ON FARM FORUM 2023

Summary Report

OSCIA

WILTON CONSULTING GROUP

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Executive Summary

The 2023 ONFARM Forum, hosted by the Ontario Soil and Crop Improvement Association (OSCIA), showcased the important work underway through the On-Farm Applied Research and Monitoring (ONFARM) program, as well as the key findings from the research. This applied research initiative supports soil health and water quality research on farms across Ontario.

The main takeaways from the Forum are as follows:

A. On-farm research positively impacts the agri-food sector.
B. Collaboration between a diversity of industry stakeholders is necessary to successfully conduct in-depth on-farm research.
C. Soil testing, and monitoring changes in soil test results over time, is crucial to understanding the agronomic impacts of beneficial management practices (BMPs).
D. While large rainfall or snowmelt events can contribute significantly to nutrient loads, producers can implement BMPs to mitigate these losses.
E. Given the variability across landscapes and soil types, it is important to study BMPs at the local level.
F. Long-term on-farm research is vital to understand the agronomic benefits and co-benefits of BMPs.

Through the discussions at the Forum, the following next steps were identified:

1) Host ONFARM Soil Health and Water Quality Indicator webinars to enable a deeper dive into the research results.
2) Share the research findings at other industry events.
3) Prepare At a Glance Infographics to highlight ONFARM's research and knowledge translation and transfer impacts.
4) Develop a key takeaways 2-pager to share with producers through other agri-environmental educational activities, such as Environmental Farm Plan workshops and Farmland Health Check-Up meetings.
5) Host debrief activities with key ONFARM stakeholders, including the Soil Resource Group, the participating Conservation Authorities, Dr. Wanhong Yang, and the cooperators to identify lessons learned for future programs.

The report that follows provides an overview of the ONFARM program as well as a summary of the discussions and key takeaways from the Forum.

1. Introduction

The Ontario Soil and Crop Improvement Association (OSCIA) hosted the 2023 On-Farm Applied Research and Monitoring (ONFARM) Forum on Zoom the morning of February 9th.

The Forum provided an update on the latest on-farm research findings in support of soil health and water quality. ONFARM researchers, including the Soil Resource Group, Conservation Authorities, and a University of Guelph professor, shared key findings related to both soil health and water quality indicators. ONFARM cooperators and other industry stakeholders joined researchers for panel discussions, which allowed for deeper dives into the findings. ONFARM cooperators also shared their experiences with the program and how it impacted their operations.

The event facilitated the following outcomes:

- ✓ Supporting soil health and water quality knowledge translation and transfer
- ✓ Increasing understanding of the agronomic benefits and co-benefits of beneficial management practices
- ✓ Building the profile of the ONFARM program
- ✓ Fostering collaboration and enthusiasm for on-farm research
- ✓ Identifying opportunities and priorities for long-term research

In total, 307 people registered for the event. Together, farmers (38% of registrants) and government representatives (23%) accounted for most registrants. Other registrants included researchers/academics (14%), and representatives of non-profits/non-government organizations (12%).

In total, 207 people participated in the Forum.

2. Context: ONFARM Program

The ONFARM program is a four-year applied research initiative, developed by the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) and delivered by OSCIA. The project supports soil health and water quality research on farms across Ontario. This program is funded by the *Canadian Agricultural Partnership*, a five-year federal-provincial-territorial initiative. ONFARM is supported by various organizations including Agriculture and Agri-Food Canada (AAFC), five Conservation Authorities and the Soil Resource Group. ONFARM is also supported by a network of farmer cooperators who are essential to the success of this program.

ONFARM builds on work completed under the Great Lakes Agricultural Stewardship Initiative's (GLASI's) Priority Sub-watershed Project (PSP). ONFARM supports Ontario's Soil Health and Conservation Strategy, and helps the industry meet commitments under the Great Lakes Water Quality Agreement.

ONFARM stakeholders operate eight edge of field sites in the PSP regions, and 25 soil health best management practice (BMP) sites across five regions of the province. (See Figure 2.) ONFARM is completing extensive soil health and water quality analysis on these 32 farm sites to assess various BMPs such as cover cropping and the use of organic amendments. This network of sites and established partnerships will help build a stronger understanding of BMPs and their effects on soil health and water quality on Ontario farmland.

The three pillars of ONFARM that benefit Ontario's agricultural industry are:

1) Continuation of the monitoring and modelling established in the Priority Sub-watersheds,
2) Establishment of on-farm paired trials in-field to identify soil health indicators and test the effectiveness of BMPs in cooperation with farmers,
3) Enhanced engagement opportunities with stakeholders and farmers to foster a network of demonstration farms.

Figure 1. Pillars of ONFARM

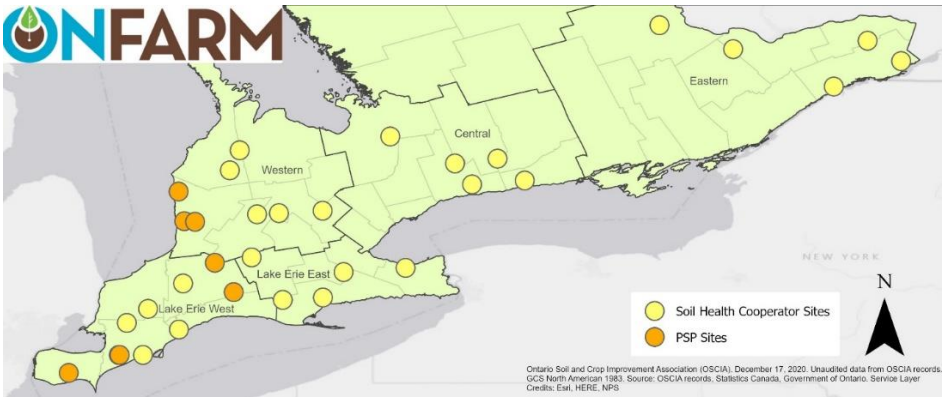

Figure 2. Location of edge of field and soil health BMP sites across Ontario

Enthusiasm about the Forum
"Thank you everyone, it's been a great morning of learning!" – Forum chat comment
"Thanks for this Forum today. … Thanks for engaging Conservation Authorities and Conservation Ontario in the promotion and delivery of ONFARM. Thanks to the ONFARM cooperators and all the partners who are engaged. It's been a great initiative to foster learning between peers, [as well as] innovation and adoption." – Forum chat comment
"Really enjoyed and benefited from the diverse line-up of speakers who all have experiences with ONFARM. The SRG presentation on findings was particularly useful." – Survey respondent
"I think I learned as much about the topics from the discussion in the chat than from the presentation itself – very stimulating and something an in-person session wouldn't allow for." – Survey respondent
"The structure of the Forum was excellent. Short, informative presentations followed by the panels were a good way to reflect and build on the information. It was an excellent way to bring in different perspectives, including producers. Well done!" – Survey respondent

3. Summary of Forum Discussions

3.1. Welcome & Setting the Stage

The Forum began with a welcome from Dr. Angela Straathof, OSCIA's Program Director, as well as Kelly McAslan, Assistant Deputy Minister of OMAFRA's Food Safety and Environment Division. The welcoming remarks to the Forum can be viewed here.

Key Points:

- A Technical Working Group advised on the content, objectives, and deliverables of the program, while a Stakeholder Engagement Working Group advised on the knowledge translation and transfer activities.
- Through the diversity of stakeholders involved in the project, a broad spectrum of Ontario's agricultural industry supported ONFARM.
- ONFARM is key for OMAFRA, as it supports several Ministry priorities, such as Ontario's Agricultural Soil Health & Conservation Strategy, and the Canada-Ontario Lake Erie Action Plan.
- ONFARM provides evidence to motivate further adoption of water quality and soil health BMPs through on-farm knowledge sharing.
- The established partnerships at each ONFARM site are critical to the success of these trials and understanding how these BMPs can be integrated to improve soil health and water quality in Ontario.
- The findings from ONFARM will inform further environmental stewardship programs OMAFRA develops.

3.2. ONFARM Highlights

Dr. Angie Straathof and Jennifer Doelman, an ONFARM Cooperator, shared highlights from ONFARM.

The video of this panel can be viewed here.

Figure 3. Jennifer Doelman (top left) with her family.

Key Points from Dr. Angela Straathof:

- ONFARM has four enhanced demonstration sites which foster increased engagement and knowledge transfer opportunities.
- In total, over the last year, 346 participants attended ONFARM knowledge transfer events. At these events, OSCIA used its new Mobile Technology Suite, which allows participants to see research results and get a closer look at soil pits.
- Through the ONFARM Data Dashboard, users can explore the ONFARM data and select variables of interest. The Dashboard has been updated to include the 2020-22 soil data and cover crop data.
- OSCIA created a Guidebook for producers interested in conducting on-farm research.
- Operation Pollinator was offered to ONFARM cooperators exclusively in 2022 to support soil health and biodiversity. In total, seven cooperators participated in 2022 and 10 cooperators will participate in 2023.
- ONFARM is a province-wide beneficial program. OSCIA is eager to continue this program and engage with its partners to continue this important research.

Key Points from Jennifer Doelman:

- Renfrew County, where Jennifer farms, is a traditionally underserved agricultural community. It lacks a conservation authority and has limited access to extension services. ONFARM brought important research and extension services to Renfrew County through Jennifer's on-farm trials and the demonstration day hosted on her family farm.
- ONFARM is incredibly farmer-friendly; it provides a practical opportunity for producers to collaborate with researchers. In the process, cooperators develop confidence in the research and build relationships with a diversity of industry stakeholders.
- ONFARM brought specific benefits for Jennifer's farm operation too. For example, the involvement of researchers helped motivate Jennifer to keep on track with the recordkeeping for her trials. Participation in ONFARM also fostered stronger buy-in from Jennifer's farm team, as the better data from the trials informed farm management decisions.
- ONFARM is an important starting point; the impacts of better soil health and water quality are measured over the long term.

ONFARM "allows for cross-pollination. The researchers were actually out on the farm, seeing the conditions we work with and the barriers we face. And we met with the researchers, which enabled us to understand why it's so important that we put in that bit of extra effort so we can get better data."
– Jennifer Doelman

3.3. ONFARM Soil Health Indicators: Key Findings

Don King, the President and Senior Agronomist at the Soil Resource Group (SRG), and Margaret Ribey, the Natural Resource Scientist at SRG, shared the applied soil health research findings from ONFARM. Don began by reviewing the key research questions and methodologies. Then, Margaret provided an overview of results from one of the trial sites. The video of this session can be viewed here.

Key Points:

- ONFARM seeks to improve stakeholder understanding of the impact of BMPs on social health at regionally representative field-scale sites across southern Ontario.
- Cooperators used a side-by-side (paired) field plot design to compare business as usual with BMP treatments that fit within their systems and their soil health goals.
- Typically, cooperators had a three-crop rotation, and studied the BMPs of cover cropping, and/or organic amendment applications (e.g., manure and biosolids). Most cooperators already operated under reduced tillage systems.
- SRG conducted soil health baseline assessments at each participating site in 2020, as well as additional testing in each subsequent year.
- Soil organic matter is the foundational reference for soil health and the researchers analyzed several soil health indicators. For example, the results show a strong positive correlation between active carbon and organic matter. However, many factors affect the indicator ranges and responses at a site. These factors include soil type, slope position, level of soil degradation or existing organic matter level, year-to-year differences, and site management history.
- About a quarter of the time, researchers saw a positive response in organic matter levels in coarse soils from the organic amendment and cover crop plus organic amendment treatments. Researchers saw a similar trend in fine soils, and also saw more instances of the cover crop treatment resulting in a statistically higher organic matter level than the control.
- About 20% of the time, the organic amendment and cover crop plus organic amendment treatments resulted in statistically higher active carbon levels in both coarse and fine soils than in the control.
- The researchers are not seeing a response in Solvita CO_2 Burst levels when comparing the treatments to the control. This indicator may be slower to reflect change in the landscape.
- The three landscape positions respond differently to the BMPs, but the responses are very site specific.
- Across southern Ontario, the predominant forms of soil degradation are historic tillage erosion and near-surface soil compaction.
- The soil health indicators tested through ONFARM mostly reflect soil organic matter levels and soil degradation, and the indicators tend to correlate with each other. However, no one “best” measure has been identified to date.

- Soil organic matter is an essential measure to use as a base for understanding soil health. In the short term, active carbon shows potential, as might SLAN (Solvita Labile Amino-Nitrogen). Autoclaved-citrate extractable (ACE) soil protein shows potential, and Solvita CO_2 Burst seems to be responsive but slow to show changes. Overall, in-field variability and the indicator consistency still requires further testing.
- Some indication exists that the indicators are measuring the effects of BMPs on soil health, but more research is necessary to make definitive conclusions.
- Increases in soil health indicators will not be a straight-line year over year. Rather, industry stakeholders must look for the trend within a site.

Case Study: Site 12

- Many benchmarks showed moderate to severe tillage erosion, which has significant impact on crop productivity.
- The cooperator used a winter-wheat-soybean-corn rotation, and trialed the BMPs of cover cropping and organic amendment applications.
- After two years (from 2020 to 2022), the organic matter, Solvita CO_2 Burst, and active carbon levels show that the mid-landscape position is responding to the BMPs.
- By continuing these BMPs, and continued monitoring of these soil health indicators, researchers can estimate how long it will take to change these indicators at that most degraded upper landscape position.
- A huge variability exists in the yield at this site. The 2022 corn yields, for example, ranged from 17 bushels/acre at the upper-most degraded landscape positions to 200 bushels/acre. This extreme level of variability did not exist within the indicators, which reinforces that a lot of factors (e.g., pH and moisture) at a given site influence yields. Thus, yield is not the best indicator of soil health.

3.4. ONFARM Soil Health Indicators: Panel Discussion

Following the presentation by SRG, a group of panelists continued the discussion of soil health indicators. The panel consisted of:

- Sebastian Belliard, a Soil Management Specialist with OMAFRA
- Luke Hannam, an ONFARM Cooperator
- Adam Hayes, a representative of SRG
- Dr. Ann Huber, the Environmental Microbiologist at SRG

The video of the panel can be found here.

Key Points:

- Soil organic matter is a keystone indicator that underpins all soil health work underway through ONFARM. This indicator is a good place for producers to start, and this type of testing is not expensive. Aggregate stability is another good baseline indicator.
- A soil's water-holding capacity is key for risk management. As organic matter levels increase, so will water-holding capacity.
- To allow for the most accurate comparisons between test results over time, it is important to pull the soil samples at the same time of the year, at the same point in the crop rotation, and from the same location each time. Ideally, the same lab will conduct the analysis each time too.
- If producers conduct soil sampling themselves, it is more cost efficient. Producers can leverage their knowledge of their farms to take samples that are representative of their fields and should take samples in poorer areas too. Producers can also use a tile probe to look at the compaction in their fields, conduct earthworm counts, and dig up some soil to look at it. OMAFRA's Agronomy Guide for Field Crops is a helpful resource for producers looking to assess their soils.
- Agronomists can also help producers with soil sampling. While this method involves a higher cost, agronomists know best practices for sampling, including the best places to sample and taking GPS reference points to ensure future samples can be pulled from the same location. Agronomists can also help producers interpret the indicators and complete a Farmland Health Check-Up or soil health assessments.
- More advanced soil testing can involve soil electrical conductivity surveys and cross referencing them with topography maps to identify points of interest for soil sampling. The findings from this testing can be combined with yield maps to create soil maps, which can then be used to create zones. Producers can use these zones when making management decisions, such as for variable-rate applications of fertiliser.
- The Soil Health Assessment and Planning (SHAP) program seeks to gather sufficient data to improve the understanding of soil health indicators and to make a soil health assessment for Ontario, as industry stakeholders currently use the Cornell Framework.

3.5. ONFARM Water Quality Indicators: Key Findings

Representatives from three conservation authorities participating in ONFARM presented some key water quality indicator findings. The presenters were as follows:

- Tatianna Lozier, the Stewardship Services Coordinator at the Upper Thames River Conservation Authority
- Colin Little, the Agricultural Program Coordinator for the Lower Thames Valley Conservation Authority
- Chris Van Esbroeck, the Stewardship Coordinator at Maitland Valley Conservation Authority

Dr. Wanhong Yang, a professor in the Department of Geography, Environment, & Geomatics at the University of Guelph, provided an overview of the watershed BMP modelling for ONFARM.

The video of these presentations can be found here.

Speakers: Tatianna Lozier, Upper Thames River Conservation Authority Colin Little, Lower Thames Valley Conservation Authority Chris Van Esbroeck, Maitland Valley Conservation Authority
Key Points:
▪ Large variability exists in climate, soil types, and topography across the six sub-watersheds studied through ONFARM. ▪ The participating Conservation Authorities conduct monitoring at the sub-watershed and edge-of-field scales. Mostly, the Conservation Authorities conduct event-based sampling (e.g., rainfalls or snowmelts). The researchers seek to capture the rise, peak, and fall of the watercourse through the sub-watershed monitoring. At the edge-of-field scale, the researchers monitor both tile drainage and overland flow. ▪ A three-day event in January 2020 in the Upper Medway resulted in 43% of the total phosphorus load lost in the 2019-20 year. ▪ Most phosphorus and nitrogen losses, as well as total suspended sediment losses, occur in the non-growing season when most of the water is moving through the landscape.
Case Study: Garvey-Glenn Edge-of-Field Site
▪ The Maitland Valley Conservation Authority has six years' worth of data for this site, as the ONFARM research builds on the GLASI project. ▪ Multiple run-off events occurred in the fall and winter of 2017-18. The edge-of-field site experienced significant total phosphorus losses that year, while the losses at the watershed outlet were average. After the producer harvested wheat, they seeded a cover crop. In October, the producer broadcast liquid hog manure in the field. Before they could return to the field incorporate the manure, a rainfall event occurred. As it was a wet year, a big tile flow event

occurred with huge nutrient losses. In early November, when the field conditions were suitable, the producer returned and incorporated the manure. However, the chisel plow pass left the soil basically bare, and rainfall events continued through the winter.
    - In contrast, in 2020-21, the producer applied the manure to the field in August after the harvest of the wheat. It was a much dryer year, too, so the researchers did not see the same level of nutrient losses as occurred in 2017-18.
    - This example shows the influence of land management practices, and the importance of studying both the sub-watershed and edge-of-field scales to better understand nutrient losses.

Case Study: Jeannettes Creek

- This research focused on Brookston clay soils under two management systems:
    - No-till continuous cover crop system in a corn-soybean-soybean-wheat rotation
    - Conservation tillage system in a corn-soybean-soybean-wheat rotation
- At both sites, the total phosphorus load is primarily in particulate form, which is likely the result of the inherent soil conditions; the cracking in Brookston clay soils provides preferential flow pathways to tile.
- When comparing the two sites, the researchers consistently see higher total suspended sentiment losses, higher total phosphorus losses, and higher nitrate loads from the conservation tillage site. These losses can likely be attributed to the higher amount of tillage and less frequent use of cover crops in the rotation. The concentrations of the total phosphorus and total suspended sentiment are significantly greater at this site too. At the no-till cover crop site, higher dissolved phosphorus losses can occur from fall flow events when fertilizer is broadcast and not incorporated into the soil. Thus, trade offs can occur between different management practices.
- A few rainfall or snowmelt events can have significant impacts on nutrient loads over time, but management practices can significantly mitigate these losses.
- Regardless of the BMPs implemented, inherent soil conditions can lead to higher nutrient loads relative to other fields in Ontario. For example, Brookston clay is a more challenging soil to manage when it comes to mitigating nutrient losses.

It is crucial “to continue to work with farmers locally to identify and validate feasible solutions to reduce nutrient loads. BMPs need to work at the farm scale and from a production perspective; they can’t just work from an environmental perspective if we want to get widespread adoption.”

- Colin Little

Speaker: Dr. Wanhong Yang, University of Guelph

Key Points:

- In-depth and accurate data collection is crucial to inform the modelling. The Conservation Authority representatives, University of Guelph researchers and farmers collaborated to collect information related to climate, topography, soil, land use, land management practices, BMPs, and water monitoring data.
- The researchers begin by modelling the existing scenario at the watershed level. Then, they evaluate the effectiveness of these BMPs by "removing" them in the model to estimate the conventional scenario. For example, the model could look at the implications of all farmers returning to conventional tillage. The scientists can also evaluate the effectiveness of future BMPs by "adding" BMPs to the model. For example, the model could show the benefits of all farmers incorporating their fertilizers and manures, or growing cover crops.
- The modeling can serve as experiments to help stakeholders understand how changes to management practices can impact the magnitude of nutrient losses from a given watershed.
- Opportunities exist to:
  - Continue and strengthen the extensive partnerships on BMP programs
  - Continue and strengthen data collection and water monitoring initiatives
  - Communicate the modeling results to a wide audience; underscore the tangible benefits of the BMPs
  - Scale up the modeling to cover more areas of the province

3.6. ONFARM Water Quality Indicators: Panel Discussion

The following panel of speakers continued the discussion of water quality indicators:

- James Cober, a Programs Analyst at OSCIA
- Rick Kootstra, an ONFARM Cooperator
- Tatianna Lozier, the Stewardship Services Coordinator with the Upper Thames River Conservation Authority
- Dr. Wanhong Yang, a Professor at the University of Guelph

The video of this session can be viewed here.

Key Points:

- The Huronview Demonstration Farm, which serves as an ONFARM edge-of-field site, had 2-foot gullies from runoff and erosion. The team operating Huronview added grassed waterways over the gullies. The team also uses strip till and cover crops. The Ausable Bayfield Conservation Authority monitors the water quality.
- It can be very difficult to understand water quality without directly measuring the water coming out of the tiles. Any time water leaves a field, nutrients are

leaving with it. However, by maintaining and improving soil organic matter, farmers can increase their soil's water-holding capacity and reduce erosion, which helps to protect water quality.

- Farmers should be mindful of their fertilizer application methods. If producers broadcast fertilizer, they should ideally broadcast into a crop. If producers use tillage, they should try to incorporate their fertilizer with the same tool (e.g., a strip till machine).
- Modelling can help farmers understand how using different combinations of BMPs can affect water quality, and the potential trade-offs with selecting one BMP over another.
- Small changes in management practices can bring positive benefits. For example, while switching from conventional tillage to complete no-till might be difficult, moving to minimal tillage can be beneficial.
- Given the range of factors outside of producers' control, it is important to develop contingency plans. For example, if your cover crop does not have a good stand, can you re-seed it later or decrease the amount of tillage you planned to increase the amount of crop residue on the soil surface?
- OMAFRA's AgriSuite has a Phosphorus Loss Assessment (PLATO) that producers can use to estimate potential losses of this nutrient from different management practices.

"Look for where the water is coming on to the farm and leaving. If you can slow it down, that's the benefit to water and soil."
- Rick Kootstra

3.7. Agronomic Benefits & Co-Benefits of BMPs: Panel Discussion

The final panel discussion explored the agronomic benefits and co-benefits of using BMPs. Agronomic benefits are measurable benefits for the crop itself, such as benefits to yield, grain quality, and disease resistance. Co-benefits are less tangible. They are unanticipated or unplanned benefits that help with another sustainability outcome, such as enhanced water quality and increased carbon sequestration. The following speakers participated in this session:

- Larry Dyck, an ONFARM Cooperator
- Gord Green, an ONFARM Cooperator
- Colin Little, the Agricultural Program Coordinator with the Lower Thames Valley Conservation Authority
- Dr. Angela Straathof, the Program Director at OSCIA
- Dr. Karen Thompson, an Associate Professor at Trent University

The video of this session can be viewed here.

Key Points:

- Benefits from no-tilling, crop rotation and cover crop usage include:
  - Reduced soil compaction
  - Increased weed control
  - Reduced erosion
  - High earthworm counts
  - Higher water-holding capacity
  - Improved water quality
- Soil health BMPs can increase the resiliency of a system. In drought years, for example, the soil's higher water-holding capacity can help to maintain yields.
- Adoption of new BMPs can be difficult, and it takes time to convince other farmers to implement BMPs. Farmers using these BMPs need to demonstrate success to inspire others, and to share their experiences with other producers.
- At a minimum, five to 10 years of research are needed to demonstrate benefits of BMPs. As climate variability increases, more seasons of data collection are necessary. Farmers are looking for field-scale trials and want to know what BMPs will look like in their own fields.
- It can take time to see results from the implementation of new BMPs. Farmers interested in trying a new practice should begin by conducting soil sampling to serve as a benchmark. Then, they should start small and be willing to adapt to challenges. They should also leverage opportunities to learn from their peers.

"The nature of research is that, as you get more information, it begets more questions. … In the research journey, we need continuous input from end users (i.e., farmers). ONFARM prioritized this approach."

- Dr. Angie Straathof

3.8. Closing Remarks

Andrew Jamieson, the Manager of the Innovation, Engineering and Program Delivery (Central/Eastern) unit in the Environmental Management Branch of OMAFRA, provided closing remarks.

The video can be found here.

Key Points from Andrew Jamieson:

- ONFARM is a pearl project for OMAFRA's Environmental Management branch. Multi-year on-farm research projects can be challenging but are critical to benefit farmers and researchers alike.
- ONFARM's stakeholder engagement and knowledge translation and transfer efforts are crucial to help others learn about the BMPs.
- There is a need for continued long-term monitoring as it takes time to see changes in soil health and water quality.

4. Main Takeaways

A. On-farm research positively impacts the agri-food sector.

- ✓ On-farm research advances understanding of BMPs in “real world” conditions.
- ✓ On-farm research, supported by knowledge translation and transfer, helps to encourage the adoption of BMPs and the fine-tuning of management strategies to suit local conditions.

B. Collaboration between a diversity of industry stakeholders is necessary to successfully conduct in-depth on-farm research.

- ✓ Through collaboration, producers, researchers, Conservation Authority representatives, and other agri-environmental stakeholders can advance understandings of the agronomic benefits and co-benefits of BMPs.
- ✓ This diversity of stakeholders can also provide insights on how to encourage the adoption of these BMPs, as they must work from agronomic, economic, and environmental perspectives.

C. Soil testing, and monitoring changes in soil test results over time, is crucial to understanding the agronomic impacts of BMPs.

- ✓ While more work still needs to be done to better understand soil health indicators, soil organic matter levels are an essential measure to use as a base for understanding soil health.
- ✓ The approach to soil health monitoring must be consistent. Each time soil samples are pulled, they should be taken at the same place in the field, at the same time of year and at the same point in the crop rotation (e.g., in the fall after wheat harvest). Ideally, the same lab should analyze the soil samples each time too.
- ✓ When analyzing changes in soil health over time, industry stakeholders must look for trends; soil health indicator results will not be linear.

D. While large rainfall or snowmelt events can contribute significantly to nutrient loads, producers can implement BMPs to mitigate these losses.

- ✓ Producers can also develop contingency plans to help deal with unexpected hurdles, such as a poor cover crop stand.

E. Given the variability across landscapes and soil types, it is important to study BMPs at the local level.

- ✓ As trade-offs can occur between different management practices and different soils pose different levels and types of risks, it is important to study BMPs at the local level.
- ✓ Local field-scale research is necessary to encourage producer adoption of BMPs.

F. Long-term on-farm research is vital to understand the agronomic benefits and co-benefits of BMPs.

- ✓ Given differences in how landscape positions respond to BMPs and the fact it takes time for soil health to change, more testing is necessary to better understand soil health indicators and the impacts of BMPs on soil health.
- ✓ ONFARM advanced the work undertaken through GLASI and stakeholder understanding of soil health and water quality; the next iteration of the program will allow for more nuanced understandings of soil health and water quality indicators.
- ✓ It will take time to consistently see the agronomic benefits and co-benefits of BMPs; long-term funding is necessary to support consistent monitoring and analysis.

5. Next Steps

5.1 ONFARM Soil Health & Water Quality Indicator Webinars

OSCIA and SRG are exploring the opportunity to host a webinar which will enable participants to further explore the ONFARM soil health indicator findings. OSCIA can also consider hosting a similar webinar with the Conservation Authorities and Dr. Wanhong Yang to allow for a more fulsome discussion of the ONFARM water quality and modelling research.

5.2 Share the Research Findings at Other Industry Events

To build on the successful ONFARM field days and Forums, OSCIA can identify and leverage opportunities to present research findings at other industry events. Both researchers and cooperators should be involved in these presentations, as they bring different insights to the discussions and together can reach a broader diversity of stakeholders.

5.3 ONFARM's Impact: At a Glance Infographics

As OSCIA plans for opportunities to continue the ONFARM research, OSCIA could develop a series of infographics. These infographics could summarize the key findings to date, identify the existing knowledge translation and transfer materials, and highlight the extent of stakeholder engagement over the course of the four-year initiative. These infographics would demonstrate the impact of ONFARM and reinforce the need for the next iteration of the program.

5.4 ONFARM: Key Takeaways 2-Pager

OSCIA can develop a simple two-pager which summarizes key takeaways for producers from ONFARM. This two-pager can be leveraged in other agri-environmental educational opportunities, such as Environmental Farm Plan workshops and Farmland Health Check-Up meetings.

5.5 ONFARM Debrief Activities

As OSCIA wraps up this four-year initiative, it can host a debrief session with its key collaborators, including the Soil Resource Group, the participating Conservation Authorities, and Dr. Wanhong Yang. During this session, the collaborators can identify what worked well, discuss opportunities to strengthen or refine the research methodology, and confirm priorities for longer-term research. OSCIA can also create a survey to share with cooperators to:

- Gather feedback on their experiences in the program
- Identify opportunities to improve cooperator experiences in future programming
- Gauge interest in continued involvement in on-farm research projects

6. Appendices

6.1. Information Package for Attendees

AGENDA

February 9, 2023 via Zoom Videoconference

The Ontario Soil & Crop Improvement Association (OSCIA) looks forward to welcoming you to the 2023 On-Farm Applied Research and Monitoring (ONFARM) Forum! This event will be a unique opportunity to learn about the latest on-farm research findings and gain a stronger understanding of best management practices (BMPs) and their effects on soil health and water quality.

Time	Activity
9:00 am	**Welcome & Setting the Stage** Speakers: • Dr. Bronwynne Wilton, Wilton Consulting Group (WCG) • Dr. Angela Straathof, Ontario Soil & Crop Improvement Association (OSCIA) • Kelly McAslan, Ontario Ministry of Agriculture, Food, & Rural Affairs (OMAFRA)
9:10 am	**ONFARM Highlights** Speakers • Dr. Angela Straathof, OSCIA • Jennifer Doelman, ONFARM Cooperator
9:20 am	**ONFARM Soil Health Indicators: Key Findings** Speakers: • Don King, The Soil Resource Group (SRG) • Margaret Ribey, SRG
9:50 am	**ONFARM Soil Health Indicators: Panel Discussion** **Speakers:** • Sebastian Belliard, OMAFRA • Luke Hannam, ONFARM Cooperator • Adam Hayes, SRG • Dr. Ann Huber, SRG

Time	Activity
10:15 am	**Break**
10:25 am	**ONFARM Water Quality Indicators: Key Findings** Speakers: • Tatianna Lozier, Upper Thames River Conservation Authority • Colin Little, Lower Thames Valley Conservation Authority • Chris Van Esbroeck, Maitland Valley Conservation Authority • Dr. Wanhong Yang, University of Guelph
10:55 am	**ONFARM Water Quality Indicators: Panel Discussion** Speakers: • James Cober, OSCIA • Rick Kootstra, ONFARM Cooperator • Tatianna Lozier, Upper Thames River Conservation Authority • Dr. Wanhong Yang, University of Guelph
11:20 am	**Agronomic Benefits & Co-Benefits of BMPs: Panel Discussion** Panelists: • Larry Dyck, ONFARM Cooperator • Gord Green, ONFARM Cooperator • Colin Little, Lower Thames Valley Conservation Authority • Dr. Angela Straathof, OSCIA • Dr. Karen Thompson, Trent University
11:50 am	**Closing Remarks** • TBD, ONFARM Cooperator • Andrew Jamieson, OMAFRA

ONFARM BACKGROUND

The On-Farm Applied Research and Monitoring (ONFARM) program is a four-year initiative developed by OMAFRA, delivered by OSCIA, that is completing extensive soil health and water quality analysis on 32 farm sites across Southern Ontario. This network of sites and established partnerships will help build a stronger understanding of BMPs and their effects on soil health and water quality on Ontario farmland. The ONFARM program is collecting water and soil quality data to assess various BMPs such as cover cropping and the use of organic amendments. Soil quality data is being collected by the Soil Resource Group, while teams at five conservation authorities are conducting water quality research. ONFARM is also supported by a network of farmer cooperators, who are essential to the success of the program.

MEET THE SPEAKERS

Sebastian Belliard, OMAFRA

ONFARM Soil Health Indicators: Panel Discussion

Sebastian is a Soil Management Specialist with OMAFRA based in Eastern Ontario. His recent work has focused on soil health assessments and the development of tools to guide growers and advisors through evaluating the different elements of soil health.

James Cober, OSCIA

ONFARM Water Quality Indicators: Panel Discussion

James Cober is a Programs Analyst with OSCIA. He contributes to the delivery of various cost-share programs with a focus on environmental stewardship in agriculture, and the ONFARM program through data management and reporting. James is a certified NASM (Non-Agricultural Source Materials) Plan Developer and holds an MSc from the University of Waterloo in Geography.

Jennifer Doelman, ONFARM Cooperator

ONFARM Highlights

Jennifer Doelman, CCA-ON, is a proud farmer, ONFARM Cooperator, and beekeeper from Renfrew County. She is also a science geek, a canola cheerleader and wannabe soil and water steward. Jenn farms in the Upper Ottawa Valley with her husband, Mike, and their children, AJ and Becky. Farming heavy silty clay in a rain shadow, they learned early in their farming career that good soil health is paramount to their farm's success.

Larry Dyck, ONFARM Cooperator

Agronomic Benefits & Co-Benefits of BMPs: Panel Discussion

Larry Dyck is a cash crop farmer in Campden, ON and an ONFARM cooperator. Together with his son Ben, Larry operates Campden Grain. Larry's wife Marg and daughter-in-law Kait are also active in the logistics of the operation. The family began experimenting with cover crops and planting green in 2015. Larry's search for knowledge contributed to his decision to participate in the ONFARM program.

Gord Green, ONFARM Cooperator

Agronomic Benefits & Co-Benefits of BMPs: Panel Discussion

Gord, his wife Laura and their son, Dave, operate Greenholm Farms, a dairy and cash crop operation north of Embro. The family is experimenting with cover crops to improve soil health and provide an alternative feed source. The Greens have two anaerobic digesters. Gord's ONFARM trial compares the use of organic amendments (liquid dairy manure and digestate) with and without a cover crop.

Luke Hannam, ONFARM Cooperator

ONFARM Soil Health Indicators: Panel Discussion

Luke is a recent graduate from the University of Guelph with a Crop Science Degree. He is also a grain farmer located in the Guelph area. His family farm grows corn, wheat, and soybeans, as well as operating a commercial grain elevator and crop input supply business. They also have a new branch of the business that focuses on precision soil mapping to help manage the farm's soils independently and accurately by soil type.

Adam Hayes, SRG

ONFARM Soil Health Indicators: Panel Discussion

Adam Hayes retired from OMAFRA as a soil management specialist in 2019. Soon after, he was hired by SRG to help setup the sites and coordinate BMP implementation with the cooperators for the ONFARM project. Adam also assisted with developing soil health training for the University of Guelph Ridgetown Campus. In his spare time, he enjoys spending time with family.

Dr. Ann Huber, SRG

ONFARM Soil Health Indicators: Panel Discussion

Dr. Ann Huber is the environmental microbiologist for SRG, with over 30 years of national and international experience in environmental and agricultural research. Her areas of focus include the evaluation and development of BMPs and technologies for sustainable water management in the horticultural sector, soil health and agricultural nutrient and pathogen management practices.

Don King, SRG

ONFARM Soil Health Indicators: Key Findings

Don King, MSc., CCA-ON, is the President and Senior Agronomist at SRG, which conducts applied research in the agricultural and environmental sectors. The firm has also provided land resource services to public agencies, government, private firms, and landowners for over 20 years. Don has extensive experience conducting on-farm projects to evaluate the environmental impact of agricultural production on soil, water, and air quality to help determine improved farming practices.

Andrew Jamieson, OMAFRA

Closing Remarks

Andrew Jamieson is currently the Manager of the Innovation, Engineering and Program Delivery (Central/Eastern Ontario) unit in the Environmental Management Branch (EMB) of OMAFRA. Over his 20 years of experience, Andrew has worked as an agricultural engineer for both OMAFRA and Agriculture and Agri-Food Canada. His engineering experience includes water quality, irrigation, drainage, soil erosion, and nutrient management.

Rick Kootstra, ONFARM Cooperator

ONFARM Water Quality Indicators: Panel Discussion

Rick Kootstra, along with his brothers Rob and Derek, farm south of Clinton, ON, where they grow corn, soybeans, white beans, winter wheat and cover crops in their rotation. Their land borders the Huronview Demonstration Farm, where Rick volunteers in an applied-research collaboration between the Huron County Soil and Crop Improvement Association and the Ausable Bayfield Conservation Authority. Rick is Vice-President of the Innovative Farmers Association of Ontario.

Colin Little, Lower Thames Valley Conservation Authority

ONFARM Water Quality Indicators: Key Findings
Agronomic Benefits & Co-Benefits of BMPs: Panel Discussion

Colin Little is the Agricultural Program Coordinator for the Lower Thames Valley Conservation Authority. Colin graduated from the University of Waterloo with an Honours Bachelor of Environmental Studies (Co-Op) Degree, specializing in Environment and Business. Colin has extensive experience working with producers to implement agricultural BMPs with the goal of improving soil health and reducing agriculturally sourced nutrient loading in the Lower Thames River watershed.

Tatianna Lozier, Upper Thames River Conservation Authority

ONFARM Water Quality Indicators: Key Findings
ONFARM Water Quality Indicators: Panel Discussion

Tatianna Lozier is the Stewardship Services Coordinator at Upper Thames River Conservation Authority, where she works closely with farmers to adopt agricultural BMPs. She has worked in rural water quality research to evaluate BMPs since 2012 and continues to be involved in innovative projects to address water and nutrient management concerns.

Kelly McAslan, OMAFRA

Welcome and Setting the Stage

Kelly is currently Assistant Deputy Minister of OMAFRA's Food Safety and Environment Division, having started at the ministry in 2010. During her time at the ministry, Kelly has worked in many branches of the Food Safety and Environment Division as well as the Ontario Farm Products Marketing Commission Secretariat. Kelly earned her Bachelor of Arts from the University of Guelph and has a Certified Human Resources Professional (CHRP) designation. In her spare time she enjoys cheering on her daughter's soccer matches, being active at the gym or outdoors, travelling, and spending time with family and friends.

Margaret Ribey, SRG

ONFARM Soil Health Indicators: Key Findings

Margaret Ribey, MSc., CCA-ON, is the Natural Resource Scientist at SRG. Her areas of expertise include soil chemistry and physics, nutrient sourcing and transport, BMPs, soil health, environmental considerations in production agriculture, and nutrient management planning. Margaret coordinates agronomic field sampling, data management and analysis, GIS support, and reporting requirements for SRG projects.

Dr. Angela Straathof, OSCIA

Welcome and Setting the Stage
ONFARM Highlights
Agronomic Benefits & Co-Benefits of BMPs: Panel Discussion

Dr. Angela Straathof is the Program Director at OSCIA. She oversees the delivery of cost-share funding and producer education opportunities, including the ONFARM program, the Canadian Agricultural Partnership, Lake Erie Agriculture Demonstrating Sustainability (LEADS), the On-Farm Climate Action Fund (OFCAF) and Species at Risk. Angela holds a PhD in soil chemistry and biology from the Department of Soil Quality at Wageningen in the Netherlands.

Dr. Karen Thompson, Trent University

Agronomic Benefits & Co-Benefits of BMPs: Panel Discussion

Dr. Karen Thompson is an Associate Professor at Trent University and the Program Coordinator of the Sustainable Agriculture and Food Systems Program. Karen's research interests include crop-microbe interactions, soil carbon and nitrogen cycling, and soil microbial responses to climate change and agricultural management. She is also the co-chair of the ONFARM Stakeholder Engagement Working Group.

Chris Van Esbroeck, Maitland Valley Conservation Authority

ONFARM Water Quality Indicators: Key Findings

Chris Van Esbroeck is the Stewardship Coordinator at Maitland Valley Conservation Authority. Chris grew up on a farm in Huron County. Previously, he worked at OMAFRA and OSCIA. He earned his master's degree working with Merrin Macrae at the University of Waterloo.

Dr. Wanhong Yang, University of Guelph

ONFARM Water Quality Indicators: Key Findings
ONFARM Water Quality Indicators: Panel Discussion

Dr. Wanhong Yang is a professor in the Department of Geography, Environment & Geomatics at the University of Guelph. He has expertise in GIS, agricultural and environmental economics, and hydrology. Since 2001, Wanhong has developed a research program on integrated economic-hydrologic-geographic information system (GIS) modelling for examining the cost effectiveness of agricultural conservation programs. Wanhong leads watershed BMP modelling for ONFARM.

This event has been approved for two Continuing Education Units (CEUs) for Certified Crop Advisors (1 Nutrient Management CEU and 1 Soil & Water CEU).
This event is an OSCIA-recognized Knowledge Sharing Event (KSE) for Ontario farmers with On-Farm Climate Action Fund (OFCAF) projects in the Nitrogen Management or Cover Cropping categories.

The On-Farm Applied Research and Monitoring (ONFARM) program is a four-year, applied research initiative that began in 2019 which supports soil health and water quality research on farms across Ontario. This program is funded by the Canadian Agricultural Partnership, a five-year federal-provincial-territorial initiative.

CANADIAN AGRICULTURAL PARTNERSHIP

OSCIA

Ontario

Canada

6.2. Information About Forum Registrants

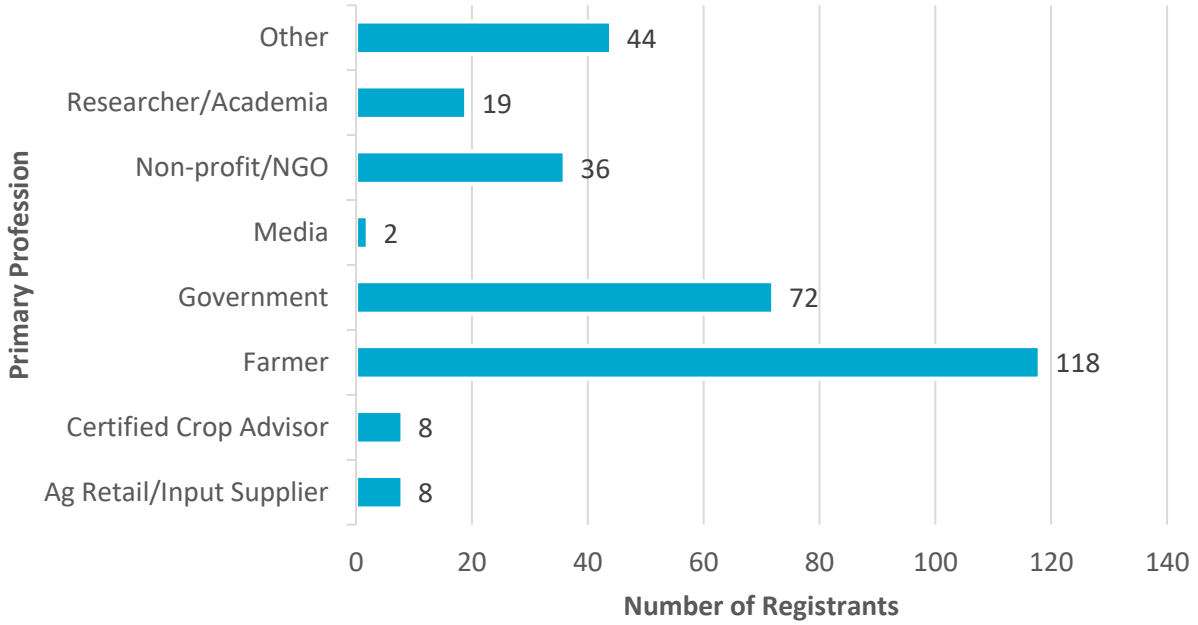

Figure 4. Primary profession of 2023 ONFARM Forum registrants (n=307)

6.3. Forum Questions & Answers

Forum participants were actively involved in discussions in the chat for the duration of the event. The questions and answers from these discussions are presented below.

General ONFARM Questions

I see a gap in cooperator sites in Hastings, Lennox and Addington, Frontenac, and Leeds and Grenville. As someone who has implemented many BMPs on my own farm, I wonder about that gap.

- The gap was not by design, but there was a limit to the number of sites that could be implemented.
- ONFARM tried to balance location in the province with all the other soil, commodity-type and landscape variability that would be captured across 25 sites.

Soil Health Indicators

There is no doubt that degraded soils can sequester carbon if converted to perennial pasture. But there is research that shows soils become "maxed out" and reach a limit in how much organic matter they can hold. But some regenerative farming advocates suggest that long-term pastures continue to sequester carbon deeper in the soil profile, and continue to be a carbon sink indefinitely.

- Soil organic matter can max out under the influence of several factors, soil texture being the most obvious.
- Pastures continue to sequester carbon indefinitely, but they also mineralize carbon indefinitely. It is the relative rate of sequestration-mineralization that determines whether soil organic matter (SOM) levels are increasing, steady, or decreasing.
- There is a theory of organic matter (OM) "saturation" in soils (i.e., theoretical maximum) based on soil type, climate etc. If this level is reached, good OM management will have negligible increases in OM. But poor management or increased tillage could result in rapid OM losses. OM is certainly easier to lose than to build.
- As far as western research goes, we have been looking scientifically at SOM since the later 1800s. We have proven a century isn't even enough.

How do the "best" ONFARM soil health indicators square with or complement those chosen by Soil Health Institute (SHI), OMAFRA's Soil Health Assessment and Planning (SHAP) program, etc.?

- Some indicators were changed midway through the ONFARM program to align with some used by SHI and SHAP.

The Yield Enhancement Network (YEN) program uses a yield potential model that incorporates soil type, weather data, fertility etc. Yields are reported as a percentage of theoretical yield. Would it be possible (and useful) to correlate soil health indicators with a similar measure?

- A lot of options exist for normalizing and comparing the indicators with various indicators of productivity; yield is just one.
- There was crossover of YEN-ONFARM participants. It would be interesting to learn how YEN calculated theoretical yields.
- Yes, and this is a major benefit to programs like ONFARM that collect management and agronomic data in addition to soil health. The next big thing in soil health is using modeling techniques that explain and quantify how management influences the soil processes that are measured by soil health indicators and how those influence the outcomes we care about like yield, agronomic efficiency, etc. Lots of work yet to be done!

Do you have confidence in the Solvita burst when considering the evidence that microbial respiration increases under stress conditions? This may result in a question of how respiration burst correlates positively or negatively with soil health.

- There is no one “best” indicator, and this is a good example of why we can’t focus on just one.
- Solvita is a test for short-term mineralization (which is related to the activity of decomposer microbes).
- Looking at indicators like this in relation to others has more promise for explaining what’s going on. Understanding how those relationships influence outcomes will take more follow-up with projects like ONFARM.

What depth are the soil health indicator samples taken?

- 6-inch sampling for most of the soil health indicators.

Probably hard to say at this point, but do you think high landscape positions (most degraded) will need more management (e.g., additional BMPs) or will they just take longer to respond?

- Both, depending on the level and nature of degradation.
- High landscape positions need to be managed differently than other areas of the fields, as producers will need to apply more BMPs in these areas to increase soil health. Producers also need to be realistic with their expectations, as high landscape positions will never be as productive or as healthy as lower landscape positions.

In Margaret’s data, it appeared some of the measures were improving numerically in the upper slope positions but they weren’t statistically significant. Did these areas just have more variability so the changes needed to be larger to show up as significant?

- That is what is being seen, particularly at the site that was presented.
- There is interest in seeing how long it would take to see a defendable change in those highly degraded positions.

- It is expected that they most degraded sites will respond the quickest, however some may simply take more time (and not having a drought year thrown in the mix).
- Degradation is still very relative. Most of the ONFARM fields were under reasonably good management and the degraded positions were within that field, but probably less degraded relative to many fields across the province.
- Upper sites were variable as to the nature and extent of tillage erosion that they almost came out as very rapidly drained. Perhaps stratified organic amendment treatments (i.e., several application rates over a longer period) could be attempted to see if efficacy rates could be improved.

Should we be looking at reshaping more farms?

- There are pros and cons of this approach. Vineyard growers have experience with this.
- You would want to do a deep dive cost-benefit analysis first.
- One thing to consider is how removing a layer of soil from a functional soil column may result in issues. I would recommend talking to a pedologist first!
- A farmer in Essex County did laser levelling to make the field slightly sloped towards three parallel areas in the field and directed it to a grassed areas before it entered the ditch. It improved drainage of his flat field and reduced sediment loss from the field.

It would be nice to have the new Sustainable Canadian Agricultural Partnership to include funding initiatives to encourage farmers to do soil sampling.

- There is a need to fund testing!
- The Ontario On-Farm Climate Action Fund is supporting soil testing that informs nitrogen management decision-making.

Water Quality Indicators

Will we see the difference between the water testing data from these creeks versus the cities emptying their lagoon/sewer water into our waters?
▪ The water sampling sites for ONFARM were located so the catchments were agricultural. It is certainly an issue with the larger watersheds where there is a mix of both agricultural and urban. ▪ Phosphorus and soil leaving my fields is something we can control and will save us as farmers money. I realize our municipalities have issues as well, but I still don't want to lose fertility or soil off my field.
Can you put into context the biological significance of phosphorus movement to the watershed? For example, do losses during non-growing season have relatively less impact on lake ecology?
▪ Modelling shows that the size and severity of algal blooms in Lake Erie is largely driven by nutrient loads in the spring/non-growing season. ▪ For context, the water retention time of Lake Erie is roughly two to three years. ▪ Phosphorus (P) chemistry works on an equilibrium scale. As water concentrations of P go down in a lake, P will be released from sediments (either dissolved P that has precipitated or particulate P) into water concentration. So, regardless of the time of loss, any lost P can solubilize and become an issue later. ▪ Some of the P ends up in the sediment, so there is internal cycling happening. This is significant for Lake Erie because it is shallow. ▪ The take home from the Jeanettes Creek site is to subsurface band P rather than broadcast! This precisely mirrors the experience in the Maumee basin in Ohio where fall broadcast P is normal practice. As they increased no-till acres, dissolved P increased because too much was left sitting on the surface. ▪ A lot of work shows that surface-applied P will react with the soil over time. So, if you need to surface apply, it will be much lower risk during spring and summer than during the fall. Spreading into cover probably makes less difference than timing.
Was there any difference in the split between surface and tile flow between the Conservation Tillage (CT) and No-Till Cover Crop (NTCC) sites? What I am interested to see is how these "new norm" 100-year storms influence this split and water movement. How much is going through the soil anymore?
▪ Observations have been that quick flow to tile drains is more likely driven by earthworm burrows than cracking. If it was cracks, there would be noticeably more quick flow in dry conditions, but it appears to stay the same year-round. ▪ It is amazing how much water can flow through earthworm burrows, but the capacity is finite. Similarly, the capacity of tile drain systems is finite, so expect the biggest storms will be dominated by surface runoff because everything below ground is saturated. No one, to my knowledge, is looking at the hydrodynamics of these systems to figure out where the different flow pathways will dominate.

- Anecdotally, we have observed more surface water runoff at the CT site over time. We still need to quantify and analyze that data in more detail. Generally, we are only seeing surface water runoff at the NTCC site when the soil is frozen and we observe rainfall on frozen ground. Otherwise, it is rarely occurring at that site. The earthworm burrows could definitely be a factor as well and are something we will have to find a way to evaluate.
- It is apparent from the studies that extreme weather, both drought (affecting yield), and heavy rainfall (affecting nutrient loss), is a factor that is hard or impossible to manage. These extreme events will become more frequent. Should we revisit our crop rotations and reduce our production of corn and soybeans?
    - Big picture synergies are essential to sustainability; diversity is key in our crop rotation, our workload, and our cash flow.
    - Corn (i.e., stalks, stubble, roots) provides more organic matter than beans or lentils. The massive root structure of corn helps anchor the soil in the off season (i.e., when the heavier precipitation and runoff events take place). Not every crop itself is the perfect solution. Collectively, they can form an effective rotation package that delivers the best possible results.
- In terms of incorporating fertilizer, I think there are ways to do it without compromising too much on tillage – banding, placing with seed, vertical till, etc.

Do you see additional opportunities for riparian BMPs in these sub-watersheds where we see such high loading events in the winter?

- Understanding if the flow in the watershed is dominated by surface runoff or tile flow is critical to answering this question. Riparian zones will have impact on surface flow, but not so much on tile flow.
- It is definitely a piece of the puzzle. In Kent and Essex counties, we do not have a lot of riparian buffer zones. Although with so much water leaving the field via systematic tile drainage, I believe that agronomic BMPs have the highest potential for a nutrient reduction return.
- We find that a lot of our surface runoff from concentrated areas at the surface (i.e., cuts through the buffer). The water is not leaving as uniform sheet flow. So, without that in-field management component reducing in-field erosion, there is a lot of water, sediment, nutrients leaving those spots. In some areas, the water can move parallel to watercourse along the buffer until it hits a low spot and that is where we get the concentrated flow off the field.
- Most fields are not on simple slopes; most have identifiable draws and concentrated flow from these draws is the source of most cropland runoff. Buffer strips are only one component of a riparian BMP system. Among many BMPs (e.g., residue management, cover crops, etc.), these systems require erosion control and surface drainage structures to help reduce surface runoff from concentrated flow.
- There is a difference in the effectiveness of BMPs that address root causes versus patch a problem. Buffer strips along riparian areas are trying to stop the impact of soil and nutrients that are already in motion. Other BMPs that stop

the soil and nutrients from starting to move in the first place are the longer term solution.
Are there examples of widening riparian buffers or other such BMPs to limit or eliminate overland flow of nutrients off of fields into waterways?
▪ We have not monitored the direct impact, but we encourage rock chutes where we know water is leaving the fields to help reduce erosion and slow water as it heads into the watercourse.
Forum participants had an active discussion about manure management and, particularly, winter spreading of manure.
▪ One producer shared that farmers in their area do not apply any manure after the soils are frozen (i.e., between about mid November and mid March). Another producer shared that a neighbour recently spread manure on snow. ▪ Manure storage on some farms might be insufficient in seasons of heavy rainfall. ▪ Support for increasing farmyard storage of manure may be necessary alongside education about the in-field losses. Peer learning opportunities can be helpful in disseminating BMPs, too.

6.4. Post-Forum Survey

A short survey was emailed to participants after the Forum. In total, 50 people completed the survey, which equates to a response rate of approximately 24%.

Most commonly, survey respondents identified as farmers (36%), government staff (18%), or academia or conservation authority representatives (12% each). The individuals who classified themselves as other were retired, a student, a teacher, an administrator, and a workshop leader.

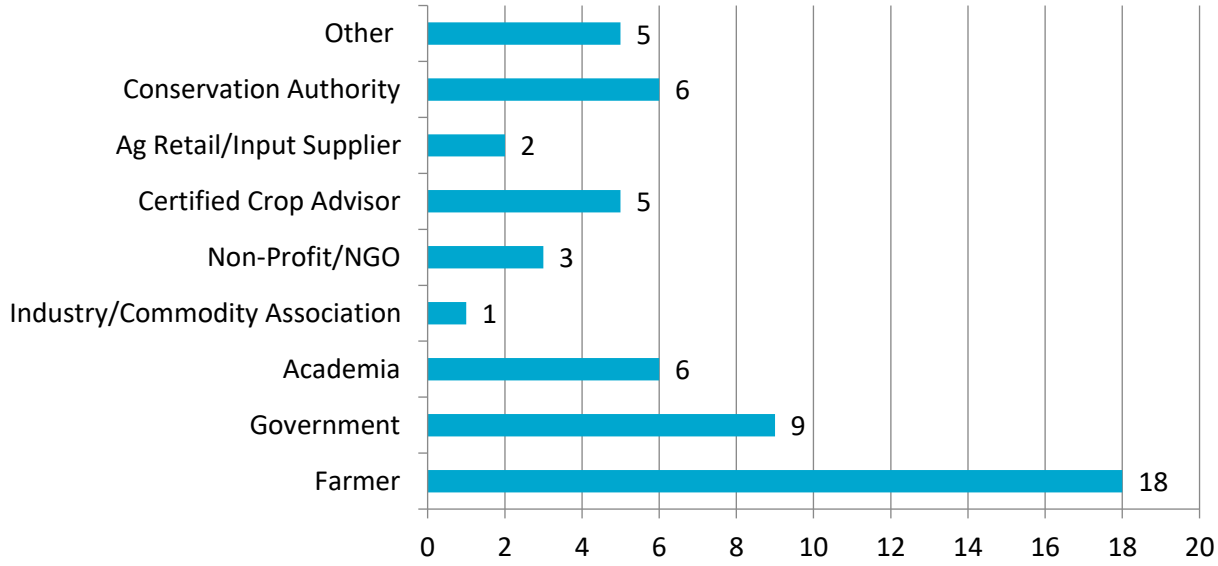

Figure 5. Primary profession of survey respondents (n=50)

Most of the survey respondents farm and/or work in Southern Ontario (48%). Other survey respondents were in Central Ontario (20%), Eastern Ontario (18%), Western Ontario (10%), and Northern Ontario (2%). The one survey respondent who farms/works outside of Ontario was from Vancouver, British Columbia.

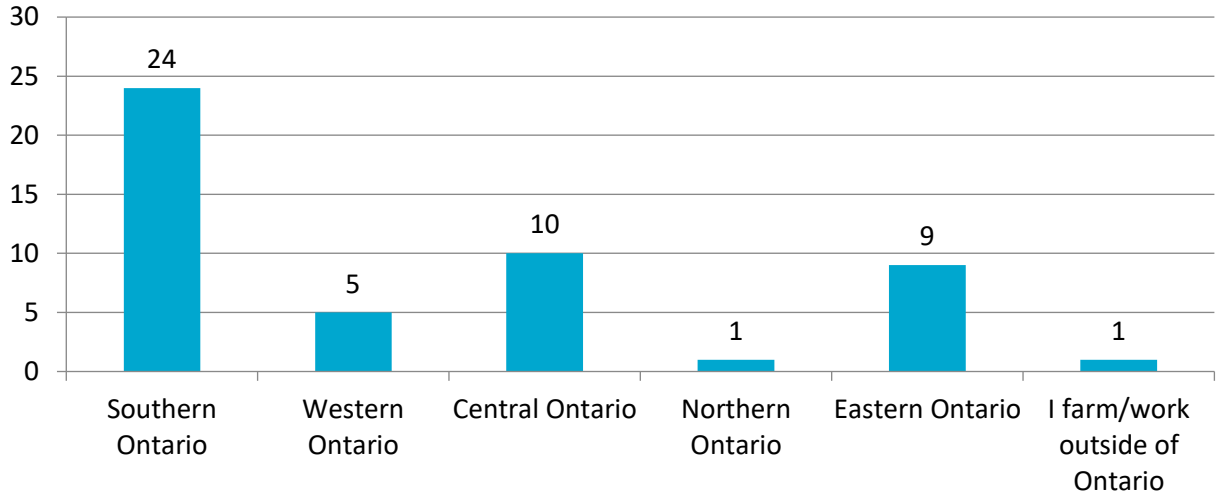

Figure 6. Regions that survey respondents farm and/or work in (n=50).

Most respondents agreed or strongly agreed with the following statement:

- The format was an effective way to share ONFARM project information (100%)
- The presenters were knowledgeable about the subject matter and content (100%)
- The presenters delivered content in an effective and engaging manner (84%)
- The information was presented in a clear and logical way (96%)

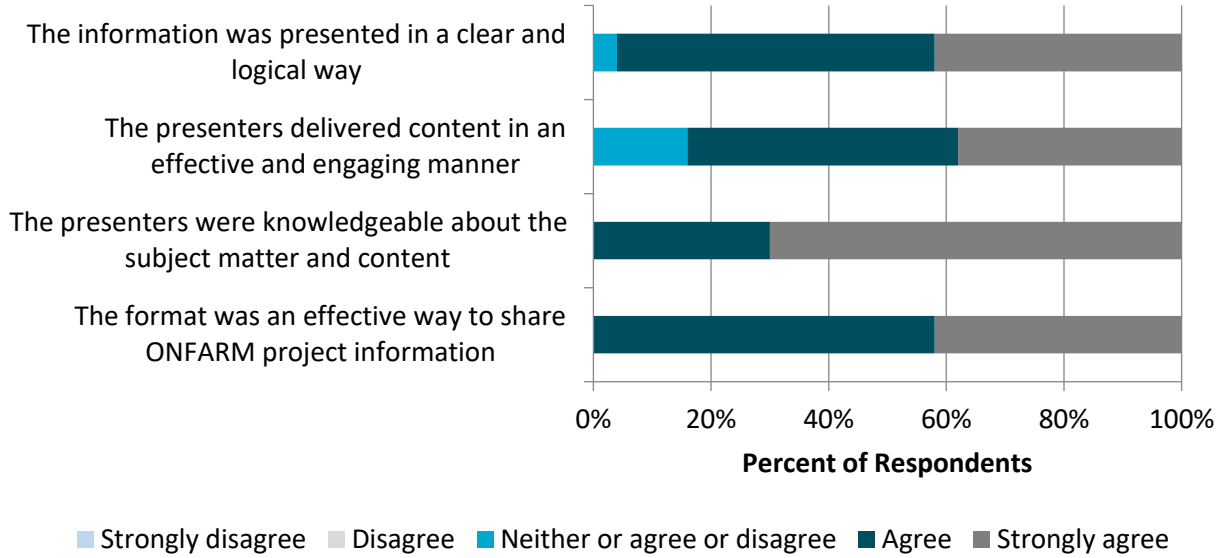

Figure 7. Respondents' level of agreement with four statements about the Forum (n=50). No one strongly disagreed or disagreed with any of the statements.

Most survey respondents intend to apply what they learned through the Forum to their farms or their research programs or advisory services; 32% said they would apply their new knowledge within six months, while another 32% said they would apply this knowledge within six months to one year. Another 22% of respondents said this question did not apply to their personal circumstances.

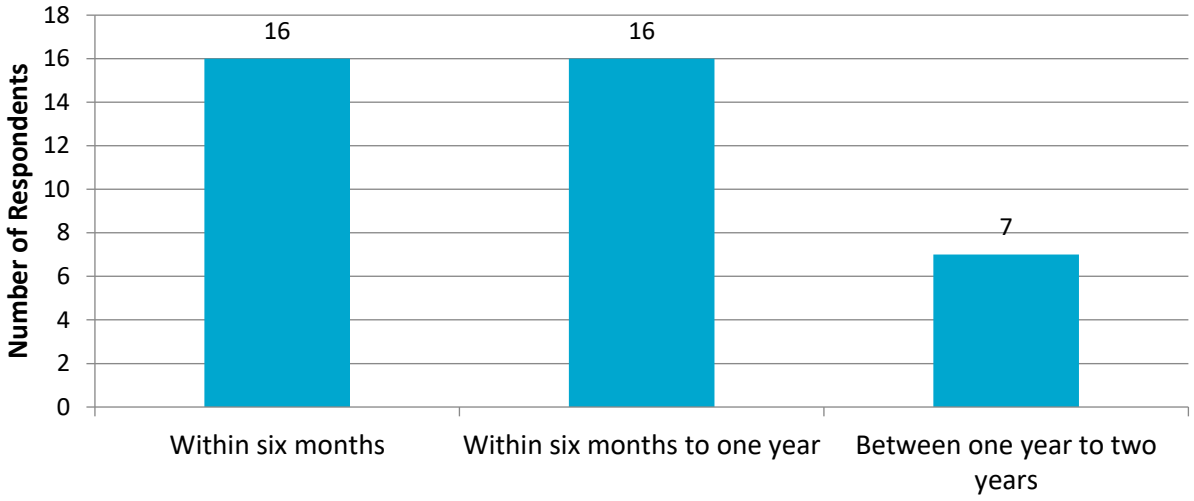

Figure 8. Whether respondents intend to apply what they learned during the Forum. (n=50; 11 responded N/A)

After attending this event, 54% of the respondents intend to implement a new or revised practice on their farms or in their research programs or advisory services. Another 38% of respondents said this question did not apply to their personal circumstances.

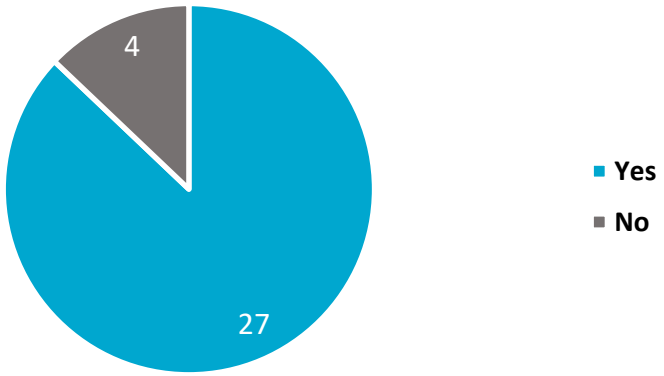

Figure 9. Whether respondents intend to implement a new or revised practice on their farms or in their research programs or advisory services. (n=50; 16 responded N/A)

Those individuals who answered yes (n=16) to the above question provided further insights on their plans:

- Improving soil sampling practises by adding a few additional tests to the basic suite we usually get
- I am going to introduce cover crops wherever possible
- I am going to look into measuring soil stability and using an app for the data collection
- I will keep adapting my nitrogen management program on my farm, and I will continue to experiment with cover crops
- It was particularly interesting to hear how edge-of-field phosphorous rates were impacted by field operations
- I am going to look into pollinator plots
- Will likely try testing other soil health indicators to see how they compare to current testing methods (e.g., try one of the Solvita tests or other nitrogen-related tests to compare with current biomass/soil nitrate testing for a better understanding of cover crop influence on potentially available nitrogen)
- I will play around with timing of cover crops and manure applications
- I will use more cover crops and some organic amendments, if possible
- I will use cover crops and perhaps a soil amendment
- I will use more cover crops & bio strips
- I will continue my exploration of the use of cover crops
- I will possibly implement new practices although I am unsure at this time
- I will implement BMPs, and record data for better trial sets
- I am starting to use strip till
- I will apply what I learned to EFP workshops

Respondents rated their knowledge, before and after the Forum, of the benefits of on-farm research and/or BMPs for soil health and water quality. The average rating before the Forum was 6.7/10, while the average rating after the Forum was 7.8/10. Thus, the Forum enabled participants to increase their knowledge of the subject matter.

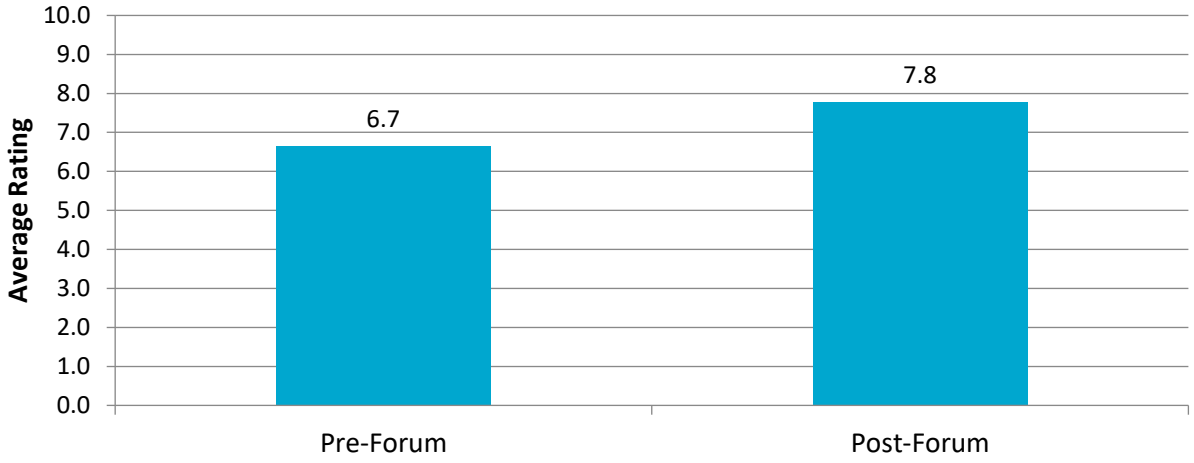

Figure 10. Respondents' average weighting of pre- and post-Forum knowledge of the benefits of on-farm research and/or best management practices for soil health and water quality (n=50)

Most respondents were very satisfied (52%) or satisfied (46%) with the Forum. One survey respondent was neutral about the Forum and no respondents were dissatisfied or very dissatisfied.

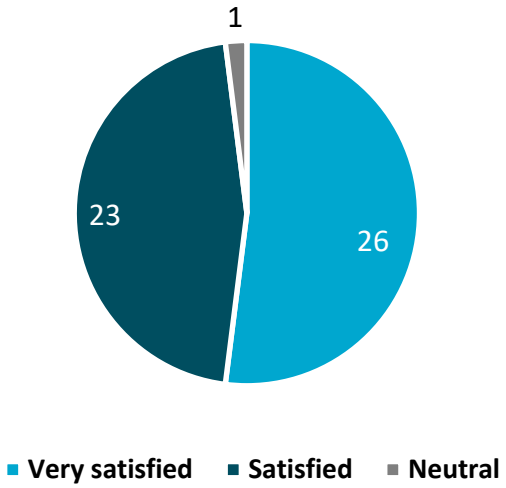

Figure 11. Respondents' satisfaction with the Forum (n=50).