing to remember is the positive change and the fact that it was done by producers.

In December the federal government ratified the Kyoto accord. They also have been developing a new agricultural policy framework (APF). As I said in the last edition, one of the chapters of the APF is the environment in which the priority areas are soil, air, water, and biodiversity. They also believe that the way to effect changes in these areas is through an environmental farm plan something like the one that Ontario has had for about 10 years. The provincial council of ADD boards (PCAB) has received CARD funding to prepare a workbook to be used for an environmental farm plan in Saskatchewan. Also part of the APF environmental chapter is a permanent cover program. At this time, they have proposed a plan in which they would have a contract with a producer. The producer would seed a Green Cover Program and maintain it for at least ten years. Agriculture Canada would pay $45/acre of which $20/acre is for seed; the remainder is a one-time acreage payment. The interesting twist on this is that the federal government would claim ownership of carbon credits produced by this cover crop.

Not only are they claiming credits under the Green Cover Program, they now have also introduced a term "business as usual" (BAU). With this term, they are saying that farmers started practices like direct seeding for soil conservation purposes, not to produce carbon credits. Therefore, those carbon credits do not belong to producers. Producers who direct seed, particularly the early adopters, are positive individuals who are well described by the terms used earlier--visionary, innovative and industrious. The changes that were made to direct seed and the actions needed to maintain the carbon sink in the soil have been and will be done by producers. SSCA objects to anyone other than producers receiving the benefit of those actions. The policy of SSCA as passed at the board meeting Nov/02 is: "That farmer's actions can both reduce, and remove and store greenhouse gas emissions as a result of their management practices. The value that results from these actions must accrue to the farmer. Any emission reduction and/or removal credits created are the property of the farmer."

SSCA has formed alliances with other farm organizations, has met with the Hon. Ralph Goodale, and is presently working on other strategies to change this federal policy. The carbon credits produced by the actions of Canadian and Saskatchewan farmers is just another good news story for Canada and particularly Saskatchewan (almost 50% of arable land is in Saskatchewan). We need to keep the benefit on those farms.

Executive Manager's Report

By Blair McClinton, PAg

SSCA Executive Manager

Over the past few months, SSCA has been very active either working to secure funding to continue delivering our field extension programs or working to develop sound policy related to climate change and carbon sequestration.

At the end of March, SSCA's three-year funding arrangement with the provincial government ends. This funding played an important role in helping SSCA maintain its Staff resources allowing SSCA to lever additional funding from other sources. We are still hoping to continue this arrangement into the future but nothing has been finalized to date.

2002 was a challenging year for the entire prairie agriculture sector. We had some concerns that we could lose some support from our industry sponsors. However, Monsanto is still committed to supporting SSCA's programs for 2003. Several other companies continue to support SSCA through sponsorship of the Direct Seeding Conference.

Over the past two years, Ducks Unlimited Canada has contracted SSCA to deliver part of their efforts to promote winter wheat production. We are currently in the process of developing a new winter wheat program starting in April.

In mid-December, the Soil Conservation Council of Canada rolled out the national Greenhouse Gas Mitigation program for soil and nutrient management. This program will promote a variety of agricultural best management practices that either sequester carbon or reduce nitrous oxide emissions. I described some of these BMPs in the previous Prairie Steward. The SSCA is taking a lead role to develop and implement this program in Saskatchewan.

With the ratification of the Kyoto Protocol behind us, industry and various levels of government are working to develop their implementation plans. These plans will likely focus on two main areas: emission reductions and emission removals through carbon sinks. In both cases, management practices are being developed to help address these issues.

Agriculture is expected to contribute 20% of Canada's emission reduction target with half of this made by Saskatchewan farmers. This is a very large contribution considering primary agriculture only contributes approximately 1.7% of Canada's GDP (Source: AAFC). However, as John Bennett's article states, there are many roadblocks, like the question of ownership with "business-as-usual" sinks that may prevent the agriculture sector from achieving its emission reduction potential.

Producers should also keep an eye on some of the other industrial sectors that affect agriculture. The most prominent is the transportation sector. Policies in this sector affect the potential for

new developments like ethanol and biodiesel, and selecting modes of transportation (road vs. rail).

In addition to promoting farmer ownership rights on carbon credits, SSCA will continue to monitor and keep you informed on the climate change issue as it develops. Best wishes for the 2003 season.

Retrofit to Direct Seed Profitably

By Garry Mayerle, PAg

Conservation Agrologist

Direct seeding can be made to work profitably on any size farm. The Craigs who farmed at Carrot River have demonstrated that big acreages, and large new equipment are not necessary to obtain benefits from low disturbance seeding.

Osborne and Dorothy Craig just retired from farming this past spring. They farmed in the NE corner of the province straight east of Carrot River about as far as you can go before you run into the Wildcat Hills. They cropped about 550 acres of grey wooded soils (Tisdale silty clay loams).

Osborne's interest in reducing tillage was first sparked in 1977. He rented a John Deere 2 rank hoe drill to seed some winter wheat into standing canola stubble. Of course the drill didn't have enough clearance and acted like a rake. However, Osborne was very happy with the yield and felt there were big benefits from trapping snow and conserving moisture.

Osborne was very active on the District #31 ADD Board. One of their projects was investigating alternative seeding methods. They worked with Jim Halford and Professor Grant Milne from the U of S on a demonstration with an early Conserva Pak drill. Osborne had a trial on his farm. One year they seeded canola into wheat stubble and compared it to a conventionally tilled and seeded field right beside it. There was a yield advantage of 10 bu/ac or better that year and the Craigs were convinced. Osborne kept the trial going for 10 years. (See Chart 1 for some of the results)

CHART 1 - ADD BOARD DISTRICT #31SOIL CONSERVATION RESULTS - CRAIG SITE

Year	Crop	Direct Seed Yield bu/ac	Conventional Yield bu/ac
1989	Wheat	47.0	52.1
1990	Wheat	41.0	33.4
1991	Canola	40.6	24.3
1992	Barley	85.1	70.3
1993	Barley	Yields not taken	
1994	Canola	19.8	17.5

1995	Barley	82.2	77.9
1996	Barley	65.9	74.2

From then on, Osborne was determined to make direct seeding work on his farm. For 3 years he hired a neighbour with a Conserva Pak drill to do his seeding. This cost $16/ac and Osborne began looking for his own equipment for direct seeding. He started off with an IH 7200 hoe drill and a two pass system where he knifed in NH_3 with an old MacGregor tine applicator. He made this application in the spring but the row spacing was quite wide on these applicators and there was often crop streaking. He tried spreading dry fertilizer on the surface but unless there were timely rains, he was not happy with the results.

There were 2 hoe drills in the region that had been retrofitted with mid row band NH_3 applicators and Osborne decided to make this work on his drill too. His drill was one 14 ft. section so filling the drill with a NH_3 tank hooked behind the drill was not too difficult. He used K-Hart coulters to apply the NH_3. These are smooth bladed coulters which swivel and can trip. The NH_3 plastic tubes run to the bottom of a 5/8 inch X 18inch coil type tine which follows immediately behind the coulter in the slot it cuts. Osborne had a welding shop extend the frame on his drill. The front wheel was moved ahead 4 feet with new frame added to support it. The coulters were mounted on a hydraulically actuated subframe which raised and lowered the coulters. Osborne says that the design worked great except for a couple of coulters that hooked at the top position. The coulters were about $400 each with the total cost for materials running about $5000.

The hoes are 7inches apart and the coulters run between every other hoe at 14inches apart. Osborne says that even where the slot behind the coulter does not close the hoes next to it throw enough dirt to close it. The coulters ran 2 to 3 inches deeper than the seed openers. He did keep his seeding speed down to 4 mph to keep front seed rows from being buried deeper. Osborne started out with an eagle beak type of seed opener but these soon wore unevenly resulting in uneven seeding depths so he replaced them with Atom Jet carbide openers. He was very happy with them. One down fall with the drill is that it tends to pull out rocks.

To manage his residue better, Osborne lengthened the straw chopper fins on his CCIL 9600 combine. He did not use a chaff spreader and did not seem to have any problem with chaff rows probably because he was only cutting 15 feet wide. He did seed on an angle which helps alleviate residue row problems. The last 2 years before he retired were very dry years in his area and residue was not breaking down as well so he harrowed. He did note though, that harrowing does promote weed growth.

Lower disturbance seeding reduced weed populations for Osborne. Interestingly, he notes that with direct seeding, he felt confident seeding wheat into barley stubble (or vice versa) without seeing volunteer barley rows in the field. A custom operator did his Round-up burn off so he often did some pre seed and some post seed burn off. There were times when burn off was not needed especially if he knew he would be using a strong dose in crop.

One of the interesting points about Osborne's rotation is that he is very positive about seeding into herbicide terminated alfalfa. He says taking a year to summerfallow alfalfa is a waste. He would spray ½ L of Roundup on the alfalfa to be terminated in the fall, another ½ L in the spring before seeding and then he felt the ground was mellow for seeding Roundup Ready canola. Another ½ L in crop pretty well took care of the alfalfa.

Retrofitting his hoe drill to precision place NH_3 meant that Osborne was able to make 1 pass low disturbance seeding work and produce good yields on his farm.

Pasture Plow Plays Role in Conservation

By Juanita Polegi, PAg

Assistant Manager

When you hear the word "plow" you don't often think of conservation. Watch a Pasture Plow in action and you soon see how this plow has a role to play in the conservation effort, especially of wetlands.

A field in which the Pasture Plow was located was one of the many stops on the Livestock Watering and Grass Establishment Field Day sponsored by the Sask. Watershed Authority (formerly the Sask. Wetlands Conservation Corporation) last August. The farmers in attendance were impressed by the simplicity of the machine and the speed at which it's able to lay the pipe.

Jason Puckett, Watershed Coordinator of the Upper Assiniboine River, organized the field day. He said the Authority encourages farmers to adopt watering systems that restrict livestock, especially cattle from the fragile shores of sloughs and stream banks.

"An off-site watering system enables the farmer to manage both his livestock and the wetlands for maximum productivity. When a farmer sees a benefit to his cattle when they have restricted access to the wetlands, he'll make sure the wetlands are protected. It's a win-win situation for the farmer and the conservation effort."

Expanding on the win-win theme, Jason explained that in the spring, the shores of wetlands are extremely susceptible to damage by cattle hooves. The shores become hummocky and aren't able to do the job of filtering run-off properly. In turn, the slough water becomes dirty form sediment moving into the water and of course, from the cattle dropping their manure into it. As the water becomes murkier, it is less palatable and the cattle don't drink as much. As a result, their weight gains aren't as large as they could be.

Also affected is the vegetation surrounding the slough's edge. The native vegetation most commonly found around a slough is more productive in the fall, holding its protein longer than domestic grasses. A general rule of thumb for grazing wetland/riparian areas is to "take half, leave half" - meaning that the more vegetation available to act as a water filter in the spring, the better the quality of the water.

Off-site watering ensure the cattle always have fresh, clean water. In fact, many farmers have indicated that given a choice between water pumped off-site to the stuff in the slough, the cattle choose the off-site water. Dick & Diane Coombs of Wroxton can attest to that. While their cows were allowed to graze in and around a slough in the fall, they always walked back up the knoll to the water tanks. The Coombs pipe their water a short distance from the slough to the tanks. Some other ranchers in the Yorkton area are using the Pasture plow to establish their off-site watering systems that are often great distances from the water source.

Mark Johanson has ranched near Yorkton for a number of years and is presently setting up a ranch near Stockholm (Saskatchewan, that is - not Sweden). In the spring of 2003, Mark will be attempting to supply water to 13 quarters of land from one water source. He wasn't quite sure how he was going to achieve that until he spoke with Neil Lamberty of PFRA and Stu Cairns with Ducks Unlimited. These fellows told Mark about the Pasture Plow they had heard about in Manitoba designed by Howard Ganski. Mark was intrigued by the idea. "Piping the water underground makes so much sense", he said. "For summer watering, it's slick". In fact, Mark and was in the process of building one for himself when he got a phone call from Howard who wanted to make sure Mark built it correctly.

The design of the plow is really quite simple. The opener for cutting the furrow is about 3 inches wide. Most often, the furrow will fall in right behind the opener over the pipe. If the soil is too dry, Jason indicated some ranchers will drive a truck over the furrow to tamp it in.

Mark uses a 2 inch high-density pipe, as it won't be hurt by the frost. The pipe is UV treated, 100psi and CSA approved. To join the pipe sections, he is currently using PVC fittings with T blot clamps. He said the T bolts clamps are a must for the extra strength they provide. Depending on the maximum water volume required, the pipe used can be as small as 1 inch or as large 3 inches.

Laying the pipe is very quick. Three hundred to four hundred yards can be laid in about 4 minutes. The tractor should have at least 80 hp. Mark likes to lay the pipe about 10 inches deep although some ranchers will go deeper. Mark thinks shallower is better. "If you never intend to break the land, lay the pipe as shallow as possible so that it will thaw more quickly in the spring. If you think you might catch the pipe with a deep tillage cultivator, then put it down a bit deeper".

The initial cost of laying the pipe may seem rather expensive (about 60 cents per foot, including the cost of the 2 inch pipe, fittings and the rental of the plow). Again, depending upon the volume of water required, Mark said smaller pipe may be used. "If you're just trying to water the home section, you can get away with 1 inch or 1 ¼ inch pipe, just depending upon the distance and the water volume and that will drop your costs even further" he said. Jason indicated that most producers who have established the system find it pays for itself within a couple of years through increased weight gains on the stock. Mark agrees. "We want good pasture and good water. The water needs to be clean and it needs to be close to the animals. This system ensures that happens". Mark indicated that when cattle have to walk more than 900 feet to water, they tend to overgraze the areas close to the water and undergraze the areas further away. Having water close to the animals ensures they better utilize their pasture.

Piping water from a wetland has 2 main benefits. It protects the wetlands from the livestock and it ensures higher gains in the herd. This is a way for the rancher to conserve the wetlands that are so important for maintaining a healthy natural resource. A win-win situation for both the bottom line and the environment.

For more information on the Pasture Plow, contact Mark Johanson at 783-5462 or 621-5770. For more information on remote watering, contact your local PFRA Area Office, DUC office or Sask. Watershed Authority office.

How Much is Too Much?

By Tim Nerbas, PAg

Conservation Agrologist

As with most things in life, too much of a good thing can do more harm than good. Whether it is chocolate, beer or soil fertility, when we push the toleration limits we should expect the unexpected.

This spring many producers are considering putting all the fertilizer down in one pass. The SSCA promotes one pass seeding for a variety of reasons including soil conservation, reduced fuel usage, and improved nutrient use efficiency. But the key to success lies with successful crop establishment. Sometimes this isn't possible with a single pass for a variety of reasons. Therefore, it is crucial to adhere to some important one-pass guidelines.

Can your existing equipment do the job? If not, depending on your circumstances, you may want to consider some of the retrofits that have proved very successful. The key is a seeding tool that maintains good depth control across the entire machine. Good depth control ensures even emergence throughout the field.

Does your equipment provide proper packing or can you add on-row packing? Packing the seed-row ensures good seed to soil contact. But be aware: research completed by PAMI shows that only minimal packing is necessary to optimize crop establishment (Table 1). Packing also encourages weed development (Photo 1). On-row packing is an important tool to get quick and even crop establishment. Leaving the area between the seed rows undisturbed and unpacked reduces weed growth. Finally, packing is most beneficial under dry conditions and over-packing can occur under wet soil conditions.

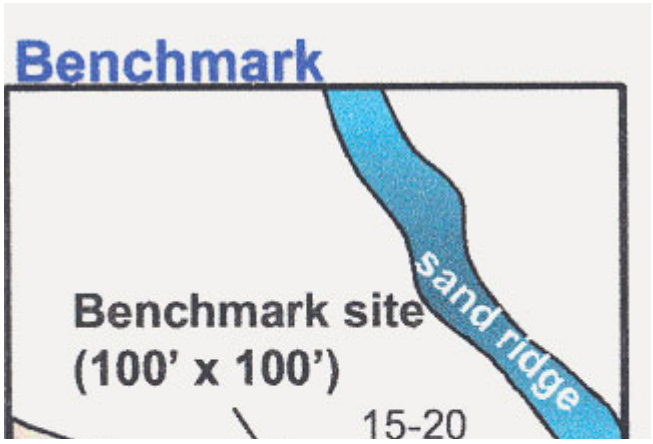
Table 1: Emergence and yield results with various opener/packer/force combinations. (PAMI Research Update 749)

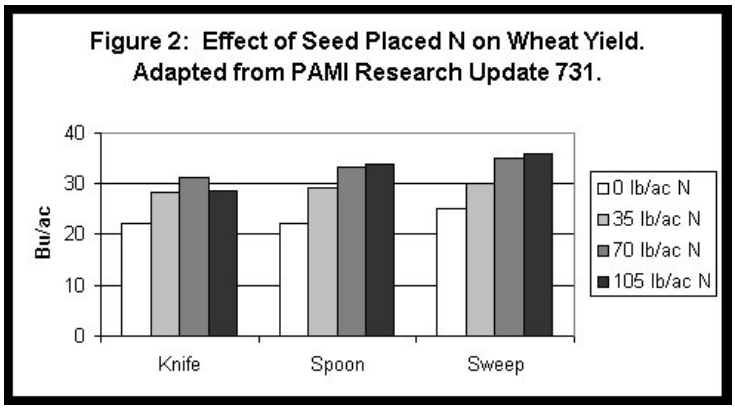
	Wheat		Canola		Pea	
	Seedlings	Grain Yield	Seedlings	Grain Yield	Seedlings	Grain Yield
Packer (lbs force)						
0	173	39.8	93	26.3	59	39.8
74	194	41.9	91	26.7	59	40.3
124	195	42.2	91	27.0	59	40.2

174	194	42.2	90	26.7	60	40.2
224	190	41.9	85	26.9	60	39.6
Opener/Packer Combination						
Spoon + Steel V Packer	190	40.5	92	27.6	57	40.2
Spoon + Flat Rubber Packer	195	41.0	86	26.4	58	40.1
Paired Row + Steel V Packer	186	41.9	92	26.6	60	38.8
Paired Row + Flat Rubber Packer	190	41.1	94	26.5	59	38.8
Sweep + Tire	184	43.5	85	26.5	63	42.1

Moisture affects not only packing, but also fertilizer requirements. The amount of fertilizer required depends on how much moisture is there in your soil this spring and how much rain you expect during the growing season. A soil test will provide you a snap shot of your fertility levels. Soil tests following the drought of 2002 show some fields require little to no nitrogen for crop production in 2003. Without a soil test, you won't know if you need no nitrogen or 30 or 60 lbs/ac to provide an adequate level of crop nutrition. Perhaps you need to balance the macronutrients N, P, K, and S. Without knowing the level of fertility, it is difficult to make an educated guess, particularly after a drought.

Too much fertilizer N can be toxic to seedlings. Seed placing too much N with the seed can cause reduced plant emergence. This can also cause delays in crop maturity and reduce the overall yield (Figures 1 and 2). It is always a gamble when high rates of N are placed with the seed. Saskatchewan Agriculture has developed guidelines for safe rates of fertilizer applied with the seed. It is based on seedbed utilization (SBU). SBU is the amount of seedbed over which the fertilizer has been spread. Increasing the area over which the fertilizer has been spread reduces the overall concentration of the fertilizer (Table 2).





If your system can provide good seed to fertilizer separation, the risk of seed injury is greatly reduced. If not, top-dressing additional N is an alternative to meeting N requirements. Remember broadcasting urea in the spring is not recommended. Ammonium nitrate may be a practical alternative if broadcasting is warranted. However, there may be difficulty in sourcing this form of N.

Table 2: Approximate safe rates of urea (46-0-0) N applications with the seed of cereal grains if seedbed moisture is good to excellent (soil moisture at or near field capacity). All rates are in pounds actual N per acre. Table courtesy of SAFRR.

Soil Texture	1 inch Spread (Disc or Knife)			2 inch Spread (Spoon or Hoe)			3 inch Spread (Sweep)		
	Row spacing			Row spacing			Row spacing		
	6"	9"	12"	6"	9"	12"	6"	9"	12"
	SBU			SBU			SBU		

	17%	11%	8%	33%	22%	17%	50%	33%	25%
Light (sandy loam)	20	15	15	30	25	20	40	30	25
Medium (loam to clay loam)	30	25	20	40	35	30	50	40	35
Heavy (clay to heavy clay)	35	30	30	50	40	35	60	50	40

If you still require more N than can be placed safely with the seed, don't lose hope. There is still one alternative. There is a urease inhibitor called n-(n-butyl) thiophosphoric tramide (NBPT or AgrotainÒ). NBPT slows the conversion of urea to ammonium and ammonia over a 14-day period. The result is less seedling damage and lower ammonia losses making more N available for the crop. Dr. Cynthia Grant at the Brandon research center has performed field studies that showed NBPT put on seed-placed urea increased both seedling emergence and grain yield of barley. NBPT also improves the N uptake from top-dressed urea.

The key of course is not to overdo - the nitrogen, the packing, or the capabilities of your existing equipment. Know when to draw the line and don't overindulge. Like all those other good things in life, too much of a good thing can cost you in the long run. All the best this growing season.

Seeding Trends 2003

By Rich Szwydky, PAg

Conservation Agrologist

Mark this date on your calendar! Saskatchewan's only direct seed field day of the year is set for May 28th, 2003. The ninth annual Seeding Trends field day will once again take place at the historic Seager Wheeler farm, located seven kilometres east of Rosthern on Highway 312. Last June, Seeding Trends 2002 attracted over 650 people, and the organizing committee expects a large turnout again this year. The tentative agenda has been set, and will include opening remarks made by dignitaries. Following these remarks, a producer panel of three experienced direct seeders will tackle issues such as fertility, weed control and herbicide residues. Two panel experts will also participate in this year's event to address producer concerns.

Upon completion of the panel forum, there will be a number of breakout sessions. They will consist of timely topics, intensive fruit production and a tour of forage plots. The timely topics will include the latest issues and research on fertility, weed control and herbicide residues in direct seeding.

The noon hour will include extra tents and additional food lines to facilitate accommodation of extra attendees. A keynote speaker will conclude the noon hour session.

The afternoon will once again feature sprayer and post emergent fertilizer demonstrations**,** the Do's and Don'ts of winter wheat production, flower garden walking tours, plus commercial herb and spice production. The granddaddy of all events**,** the direct seeding demonstrations, will end the day. This year's organizing committee is expecting additional companies to participate.

Of special importance this year, we will be honouring the memory of agrologist Larry Gramiak. Larry passed away from cancer in the fall. Larry was an integral part in organizing and participating in many of the past direct seed field days.

In case of inclement weather, the rain date is set for Friday, May 30th. Brochures outlining the final agenda will be mailed in early May. Everyone is welcome to attend.

Pesticide Free Production - Another possible option for producers

By Eric Oliver, PAg Conservation Agrologist

Bryan Nybo, PAg Farm Manager,

Wheatland Conservation Area

Producers are always looking for ways to cut costs in their farming operation. Inputs tend to make up a very large, if not the largest portion of a producer's production costs. An idea initiated a few years ago suggested that there might be a market for grains produced without pesticides during the growing season. This production would not be organic, but there may be a niche market for this type of production in the marketplace. Pesticide free production (PFP) allows a pre-seeding burnoff with a glyphosate, fertilizing with commercial fertilizers, but no residual granular herbicides or in-crop pesticides. Wheatland Conservation Area undertook a study at Swift Current, starting in 2002, that compared the effects of increasing seeding rates of three crops (wheat, field peas and flax) while eliminating in-crop pesticide treatments to traditional seeding rates with an in-crop herbicide application with respect to weed densities and crop yields. Crop competition with weeds becomes essential for this system to work. While higher seeding costs occur as a result of increased seeding rates, it was hoped that equivalent yields and no in-crop pesticide costs, as well as the potential for a premium price for the PFP would make this system a viable option for part of a producer's operation.

The study used a randomized complete block design with four replications. Treatments included peas seeded at 180 and 220 lbs/ac, flax seeded at 45 and 56 lbs/ac, and wheat seeded at 90 and 113 lbs/ac. The wheat and flax received 60 lbs/ac of actual nitrogen and 20 lbs/ac of phosphorus. The peas received 5 lbs/ac of actual nitrogen and 20 lbs/ac of phosphorus and were inoculated with a peat stick-on type. The seed and fertilizer were double-shooted using Stealth sidebanding openers seeded with Wheatland's Flexi-Coil 5000 16 foot plot drill on 9 inch row spacing. All treatments had a pre-seed burnoff with Roundup Transorb at 0.5 l/ac rate. The lower rate of peas and flax was sprayed in-crop with Poast Ultra at 0.35 l/ac rate. The low seeding rate of wheat was sprayed in-crop with Achieve Extra Gold at recommended rates.

Results from 2002 showed a definite increased canopy of all crops with the higher seeding rate. In addition, the yields of the PFP treatments of wheat and flax showed a significant yield increase over the traditional seed rate treatments with in-crop herbicide applications. There was no significant difference in pea yields. All crops established well and developed good canopies, particularly the PFP treatments. It should be noted that 2002 had unusually high summer precipitationand the field had a history of good weed control previously. However, in drier years, the higher seed rate PFP crops may have much greater competition for moisture and if the pre-seed burnoff is ineffective, the result may be lower yields in the higher seed rate crops.

Table 1: Mean yields and crop densities of the three crops at Swift Current, 2002.

Crop & Seeding Rate lbs/ac	Yield bu/ac	Crop Density Plants/m2
Wheat 113	37.2 a	178 a
Wheat 90	34.6 b	131 b
Flax 56	27.7 a	354 a
Flax 45	23.27 b	284 a
Peas 220	54.5 a	85 a
Peas 180	55.6 a	73 a

Values with different letters indicate there is a significant difference.

Assuming commodity prices of $9.80/bu for flax, $5.50/bu for wheat, and $7.00/bu peas, we can compare some economics of the various treatments. Since the burnoff and fertilizer costs are the same for all treatments, only the seed and in-crop herbicide costs will be used to compare the net return. Table 2 indicates that with the exception of peas, there was a significantly higher net return with the PFP treatments. The results could be even more attractive with a price premium for the PFP crops.

Table 2: Net return comparisons of treatments, 2002, Swift Current.

	Seed Costs/ac	In-Crop Herbicide Costs/ac	Gross Yield Return ($/ac)	Net Return ($/ac)
Wheat 90	12.00	18.95	190.30	159.35
Wheat 113	15.07	-	204.60	189.53
Flax 45	12.86	20.45	228.05	194.74
Flax 56	16.00	-	271.46	255.46
Peas 180	39.00	20.45	389.20	329.75
Peas 220	47.67	-	381.50	333.83

It is important to note and caution producers that that these results are from only one year of the study and that the land this study was located on had a long history of very good weed control. There was only a grassy weed herbicide used in-crop because of the low level of broadleaf weed problems and even the grassy weed densities were low. Land with higher weed populations could reduce the yield advantage observed in the PFP treatments in 2002. The results may be quite different in a dry year as well with greater in-crop competition for moisture. In addition, practicing PFP on the same land for consecutive years may lead to increased weed seed production and reductions in crop yield. However, PFP may have a fit for part of a producer's production, especially if there is a market premium for the production.

SSCA Welcomes Lyle Wright as West Central Director

The Saskatchewan Soil Conservation Association welcomes Lyle Wright, producer from the Kerrobert area, to fill the west central regional director position. Lyle was elected by acclamation in the recent Board elections. The SSCA would like to thank outgoing director John Bennett for his efforts and commitment to the Board.

Lyle earned his Bachelor of Science in Engineering from the University of Saskatchewan. After earning his degree, Lyle worked at the Ag Canada research station in Swift Current as a technician in the cereal-harvesting program. The main aspect of this research was to determine the proper time to swath and straight cut cereal crops. This preliminary work, under the watchful eye of Murray Dodds, determined that at 35% moisture content or less, there would be no reduction in quantity or quality of the cereals investigated - wheat, barley, oats and rye.

Before moving back to the farm southeast of Kerrobert, Lyle and his wife Carol enjoyed traveling in Europe. They have two children - one married daughter Trisha, who works in the oil patch in Alberta, and one son Michael, who is a commercial pilot. The children are not currently involved in the farm, and Lyle and Carol are neither encouraging nor discouraging their involvement.

Lyle and Carol moved back to the farm in 1974. They farmed approximately 2500 acres throughout the late 70's and early 80's with Lyle's brother Harold and his wife Sally, as well as their parents. In 1988, Harold's family moved to Kelowna to pursue other ventures, and Lyle bought his brother's share of the farm.

Lyle remembers when he started farming in the dry land region of the dark brown soil zone. The rotation was a 50/50 crop-fallow rotation, and the crops grown on the farm were wheat, barley, mustard and flax. The seeding equipment included discers and hoe drills. In the early 90's, Lyle decided to move away from the 50/50 rotation and began experimenting with continuous cropping - even though west central Saskatchewan tends to be a moisture deficit region. Lyle says he was frustrated with the bare soils and depleted soil organic matter on his farm. He began to experiment with low disturbance direct seeding equipment and, over a five-year period, rented various low disturbance drills. Some of these trials were arranged by the local ADD Board soils technician. The drills included the Morris Maxim, Flexicoil, ConservaPak and Bourgault air seeders and drills. Following this experimentation, Lyle decided to invest in a Bourgault 5710 seeding tool.

To help reduce the erosion concerns on their farm, Lyle and Carol planted 80,000 trees on the majority of the farmland. Lyle stated that this equates to 15 miles of shelterbelts. This initiative was a community effort. Three farmers built the tree planter, capable of watering as they planted. In addition, the hedgerows were hand hoed for the first three years. Since then, the planter had been used on numerous farms. In the mid 90's, Lyle and Carol also seeded 500 acres to perennial forages on some of the lighter, variable or saline land. The perennial forages are used for both

grazing and forage production, along with the production of grass seed. Lyle uses alfalfa for forage production, an intermediate wheat grass for seed production, and a grass plus legume mixture for grazing.

Because of the drought the past three years, Lyle and Carol have ventured into certified organic crop production. They currently have two quarters that are certified organic, and plan to move the entire farm into certified organic status. Their neighbours have been successful in organic production, and were keeping input costs down, using fewer pesticides and selling their production at a premium. Lyle hopes to marry low disturbance seeding and certified organic production. He currently single pass seeds with his drill with either sweeps or 2" spoons, depending on the weed growth, and then runs a rod-weeder across the field prior to crop emergence. He says the rod-weeder helps roll weeds onto the surface while still leaving significant trash cover (if there was enough moisture to grow a previous crop!) on the soil surface. With the venture into certified organic production, Lyle's main conservation concerns include maintaining soil fertility with the inclusion of pulses and chickling vetch in the rotation, controlling weeds, and preventing wind and water erosion.

Lyle decided to get involved with the SSCA because of the organization's leading role in soil conservation. He stated the SSCA should be proud of its annual trade show and convention format, as well as its success in providing information to farmers.

Salinity: The Water Problem

By Travis Goebel, PAg

Conservation Agrologist

The word salinity is a scary word in many areas of the province. Salinity is widespread in Saskatchewan but the severity varies due to many management and natural factors. A common misconception concerning soil salinity is referring salinity as alkalinity. Saline soils are high in soluble salts whereas alkali soils are low in soluble salts but high in Sodium (Na) and have a pH over 8.5.

Saline soils are formed from the accumulation of salts. There are different ways in which salts accumulate in soil and this will be pointed out in a later section. There are many different types of salt and they vary in ability to create saline soils. Basically, the more soluble a salt is the more it can contribute in forming saline soil. Some common salts are listed in Table 1 along with their corresponding solubility. Gypsum and lime are present in most saline soils but their low solubility indicates they are not as damaging as other salts such as Glaubers's and Epsom salts. In many cases, it is possible to visually see the salts in the soil when they precipitate out of solution. White streaking throughout the soil profile and a white crusting on the surface can be visible. Salts are not always visible. For example, lime is quite difficult to see in the soil. Soil can easily be tested for lime by applying a dilute acid such as HCl to the soil; fizzing and bubbling indicates its presence. The salt content of a soil can be estimated by measuring the electrical conductivity (EC) of the soil (EC is expressed in deciSiemens/meter, dS/m). EC can be measured in a laboratory by preparing a water-soil solution from a sample of soil. A soil is considered saline if the EC is greater than 4 dS/m. There are also hand-held devices available that are much quicker and easier than sending away a soil sample to a laboratory. When using handheld devices, measurements can be obtained quickly in the field. One device used is called an EM 38, which is placed on the surface of the soil and it then immediately takes a reading. It is important to realize that when using the quick field method there are many factors that may skew results. The operator of an EM 38 must know and understand properties of soil such as texture and moisture. The soil texture and soil moisture can affect the reading obtained. For example, the reading from a non-saline sandy soil could measure 15-30 and a measurement from a non-saline clay soil at field capacity 70-80.

Table 1. Solubility of salts in water

Salt	Common Name	Chemical Formula	Solubility (grams/litre)
Sodium Sulphate	Glauber's Salts	Na_2SO_4	160
Magnesium sulphate	Epsom Salts	$MgSO_4$	300
Calcium sulphate	Gypsum	$CaSO_4$	2

Calcium carbonate	Lime	$CaCO_3$	0.01

There are many visual indicators of salinity in affected areas. The absence of crop or poor crop in seeded areas can be a good indicator that salts are present. Another indicator of soil salinity is the presence of a "Bathtub ring" around sloughs or depressions; this is an area around a slough where it is easy for salts to accumulate under the right conditions. Vegetation is also a good indicator of salinity problems. In areas where salt concentrations are high halophytes, salt-tolerant plants, thrive. Some examples of halophytes, in cultivated land, include: kochia, Russian thistle, and foxtail barley. Red samphire, salt grass, and greasewood are halophytes common on uncultivated land. It is quite common for weeds that are halophytes to become a severe problem and completely take over saline areas of the landscape due to the absence of crop competition. A common symptom of plants affected by salinity is a bluish appearance.

Table 2 shows various crops and their tolerance levels to saline soil. Even though many field crops do not grow well in saline soil there are other cropping options, such as forages, that will grow well. Crop selection is a valuable tool in a salinity management program.

Table 2. Relative Tolerance of Annual Field Crops and Forages

Electric Condutivity (dS/m)	Annual Crop	Forage Crop
Non to Slightly Saline (0-4)	Soybeans	Red Clover
	Field Beans	Alsike
	Fababeans	Timothy
	Peas	
	Corn	
Moderately Saline (4-8)	Canola	Reed Canary
	Flax	Meadow Fescue
	Mustard	Intermediate Wheat
	Wheat	Crested Wheatgrass
	Fall Rye	Bromegrass
	Oats	Alfalfa
	2-Row Barley	Sweet Clover
Severely Saline (8-16)	Barley may grow but forages are more productive in severe salinity	Altai Wild Ryegrass
		Russian Wild Grass
		Slender Wheatgrass

		Tall Wheatgrass
		Salt Meadow Grass

*Crops are in order of increasing salt tolerance
*Conductivity is in dS/m of saturated paste

What happens when salt is present in the soil solution?

It is interesting to know what causes the problem with plant growth when salt is present in the soil solution. When plants take in water, nutrients are also present in the water and are taken up. Plants naturally have salt present in their rooting systems which pulls water into the plant from this difference in osmotic pressure. Salt in the soil solution decreases the osmotic potential of the system and slows or even stops the uptake of water. As the difference in concentration decreases, the osmotic potential decreases. When the concentration of salt in the soil increases and approaches that of the plant attempting to grow, the osmotic potential decreases. As the osmotic potential decreases, the movement of soil solution into the plant decreases. Salt sensitive plants basically perish from water deprivation. The plant will express symptoms of drought even though the soil is saturated with water. The water is present but is unavailable to the plant.

Where do salts come from and how do they get into my field?

This is a common question that is quite simple and will be investigated here. Originally salts came from the weathering of rocks that contain salt. Salinity is seldom produced as a result of the weathering of rocks but rather the redistribution and accumulation of salts. Salt accumulates by water entering the soil at a "recharge area"; this water flows through the soil profile and into aquifers in the bedrock. The water flows through these aquifers accumulating salts into solution, as the water flows through areas that have high concentrations of salt, the salt concentration in the water increases. Eventually, due to bedrock formation, the water in the aquifer is forced close to the soil surface and the water table is elevated. There are different mechanisms that cause an elevated water table. Once the water table is within 2 meters of the soil surface, it is possible for the salt infected water to creep up to the surface by capillary action. The location where the water creeps to the surface is called the discharge area. This upward flow of water, accompanied by evaporation, leaves high concentrations of salt on or near the soil surface. There are two vectors acting on the salt infected water, the upward pull from evaporation and capillary action and the downward force of infiltration. Whenever the net flow is up, a saline soil will result. It is important to realize that any factor that increases downward infiltration in a recharge area or any practice that increases evaporation and decreases downward percolation in a discharge area will increase the potential for having a saline soil.

What causes an elevated water table?

There are three different underground mechanisms that cause an elevated water table. Artesian discharge is where water enters through a recharge area and travels through layers of bedrock to a discharge area in lower lands. The distance from recharge area to the discharge area can be greater than 10 kilometers. There is pressure that forms at the discharge area, this pressure

pushes water toward the surface. These areas have a high water table. A good indicator of artesian discharge is the presence of free flowing water wells. The extent to which this causes salinity depends on the pressure, salt content, and the extent of upward water movement. Evaporitic rings occur in low-lying potholes. In these areas it is difficult for the surface water to drain. The combination of failure to drain, high water table, and evaporation causes salinity around the slough, sometimes referred to as a "bathtub ring". Side hill seeps are another mechanism that causes saline soils on the side of hills. For this type of problem, water enters an upland recharge area and travels through the bedrock then is discharged at a side hill. This occurs due to an impermeable layer in bedrock close to the surface. The water is pinched off and forced to exit the system at the side of a hill.

How can saline soils be managed?

The mechanisms of saline soils are important but what is even more important is the management of the infected soil and how to slow the formation of these soils. As mentioned previously, there are two areas of concern of saline soils; recharge and discharge areas. It should be realized that salinity is a water problem not a soil problem. Excess water at the recharge area is what causes most salinity problems. Preventing the accumulation and resulting deep percolation of water to the bedrock is important. Excess water in recharge areas may arise as a result of man made ponding, excess accumulation of snow, excessive summerfallowing, excess annual cropping, and decreased forage and perennial cropping. Control of water accumulation in recharge areas can be established by drainage. Care should be taken when attempting any type of drainage as it may result in causing salinity elsewhere. Continuous cropping or planting alfalfa is a strategy that helps decrease soil water content. Alfalfa does exceptionally well at using up moisture because of its deep rooting system. Summerfallowing should be avoided in recharge area because there is no crop to utilize available soil moisture.

There are also different management strategies for saline discharge sites. The goal of discharge management should not be to remove salts completely, rather decrease the salt concentration in the top 12 inches of the soil. Practicing direct seeding in these areas reduces evaporation and increases deep percolation of water. This is achieved because the trash layer insulates the soil and consequently reduces evaporation. The trash layer also decreases water runoff which increases deep percolation.

Crop selection is required to find a crop that will grow in a saline area. Table 2 shows various crops and their tolerance to salt; there are more extensive lists available and different forage blends available that can be very productive. It is important to have good fertility management for the crops grown to have a better chance of successful stand establishment. When seeding forages into saline soil they should be seeded as shallow as possible and early when the salt concentration may be lower in the top portion of the soil.

There is no magical soil additive that will neutralize the effects of salt on soil. Water management is the key to successful salinity management. Although saline soils are not as easy to manage as healthy non-saline soils it is possible, with proper management, to grow productive crops on saline soil.

Getting the Most out of Your Soil Test

By Dave Larsen, AAg

Conservation Agrologist

Soil testing is an important management tool that is often underutilized. An accurate soil test is a low cost way of determining the appropriate nutrient package for your crop. For less than one percent of the fertilizer cost, a field can have a fertilizer recommendation. Optimal fertility rates will maximize yield and economic return. Yet incidences of nutrient deficiencies are common. Under-fertilization will not meet the needs of the crop, while over-fertilization can be costly and inefficient. Without soil testing, nutrient application is merely a guess.

Crops require nutrients. Without a proper fertility package, the crops' nutrient requirements will come from soil reserves. The contribution from soil reserves may meet the requirements in the short term, but can have a long-term impact on future fertility of a soil. To maintain the long-term nutrient balance in a field, enough fertilizer must be added to meet the needs of the crop. Maintaining a nutrient balance leads to higher yields and quality, more efficient use of inputs, and increased profits.

If crop residue is returned to the soil, the amount of fertilizer that has to be added to maintain the status quo is equal to the nutrients removed by the crop. The amount of nutrients taken with the crop is summarized in Table 1. Long-term fertilization at recommended rates contributes to soil nitrogen supplying power. Nitrogen fertilizer that ends up immobilized in microbial biomass and soil organic matter contributes to a long-term reservoir of organic nitrogen that can be slowly made available through mineralization. (Schoenau et al. 1998).

Table 1. Nutrient uptake by the growing crop, and removal in the harvested portion of selected crops for western Canada.

Crops	N	P2O5	K2O
Cereals	- - - - - - - Uptake (Removal) - - - - - - - - lb/bu		
Barley	1.53 (1.10)	0.61 (0.40)	1.46 (0.35)
Oats	1.38 (0.80)	0.40 (0.25)	1.60 (0.20)
Corn	1.18 (0.75)	0.63 (0.44)	1.41 (0.29)
Wheat 10% protein	1.55 (1.10)	0.67 (0.50)	1.47 (0.35)

12% protein 14% protein	1.83 (1.30) 2.12 (1.50)	0.67 (0.50) 0.67 (0.50)	1.47 (0.35) 1.47 (0.35)
Oilseeds			
Canola	3.12 (1.88)	1.30 (0.91)	2.05 (0.46)
Flax	2.58 (2.00)	1.42 (1.10)	2.00 (0.65)
Sunflower	1.17 (0.84)	0.43 (0.33)	0.61 (0.18)
Soybean	5.80 (4.00)	1.00 (0.80)	4.40 (1.40)
Pulses			
Field peas	3.36 (2.40)	0.92 (0.76)	3.00 (0.71)
Lentils	3.01 (2.00)	0.90 (0.62)	2.57 (1.10)

Source: (Dr. Adrian Johnston, Potash and Phosphate Institute of Canada, 2002)

Yet less than 10% of the fields in Western Canada are currently managed based on annual soil testing practices (Karamanos, 2001). Amongst farmers that filled out survey forms at past SSCA Direct Seeding Conferences, only 35% reported soil testing on a regular basis. Something is obviously preventing producers from adapting this management technique.

So why isn't soil testing more common?

While the reasons for not sampling may vary, generally soil test results are considered too inaccurate to precisely follow the recommendations. Although testing labs are quite accurate, the greatest challenge in soil sampling is obtaining a sample that reflects the true fertility status of the field. Easy to say, not so easy to do. However, applying your knowledge of the field you are sampling will increase your soil tests accuracy.

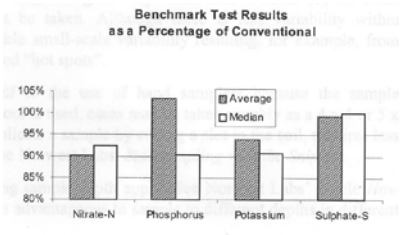
Fields are inherently variable in nutrient composition. Mobile nutrients such as nitrogen, sulfate and chloride move with water and as a result, often accumulate in lower slope positions. As immobile nutrients, phosphorus and potassium are tightly bound to the soil and move through the landscape as a result of soil movement. Therefore, in a direct seeding system the phosphorus and potassium will be relatively immobile, as soil movement is minimal. Nitrogen, sulfate and chloride movement will not differ with direct seeding. Even in flat fields there is a wide range of nutrient levels throughout the field. The soil nutrient variability can make accurate sampling difficult. Therefore laboratory recommendations often do not match the crop's needs.

For example, a study in Alberta revealed a 40 acre field with soil potassium levels between 118 and 620 pounds per acre with an average of 270 pounds per acre. This would result in no

potassium fertilizer recommendation for the field. With this recommendation, the field would be potassium deficient in 30 percent of the field with another 33 percent marginal.

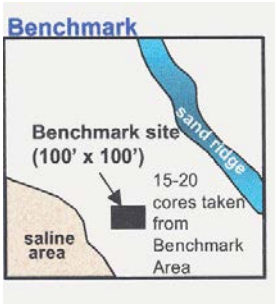
The most common method of soil sampling is random sampling. Random sampling will typically generate numbers that are higher than the overall field's nutrient requirements. Typically the water-soluble nutrients, nitrogen and sulfate, will be more closely represented than the non-soluble nutrients, phosphorus and potassium. However, one or two cores that have a high concentration of sulfate can have a dramatic effect on the recommendation. For a crop like canola that is sensitive to S deficiency, the inflated S levels will create deficiencies in the crop if the recommendations are followed.

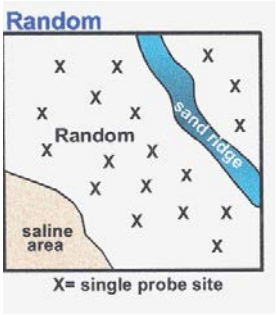
Variability of phosphorus and potassium will be greater than nitrogen and sulfate regardless of the sampling mechanism. Benchmark sampling has been shown to reduce some of the variability. Patterns of distribution of the immobile nutrients are harder to determine than the water-soluble nutrients. Fields under direct seeding will have a higher concentration of phosphorus and potassium in the top three inches. Increased nutrient concentration in the upper layer occurs from the fertilizer banding and nutrients released from residue decomposition. From a management point of view, the increased concentration of nutrients in the upper layer of soil is not detrimental. In fact, the increased concentration of roots in a zone of higher fertility can create greater nutrient availability. Samples should be taken away from the location of the nutrient band to avoid getting inflated levels.



(Doug Keyes, Norwest Labs, 1999)

Sampling one area is all that is required if you can find a representative area. This is called benchmark sampling. This method of sampling is simple and effective. Benchmark sampling reduces the inherent variability of a field by reducing the area sampled. A small area (generally about ¼ of an acre) representing the majority of the field is sampled. The same number of cores is taken, but it is taken from a smaller area. This is treated as the reference area from which fertilizer recommendations are made. It is marked with GPS and returned to for subsequent years. Sampling from the same area will reduce sampling variability, and create a better picture of year to year changes.





(Westco Fertilizers)

Analyzing a few separate benchmark areas in the first year will reduce the risk of getting a sample not representative of the field. Although you will have higher analysis costs the first year, it will help determine what area to use as a benchmark.

Another way to reduce the risk is to take a composite sample of a few identified areas. This form of managed random sampling will average the variability of the sampled areas, reducing the effect of a single unrepresentative sample. This is different from completely random sampling. Managed random sampling only samples from areas you identified as average production areas. Random sampling will be an average of all cores taken throughout your field. Managed random sampling or creating more than one benchmark is recommended if you cannot identify a dominant production area on your field.

Applying your knowledge of the field will help decrease the soil test variability. Your soil sample should be representative of the field. Therefore, by sampling from an area of the field where yield is typically average, your soil test results should come back with an average representation of the field. Identifying areas that are representative can be difficult without a first hand knowledge of the field. If the person taking the soil samples does not take the time or have the knowledge required to take a sample in the appropriate location, the results can come back somewhat sporadic.

Areas to avoid include:

- Entrances to a field
- Next to roads and along fence lines
- Headlands
- Old stack bottoms/farmyards
- Where there were brush piles
- Areas where manure has been added
- Sloughs and depressions
- Hill tops and eroded knolls
- Areas where unusual growth has been seen

When picking a location, use observable features such as soil colour and landscape to roughly identify where different soil types occur. Select a site that has characteristics similar to most of

the field or the dominant soil type. Often the best time to identify the different soil characteristics is through crop development. At the beginning of the growing season when crop establishment and vigour differences can be seen, a typical location may be easier to pick out.

If you are not comfortable in picking a location to sample or do not have the time to go out with the person taking the soil samples, there are a couple of options available. Maps of your field's productivity can be obtained from either yield monitors or satellite images. Areas of average production can be identified from the maps and geo referenced using GPS to the corresponding location in your field.

Yield maps require a yield monitor on the combine. Some custom combining outfits will offer this service if you do not have the equipment yourself. However, if you are not already planning to have a yield map made it is unlikely to be economically feasible. Yield is also affected by many factors other than nutrient deficiencies. If another factor is influencing yield (when isn't it?) yield monitors won't be as effective for nutrient assessment. A cheaper and more effective technique is to get a satellite image of the field you want tested. Previous crop years can be viewed at different dates throughout the year. The images display the vegetation growth on your field through infrared photography. The pictures will accurately depict management zones to help determine average production areas. This is a very effective and cheap technique, however it does require some technical ability to read the maps and operate the software.

With growing sophistication you can take the benchmark process even farther. Establishing a couple of benchmark areas in different areas will allow customization of your fertilizer rates. By identifying a primary benchmark area and a secondary benchmark area and perhaps even a tertiary benchmark area, you can further fine-tune your fertility package even without variable rate technology. Analyzing a couple of production zones will provide you with a good understanding of your fields' fertility levels. If there are deficiencies in the secondary benchmark area that do not occur in the primary benchmark area, then a decision should be made as to whether the extra yield on the secondary benchmark is worth the over application on the primary area.

Dividing your field into management zones allows you to get an understanding of different conditions within your field. This is particularly effective in rolling landscapes. For example, a large depression may be a very productive area, but a separate soil test may indicate it can be optimized with a higher rate of nitrogen than the benchmark is indicating. While most producers do not have variable rate capabilities, rates can often be easily increased through other adjustments.

There are 3 companies in Western Canada that will provide soil analysis. They are Western Ag Labs, Norwest Labs, and Envirotest Labs. Some will also provide field testing services or work through an input supplier to provide the service. While each lab will provide consistent and accurate analysis they do have some differences in their techniques and recommendations. You must decide which one you are most comfortable with. Finding out what your soil has available and how you can tailor your fertilizer package to optimize yield will take a lot of the guesswork out of your spring fertilization.

New Projects for the Conservation Learning Centre

By Laurie Hayes, MSc, PAg

Manager, Conservation Learning Centre

Some new "happenings" are in the works for the CLC this year. We have rented an extra 80 acres - 20 acres will be used for canola variety trials, 20 acres for all other demonstrations and the remaining 40 "idled" with a cereal crop (wheat in 2003) and then the "plots" rotated yearly. Through this, we hope to expand the scope of the CLC as well as increase the visibility of its other programs. Having the extra 80 acres will enable us to leave our four other fields as entire fields without any plots on the sides or in the middle as in the past.

Just as exciting is the hiring of a full-time technician, made possible through partial funding from CARDS for our riparian barrier project. Ryan Malmgren from Melfort is currently helping us on a contractual basis with our precision farming project and will join our staff full-time April 1. He has worked at the Melfort Research Farm for seven summers. The knowledge gained at Ag Canada as well as his experience as a producer will be a great asset to the CLC. We are looking forward to the continuity that having a full-time permanent technician will bring to the CLC's operations.

We will continue with our precision agriculture project - this year looking at flax. In the past, liquid nitrogen and granular phosphate have been used and the rate of both varied. With flax, this will be a challenge, given the small amount of 11-52-0 that can be put down with the seed without damage. We will be working again with Doug Schmuland (Moker & Thompson) to ensure that our project runs smoothly.

The other fields at the CLC are committed to 2533 InVigor canola, Osprey winter wheat (seeded September 2002) and Stratus malting barley.

The quality of our school program has once again been recognized - this time nationally. We have been awarded a three-year grant through a national organization. I would love to give more details but they have requested that particulars not be released until there has been a press release coinciding with the visit of a federal minister to Saskatchewan. Together with partial funding from CARDS and the continued support of the Saskatchewan Canola Development Commission, we will continue to offer a quality learning experience for our youth.

We will also be dabbling a bit with fruit - we will be working with Karen Tanino (University of Saskatchewan) on a project with strawberry crowns. Saskatchewan-developed strawberries exhibit northern vigour and out-produce other strawberries, particularly in California where the market for plants is.

We will also be demonstrating many varieties of forage corn, beans (with an 80-day growing season), peas, fababeans, sunflowers and possibly high fibre flax. We will be showcasing some new products - Prosper seed treatment and Headline fungicide for peas and wheat. We are going to try to establish our "maize maze" again. We anticipate that there will also be other demonstrations generated through the Agri-ARM system. But it is early yet and there are always many projects that "pop up" later - usually right around seeding time!!

As this fiscal year comes to an end, we would like to acknowledge our 2002-2003 partners ***Ducks Unlimited*** and ***Saskatchewan Canola Development Commission*** and our Silver Sponsors **Simplot, BASF** and **Farm World**.

We sincerely thank our contributors: Monsanto / Dekalb, Aventis / Bayer CropScience, Syngenta, Saskatchewan Flax Development Commission, Gates Fertilizers, SeCan, Proven Seeds (Agricore United), Dow AgroSciences, CropMate (ConAgra), Moker & Thompson Implements, Saskatchewan Wheat Pool, Gustafson, K & K Seeds and Canamaize.

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Special thanks to our board and the agencies they represent for their continued input, guidance and support:

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Randy Kutcher, Ag Canada

Don't forget our annual **General Field day: Tuesday, July 22, 2003**and watch for announcements of our **Canola Field Day**. If you would like to bring a group to tour the CLC, just give us a call at 306-953-2796. Here's hoping we all have a good year in 2003.