The Southwest Soil and Crop Improvement Associations and the Ontario Ministry of Agriculture, Food and Rural Affairs present...

The 18th Annual Southwest Agricultural Conference
January 5th & 6th - 2011

Harvesting Success from Research & Innovation
CONFERENCE WORKBOOK

With Support From Farm Producers, Agribusiness, and

www.southwestagconference.ca
If you’re not using
BioStacked®
HiStick® N/T...
what are you leaving on the table?

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Ask your retailer about BioStacked® HiStick® N/T – for value and performance that really stacks up.™
As the needs of our planet grow, the importance of farming means more than ever. With innovation like the Genuity® brand, Monsanto’s family of breakthrough traits across corn, soybeans, canola and specialty crops, we’re revolutionizing trait technology to help farmers feed, fuel and clothe the world.

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Leaders of the Pack.

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Roundup Ready 2 Yield®
Soybeans

ALWAYS READ AND FOLLOW PESTICIDE LABEL DIRECTIONS. Always follow grain marketing and IRM requirements. Details of these requirements can be found in the Trait Stewardship Responsibilities Notice to Farmers printed in this publication.
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Get an instant discount off Guardian® and Guardian® Plus herbicides with the DuPont® Guardian® Early Purchase Program.

DuPont™ Guardian® herbicide delivers one-pass, broad-spectrum residual control of tough weeds in soybeans like dandelion, yellow nutsedge and annual sow-thistle.

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*Offer valid from October 1, 2010 to February 14, 2011. See your retailer for details. Terms and conditions apply.

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• GFO website: www.gfo.ca/sellsmart
• BlackBerry® App World: http://appworld.blackberry.com

SellSmart offers local price information from anywhere you are with your BlackBerry® Smartphone, head-to-head elevator bid comparisons and price alerts.

Inquiries can be directed to info@gfo.ca.
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Thank you to the Municipality of Chatham Kent Economic Development Corporation for their support.

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Exhibits are Located in the Rural Development Centre Auditorium

Based on information at time of printing. Our apologies if we have missed listing your organization.
Welcome to the 18th Annual Southwest Agricultural Conference! The theme of this year’s conference is ‘Harvesting Success from Research & Innovation’. Research and innovation is important for everyone, and plays a key role in agriculture as well. It can affect all aspects of our lives including producing safer, higher quality food, protecting our environment, producing bioproducts and renewable fuels, achieving growth and profitability and building stronger rural communities.

We have planned two great days of speakers and topics and so much more. Some of our exciting topics this year include the ever popular Market Outlook 2011, progress in soybeans, managing glyphosate resistant weeds, innovation opportunities, organic matter and manure strategies, bioenergy crop production and numerous other crop strategies for 2011.

The Southwest Agricultural Conference steering committee along with our partners Southwest Soil and Crop Improvement Associations, Ontario Ministry of Agriculture, Food and Rural Affairs, University of Guelph Ridgetown Campus, industry sponsors and producer supporters are pleased to have you as our guests for this edition of Ontario’s premiere educational conference. This conference attracts speakers from all over North America who share their expertise in crop production, pest management research, marketing and business strategies, soil management and technology innovations.

Be sure to stop by and visit our industry trade show and research poster session that will be held in the RDC Auditorium. Take advantage of the OSCIA NEW MEMBER incentive program at the conference. Join your local county soil and crop improvement association using the $10.00 coupon included with all non member registration packages. Present your discount coupon at the Ontario Soil and Crop Improvement Association Booth in the trade show at SWAC to sign up for only $5.00 for a one year membership. This a great deal with lots of perks!!!

We appreciate the dedication and continued support of our program organizers and conference sponsors. We would also like to send a special thank-you to our conference participants. Don’t forget to let us know how we are doing! Your input is important to us so please be sure to complete the enclosed evaluation forms and submit them at the end of the conference.

Thank-you for attending and we hope that you will enjoy this year’s program!

Sincerely,

Jamie Littlejohn, SWAC Chairperson
Elgin County Soil and Crop Improvement Association

www.ontariosoilcrop.org
Dr. Alastair Summerlee
President, University of Guelph
Guelph, Ontario

**WEDNESDAY, JANUARY 5, 2011**

**THE TIME IS NOW**

*Successful development in agriculture has always involved innovation on the farm and in research. Together we can work to transform agriculture. Our time is now...*

- Internationally acclaimed biomedical scientist
- 3M Teaching Fellow - recognized for outstanding leadership in teaching, education and academic program development
- Past chair of the World University Service of Canada (WUSC) - one of Canada’s largest NGOs

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Chantal Petitclerc
Paralympic Champion & World Record Holder
Montreal, Quebec

**THURSDAY, JANUARY 6, 2011**

**SHARING MY STORY**

*Injured in a farm accident. She is the epitome of determination, perseverance and discipline. Prepare to be inspired!*

- The most successful wheelchair racer of all time
- Awarded the Lou Marsh trophy for Athlete of the Year for 2008
- Appointed to the Order of Canada in 2009

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**CEU's Requested:**

- **Nutrient Management:** 5.5
- **IPM:** 5.5
- **Soil & Water Quality:** 3.5
- **Crop Management:** 19.5
- **Professional Development:** 12.0

**Total:** 46.0
**Session 1**

**Future of Agriculture**

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<td>11194 Base Line Dresden ON N0P 1M0</td>
<td>10248 John St. Rd Murillo ON P0T 2G0</td>
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<tr>
<td>ph. 519-683-1307</td>
<td>ph. 807-935-2154</td>
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<tr>
<td>e-mail: <a href="mailto:gpdev@ciaccess.com">gpdev@ciaccess.com</a></td>
<td>e-mail: <a href="mailto:peggy@tbfarminfo.org">peggy@tbfarminfo.org</a></td>
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<table>
<thead>
<tr>
<th>Peter Hannam</th>
<th>Tom Button</th>
</tr>
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<td>7861 Hwy #7 E, RR#2 Guelph ON N1H 6H8</td>
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**Peter Hannam**

We are now entering the Bioscience Century. We have gone through the Stone Age, the Iron Age, the Industrial Revolution, the Gold Rush, the Oil boom, the IT boom, and now the world is looking more and more to living microbes, plants and animals to solve many of its problems.

In the next 40 years, we will likely be asked to feed 9 billion people, with better nutrition, less land, and protect the environment.
But we will be asked to do a lot more than that!!!

I see three major trends and developments, in areas that I am familiar with, that will drive our future, and that will be of key importance to Canada as a whole.

**Food and Health**

First, there will be a growing link in the public’s mind between food and health. This opens huge opportunities for you. Most people now want taste, but there is a growing public awareness of health concerns. We will continue of course to want to maintain taste and texture. But the health trend will grow and lead to more demand for more specialty and more nutritious foods. Due to many new technologies, new variety development, and very advanced food science research around the world, we will be able to, and will be required to produce more functional foods. They will be produced under contract, and their identity preserved right through to the consumer on a large scale adding additional margins for all parts of the food chain. Food and health will be more linked in the public’s mind than ever before.

A recent report in the US, estimated that the potential market for functional foods in the US will grow to over $40 US billion in the next few years. We are behind that in Canada, mostly because of archaic regulations that will not allow meaningful labels for them, but we will catch up.
**Energy**

Ontario farmers are already producing energy by growing corn for Ethanol, producing some Biogas, and introducing wind and solar energy. All of these sources will grow, but perhaps the biggest new market for agriculture will be energy from Biomass.

The Ontario Power Authority will require over 2 million tonnes starting in 2014. As the plans get finalized, agriculture must get geared up to supply a major amount of this, in addition to forestry sources. Some crop wastes and stover will be used, but a whole new industry in specialized biomass crops will emerge very quickly. Not only will there be opportunities in crop production, but in regional pellet mills, and other infrastructure which can add substantial income for farmers and the Ag industry.

Who knows what we will be producing or utilizing on our farms to feed this monstrous market in 10 years?

**Biomaterials**

But it is the third trend, the rapid development of Biomaterials that could have the biggest economic impact on Canada, and perhaps can have the biggest economic impact on farmers. We will now be asked to produce crops to make car parts, foam, insulation, plastics, clothes and building materials among others to reduce our reliance on fossil fuels, to reduce greenhouse gases, to improve the environment, and to make the manufacturing process cleaner, safer, and more efficient.

I hope everyone saw the house made of crops that the GFO installed at Plowing Match and RAWF. There is an amazing range of biomaterials available in Ontario now.

Henry Ford did it 80 years ago, but it has not been economical to use crop materials ever since – until now. We can and will play a major role in developing new technologies to make these processes more efficient, and to use more plant parts useable for biomaterials.

Anything you can make out of petroleum, you can make out of crops.

Imagine the impact on Canadian manufacturing, and on our standard of living, if we can use Canadian crops to make Canadian auto parts, for example, both to sell in our own country and for export to the USA.

Imagine if we can replace the train car loads of fibreglass and polyurethane pellets that come into Ontario every week from Texas and wherever, with materials that we produce on our own farms and process in our own towns and cities. Consider the impact on our rural communities, our farms, our employment levels, our balance of payments, and on our economy.
**Consumer Demand**

These three trends have one other major attribute in common. They are being driven by the market, not by farmers. These three trends to functional foods, to biofuels, and to biomaterials, are being driven by the market to achieve other goals like health and wellness, improved air quality, national energy security, import reduction, employment, and economic growth. These offer opportunities that are unparalleled in recent history, and they are ready for us to take up.

I am not talking theoretically. These developments are taking place right now, and I have no doubt that they will intensify and shape our future.

Ontario has huge advantages to make this possible. We have world class research capabilities in many technologies, we have abundant good land with a moderate climate, we have keen and knowledgeable people in the industry eager to try new technologies, all located right beside Canada’s largest chemical manufacturing facilities and Canada’s largest manufacturing base, and in the centre of Canada’s largest consumer population. More than that, we are within a day’s drive of a 140 million mouth market for our food and our products. It is indeed a ‘Dream Team’ of opportunity just waiting to be tapped!

The bottom line is that there will be many valuable opportunities for agriculture to produce new products, to add value to current products, to diversify, to add stability to their incomes, to enhance their ability to meet consumers demand, and to make an even larger contribution to Canada’s economy.

And young farmers today will be the generation that makes it happen!

*Peggy Brekveld*

**Who’s Really in Charge?**

Who or what is influencing the changes that we have seen up until now? As farmers, we often think that we are the primary decision maker on our operation. We are influenced by input prices, market forces and the weather. Some of us watch these numbers incessantly, checking the forecast 4 times or more a day! But there is one other set of statistics and numbers that you need to keep an eye on, it’s the Canadian Census.

Because, unfortunately, while we may think that we are the driving force behind our businesses, the reality is that the consumer sets the direction. And, that consumer is interested in convenient, environmentally friendly produce, and he wants his food cheap.

There is one thing that farmers need to realize as they go ahead --- farming in the future will be led by the consumer. And because of this, the biggest challenge that faces agriculture in the future will be educating a consumer that knows very little about the realities of farming today.
Questions to think about:

1. Who is the primary decision maker on your farm operation? Describe that person.

2. What influences the decisions made on your farm (e.g. economics, health and safety, environmental concerns)?

3. Who are the leaders of the farming community as a whole? (Who is making decisions for the agriculture industry?) What influences these decision makers?

75 years ago, most Canadians still knew a farmer personally. They had an uncle or a grandfather on the farm. They understood the ways of farming, because chickens were raised in the backyard, mom had a large garden, and they knew that milk came from a cow. There was a connection.

Now think of today’s consumer. When was the last time that they were on a farm, and what kind of farm was it? Was it a real, working farm, or a petting zoo? In fact, if you ask, all of their food comes from the store. Convenient, yes. But there is no link to farms.

There are three things that you should think about when you bring any issue to the general public – What? So What? and Now What? Remember to ask yourself why City Bob will care.

4. What was the last charity that you donated to? Why did you donate to that particular cause?

5. Think of a controversial issue in your commodity.
   a. What? What is the message that you want the public to hear?
   
   b. So what? Why are they going to care? How is it relevant to City Bob’s life?
   
   c. Now What? So it’s going to affect City Bob. What do you want him to do about it?
Session 2

Roots – The Foundation of Yield

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Please use the balance of this page for notes.
Roots are the foundation of crop yields. An in depth look at what is happening with our roots.

Richard W. Zobel
Plant Physiologist
Appalachian Farming Systems Research Center
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http://www.ars.usda.gov/naa/afsrc

Environmental impact on a plant is primarily sensed through it’s roots

Soil Physical Structure
Soil Chemistry
Water, Air, Temperature
Air, Weather, Temperature

Who is who in the soil
• Soil physical and chemical characteristics
  • Aggregate/pore size
  • Compaction
  • Beneficial and toxic chemicals
• Microbes – both beneficial and deleterious.
  • Bacteria
  • Fungi
• Mesofauna and mesoflora
  • Microarthropods
  • Algae
• Plant roots

So, what do roots do?
• Take in water and nutrients,
• Keep the plant upright,
• Use from 25-75% of photosynthe,
• Maintain the soil environment,
• Feed the soil flora and fauna,
• Modify soil chemical and physical properties

A root is a root?
• Primary root system: roots that develop during germination and seedling development, including any lateral branches.
• Secondary root system: roots that develop from the shoot

Primary Root System
Three major classes of root
• Tap Root – first to emerge from the seed
• Basal roots – emerge from the seed (i.e. seminal roots) or at the bottom of the hypocotyl/mesocotyl.
• Lateral roots – branches off other roots
  – First order branches
  – Second order branches …..
Secondary Root System
Two classes of root

• Shoot-Borne roots
  – On monocots: nodal, tiller or prop roots
  – On dicots: stem, or nodal roots

• Lateral roots – Branches off other roots
  – First order branches
  – Second order branches…..

Different Strokes

• Dicots (tomato, potato, pea, bean)
  • Most roots thicken as they age.
  • Predominantly rely on an expanded primary root system

• Monocots (corn, wheat, other grasses)
  • Roots do not thicken with age
  • Predominantly rely on a secondary root system

A root system is an organized collection.

At last count, there were 8 different classes of root on a single root system (in this case, maize). These roots come in many different sizes and lengths.

The thinnest roots are the most critical for nutrient and water uptake, but each root is only a centimeter or so long, and lives only about two weeks. There are, however, a lot of them.

Come on, a root is a root!

Unfortunately not:

The major classes of root described above have been demonstrated to function differently than each other.

Differences in:
  nutrient and water uptake
  response to stresses
  amounts and kinds of chemicals released into the soil
• Roots are the driving influence on soil ecology.
• Different classes of root respond differently to environmental perturbations, including fertilizer, herbicide, and irrigation.
• Plant growth and development, and, ultimately that most important aspect, YIELD are the cumulative effects of how the roots react to soil environment and how the soil ecology reacts to the roots.
Session 3

Biodiesel Basics

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Project Background

The Biodiesel Project is the first project officially commissioned by CARES (Centre for Agricultural Renewable Energy and Sustainability). CARES is based out of the University of Guelph, Ridgetown Campus and is a hub for applied and adaptive research, training and education, technology transfer, and rural community development in bio-energy and the bioeconomy. The biodiesel facility setup was completed in the fall of 2009 and production of biodiesel began shortly thereafter.

Project Design

The biodiesel facility was designed in a manner that outlines what a large farm or a co-operative of farmers or interested individuals could construct using relatively simplistic and inexpensive equipment. This facility has a nameplate capacity of 1 million litres per year. The consulting company that developed the technology for this project is Lougheed Biodiesel Reactors out of Owen Sound.

Project Objectives

At the CARES biodiesel facility waste vegetable oil is currently being used as the main feedstock. The primary reasons for using a second generation product are the cost effectiveness as well as sustainability reasons. As the project progresses, however, the feasibility of pressing oilseeds on-farm and using that oil to produce biodiesel will be explored. The idea is for individuals or co-operative groups to be able to produce their own fuel for transportation and farming practices. The overall scope is to support a more decentralized fuel systems where farms can become more independent and self sufficient.

Anaerobic Digester and Oilseed Processing Facility

The anaerobic digester and oilseed processing facility are the two most recent projects underway through CARES and are all part of an integrated system where products from one project are used in another. This can be seen, for example, with the biodiesel byproduct streams (glycerin and wash water) which are excellent high energy feedstock for the anaerobic digester.

The anaerobic digester will take in all of the livestock manure produced on campus as well as purpose grown energy crops and off-farm material. Through the digestion process methane gas
is produced which is then run through an engine to turn a generator to produce electricity. The initial output of the digester will be 250 kW of electricity.

The oilseed processing facility will focus on extracting the various products (oil, meal, hulls, gums, etc.) and finding value for each of these. Studies will be conducted to see whether it is economically feasible for farming operations to process oilseeds into their own feed and fuel or adding farm gate value to their commodities.

**Biodiesel Processing**

The basic process of converting vegetable oils and animal fats into biodiesel is relatively straightforward. A triglyceride (oil or fat molecule) is broken apart and formed into three new molecules known as a Fatty Acid Methyl Ester (biodiesel) and a glycerin molecule. The full process is slightly more detailed but is still fairly simplistic.

**Esterification**

The waste vegetable oil is pumped into either of the reactor tanks. Once in the tanks the oil is heated to approximately 120°F. Due to the oil being somewhat degraded it is generally too high in free fatty acids (FFA) to go directly to the transesterification reaction (the main biodiesel reaction) so it must be preprocessed to lower the free fatty acid number using a process called esterification. In this step an acid catalyst is mixed with methanol and pumped into the reactor vessel with the heated oil. The contents are then re-circulated using a pump. After the reaction is completed and the FFA number lowered beyond a certain threshold the oil can then undergo the transesterification reaction.

**Transesterification**

In the transesterification process a methanol and base catalyst (potassium hydroxide) are first mixed together. This mixture is then pumped into the reactor tank with the oil, which is still kept at 120 °F. This mixture is re-circulated then left to settle. Shortly after the glycerin contained with the biodiesel begins to separate from the biodiesel and can then be drawn off of the bottom of the reactor vessel. After the glycerin has been removed the residual impurities left in the biodiesel must be removed. This is accomplished by washing and drying the biodiesel.

**Washing**

The biodiesel washing uses roughly 10% (about 2% per wash) of the volume of biodiesel worth of domestic tap water. This washing occurs over 5-7 separate passes in which the water is splashed into the biodiesel, agitated, allowed to settle and the wash water is drawn off of the bottom. After the final wash the last of the water is drawn off and the biodiesel is pumped over to the biodiesel dryer.

**Drying**

After washing the biodiesel picks up some moisture and becomes cloudy. Biodiesel does not have a strong affinity for water and if it were to be left in an open container the water would
actually leave the biodiesel. The biodiesel dryer speeds up this process to quickly produce a dry, clear, finished biodiesel. The dryer works by re-circulating and spraying the wet biodiesel into the head space of the dryer tank. A forced air system then pushed the atomized biodiesel and water vapour up through the condenser above the tank. The biodiesel condenses and falls back into the tank while the water vapour continues through the condenser and out into the atmosphere.

**Facts about Biodiesel**

Biodiesel has many positive attributes but also has a few negative ones. Biodiesel is a non-toxic, biodegradable product that reduces emissions when used in diesel engines. It can be used in any diesel engines and provides benefits such as added lubricity, increased power, torque and mileage, even at low blends.

One of the main drawbacks with biodiesel is that it will gel (solidify) in the wintertime if it is not blended with petroleum diesel. Another drawback to some is that the biodiesel has a solvency effect and will clean out fuel tanks and lines causing that foreign material to plug up fuel filters, particularly at higher biodiesel blends. This means that until the tank becomes free of this debris more frequent filter changes are required.

**Byproduct Management**

There are two main byproducts that need managing in this type of biodiesel production system: the wash water and the glycerin. Both of these products contain sources of energy and nutrients. The campus is currently conducting several research trials ranging from growing microbes to produce bioproducts from the glycerin to composting wash water trials and doing in house purification of the glycerin byproduct. Another large scale route for utilizing the byproducts is to feed them into the anaerobic digester. Both of these products are excellent feedstock types for the digester and will ultimately boost the production of electricity yield.
Session 4

Cover Crops – Money Saver or Waster?

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Dave Van Segbrook
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Cover crops in horticulture – what are they worth to you?

With many vegetable crops harvested before mid-September, there is enough growing season to plant a cover crop. The costs of planting cover crops include more than seed costs such as cost of planting, cultivating and perhaps controlling growth. But the benefits in terms of profits or soil quality of planting a cover crop are difficult to measure. Grower experience and research results from Ontario and elsewhere will be presented to give Ontario horticultural producers practices to implement next season. Topics will include:

- Making red clover work in winter wheat – What’s Dave’s secret?
- Red clover nitrogen credit – Does grower experience match with research estimates?
- Preventing wind erosion – How do you value healthy soil?
- Profit margins in sweet corn, cucumbers, and processing tomatoes – Can cover crops pay for more than seed costs?
- Comparing early August vs. early September cover crop planting dates – Does it make a difference the following year?

This talk is a must if you grow vegetable crops. But if you grow cash crops, you may be interested in how one grower makes red clover work in winter wheat.

For cover crop resources, check out the following websites:

- Laura Van Eerd http://www.ridgetownc.uoguelph.ca/research/profile_lvaneerd.cfm
- Midwest Cover Crops Council http://www.mccc.msu.edu/
- OMAFRA http://www.omafra.gov.on.ca/english/crops/facts/cover_crops01/covercrops.htm
Session 5

Innovation Opportunities

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Innovation Opportunities

Dr. John Kelly, Vice President, Ontario Fruit and Vegetable Growers' Association
Erie Innovation and Commercialization at the Southwest Agricultural Conference

So you want to be an entrepreneur, and you want to seize opportunities from the innovation agenda. In agriculture, we are seeing a significant change in the opportunities that are being presented. Conventional agriculture is changing. No longer just growers of food for the population, agriculture is being seen as the future for many different sectors, ranging from energy and manufacturing to solutions for human and environmental health issues, along with meeting the demands of a fickle consumer.

There are a few caveats for the development of innovation in Ontario. First, Research Without Implementation does not have the same value potential. This means that for a lot of what we seek, there must be an end use. Increasingly we are seeing research which is less curiosity driven, but more end point driven. Further, research programs are more commonly demanding active financial industrial participation in research programs.

We are also seeing a Convergence of Disciplines. This means that other sectors are starting to see the value that agriculture can have in meeting consumer demands. Medicines, pharmaceuticals, nutraceuticals, and functional foods are all having a positive impact on the health of Canadians and consumers around the world. We need to find ways that agricultural producers can benefit and capitalize on this demand.
The “Made in Canada” requirement for research implementation must be eliminated. We have to be searching globally for the most effective technologies and opportunities for producers, and we have to find those markets which can add value to Canadian producers. WE ARE IN A GLOBAL FOOD RACE.

The involvement of agriculture in the entire value chain is increasingly becoming more important. The typical value chain for most agricultural products is as follows:

Innovator → Grower → Aggregator or Processor → Retailer (End User) → Consumer.

Producers need to be actively engaged in finding out what consumers want, and find new ways to meet their needs. We have to have an end target market and look for “market pulls” rather than “market pushes”. Just because we can grow it, should we? Also, we need to see what is in our own backyard and seek out those opportunities. The changing demographic of the producer is changing what we should be producing.

In finding markets that need products, we will serve the market pull. Development of new crops, such as Asian vegetable crops for the Greater Toronto Area, fruits with longer growing periods, hazelnuts to fill the requirement for manufacturers, industrial oil production from biosources, energy to fuel our major power plants for expensive, on-demand electricity as well as meeting the increasing demand for local product are all innovations that have great potential.

Ontario has first class research and product development. With the advent of food products directly targeting the health and wellness market (omega-3 eggs, DHA Milk, probiotic yogurts, specialty crops), agriculture is now addressing specific human conditions ranging from Alzheimer's disease, Asthma, and Attention Deficit Hyperactivity Disorder (ADHD) to Heart and Cardiovascular disease to liver disease and many forms of cancer.
In addition to food, Op for Ontario based agricultural research and product implementation can be broadly defined into three areas: Food/Health, BioEconomy and Environment. And there are agri-tourism prospects as well. Each of these areas represents tremendous opportunity for producers and entrepreneurs. Each of these areas also represents some risk. How do we deal with this risk?

Opportunities abound. We must relentlessly seek them out! We must implement. For the scientists and entrepreneur, don’t let the search for perfect science prevent the application of the innovation. Opportunities must have the proper rate of return. How do we address the challenge of these opportunities?

This session will address the innovation economy and provide examples of where application of innovation can provide useful returns to producers and positively impact the health of the Ontario and Canadian economy.
Overview

Organic matter is an important part of maintaining a healthy, productive soil. It:

- feeds the microorganism populations, improving soil live diversity
- improves soil aggregation
- increases nutrient cycling and the ability to hold some nutrients
- improves water holding capacity
- reduces the risk for compaction
- increases soil resilience against wind and water erosion

With increasing demands on harvesting carbon for bio-energy, while at the same time sustaining soil productivity, what are the options for maintaining or even building organic matter levels in the soil?

This presentation will focus on how additions of carbon – ranging from crop residue to cover crops to manure, compost and other non-agricultural sourced materials can benefit the soil.

There are many sources of organic carbon that will help build soil organic matter. In addition to manure and cover crops, there are other sources of organic amendments available to cash crop farms. Some of these sources include biosolids pellets, municipal green-bin compost, N-Viro, digestate from anaerobic digestion systems as well as sewage biosolids, and pulp and paper biosolids. Each of these amendments will provide benefit to the soil, but each product has a slightly different composition. Which organic matter source or amendment has the best fit for your operation?
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<th>Biosolids Pellets (Windsor)</th>
<th>Biosolids Pellets (Toronto)</th>
<th>N-Viro (Sarnia)</th>
<th>Municipal Greenbin Compost AIM - Hamilton</th>
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<td>2.0</td>
<td>0.2</td>
<td>0.1</td>
<td>---</td>
<td>0.05</td>
<td>0.03</td>
</tr>
<tr>
<td>Zinc Zn</td>
<td>0.1</td>
<td>1.0</td>
<td>1.9</td>
<td>0.4</td>
<td>0.1</td>
<td>---</td>
<td>0.03</td>
<td>0.11</td>
</tr>
<tr>
<td>Total Salts</td>
<td>---</td>
<td>6</td>
<td>5</td>
<td>32</td>
<td>8</td>
<td>---</td>
<td>2</td>
<td>1.4</td>
</tr>
<tr>
<td>Organic Matter</td>
<td>562</td>
<td>1320</td>
<td>1152</td>
<td>432</td>
<td>753</td>
<td>~480</td>
<td>708</td>
<td>592</td>
</tr>
</tbody>
</table>

¹ Available N is an estimate of available N in the year of application (fall or spring applied) – availability will vary with season of application, soil temperature and moisture conditions and C:N ratio.
² P₂O₅ availability could be reduced with high Aluminium levels when combined with low pH
³ taken from nutrient composition of common forages and converted to wet as-is basis.
Session 7

Manure – More than Just NPK

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Overview

If manure was applied only considering the nutrient value, then the majority of manure would be applied to corn crops. Manure management requires a planned systems approach. There are other considerations in many farm operations that have resulted in manure being applied to wheat, soybean and forage crops in addition to corn crops. Some of those considerations include:

- More frequent application of manure may eliminate the need for new or additional manure storage
- Application of manure outside the busiest seasons of spring planting or fall harvest results in more economical distribution of time, labour and machinery resources
- Nutrient composition of manure (ie high water content) may allow higher application rates during the growing season when crops could also benefit from the moisture in manure
- Early spring application of manure to wheat crops (with carrying frost) can reduce compaction and wheel track damage
- Manure that is applied during ideal conditions will not require contingency planning during wet conditions or seasons with late harvest
- Manure applied to growing crops generally have to lowest environmental risk

The farm panel of Gord, Henry and Dean will discuss how they have tried manure application to corn, wheat and/or forage crops and where the manure application best fits into their cropping system. They will discuss what works well and where there are challenges with manure applied to cereal and forage crops.
Henry Hartemink finds that liquid hog manure applied to wheat works well in his operation. Table 1 shows the results from his side-by-side comparisons for 2009 and 2010.

Goals:

- Better utilize manure from undersized storage
- Cover as much acreage as possible
- Save fertilizer costs
- Build soil fertility levels (including micros)

Challenges:

- Must be frost applied early in morning before ground becomes greasy
- Uniform application with splash pan system
- Carrying frost with no snow
- Risk of wheat damage if manure is applied later in spring

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Yield - 2009</th>
<th>Yield - 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full rate as manure</td>
<td>85.3 (86.5)</td>
<td>97.9 (102.5)</td>
</tr>
<tr>
<td></td>
<td>81.7 (83.7)</td>
<td>93.2 (95.4)</td>
</tr>
<tr>
<td>2/3 manure 1/3 fertilizer</td>
<td>77.0 (75.8)</td>
<td>98.1 (105.7)</td>
</tr>
<tr>
<td></td>
<td>78.1 (79.1)</td>
<td>90.4 (92.4)</td>
</tr>
<tr>
<td>Full rate as Fertilizer</td>
<td>72.4 (63.1)</td>
<td>98.8 (101.4)</td>
</tr>
<tr>
<td></td>
<td>81.7 (83.7)</td>
<td>96.2 (98.2)</td>
</tr>
<tr>
<td>Check</td>
<td>No manure</td>
<td>59.3</td>
</tr>
<tr>
<td></td>
<td>No nitrogen</td>
<td>(56.7)</td>
</tr>
</tbody>
</table>

Manure Applied to Wheat

Table 1: 2009-2010 Plot Results
Gord Green applies liquid dairy manure to forages and finds that to be a good fit in his production system. Results are shown in Table 2 - 4.

Table 2: Alfalfa Yield and Quality Comparison – 2009 All Plots
Manure vs Fertilizer vs Nothing

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Yield Adjusted for DM</th>
<th>Quality</th>
<th>Yield + Quality Adjusted for DM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>tons/ac</td>
<td>% Δ</td>
<td>lbs milk / ton</td>
</tr>
<tr>
<td>Manure</td>
<td>1.13</td>
<td>7.1</td>
<td>2,958</td>
</tr>
<tr>
<td>Fertilizer</td>
<td>1.09</td>
<td>3.7</td>
<td>2,938</td>
</tr>
<tr>
<td>Zero</td>
<td>1.05</td>
<td>---</td>
<td>2,827</td>
</tr>
</tbody>
</table>

Represents 6 locations – 2 or 3 cuts/site (~250 samples)

Table 3: 2009 – GREEN - Surface Applied Manure vs Commercial Fertilizer vs Nothing

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Yield/cut (ton/ac)</th>
<th>Difference</th>
<th>lbs/ton difference</th>
<th>lb/acre difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing</td>
<td>0.92</td>
<td>---</td>
<td>2,886</td>
<td>2,611</td>
</tr>
<tr>
<td>Fertilizer only</td>
<td>0.88 (4.3)</td>
<td>2,952</td>
<td>2.2</td>
<td>2,609 (0.1)</td>
</tr>
<tr>
<td>Surface Applied</td>
<td>1.13</td>
<td>2,954</td>
<td>2.3</td>
<td>3,450</td>
</tr>
</tbody>
</table>

Soil Test: pH = 7.3; OM = 3.3; P = 14 ppm; K= 60 ppm
Manure application: July 5 @ 4,000 gal dairy manure – nutrients applied (lbs/ac):
N – P205 – K20 = 52 – 37 – 78

Impact of tire tracks from manure application equipment is significant both for yield and quality. In both these examples shown in Table 4, manure was applied ~10 days after cutting. Regrowth for both these fields was significant when manure was applied. With a multiple cut system, the opportunity for manure application can occur after 1st, 2nd, 3rd and/or 4th cut.

Table 4:

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Yield/cut (wet tons/ac)</th>
<th>Advantage</th>
<th>Protein</th>
<th>ADF</th>
<th>NDF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manure 1</td>
<td>5.80</td>
<td>32</td>
<td>22.7</td>
<td>30.8</td>
<td>42.2</td>
</tr>
<tr>
<td>Tire track 1</td>
<td>3.96</td>
<td>23.7</td>
<td>26.8</td>
<td>33.7</td>
<td></td>
</tr>
<tr>
<td>Manure 2</td>
<td>7.73</td>
<td>41</td>
<td>20.7</td>
<td>42.5</td>
<td>52.5</td>
</tr>
<tr>
<td>Tire track 2</td>
<td>4.59</td>
<td>24.5</td>
<td>32.9</td>
<td>38.9</td>
<td></td>
</tr>
</tbody>
</table>

Kent Soil & Crop Improvement Association
Dean Van Aerthals has applied liquid hog manure to a variety of crops comparing the manure to commercial fertilizer benefits.

**Corn**
- 4000 gal/ac finishing hog manure is injected in spring with a disk injector at 10” spacing by drag hose
- 43 lbs available N, 32lbs P205 and 36lbs K20 per 1000gal (172-128-144)
- a 7-17 bushel advantage of manure vs 28% and starter fertilizer has been seen over 8 years of plots

**Wheat**
- manure has been spread on wheat 7 different times but not every year
- spread in March on frost or April on dry ground
- apply 3200 to 3500gal/acre with drag hose with hydraulic distributor and drop tubes at 10” spacing
- have used tankers and spread bar with splash plates on drag hose but not happy with spread patterns
- manure has still out yielded 28% by 5-9 bushels 6 out of 7 times
- 7th time spread in December, wheat looked great until April and then heaved out where the manure had been spread and had to be sprayed off

**Alfalfa and Wheat Stubble**
- manure is usually spread after 2nd or 3rd cut at 5000gal/acre
- used to inject manure into wheat stubble and till, but now stubble and clover is mowed and manure is spread on clover at 5000gal/acre
- usually only spread enough to ensure storage space over winter

**Cover crops**
- definite advantage to manure on the cover crop for growth (5 yrs of plot work)
- red clover is still the cover crop to beat for N to the corn crop the following year
- did notice better soil tilth from all of the cover crop plots the following year (oats, peas, oil seed radish and clover)

**Pros and Cons of Handling Manure**

**Pros**
- don’t have to deal as much with the highs and lows of the fertilizer markets
- don’t have the large fertilizer bill
- free micro nutrients
- if you have it take advantage of it

**Cons**
- weather
- patience
- compaction
- knowing when to go to plan B
Session 8

Better Crops, Safer Water

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Please use the balance of this page for notes.
Better Crops - Safer Water

David L. Rudolph and Don J. King

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Guelph, Ontario

Regional Nutrient Impacts
- Legacy fertilizer use has resulted in elevated nitrate levels in some municipal wells.
- Nutrient reductions in well head protection areas are being implemented as BMPs.
  - Paucity of field-based data available on the performance of these BMPs.
  - Long response times result in monitoring challenges and discourage municipal authorities.

Assessing Impact Of Nutrient BMPs on Municipal Well Water Quality
1. Establish regional field facility for long-term monitoring of BMP impacts.
2. Develop monitoring strategy to quantify BMP performance in a timely fashion.
3. Employ predictive tools (models) to assess potential magnitude and timing of impacts on municipal wells.

Socio-economic Challenges

Thornton Well Field, Woodstock, Ontario
- Primary water supply for Woodstock
- 5 production wells in sand and gravel aquifer.
- Average well depth 30 m
- Adjacent to active farm land where fertilizers applied for decades.
- Typical setting for municipal groundwater supply in Ontario

Nutrient Management Strategy
2. Release tender for managing the land under reduced nutrient use (BMP).
4. Implement monitoring protocol to assess effectiveness of the BMPs.
Changes in Nutrient Application

<table>
<thead>
<tr>
<th></th>
<th>Historical Practice</th>
<th>Modified Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crops</td>
<td>Cattle/Hog production, primarily corn cropping, some wheat and soy</td>
<td>Soy-wheat-corn rotation; some fields in permanent grass</td>
</tr>
<tr>
<td>Applied Nutrients</td>
<td>Commercial fertilizer some manure</td>
<td>Commercial fertilizer (variable rate)</td>
</tr>
<tr>
<td>Average N application</td>
<td>100 lb/ac</td>
<td>54 lb/ac</td>
</tr>
<tr>
<td>N - Balance</td>
<td>(+) 23 lb/ac</td>
<td>(-) 26 lb/ac</td>
</tr>
</tbody>
</table>

Stored Nitrate Mass in Unsaturated Zone

<table>
<thead>
<tr>
<th>Year</th>
<th>Core 1</th>
<th>Core 2</th>
<th>Core 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003/04</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2004/05</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2005/06</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2006/07</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2007/08</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2008/09</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Influence of the Nutrient Reductions

1. Loading correlates with:
   - Topography
   - Permeability of near-surface materials
   - Nutrient management practice
2. Avg. conc. beneath root zone decreased from ~20 mg/L to ~8 mg/L
3. Total nitrate mass loading decreased from 5.6 to 2.1 tonnes/year (from 2006 to 2008)

Transient Nitrate Concentrations in Municipal Wells

Cumulative mass vs Depth at Station 4

Cumulative mass (g NO₃-N/m²)

Depth (mG)

60% reduction in total stored nitrate mass
Implications and Conclusions

1. Regional nutrient management BMPs can effectively improve municipal groundwater quality.
   - Full impact may require years to decades
   - Local area may be sufficient
2. Source water protection policies can consider these BMPs in recommended guidelines.
3. Combined vadose zone monitoring with upscaling and regional modeling can be useful in predicting BMP performance.

Nitrogen Management BMPs

Enhanced practices for agricultural land in a source water protection area

Consider:
- BestMP's for agricultural land
- Crop rotation and conservation tillage
- Reduce nitrogen but maintain productivity
- Recommended and newer technologies

Nitrogen Management Supply

- Corn nitrogen management experiment
  - N type, timing, rate (corn calculator), landscape position, red clover cover crop
- Corn nitrogen fertilizer source experiment
  - N type (coated urea), rate, GE hybrid
- 2 year study
  - 2009 - 2010

Collaborators: Oxford Cty, SRG, UofW, OMAFRA, UTRCA, UofG
David Start and Mark Rutherford
Funding: MOE Ontario Drinking Water Stewardship Program

Rates of Nitrogen (lbN/ac)

<table>
<thead>
<tr>
<th>Nitrogen management plots</th>
<th>Winter Wheat residue</th>
<th>WW/Red Clover residue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Calculator spring</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coated urea</td>
<td>138</td>
<td>76</td>
</tr>
<tr>
<td>Calculator spring</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urea</td>
<td>138</td>
<td>76</td>
</tr>
<tr>
<td>Calculator side dress UAN</td>
<td>125</td>
<td>69</td>
</tr>
<tr>
<td>UAN 28%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High rate side dress UAN</td>
<td>173</td>
<td>173</td>
</tr>
</tbody>
</table>

Nitrogen source plots

<table>
<thead>
<tr>
<th>Nitrogen source plots</th>
<th>Coated urea</th>
<th>Urea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Spring application</td>
<td>50/100/150</td>
<td>50/100/150</td>
</tr>
</tbody>
</table>

Monitoring

- Environmental
  - soil nitrate N (12 and 24in.)
  - soil solution nitrate N (3ft.)
  - soil core (to 15ft.)
- Production yield
- Groundwater impact (leaching potential)
- Nitrogen efficiency (BMP effectiveness)
Winter Wheat residue
Upper field position

Year 2009
NO3-N (ppm)
ESN138
Urea138
Side125
Side173
Control5

Year 2010
NO3-N (ppm)
ESN76
Urea76
Side69
Side173
Control5

SRG SRG

N Management Yield

Treatment average
WW = 178bu/ac
WW+RC = 178bu/ac

Treatment average
WW = 219bu/ac
WW+RC = 219bu/ac

N Source Yield

ESN GE
Urea GE
ESN CV
Urea CV

SRG SRG

Economic Efficiency

• N management (2 residues, positions & years)
  - NUE (bu/N): SDcalc > Urea ≥ C.urea
  - NEE ($ in/N$ out): SDcalc > Urea > C.urea
  - Relative Return: Urea, SDcalc, C.urea / Urea
    (N cost, corn price, SD cost, RC cost)

• N source (Urea vs. C.urea, GE vs. CV hybrid)
  - NEE ($ in/N$ out): Urea > C.urea (15-30%)
    (N cost, corn price)
  - Relative Return: GE > CV both years
    (N cost, corn price, herbicide cost diff. > seed cost diff.)

Conclusions/Observations

Nitrogen BMP Evaluation:
• Coated urea provided an environmental advantage without impact on productivity although there was an economic premium
• Genetically Enhanced hybrid overall had small production advantage and potential economic advantage
• Nitrogen reduction with side-dress application had greatest environmental and economic efficiency
• Red clover had an economic advantage without yield reduction
### Session 9

**Profit & Pitfalls in Dry Beans**

<table>
<thead>
<tr>
<th>Paul Cornwell</th>
<th>Steve Twynstra</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hensall District Co-op</td>
<td>Twilight Acre Farms Ltd.</td>
</tr>
<tr>
<td>1 Davidson Dr.</td>
<td>26552 New Ontario Rd, RR 1</td>
</tr>
<tr>
<td>Hensall ON N0M 1X0</td>
<td>Ailsa Craig ON N0M 1A0</td>
</tr>
<tr>
<td>ph. 519-262-3002</td>
<td>ph. 519-232-4447 x213; 519-878-4205</td>
</tr>
<tr>
<td>e-mail: <a href="mailto:pcornwell@hdc.on.ca">pcornwell@hdc.on.ca</a></td>
<td>e-mail: <a href="mailto:stwynstra@isp.ca">stwynstra@isp.ca</a></td>
</tr>
</tbody>
</table>

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*Please use the balance of this page for notes.*
Session 10

Tillage, Erosion & Field Variability

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Please use the balance of this page for notes.
Session 11

Dollars from Dryers

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John has been employed as a “Quality Grain Care” Consultant For Pioneer Hi-Bred providing Harvest Management Seminars and On-farm Assessments for over 14 years.

John’s career spans 45 years of experience working with Grain drying, storage, & harvest management.

TOWER DRYERS WITH INTERNAL FAN ASSEMBLIES

- Understanding what you have purchased
- Determining best management practices
- Prior to your harvest, identify the condition of your crop – the corn moisture & test weight
- Do not operate your dryer in the same manner every year
- Select the operating temperature that provides the best kernel quality --
  1 Test weight
  2 Lowest percentage of stress fractures – 25% or less
- Managing your start-up
- Average ambient air temperatures --
  Example: 50º F daytime & 25ºF nighttime -- you need to log these temperatures.
  Changes in ambient temperatures, require more or less free air added to your cooling section.
- Over-cooling the grain (corn) creates a higher percentage of kernel stress fractures
- When plugging occurs, clean the exterior & interior of the grain dryer – ASAP!

LOW PROFILE CONTINUOUS FLOW DRYER
(Discharging hot grain)

- For best kernel quality, keep discharge grain temperature at 130ºF if possible.
- Adjust plenum for highest test weights.

In-Bin Cooling Process

- Your roof venting is based on 1.5 sq. ft. opening per 1000 CFM of air.
- Your airflows need to be documented
- Hot grain risk factors increase in cooling bins every 10ºF above 90ºF
  Example: 150ºF grain = high risk!
OPERATING STACKED DRYERS with PRESSURE HEAT COOLING

- Cold weather operation causes high levels of stress fractures.
- If suction cooling is used, the free air inlets must be open when the ambient temperatures falls below 50°F.

IN-BIN CONTINOUS FLOW DRYING SYSTEM

- This system operates at peak performance if the air flow is at 20-25 CFM per bu.
- Maximum capacity can be maintained if a wet holding bin is part of the system.
- Grain depth (3’ – 4’) is necessary in order to achieve 20-25 CFM per bushel.
- All in-bin drying systems need proper roof venting. This prevents the transfer of condensation to the grain being dried.
There are a number of options open to rural landowners in Ontario to produce energy both for their own use and for income purposes. This certainly is not a new concept. During settlement of Ontario, woodlots were commonly included for each farmstead. Typically these woodlots had a minimum size to supply the heating and cooking fuel for the households located on the farm. Later, most farmsteads installed windmills to transfer water from the well to the farmstead.

As the rural electrical and natural gas grids developed across Ontario, the need for traditional farmstead energy production has decreased (but not eliminated since many rural homes still heat with wood).

There are a number of options currently available to reduce external energy use by the farmstead. These include…

- reduction in use due to conservation (better lights, more efficient motors etc.),
- solar heat generation for hot water and building heating,
- heat pump systems (more economical during night time use with lower power rates) and
- optimizing use of wood as a heating fuel from bushlots and fencerows.

Very recently, there has been interest to produce energy primarily for farmstead income purposes. This has been driven by the opportunity to sell renewable energy on the electricity grid at a price that allows a specified return on equity. Since the introduction of the Feed-In Tariff (FIT) and microFIT programs in Nov 2009, over 20000 applications for projects have been made with the bulk of applications to the smaller Micro-FIT programs (<10 kW).

As of Dec 6/2010, 2181 microFIT projects have had their “contracts executed”. That means they are built, connected and placing power into the grid. According to the Ontario Power Authority (OPA), 99% of these systems are solar and a substantial percentage of these systems are located in Rural Ontario.

One challenge has been to quickly develop this technology for Ontario conditions. Only a few systems have been installed in 2009 or earlier. Early indications of electrical yield have matched or exceeded projections from software programs such as Retscreen (developed by Natural Resources Canada). However, caution must be expressed when using these numbers since yield is expected to reduce over time (0.5% to 1% per year) and the effects of Ontario’s climate causing wear and tear on components has not been fully tested.
There is increasing interest in roof mounted solar systems. Many farmsteads have roofs easily capable of allowing over 100 kW of panels (about 100 ft² per kW). There are a number of steps required prior to investing. These steps include:

- determining the ability and cost to connect to the electrical grid (key for all projects),
- obtaining the contract from OPA,
- making sure the domestic content requirements are met and
- ensuring the roof is structurally adequate to support the panels and the possible changes in snow loading conditions.

Ground mount systems >10 kW are being considered for Ontario farms. Systems <= 100 kW typically fit on 1 hectare of land and are not restricted by soil classification. There is an opportunity to locate these systems along laneways or fencerows and cause very little loss of agricultural land. Ground mount systems >10 kW will require Renewable Energy Approval (REA) from the Ontario Ministry of Environment.

Solar is not the only energy option for rural Ontario. Wind production is possible. Most current development in wind is with larger units (> 1 MW each). Smaller units are possible however location and long term durability must be carefully considered.

On farm production of biogas with conversion to electricity and heat is being (or will be) completed on over 25 farms in Ontario. Most of these farms use manure and food waste as inputs to provide an almost continuous production of electricity. In Germany, most biogas systems also use corn silage as a feedstock for a digester. Economic returns in Ontario currently will not support significant use of energy crops. Fortunately, Ontario has many food processors and many towns and cities creating large volumes of good quality off farm source inputs (such as concentrated grease trap waste from restaurants).

Biogas systems also create other benefits such as pathogen and odour reduction from inputs such as manure. They have the ability to produce continuous power or to store biogas for short period and generate electricity during peak demand periods.

Under the FIT program, renewable biomass can also be used as feedstock to produce electricity along with heat production. Larger rural heat users (such as greenhouses) may utilize this process.

There are further farmstead energy options beyond electricity production via the FIT program. These include biomass production generally for heat production (or large scale remote electricity production). The easiest farmstead process is to directly burn crops such as grain corn. Bulky biomass (such as switchgrass) likely needs to be put in a form that compresses the material, makes it easier to handle in bulk form and allows easier utilization by furnaces. In most cases, this means pelletization although it is possible to granualize the material. Pretreatment could also include torrefaction (somewhat equivalent to turning it to charcoal) which concentrates the material and makes it easier to store. One challenge is to determine a uniform means to trade a
product such as biomass. The value for a product depends on many factors such easy of storage and handling, timing, amount of minerals (lower the better) and moisture.

There are other options to move energy from rural Ontario to users other than using electrical lines, roads and rails. Ontario has excellent natural gas pipeline and storage systems. Biogas plants produce biogas which consists primarily of methane and carbon dioxide. Equipment is now available to concentrate the methane to levels the same as natural gas. This allows the facility to inject renewable natural gas (known as biomethane) into a standard natural gas line. This line will conduct most of the energy (not just 35% as for electrical) to renewable energy users to heat buildings or power remote electrical generation systems with renewable energy. This can be accomplished by the energy user without changing the existing natural gas equipment. A number of these facilities are operating in Germany and one just started on a dairy farm located near Vancouver.
Introduction: Where does the energy come from?

The answer to the question of where bioenergy originates from is quite simple – the sun. In fact, virtually all of the energy we use today comes from the sun – even fossil fuels. Petroleum and other fossil fuels were made from the process of photosynthesis performed by plants and oceanic microorganisms that lived 300 million years ago. Photosynthesis is the process used by plants to convert atmospheric carbon dioxide to longer chain carbon molecules such as glucose. This process is sometimes referred to as “autotrophically derived” energy since it is created from organisms using inorganic CO₂ and sunlight. Yesterday’s biofuels, including the hay that grandpa fed to his horses, and the logs he fed to his furnace, were autotrophically derived. Today’s biofuels including ethanol and biodiesel are autotrophically derived but unlike fossil fuels, they are made from CO₂ taken from today’s atmosphere which offers society a huge benefit (sometimes called an “ecosystem service” in the environmental vernacular). Conversely, gasoline, diesel, and other fossil fuels such as coal and natural gas emit CO₂ into the atmosphere every time we use them – CO₂ that was safely sequestered below the surface of the earth for hundreds of millions of years. This release of CO₂ to the atmosphere is the basis for the global warming issue we currently hear so much about – more about that below.

Unfortunately, oil won’t last forever. Unlike our generation, future generations will not have the luxury of fossil fuels that are readily available, and easily converted to liquid transportation fuels. This fact was already recognized by Henry Ford when he experimented with biofuels such as biodiesel and ethanol. America’s reliance on fossil fuel energy did not really begin until quite recently in our history. In the year 1885, coal first passed wood as the U.S. primary energy source thus beginning the “fossil fuel era.” Today, 83% of our 99.2 quadrillion U.S. Bltu energy consumption comes from fossil fuels. Our contemporary generation will be unique in the fact that we will comprise the small blip in the human history timeline that relied on fossil fuel energy rather than renewable energy.

Coal, large natural gas deposits, and other fossil fuels are derived from processes requiring a geologic time scale measured in millions of years. The USEPA estimates that today’s proven oil reserves will likely supply the world at current consumption trends until roughly about the decade 2040. Perhaps even more concerning, the U.S. controls only 2% of the world proven reserve oil supply. Development of new exploration and extraction technology will likely lead to the discovery and accessibility of new oil reserves in the future which will push the “out of gas” date a little further ahead in time. However, it is clear that a sustainable future will require divergence from the current reliance on fossil fuel energy.
Biofuels are better for the environment than fossil fuels. In the mass media lately we have been hearing a lot about “carbon footprints” “greenhouse gases” “climate change” and “global warming.” Unfortunately, some of the information is non-defensible, inaccurate, or misrepresented. This muddling of the facts has been especially prevalent when assessing the environmental impact of biofuels. Further complicating the issue are non-scientifically valid efforts to assess and assign indirect carbon costs such as land use changes occurring on other continents. Land use change in foreign countries is as old as history itself and the multiplicity of factors that drive it are far too complex to attribute solely to biofuel production in the U.S. Furthermore, serious errors have been uncovered in the methodology used in these indirect land use change assessments such as ignoring the fact that approximately half of the feed value of corn grain is maintained in co-products such as distillers grain when corn is converted to ethanol.

However, it is fairly straightforward to compare the direct carbon footprint of gasoline relative to a biofuel such as corn ethanol. According to the USEPA, for each gallon of gasoline burned in an automobile, 19.4 lb of CO₂ are emitted to the atmosphere. This is just from the carbon actually contained in the gasoline and does not include the carbon from extracting the crude oil, transporting the crude oil, refining the crude oil, and transporting the gasoline. Furthermore, prior to refining, the carbon from gasoline was safely sequestered below the earth’s surface for hundreds of millions of years. It is basically new carbon added to the atmosphere – 2.7 trillion lbs. of new CO₂ annually from cars in the U.S. alone! By comparison, the net global warming potential of an equivalent amount of ethanol (1.4 gallons of ethanol per gallon of gasoline) is significantly lower. This is because the carbon contained in biofuel ethanol is autotrophically derived. When burned, the ethanol carbon is simply recycled back to the atmosphere from where it came. It is not new carbon added to the atmosphere.

Corn crop residue, a.k.a. corn stover, has been identified as an important feedstock for future cellulosic ethanol production. While corn stover will likely be an important revenue source for farmers as a bioenergy feedstock in the not-too-distant future, it is important to understand the agronomic and environmental value associated with keeping some corn stover in the field. Each ton of corn stover also contains about 22 lb N, 8 lb P₂O₅, and 32 lb K₂O. The value of these nutrients should factor into a grower’s calculations in pricing corn stover. Other agronomic values associated with SOM include increased water permeability, improved nutrient cycling, quicker spring warm-up due to dark color, and increased water holding capacity. Many environmental advantages are also associated with leaving some crop residue on your soil, particularly in reducing erosion. Finally, cultural management practices such as manure applications and the use of cover crops can successfully be used to augment carbon lost with crop residue removal.

Both perennial and annual crops will be needed for a successful bioeconomy. Regional differences in climatic conditions, soil fertility, water availability, market access, and processing capacity require a diverse matrix of available bioenergy crops. There is no “one size fits all” bioenergy crop. All biomass is local and no single crop is a best fit for all localized growing conditions. Having a number of energy crop alternatives available to growers is critical to the success of the bioeconomy. This inherent requirement for diversity includes life cycle (annuals, winter annuals, and perennials) in addition to a multiplicity of crop species. Second generation energy crops including switchgrass and miscanthus are warm season perennial grasses. Being perennials, they maintain a viable root system year-round and following winter dormancy they will regenerate shoot growth from the same root.
system that supported the plant the previous year. In the fall when the shorter days and lengthening nights signal the onset of another winter, the plant will translocate nutrients to the root system to ensure survival until the next growing season. This perennial life cycle infers distinct environmental advantages relative to annual crops. Conversely annual crops offer advantages in grower marketing flexibility, and often biomass yield. If managed correctly annual crops are also protective of the environment particularly when integrated with cover crops.

**BioEnergy feedstock crops have a wide range of energy efficiency ratings.** Biofuels have the potential to be cost competitive with fossil fuels. One metric used to compare the efficiency of a particular bioenergy feedstock crop is based on the amount of energy the crop produces in its final fuel form compared to the cost of the feedstock. This metric is expressed as dollars per giga-Joule of energy produced ($ per GJ). For reference, a GJ is equivalent to 0.948 million Btu. Recently, scientists (Lynd et al., 2008) estimated the cost of liquid transportation fuels derived from cellulosic feedstocks to be at $3.00 per GJ compared to $8.70 for gasoline. Additionally, the authors project costs of $13.80 and $6.60 per GJ for soy biodiesel and corn grain ethanol respectively. Determining the best feedstock for biofuel production is confounded by several issues. A wide disparity between reported economic and energy input costs exists in the literature. My own experience in working with farmers the past 20 years has shown a tremendous diversity in management between farms and even between years for the same farm. Decisions on which tillage operations to perform, which and how much fertilizer, pesticide, and seed traits to use are often based on a myriad of temporal economic, climatic, and environmental factors and interactions. Biological systems, including farming, are naturally fraught with variability. Therefore, significant variability in the cost per GJ of bioenergy produced will continue to be observed. However, some generalizations can be made. When comparing enterprise cropping budgets for input costs and energy requirements, several items consistently rank near the top. These include nitrogen fertilizer, seed, and field machinery operations. Therefore, cropping systems that minimize these primary input cost items while maintaining yield will generally result in being more efficient on a cost per GJ of bioenergy produced basis. For example, perennial grass crops such as switchgrass have the potential for lower cost per GJ produced by virtue of their perennial life cycle (lower planting costs since a stand will last about 10 years) and lower nitrogen fertilizer costs (perennials will translocate some nutrients to root system in fall) compared to an annual grass crop such as corn. On soils responsive to reduced tillage, switching to no-till management can improve economic and energy returns with annual crops such as corn. Furthermore, the efficiency of annual crop systems can be improved by double-cropping a winter annual biomass crop such as winter cereal rye, with corn or soybean.

To date, oilseed feedstocks for biodiesel such as soybean have tended to be less competitive than starch feedstock for ethanol when evaluated on an energy metric such as $ per GJ. This is primarily due to competition for oilseed feedstock from food markets which drives the price for the feedstock up. Additionally, the value of a co-product is not generally factored into an energy-based metric such as $ per GJ. Because soybean is considered more of a protein crop than a bioenergy crop, it tends to compare less favorably with other crops when measured on its energy value alone without regard to the value of the soymeal protein co-products.

**Food vs. fuel concerns should not preclude development of a new bioeconomy.** Throughout agricultural history one thing is very clear, farmers take their mission of feeding the world seriously and
they feel a sense of pride in their ability to serve this critically important role for mankind. This most important role of feeding the world will not change – however, I do believe farmers have the capacity to add “fuel” to their short-list of products which currently includes “food, feed, & fiber.” We have a lot of people to feed. Since 1960, the global population has more than doubled, from 3 billion to the current level of over 6 billion. However, to date, technological advances have kept up with human demands for food. In fact, there is currently more food available per capita than there was in 1960 when the world had half the current population. Data from the United Nations, Food & Agriculture Organization, shows that we currently produce food in excess of the global per capita calorie requirement. Unfortunately, there are still millions of starving people in the world. But the facts suggest it is a result of a food distribution issue and not one of production.

To meet global projections for food and current policy projections for renewable fuels, the International Food Policy Research Institute predicts that crop yields will need to increase about 45% and the available land base will need to increase approximately 15% over the next 30 yrs. Whether or not we can reach this goal is a legitimate question to ask. Historically, we have achieved similar increases in production through improved crop genetic yield potential and technological advances in plant nutrient management. We know that we receive plenty of sunlight energy to drive a food, feed, fiber, and fuel agricultural production system. In fact, it is estimated that mankind uses only a fraction (about 0.02%) of the solar to earth radiant energy annually. However, water and plant nutrients, which all cycle through agricultural production systems, will need to be managed more judiciously than they have been in the past if we hope to meet these new production goals.

The economic advantage of the food market suggests that biofuel feedstock production will be relegated to marginal lands. Marginal lands that are not currently employed for food crop production can be used for producing bioenergy feedstock. The summer of 2008 provided a real-world test case for the Food vs. Fuel issue. The price of oil had reached record highs, nearing $150 per barrel. Crop commodities like corn and soybean were also trading at very high price levels and the July 2008 price for soybean oil was $0.62 per lb. Given that it requires over 7 lb of soybean oil to produce a gallon of biodiesel, it became prohibitive for biodiesel refineries to use soybean oil as a feedstock. However, even under these extreme market conditions, the food market was still able to procure and use soybean oil as a food product. The market conditions during the summer of 2008 demonstrate that the food market can out-compete the fuel market for feedstock, even at oil prices approaching $150 per barrel. This suggests that under our free market system, our nation’s more productive lands will likely remain in the higher value food crop markets, pushing bioenergy crop production to more marginal lands. Bringing more marginal lands back into production for growing bioenergy crops offers several advantages, particularly in creating rural economic development opportunities. Furthermore, if managed correctly, bioenergy crops such as warm season perennial grasses are conducive to maintaining many of the recreational uses these lands currently provide including wildlife habitat and other eco-system services.
Session 14

Plant Early or Bust

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Please use the balance of this page for notes.
Plant Early Or Bust!

SWAC
Ridgetown ON
January 2011

VanQuaethem Farms Ltd.
Norfolk County
80% light ground,
20% heavy ground
10 000 acres
5500 acres of field corn
3500 acres 1st year corn
2000 acres 2nd year corn

Brian VanQuaethem,
VanQuaethem Farms Ltd.

Fall Tillage on Corn Stalks

Spring Tillage

Planting
If I Could Plant It All In 1 Day...
- April 26th
  5000 acres
  ~ 320 ac/day
- April 18th
  100 ac/day
- April 26th
  500 ac/day
- May 4th
  300 ac/day

VanQuaethem Farms Ltd.
SWAC 2011
Jeff Barlow  
Southwest Ag Conference  
Ridgetown, ON  
January 2011

**Plant Early or Bust!**

---

**Introduction**

- Farm 4500 acres of corn, soys, and wheat in the Binbrook area
- Heavy clay, very little tile
- Follow an “adapted conservation tillage” regime
- Red clover
- We like to plant early

---

**The Problem:**

- **RESIDUE & COLD, WET CLAY**
  - Clay soils take much longer to dry out and warm up than loam or sand
  - Excess residue blocks the sun’s rays from hitting the soil directly, reducing soil warm-up and surface evaporation

---

**The Solution: Part 1**

- **EFFECTIVE PRIMARY TILLAGE**
  - Leaves the soil with minimal residue on the surface
  - Lets the soil warm up faster in the spring
  - Effective is the key! Right tool for the right conditions, also try to keep it level.

---

**The Solution: Part 2**

- **EFFECTIVE SECONDARY TILLAGE**
  - If you did a good job on Part 1, then you stand a chance of doing well on Part 2
  - Try to leave a decent UNIFORM seedbed in as few passes as possible to prevent crusting
  - The key is LEVEL equipment and NOT TOO DEEP
  - If the first piece of equipment doesn’t work, TRY something else!

---

**Crust Busting**

- Need to scout corn several times 1-2 weeks after early planting
- Use a rotary hoe if ground is soft or just had a rain
- Use an RTS or similar at 40deg angle any other time
- Use low tire pressure
Weatherstation

- Look at soil temperature data from 2" and 4"
- Like to plant when 4" soil temp stays above 8°C at night
Session 15

Strategic Soybean Management

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Please use the balance of this page for notes.
Session 16

Top Yielding Soybeans

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Illinois Soybean Production on the Web: http://soybean.extension.illinois.edu
Follow me on Twitter: www.twitter.com/vmdavis

There is a lot of desire by the entire agriculture industry to find ways to significantly increase soybean yields. Soybean yields have increased in Illinois by an average of 0.4 bushels per acre over the last 40 years, and 1/3 bushels per acre per year for the last twenty years. However, in the most recent half decade (2003 to 2008), the average soybean yields have seemed to level off causing frustration and concern for some people. In addition, soybean yields greater than 150 bushels per acre were achieved by Kip Cullers, a soybean yield contest participant in Southwest Missouri in 2007. Moreover, Kip Cullers upped that record to 160.6 bushels per acre in 2010. There have been other various (mostly anecdotal) reports of yields greater than 100 bushels per acre, which is more than twice our typical state average yield.

This perceived lagging trend, and these high contest yield reports, have raised questions about the management and additional inputs needed to produce higher soybean yields among soybean producers and academic researchers alike. Management practices for high yield soybean production must be constructed in a holistic approach using sound agronomic and pest management recommendations. There are no ‘magic pills’ or ‘silver bullets’ to make yield. To find higher yielding management practices, one research approach is to use small-plot, University trials to investigate various additional inputs to deduce limiting yield barriers. Another approach is to find the best combination of management practices to increase soybean yields in different regions throughout the state using on-farm research.

While researchers continue to look for practices that greatly increase soybean yields, the best recommendations to maximize yield, and more importantly profits, are to utilize the best basic management and agronomic decisions for soybean production in your area, and then repeatedly scout your fields and adjust for next year. The amount of yield influenced by basic agronomic management decisions like fertility levels, variety selection, planting date, row spacing, and seeding rates will be discussed, as well as, both small-plot University research efforts evaluating additional inputs, and the soybean ‘Yield Challenge’ which started in 2010.

Notes:
It takes a total management approach for high soybean yields

- Appropriate fertility levels
- Variety selection
  - Including SCN and other appropriate protection traits
- Good planting and agronomic practices
  - Timely
  - Row spacing and seeding rate
- Increasing inputs for high yields?
  Pest management protects yield potential
- Eliminate bushels lost to weeds
- Eliminate bushels lost to other pests by thresholds – MUST SCOUT!
- Make a plan, it takes more than one year

Davis, V.M.
## Nutrient requirements soybean versus corn

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>P$_2$O$_5$</th>
<th>K$_2$O</th>
<th>Mg</th>
<th>S</th>
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</thead>
<tbody>
<tr>
<td><strong>Soybean</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grain</td>
<td>3.8</td>
<td>0.84</td>
<td>1.3</td>
<td>0.21</td>
<td>0.18</td>
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<tr>
<td>Stover</td>
<td>1.1</td>
<td>0.24</td>
<td>1.0</td>
<td>0.22</td>
<td>0.17</td>
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<tr>
<td>Total</td>
<td>4.9</td>
<td>1.08</td>
<td>2.3</td>
<td>0.43</td>
<td>0.35</td>
</tr>
<tr>
<td><strong>Corn</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grain</td>
<td>0.9</td>
<td>0.38</td>
<td>0.27</td>
<td>0.09</td>
<td>0.08</td>
</tr>
<tr>
<td>Stover</td>
<td>0.45</td>
<td>0.16</td>
<td>1.1</td>
<td>0.14</td>
<td>0.07</td>
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<tr>
<td>Total</td>
<td>1.35</td>
<td>0.54</td>
<td>1.37</td>
<td>0.23</td>
<td>0.15</td>
</tr>
</tbody>
</table>


Davis, V.M.
Average Solar Radiation at Champaign, IL
1989 to 2008

Flowering initiates based on photo period

Cumulative day of the year

Davis, V.M.

Cumulative glyphosate-resistant weed species
- Glyphosate use in soybean
- Glyphosate-resistant soybean
- Glyphosate use in corn
- Glyphosate-resistant corn
- Glyphosate use in cotton
- Glyphosate-resistant cotton

Johnson et al. 2009
Session 17

Progress in Soybeans

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Istvan Rajcan

Is the yield curve for soybeans actually flat? A number of production challenges specific only for soybeans have been slowing down its yield progress in North America, including pests such as the soybean aphid as well as diseases, especially the soybean cyst nematode. While not as steep as that for corn, the progress in soybean yields over the past several decades is evident. The plant breeders continue to work hard on developing and adopting new genetics and technologies to meet the growers' demand for high and stable yields. Taking advantage of molecular breeding tools has become part of the routine in many private and some public breeding programs. Molecular markers that help breeders in selecting superior genetics continue to evolve rapidly along with the development of new plant molecular tools and bioinformatics.

One area that has received relatively little attention by many plant breeders has been the exploration and utilization of novel sources of genetic diversity. Plant introductions (PI) are a rich source of favorable alleles that could improve different characters including yield, increase genetic variability and lead to greater gains from selection. However, PIs have been rarely used by breeders, especially for yield improvement. To make better use of the PI germplasm, it is important to dissect and analyze the genetic basis for yield by studying the quantitative trait loci (QTL) associated with yield. China is the centre of origin of soybeans and also part of the world holding the most genetic diversity in soybean anywhere. The use of Chinese varieties in plant breeding in Canada or the U.S., however, is not simple or easy. Since 2005, we have been collaborating with Chinese scientists to test and analyze breeding populations developed by crossing Canadian and Chinese varieties to better understand the the genetics of yield. Our main objective has been to identify the genomic regions on soybean chromosomes where breeders can look for alleles to make further improvements in yield for both the North American and Chinese environments. The collaborations has been expended to include Ontario and Minnesota in North America and Heilongjiang and Jilin provinces in northeastern China. Using two different populations, we have identified a number of yield QTLs that are enhance yield on both continents or just one. A better understanding of the genetic bases of plant adaptation to their native or exotic environments will lead to a more efficient introgression of novel high yield alleles.
Session 18

Soybean Diseases

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Please use the balance of this page for notes.
**Session 19**

**Soybean Weed Control**

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*Please use the balance of this page for notes.*
Weed Management in Soybean
Questions from Ontario Farmers

Boundary  Roundup + Conquest  Guardian
Pursuit (Post)  Roundup (Post)

Peter H. Sikkema
University of Guelph
Ridgetown Campus

Question # 1

I heard RR soybean is off patent. Can I grow bin run RR soybean?

Roundup Ready Soybean

<table>
<thead>
<tr>
<th>Date</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>August 28, 2011</td>
<td>Patent on first generation RR soybean expires. Seed planted before August 28, 2011 cannot be saved without breaching the TUA and patent law. Stockpiling is not allowed under the law. Seed purchased prior to patent expiry is still protected by the law regardless of when it is planted.</td>
</tr>
<tr>
<td>Spring 2012</td>
<td>Seed purchased after August 28, 2011 can be saved and replanted.</td>
</tr>
<tr>
<td>Spring 2013</td>
<td>Earliest a farmer could replant RR soybean seed from the bin is 2013 from seed saved in 2012.</td>
</tr>
</tbody>
</table>

1. The patent for RR2Y soybean was filed on December 12, 2000 and expires on December 12, 2020 (20 years).

Question # 2

I planted my corn very early this spring and put down my PRE residual corn herbicide. I had a really poor stand of corn and I want to re-seed to soybean. Is it safe?

Corn Herbicides

Summary
1. Primextra - there was less than 5% injury, stand loss and yield loss regardless of application timing
2. Dual + Callisto - wait at least 2 weeks (up to 17% injury applied PRE)
3. Battalion - wait at least 4 weeks
4. Frontier + Marksman - wait at least 6 weeks
5. Converge - do not plant soybean

Question # 3

Is there a benefit of adding Crop Booster to glyphosate in RR soybean?
Crop Booster

Summary
1. No difference in weed control
2. No difference in RR soybean yield

Question # 4
My IP soybeans are at the flowering stage and I have some weed escapes. Which herbicides are safest to apply at this late stage?

Late Herbicides

Summary
1. Assure, Basagran and Reflex
   a. May cause leaf burn shortly after application
   b. Crop usually recovers with no impact on yield
2. FirstRate and Classic
   a. May cause yellowing, reddening of the veins and stunting
   b. Crop usually recovers with no impact on yield
3. Pursuit and Pinnacle
   a. May cause yellowing, reddening of the veins and stunting
   b. Crop yield losses may occur

Question # 5
I heard about glyphosate-resistant weeds. What are my weed management options in RR soybean?

Roundup Ready Soybean

Conclusions
1. Excellent soybean yields can be obtained with different weed management programs
2. Weed management is field specific
3. The most consistent weed control was provided by
   a. A tankmix of glyphosate plus a residual herbicide (EP)
   b. A residual herbicide (PRE) fb glyphosate (LP)
   c. A sequential application of glyphosate applied EP fb LP

Question # 6
When is the best time to apply glyphosate in RR soybean?
### Roundup Ready Soybean

#### Application Timing

<table>
<thead>
<tr>
<th>Days After Emergence</th>
<th>Delay in Application</th>
<th>Yield Loss (bu/ac)</th>
<th>Value ($/acre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>23</td>
<td>1</td>
<td>1.0</td>
<td>10.00</td>
</tr>
<tr>
<td>24</td>
<td>2</td>
<td>2.0</td>
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<td>25</td>
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<tr>
<td>26</td>
<td>4</td>
<td>4.0</td>
<td>40.00</td>
</tr>
</tbody>
</table>

### Roundup Ready Soybean

#### So, what is the right application timing?

Well, it depends …

1. Relative time of weed emergence
2. Weed species composition
3. Weed density
4. Environmental conditions
5. Soybean and Roundup price

### Roundup Ready Soybean

#### Early/Correct Application Timing

1. Protect the full yield potential of the crop
2. Severe yield losses may result if application is delayed too long
3. Generally weeds are easier to control when they are young and actively growing
4. Late emerging weeds generally do not reduce crop yield
5. A second application will be required in some fields

### Question # 7

Does time of day affect weed control with postemergence herbicides in soybean?

### Time of Day

#### Summary

1. Change in efficacy during the day is thought to be due to:
   a. Changes in air temperature
      i. Epicuticular wax is more fluid at higher temperatures
      ii. Increase in membrane permeability
      iii. Increase in rates of diffusion
      iv. Increase in enzyme activity and metabolic processes
   b. Changes in leaf angle
      i. Decrease in spray interception and retention

2. The level of weed control due to time of application can affect soybean yield
Question # 8

I have heard about glyphosate resistant weeds so I want to add a tankmix partner to my preplant burndown. Is it safe to add 2,4-D or Amitrol?

Amitrol & 2,4-D

Summary
1. When applied 14 DBP
   a. There was less than 1% injury
   b. There was less than 1% yield loss

Question # 9

I just scouted my field and noticed that there are manganese deficiency symptoms and weed escapes. Should I add manganese to glyphosate?

Question # 10

Is there an effect of nozzle selection, water carrier volume and spray pressure on weed control?

Nozzles, Water Volume & Pressure

Summary
1. Nozzle selection (FF vs Al)
   a. No difference in broadleaf weed control with Basagran, FirstRate, Reflex and Roundup
   b. Reduced barnyard grass control (3%) with Assure with the AI nozzle
2. Higher water volume (FF)
   a. Improved velvetleaf and lamb’s-quarters control with Reflex
   b. Improved barnyard grass control with Assure
3. Higher water volume (AI)
   a. Improved velvetleaf and ragweed control with Reflex
   b. Improved barnyard grass control with Assure
   c. Lower velvetleaf and lady’s thumb control with Roundup
4. Higher spray pressure (AI)
   a. Improved lamb’s-quarters control with Basagran
   b. Improved barnyard grass control with Assure

Thank You

1. Research Technicians: Christy Shropshire, Todd Cowan, Lynette Brown and Chris Kramer
2. Grain Farmers of Ontario
3. Agricultural Adaptation Council (Farm Innovation Program)
4. Herbicide Manufacturers

Peter H Sikkema
University of Guelph
Ridgstown Campus
Session 20

The Quest for 300 Bu Corn

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Summary

We developed the Seven Wonders of the Corn Yield World as a tool to teach farmers and agricultural professionals the value of their individual crop management decisions. Given the key prerequisites of weed and pest control and proper soil fertility, the Seven Wonders ranks the top seven factors affecting corn yield each year, and gives each ‘yield wonder’ a relative value expressed in bushels per acre. We used this concept and our understanding of an individual wonder’s value to develop and evaluate a high technology package of five optimized management practices and inputs, and we compared this to a traditional management system. Yield enhancement from use of a high technology system (combining all five factors) was compared to a traditional technology system (none of the factors), and the value of each individual factor determined using an ‘Omission Plot’ design where each factor is either added one at a time to the traditional-technology system, or removed one at a time from the high technology system.

The five components of the high technology package included: 1) improved soil fertility (i.e. better prerequisites), in the form of a well-placed application of 100 lbs P₂O₅ as MicroEssentials SZ, even though the soil P test would predict no yield response to fertilizer P; 2) the use of advanced triple or smart-stack hybrids (i.e. herbicide tolerant, corn borer and rootworm resistant); 3) sidedressing an extra 100 lbs of N per acre over the base rate of 180 lbs N/acre as a controlled-release source (we used SuperU) to provide a steady supply of ammonium-N during the critical period of yield formation; 4) growing at higher plant populations than standard (45,000 compared to 32,000 plants per acre), with both 30 inch and twin-rows in 2010; and, 5) applying a strobilurin foliar fungicide at flowering (Headline or Quilt) to control leaf disease and to relieve plant stress.

Replicated trials were conducted in DeKalb, Joliet, Champaign, and Dixon Springs, Illinois in 2009 and 2010 using the Omission Plot design. There was a marked visual difference in plant appearance between the traditional and the high-technology plots during late grain fill (see picture below), which was associated with higher yield for the high-technology plots at all sites (range of 14 to 66 bushels/acre). Although the relative importance of the five high-technology factors varied for the different sites and years, in all cases the value of a given factor when combined with the other factors in the high-technology package was substantially greater than when that factor was provided alone. These trials show that single production factors cannot guarantee high corn yields, but rather it is the positive interaction among multiple factors that gives farmers the greatest opportunity to grow 300 bushels/acre.
### Seven Wonders of the Corn Yield World

<table>
<thead>
<tr>
<th>Rank</th>
<th>Factor</th>
<th>Value</th>
<th>bu/acre</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Weather</td>
<td>70+</td>
<td>27</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Nitrogen</td>
<td>70</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Hybrid</td>
<td>50</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Previous Crop</td>
<td>25</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Plant Population</td>
<td>20</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Tillage</td>
<td>15</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Growth Regulators</td>
<td>10</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>260</td>
<td>100%</td>
</tr>
</tbody>
</table>

Given key prerequisites

### Weather impacts Nitrogen response

![Graph showing the impact of weather on nitrogen response](image)

<table>
<thead>
<tr>
<th>Year</th>
<th>Fertilizer N rate (lb/acre)</th>
<th>Grain yield (bu/acre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>80</td>
<td>120</td>
</tr>
<tr>
<td>2006</td>
<td>100</td>
<td>140</td>
</tr>
<tr>
<td>2007</td>
<td>120</td>
<td>160</td>
</tr>
<tr>
<td>2008</td>
<td>140</td>
<td>180</td>
</tr>
</tbody>
</table>

### Continuous Corn needs more N

![Graph showing grain yield for different fertilizer rates](image)

<table>
<thead>
<tr>
<th>Year</th>
<th>Fertilizer N rate (lb/acre)</th>
<th>Grain yield (bu/acre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>80</td>
<td>120</td>
</tr>
<tr>
<td>2006</td>
<td>100</td>
<td>140</td>
</tr>
<tr>
<td>2007</td>
<td>120</td>
<td>160</td>
</tr>
<tr>
<td>2008</td>
<td>140</td>
<td>180</td>
</tr>
</tbody>
</table>

### Better N use from Biotechnology Traits

![Graph showing grain yield for different hybrid pairs](image)

<table>
<thead>
<tr>
<th>Fertilizer N rate (lb/acre)</th>
<th>Grain yield (bu/acre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>120</td>
</tr>
<tr>
<td>50</td>
<td>140</td>
</tr>
<tr>
<td>100</td>
<td>160</td>
</tr>
<tr>
<td>150</td>
<td>180</td>
</tr>
<tr>
<td>200</td>
<td>200</td>
</tr>
</tbody>
</table>

### Are Twin Rows a way to increase Plant Population?

![Image of twin rows](image)

### Leaf greening from Strobilurin Fungicides

![Image of greener leaves](image)

Leaves greener 60 days after VT application
How to Get 300 Bushels?

- Better prerequisites along with packages of optimized yield wonders.
- Is the value of combined factors greater than their individual impact?

**Best High Yield Factors - Omission Plot**

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Fertility</th>
<th>Nitrogen</th>
<th>Genetics</th>
<th>Population</th>
<th>Fungicide</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High Tech Package</strong></td>
<td>No P &amp; K</td>
<td>Base + Slow release</td>
<td>Triple stack</td>
<td>45,000</td>
<td>Strobilurin</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>P2O5 as MESZ (P, S, and Zn)</td>
<td>100 lbs base N as UAN</td>
<td>180 lbs extra N sidedress as Super-U</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Genetics</td>
<td>RR Refuge Hybrid (DKC 61-22)</td>
<td>Triple stack Hybrid (DKC 61-19)</td>
<td>Both with soil insecticide at planting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Population</td>
<td>32,000 plants/ac vs 45,000 plants/ac</td>
<td>Both in 30 inch rows and twin rows in 2010</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fungicide</td>
<td>No Fungicide</td>
<td>Headline or Quilt-Xcel (@ R1)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Omission Plots 2009**

- Medium to high soil P & K
- 180 lbs base N as UAN
- DKC 61-19 or 61-22
- Soybean as previous crop
- Conventional tillage
- 30 inch & twin-rows in 2010

**Weather**

- Wet spring in both years
- Abnormally cool in 2009
- Abnormally hot in 2010
- Early frost (2009) or severe wind damage (2010) in DeKalb

**Standard vs High Tech Package**

- **Fertility**: No P or K based on soil test
- **Nitrogen**: 100 lbs P₂O₅ as MESZ (P, S, and Zn)
- **Genetics**: RR Refuge Hybrid (DKC 61-22)
- **Population**: 32,000 plants/ac vs 45,000 plants/ac
- **Fungicide**: No Fungicide

**Yield Enhancement with High Tech Package**

<table>
<thead>
<tr>
<th>Location</th>
<th>Traditional Practice</th>
<th>High Tech Package</th>
<th>Δ</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>bu acre⁻¹</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DeKalb</td>
<td>199</td>
<td>213</td>
<td>14*</td>
</tr>
<tr>
<td>Champaign</td>
<td>208</td>
<td>274</td>
<td>66*</td>
</tr>
<tr>
<td>Dixon Springs</td>
<td>188</td>
<td>245</td>
<td>57*</td>
</tr>
</tbody>
</table>

* Significance difference (p<0.10)

Data from 2009, Early frost at DeKalb
### Traditional vs High Tech - 2009

<table>
<thead>
<tr>
<th>Factor</th>
<th>Traditional</th>
<th>High Tech</th>
<th>Δ Yield (\text{bu acre}^{-1})</th>
</tr>
</thead>
<tbody>
<tr>
<td>None or All</td>
<td>198</td>
<td>260</td>
<td></td>
</tr>
<tr>
<td>Fertility</td>
<td>202</td>
<td>248</td>
<td>-12</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>206</td>
<td>240</td>
<td>-20</td>
</tr>
<tr>
<td>Genetics</td>
<td>208</td>
<td>235</td>
<td>-25</td>
</tr>
<tr>
<td>Population</td>
<td>185</td>
<td>250</td>
<td>-10</td>
</tr>
<tr>
<td>Fungicide</td>
<td>198</td>
<td>242</td>
<td>-18</td>
</tr>
</tbody>
</table>

LSD (p<0.10) = 10 Data from Champaign and Dixon Springs

### Yield Enhancement with High Tech - Illinois, 2010

<table>
<thead>
<tr>
<th>Location/Row arrangement</th>
<th>Traditional Practice</th>
<th>High Tech Package</th>
<th>Δ Yield (\text{bu acre}^{-1})</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joliet</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>201</td>
<td>221</td>
<td>20*</td>
</tr>
<tr>
<td>Twin</td>
<td>185</td>
<td>208</td>
<td>23*</td>
</tr>
<tr>
<td>Champaign</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>192</td>
<td>232</td>
<td>40*</td>
</tr>
<tr>
<td>Twin</td>
<td>194</td>
<td>223</td>
<td>29*</td>
</tr>
<tr>
<td>Dixon Springs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>183</td>
<td>228</td>
<td>45*</td>
</tr>
<tr>
<td>Twin</td>
<td>178</td>
<td>221</td>
<td>43*</td>
</tr>
</tbody>
</table>

* Significance difference (p<0.10)

### Traditional vs High Tech - 30 Inch Rows 2010

<table>
<thead>
<tr>
<th>Factor</th>
<th>Traditional</th>
<th>High Tech</th>
<th>Δ Yield (\text{bu acre}^{-1})</th>
</tr>
</thead>
<tbody>
<tr>
<td>None or All</td>
<td>192</td>
<td>227</td>
<td></td>
</tr>
<tr>
<td>Fertility</td>
<td>196</td>
<td>226</td>
<td>-1</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>194</td>
<td>222</td>
<td>-5</td>
</tr>
<tr>
<td>Genetics</td>
<td>200</td>
<td>214</td>
<td>-13</td>
</tr>
<tr>
<td>Population</td>
<td>188</td>
<td>225</td>
<td>-2</td>
</tr>
<tr>
<td>Fungicide</td>
<td>203</td>
<td>202</td>
<td>-25</td>
</tr>
</tbody>
</table>

Average of 3 sites, LSD (p<0.10) = 8

### Traditional vs High Tech - Twin-Rows 2010

<table>
<thead>
<tr>
<th>Factor</th>
<th>Traditional</th>
<th>High Tech</th>
<th>Δ Yield (\text{bu acre}^{-1})</th>
</tr>
</thead>
<tbody>
<tr>
<td>None or All</td>
<td>186</td>
<td>217</td>
<td></td>
</tr>
<tr>
<td>Fertility</td>
<td>190</td>
<td>219</td>
<td>+2</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>191</td>
<td>210</td>
<td>-7</td>
</tr>
<tr>
<td>Genetics</td>
<td>199</td>
<td>197</td>
<td>+20</td>
</tr>
<tr>
<td>Population</td>
<td>172</td>
<td>223</td>
<td>+5</td>
</tr>
<tr>
<td>Fungicide</td>
<td>199</td>
<td>194</td>
<td>-23</td>
</tr>
</tbody>
</table>

Average of 3 sites, LSD (p<0.10) = 11

### Traditional vs High Tech – All Years

<table>
<thead>
<tr>
<th>Factor</th>
<th>Traditional</th>
<th>High Tech</th>
<th>Δ Yield (\text{bu acre}^{-1})</th>
</tr>
</thead>
<tbody>
<tr>
<td>None or All</td>
<td>195</td>
<td>244</td>
<td></td>
</tr>
<tr>
<td>Fertility</td>
<td>199</td>
<td>237</td>
<td>-7</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>200</td>
<td>231</td>
<td>-13</td>
</tr>
<tr>
<td>Genetics</td>
<td>204</td>
<td>224</td>
<td>-20</td>
</tr>
<tr>
<td>Population</td>
<td>186</td>
<td>237</td>
<td>-7</td>
</tr>
<tr>
<td>Fungicide</td>
<td>200</td>
<td>222</td>
<td>-22</td>
</tr>
</tbody>
</table>

Data from Joliet, Champaign and Dixon Springs, 2009 & 2010 in 30 inch rows

### Conclusions

- Big yield gains are possible from crop management that provides better Fertility along with packages of optimized Yield Wonders (High-Tech)
- The High-Tech system either protects or pushes yield depending on the weather
Session 21

Would More Nitrogen Pay?

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Please use the balance of this page for notes.
Session 22

Variable Rate Opportunities

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Lynne Warriner

Practical ways to make precision ag pay.

The whole concept of precision agriculture centres on the idea that factors influencing crop yield are not consistent across the whole field. Variability in soil characteristics, management practices (for example: conventional vs no-till / manure vs no-manure), and environmental factors can drastically influence yield from one location to another. The goal of precision farming is to collect and monitor the information about the field variability in order to maximize the efficiency of crop inputs within each particular area of the field.

Think of all the information you collect about your farm each season as a layer of data anchored to a particular field boundary. Drilling down through the data layers can answer questions about the reason(s) for the field variability. It is through this query process that a grower can capitalize on variable rate opportunities. Using the information from your farm to create customized variable rate applications or management practices is where the power of the technology lies.

The more layers of data that you can include in the process of creating a variable rate prescription the better. Crop scouting records, soil type, soil nutrient analysis, historic yield data, elevation, in-season imagery etc. are all excellent ways of describing field variability. When two or more of these data layers are used in conjunction you can begin to figure out the true reason behind field variability. Therefore, the customized variable rate application you create to manage the variability will be even more effective.

Locally we have been working with growers to create customized variable rate options for soil sampling, crop scouting, fertilizer applications, and planting operations. The goal of today’s presentation is to demonstrate how the information many of you are already collecting on your farm can be used to optimize your production practices through variable rate opportunities.

Examples will demonstrate: how RTK elevation and historic yield can be used to create variable soil sampling schemes; how chlorophyll imagery can be used for directed crop scouting; how soil analysis maps and crop scouting information can be combined to create a customized variable
rate fertilizer application; and how historic yield, variety strip-trials and soil characteristics can influence variable rate planting applications. Customization is one of the most important factors in making variable rate opportunities pay. Using data from your farm to generate field specific variable rate prescriptions is a practical way to make precision ag pay on your farm.

Every field has variability and variable rate equipment with GPS technology can help you manage it.

Dale Cowan

The Opportunity

Precision agriculture technologies offer a management approach. It is predicated on the fact that fields can be highly variable in their productive capacity. The potential gain from measuring, understanding and then managing this variability is where the concept of site specific or variable rate application was born with the intent of increasing profits or reducing costs.

Farmers have seen the differential in yields across the field landscape for years. The inherent range in yield causes a disproportional removal of nutrients relative to single rate applied fertility. This fact has influenced the nutrient profiles across the field landscape. Yield variability is also fixed to physical attributes that may or may not be influenced or changed. Having a practical method or technology to measure the variability came with the GIS and GPS (software and hardware) available in the mid 1990s.

The History- then and now

The early software and knowledge base of the day started with a grid sampling technique to discover and measure the extent of this variability. The original efforts quickly pointed out that the poor performing areas had very high fertility and the best parts of the field tested much lower. This was disconcerting to all of us in production agriculture. With the advent of yield monitors we quickly realized that poor yielding areas resulting in low crop removal and high soil tests. Years and years of single rate applications and indeed when there was a “little bit” of fertilizer left in the spreader we went over the poor areas one more time to “fix them up”. It became clear that we could save fertilizer on the high soil test areas and increase the rates in the low test, high yield areas to maintain soil test levels. This strategy is acceptable when we apply current agronomy knowledge. The more variable the nutrient profile in the field (depending on soil test ratings) the more it responds to applied nutrients (fertilizer and manure). Being able to isolate the areas in most need offers the greatest return.

The early efforts focused on fertility, adjusting pH, P and K applications. This was one of the easiest to measure and make application maps for, however it was met with variable responses. Application of limestone offered the biggest return on investment and still does today. Unless the field had significant areas testing below targeted or threshold values it was difficult to demonstrate clear profit potential. It was and is however an effective way to “maintain” soil test levels by matching crop removal rates with actual yield, when yield and soil test information is combined.
Today and moving forward

The technology has progressed and represents so much more in management opportunities for production agriculture. While soil sampling or site specific sampling is common place and has morphed into smart or zone sampling, the hardware and software interface offerings have exploded in better yield monitors, GIS software, multitask controllers, RTK guidance systems, and a host of process control applications.

One of the single biggest advantages to production agriculture is the “process control technology”; the instant feedback to management in real time, on such things as application rates, plant population, and equipment performance. RTK path guidance will reduce the human error associated with critical activities. If you can do it right the first time it will save money and enhance efficient use of resources.

There is no argument that the technology works. The ability to create a map to run a controller and precisely vary the rate of anything we wish is not the issue. The opportunities to take advantage of the profit potential lies in the expert approach to understand the implications and importance of proper interpretation of captured information to cause one to change the rate and variably apply a product in a specified spot with a reasonable expectation of a profitable return. Just because you can change the rate should you?

So many of the decisions to be made in “variable rate” are counterintuitive to what you think you should do. Numerous examples of variable rate N application have gone astray by doing opposite of what should have been done. Dropping plant populations of corn in areas where productivity is low has at times resulted in lower average field yields. (35,000 nubbins out yields 30,000 nubbins every time)

The bottom end of the map legend is where the profit potential lies in precision agriculture. The legend that is < 100 bushels has more upside and downside potential than the legend area where corn yields are >230 bushels. Sorry to say that the areas that yield 230+ bushels, you had very little influence on. The areas yielding <100 bushel, you may have had more impact on than you realize.

The focus today seems to logically point toward reducing inputs on low productivity areas. While in some fields this maybe the thing to do it may in actual fact cost you more money in lost yield. Not all fields will be this way. There is no software or hardware that gives you the right answer. There are no right answers. Only a disciplined process to determine the risk associated with management decisions. The question is: how do we determine the best solution?

Summary

Use the technology by setting up learning opportunities. Knowing the difference between fertility and productivity factors is essential when interpreting your site specific information. This discussion has fixated on yield and with good reason. The more you produce the more you have to sell at any price. Using the technology to identify and then remove limiting factors should be the focus.
**Variable Rate Opportunities**

South West Ag Conference 2011

Jason Van Maanen
Agronomy Lead – South West Ag
Partners Inc

---

**Precision Ag Opportunities**

What is precision agriculture?
- Variable rate technology (fertility and seed)
- Spatial yield data
- Precision guidance and auto steer
- Spatial soil data
- Satellite and aerial imagery
- Planter and sprayer control

---

**Recognizing Opportunities**

- Goal is to better understand and manage variability
- Determine your needs
  - Increase profitability (increase yields or decrease costs)
  - Manage environmental variables (N leaching or P runoff)
- Know your management system
  - Not everything works for everyone
- High value crops – potential for return
- Does it make money?

---

**Understand Your Variability**

- Need a base level of information
  - Spatial soil data
  - Yield monitor data
- Is the variability worth addressing?
  - Is it worth the effort – Is there a return?
  - Good agronomy should accompany, not be offset by precision farming

---

**Making It Work**

- Need quality information, not quantity
- Does it make money? Check that it does
- Can you work with the technology?
  - “Throw it in the bush” syndrome
  - No value if it is turned off
- Have a support network
  - Consultants, dealers, neighbors, family
- Need meaningful delivery of the information

---

**Row Shutoff – A Working Example**

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SWAC 2011
**Row Shutoff – A Working Example**

- Planter with row shut offs (8 row X 2 sections), Liquid is 1 X 16 row, both logged applied acres
- Rows shutoffs planted 1371ac, liquid 1425ac
- Shutting off sections saved 54ac
- Savings of $6500 per year
- Set up cost $11000
- Over 5 years net benefit of $4300/yr

**Row Shutoff – A Working Example**

- Identified opportunity
  - Seed and fertilizer savings
- Understand variability
  - Excessive gore and overlap
- Make it work
  - New planter purchase – factory ready
  - Multi use monitor
    - also used for VRN NH3 – split monitor cost
    - touch screen and easy to use

**Conclusion**

- It has to pay
- Good agronomy is essential
- Be comfortable with the technology
- Be sure to set up checks
- No idea is undoable
Session 23

Making and Marketing Hay

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Please use the balance of this page for notes.
Key Features of a Marketing Plan

Marketing has a direct impact on your overall business success. Changing buyer demands, local and global competition, market volatility and other market forces have resulted in the business of agriculture moving from being totally focused on production to being market driven as well. A marketing plan develops strategies for marketing your crops. It challenges you to identify costs, develop price goals, consider production and price risks, and to review price and market outlooks. It is like a road map since it provides the details, responsibilities, and actions for marketing your crops. This helps to minimize the guesswork and emotion when making key marketing decisions. Market planning is a continuous task that needs to be flexible to accommodate changing market and production conditions. A marketing plan is a farm business management tool to assist in facilitating the successful marketing of your grain.

Here are seven elements of a marketing plan to consider:

1. **Know your crops and business** – Very simply this is tying together your production and financial situation to achieve your farm business goals. It means fitting your production plans (crops grown, quantity produced, and when available to sell) into your cash flow to ensure financial commitments are covered in a timely fashion. Consideration should be given to risk management tools (i.e. production practices, diversification, and insurance) that can be used to manage production risk. Review your current financial situation and business goals to ensure your marketing plan is in line with your overall business plan. The financial health of the business provides an indication of the amount of risk the operation can bear. Individual attitudes toward accepting and managing risk will vary. Focusing on relatively simple strategies to increase income and reduce risk could be a place to start. A simple marketing goal could be to cover the cost of production plus a reasonable return as opposed to simply trying to maximize the price received.

2. **Cost of Production** - To effectively market your crops you need to know your cost to produce a bushel or tonne of grain. A crop budget will determine the quantity to be produced, the costs involved, and establish a production flow. One suggestion is to break out the costs into direct cash costs, other variable costs, and fixed costs. A breakdown of your costs will be useful to establish price targets. The OMAFRA Publication 60 – Field Crop Budgets is a good tool available to assist in calculating crop production costs. Historical crop production insurance yields are an excellent source to base projected yields on.
3. **Market Information** – Remember good market information gives the producer marketing power! Market information includes market prices, fundamentals, analysis, outlook, and strategies. Understanding the market fundamentals helps to make informed marketing decisions to capitalize on market pricing opportunities. The ultimate challenge is to have a future market perspective that takes into consideration the current market conditions, the seasonal trends, and the historical market information. To develop your outlook there are numerous sources of market information available. These include advisors, newsletters, bulletins, websites, emails, seminars, and courses. It is critical to choose reliable information resources to provide the type of market information that your business needs. Market conditions change and a marketing plan needs to be responsive. The Ontario Commodity Report provides access to daily market pricing and is available online or by email from the Grain Farmers of Ontario.

4. **Marketing Tools** – This is where producers evaluate the pricing and delivery opportunities available to them. This may include cash sales, forward price contracts, basis contracts, futures first contracts, and hedging using futures or options. If currency risk is a concern, also check with your lender to see what tools are available to manage currency risk. The first step is to understand how each marketing tool can manage price risk. Next, review the strengths and weaknesses of using them in your marketing plan. Finally, consider any special requirements (i.e. extra credit) needed to make them work effectively. Individual attitudes toward accepting and managing risk will vary depending on the situation and resources available. It can range from a preference to avoid price risk to preferring to use a risky marketing strategy to generate potential higher returns. The challenges are to understand how each marketing tool can manage price risk and the pros and cons of using them in your marketing plan.

5. **Price and Time Targets** - Knowing your cost of production helps to establish target prices to recognize acceptable market prices that are compatible with your financial situation. Recognizing the seasonality of a grain market helps to establish dates or times when sales may be considered. Spreading out sales during both pre and post harvest time periods may improve the average price received for your total production. A marketing plan, no matter how good, may not be able to lock in prices that cover all the costs of production all the time. Key target prices that compensate for specific costs are important to have in years where opportunities to cover all costs are limited.

6. **Take Action … Pull the Trigger** - Taking action to make a pricing or marketing decision will probably be the hardest part. Having a combination of strategies and examining “what if” situations in advance as part of your planning process will help. Put someone in charge (i.e. yourself, spouse, etc.) of executing your marketing plan with support from your marketing team (i.e. yourself, spouse, market advisor, lender, etc.).
7. **Evaluate and Monitor** - Walking your fields and noting crop performance helps to make production decisions. Similarly, a market log book can be used to record market information to assist in executing and evaluating your plan. The information could include cash prices, future prices, basis, marketing positions, and notes on why a decision was made. Set aside (assign) appropriate time to review the markets and your marketing goals/targets.

Since no one can predict what the grain market will do in the future, a marketing plan helps to manage the risks involved. A well thought out plan guides the decision making process and provides the discipline to execute it. Keep the plan realistic, manageable, and monitor your progress.
Victor has more than fourteen years experience in commodity trading and marketing. He received a Masters Degree in Business Administration from the Richard Ivey School of Business at The University of Western Ontario, London Ontario Canada. Victor is a Professional Member of the Canadian Association of Farm Advisers and is also a Derivative Specialist certified by the Canadian Securities Institute.

Until very recently and for eight years Victor was the Snr. Risk Management Consultant at Farms.com Risk Management. Victor had primary responsibility for managing commodity price risk for Farms.com. The company’s physical commodity trade exceeded $50 million a year during 2006-2007.

Victor is currently the Senior Risk Management Consultant and Head of Strategic Planning at HISGRAIIN Commodities Inc. a provider of Commodity and Renewable Energy Marketing and Strategic Planning Consulting Services.

Apart from direct commodity marketing experience, Victor also worked with a wide range of clients across the United States and Canada in livestock and grain marketing. Victor led the Farms.com Risk Management Division that provided hands-on marketing advice to commodity producing and trading clients with business in excess of $300 million. The unit was also involved in pricing energy price risk management products using derivatives for agricultural clients such as green house operators. Victor has also developed specialized price protection contracts backed by derivatives traded on the Chicago Mercantile Exchange (CME) and the Chicago Board of Trade (CBOT).

Victor’s area of expertise encompasses areas of strategic planning for commodity producers and users with emphasis on marketing and price risk. Victor has made numerous presentations to groups across the USA and Canada and is a sought-after speaker who possesses considerable experience when it comes to explaining and sharing his knowledge of marketing price risk and strategies for addressing this problem.
Session 26

Market Outlook 2011

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Please use the balance of this page for notes.
“Commodity Markets” move as a basket of goods. Therefore products which do not appear to be related move in conjunction with one another as money flows into and out of “commodities”

Fundamentals still matter, but in today’s markets they are more of a trigger to directional movement than predictors of the size of the move.

With the exception of the WCE market, futures contracts are valued in U.S. dollars.

“If the” or “as the” $US declines in value, the prices of commodities rise, partially because hard products have an intrinsic value beyond their unit of measure, and partially because hedge funds use commodities as the “hedge against inflation”
Observing cash corn values between 2001 and 2006, over the course of 5 years the value did not deviate $1 per bushel.

During this 5 year period we can reasonably assume that all of the same fundamental factors, (supply, demand, weather etc), effected the market, but the impact was muted compared to today's standard.

Pre 2006, basis moved in harmony with futures, as the CBOT rose and fell, basis moved with it.

There were two reasons for this relationship,
1- Futures were a reasonably accurate predictor of demand
2- Currency exchange was a significant portion of the basis calculation.

Today basis functions as the “flat price corrector”
Fundamental market factors, such as export demand, weather, storage availability are still major market signals, but the responses to those signals are disproportionate.

Note the action in CBOT Wheat futures and the stocks to use and carry out in soft red wheat.
Session 27

Interpreting Soil Tests

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This workshop session will give you the chance to understand your soil test results better, and to make better use of the information included in your soil test. Your questions will guide most of the discussion, but here are some topics we will likely touch on:

What factors can change the soil test results?

Which soil test results are actually measured, and which are calculated from other numbers on the report?

I changed my cropping plans…can I use the same soil test results?

Why are the recommendations on the report different from in the Agronomy Guide?

The attached factsheet provides some background information. Further detail is available in OMAFRA publication #611, Soil Fertility Handbook and Factsheet 97-005, The Phosphorus (P) and Potassium (K) Soil Testing and Fertilizer Recommendation System in Ontario, found at http://www.omafra.gov.on.ca/english/crops/facts/97-005.htm
Soil testing plays an important role in crop production and nutrient management. On farms that use commercial fertilizer as the main nutrient source, it is the best way to plan for profitable fertilizer applications. On livestock farms, knowing how much nutrient is present in the soil to start with is critical. Only then can a nutrient management plan be developed to properly manage both the nutrients that have been generated on-farm and any nutrients that are being imported to the property as biosolids or commercial fertilizer.

Soil testing is really a three-step process: the collection of a representative sample from each field or section, proper analysis of that sample to determine the levels of available nutrients, and use of the results to determine optimum fertilizer rates. Keeping records is an integral part of the soil-testing process; they will help determine if soil test levels are increasing, decreasing or being maintained over time.

**SOIL SAMPLING**

The sample that is sent to the lab for analysis normally weighs about 400 gm (1 lb), but this sample must accurately represent up to 20,000 t of soil — the amount of soil in 10 ha (25 ac). Clearly, care in the sampling process is necessary.

**Sampling Area**

Choice of the area to be included in the sample can have a large impact on the accuracy of the soil test. Where fields are small, it is relatively simple to collect a sample for each field, but larger fields must be divided into smaller sampling areas. As much as possible, ensure that each sampling area is uniform and separate from areas that are obviously different.

Variation in soil fertility can occur because of differences in the native fertility of the parent material, the texture of the soil, the amount of nutrient removal by crop growth or the position in the landscape. By far the largest variation, however, comes from past applications of nutrients, either as fertilizer or manure. When the variation is small, include several cores in each sample; when the variation is large, sample areas separately. Where past field boundaries are known, use them to divide large fields into smaller units. Base further subdivision, or divisions where past field boundaries are not know, on soil type or topography. The maximum area included in a single sample should be 10 ha (25 ac).

There is no minimum size for the area that can be represented by a single sample, so precision sampling, site specific sampling or grid sampling are permitted but not required for nutrient management.

Any areas that have obviously different nutrient levels from the balance of the field should not be included in the composite sample for the field. This could include dead furrows, eroded areas, laneways or areas where manure or lime has been piled. If these areas are large enough to be managed separately, sample and analyze them separately.

**Sample Depth**

The normal sampling depth for nutrients is about 15 cm (6 in.) because most plant roots grow to that depth, and tillage mixes most nutrients into the soil to about 15 cm deep. Subsoil is normally much lower in nutrient content, so sampling too deep will produce a sample that is not representative of the field.

However, when sampling for soil nitrates, a sample down to a depth of 30 cm (1 ft) will provide a more accurate indication of the amount of nitrate available to the crop, since nitrate will move more easily with soil water than other nutrients will.

Sample depth is not changed in a no-till system, even though the nutrients are no longer being mechanically mixed into the soil, with the possible exception of pH samples. It may be appropriate to collect a shallow
sample (5 cm or 2 in.) to check for acidification in the surface layer if nitrogen is being surface applied. Do not use these samples for nutrient analysis, since they will overestimate the nutrient availability from the soil.

**Sample Collection**

A representative sample from a field must include enough cores, collected randomly from across the entire area. Too few cores increase the risk that a non-representative core could skew the result for the whole field. Non-random sampling increases the risk that a bias could be introduced into the sample. The most efficient way to achieve random sampling is to follow a zig-zag pattern around the field. Collect a minimum of 20 cores to produce the composite sample and one additional core per acre for fields larger than 20 ac.

Often the most overlooked step in collecting a soil sample is the thorough mixing of soil cores before the sub-sample is collected. Sampled soil cores should be mixed in the bucket until no evidence of soil cores exist. Heavy clay soil cores sometimes need to be dried before they can be sufficiently mixed to allow for a suitable sub-sample. The sub-sample should be no more than 400 gm or about 1 cup of soil.

Store collected samples at room temperature, with the exception of soil nitrate samples, which should be kept cool (below 4°C) and delivered to the lab within one day for immediate analysis. Freeze any samples that will not be analyzed immediately as soon as possible.

**Sampling Equipment**

While it is possible to collect samples using a shovel or spade, it is much more efficient to use a sampling probe or auger. These should be constructed of stainless steel, particularly if the samples are going to be used for micronutrient testing. Many agricultural retailers will lend sampling probes for soil sample collection.

Collect soil cores in a clean plastic pail. Galvanized pails will contaminate the samples with zinc, which will make the analytical results for micronutrients unusable. Avoid pails that have contained sanitizers or detergents, since phosphates from these materials can be carried over into the samples.

A sturdy stainless steel or aluminum trowel works well for mixing the cores before collecting a sub-sample. A screwdriver is also useful for dislodging any soil cores that might get stuck in the sampling tube.

**Sample Frequency**

Collect samples frequently enough to detect changes in the soil test for a field, before they become large enough to significantly affect crop yields or fertilizer requirements. For most farms, once every three years is adequate for this purpose, and this often works out to once in the rotation, at the same point in the rotation.

Rapid changes in soil test values can occur where the soil has a low capacity to hold nutrients or when crops that extract large amounts of a particular nutrient are grown. More frequent sampling will be necessary on coarse-textured soils or where crops that remove large quantities of potassium are grown such as alfalfa, corn silage or processing tomatoes.

**What Does the Regulation Say About Sampling Frequency?**

Ontario Regulation 267/03 states that a sample must be collected and analyzed from each field area prior to the completion of each nutrient management plan, and that the results from this sample must be used in the preparation of the plan. This would normally mean the maximum sampling interval would be 5 years, unless a change in the operation made the preparation of a new plan necessary. The exception is a plan for a new operation, where there are default values provided that are high enough to place maximum restriction on nutrient application.

**Sampling Time**

There is some variation through the year of soil pH and nutrient content, particularly related to soil moisture, but these differences are not large enough or consistent enough to impact a nutrient management plan. Taking soil samples at the same time of year each year eliminates seasonal variation as a factor in comparing soil test results over time. More importantly, if the samples are taken immediately after harvest, the results will be back in plenty of time for planning the fertilizer program for the next crop.

**Sample Analysis**

Samples for a nutrient management plan must be analyzed at an OMAFRA-accredited lab, using the OMAFRA-accredited tests. The accreditation process assures quality analysis using Ontario-proven methodology.

Table 1, next page, lists accredited labs in Ontario.

Soil testing for available nutrients involves extracting a portion of the nutrient from the soil and then analyzing the extract. The value measured by this process is not the exact physical quantity that is available to the plant. The complexity of soil chemistry and plant uptake is too great to make this measurement possible. Instead, the value measured is related to the amount of nutrient that a plant root can extract. These values can vary widely with different tests. You cannot use the results from different tests with Ontario recommendation tables. The accredited tests have been chosen to provide accurate results in the range of soil conditions found across the province.
enough water to saturate the soil pores. More dilute
should be measured in a soil-water paste that has just
grow and the activity of many herbicides. The pH
availability of many nutrients, the ability of crops to
alkalinity of the soil, which in turn influences the
test is soil pH. This is a measure of the acidity or
magnesium, calcium and sodium, if desired.
Acetate extract. The ammonium displaces cations, such
available potassium is measured using an ammonium
recommendations tables that are calibrated to relate the
extractable nutrient with the amount of fertilizer
required to achieve optimum crop yields.
The OMAFRA-accredited test for phosphorus uses a
sodium bicarbonate solution for the extraction. This
method, which is often referred to as the Olsen method,
human soil samples have been collected and analyzed, these results should be used to
to prepare a nutrient management plan for that field. This can mean comparing the results to the OMAFRA
fertilizer recommendation tables to determine fertilizer
rates, or inserting the test results into a nutrient
management computer program (like NMAN) or onto
the Nutrient Management Worksheet, where the
nutrients from all sources can be considered to calculate
application rates for nutrients.

Soil sample results are also useful in a recordkeeping role
for comparing the analysis data to results from previous
years. Determining the increasing or decreasing soil
fertility levels helps evaluate the effectiveness of the
overall fertilizer program or nutrient management plan.

Using the results becomes more complex when multiple
samples have been collected for a field or single
management zone. Multiple sample results can come
from fields that have been grid sampled. If the field size
is larger than 10 ha (25 ac), it may be desirable to
fertilize the entire field as one block. Table 2, next page,
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fertilize the entire field as one block. Table 2, next page,
TABLE 2. Options for determining fertilizer rates from multiple sample results.

<table>
<thead>
<tr>
<th>Option</th>
<th>Pros</th>
<th>Cons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treat each area separately, applying manure or fertilizer according to the soil test for that area.</td>
<td>• Most precise matching of nutrients to requirements</td>
<td>• Complex to manage, particularly if varying multiple nutrients</td>
</tr>
<tr>
<td>Use average of soil test values for entire area to set fertilizer and manure rates.</td>
<td>• Single application rate, therefore, simple to manage</td>
<td>• May result in part of the field being under-fertilized</td>
</tr>
<tr>
<td></td>
<td>• Nutrient application rates close to requirements for most of the field</td>
<td>• May result in nutrient losses to the environment from parts of the field with excessive nutrients</td>
</tr>
<tr>
<td>Use highest soil test values from the available samples to set fertilizer and manure rates.</td>
<td>• Most environmentally conservative application rates</td>
<td>• May result in part of the field being under-fertilized</td>
</tr>
<tr>
<td>Use lowest soil test values from the available samples to set fertilizer and manure rates.</td>
<td>• Minimized risk of yield losses from under-fertilization</td>
<td>• May result in nutrient losses to the environment from parts of the field with excessive nutrients.</td>
</tr>
<tr>
<td></td>
<td>• High fertilizer costs, without increasing yields</td>
<td></td>
</tr>
</tbody>
</table>

In any averaging, the results must be weighted to reflect the area included in each sample. This is done by multiplying the sample result for each parameter by the number of acres represented by that sample, and then adding the products of that multiplication for each sample in the field. This total is then divided by the total acres in the field to give a weighted average for this entire field. This process prevents a single sample from a small area skewing the results if it is widely different from the rest of the field.

**Sample Calculation:**

<table>
<thead>
<tr>
<th>Field Section</th>
<th>Soil P test</th>
<th>Area of Section</th>
<th>Weighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Front West</td>
<td>16</td>
<td>15 ac</td>
<td>16 x 15 = 240</td>
</tr>
<tr>
<td>Front East</td>
<td>32</td>
<td>4 ac</td>
<td>32 x 4 = 128</td>
</tr>
<tr>
<td>Old Barnyard</td>
<td>92</td>
<td>1 ac</td>
<td>92 x 1 = 92</td>
</tr>
<tr>
<td>Back West</td>
<td>8</td>
<td>25 ac</td>
<td>8 x 25 = 200</td>
</tr>
<tr>
<td>Back East</td>
<td>6</td>
<td>25 ac</td>
<td>6 x 25 = 150</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>90 ac</td>
<td>810</td>
</tr>
</tbody>
</table>

In this example, the weighted average soil P test is 9 (810 ÷ 90). If the soil test values were simply averaged, the high values for the old barnyard and the front east field would skew the number upwards and give a result of 31. On a farm that was using commercial fertilizer as the nutrient source, this represents a difference in phosphate fertilizer recommendations from 0, for the simple average, to 70 kg/ha, for the weighted average.

Where sample results are combined for a nutrient management plan, the method that is used must be noted on the plan so that anyone reviewing the plan can understand how the numbers used in the plan were derived.

See the OMAFRA website: www.omafra.gov.on.ca/crops to find the current list of accredited soil test laboratories.

This Factsheet was written by Keith Reid, Soil Fertility Specialist, OMAFRA, and reviewed by Donna Speranzini, Horticulture Crops, and Christine Brown, Nutrient Management Field Crops Lead, OMAFRA.
Session 28

Large Scale Organic Production

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Please use the balance of this page for notes.
**Session 29**

**Production Pundits**

<table>
<thead>
<tr>
<th>Name</th>
<th>Company</th>
<th>Address 1</th>
<th>Address 2</th>
<th>Phone</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peter Johnson</td>
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<td></td>
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<td>519-271-4932</td>
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</tr>
<tr>
<td>John Hussack</td>
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<td><a href="mailto:jhussack@clarkagriservice.com">jhussack@clarkagriservice.com</a></td>
</tr>
</tbody>
</table>

Be sure and fill out the questions sheet that is included as part of your registration package! Your questions will be given to the “Production Pundits” panel to answer during the sessions at 4:10 pm each day in the Livestock Pavilion.
Session 30

Soils Make Yield

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Bryan Cook

Introduction

Estimating crop yield potential from soil sample parameters is an interesting concept. Most farms have fields that routinely perform above or below the farm average. The focus of this session is to compare soil data from above average fields to below average producing fields. An attempt is made to realize a common soil parameter or characteristic that indicates yield potential.

Data Source

Soil sample results are from 24 very high producing fields and 24 below average producing fields from Dundas and Grenville counties. Fields were chosen from a data base of 65 clients representing 30,000 acres. Parameters analyzed include soil pH, organic matter, phosphorus, potassium, C.E.C, and base saturation ratios.

Discussion

Soil fertility and nutrient recommendations generate a lot of interest among agronomists and producers. With so much focus on fertilizer inputs, many other factors to yield are overlooked. Drainage and field uniformity has profound influence on final yield.

Data analysis indicate that very high producing fields do so under a wide range of fertility levels, organic matter content and base saturation ratios. Establishing guidelines to evaluate soil health and yield potential is difficult. Distinguishing trend lines within this data set, or correlating any soil parameters to yield potential was very limited.

The information presented allows the opportunity to evaluate fertility recommendations and soil preferences for yield response and overall productivity.
Soil ABCs to get the Best Crop Performance

Invariably getting the best crop performance requires a holistic approach. It often and should always begin with a current accredited soil test. Making nutrient management decisions with a soil test more than 3 years old is not a good practice. Just as you would not make a current financial decision with a financial statement from 2007 you should not make a fertilizing decision for 2011 with old information.

While one sample year is good many sampling years are better. It helps to establish a trend. If your soil tests are increasing each sampling period it means you are exceeding crop removal rates with additions. If the levels are staying the same you are matching the additions and removals. And obviously if the soil test values are declining you are removing nutrients at an amount greater than you are applying.

The soil test will measure the soils ability to supply; it does not necessarily measure the amount of nutrient. Soil test ratings assist us in understanding the relative fertility or supplying power of our soils. Soil nutrients with the rating HR are highly responsive to the applied nutrient. Soils with MR are moderate response and soils with RR rarely responsive to that applied nutrient.

Soil testing is one of the few tools we have in risk management with a predictive capability of determining crop productivity levels. Soils testing in the low end of the range will not likely produce maximum yield if the nutrient in question is not applied.

The 4R nutrient management concept of the right nutrient, at the right rate, right time, and right place works better when it starts with a soil test to determine the nutrients in greatest need. Understanding how plants take up nutrients and the associated productivity factors needs to be understood in order to maximize efficient uptake and enhanced yield.

Root interception, diffusion and mass flow are all critical process in delivering nutrients to the root interface. Understanding how soil compaction, crop rotation, drainage, soil texture, CEC, and soil pH influence these processes will lead to smarter decisions on nutrient management.

Emerging nutrient limitations are starting to show in greater responses to applied sulphur in crops like wheat and canola. Manganese in both wheat and soybeans are becoming more commonplace.

Effective nutrient management and nutrient balance is the key to maximizing efficient use of nutrients and producing desired yields. The Von Liebig’s barrel below sums up the process nicely. Yield will only be as high as the most limiting nutrient will allow.

Joins us in this session to learn more about the process of soil testing, interpretation and designing a nutrient program for 2011.
Managing Glyphosate Resistance Worldwide

Origins of resistance
Herbicide resistance is the evolved capacity of a previously susceptible weed population to withstand a herbicide and complete its lifecycle when the herbicide is used at normal rates in an agricultural situation. Through rare random genetic mutations, weed populations naturally contain herbicide-resistant individuals at very low frequencies. These rare, random genetic mutations provide the weed with a mechanism to resist herbicides. Weeds may resist herbicides through an altered target site, enhanced metabolism, decreased translocation, or increased sequestration. The frequency of resistant individuals is dependent on the weed species and the herbicide mode of action. For some herbicides, such as the ALS inhibitors, the frequency of resistant individuals prior to herbicide application may be as high as 1 in 10,000, thus ALS inhibitors are prone to the rapid development of resistance. For others, such as glyphosate, the resistance frequency may be less than 1 in a billion. Repeated use of the same herbicide, or herbicide mode of action, eventually enriches the frequency of these rare mutations to a point where they predominate and cause herbicide failure. Herbicide-resistant weeds can then easily spread as contaminants in crop seeds, by machinery, water, animals, wind, and pollen.

Glyphosate-Resistant Weeds
Glyphosate has been used since the 1970’s as a broad spectrum herbicide and its usage has steadily increased since then, to become the largest selling crop protection product worldwide. The steady increase in area treated with glyphosate globally has been driven by a number of factors. Price reductions in the 1980’s and 1990’s, along with a movement towards zero tillage (requiring more glyphosate for weed control) initiated the increase. This was followed by the introduction of glyphosate-tolerant crops, along with the chemical patent expiration, which led to massive price reductions. Just prior to the introduction of the first herbicide-tolerant crop (glyphosate-tolerant soybean) there was much debate whether herbicide-resistance would become a major issue. Some argued that glyphosate had been used for many years and at that time (1995) there was not a single case of a field selected glyphosate-resistant weed. Glyphosate is known, from practical experience, to be a low risk herbicide for resistance. Others argued that if not managed correctly the massive increase in area and intensity of use of glyphosate would result in glyphosate-resistant weeds and threaten the sustainability of glyphosate-tolerant crops (Jasieniuk, 1995; Bradshaw et al. 1997).
Since the introduction of glyphosate-resistant crops there has been a steady increase in the number and area of glyphosate-resistant weeds. This is as a direct result of the increase in use of glyphosate in glyphosate-resistant crops.

Certainly the first appearances of glyphosate-resistant weeds were not as a result of the introduction of glyphosate-tolerant crops. Rigid ryegrass (*Lolium rigidum*) in Australia (Prately et al. 1999), and goosegrass (*Eleusine indica*) in Malaysia (Lee and Ngim, 2000) were the first reported field selected cases of glyphosate-resistant weeds, and both were in orchards. However horseweed (*Conyza canadensis*) was the first case of a glyphosate-resistant weed appearing in a glyphosate-tolerant crop (soybean) when it was found in Delaware and Tennessee in the USA (VanGessel, 2001). Glyphosate-resistance in horseweed resulted from the repeated use of glyphosate in the absence of an IWM program. A total of 19 of weeds have evolved resistance to glyphosate globally (Table 1).
Table 1. Weeds that have evolved resistance to glyphosate.

<table>
<thead>
<tr>
<th>Year</th>
<th>Weed</th>
<th>Locations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1996 Rigid ryegrass (<em>Lolium rigidum</em>)</td>
<td>Australia, USA, South Africa</td>
</tr>
<tr>
<td>2</td>
<td>1997 Goosegrass (<em>Eleusine indica</em>)</td>
<td>Malaysia</td>
</tr>
<tr>
<td>3</td>
<td>2000 Horseweed (<em>Conyza canadensis</em>)</td>
<td>USA (many states)</td>
</tr>
<tr>
<td>4</td>
<td>2001 Italian ryegrass (<em>Lolium multiflorum</em>)</td>
<td>Chile, Brazil, USA</td>
</tr>
<tr>
<td>5</td>
<td>2003 Buckhorn plantain (<em>Plantago lanceolata</em>)</td>
<td>South Africa</td>
</tr>
<tr>
<td>6</td>
<td>2003 Hairy fleabane (<em>Conyza bonariensis</em>)</td>
<td>South Africa, Spain, Brazil, USA</td>
</tr>
<tr>
<td>7</td>
<td>2004 Common ragweed (<em>Ambrosia artemisiifolia</em>)</td>
<td>USA (several states)</td>
</tr>
<tr>
<td>8</td>
<td>2004 Giant Ragweed (<em>Ambrosia trifida</em>)</td>
<td>Indiana, Kansas</td>
</tr>
<tr>
<td>9</td>
<td>2004 Ragweed parthenium (<em>Parthenium hysterophorus</em>)</td>
<td>Colombia</td>
</tr>
<tr>
<td>10</td>
<td>2005 Palmer amaranth (<em>Amaranthus palmeri</em>)</td>
<td>USA (many states)</td>
</tr>
<tr>
<td>11</td>
<td>2005 Johnsongrass (<em>Sorghum halepense</em>)</td>
<td>Argentina, USA</td>
</tr>
<tr>
<td>12</td>
<td>2005 Common waterhemp (<em>Amaranthus tuberculatus</em>)</td>
<td>USA (several states)</td>
</tr>
<tr>
<td>13</td>
<td>2006 Wild poinsettia (<em>Euphorbia heterophylla</em>)</td>
<td>Brazil</td>
</tr>
<tr>
<td>14</td>
<td>2007 Crabgrass (<em>Digitaria insularis</em>)</td>
<td>Brazil</td>
</tr>
<tr>
<td>15</td>
<td>2007 Junglerice (<em>Echinochloa colona</em>)</td>
<td>Australia</td>
</tr>
<tr>
<td>16</td>
<td>2007 Kochia (<em>Kochia scoparia</em>)</td>
<td>USA (Kansas)</td>
</tr>
<tr>
<td>17</td>
<td>2008 Liverseedgrass (<em>Urochloa panicoides</em>)</td>
<td>Australia</td>
</tr>
<tr>
<td>18</td>
<td>2008 Perennial Ryegrass (<em>Lolium perenne</em>)</td>
<td>Chile</td>
</tr>
<tr>
<td>19</td>
<td>2009 Sumatran Fleabane (<em>Conyza sumatrensis</em>)</td>
<td>Spain</td>
</tr>
<tr>
<td>20</td>
<td>2010 Annual Bluegrass (<em>Poa annua</em>)</td>
<td>USA (Mississippi)</td>
</tr>
</tbody>
</table>

Of these, the most economically significant in glyphosate-resistant crops are Palmer amaranth and horseweed. Glyphosate-resistant Palmer amaranth has rapidly covered a large portion of the glyphosate-tolerant cotton producing regions of the USA (Culpepper et al. 2006). It is now by far the most serious glyphosate-resistant weed. Glyphosate-resistant horseweed is very widespread in the corn/soybean rotations in the USA and is relatively easy to control with other herbicide modes of action, such as the synthetic auxins. Other potentially serious glyphosate-resistant weeds are common waterhemp, giant and common ragweed, and Johnsongrass (Table 1).

Management of Glyphosate-Resistant Weeds

Management of herbicide-resistant weeds in herbicide-tolerant crops is no different to the management of herbicide-resistant weeds in conventional crops. The Herbicide Resistance Action Committee (HRAC) provides the following guidelines for management of resistant weeds.

- Apply integrated weed management practices. Use multiple herbicide modes-of-action with overlapping weed spectrums in rotation, sequences, or mixtures.
- Use the full recommended herbicide rate and proper application timing for the hardest to control weed species present in the field.
- Scout fields after herbicide application to ensure control has been achieved. Do not allow weeds to reproduce by seed or to proliferate vegetatively.
- Monitor sites and clean equipment between sites.
For annual cropping situations also consider the following:

- Start with a clean field and control weeds early by using a burn down treatment or tillage in combination with a pre-emergence residual herbicide as appropriate.
- Use cultural practices such as cultivation and crop rotation, where appropriate.
- Use good agronomic principles that enhance crop competitiveness.

Currently farmers deal with glyphosate-resistant weeds in a similar fashion to that for triazine-resistant weeds. They continue to use glyphosate and add other MOA’s to their program. This strategy effectively mitigated the impact of triazine-resistant weed, in part, because many new herbicide MOA’s became available in the 1980’s and 90’s. Few new herbicide MOA’s are being developed today and, combined with the fact that resistance is common to many of the current herbicide groups, translates to a high level of concern by farmers, academics and industry that this strategy may not be as effective in mitigating the economic impact of glyphosate-resistant weeds in the future.

More information on herbicide-resistant weeds can be found at The “International Survey of Herbicide-Resistant Weeds”) website (ISHRW http://www.weedscience.org (Heap, 2010).

References


Session 32

Succession Planning

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For Your Family’s Sake
By Len Davies

Estate planning and farm succession are two extremely broad subjects. They deal with the ultimate transfer of your assets to the next generation, as well as the accumulation and management of those assets during your lifetime. If the planning is carried out properly, attention will be given not only to income tax, legal, and business considerations, but also to personal considerations. In most family situations, these have an even greater significance. The fact that the subject is so broad, makes it difficult for farm families to know how to tackle it. Where do you start? What options do you have?

Personal and Business Goals

The first thing that needs to be established is the family goals. It is very important that these family goals are clearly defined for a succession plan to thrive. A succession plan is built to meet the goals of the family. It will only be successful, when the needs and goals of all the family members are addressed, and can be accomplished over the life time of the transition. It is important to realize that there will be differing opinions between the founders and successors.
This is completely normal. This needs to be accepted, and understood by all that are involved in the farm enterprise.

**SWOT Analysis**

The next step in the planning process is to look at the strengths, weaknesses, opportunities and threats of your farm business. During this part of the process, we look at the skills of the family members. We pay particular attention to the successor’s skills, and discuss how they should be updated. Also, new skills could be developed.

**Financial Analysis**

At this point, you need to consider the financial well being of the farm today. What would be the desired financial status of the farm after the transition? At the same time, you need to look at what the parents would need to finance their retirement needs. Will the farm transition support these needs? If, at this point, the financial data causes you some concern, you may have to re-align your personal and business goals, before moving forward. Your financials have to be able to support your goals.

**Strategy**

Once you are satisfied your financial projections can support your goals; you are ready to move into the next stage; where you will look the strategies that available to you. In this area, we consider the worse case scenarios such as:

- An untimely death occurs, who would own and operate the farm?
- What would happen if someone suffers a disability that will affect the farm business and the family?
- How would a divorce affect the farm business?
- What would happen if someone wanted to sell an asset, or wanted to exit the business?
- How would you handle a disagreement that could jeopardize the farm business and family relationships?
- What would happen if the farm business had some financial difficulties?
- How will the farm transfer be financed?
- What mechanism is in effect to transfer the farm management to the successors?
- How will communications between family members be maintained?
- How do you treat non-farm family members when it comes to settling your estate?
- How do we improve the management of the successors?

There may be other issues, that you have to consider what strategy you need to use to meet your goals. Much like the financial issues, you may have issues here that pose a problem. You have to go back and look at your goals. Then, you have to decide what adjustments to make on what you have done so far.
Planning and Preparation

At this level, you need input from all of your succession planning team. This is to ascertain that all the strategies that you have developed, will complement one another, and any of your goals and objectives will not be derailed. Depending on the age of the family members and time period that you have to implement the plan; you may be at the point of finalizing these strategies with legal agreements. In the strategic section, you would have addressed the issues of the transfer of management. Do not forget to implement your strategies. Sometimes we get too caught up on tax and legal matters; we tend to brush over this area.

Estate Planning

Now it is time to move on, and take care of your estate objectives with a good will, that will see that your wishes are met. Do not forget that your will has to be in harmony with your succession plans.

Action

Succession planning is a process, not an event, so there are several things that have to be put in action. Many people think that after legal documents are signed that everything is completed. Attitudes, such as this, may lead to problems down the road between the successors and the rest of the family members. Family business meetings, family meetings involving non-farm family members, sharing of financial information with other family stakeholders, and other issues not covered by legal documents, have to be put in place. If the correct action occurs at this stage, your chances of a successful farm business and family harmony between all family members is greatly improved.

There is no perfect solution to a business succession; since every option has pluses and minuses attached to them. You have to go through the process to identify them, see how you can deal with them, and then pick the option that best suits you family and accomplishes your goals.

The business goals, of the two generations, will most likely have significant variations. This is due to the differences in the amount of time each individual will be involved in the farm business. To help deal with this, each person needs to place themselves in the other’s shoes and look at the business from their point of view.
Session 33

Tax Tips and Program Update

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Please use the balance of this page for notes.
TAX TIPS & PROGRAM UPDATE

2011 Southwest Agricultural Conference

prepared by John A. Dick, C.A., BDO Canada LLP, Ridgetown
for presentation January 5-6, 2011

Personal tax rates

Combined federal & Ontario personal income tax rates:
(for 2010 excluding Ontario Health Premiums)

<table>
<thead>
<tr>
<th>Income bracket</th>
<th>Rate on “regular” income</th>
<th>Rate on “ineligible” dividends</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to $37,106</td>
<td>20.05%</td>
<td>1.77%</td>
</tr>
<tr>
<td>$37,106 to $40,970</td>
<td>24.15%</td>
<td>7.90%</td>
</tr>
<tr>
<td>$40,970 to $65,342</td>
<td>31.15%</td>
<td>16.65%</td>
</tr>
<tr>
<td>$65,342 to $74,214</td>
<td>32.98%</td>
<td>17.81%</td>
</tr>
<tr>
<td>$74,214 to $76,979</td>
<td>35.39%</td>
<td>20.82%</td>
</tr>
<tr>
<td>$76,979 to $81,941</td>
<td>39.41%</td>
<td>23.82%</td>
</tr>
<tr>
<td>$81,941 to $127,021</td>
<td>43.41%</td>
<td>28.82%</td>
</tr>
<tr>
<td>$127,021 and over</td>
<td>46.41%</td>
<td>32.57%</td>
</tr>
</tbody>
</table>

Marginal tax rate

Your “marginal” tax rate is the rate of tax on the next $1 of income/expense. For example, if you already had taxable income of $60,000, your 2010 marginal rate of income tax on regular income was 31.15% on the next $5,342 of income.

Most investment and other tax planning literature uses the top tax rate for illustration purposes - which may not be appropriate to your situation.

In addition to the income tax rate, there are other factors to consider - such as:
- CPP cost (see next slide)
- effect on refundable tax credits such as child tax benefits
- effect on non-refundable tax credits (e.g. age amount)
- “clawback” of Old Age Security benefits

Personal exemptions

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Federal</td>
<td>Ontario</td>
<td>Federal</td>
</tr>
<tr>
<td>Basic personal amount</td>
<td>$10,382</td>
<td>$10,527</td>
</tr>
<tr>
<td>Spouse amount</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- reduction threshold</td>
<td>10,382</td>
<td>10,527</td>
</tr>
<tr>
<td>Age 65 or more</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- less 15% of income over</td>
<td>6,446</td>
<td>6,537</td>
</tr>
<tr>
<td>Non-refundable tax credit @ 15%</td>
<td>32,506</td>
<td>32,961</td>
</tr>
</tbody>
</table>

Corporate tax rates - federal

Federal income tax rates on active business income:
For Canadian-controlled private corporations (“CCPCs”) claiming the small business deduction on business income up to $500,000, the net tax rate is:
- 11% effective January 1, 2009
For other corporations and/or income in excess of $500,000, the net tax rate will decrease as follows:
- 19% effective January 1, 2009
- 18% effective January 1, 2010
- 16.5% effective January 1, 2011
- 15% effective January 1, 2012
Income tax rates are pro-rated for taxation years straddling the effective dates.

RRSP and CPP Limits Update

<table>
<thead>
<tr>
<th>Item</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>RRSP contribution limits</td>
<td>$22,000</td>
<td>$22,450</td>
<td>$22,970</td>
</tr>
<tr>
<td>Maximum RRSP earned income limits for subsequent year</td>
<td>$124,722</td>
<td>$127,611</td>
<td>indexed</td>
</tr>
<tr>
<td>CPP maximum pensionable earnings</td>
<td>$47,200</td>
<td>$48,300</td>
<td>N/A*</td>
</tr>
<tr>
<td>CPP maximum employee contributions</td>
<td>$2,163.15</td>
<td>$2,217.60</td>
<td>N/A*</td>
</tr>
</tbody>
</table>

* 2012 not yet announced
Corporate tax rates - Ontario

Ontario income tax rates on active business income:

For Canadian-controlled private corporations claiming the small business deduction on business income up to $500,000, the net tax rate is:

- 5.5% effective January 1, 2007
- 4.5% effective July 1, 2010

For other corporations and for income in excess of $500,000, the net tax rate will decrease as follows:

- 14.0% effective January 1, 2004 (12.0% on farm income)
- 12.0% effective July 1, 2010 (10% on farm income)
- 11.5% effective July 1, 2011 (10% on farm income)
- 11.0% effective July 1, 2012 (10% on farm income)
- 10.0% effective July 1, 2013 (10% on farm income)

Income tax rates are pro-rated for taxation years straddling the effective dates.

Combined federal & Ontario corporate tax rates

On January 1, 2011:

- 15.5% - active business - income up to $500,000 for CCPCs
- 26.5% - active business - other farm income (over $500,000 for CCPCs)
- 28.5% - active business - other income
- 46.67% - investment income
- 26.67% - refundable tax on investment income at rate of $1 per $3 of taxable dividends paid

GST/HST Issues

Harmonized sales tax (HST) in Ontario as of July 1, 2010 replaced Ontario Retail Sales Tax - administered by Canada Revenue Agency.

“Small Business Transition Tax Credit” ($300 to $1,000) is business income.

HST @13% treated the same as GST (with minor exceptions).

Many items are zero-rated for agriculture. However, some items that are routinely missed that are not zero-rated may be more significant at the 13% HST rate:

- Custom work
- Land rent

There has been increased review of GST/HST by CRA - mainly “desk” audits.

“Agressive” netfiling/telefiling initiatives by CRA.

Capital cost allowance - computers

Timing of computer purchases

- temporary CCA rate of 100% (Class 52) for purchases of computer hardware and systems software ends if not purchased before February 1, 2011
- also, Class 52 property is not subject to the half-year rule in the year of acquisition
- purchases after January 2011 will be subject to a 55% CCA rate and the half-year rule will apply

Capital cost allowance - specified energy property (e.g. solar collectors)

CCA class 43.2 (new equipment)

- 50% declining balance
- subject to the half-year rule in the year of acquisition
- also subject to “available for use” rules
- excludes buildings
- limited to net income from sale of energy (i.e. cannot create a loss from claiming CCA to reduce other sources of income)

[ref. CRA technical interpretation document no. 2009-0352781E5; ITR 1100(24)]

Specified energy property - other considerations

Income from business or property? (usually business)

Incidental to farming business? (likely not)

Non-farming Income - accrual rules apply (not “cash” basis)

Payments for Right of Way/Easement - capital gain

[ref. CRA technical interpretation document no. 2009-0312701E5; CRA IT-264R pp.2]

Family farm corporation - may lose status if more than 10% “non-farm” assets
**Tax-Free Savings Accounts (TFSAs)**

New in 2009 - Initial annual limit of $5,000. No deduction for contributions, but no income tax on earnings/withdrawals. Unused annual limit added to subsequent year’s limit. ($15,000 total limit for 2009, 2010, plus 2011) Excessive contributions subject to penalty of 1% per month. Amounts withdrawn get added to NEXT YEAR’s total limit. CRA providing administrative relief for “genuine” misunderstandings in 2009 in connection with recontributing amounts withdrawn.

See BDO “Tax Factor 2010-03” at www.bdo.ca for more detailed info.

**Pension income planning**

Spouses receiving CPP retirement benefits can apply to have pensions equalized. Other eligible pension income qualifies for:

• federal non-refundable tax-credits on first $2,000 of pension income
  (Ontario credit on first $1,259 for 2011)
• pension income splitting with spouse

Although you have until the end of the year you turn age 71 to convert your RRSPs to RRIFs, you should consider converting some RRSPs in the year you turn age 65 so that you can take advantage of the annual non-refundable tax-credits available and/or pension income splitting.

**Farm support programs**

CRA RC4060 “Farming Income and the AgriStability and AgriInvest Programs Guide” - good source of information on preparation of T1163 income and expense statement.

Important to identify and code certain income and expense sources correctly, especially:

• Commodity sales & program payments
• Other farming income
• Commodity purchases & repayment of program benefits
• Allowable expenses
• Non-allowable expenses

  e.g.: Crop/production insurance (allowable) vs. other insurance (non-allowable).

**Farm support programs**

Ontario Risk Management Program extension for 2010:

• notify Agricorp if opting out (don’t ignore premium notice)
• consider various coverage level options

AgriInvest deposits switched to financial institutions - watch tracking of non-taxable producer deposits. Producer deposits are non-deductible, but not-taxable when withdrawn. Government matching contributions plus interest must be withdrawn first, but are taxable when withdrawn. One deposit allowed per program year by deadline, but multiple withdrawals allowed.

**Qualified farm property for purposes of $750,000 lifetime capital gains exemption**


Property used in a farming business will require continuous ownership by individual, individual’s spouse, and children.

Farms passed down from parent to child, then by child to a brother/sister will no longer be able to look back to parent’s period of ownership.

**Income tax instalments**

Where farming is chief source of income, annual instalment - due Dec. 31st, otherwise quarterly instalments may be required. CRA will notify.

Current interest rate is 5% (revised quarterly).

Interest is non-deductible - so actual cost is higher depending on tax rate.

[Example: If marginal tax rate is 30%, before tax interest rate is 7.1%.

Consider making late instalment (say in January), to minimize interest cost.

If actual tax for year is expected to be less than prior year base for instalments, consider reducing instalment payment.
Ontario Tax Credits

Changes to former property and sales tax credits.

New “Ontario Energy and Property Tax Credit” and “Ontario Sales Tax Credit”. Maximum annual benefit of $1,025 (OEPTC) and $260 (OSTC).

For 2010, paid after tax returns processed.

For subsequent years to be paid quarterly.

Need to file income tax returns (both spouses if married) to establish eligibility.
Session 34

Putting AgSmarts into Smartphones:
The Basics

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Greg Kitching

Have you ever sat in your office and felt frustrated because you really wanted to be somewhere else? Smartphones could end this anxiety by providing the flexibility to connect to many business functions that, historically, could only be accessed from your office. No longer do you need to be tied to your desk to send or read emails, receive market information, track weather systems, identify weeds or remotely monitor systems or buildings. Tasks traditionally performed by your desktop computer can now be done using a device that comfortably fits in the palm of your hand.

This session will provide insight into today’s smartphone technology to those who are considering purchasing a smartphone or those who have recently started to use one.

There are many suppliers of smartphones and service plans. Deciding which combination is best for you and your business can be a daunting task. We will review some factors to consider that will maximize the return on your investment and discuss the cost and the time it takes to be comfortable using a smartphone.

Similar to how many people use technology, smartphone users tend to utilize only a fraction of their capability. Features such as cameras, Internet access and GPS open a world of potential – previously unimaginable to producers and consultants.

Regardless of the type of smartphone purchased, all systems are equipped with access to applications specifically developed for the manufacturer’s operating system. These applications are described as self-contained programs that are typically focused on one function, such as online banking or weather. We will explore some of the basic applications that are relevant to agriculture and provide a list of many others that you may use as you become more comfortable with a smartphone.

Having a cutting-edge smartphone may seem an extravagance at first glance, but producers don’t have the luxury of being disconnected from their office or management responsibilities. With the cost of a smartphone becoming increasingly affordable, it may represent the most powerful and cost-effective technology on your farm, which is very impressive for an item that easily fits in your pocket.
Session 35

Putting AgSmarts into Smartphones: Advanced Tools and Apps

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Please use the balance of this page for notes.
Putting AgSmarts into Smartphones: Advanced Tools and Apps

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What Smartphone is the Smartest?

• All Smartphones deserve respect whether they are iPhone BlackBerry, Android or Windows devices
• The technology produced by these 4 is solid and impressive
• Choice is entirely based on personal preference
• iPhone and BlackBerry, in Canada, are almost equal marketshare
• We will be focusing on these 2 platforms along with iPad tablet

Farming your BlackBerry®

• BB's have been around for many years and offer solid email, web browsing and an increasing number of apps that can benefit farmers.

• Arrival of Playbook that will "tether" to BB device an interesting development. More utility for farmers?

Farming your BlackBerry®

• BlackBerry Messenger (BBM) offers BB users an effective and secure way to communicate.
• Better than SMS (texting) or email in a number of ways.
• Can send text, images, video and GPS location.

• New devices with OS 6 offer greatly improved web access and browsing efficiency. Touch screen functionality AND real keyboard on the BB Torch offer best of both worlds.

Farming your BlackBerry®

BlackBerry App World

• Number of apps available on BB are rising steadily – more business/value oriented than iPhone.

• First step is to load App World app to your device and monitor periodically – can check for most recent, most popular free, most popular paid.

• Ag-specific apps becoming available. More on the way!

Farming your BlackBerry®

Apps that I use....

• WeatherEye – Weather Network- local forecast
• BlackBerry Messenger
• GFO SellSmart – futures and basis for corn, soybeans, wheat
• Poynt – White/Yellow pages, business locator, etc.
• Pioneer "From the Field" – agronomy content
• DEKALB Plant Population Calculator
• Genuity Seed Selector
• miTimesheet – custom and off-farm work-record keeper
• UberTwitter- Twitter
• GolfLogix- GPS yardage app for golfers
Farming your BlackBerry®

How will farmers use Playbook?

- Device will link or tether to your BB for internet access
- Larger screen will improve web viewing and app utility. Better for video viewing as well.
- No requirement for separate data plan
- Has a built in camera and better ability to view images will be of benefit to farmers. Crop/weed/pest images will be much better on Playbook versus BB device
- New apps will come quickly to take advantage of improved screen and user interface

Farming your iPhone

The Pros: iPhone

- The Beautiful and Intuitive
- Camera and Display – Front facing/Retina Display
- Excellent Web Browsing
- Geolocational/Mapping Abilities
- Multitasking and Multimedia (music/video)
- Ease of Operating System Upgrades
- The Plethora of Apps – over 300K
- The Quality of Apps – strict submission

The Cons: iPhone

- Battery drain
- Fragility of the device
- Email – no native push notification
- Geolocational/Mapping Abilities
- Multi! Multitasking/Multimedia
- Ease of Operating System Upgrades
- The Plethora of Apps – over 300K
- The Quality of Apps – strict submission

The Apps: Types: iPhone

- Money Management
- Weather and Environment
- News and Updates
- Task Tracking
- Tools

The Apps: Examples: iPhone

- TractorHouse – search and buy farm equipment
- TankMix – By DuPont – calculate amount of product needed
- AgWired – News (US-focused) and Content Application
- TD Banking Application
- Twitter for iPhone
- NeoReader Application – for scanning QR Codes
Farming your iPad

The Device: iPad

- Reading on-the-go: iBooks
- Presenting Information: Sales and Service
- Photo Storage and Display
- Geolocational/Mapping Abilities
- VOIP for making calls (ie. Skype)

Farming your iPad

The Why: iPad

- Reading on-the-go: iBooks
- Presenting Information: Sales and Service
- Photo Storage and Display
- Geolocational/Mapping Abilities
- VOIP for making calls (ie. Skype)

Farming your iPad

The Pros: iPad

- Size and Shape - Portability
- Battery Life
- Simple WiFi access
- VOIP for making calls (ie. Skype)

Farming your iPad

The Cons: iPad

- No camera
- No Tethering from your iPhone (unless jailbroke)
- No USB: you have to buy from iTunes or use the Cloud
- No GPS
- No Multi-tasking.
- No Flash (not sure how bad this is)

Farming your iPad

The Next Release: iPad

- Dual Cameras
- USB Port
- 7 inch screen
- Compete with the PlayBook

Farming the Future

Technology to Talk About!

- QR Codes
- Augmented Reality
Session 36

Macro Photography

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Please use the balance of this page for notes.
Macrophotography Workshop
Presentation Notes

Presented by:
Dave Cheung
University of Guelph Insect Collection
dkodigaldesigns.com

Principles of Photography

- Metering takes a measurement of the available light gives you and an ideal of how much light there is for a proper exposure.
- Exposure controls the amount of light coming into your camera by changing the aperture, ISO and shutter speed.

Aperture

- A high F-Stop value is preferred in macro photography to achieve greater depth of field
- F8 – F22 is commonly used depending on the camera

Shutter Speed

- The longer the shutter speed, the higher the chance of introducing handshake or subject blur in your photograph.
- General rule:
  - Use a shutter speed of 1/focal length of your camera to avoid blur. If using flash, set your shutter speed at your flash sync speed.

ISO / Film Speed

- ISO is the sensitivity of the sensor
- High ISO require less light but generates more noise
- Low ISO requires more light but generates less noise
- Use the lowest ISO setting (that still allows for correct exposure) for best quality photos

General Settings

- Manual focus
- Manual exposure (f16, 1/125s)
- Bracing
- Off camera flash
- Maximizing depth of field
Using Flash

- To overcome the shallow depth of field, you can use flash to provide additional light and use a higher F-STOP.
- Default flash settings tend to produce bright highlights that yield unnatural and unflattering results.
- Use flash compensation for a more natural fill lighting. Use ambient light to fill your background while using the flash to softly light your subject.

Bouncing Light and Diffusers

- Bounced light gives a nice soft look to photographs. It also does a great job in showing various textures and reducing shadows.
- Point and Shoots can yield good macros shots that are illuminated by flash. Use of homemade diffusers such as tracing paper, vellum, films, and scotch tape placed over the built-in flash makes a huge difference.

Controlling Flash Output

- Check your exposure (manual mode)
- Check flash output
- Diffuse your flash

Holding Still!

- Use a tripod
- Kneel or sit
- Take a deep breath
- Brace your body on something, i.e. tree, or a friend’s shoulder

Focusing

- Auto focus in a macro situation almost never works.
- Set your focus manually and move your body and camera closer or further away for fine focusing.
- If auto focus doesn’t work try using focus lock.
- Set focus to the shortest working distance for your camera.

More Tips

- Watch your shadow
- Assess your environment for the following
  - Background. Which angle is the best point to shoot from?
  - Where is the sun? Is it being blocked by something? How does the light fall on your subject?
General Macro Tips With a Point and Shoot

- Avoid digital zoom
- Avoid zooming in all the way.
- Use your macro setting usually 1/3 closest to wide angle setting.
- Macro Scene mode vs. Manual with Macro Setting.

In the Studio

- Use multiple flashes to bounce and soften light
- A foam cooler doubles as a cheap and effective light box

Working with Mobile Phones

- Macro lens adaptor ~$20
- Functions like a magnifying glass, allows you to focus closer to your subjects
- Good for imaging plant damage and large pests (3 cm)
- Turn off shutter sounds
- Use LED flash if available
- Learn to diffuse light

What to look for in a macro camera

- Manual focus
- Manual exposure
- Flash compensation or manual flash controls
- Lens with a short working distance
- Wide Angle lens rather than zoom lens
- Short shutter lag
- Good build quality
Session 37

Western Bean Cutworm

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Please use the balance of this page for notes.
Session 38

Breaking Wheat Yield Barriers

<table>
<thead>
<tr>
<th>Peter Johnson</th>
<th>Dr. David Hooker</th>
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<tbody>
<tr>
<td>OMAFRA</td>
<td>University of Guelph, Ridgetown Campus</td>
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<tr>
<td>581 Huron Street</td>
<td>120 Main Street East</td>
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Please use the balance of this page for notes.
Session 39

Biomass Market Opportunities

Dr. Paul Carver
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Background

New Energy Farms Group (NEFG) supplies services to the agricultural and end use customers in the biomass feedstock supply chain. Specifically, NEFG supports agricultural customers growing perennial energy crops which produce renewable biomass feedstock. This feedstock is then utilized by end users to produce heat, electricity, liquid road fuels and industrial markets. NEFG supplies products and services across the complete supply chain from farm to end use. NEFG supplies a range of energy crops to customers. The focus of our expertise is in perennial grasses with particular depth in Miscanthus. This is the leading energy crop for arable areas of North America and the EU to produce biomass feedstock. It is a perennial grass, established once, producing feedstock annually for 10 years or longer without replanting. Yield in North America has been demonstrated to be over 25t Ha Yr. The end product can be cost effectively processed for different energy end users and uses, using existing farm machinery. NEFG is also developing other annual and perennial grass crops such as sugarcane hybrids and sorghum.

Markets for biomass

Perennial grass energy crops are a profitable proposition for farmers, and are seen as potentially occupying 30% of the energy crop market. In the US market alone a 30% requirement would require the establishment of 16 Million Ha (40 Million Acres). However, for this to occur a cost effective scalable solution is required to meet the requirements of all three stakeholders, agricultural land owners, end users for feedstock and technology providers (such as plant breeders bringing new cultivars to market). The current market position for biomass is reviewed in both the EU and North America for energy, industrial and agricultural opportunities.

Delivering

The opportunity for biomass to deliver for both farmer and end user perspectives is outlined. Long term feedstock supply to end users needs a proportion of energy crop supply, to provide line of sight and security of supply. For this to occur key market barriers have to be removed such as high crop establishment costs and financial security of feedstock supplies from an investment perspective. This is now possible for Miscanthus and other perennial energy crops.
Curbside appeal - beautification, pride, ownership, perception, confidence, ability, success, comfort, consultation, and finished product. We all have the beforementioned attributes and many more that aren’t listed here. All of us have a specific opinion on what is curbside appeal.

Navigating and maximizing the numerous roads of effort and minimizing the roadblocks that we encounter, we stickhandle to get to our finished product. Beautification is a measure of a material state. Many avenues are open to us in the form of grants (one of our favourite words).

Whether it be government incentives to replace windows, add insulation, change heating systems or proceed with an environmental farm plan, the list goes on and we pick and choose our priorities.

Local County and Regional events such as the International Plowing Match, Municipal Centennial celebrations, Fall Fairs, Church Anniversaries and other events motivate a beautification project.

The International Plowing Match beautification committee is the one that I am most familiar with. For this event, a committee is organized to provide leadership to enhance the beauty of the host county. Numerous sub-committees blend and work together. Several categories are decided on by the committee such as most improved farm and/or residence, a landscape garden competition, farm entrance, commercial building and/or a residential entry to name a few. Before and after pictures are taken and judged on their merit as well as a visit to the location by the judges. Prizes are awarded in each category often at a Beautification Banquet. Sponsorship is great and I am a strong believer in Event Sponsorship. Finding the correct mix is essential to the event and the sponsor.

Thank you,

Graeme Craig
In our agri-food industry, we have a responsibility to produce safe food and insure public safety and personal safety while achieving production efficiency. Scientific development during the past several decades has allowed good progress on all fronts. In the past, pest control products were mainly natural or organic and have almost always been very toxic and very persistent. The introduction of 2,4-D in the 1940s signaled a change. It continues to be used. World wide, it has been re-evaluated 17 times; each time passing tougher scrutiny. DDT was also first available for use in the 1940s. It was safe for humans but was persistent in the environment so its use was curtailed in Canada within about 20 years.

Concern for the environment and human health soon brought much more careful scrutiny of the many new products that came to market. Public concern and strict regulation based on the full body of evidence-based science, plus built in precautionary factors resulted in the development of increasingly safer products and more precise application. Education programs and certification for growers in Ontario and the development of Integrated Pest Management strategies has allowed reduced use of pesticide and reduced risk of pest tolerance to specific pesticides. Recently, new genetics have made some crops resistant to some pests or pesticides. This has allowed further reduction of applied pesticide and created opportunity to use the safest product. Science allowed these advances.

In general, the lawn care industry behaved differently than farmers. Farmers marketed their produce. The lawn care industry aggressively marketed their services. More applications produced more profit. Their cavalier attitude toward public concern about pesticide safety was one factor that led to the “Cosmetic Pesticides Ban Act, 2008”.

That “Act” was also driven by eco-activist agendas. Through history there has always been some resistance to science because science often does not support philosophical beliefs. However, this movement really got underway during the DDT experience of the 1960s. Often these people have been honest and their causes have been legitimate. However, as time wore on, emotion and philosophy and marketability has driven causes. Selected pieces of science have been “used” to support their positions. This is fraudulent use of science.

Following the Walkerton water quality experience, the eco-activist movement has regularly misused the “precautionary principle” to advance their causes. A full body of sound evidence-based science has not been demanded by politicians as they considered the pesticide issue. Evidence presented has gone unchallenged, as did the credentials of the presenters. The result is the “Cosmetic Pesticide Ban Act, 2008”.
At a meeting of the Ontario Fruit and Vegetable Growers in January 2009, Gord Miller, Ontario’s Environment Commissioner, was reported to say, “The decision to ban cosmetic use of pesticide was not backed by science, making it a political decision – which politicians have the right to do.”

This lack of science gives cause for real concern as we look to the future. It encompasses reduced science and transparency through the pesticide evaluation process. It (incorrectly) seems to assume that old or natural pesticide is safe. The efficacy and cost of natural product seems to be disregarded. Example: For weed control in turf, chelated iron is the best substitute for 2-4-D. However, the data shows weed control is not good and the cost appears to be 3,500 times higher than 2,4-D.

The eco-activist anti-science, anti-business agenda will continue. On a day by day basis, modern agriculture is portrayed as environmentally irresponsible and contributing to food and health risk issues. Synthetic pesticide, no matter how safe, is referred to as poison on our food.

Science based food production is being challenged. Agriculture is under scrutiny. We cannot count on support from government as municipally and provincially it appears they take positions based on their perception of the public mood. Premier McGuinty indicates that the lawn care ban is ‘just a first step’.

Ontario agriculture must respond in two ways:

1. Farmers themselves must police the industry to use responsible management of soil, water and other resources. Sloppy management is not acceptable. Our track record has been good with initiatives like the Grower Pesticide Safety Courses and Environmental Farm Plans. We must continue with similar activities, and more importantly, we must keep telling this story to the public.

2. Farmers must defend the science that supports high productivity of safe, high quality food, farmers must aggressively tell their story directly to the public NOW! Good face to face relationships are important. Communication must be accepted as a cost of doing business.

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1 The “Precautionary Principle” was intended (at the Rio Declaration) for use where science does not exist. It currently is used by eco-activist groups to justify their position where science does not support their philosophy.
3 Reference Hansard: Legislative Assembly of Ontario, Monday, May 12, 2008, Order of the Day – 1520. “Two weeks before the last election, Premier McGuinty was on The Bill Carroll Show on CFRB. On that show he’s reported to have said, when asked about the pesticide legislation, that this is the first step. I guess there’s more to come. I do ask, when will the other shoe drop?” – Toby Barrett, MPP, Environment Critic
Examining alternative strategies for growing turfgrass

Cynthia Siva, François Taroi, Greg Boland, and Katarina Jordan

Objective

- Test various weed management options as potential alternatives to conventional herbicides for maintaining weed-free turfgrass

Experimental design

- Randomized complete block factorial design
- 4 site preparation treatments
- 6 post-renovation treatments
- Established Kentucky bluegrass lawn with uniform weed coverage (~30%)
- Prominent weeds: dandelion, broad- and narrow-leaved plantain, black medic and white clover

Treatments

- Site-preparation:
  - Untreated
  - Acetic acid
  - Flame-weeding
  - Roundup
  - Sod

- Post-renovation:
  - Untreated
  - Corn gluten meal
  - Fiesta
  - Organo-Sol
  - Sarritor
  - Par III

Site-preparation: Acetic acid

- EcoClear containing 25% acetic acid
- Pre-emergence, contact, non-systemic
- Destroys cell membranes → desiccation
- Broadcast: 1L EcoClear + 2.25L water; 100 mL/m²

Site Preparation: Flame-weeding

- Flamed plot
- Flamed dandelions

Flaming technique
Plots treated with flame (2 DAT) are black; EcoClear (3 DAT) are light brown; and Roundup (14 DAT) are darker brown.

**Post-renovation: Corn Gluten Meal**
- Protein fraction of corn grain extracted during milling process
- Pre-emergent: inhibits root formation → dehydration
- Also fertilizes (10% N)
- Broadcast: 100 g/m² in April, July and September

Broadcasting CGM over turf

**Post-renovation: Fiesta**
- Chelated iron product (4.43% FeHEDTA)
- Selective iron toxicity in dicotyledonous plants
- Broadcast: 40 mL Fiesta + 960 mL water; 400 mL/m²
- Repeat once after 4 weeks

**Post-renovation: Organo-Sol**
- Byproduct of dairy fermentation
- Targets leguminous weeds
- Lactic (1.8%) and citric acid (2%)
- Broadcast: 25% Organo-Sol + 3% surfactant + 72% water; 200 mL/m²
- Repeat every 2 weeks (min 5x)

**Post-renovation: Santitor granular bioherbicide**
- Contains the fungal plant pathogen Sclerotinia minor
- Virulent toward broadleaf weeds; non-pathogenic toward grass
- Oxalic acid, pectolytic enzymes
- Mycelia do not survive past 10 days in absence of plant host → no survival structures in field
- Broadcast: 40 g/m² when daytime high is 18-24°C + rainfall within 12 hours

**Fall 2009:**
- September
  - Roundup
  - Flame
  - EcoClear
- October
  - Till, seed, sod
### Spring/Summer 2010:

- **April**
  - Corn gluten meal

- **June**
  - Sarritor
  - Par III
  - Organosol
  - Fiesta

- **July**
  - Fiesta
  - Corn gluten meal
  - Organosol

### Fall 2010:

- **August**

- **September**
  - Corn gluten meal
  - Par III
  - Sarritor

### Data Collection

- Monthly weed counts using point quadrat
- Visual quality and vegetation greenness ratings

Performing a weed count using a 50 x 50 cm point quadrat.

### Results

- No differences between the site preparation treatments
  - Untreated = Flame = EcoClear = Roundup
- Tillage and seeding reduced the weed population by ~ 9%
- Large differences in the performance of post renovation treatments

### Conclusion

- After one year, the preliminary data suggests that Fiesta (chelated iron) works as well as the standard control
- Further data analyses are in progress
- This experiment will be repeated once from Fall 2010 to Spring 2011

### Acknowledgements

- **GTI staff:**
  - Ken Carey, Alex Porter,
  - Peter Purvis

- **OMAFRA**
  - Pam Charbonneau
  - Jordan lab
Chop It, Bury It, or Leave It?

Adam Hayes

How crop residues are managed has a significant impact on crop production. It also has a big impact on the health of our soils. Many think about managing residues from a crop establishment perspective as well as for insect and disease management. But good crop residue management can help protect the soil from erosion, maintain or improve organic matter and soil structure and encourage soil life. A successful residue management system considers the tillage, planting and harvest equipment as well as the crop rotation and manure if present.

The main focus in the spring is to have managed the residue so the soil dries out to allow timely planting. This may be accomplished by spreading the residue evenly at planting and ensuring the planter or drill can do enough “tillage” to ensure good seed to soil contact. Or it may be done with just enough tillage to facilitate good seed placement. As the price of equipment, fuel and labour continue to increase it will continue to be important to monitor the economics of what ever approach is taken.

Ivan DeJong

We have two distinct cropping systems. The first is a corn, soybean and winter wheat three year rotation. Soybeans are no-tilled into corn stalks with either a Case IH SDX no-till drill at a small angle to the corn rows in 15” rows or planted with our corn planter in twin rows between the existing corn rows. The residue from the soybeans is chopped as fine as possible with the combine and spread as even as possible. Winter wheat is no-tilled into the soybean stubble with our no-till drill.

The wheat is under seeded with red clover in March. At combining we use our Flex head to cut the straw evenly at about 5” and remove and sell the wheat straw. We spray the red clover late in the fall and then find one medium depth pass with a cultivator in the spring makes a seed bed for corn. In the fall we combine the corn with a Case IH head (non-chopping) and leave until spring for no-till soybeans.
The other cropping system, comprising about 2/3 of our corn acres is continuous corn. We combine the corn in the fall and leave the residue as much as possible on the row. In the spring we make one or two passes with a Salford RTS vertical tillage machine (equipped with no rolling basket or harrows) in the same direction as the corn row attempting to leave the corn root ball in the ground with the bottom of the stalk attached. We then use our RTK guidance system to plant between the rows. We have about 1200 acres in this system. 600 acres has been managed this way for eight years now.

Liquid fertilizer with the seed was recently added to the planter as well as dry fertilizer in a 2x2 band. A Reynolds scraper was recently purchased to avoid using tillage to fix rills and to move topsoil back on some slopes.

Mac Ferguson

The soils cropped range from Plainfield and Walsingham sands to Muriel clay loam. Tillage practices are heavily influenced by our crop mix and planting dates. Our most important customer, Bonduelle North America, a world leader in vegetable production suggests cultural practices for the crops we grow and with lima beans the soil surface must have very little or no residue present when the crop is harvested and the soil surface must be level i.e. rolled after seeding to maximize harvest recovery. As a result we employ a mix of tillage tools in our cropping enterprise and a non-standard crop rotation.

The crop rotation objective is 4 years of grass crops with one year of legumes. The grass crops we grow are corn, wheat and sweet corn and the legumes are soybeans, green beans, lima beans and edible beans. Crop rotation and tillage is adjusted for soil type. To deal with fall residue we use plows, a Case IH Ecolo-Tiger 870, a JD 714 Soil Saver and a Case IH 330 Turbo. In the spring we use the 330 Turbo, both C-tine and S-tine cultivators which may or may not tow seedbed finishers, a packer or a roller. Last fall was the first year we did not plow a single acre. Wheat stubble is sprayed to burn off the clover and is then tilled with the 870 preferably or the 714 when the soil is dry in October. Corn stubble is tilled with the 870. During the fall of 2009 we used the 330 Turbo to size corn stalks ahead of the JD2700 Mulch Ripper or when it was too wet to rip, ahead of the plows, it worked well and was much faster than chopping stalks. The soil saver with 2” hardened spikes is used to work bean ground in the fall, providing a balance of tillage and residue. Either tool is used to work sweet corn stubble.

In the spring we do what tillage is necessary to prepare a “seedbed” for the crop. That may be one pass ahead of the corn planter or soybean drill with a field cultivator or vertical tillage tool or it may be three passes ahead of a green bean crop. We look at crop type, date, particle size, seeding tool, soil moisture and soil type to determine the type and amount of spring tillage. Our focus is on maximum cost effective yield.

Jamie Littlejohn

We started no-till soybeans in 1985 and felt it worked well enough that we followed with corn and wheat in 1986. We currently farm 870 acres in Dunwich Township, Elgin County. Soil types are primarily a loam however; we also have acreage that is heavy clay and light sand. Our crop mix is up to 200 acres of wheat under seeded to single cut red cover and the balance of the acreage...
split between corn and soybeans. The only time the soil is worked is after wheat. The clover is killed off with a dicamba product in early October and the residue disked once followed by a cultivation prior to planting in the spring.

Our corn planter is a 12 row White front fold with International 1200 units. We have John Deere single disc fertilizer coulters applying 30 lbs. of N, 50 lbs. of K and 50 lbs. of P. Behind the fertilizer coulter are trash wheels and then the seed unit.

Our soybean planter is a Sunflower 30 ft. 15" spacing. It is not equipped with any pre-tillage. It does have the 4" press wheel. When planting soybeans we plant between the old corn rows. Fertilizer is spread on top of the ground.

Our combine is equipped with a chaff spreader and straw chopper is set to spread the swath width.

This year we hope to do some strip tillage trials with the RTS type equipment in soybeans.

Questions for Discussion
Is the residue from a 200 bu/ac corn crop too much for the following soybean crop?

Will there be an excessive build up of corn residue on the soil surface from continuous corn?

How does tillage change as crops in the rotation change?

When is the best time to use certain tillage tools, fall or spring?
Local Food...More Than Just a Buzz

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Ellen and Peter Jennen

Local food is more than just a “buzz” word at our farm –

We are a family farm operation managing to remain well diversified in the variety of crops we produce. We operate a small but mighty retail market on the farm and travel to several Farmers’ Markets every Saturday for more than 6 months a year. We are also a featured producer on the Chatham – Kent Buy-Local, Buy Fresh Map available to direct customers to local food in our county and a member of the Farmer’s Markets Ontario - MyPick™ Program. We also wholesale to other local markets within 1 hour of our farm.

Through our Farm gate retail market we meet with many customers who tell us that they want to see more local food, they are driving farther to get it and they are asking for it.

With the steady increase in imports, even on produce grown in Ontario, we decided we needed to find an edge on production to get into the produce markets earlier and hold on to that local market share longer.

Recently, using intensive high tunnel farming we have been able to demonstrate that the local food movement can be facilitated in berry crops through the use of new technology, environment and land stewardship. Starting with 3.2 acres in 2008 to almost double that in 2010, we have adopted and developed this unique concept and evolved it in to our Farm Gate market and can demonstrate the "100 mile local food market" can be attainable in some crops.

Utilizing what we already knew from years of conventional farming we applied it to this new innovation. Since there was not a lot of information available about this type of farming we travelled extensively and attended international trade shows in an effort to obtain more knowledge. We have also planted and observed several trials of new varieties and crop types to help determine the most efficient and productive. We have even trialed the use of row covers inside the tunnels to further extend the season allowing our farm to keep producing Local Food longer than conventional cropping practices.
This farming practice leaves no footprint on the earth and can easily be moved from site to site as needed. Our project is in the development stage as we continue with trials here on the farm to learn and realize the full potential of high tunnel farming. Buying local food produced close to home has far less environmental impacts both in production and transportation.

Our farm gate consumers are extremely excited about the availability of Fresh Ontario strawberries and field tomatoes until Halloween weekend! They know that buying local is helping agriculture in their own community and they can ask about production techniques like when and how it was picked and the questions are answered by the producer. With more education - it won't be long before Ontario consumers will know that what used to be "out of season" is now available to them several months longer than ever thought possible.

*Izabela & Mark Muzzin*

County Connect is an Online Local Farmers’ Market intended to cultivate a Quality Local Food Culture in Essex County by making local products (produce, meats, fish, etc.) available, with delivery to both restaurants and households. Through County Connect, area farmers are profiled, restaurants purchasing local food are promoted, and food-centric information is provided in an attractive and interesting way.

Founders Izabela and Mark Muzzin (of Aleksander Estate Winery and Bemben Farms) recognized the difficulty that restaurants and consumers alike had getting local food and thus have creatively developed County Connect to satisfy this growing demand. The intention of County Connect is to support local farmers, make fresh, quality, local food easily available to the community, provide restaurants local fare to creatively share the flavours and stories of the Essex County region, and to build relationships and partnerships to prepare the region for culinary tourism. In these efforts, County Connect was the recipient of the 2010 Local Food Hero Award through WindsorEats.com.

County Connect began operations in May 2010 and currently provides the only comprehensive link to local food in Essex County by establishing direct relationships with the farmers that grow/raise their products. This is made available in a one-stop-shop environment. County Connect’s Butcher, Jamie Waldron ensures that the meat is carefully and properly prepared to show its finest, offering consumers the best experience possible. The restaurants that are using the County Connect program are progressive in their approach to using and marketing fresh, healthy, local food.

The County Connect Meat Share Program was created to bring high quality, naturally raised, healthy, local meat to the people of our community. Through County Connect, consumers can purchase a “share” of an animal lovingly and sustainably raised by local farmers they know and trust. Meat from the whole animal is used giving consumers a selection of cuts from the animal. Beef and turkey programs have been formed and created thus far, with pork, chicken and lamb programs to be included in the new year. The success of this program has been recognized by repeat consumers and the continued interest of new customer bases.
A weekly seasonal fresh food basket program was established and will be made available again for the 2011 growing season bringing fresh food to people’s homes and including recipes highlighting the seasonal selection provided by Essex County Chefs.

County Connect works actively with area stakeholders including farmers, wineries, accommodations, attractions, through and with Tourism Windsor Essex County Pelee Island (TWEPI) and the Windsor Essex Economic Development Corporation (WEEDC) to prepare the region to be market ready for culinary tourism. Through these channels and partnerships that County Connect is involved with, we support and benefits from regional events and initiatives that promote the Go Local, Grown Right Here campaign.

County Connect establishes relationships with area farmers and provides a local market for the products they grow or raise. County Connect supports local farmers that are growing/raising products in a sustainable, healthy fashion ensuring minimal impact on the environment and a supply of fresh, healthy food for our community. In addition, the farmers are profiled and promoted both on the website and through our newsletters for who they are and what they do, allowing the community to understand and know who grows their food and where it is grown. We have taken that which is available by season, and found the farmers that are growing it, ensuring that non GMO products are used, and the animals are steroid, hormone and antibiotic free. Knowing in advance that there is a market for their product gives farmers a sense of security knowing their products will be sold. We leave a minimal environmental footprint as all our products are local and do not travel outside of the community allowing food to be received at its freshest. Some of our customers have asked for specifically grown/raised products, and our farmers were happy to satisfy these needs which opened up new market opportunities for them.

On the restaurant end, County Connect is the only system that makes getting fresh, local product easily and efficiently. We have taken area chefs on farm tours introducing them to the farmers in the area that are growing the food they are sharing with their guests. On the County Connect website and through our social media marketing, the restaurants that are using local products are promoted providing our community the resources to know where they can go to find local product when dining. We are also connecting restaurants and chefs with each other to best capitalize on their local foods/flavours campaign.

The following details the impact and benefits County Connect and its services provide the Ontario agri-food sector and the Essex County Region.

Job Creation - County Connect employes three employees with an anticipated two more positions to be added in 2011. Our renown butcher, Jamie Waldron returns to the Essex County area bringing his butchery skill set back to the Essex County region.

Sustainability - County Connect develops and supports sustainability by purchasing local products from area farmers and servicing the community and restaurants. We support farmers that grow/raise their products in responsible ways (minimizing environmental impact and providing healthy local food) encouraging them to keep doing what they are doing and to continuously provide safe, healthy, fresh local fare. Through our growing markets and sales channels, there is an increased need for the products that local farmers grow. Long term
relationships are being established to meet the future demands of our region. Through County Connect, we establish the basis for culinary tourism and diversification.

Education - Through the County Connect website and its media relations, we educate our community about what is available, who are the people that are growing their food and where it is grown.

Environmentally Friendly - Servicing local product locally means food has to travel less to get to people’s plates. In addition, County Connect supports and promotes those farmers that grow responsibly.

Social Responsibility - County Connect ensures that our community has access to fresh, healthy local product, and we do this in an innovative and way. We are very human in our projects and relationships.
Who are we?

• A different kind of Food Company
• Focus – Local Food
• Value Chain – not Supply Chain
• Brief History
  • Founded – 2007
  • Pilot Project – 2008
  • Ontario Operations – 2009
  • over 1,500 SKU’s
  • over 150 producer/processor partners

Why Local Food?

• More than just a buzz
• One of fastest growing segments in food
• Google Search – Local Food
  • April 2008 – 438,000 hits
  • November 2010 – 944 million hits
• Willing sellers (producers)
• Willing buyers (top chefs, consumers)
• Current infrastructure for local food – underdeveloped

Our goals …

• The ‘go to’ name for local food
  • Consumer
  • Producer
  • Food service/institutions
• Create sustainable value chain for local food
• Raise the profile of our producer

Our methods …

• Promote producer name with all our products
• Practice ‘fair trade at home’
• Looking for value added products
• One-stop-shop service for our customers
• Product mix – produce, meat, fish, dairy, grains, processed
• Cross geographical and commodity lines
• Supply local food – our product is service

How can I capitalize?

• Produce value-added product
• Package it for your market
• Listen to your customer
• Price it fairly
• Look for opportunities/trends
• Work with marketer/distributor??
• Consistent supply and quality
100 Mile Market

Local food... guaranteed
Some Ontario wheat growers have already broken the 100 bu/ac barrier using intensive wheat management practices, in fact field averages of 120-140 bu/ac have been recorded and 160+ bu/ac regions have been observed on calibrated yield monitors, which all illustrate the yield potential of wheat in the province. While there have been increases in wheat yields over recent years (mainly as a result of OMAFRA and private sector research), Ontario yields still fall short of other areas and many opportunities exist to raise yields and boost profits; often without significant increases in production costs. Take England for example, a country where the national wheat yield average is around 125 bu/ac (source: fas.usda.gov), with top producers pushing field averages over 200 bu/ac. While there are obviously growing season differences between the two countries, rainfall and soils are often quite similar within the major wheat producing regions.

Phil Needham, a native of Lincolnshire, England joined Miles Farm Supply, (headquartered in Kentucky) as a wheat consultant in 1990, helping Kentucky and surrounding state producers introduce and expand European wheat management practices. In fact, over a 20 year period, Miles Farm Supply brought over about 10 agronomists skilled in wheat management (mainly from England and Ireland) to further research and expand the wheat system. This system has had a significant impact on wheat production, for example it contributed to a doubling of the Kentucky state yield within a 20 year period (source: USDA data). In 2006, Phil started his own crop management company, Needham Ag Technologies, LLC., where he now works with wheat producers across the US, Mexico, Canada, Russia, Ukraine, England, Sweden, France, Germany, Australia and more recently the United Arab Emirates.

Based upon Phil’s experience and research, he firmly believes many producers in Ontario are not taking advantage of the latest wheat management technologies, to help increase wheat yields and profits. Some of these technologies may include:

**Improved Soil Testing.** Producers need to soil sample regularly, to better understand major and micronutrient levels, plus how their levels change over time. Some of the better farmers Phil works with have sampled every field annually for the last 30 years, documenting yields, nutrient applications and cropping histories, to be better able to make more informed crop input decisions in the future.
**Better Seed**: High yields always begin with good seed. Growers need to select varieties which have been found to offer a high yield and strong disease resistance package which is appropriate for their soils and management. Phil’s larger clients raise at least 4-6 different varieties each year, both to spread the risk and also help understand which ones are most suitable. Seed needs to be well cleaned (ideally with a gravity table) and treated uniformly with a fungicide seed treatment. Professional seed treatment units are preferred, because treating wheat through an auger frequently does not provide uniform standards of coverage. When it comes time to seeding rates, Phil says many producers need to change their thinking. Before intensive wheat management, it was common for Kentucky producers to sow around 2 bushels of wheat per acre, but Phil soon trained his clients to plant by live seeds per square yard. Seed sizes vary too much, so you can’t plant seed by lb/ac.

**Residue Management**: Poor wheat emergence uniformity can frequently be traced back to poor residue distribution with the combine. Heavy streaks of residue result in delayed or uneven emergence, and wheat stands within these areas tend to remain thin all the way to harvest, reducing head counts and final yields. So residue must be distributed uniformly with the combine at harvest time.

**Uniform Stands.** Phil wants to see a consistent number of plants per square yard emerge, plus he looks for consistent emergence across the field. Even with different soil types and topographies, variations in emergence should be minimal. Plant populations should be calculated soon after emergence, in preparation for making spring nitrogen rate and nitrogen timing decisions. Phil has seen fields in Ontario which had 40-50 plants per yard of row in one area and 20-25 plants per yard of row in another. Upon closer examination, some of these differences were as a result of the drill/air-seeder not metering seed consistently, others were as a result of seeding depth differences or other soil specific differences. While it’s not easy to get perfectly consistent stand counts everywhere across the field, big improvements are often required to generate stands capable of producing 100 bu per acre.
**Uniform and Timely Nitrogen Application:** Most growers need to do a better job scouting their fields and quantifying their stands and tiller populations. Remember, if you can’t quantify it, you can’t manage it. Many producers still struggle with uniform nitrogen applications, which frequently result in streaked fields and poor standability standards at harvest. Lodging must be avoided, so Phil discourages the use of spinner spreaders unless they have been extensively pattern tested for the product being applied. Phil prefers split applied liquid nitrogen applications in early spring, based upon the health of the crop and the number of tillers. Tiller populations can be manipulated up or down using nitrogen rates and timings, to achieve close to ideal head populations at harvest. Liquid nitrogen can be applied uniformly and accurately with stream bars which almost eliminate leaf scorch, plus it delivers a form of N that’s both nitrate and ammonium, providing a staged release.

**Monitor Weeds:** If any weeds exist before no-till planting, Phil recommends applying a burn-down herbicide. If no weeds are present at that stage, but threshold levels of winter annuals do emerge in the fall, consider applying a post applied herbicide, before the wheat reaches dormancy.

**Insects:** Scout fields regularly in the fall and early spring for insects, as they can have a direct and indirect impact on yields and profits. Aphids for example can vector barley yellow dwarf, a virus vectored by 3 types of aphid. You have to scout for aphids to determine if thresholds have been reached. Typically Phil uses a threshold of 5 aphids per square foot in the fall to pull the trigger on a fall applied insecticide.

**Diseases:** A final boost for wheat yields and quality frequently comes from the use of well timed and properly applied foliar fungicides. Regular field scouting and the use of disease forecasting models really help fine tune fungicide decision making. How much payback a grower is likely to receive from a foliar fungicide is obviously determined by variety and the disease you’re going after, but Phil has seen 30-50 bu/ac yield responses to a fungicide, plus 5 lb/bu increases in test weight, just from the application of a single fungicide within a heavy disease pressure environment. Producers will also need to invest in a set of nozzles specifically designed to apply foliar fungicides. Such nozzles should ideally deliver droplets within the 300-350 micron range, which help achieve good standards of canopy penetration and coverage. If producers are targeting fusarium head blight (scab), then a well timed application of a foliar fungicide using forward/backward angled nozzles is recommended to achieve maximum coverage and disease suppression.
**Fine Tuning:** Raising 100 + bu/ac wheat yields doesn’t always mean an increase in production costs, in fact some producers can increase their yields while holding their inputs at previous levels. It simply depends where the weak links exist within the management system, for example many producers have 2-3 obvious yield limiting factors such as poor stand uniformity, poor nitrogen distribution standards or poor timing. These weak links don’t cost much to improve, if anything.

Other growers may have about 10 smaller yield reducing factors, which if eliminated can provide a significant yield advantage, so growers need to start out by closely monitoring their fields to determine which weak links exist, then try to improve or eliminate them.
Building High Wheat Yield Potential - Common Weak Links

Seed Quality:
- High Yielding Varieties, adapted to your soils and management
- Tested for germination % and vigor (preferably cold-germ)
- Ideally the wheat seed will be cleaned with a gravity table
- Seed should be uniformly treated with a seed treatment fungicide, if growers intend to plant wheat early, then a seed treatment insecticide is a good investment.

Seeding:
- Planted within the ideal planting date window
- Drill/Seeder should be calibrated to deliver the correct population of seeds per acre (based on soil conditions and date).
- Planted to a consistent depth, ideally in narrow rows

Soil Fertility:
- Soil test every year to build a history of nutrient levels
- Record nutrient applications, crop yields and ideally yield maps to help formulate a sound future fertility program.
- Adjust fertility by field, or preferably regions within fields using variable rate, based on nutrient levels and expected yield potential.
- Apply all nutrients accurately, preferably using air-trucks or liquid fertilizers (spinning disc spreaders are only recommended if each product is properly pattern tested that season.

Uniformity:
- Uniform residue distribution at harvest is the foundation to uniform emergence of the following crop/crops.
- Uniform seeding depth is essential for high yields, so properly adjusted, maintained and ballasted drills or air-seeders are essential.

Scouting:
- Regular scouting, looking for insects, weeds and diseases early, to make sound recommendations based on thresholds.
- If you can’t scout your fields regularly, find someone that can. A qualified and experienced crop consultant is a good investment.
- Stand counts are essential, if you can quantify it, you can manage it. Also, look for standards of uniformity within fields.
- Adequate sprayer, seeding equipment and combine capacity is required to conduct field operations in a timely fashion.
Southwest Agriculture Conference 2011 Poster Displays

Location: W.G. Thompson Stage, RDC Building
Time: 10 am Wednesday (Day 1) until 4 pm Thursday (Day 2)

Participants are encouraged to peruse the research and extension posters that are on display on the W.G. Thompson Stage of the RDC Building throughout the conference. Corresponding authors are in bold, with their email addresses provided below.

**Theme: Soils and Nutrient Management**

**PD01** What about Soil Health? How Can Biofuel Production Systems Affect the Sustainability of Your Soils?
Kari Dunfield, Ian McCormick, Deanna Deaville Németh, Karen Thompson
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Recently the Ontario government has targeted increased biofuel production as a way to combat the province’s dependence on fossil fuels. The increased demand for plant biomass has challenged the agricultural sector to provide agricultural crops for food, animal grain, as well as biofuels. One major concern associated with biofuel production systems is the long-term sustainability of soil health, because of the large volumes of agricultural residues that are removed from fields. These crop residues are vital resources for sustaining soil productivity. Soil microbial communities, a key component of the soil food web, are intrinsically linked to the quality and quantity of crop residue that is returned to soils, and in turn determine greenhouse gas emissions in the form of carbon dioxide and nitrous oxide. We assess microbial communities involved in N and C cycling and measure soil carbon pools in order to determine how crop rotation and biomass removal may impact long term soil functions. Our results complement current efforts that are underway to predict the environmental footprint of these systems, and may help predict which soil and climatic regions in Ontario can most easily sustain biomass removal for biofuel production while maintaining soil health and productivity.

**PD02** Nitrogen Fertilization of C4 Grasses Grown for Bioenergy
Heather Engbers1, Bill Deen1 & Doug Young2
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Nitrogen fertilization has the potential to significantly affect yield, nutrient concentration and removal and overall stand longevity of C4 grasses grown for bioenergy production. While most studies report that these grasses need little to no fertilizer inputs to maximize yield, no specific recommendations have been given for fertilizer requirements across a wide range of C4 perennial grass species, cultivars, harvest timings and N application rates. Two field trials were established in the summer of 2008 in Ridgetown and Elora, Ontario to compare 4 miscanthus (M. sinensis and M. sacchariflorus crosses; Nagara and Amuri, and Miscanthus x giganteus; M1 Select and Polish), 2 switchgrass (Panicum virgatum L.; Cave-in-rock and Shelter) and 2 big bluestem varieties (Andropogon gerardii Vitman; Prairie view and Southlow), 4 nitrogen fertilization rates (0, 40, 80, and 160 kg N ha⁻¹) and 2 harvest timings (fall vs. spring harvest). Plants were harvested in the fall of 2009 and spring of 2010. Results were analysed to compare yield response, elemental nutrient concentration in leaves and stems, stand establishment and size. Miscanthus, switchgrass and big bluestem all responded significantly to N fertilizer application for both the fall and spring harvest timings.

**PD03** Does Prior Winter Wheat Straw Removal Influence Processing Tomatoes?
Laura L. Van Eerd1,2 and Steven A. Loewen2
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The anticipated removal of crop residues to meet the demand for bioenergy sector may have an impact on subsequent crop productivity and quality. A field experiment was designed to evaluate the response of processing tomato yield and quality to typical winter wheat management practices of: 1) leaving the straw in the field –control treatment, 2) physically removing straw after wheat harvest, or 3) leaving the straw in the field with a fall application of calcium ammonium nitrate at 30 lb N per ac to encourage straw breakdown. Over three locations at Ridgetown, marketable processing yield was significantly higher in the straw-retained control treatment than the straw-removed
treatment. The straw+fall N treatment was not different from the other two straw treatments. Over two locations at Leamington, trends were similar but there was no statistical difference in processing tomato yields. At all locations, winter wheat straw management did not impact tomato quality parameters of fruit pH, soluble solids or Agtron colour. Differences in processing tomato yield were not due to N dynamics (soil mineral N or plant uptake) but may be due to differences in soil active carbon fraction or the amount of residue on the soil surface. Thus, removal of crop biomass can negatively impact productivity of the subsequent crop.

PD04 Effects of Cover Crop Type, Planting Date and Spring Rye Removal on Nitrogen Dynamics in a Cucumber Cover Crop Cucumber Rotation

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Cover crops are used for improving agro-ecosystem processes including; soil quality, erosion control, foraging and nutrient management. Our objectives were to determine the effects of planting date, cover crop type and biomass removal for livestock feed on N cycling in a cucumber-cover crop-cucumber rotation from 2008-2010. Cover crop treatments were no cover, no cover+N (84 kgNha⁻¹ applied before cucumber planting), rye (Secale cereale L.), oats (Avena sativa L.), oilseed radish (OSR) (Raphanus raphanistrum [L.] var. oleiferus Metzg [Stokes]), peas (Pisum sativum L.) and hairy vetch (Vicia villosa L.). In a split-plot design, cover crops were planted in early August and early September and rye was removed in late May. By April, all early-planted cover crops, except rye-removed had higher PAN compared to the no cover (53-157 kgNha⁻¹). Cover crop planting date had no effect on cucumber yield income (P=0.8282). Oat, OSR, pea and vetch treatments returned an income as high as the no cover+N treatment (1131-1548 $ha⁻¹). Low income of rye and rye removed (596 & 645 $ha⁻¹) may have been a result of lower PAN due to delayed mineralization and/or slug damage. Although there were differences in N dynamics over the rotation, this did not affect marketable yield income.

Theme: Marketing and Economics

PD05 Ontario & Great Lakes Farm Input Price Survey

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Ontario crop producers strive to compete in a global market and competitive pricing of farm inputs relative to other countries is an important issue. On Ontario cash crop farms, typically 50 to 60 percent of cash operating expenses are related to seed, fuel, fertilizer and pesticides. Many farm inputs used in Ontario are basically identical to those used by producers in the US. Therefore, there is a need to know if price differences exist for these products between Ontario and nearby US states. Also, price data captured through this research can help identify changes in farm input prices over time.

Through the use of a survey tool, pricing data is obtained for fuel, fertilizer and pesticides from 10 locations across Ontario as well as 6 US locations. The survey is administered four times during the cropping season and has been ongoing since 1993.

Theme: Pest Management

PD06 Giant Hogweed and Wild Chervil Are Effectively Controlled By aminocyclopyrachlor

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A new active ingredient, aminocyclopyrachlor, was tested in 2010 to determine its efficacy on the invasive Giant Hogweed and Wild Chervil

PD07 Impact of Time of Day on Herbicide Efficacy in Corn

Peter H. Sikkema¹, Christie L. Stewart², Robert E. Nurse³, Christy Shropshire⁴, and Nader Soltani¹

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Field trials were conducted from 2005 to 2007 at two locations in southwestern Ontario to investigate how the timing of herbicide applications throughout the day affects weed control in corn. Weed control following the application of six postemergence (POST) herbicides (atrazine, Pardner, Distinct, Roundup, Liberty, and Accent) at 600, 900, 1200, 1500, 1800, 2100 and 2400 hours was assessed. For many weed species herbicide efficacy was reduced when applications were made at 600, 2100, 2400 hours. Velvetleaf was the most sensitive to the time of day effect, followed by common ragweed, common lamb’s-quarters and redroot pigweed. Annual grasses were not as sensitive to application timing; however, control of barnyardgrass and green foxtail was reduced in some environments at 600 hours and after 2100 hours. Only in the most severe cases was corn grain yield reduced due to poorer weed control. Changes in leaf orientation, air temperature, relative humidity and light intensity throughout the day cause species-specific physiological changes that may account for the variation in weed control throughout the day. The results of this research suggest that there is a strong species-specific influence of ambient air temperature, light intensity and leaf orientation on the efficacy of POST herbicides. It is hoped that the results of this research will aid growers to apply herbicides when they are most efficacious, thus reducing costs associated with weed escapes.

PD08  Response of Spring Cereals to Callisto
Peter H. Sikkema, Todd Cowan, Christy Shropshire, and Nader Soltani
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There is little information on the response of spring planted barley, oats and wheat to Callisto under Ontario environmental conditions. Four field studies were conducted in Ontario, Canada over a two year period (2008 and 2009) to evaluate the sensitivity of spring planted cereals (barley, oats, and wheat) to pre-emergence (PRE) and post-emergence (POST) applications of Callisto at 50, 100, and 150 g ai ha⁻¹. Callisto applied PRE caused minimal injury at 3, 7, 14 and 28 days after emergence (DAE) and had no adverse effect on plant height or yield of barley, oats and wheat. Callisto applied POST caused as much 11% injury and reduced plant height as much as 6% in spring planted cereals. Injury was higher in wheat compared to barley or oats. Callisto applied POST had no adverse effect on the yield of barley or oats but decreased the yield of wheat as much as 14%. Based on this study, Callisto applied PRE at 50, 100 or 150 g ai ha⁻¹ can be safely used in spring planted barley, oats, and wheat. Callisto applied POST at the proposed dose of 50, 100 or 150 g ai ha⁻¹ can also be safely used in spring planted barley and oats. However, Callisto applied POST results in unacceptable injury in spring planted wheat.

PD09  Competitiveness and Control of Volunteer Winter Cereals in Corn
Greg C. Wilson, Nader Soltani, Darren E. Robinson, Clarence J. Swanton, Francois J. Tardif, and Peter H. Sikkema
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Fourteen field experiments were conducted over a two-year period (2006-2007) at four Ontario locations to evaluate volunteer winter cereal competitiveness and control in corn. The level of competitiveness was dependent on the density of volunteer wheat and environmental conditions. Volunteer wheat competition in corn resulted in the reduced emergence of corn leaf collars. Furthermore, volunteer wheat competition reduced total leaf area by 66%, leaf dry weight by 54%, shoot dry weight by 66%, plant and ear height by 49%, and yield as much as 66% compared to the weed-free control. Option, Accent and Ultim provided greater than 70% control of volunteer cereals, while Summit and Elim provided greater than 60% control. The early application timing provided greater than 82% control of the volunteer cereals. Volunteer cereal control at the late application timing was 61% and higher. Hard red winter wheat control ranged from 84 to 93%, soft red and soft white winter wheat control ranged from 76 to 87%, and fall rye control was 56 to 71% at 56 days after treatment. Early herbicide application resulted in improved control of volunteer cereals and higher corn yield.

PD10  Glyphosate-resistant Giant Ragweed in Ontario
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Giant ragweed (Ambrosia trifida) is an extremely competitive weed and is becoming an increasing problem for soybean growers in southwestern Ontario. In 2008, a giant ragweed biotype near Windsor, ON was not controlled with Roundup and further testing confirmed it as the first glyphosate resistant weed in Canada. Giant ragweed seed
was collected from 65 fields across Essex, Kent and Lambton counties to document the distribution of glyphosate resistant giant ragweed in Ontario. Giant ragweed seedlings were sprayed with Roundup at 1800 g ae/ha, and evaluated 1, 7, 14 and 28 days after application. Preliminary results from the greenhouse testing indicate there are sixteen additional fields in southwestern Ontario with glyphosate resistant giant ragweed. Field trials in soybean were initiated during the summer of 2010 at three locations in Essex County with known glyphosate resistant giant ragweed. The objectives were to determine the level of giant ragweed control with higher rates of Roundup, Roundup tank mixes applied preplant and Roundup tank mixes applied postemergence. Based on the first year of field trials, there are only two Roundup tank mixes applied preplant that provided acceptable control of glyphosate resistant giant ragweed. Roundup (900 g ae/ha) + 2, 4-D ester (500 g ai/ha) and Roundup (900 g ae/ha) + Eragon (25 g ai/ha) provided 97% and 87% control 4 weeks after application, respectively. Giant ragweed control with higher rates of Roundup was not satisfactory. The recommended field rate (900 g ae/ha) provided only 31% control, while some giant ragweed plants were able to survive Roundup applied at 10,800 g ae/ha or 12 times the recommended field rate. Use of Banvel in Dicamba Tolerant (DT) soybeans was very effective for the control of glyphosate resistant giant ragweed at the one confined field trial location where it was tested.

PD11  Weed Management in Cranberry Bean with Lorox.

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Field studies were conducted at the Huron Research Station near Exeter, Ontario in 2006 to 2009 to determine if the sequential application of Treflan plus Pursuit applied preplant incorporated (PPI) followed by Lorox applied preemergence (PRE) at various doses can be used as an effective weed management strategy in cranberry bean production. There was minimal crop injury (6% or less) with various herbicides evaluated at 1 and 4 weeks after emergence (WAE). Treflan plus Pursuit applied PPI provided 97 to 100% control of common lamb’s-quarters, 100% control of redroot pigweed, 99 to 100% control of wild mustard, 93 to 100% control of common ragweed, and 97 to 100% control of green foxtail. Lorox applied PRE provided 11 to 100% control of common lamb’s-quarters, 90 to 100% control of pigweed, 78 to 100% control of wild mustard, 71 to 100% control of ragweed, and 20 to 100% control of green foxtail. The sequential application of Treflan plus Pursuit applied PPI followed by Lorox applied PRE at various doses provided 100% control of lamb’s-quarters, 100% control of pigweed, 100% control of wild mustard, 96 to 100% control of ragweed, and 97 to 100% control of green foxtail. Weed density and shoot dry weight correlated with the level of weed control. All of the herbicide treatments evaluated increased cranberry bean yield compared to the weedy control. Based on these results the sequential application of Treflan plus Pursuit applied PPI followed by Lorox applied PRE at 1000 to 2500 g ai ha⁻¹ provides a safe and efficacious weed management strategy in cranberry bean production.

PD12  The Effect of More Aggressive Fusarium graminearum Isolates on Fusarium Head Blight (FHB) Resistance in Wheat

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Fusarium head blight (FHB) caused by the fungus Fusarium graminearum is a concern to Ontario grain farmers because it causes decreases in yield, quality and produces mycotoxins (fungal toxin) including deoxynivalenol (DON or vomitoxin). Two different isolates or chemotypes of F. graminearum have been identified in North America that produce slightly different forms of DON called 15-ADON and 3-ADON. In some parts of North America, more 3-ADON chemotypes have been seen recently; this is a concern because the 3-ADON chemotype is more aggressive and 3-ADON is more toxic than 15-ADON. Breeders have found wheat lines carrying QTLs (quantitative trait loci) or genetic regions linked to FHB resistance; including the ‘Wuhan/Nyubai’ spring wheat population which has lines with no QTLs, one QTL or two QTLs. In 2008, 2009 and 2010 field trials with lines from ‘Wuhan/Nyubai’ were planted in Ridgetown, Ontario to investigate the effects of 15-ADON and 3-ADON chemotypes on FHB resistance. At 50% flowering, single isolates of 15-ADON and 3-ADON chemotypes were sprayed on each plot using a backpack sprayer; control plots were sprayed with water. Visual symptoms were recorded for each plot as incidence and severity. Harvested grain was analyzed for DON levels using the ELISA method. The results will be presented and discussed.
**PD13  Fusarium Species and Mycotoxins Associated With Oat (Avena Sativa L.) in Southwestern Ontario, Canada**

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**Fusarium graminearum** Schwabe [teleomorph: Gibberella zeae Schwein, Petch] is the predominant *Fusarium* species pathogenic to wheat and corn in Ontario (ON), Canada and produces the mycotoxin deoxynivalenol (DON) in grain. The objective of this study was to determine the *Fusarium* spp. and mycotoxins from oat (*Avena sativa* L.) fields grown in the same area as wheat and corn in ON. Combine-harvested grain from a total of seventy oat samples collected during three years (2006-2008) in ON was analyzed for presence of *Fusarium* species. Twelve *Fusarium* species were identified: *Fusarium sporotrichioides*, *F. poae*, *F. graminearum*, *F. equiseti*, *F. chlamydosporum*, *F. compactum*, *F. scirpi*, *F. culmorum*, *F. acuminatum*, *F. oxysporum*, *F. avenaceum* and *F. solani*. Similar species were identified from wheat spikes, seed corn stalks and corn cob in ON previously. An advanced liquid chromatography-combined mass spectrometry (LC/MS/MS) multi-mycotoxin method was used to analyze mycotoxins in the same seventy samples of oat. A range of mycotoxins produced by *Fusarium* spp. were identified. This method has the ability to detect a broad range of mycotoxins, even if very small amount is presented in the sample. Further investigation about significance of detected mycotoxins in Canadian oat is needed. The relatively low level of *F. graminearum* infected oat kernels indicated that oat is in general less affected with this species than wheat and corn in ON.

**PD14  Efficacy of Fungicides on Fusarium Head Blight Symptoms, Deoxynivalenol (DON), 15-acetyl DON and 3-acetyl DON Level Caused by 15-ADON AND 3-ADON Fusarium graminearum Isolates in Spring Wheat in Canada**

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**Fusarium graminearum** (Schwabe) is the principal cause of Fusarium head blight (FHB) in North America, one of the most serious diseases of wheat. Deoxynivalenol (DON) is the most important mycotoxin produced by *F. graminearum*, but 15-ADON and 3-ADON analogs are also produced at low levels. The fungicides FOLICUR (tebuconazole), PROLINE (prothioconazole), PROSARO (tebuconazole + prothioconazole) and CARAMBA (metaconazole) are commonly used to control FHB in Canada. The objectives of this study were 1) to investigate the effect of the fungicides on FHB symptoms and DON level after inoculation with 15-ADON and 3-ADON *Fusarium graminearum* isolates in inoculated, misted plots, 2) to determine level of 15-ADON and 3-ADON analogs as percentage of total DON after inoculation and fungicides application and in controls.

The highest level of DON (69.4 ppm) in this study was recorded in ‘Roblin’, after inoculation with isolate M5-06-01, without fungicide application; 1.4 ppm of 3-ADON was detected in the same sample. Fungicides lowered DON levels by 55% in ‘Roblin’ plots which had been inoculated with the same *F. graminearum* isolate. In the present study, 15-ADON isolates produced DON and both 15-ADON and 3-ADON, while 3-ADON isolates produced only DON and 3-ADON analogs in the harvested grain. 15-ADON and 3-ADON analogs were detected in wheat grain samples at only about 2% of the total concentration of DON without fungicides. Our results indicate that all four fungicides controlled FHB in spring wheat in Ontario and Manitoba, Canada regardless of the *F. graminearum* chemotype inoculated.
Apple growers in Ontario are removing older orchards and replanting their best sites with intensive orchards of dwarf trees in new cultivars. Apple replant disease can potentially cause devastating production losses and tree mortality. This study is assessing oriental mustard as a biofumigant cover crop and non-host cover crop pearl millet, in the year prior to replant to reduce yield loss from nematodes and soil borne diseases under Ontario growing conditions. There are three commercial apple orchards with 4 or 6 replications of treatments which include 1) pearl millet ‘CFPM101’, 2) two consecutive crops of oriental mustard ‘Cutlass’, 3) fumigation and 4) fallow as a control. Soil samples were taken to determine pest organisms, soil fertility and health. Cover crop growth was measured. New orchards will be established in spring 2011, and tree diameter will be measured.

Lessons from 2010: Avoid mowing millet too close to the ground (not less than 6 inches), as this kills the growing tip. Previous research indicates that to achieve adequate suppression of nematodes and diseases, there must be dense, consistent mustard growth which is well chopped followed by immediate incorporation, and ideally irrigated to seal biofumigant in. Results will be available in fall 2011.

A record number of Western bean cutworm (WBC) moths were captured in the Great Lakes Region in 2010. Trap catches for Ontario, Quebec and neighbouring states are displayed by county. See where the hot spots were and where economic damage was recorded.

Western bean cutworm (WBC, Striacosta albicosta (Smith) [Lepidoptera: Noctuidae]) is a pest species of corn (Zea mays L.) and dry beans (Phaseolus vulgaris L.) first reported in 1887 (Smith 1887). Although native to the western United States (Colorado, Nebraska) WBC has steadily moved north and east into Iowa, Minnesota, Illinois and Indiana since 2000. WBC moths were first captured in pheromone traps in Michigan and Ohio in 2006 (DiFonzo and Hammond 2008), western Ontario in 2008 (Baute et al. 2009), and eastern Ontario and Quebec in 2009. By 2010, WBC numbers dramatically increased across the Great Lakes region with economically damaging levels in corn in some southwestern Ontario locations. The objective of this study was to evaluate the survival, phenology, and resulting damage of WBC on conventional and transgenic corn expressing various Bt-traits in the Great Lakes region.
Western Bean Cutworm (WBC) is a new pest of dry beans and corn in Michigan. Moths were first detected in Michigan in 2006. My objective is to study WBC biology and behavior in dry beans in Michigan. WBC moths were trapped weekly throughout the summer of 2010 to monitor flight patterns, peaks, and shifts between crops. Peak flight was centered on the week of 24 July. Overnight observations were also made to see when moths were most active. Of 31 total moths caught overnight, 90% were caught between 1:00 am and 4:00 am. Bucket and milk jug traps were also compared at thirteen sites to look for differences in trap catch. A controlled study on dry beans determined larval distribution 1, 3, 5, 7, 14, 21, and 28 days after egg hatch (DAH). 1 to 3 DAH, larvae were found in the blossoms but were difficult to find later on. Based on overnight hourly observations, larvae were more active in the early morning and stayed on the ground when they were not feeding. Data from these studies will be used to better understand WBC in the Great Lakes Region and ideally develop more applicable methods of control.

PD19 Western bean cutworm (*Striacosta albicosta*) management in Michigan dry beans
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A summary of trials conducted in 2010 in Michigan to determine effective management strategies for western bean cutworm in dry beans.

PD20 Is the Establishment of the Western Bean Cutworm (*Striacosta albicosta*) in Ontario a Threat to Sweet Corn and Snap Bean Production?
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Western bean cutworm (*Striacosta albicosta*) (WBC) was first detected in Ontario in 2008. To determine if the arrival of WBC is a threat to Ontario sweet corn (Zea mays L. subsp. mays) (SWC) and snap beans (*Phaseolus vulgaris* L.) (SB) a survey was conducted at 17 locations in Essex, Kent, Middlesex and Norfolk counties in 2010. Peak moth flight was recorded from mid-July to early August and ranged from 0.7 moths trap⁻¹ in Essex SWC to 11.0 moths trap⁻¹ in Norfolk SWC, and 1.0 moths trap⁻¹ in Essex and Kent SB to 101.5 moths trap⁻¹ in Middlesex SB. No economic damage was reported in any commercial fields included in the survey. Insecticide performance for WBC, corn earworm (*Helicoverpa zea*), and European corn borer (*Ostrinia nubilalis*) management was also evaluated in one SB (SNAP-L), one early SWC (SWC-E) and one late SWC (SCW-L) trial at the Ridgetown Campus, University of Guelph. Coragen, Belt, and HGW86 had 62, 54, and 44 percent more clean cobs than the control in SWC-L. In SWC-E, Matador had 25 percent more clean cobs than the control. No differences among treatments for WBC damage were observed in SNAP-L.

PD21 Phenology of *Cerotoma trifurcata* (Coleoptera: Chrysomelidae) in Ontario and Impact of Feeding During Soybean Reproductive Stages
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The bean leaf beetle, *Cerotoma trifurcata* (Forster), is a relatively new pest in Ontario soybean ecosystems. Information on the number of generations, and timing and intensity of feeding is important to development of an effective integrated pest management program for soybean growers. Little is known about the biology and behaviour of *C. trifurcata* in Ontario, but its phenology varies throughout North America.

In 2010, cage studies were conducted to determine the number of generations that occur in 3 different counties in southern Ontario. Soil and soybean root samples taken throughout the soybean growing season showed one cycle of eggs, larvae and pupae.

The effect of feeding by *C. trifurcata* on soybean yield and quality was examined in using cage studies during 4 soybean reproductive stages, R3 to R6. Cages were artificially infested with 0, 2, 4, and 8 beetles per plant and an uncaged control. Feeding damage was assessed at completion of each stage, and yield and quality at harvest. Intensity of pod feeding increased, while yield decreased with pod formation. Action thresholds will be determined based on intensity of feeding and subsequent losses in yield and quality.
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