



**ONTARIO 4R DEMONSTRATION FARM TOUR SUMMARY
2017 REPORT**



FERTILIZER CANADA
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2017 Ontario 4R Demo Farm Tour Report

Background

Charles Lalonde of CJ Agren Consulting was retained by Fertilizer Canada to organize a 2017 4R Nutrient Stewardship Tour and work with AGRIS Coop to demonstrate best management practices on a livestock and grain farm in Southwestern Ontario. The project also included a soil health component by reporting on a soil health test that supplements soil chemical analysis. Finally, the tour ended with a visit to Ridgetown Campus of the University of Guelph to meet with Ontario researchers on latest results from phosphorus and nitrogen trials.

Agenda Summary

The participants gathered at the Bradley Centre in Chatham Kent where Jim Campbell presented with an overview and status of the 4R implementation in Ontario. Dale Cowan followed with background information on the farm visit at John Nooyan Farm and the basic principles supporting the development of a Nutrient Management Plan. The group then moved to the farm where Dale Cowan completed the presentation of the Nutrient Management Plan integrating farm specific precision agriculture parameters. Participants then viewed the farm equipment with respect to precision features and an electronic weather station. The group then had an interactive session with the farm owner. Following lunch at the farm, the tour then moved to Ridgetown Campus for a presentation on a new Soil Health Test and Report by Christine George of Alpha Agri and presentations by Dr Laura vanEerd on considerations for the 4R and soil health program and by Dr O'Halloran on 4R Nutrient Management and Surface Water Phosphorus (P) Loading. Subsequent to these presentations, the group toured test plots where Anne Verhallan demonstrated various practical soil health tests.

Outcome

1. Approximately 60 people attended the tour. There was a good mix of agri-retailers, environmental groups and commodity organizations including farmers. The addition of government officials and researchers complemented the group and made for most interesting exchanges.
2. Based on participant feedback to the tour, everyone was very satisfied with the day.
3. Three specific feedback questions were circulated for response. These were:
 - Looking back at the day, what is the first thing that comes to mind?
 - What would be your three highlights of the day?
 - What would you like to see in next year's tour?
4. Selected quotes from the feedback received on the above noted questions:

Looking back at the day, what is the first thing that comes to mind?

"The first thing that comes to mind is how agriculture has become so "High Tech!"

"At the host barn/yard on farm talking about technology and decisions that support P reduction and the challenges of reality."

"Sophistication of the technology used by farmer and his consultant in today's farming."

What would be your three highlights of the day?

"Nooyen describing steps they are taking towards 4R Certification. In particular, John's pride in being the best, growing the best products."

"John Nooyen's farm and his equipment (drag line, weather monitoring system, planter and fertilizer/pesticide sprayers). This was the first time I had seen farm equipment up close in person."

"I appreciated the intentional networking opportunities. Hearing the facilitator give specific instructions to sit with different people on the bus really encouraged participants to meet each other, and I believe it was successful. I met a lot of new people, and saw others making connections as well."

"Other highlights were the presentations by Dr Ivan O'Halloran and Dr. Laura Van Eerd. Their contributions were meaningful and they did a good job demonstrating that current decision making on farm is supported by results found in scientific investigations."

"I learned a little more about the perspective of a farmer...how he added features to help reduce impacts of neonics despite not being supportive of

government policy, and how adamant he was about not sharing soil test results. It was really good to hear about how and why he's engaged in the 4R program. Understanding the motivation of farmers is really important but difficult to do!"

"The mix of presentations was excellent. 4R presentation; site visits; soil-health presentation."

What would you like to see in next year's tour?

"A panel to discuss topics — panel include water NGOs, rural water initiatives (rotary club), farmer, agronomist, Fertilizer Canada rep."

"To talk in particular about regulations and action that can be done on the ground on a voluntary basis – go over what can and can't be expected from a farmer, especially when there's so many variables at play."

"Have the audience do some problem solving e.g. how do you know if a planter bands fertilizer? Which of these fertilizers are coated? In this field what would you do to protect soil and water? Maybe similar to diagnostic days where they work in small groups to fill in the blanks while they look at equipment, soil, tools, test results. Keep it simple."

"What fertilizer looks like — maybe next year it would be a good idea to have a same out of what some of the common fertilizers look like and what forms they come in."

"I suspect that some of the detail presented by Dale was beyond some of the participants. His talk was my favourite part of the tour, and I could have listened for a while longer. But I'm not sure all of the tour participants had enough background on nutrient management to appreciate it. I wouldn't want to go on another tour that tries to cover the basics of 4R and soil health, though I do think that would be valuable to those who are somewhat removed from the field."

Recommendation

The 4R Tour has had a southwest Ontario focus for the past three years. Moving the event to Huron County could attract new tour participants and help expand the use of the 4Rs. However, Southwest Ontario is the primary focus of the 2018 4R Certification program launch, and could provide an overview of the program in this area.

The agenda for next year should include an update from this year's tour to ensure continuity.

Linkage of the 4Rs to soil health and nutrient loss to watersources would be timely subjects to present and discuss.



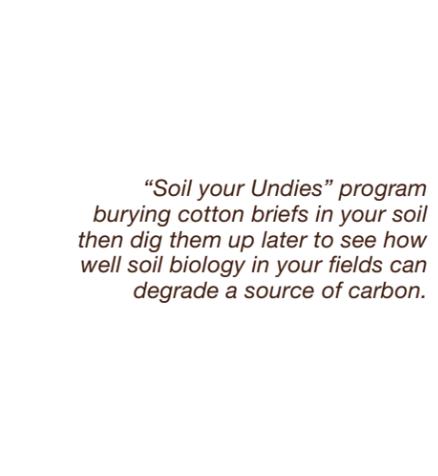
Dale Cowan explaining how the 4R Nutrient Stewardship approach supports the three pillars of sustainability with economic, environmental and social goals.



John Nooyen, Nooyen Farms, explaining how corn planter technology and variable rate seeding optimizes productivity and nutrient use efficiency by matching seeding rates to soil zones.



Anne Verhallen, Soil Management Specialist Horticulture, Ridgeway.



"Soil your Undies" program burying cotton briefs in your soil then dig them up later to see how well soil biology in your fields can degrade a source of carbon.



"Having local accurate weather data is a key management input for managing nutrient type, rates, timing and placement," says Paul deNijs of AGRIS Co-operative.



Ontario 4R Nutrient Stewardship Demonstration Farm Report

Beginning in 2016, six farms began reporting on the status and results of their 4R Nutrient Stewardship farm plans. All six farms were at various stages along the 4R improvement continuum. These farms were also hosts at the 2016 4R Nutrient Stewardship Demo Farm Tour in Southwestern Ontario.

These farms represent a variety of commodity production including corn, soybeans, winter wheat, tomatoes, sugar beets and pork production. All farms are located in the Lake Erie basin, where growers are under pressure to increase crop production and, simultaneously, work towards reduction in nutrient loss and the long term improvement of the Great Lakes water quality.

4R Nutrient Stewardship Objectives

4R Nutrient Stewardship balances grower, industry and government goals to improve on-farm economics, crop productivity and fertilizer efficiency while benefiting the environment. Each of these growers have developed 4R objectives with respect to the economics, environment and social achievements of their farm.

Economics

Based on historical records and climate conditions for the current year, production goals are established based on target yields. The target yield is then used to calculate in-year nutrient requirements. For example:

- Corn yields range from 170 bu/acre to 220 bu per acre
- Soybean yield range from 48 bu/acre to 60 bu/acre
- Winter wheat yield range from 85 bu/acre to 110 bu/acre
- Tomato yield from 40 to 60 tons/acre
- Sugar beet yield of 45 tons/acre

Each grower is cognizant of optimizing fertilizer use per unit of production to increase productivity of the crop, while reducing nutrient losses.

Environmental

Under the Canada–Ontario Lake Erie Action Plan, the federal and provincial governments are expecting a reduction in phosphorus runoff by 40 per cent. The Ontario agriculture industry is committed to working towards the long term improvement of the Great Lakes water quality and recognizes the potential for regulations, the importance of environmental stewardship and its role in ensuring the proper use of fertilizer.

As these growers are located in the Western Lake Erie basin, run-off waters can leave the farm through tile drained land, overflow surface water arising from severe rainfall events, through municipal drains and through surrounding watersheds leading to the Great Lakes. By supporting the need to protect and restore the ecological health of the Great Lakes, the Ontario agriculture industry is committed to being a part of the solution to ensuring the Great Lakes remain “drinkable, swimmable and fishable.”

4R Nutrient Stewardship is a science-based, proven program that can help growers validate and communicate their efforts towards sustainable agriculture and environmental stewardship.

A variety of nutrient sources are used, from anhydrous ammonia to granular fertilizers to liquids. In addition, compost, biosolids and manure are used. Each source of nutrient represents unique challenges as potential pathways to nutrient loss to the environment (air and water) and each grower has strategies to minimize losses while creating a most positive environment for the plant.

Accordingly, these growers use 4R Nutrient Stewardship best management practices (BMPs) to minimize losses to the environment through volatilization, leaching and runoff. Furthermore, these growers have also participated in specific environmental monitoring under the Ontario GLASSI program.

Social

Social responsibility is demonstrated through education and certifications obtained for nutrient management, applicator licenses and integrated pest management practices.

The farming community, including these six Ontario demo farms, is aware that there is a demand for sustainable farming and that these efforts need to be validated and communicated to the public. Communicating these efforts directly and through farm organizations will enhance trust and transparency with local communities.

4R Nutrient Stewardship

4R Nutrient Stewardship refers to applying the Right Source, at the Right Rate, at the Right Time and in the Right Place.

4R Nutrient Stewardship BMPs must be customized to fit each farm’s unique climatic, soil, cropping and operational conditions. This is achieved with professional input from recognized and qualified specialists such as Certified Crop Advisors (CCAs) who work with growers to assess their situations and develop management plans. Each grower has their own, unique strategy to implement BMPs to meet their cropping demands. Planning for each field and crop often requires crop rotation, tillage practices, use of cover crops, soil testing, soil types, drainage systems, farm equipment and access to precision farming tools. The opportunity to deliver nutrients to the plant can be constrained by the type of equipment that each grower uses for each crop.

The Right Source

Each grower has addressed the Right Source for their unique crop, soil and climate. Commercially available fertilizers provide the greatest flexibility with respect to application timing, while access to manure and biosolids is limited for post winter wheat harvest when soil compaction is not an issue. One grower, depending on

manure, has improved his system by going to tire deflating technology on the manure spreader and use of drag lines to enable application prior to planting corn. Accordingly, this grower now has a late summer and spring application season. Another grower has implemented below ground irrigation providing opportunity to use liquid fertilization plus granular application at planting. All growers use nitrogen inhibitors to prevent volatilization.

The Right Time

The Right Time must be considered in any 4R Nutrient Plan, and is often the best way to address nutrient loss associated with run-off and local water quality issues. Timing of fall applied nutrients is linked to a growing crop such as winter wheat. Spring fertilization is used for starting the plant and is either broadcasted and incorporated in the soil prior to planting and supplemented through banding and with split applications.

The other time consideration is crop-specific application, including soybeans as this crop tends to grow as a scavenger crop using nutrients left in the soil from the corn crop. With access to variable rate fertilizer application, one grower supplemented the soybean crop with nutrients based on a nutrient map. It was interesting to see how the nutrient map zones shifted based on different crop requirements.

Producers were also experimenting with two approaches on the use of cover crops. These producers all practiced end of season use of cover crops after winter wheat as a means of storing nutrients for the next crop while preventing erosion. One grower was also cognizant of using cover crop varieties that naturally dies over winter to avoid the need to kill the crop. The second approach involves the seeding a cover crop early during the corn growing phase. The cover crop gets established and flourishes after the corn is harvested to provide cover and soak up nutrients. These producers also recognize that using the right cover crop, nutrients are released quickly and available to the next year’s crop. In one instance, cover crops are used extensively enabling the grower to fertilize with P in the fall with limited risk of runoff loss.



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The Right Place

Fertilizer placement has led to the greatest ingenuity amongst growers, adjusting farm equipment delivery systems. Systems vary from broadcasting, placement (2x2) at seeding, inter-row placement, split application incorporation and use of Y drop systems. With precision farming, growers are also shifting the rows from year to year to ensure that the inter-row fertility is completely used during a 3–4-year crop rotation. One of the six growers in a corn on corn system, shifts the edge of field row every year, while another producer on corn–soy–winter wheat rotation would shift the bean row to be in the corn mid-row. To accomplish the spacing objective the second example grower uses a 20-inch spacing for his corn and soybeans.

The Right Rate

These growers approach fertilizer quantity with respect to specific crop needs and yield targets. Recognizing environmental goals, each of the 4R Nutrient Stewardship plans are designed to reduce fertilizer losses by optimizing nutrient uptake on the field. The strategies used are specific for each grower, and considers potential nutrient loss pathways such as leaching and volatilization. For example, nitrogen (N) fertilization requires incorporation to bind N to soil particles to prevent volatilization while N supplementation on growing winter wheat and corn requires the use of an inhibitor to reduce volatilization. One grower using both manure and anhydrous ammonia/UAN uses both incorporation and inhibitors to reduce N loss.

Crop removal rates are used throughout to determine the quantities of each specific nutrient for the following

crop. Generally, fields are soil sampled after the winter wheat crop as either a corn, tomato or sugar beet crop follows. The use of Cation Exchange Capacity (CEC) scanners allows for the preparation of zone fertilization recommendations. These are crops with very high nutrient needs to achieve target yields. During the corn, tomato and sugar beet growth, plant tissues are analyzed to ensure that these plants are not nutrient deficient. One grower with corn does a 360–soil scan and tissue analysis to determine how much supplemental N to apply to the growing crop. This grower also planted six test plots to measure the point where supplemental fertilization did not improve yield. As a result, if general soil fertilization is maintained, the use of supplemental N on corn can be reduced. Sugar beets have a large N requirement early in the plant growth producing healthy highly productive plants. However, when nitrogen (UAN) is present later in the growing season it can have a negative impact on beet sugar quantity. Accordingly, the producer relies on zone tillage and on no-tilled strips cover crops to soak up nutrients late in the beet growth and store excess nitrogen for the next crop. This has required adjustment to several pieces of equipment with the addition of wind-guards to create strips, precision planting of cover crops and better strip till equipment.

Conclusion

Grower–discussion and knowledge transfer is ongoing on the six Ontario 4R Demonstration Farms. It is a two-way knowledge transfer as growers and CCAs work together to modify practices and delivery systems to optimize nutrient use and farm profitability. As one grower said, “I am about two thirds done on my BMP modifications. Next, I want to address one pass systems.”