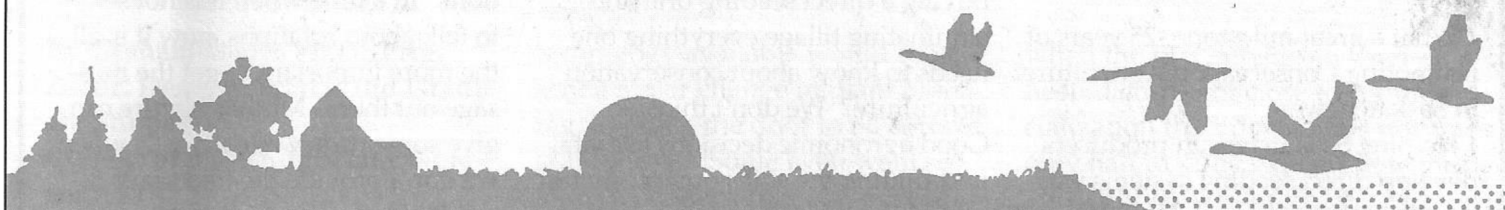
Prairie Steward

Farming For Your Future Environment



The Newsletter of the Saskatchewan Soil Conservation Association — Spring Issue No. 64, 2013

Global Food Security: What does it mean for Prairie Producers...

By Guy Lafond
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Approximately 93-99% of the food consumed by humans comes from the land hence the critical importance of the global arable land base.[7,8] Ultimately all food consumed by animals and humans comes from plants and the basic requirements for plant growth are sunlight, water and minerals. In more general terms, plants source their water and nutrients from the soil through their root system hence the importance of protecting the soil resource.

In This Issue

On a global basis, the estimated land area available for annual crop production is 3.859 billion acres (ac).[2] In 1960, there was 1.1 ac per person of available arable land, in 1999 0.60 ac per person, in 2009 0.56 ac per person and the projection is for 0.42 ac per person by 2050 when we reach 9.2 billion people. In actual fact it will be much less because an extra 2 billion people will consume a lot of land for infra-structure. One major concern however, is that currently 45% of global arable soils are affected by degradation.[5] As well, 0.3-0.8% of the world's arable land is rendered unsuitable yearly for agricultural production owing to excessive soil degradation, with wind and water erosion accounting for 84% of the degradation and urbanization the other 16%.[3,4] This is equivalent to 1.2 to 2.9 times the current arable land area for Manitoba degraded annually or 0.3 to 0.8 the area of Saskatchewan. Saskatchewan has approximately 43.2 million acres of arable land. At a recent World Congress on Conservation Agriculture (CA), the FAO endorsed CA as the key step to meeting the long-term global demand for food, feed and fibre for the projected 9.2 billion people by 2050.[6]

Together, Canada, Mexico and the United States have 17.1% of the total global arable land supply with Canada having 3.1% and Mexico 1.8%. Globally, the United States has the largest share. Nationally, Manitoba, Saskatchewan and Alberta have 87% of the total arable land area in Canada and Saskatchewan has the largest national share at 50%. Therefore, North-America has a large role to play in the global food security and will continue to play an important role into the future.

Humans require nutrition to sup-

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President's Message – So What Now!

By Tim Nerbas, PAg
SSCA President

What a great milestone -25 years of promoting Conservation Agriculture in Saskatchewan.

Helping Saskatchewan producers develop direct seeding systems was a tremendous success. The 2011 Stats Canada report shows over 70% of the crop land is managed using direct seeding methods, 20% under a reduced tillage system leaving less than 10% of the crop land under conventional tillage. Summerfallow acres have also been greatly reduced (3.5 million acres in 2011). With such a successful extension program some have questioned why the SSCA is still around. What else needs to be done?

The future of the SSCA is a topic that has garnered significant discussion around our board table.

Our mandate is to "promote conservation agriculture systems that improve the land and environment for future generations". Is simply buying a direct seeding unit and eliminating tillage everything one needs to know about conservation agriculture? We don't think so. Good agronomic decisions are vital for building the soil's organic matter and ultimately the soils productive capability.

Soil Carbon is considered to be the measure of soil quality or soil health. Through direct seeding we have made significant strides in rebuilding our soil health. Soil erosion has been significantly reduced and the decline in soil organic matter halted for the time being. However one key question is still being considered: how far can soil organic matter be rebuilt?

Is it possible to attain levels of soil organic matter found in our former grassland soils? Rebuilding soil organic matter to the level found in the former grasslands will not occur by merely reducing tillage. It also requires diversified cropping rotations. In a time when it is not sexy to talk about rotations, now it is all the more important to get the message out there. Mother Nature can give some rude wake up calls when we don't provide the necessary diversity in our cropping rotations.

Stubborn weed control problems are the issues that arise first. Conservation Agriculture relies heavily on the use of glyphosate. We started by using glyphosate to control weeds in chem-fallow and prior to seeding and at pre-harvest and post-harvest to control perennial weeds. But with the introduction of a number of glyphosate resistant crops, the number of glyphosate applications in a given growing season has grown significantly. In some parts of the world only glyphosate crops are grown. The result is numerous

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SSCA's mission is "to promote conservation agriculture systems that improve the land and environment for future generations."

SSCA's vision is "to be the recognized driver and facilitator of change that leads to conservation agriculture being practiced on prairie agriculture land."

Genetically Engineered Crops Part 1 - their history and current status

By Graham Scoles Ph.D., PAg,
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Genetic engineering of organisms (the deliberate insertion of a gene) only became possible after the 1970's when scientists discovered how to cut and paste pieces of DNA together. This early work was performed in bacteria which are much more promiscuous than higher organisms when it comes to sharing and swapping DNA. However it was later discovered that a bacteria had evolved a way to put part of its own DNA into a plant's chromosome as a mechanism of disease (it had been genetic engineering for thousands of years!). Within a few years this mechanism was understood and the bacteria was successfully manipulated so it could be used as an intermediary to transfer any piece of DNA into plants (and without causing the disease symptoms). Shortly thereafter it was discovered that using a special "gun" and nanoparticles one could literally shoot small pieces of DNA into plant cells which became stably incorporated into the cells chromosomes. These two techniques continue to be the primary ways in which genetically engineered crops (aka GMOs) are produced.

Once these technologies to genetically engineer were perfected, many speculated that having this technology available would represent a major change in plant breeding, opening the door to all sorts of good things. Some even went so far as to suggest that plant breeders would no longer be needed! With these techniques in hand the challenge was to identify genes that it would be worthwhile putting into crops and to make sure that they work as expected.

As the search for "good" genes got underway and word of this new technology spread, some expressed concern that moving genes between different types of organisms (all living organisms use DNA as their genetic material so any living organism was a potential source of genes) was dangerous. However we now know that genes have frequently moved between species during evolution and that our own chromosomes are full of DNA that has its origin in viruses. It is clear that the idea that each organism has its own DNA which is distinctly different is no longer tenable – in a sense all living organisms share a common pool of DNA. Nevertheless concerns continue to this day, particularly in some areas of the world – more on that later.

To help to allay the concerns expressed by some that genetically engineered crops could pose a danger to the environment or consumers, governments began to develop regulations that went well beyond what had previously been in place for cultivars developed by traditional plant breeding. Thus when the first genetically engineered crops got close to commercialization their developers not only had to fully explain how the new cultivar was produced and what gene was inserted but also had to prepare an extensive dossier including results of tests that had been performed to examine possible risks to the environment and safety for consumers. This step involved a considerable investment on behalf of the developer. Companies embarking on moving material through the regulatory process hired people to coordinate that work and stick-handle this material through the regulatory process.

The advent of genetic engineering also brought another new paradigm to the development of genetically engineered crops. Many of the technologies mentioned above that were essential to genetic engineering had been patented by their inventors. Thus if one wished to genetically engineer a crop and commercialize it then arrangements for licensing the technology would need to be made. Navigating through such agreements required legal expertise to negotiate such agreements thus another set of additional costs for licenses and lawyers.

These additional costs over and above the costs of traditional plant breeding meant that commercialization of a genetically engineered crop required considerable addi-

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Adoption of Direct Seeding Improves Soil Fertility and Crop Nutrition

By Ross H. McKenzie PhD, P.Ag.
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Many prairie farmers have adopted direct seeding, also referred to as no-till cropping, which has improved soil organic matter levels and soil quality. Increased soil organic matter often increases the nutrient supplying power of soil. Nitrogen (N), phosphorus (P), sulphur (S) and other required plant nutrients are stored in soil organic matter.

"Most research across the prairies has shown that the potential for soil organic matter mineralization is increased under direct seeding."

For the soil to release nutrients, the right conditions are necessary, such as warm soil temperatures and good soil moisture conditions, which are needed for soil microbes to break down or "mineralize" N, P and S in the organic matter. Normally, there is good potential for soils that have been in no-till for a number of years, to have the increased ability to mineralize more N and other nutrients versus conventional tilled fields. But that doesn't always happen, particularly in cooler spring and summer conditions.

Most research across the prairies has shown that the potential for soil organic matter mineralization is increased under direct seeding. This is because the make-up of the soil organic matter is different in direct seeded land versus conventional tilled land. The proportion of easily mineralizable nutrient is higher in soil organic matter that develops under no-till cropping systems versus conventional tillage systems.

After converting to no-till from conventional tillage cropping, many growers found they had to increase their N fertilizer rates as there was an increased portion of the fertilizer N that became tied up in organic matter. Also, no-till cropping conserves soil moisture meaning crop yield potential was higher and more N was needed to achieve optimum yields. Every soil tillage operation means losing ½ to 1 inch of soil water, so under no-till, crop yield potential could be easily increased by five bushels for wheat and seven to eight bushels for barley, for each inch of water conserved in the soil. When developing fertilizer plans, farmers adjusted their fertilizer inputs for higher target yields.

Phosphorus and sulphur are also contacted in soil organic matter. Mineralization and release of P and S from crop residue tends to be higher in no-till and reduced tillage systems versus conventional tillage. Potassium (K), also referred to a potash, is not present in organic form, so availability of soil K is not directly affected.

Many farmers that have shifted to no-till, have also adopted more diverse crop rotations including cereals, oilseed and pulse crops in their rotation. Including pulses such as pea in a crop rotation will contribute to in increased N availability for the subsequent crops. Remaining pea straw and root residue has higher N content and will breakdown relatively quickly, whether it is incorporated or not. Including a pulse crop in a no-till crop rotation can increase soil N availability to subsequent crops, reducing dependence on commercial N fertilizer.

Farmers using low disturbance seeding systems usually side or mid-row band N fertilizer and seed-place phosphate fertilizer, at the time of seeding. These are the most effective methods of applying these fertilizers, and result in successful direct seeding of crops.

To optimize no-till crop production, one of the best management tools farmers can use is soil testing. Developing a fertilizer management program based on soil testing helps farmers make informed management fertilizer choices and helps them take advantage of all the benefits of low-disturbance direct seeding. ■

Opener and Seeding Speed Effects on Canola Emergence

By Dr. Bob Blackshaw
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INTRODUCTION

Farmers consistently plant high quality canola seed (>95% germination) but plant emergence is often only 40-60%. This poor plant emergence results in low and uneven densities of many canola crops that in turn can lead to increased competition from weeds, delayed flowering, uneven and delayed maturity, lower yields, and reduced quality (e.g. higher green seed content).

A previous multi-site, multi-year field study examined the effects of cultivar (hybrid vs. open-pollinated), seeding depth (1 vs. 4 cm), and seeding speed (4 vs. 7 mph) on canola emergence (Harker et al. 2012). Canola emergence was not affected by cultivar but often was influenced by the other two variables. Canola emergence improved 37-62% with shallow seeding (1 vs. 4 cm depth). Seeding speed effects were less consistent but emergence was often about 10-15% lower at the higher speed. Additionally, there was a significant depth by seeding speed interaction in some cases with the lowest canola emergence occurring with deep seeding and high travel speeds.

The above study was conducted with a ConservaPak drill equipped with knife openers that can cause considerable soil disturbance, especially when operated at high ground speeds. Researchers and farmers alike wondered whether the above canola emergence results would be similar with other types of no-till drills. Thus, a follow-up

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Table 1. Canola emergence response (plants m-2) to various seed drill openers in 2012.

Seed drill opener	Disturbance	Lethbridge[1]	St. Albert	Zealandia	Indian Head	Brandon
Single shank single shoot 0.5" knife	Low	65 a	75 a	68 a	78 a	75 a
Disk double shoot	Low	58 a	65 b	58 b	69 b	72 a
Single shank single shoot 3" spread tip	Medium	50 b	61 b	66 a	69 b	76 a
Double shank	Medium	53 b	73 a	71 a	74 a	70 a
Single shank double shoot 2" side band	Medium to High	49 b	75 a	57 b	77 a	76 a
Single shank double shoot 4.5" paired row	High	45 b	66 b	60 b	74 a	71 a
Overall mean		51	67	65	73	73
Percent emergence		53	69	67	75	75

[1]Values followed by the same letter within a column (site) are not significantly different at the 5% level of probability.

Adoption of Direct Seeding Improves Soil Quality

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Starting in the early 1980's, prairie farmers gradually switched from conventional tillage to adopt direct seeding, the seeding of crops directly into undisturbed or cultivated soil. Direct seeding of crops has improved soil quality, increased soil organic matter and improved nutrient supplying power of the soil. Generally, over a period of years of direct seeding, not only has soil organic matter increased, but there are other improvements in soil quality such as better soil tilth.

No-till leaves more crop residue on the soil surface to protect surface soil from the damaging forces of wind and rain. Elimination of tillage means less oxygen is added to the soil, which stimulates microorganisms that break down and decompose residue. Crop residue on the soil surface reduces contact with the soil organisms that decompose residues. As a result, surface residue and remaining root material stay in the organic form longer. This contributes to increased soil organic matter.

Prairie farmers are using more diverse crop rotations with cereals, oilseed and pulse crops in their rotation. This generally results in higher crop yields by interrupting the life cycle and impact of some weeds, insects and diseases. More diverse crop rotations and increased crop yield means more surface residue and root material is returned to the soil to improve soil organic matter. In a long-term crop rotational study initiated in 1992 at Bow Island, Alberta in the Brown Soil Zone, McKenzie has been comparing traditional wheat fallow rotations with extended rotations that include more diversified crop systems. Soil quality, including soil organic carbon, was measured 6, 12 and 18 years after the trials were initiated.

There was a significant increase in soil organic carbon, a reflection of organic matter, in the first 6 years. The increased organic matter has continued after 12 years and 18 years, however, the increase has flattened out as the soil organic matter levels have approached an equilibrium or steady state.

Organic matter acts like a glue to bind soil mineral particles together. Using low disturbance direct seeding systems not only improves soil organic matter, but other benefits include improved soil structure, which in turn improves water infiltration into soil. When the only soil disturbance occurs at seeding, there is less disturbance of root and earthworm channels. This also increases the water infiltration rate of rain water into soil and reduced water runoff. The more water that can penetrate and be stored in soil, the greater the crop yield potential. Direct seeding contributes to increased crop water use efficiency. This is particularly important in the drier soil regions in southern and south central Alberta. Increased crop water use efficiency results in more stable crop yields and farm income. ▪

Global Food Security: What does it mean for Prairie Producers… CONTINUED FROM PAGE 1

port life, work and leisure and this nutrition is derived from either plants or animals recognizing that all animals ultimately derive their nutrition from plants. In order to support their existence, humans need access to the equivalent amount of 500 kg or 1102 lbs of grain per year hereto referred to as the Standard Nutrition Unit (SNU).[1] The human population now exceeds 7 billion and in order to meet SNU, the requirements would be for 3500 Million tonnes (Mt) of grain. However, current yearly world grain production is estimated at 2850 Mt which is short of the 3500 Mt required. This is why people go to bed hungry every night.[2] When the projected population reaches 9.2 billion people in 2050, we will require an extra 2000 Mt of grain, or a 70% increase over current levels of production[2] and there lies the challenge for all of us.

The Challenge for Global Food Security.

More Land: If crop yields were to remain at the current levels, we would require an additional 2.72 billion acres of land and of course that amount of extra arable land is not available to meet the 2050 target. Current analyses indicate only a modest possible increase of 297 million acres of additional arable land is possible. Irrigation worldwide accounts for 15% of arable

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Misconceptions of Winter Wheat in Dry Soil

By Larry Durand PAg, CCA
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'Seed into the dust and the bins will bust!' This is the common best management practice that is recommended to producers who are planning to seed winter wheat. Seeding shallow, one inch deep or less, typically results in a rapidly emerging winter wheat crop that has a well developed crown going into the critical winter months.

However, every now and then we come across a fall where moisture seems to be elusive and that shallow seeded winter wheat does not get the fast start we are accustomed to. In many areas of the Canadian Prairies, 2012 experienced this type of fall. In fact some areas received so little moisture that winter wheat crops failed to emerge altogether. This has many producers wondering what will happen to their winter wheat.

First of all it is important to dispel a common misconception, that winter wheat that has not germinated will fail to set seed the following year. Winter wheat must go through a process known as vernalization which allows it to move from vegetative growth to reproductive growth which allows it to flower and set seed the following spring. For vernalization to occur in winter cereals, the initial stages of germination must occur followed by exposure to the extended cold period offered up by our fall and winter months. When there is no visual evidence of germination in the fall, it is common for people to think that the vernalization process will not take place. This simply is not true. Even if there are no apparent visual signs of germination in the fall, the physiological cues to allow our winter wheat varieties to vernalize over the fall and winter months still take place. So producers can rest assured that if they seeded their winter wheat in the fall, barring any winterkill losses, it will emerge and set seed.

In an ideal situation, a winter wheat crop would emerge early, get well established and have a well developed crown heading into winter. Under these circumstance winter wheat crops have their highest levels of winter hardiness, will resume growth early in the spring, be most competitive against weeds, have the greatest opportunity to escape pests such as the orange blossom wheat midge and fusarium head blight, have an early crop maturity, and have the greatest potential to reach optimum yields. In situations that many producers are faced with this year with relatively poorly developed winter wheat going into winter, these benefits may be compromised. Therefore, winter wheat producers should be more vigilant in scouting for weeds and other pests and set their expectations appropriately for harvest timing and crop yields. The opportunity to reach those high yields that we are accustomed to getting with winter wheat still exists, however the likelihood of reaching those yields is substantially decreased.

So if you are currently faced with a situation in which your winter wheat crop has been negatively impacted by dry conditions this fall, rest assured that all is not lost. There is still a very good possibility that your crop will emerge just fine in the spring, albeit a bit later than a typical winter wheat crop would. Make sure to be vigilant with field scouting to be on top of pests and provide your crop with adequate nutrition. In doing so, given the slow start, you may still be pleasantly surprised with what your winter wheat crop will reward you with. ■

Global Food Security: What does it mean for Prairie Producers... CONTINUED FROM PAGE 6

land and 42% of crop production and the expectation is that by 2050, the irrigated arable land base will only increase to 16% and account for 43% of total crop production so very little additional increase from irrigated land areas. This means that global food production in 2050 can only be met if cropping intensification is carried out on the current existing land base.

<u>*Food vs Fuel:*</u> Currently, about 89-101 million acres are devoted worldwide to biofuel crops but the prediction is for an increase to 148-198 million acres by 2020. Given that the SNU is 500 kg per person per year, this amounts to the equivalent of about 31 imperial gallons of gasoline or enough to fill a vehicle one to two three times, depending on the size. Therefore, two to three fills of the gas tank is equivalent to feeding one person for one year. When put in those terms, it is obvious that using grain for biofuel does not

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make sense in the long-term. The use of cellulose makes more sense and one possible source is crop residues but residue removal has serious implications on long-term soil fertility. Some argue that biofuel makes sense in the short-term because it increased demand resulting in higher prices and removed a large portion of the grain crop from global trade and the avoidance of a glut of grain on the world markets which would have resulted in low prices. The higher prices of the last few years provided an opportunity to stimulate global crop production with better technology and practices providing us with a glimpse into what may be possible with current crop production systems.

Crop Yield Limitations: Given that an extra 2000 Mt of grain from the current level of production will be required by 2050, what can be expected from current yield advances with plant breeding? If the current rate of yield increase from crops like wheat, rice and corn observed from 1965 to 2005 can be maintained to 2050, this will add another 980 Mt of grain, which is still short of the 2000 Mt required. Some argue that the past rate of increase cannot be sustained to 2050 because some of the world's most productive cropping systems have been stable for many years with no obvious yield increases observed (eg. rice in China; wheat in Northwest Europe and irrigated corn in the USA). In other words, it would appear that the biological and environmental limit of crop production has been reached in certain areas of the world.

Environmental Considerations: The challenge must also consider the environment. It is important that we protect and even enhance the basic soil resource while maintaining air and water quality. This is to ensure that future generations will have the ability to continue feeding themselves adequately. We must also ensure large tracts of undisturbed wilderness and nature to maintain biodiversity.

Economic Considerations: Attaining 2050 crop production levels also requires a proper economic environment. Producers will need to be ensured of a continued return on investment to account for risk and access to capital in order to invest in new technologies. At the same time, a healthy economic environment at the farm gate also means that companies will want to invest into research and development for new and innovative technologies.

How do we increase crop production 70% by 2050?

Research: We must, first of all, try to sustain the current rate of yield gains with plant breeding combined with additional innovative agronomic practices otherwise more land would need to be converted to annual cropping.

Public and Private Support: Enhance government and private support for basic research into all aspects of crop production to find ways to continue to increase crop yields, encourage innovation and continue to support infra-structure development for crop production in all areas of the world.

Reduce Food Waste: It is now recognized that significant food wastage occurs all along the food chain, especially for fresh fruits and vegetables, milk products, meat and other products at the meal table.[8] Losses totalling 30-40% occur in both developing and developed countries but at different steps of the food chain. Losses of 25-35% occurs on farm or during transport and processing in developing countries while only 12-16% in developed countries. The major losses in developed countries, 18-24%, occur with final preparation and consumption. The solution to this dilemma in developing countries is education and appropriate low cost storage technologies to lessen wastage. In developed countries, solutions to this dilemma will require changes in diet involving some reductions in meat consumptions and development of more plant based diets.

Enhanced Agricultural Production Systems: The evidence provided clearly shows that the solution to higher crop production lies in ever increasing crop yields per unit area and more intensive cropping. It will not come from an expansion of arable land area or from a revolution resulting in a radical change in production systems but rather from an evolution of the current production systems. As stated by Connor and Minguez[2] *"The solution to feed and green the world in 2050 is to support this evolution more strongly by providing farmers with necessary information, inputs and recognition. There is no revolutionary alternative."*

What does this all mean for Prairie Producers?

Regardless of where producers are located on the prairies, their roles and contributions to Global Food Security is essential to meet the 2050 target. All the best innovations, practices or technologies will be-for-not if it is not possible for producers to implement these, whether for reasons of access to information, supplies or investment of capital in a timely manner. It will be imperative that producers get a clear understanding of the most yield limiting aspects of their farming operation whether from their soils, climatic conditions or

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"Manure Happens" – Farmers Should Make the Most of It!

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Livestock manure is a great fertilizer and soil amendment! When proper manure management practices are followed, livestock manure can be utilized as a valuable nutrient resource rather than be treated as a waste. Manure is an excellent "organic" fertilizer containing nitrogen (N), phosphorus (P), potassium (K) and many other essential plant nutrients. When added to soil at modest rates, manure not only adds nutrients to enrich the soil, manure will physically benefit the soil. Manure adds organic matter which improves soil tilth and structure.

Because manure is "organic", there is a perception that manure cannot be harmful to soils or the environment. There is no question that adding modest amounts of manure to soil can be very beneficial to improve the physical quality of soil quality and greatly improve soil fertility. However, too much of a good thing over a period of time could lead to both agronomic and environmental problems.

To prevent problems from developing, intensive livestock operators must use best manure management practices (BMP). It is very important to remember that BMP will vary from region to region and even from farm to farm, depending on: the climatic zone of the farm, the type and number of animals in confinement, the total amount of manure produced and how the manure is collected, stored and applied. It will also depend on: the amount of land available to apply manure, soil types on the farm, types of crops grown and crop yield potential. BMP's need to be specifically tailored to match the needs of each farm. Producers must take a pro-active approach to manure management to ensure the sustainability of both their farm and the environment. Following a step-by-step approach is essential in planning best manure management practices for each farm. Steps include:

1. Determine the amount of manure produced by the operation
2. Ensuring the manure is safely and properly stored
3. Determine the manure nutrient content before application
4. Identify and soil sample all fields before manure application
5. Determine which crops will be grown in each field
6. Determine manure application rates for each field, based on soil testing and manure testing/
7. Determine when and how to best apply the manure.

Nutrients in manure give it significant value. It is difficult to put an exact value on manure because of the variability in nutrient content and because the nutrients are released over a period of years. However, if we assume that commercial nitrogen (N), phosphate (P_2O_5) and potassium (K_2O) fertilizers have values of $0.65, 0.60 and 0.40 per pound, respectively and feedlot manure has a total N, P_2O_5 and K_2O content of 21, 18 and 26 lb, respectively, in each ton of manure, then the approximate value of one ton of feedlot manure has a potential value of about $35.00/ton.

Producers that don't have livestock but live within 10 km of a confined livestock operation should consider talking to their neighbors about utilizing manure as a fertilizer source and for improvement their soil quality. The potential to purchase manure from your neighbor by paying for delivery and spreading has a double benefit. The confined livestock operator can dispose of extra manure and a nearby neighbor has the advantage of an excellent source of fertilizer at a reasonable cost. In addition, manure applied to eroded areas of fields will also improve the physical quality of the soil. When neighboring farmers can take advantage of win-win situations like this, the whole agricultural community benefits!

For more detailed information on manure management consult the booklet: Nutrient Management Planning Guide - 2007, available from Alberta Agriculture by calling 1-800-292-5697. It is also available on-line at: http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/epw11920

Manure is a great fertilizer and soil amendment! Remember, "Manure Happens" - so make the most of it! ▪

financial risk. Producers in Western Canada have, for the most part, already made the investment and required changes in their production systems to protect their soils from wind and water erosion. If we are to meet the 2050 target of a 70% increase in crop production, we have 37 years left starting from 2013. This means that, on average, yields should be increasing by roughly 1.9% per year for the next 37 years from the current grain production levels. Therefore in 2023, we should have increased average grain yields by roughly 19%. What producers need to do is determine their average grain yields by crop for the last 10 years and determine how much of a yield increase 19% represents for each crop in actual bushels per acre and set that as their 10-year goal.

What does it mean for the Research Community?

The identification of very specific crop production goals or targets would force a detailed analysis of the major limiting factors to crop production as a function of soil type and climatic condition or from established agro-ecological zone designations. Understanding the limiting factors would allow specific attention to them. This would then be followed with some very detailed field studies with the goal of pushing crop production to the limit while taking into consideration both the environmental and economic impact. This exercise would identify gaps and technology needs stimulating investments into new approaches and technology.

What are the implications of taking on the challenge?

In 2012, the Premier of Saskatchewan, Brad Wall, set forth the goal of increasing crop production by 10 Mt by the year 2020. The average annual crop production for the period 2002-2012 in Saskatchewan is estimated at 20.9 Mt using Statistics Canada figures. An extra 10 Mt represents a 48% increase in grain yield from this 11 year average. Table 1 provides a summary of grain yields for the RM of Indian Head and an indication of yield increases required to meet the goal of an extra 10Mt or 48% increase in crop production by the year 2020. Assuming that this goal could be reached, we would be more than two thirds of the way to attaining the goal of a 70% increase in crop production for Western Canada by 2050. The implications of this achievement, if attained, are enormous. It would signify that important solutions would have been found for dry land farming systems and many of these solutions would be exportable to other similar areas of the world contributing to Saskatchewan and Canada's GDP, not to mention the influx of knowledge workers into Saskatchewan to build on these achievements.

Table 1: Average Grain Yields for the RM of Indian Head (#156) for the period 2002-2011 for selected crops and expected yield increase by 2020.

Crop	Average Yield (bus/acre) [1] 2002-2011	Expected Average Yield by 2023 assuming a required 48% increase (bus/acre)
Canola	30.4	44.9
Spring Wheat	34.9	51.7
Field Pea	32.9	48.6
Flax	21.8	32.3

[1]Taken from http://www.agriculture.gov.sk.ca/rmyields

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Opener and Seeding Speed Effects on Canola Emergence ... CONTINUED FROM PAGE 5

small-plot study was initiated with six seed drill opener types representing low, medium, and high soil disturbance planting systems.

Additionally, a complementary field-scale study utilizing farmer's seeding equipment was implemented to examine the effect of various seeding speeds on resulting canola emergence.

MATERIALS AND METHODS

Small-plot opener study: The AgTech Centre (Lethbridge, AB) conducted a field study at Lethbridge, St. Albert, Zealandia, Indian Head and Brandon in 2011 and 2012. A seed drill was used that was capable of attaching various tool bars equipped with different opener types thus avoiding possible confounding effects such as drill weight, row spacing, seed metering system, and packing system. The six opener types evaluated were 1) single shank single shoot 0.5 inch narrow knife (low disturbance), 2) disk double shoot (low disturbance), 3) single shank single shoot 3 inch spread tip (medium disturbance), 4) double shank (medium disturbance), 5) single shank double shoot 2 inch side band (medium to high disturbance), and 6) single shank double shoot 4.5 inch paired row (high disturbance). Row spacing was 12 inches for all openers and LL hybrid canola was planted at 110 and 97 seeds m-2 in 2011 and 2012, respectively. Two seeding speeds were used with each opener type; 4 and 6 mph. Canola emergence counts were made 3 weeks after planting and plots were harvested for yield at maturity.

Table 2. Canola emergence response to increasing seeding speeds when using field-scale equipment in farmer's fields in Alberta.

Type of seed drill	Ground speed (mph)	% reduction in canola emergence (2011)	% reduction in canola emergence (2012)
JD 1895 disc drill (10" rows)	4	0	0
	6	17	2
	8	17	9
	9.5	26	--
Flexicoil 6000 with pillar laser openers (10" rows)	4	0	0
	6	10	13
	8	21	19
Morris 425 with paired row openers (10" rows)	4	0	0
	6	2	28
	8	11	--
Bourgault with narrow hoe openers (9.8" rows)	4	0	--
	4.5	4	--
	6	11	--
JD ConservaPak (10" rows)	4	--	0
	5	--	13
	6	--	40

Field-scale study: Cooperating farmers were asked to plant adjacent test strips using their own seed drills on their canola fields. The test strips would represent different seeding speeds and growers were asked to seed at 3-4 ground speeds. Canola emergence was determined 3 weeks after seeding in 10 quadrats per

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seeding speed strip.

RESULTS

Small-plot opener study:

2011 results: Soil moisture conditions were very good at Lethbridge, St. Albert, and Zealandia but excessively wet at Indian Head and Brandon (delayed seeding at those two sites). Canola emergence varied considerably with site; ranging from a low of 47% at Indian Head to a high of 89% at Brandon. Somewhat surprisingly, there were no differences in canola emergence among the various seed drill opener types at any site. Mean canola emergence (plants m-2) at the various sites was: Lethbridge (84), St. Albert (64), Zealandia (60), Indian Head (52), and Brandon (98).

In 20% of the cases, canola emergence was reduced with a seeding speed of 6 mph compared with 4 mph. The number of sites that this occurred with each opener type were: single shank double shoot 2″ side band (2 sites), disc double shoot (2 sites), single shank single shoot 0.5″ knife (1 site), and single shank double boot 4.5″ paired row (1 site).

There was no significant opener or seeding speed effect on canola yield at Lethbridge, St. Albert or Zealandia. Plots at Indian Head and Brandon were not harvested due to extremely late seeding (July).

2012 results: Canola emergence ranged from a low of 53% at Lethbridge to a high of 75% at Indian Head and Brandon (Table 1); again indicating canola emergence can often be low and variable. Canola emergence varied with seed drill opener type at 4 of 5 sites. There was general trend of lower canola densities being achieved with openers that caused higher levels of soil disturbance at Lethbridge and Zealandia (Table 1).

Table 3. Canola emergence response to increasing seeding speeds when using field-scale equipment in farmer's fields in Saskatchewan.

Type of seed drill	Ground speed (mph)	% reduction in canola emergence
John Deere Air Disc (2011)	4.5	0
	5.5	14
	6.5	23
	7.5	20
	8.5	24
Morris Atom Jet (2011)	3.5	0
	4.5	10
	5.5	19
	6.5	44
JD ConservaPak Paired Row (2012)	3	0
	4	4
	5	12
	6	15
Bourgault Paralink (2012)	3	0
	4	0
	5	6
	6	10
	7	19

A seeding speed of 6 mph compared with 4 mph resulted in reduced canola densities in 33% of the cases. The number of sites that this occurred with each opener type were: single shank single shoot 0.5″ knife (3 sites), single shank double shoot 2″ side band (2 sites), single shank double boot 4.5″ paired row (2 sites), and for the remaining three opener types (1 site).

Canola yield was not affected by seed drill opener or seeding speed at any site.

Field-scale study

Alberta results: The study was conducted at two farms in southern Alberta and two farms in central Alberta in each of 2011 and 2012. Regardless of the seed drill used, there was a consistent trend of reduced canola emergence with higher travel speeds in both years (Table 2). Sometimes the reduction in canola

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stand was <10% and would likely not a have meaningful biological effect. However, in several cases canola stand was reduced >20% and reductions in canola yield and quality would be expected.

Saskatchewan sites: Additional ADOPT and NARF funding allowed the field-scale study to be conducted at 16 farms in 2011 and 11 farms in 2012. Seed drills evaluated included Bourgault Knife, Seed Hawk Knife, John Deere Air Disc, Bourgault Atom Jet, Ezee-On Atom Jet, John Deere ConservaPak, Borgault Paralink, Flexicoil Paired Row, Morris Atom Jet, and Concorde Spoon. Seeding speeds ranged from 3 to 8.5 mph depending on the farm. Soil moisture was excellent to excessive in 2011 and generally good to excellent in 2012.

Canola emergence was reduced with higher seeding speeds at 2 of 16 sites in 2011 and 2 of 11 sites in 2012 (Table 3). In 2012, canola emergence over all sites ranged from a low of 23% to a high of 68%, again indicating how variable canola emergence can be at the farm level.

Table 3. Canola emergence response to increasing seeding speeds when using field-scale equipment in farmer's fields in Saskatchewan.

SUMMARY

These studies confirm that canola emergence is highly variable and often in the range of 40-70%. Canola emergence was affected with seed drill opener type in 4 of 10 site-years. Low disturbance drills gave the highest canola emergence at Lethbridge and Zealandia in 2012 but there were no clear superior openers at the other sites. Generally all seed drills performed quite well in this study.

Across all opener types, an increase in seeding speed from 4 to 6 mph in the small-plot study caused reduced canola emergence in 20% and 33% of the comparisons in 2011 and 2012, respectively.

The field-scale farm trials in Alberta also indicated a general trend of reduced canola plant stands with higher seeding speeds. However, this result occurred much less frequently in the Saskatchewan trials.

Soil moisture was generally good to excellent in both study years and may have been the great equalizer among treatments in terms of canola emergence in these studies. Previous research determined that rainfall received one week before seeding through two weeks after seeding is the most important environmental variable affecting overall canola emergence.

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Genetically Engineered Crops Part 1 - their history and current status ...CONTINUED FROM PAGE 3

tional up-front investment. For this reason (but with a few exceptions) to date those genetically engineered crops that have made it to market in North America have been large acreage crops (where return on investment will be significant) and have been developed by large agricultural biotechnology companies that can afford the up-front costs of developing those crops.

With that as a background, the first genetically engineered crop hit the market in 1994. It was known as the Flavr-Savr tomato and while genetically engineered, did not in fact have a gene from another organism inserted but instead had a tomato gene involved with fruit softening inserted backwards. This meant that as the fruit ripened on the plant it did not soften and so could be shipped ripe without damage (rather than green). This tomato had a relatively short life primarily because not enough plant breeding had been done to ensure that all other traits were optimal.

The next couple of years saw a number of genetically engineered crops pass through the regulatory process and come to market. In Canada the first genetically engineered canola was grown in 1995. While this was a canola genetically engineered for herbicide tolerance it was not the first deliberately developed herbicide tolerant canola. A triazine tolerant canola developed through traditional breeding techniques was registered in 1984. The source of this tolerance was a weedy relative of canola found growing in a corn field in Quebec (presumably it had arisen naturally during multi-year applications of triazine herbicdes) and the tolerance was transferred into canola by crossing. While the first triazine tolerant canolas suffered a yield penalty in the early 1990's, better agronomic types were becoming available and could have occupied a significant acreage, but shortly thereafter genetically engineered

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Smartphone Apps Project Update

By Tom Wolf
SSCA Director

Many of you will already know that the SSCA has received funding from the Canadian Agricultural Adaptation Program (CAAP) to develop several apps for smartphones and tablets. We believe that the world of smartphones and tablets is rapidly evolving, and will become a valued productivity resource for modern producers.

Producers who own smartphones each have their own favourite uses for the device. They are handy for taking pictures and e-mailing or texting these to your agronomist. They have gps, and help with navigation. They can act as flashlights, they can show pictures, and can record conversations. Some use them to check the weather forecast or to communicate with others through Twitter. But despite all these many uses, productivity apps designed specifically for agriculture are still hard to find. There are some good starts – seed cart calculators, tank mix advice, record-keeping programs – but so much more can be done.

Your Board has contracted Dr. Ralph Deters and his grad students to develop several apps over the next year. Dr. Deters is very pleased to be part of this, as it gives his students a chance to be part of commercial product development. He is also interested in learning how producers use apps, and what advanced features might be of interest.

The first app is a version of the Guide to Crop Protection. It will allow users to identify pesticide options for their specific crop and pest complex with a few taps and swipes. We've received generous help from Jill Turner, and especially Henry De Gooijer, the authors of the Prairie Crop Protection Planner CD, and look forward to its completion in the near future.

Apps are being developed for iPhone and Android, and a third version that uses a web-browser approach will run on all other devices, including the new BlackBerry Z10 and older BlackBerries.

Other ideas for apps are evolving and we are talking about a fertilizer blend calculator, perhaps other sorts of calculators that are currently available only on spreadsheets. Please tell us what apps you'd like to see – contact Ian Boyd (iboyd.ssca@gmail.com) . We would like to hear your thoughts. ■

President's Message – So What Now! ... CONTINUED FROM PAGE 2

weeds with glyphosate resistance worldwide. In 2011 glyphosate resistant kochia was identified in Alberta and in Saskatchewan in 2012.

Researchers have long told us not to do the same thing at the same time year after year. It is a recipe for disaster. Crop diversity is a natural way to change the timing of seeding and harvest on each field. It is a natural way to change the timing of pre-seed burn-offs, in-crop herbicide applications, and the use of different modes of action on a field. Crop diversity helps break disease cycles. The soil is a living system. Remember the adage "you are what you eat"? Well, microbes, like us, like diversity in their diet. However, they don't like tillage because it destroys their home. This information is not new to producers, but high grain prices have meant that on many operations, long term planning has been trumped by short term gain. It is important for producers to be reminded once again of the risk going forward. Will production costs be higher in the future because of our short-sightedness with regard to crop rotations?

Crop diversity is an important message. However, sometimes you have to hear the message over and over again before it hits home. The key is having a mechanism, a voice if you will, to continuously broadcast that message to producers time and time again. The SSCA has acted as that voice for 25 years.

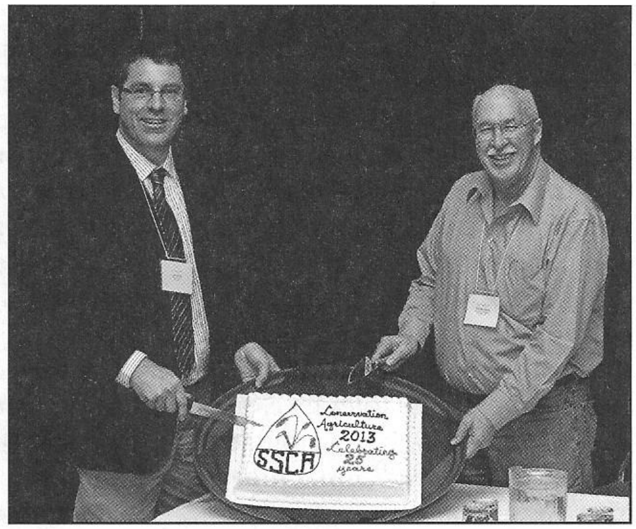
Does the SSCA have a future? Ultimately the membership will decide. But it is important to remember that the soil feeds us all and it is in our best interests to look after it.

Mark your calendar's:

- Soil Conservation Council of Canada (SCCC) will host the 6th World Congress on Conservation Agriculture in Winnipeg June 23 – 25, 2014.
- National Soil Conservation Week is April 21-27, 2013 (www.soilcc.ca). ■

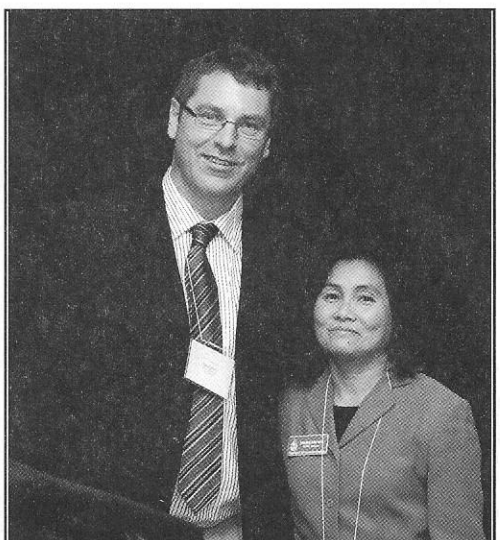
Scenes from the SSCA 25th Anniversary Conference

Tim Nerbas (L), along with Pat Flaten (Far R), a former employee of SSCA and sister of Don, present the SSCA Award of Merit to Don Flaten (Centre), University of Manitoba.

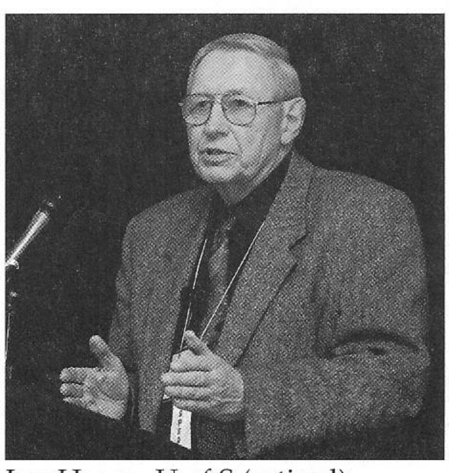


Current SSCA President Tim Nerbas and SSCA's first president Brett Meinert with Anniversary cake.

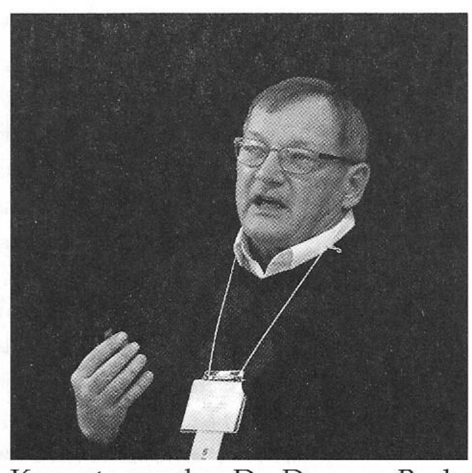
Scene of large crowd attending the SSCA 25th Annual Conference



SSCA President Tim Nerbas and outgoing Office Manager, Marilyn Martens commemorating her 13 years of service.



Les Henry, U of S (retired), speaking on "Back to the Basics for Precision Ag."



Keynote speaker Dr. Dwayne Beck speaking on "The KeyBehind successful No-till."

Genetically Engineered Crops Part 1 - their history and current status ...CONTINUED FROM PAGE 3

types became available and there was no longer a place for triazine tolerant varieties.

In the same year that genetically engineered herbicide tolerant canolas came to market other herbicide tolerant canolas derived through mutagenesis (another traditional breeding technique) were also commercialized. These were primarily canolas tolerant to the imidazolinone group of herbicides, however genetically engineered types now occupy a major share of the market (80-90%). The fact that herbicide tolerance can be derived through either genetic engineering or traditional breeding needs to be kept in mind when considering the pros and cons of genetically engineered crops.

At the same time as herbicide tolerant crops reached commercialization, including herbicide tolerant soybean, genetically engineered forms of insect resistant corn and cotton reached the market. In this case these crops have been genetically engineered to carry a protein derived from the bacteria Bacillus thuringiensis (Bt) which is toxic to the larvae (caterpillars) of certain forms of insects when consumed by them (but is not toxic to mammals). It is of interest that a dust of particles of Bt has been used by organic farmers as a means of insect control.

The four crops mentioned above and the two traits (herbicide tolerance and Bt resistance) were the first to be commercialized and to this day continue to occupy a majority of the acreage. While first introduced into North America these crops are now widely grown around the world and in 2012 occupied most of the almost 450 million acres (estimated to be grown by 17 million farmers). Herbicide tolerant soybeans and insect resistant cotton now both occupy just over 80% of the world's soybean and cotton areas. In 2012 twenty-eight countries reported growing genetically engineered crops (some on a very limited acreage) and for the first time the acreage of genetically engineered crops in developing countries exceeded the acreage in the developed world. Outside of North America many genetically engineered crops beyond the "big four" now occupy small areas but the acreage of those crops can be expected to grow over next few years.

In part 2 I will discuss the issues that have arisen as these crops were commercialized, the reasons that have led to their rapid adoption and what I see in the future. (Editor's note: Part 2 will be included in the Fall, 2013 edition of the Prairie Steward). ▪

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Publication Agreement No. 40065736
If not delivered, please return to:
SSCA, Box 1360, Indian Head, SK, S0G 2K0