

Acknowledgements

This document is supplementary to Canadian Water Network's synthesis document, *Key Questions of the Science on Agricultural Phosphorus Losses During Storm Events and Beneficial Management Practices*, which was revised in May 2018.

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McKenzie Smith (Audit Coordinator, Fertilizer Canada), and **members of the 4R Ontario Steering Committee**, including: Fertilizer Canada, Ontario Agri Business Association, Grain Farmers of Ontario, and International Plant Nutrition Institute

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This project was funded by the Ontario Ministry of Agriculture, Food and Rural Affairs.

Canadian Water Network is Canada's trusted broker of research insights for the water sector. When decision-makers ask, 'What does the science say about this?' we frame what is known and unknown in a way that usefully informs the choices being made.



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Introduction

With financial support from the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA), Canadian Water Network (CWN) undertook a project to summarize the state-of-the-knowledge on agricultural phosphorus (P) losses during extreme weather events in Ontario, with the goal of achieving better use of that collective knowledge to inform actions and investments aimed at reducing nutrient losses from agricultural lands.

This process involved an expert workshop and online questionnaire that gathered multiple perspectives from academia, conservation authorities, federal and provincial government representatives, and the agriculture industry in southwestern Ontario. Some experts from Western Canada and the United States were also invited to participate in the discussions.

In consultation with a technical advisory group, a synthesis document was drafted in March 2018 to convey key messages of the state-of-the-knowledge to OMAFRA. This document focused on high-level implications of leading science and practice for selecting and implementing P management options, including recommended approaches and next steps for the selection of beneficial management practices (BMPs).

During early discussions with the technical advisory group, a consensus emerged regarding the need to focus further work on clarifying the contribution of hydrologic events and transport pathways to better understand the ability of BMPs to reduce P losses from agricultural lands. The experts agreed that in order to characterize BMPs as successful and unsuccessful, the utility of the practices had to be determined in the context of site-specific considerations related to dominant transport conditions for a given farm/setting, as well as the likelihood of practical uptake and application by practitioners, rather than solely technical generalizations about overall “effectiveness” of individual BMPs. The experts indicated that the two biggest factors in determining which BMPs would be most effective were: recognizing the nature of the dominant ways phosphorus would likely be transported to receiving waters; and recognizing how reducing the risks from these pathways relate to the risks experienced by the farmer/practitioner. As a result, the synthesis document focused on recommended approaches to address these gaps in knowledge and next steps for OMAFRA.

In the spring of 2018, representatives from the agricultural community, and those who work closely with farmers, were asked to provide feedback on the recommended approaches. CWN consulted members of the Ontario Soil Network, 4R Ontario, the team that produced Ontario’s Phosphorus Primer on Best Management Practices for Reducing Phosphorus from Agricultural Sources, OMAFRA staff, Grand River Conservation Authority, Grow Ontario Together and Ontario Pork for their insights on how the recommended approaches, if implemented, would play out “on the ground.” Their aggregated input has been collated in this document, which is intended to supplement the initial synthesis report.

Initial recommended approaches from the synthesis document

1. Require and support a site-based approach that assesses the most likely dominant transport characteristics/pathways for the basis of BMP selection, in alignment with existing stewardship plans (e.g., environmental farm plans), programs and policies that support a site-based approach.
2. Structure further work and research assessing the efficacy of BMPs in the context of transport mechanism groupings. Investigate the potential to develop tailored regional or sub-regional assessments and characterizations that group main transport pathways, types of agricultural activity (e.g., crop types vs. livestock), and conditions for an area to better prioritize comparisons and selection of BMPs.
3. Adopt a risk-based framing for BMP assessments, discussions and outreach that recognizes the different risk management considerations to better recognize and align risk-sharing frameworks among producers and regulators.
4. Advance the knowledge base for existing measurements, like soil-test P, to gain a better understanding of long-term availability of soil P to avoid the over-application of fertilizers and recognize risks to the surrounding environment, as well as better understand the relationship of such measures to predicting P loss from the landscape.
5. Increase support for education and training regarding best application of source control options (e.g., 4Rs), structures with incentives and regulations that recognize and reflect the realities of decision needs for producers.
6. Advance initiatives that better highlight success stories and learnings from BMP applications not specific to assessment or promotion of individual technologies or practices, but that advance knowledge of what has been learned about the ability to manage transport.

Stakeholder outreach

Groups and individuals from the agricultural sector were asked to provide feedback on:

- Which of the recommended approaches would be seen as helpful or unhelpful by the farming community for reducing P losses, and why.
- How these recommended approaches, if implemented, could lead to changes in program design (related to upstream recommendations) and changes in farmer BMP choices in anticipation of more extreme weather events in their area (related to downstream recommendations).
- Suggestions on what is needed to accelerate implementation.

The participants were asked to consider the following questions:

- Of the six recommendations, which ones do you (or the group you represent) see as being most helpful to the farming community? Why?
- Of the six recommendations, which ones do you (or the group you represent) see as being least helpful to the farming community? Why?
- From your perspective, what changes do you think could be made to improve the clarity/wording or downstream implications of any of these recommendations?
- Which of these recommendations do you think have good potential to be implemented in the future? (You can define what “good potential” means, as well as what the timescale would be.) Why?
- Which of these recommendations do you think will encounter difficulties getting to implementation? What about during implementation? Why?

CWN discussed these questions with each of the participants in person, over the phone, or through email correspondence, depending on participants’ location and availability.

Summary of feedback

Helpfulness of recommended approaches

All six recommended approaches were considered helpful by at least one group or individual engaged in this follow-up process, particularly when considered as an integrated approach to reducing P loss. That said, responses varied depending on perspective.

Overall, a site-specific approach, together with assessing the efficacy of BMPs in the context of transport considerations, alongside additional extension work and the use of case studies highlighting success stories (approaches #1, #2, #5 and #6), were thought to have good potential to help the farming community, if implemented appropriately. A site-specific approach was considered most helpful on the ground, with assessment of efficacy, risk-based framing and extension activities (#2, #3, and #5) helping make that happen, and case studies (#6) serving to support all of the above. A further suggestion was to ensure that an overarching outcome-based framework, with specific goals and commitments, ties these recommended approaches together (e.g. the Lake Erie Action Plan).

Some felt that advancing the knowledge base for existing measurements (approach #4) was least helpful as written, while others closer to the ground thought that it was useful from an implementation perspective.

Almost all farming community respondents indicated that approach #5 on effective outreach/extension/education was critical, and despite lack of clear consensus on who is best suited to deliver this outreach, it was clear that this is a priority for the majority of respondents. One group commented that it is difficult for farmers to see site-specific transport or BMP efficacy research as useful to their decisions until the knowledge is incorporated into education, training or extension efforts.

Implementation of recommended approaches

Work is already underway on many of the recommended approaches designed to move toward a site-based approach that considers dominant transport pathways. However, groups expressed the need for better coordination of efforts, as well as case studies, incentives and extension supporting this work.

Case studies

One respondent felt a site-specific approach and assessing BMP efficacy in the context of transport considerations (recommended approaches #1 and #2) were the most beneficial to farmers, but also the most difficult to implement. It is difficult for experts to recommend a particular practice as beneficial in all situations, but helpful to develop a series of case studies and gather input from farmers on their viability and efficacy (approach #6).

Incentives and co-benefits

Incentives are designed to help lessen the barriers for those interested in adjusting agricultural practices. While current funding programs are about sharing real and perceived risks of BMP implementation, including both financial and environmental risks, care must be taken in how these risks are framed. Several groups noted it is helpful to frame BMP adoption in terms of the co-benefits for farmers of improved water quality, resilience to flooding and drought, reduced soil erosion, and enabling financial cost-savings (e.g. nitrogen as an economic opportunity). If we are asking farmers to take on certain risks in order to achieve multiple benefits, extension programs are needed to help get them there.

Collaborative, peer engagement approach to extension

While it was acknowledged that education and outreach are already taking place in the farming community, several respondents indicated that more support is needed from the province. Respondents further noted that education and outreach should not necessarily be delivered by government, and that, at a minimum, government needs to be less “top-down” in its approach. Farmer peer-to-peer sharing is critical, but there should not be an expectation that farmers will simply volunteer their time in this regard.

Overall comments

A site-specific approach calls for – and can be the pathway to – major behavioural change, and is therefore linked to both incentives and extension. To implement changes over the long-term, more resourcing is needed for extension that is led by farmers and groups who are already doing this, as well as support for an adaptive approach that enables farmers to build on what works and doesn't work in their own conditions and ensure continuous improvement.

Clarity of language

Recommendation #1 on supporting a site-based approach

We understand that farmers have been hearing "site-specific" for some time. It is important to highlight where practices have and have not worked through case studies. Academics and other experts continue to publish success stories and lessons learned in journals, but these recommendations do not necessarily reach farmers. Implementing similar BMPs at different sites requires attention and some caution, given the multiple variables impacting effectiveness and the timing of results. This is where assessment tools and case studies can help farmers understand where P is coming from and what has worked to curb it. However, specifics and actual results will depend on context.

It was also noted that the 4R Nutrient Stewardship Framework for fertilizer application, currently under development by 4R Ontario, aligns with the assertion that nutrient management is site-specific. Maximizing nutrient uptake depends on both source application and control practices (such as timing and placement) in addition to transport. Implementation of 4R nutrient stewardship through 4R Certification serves as a means to measure improved on-farm management of nutrients and monitor agricultural sustainability. 4R Nutrient Stewardship Plans

are living documents meant to evolve over time through adaptive management and continuous improvement. What we heard is that 4R nutrient stewardship should be referenced as a complementary approach to reduce nutrient loads in watershed management and agricultural stewardship planning initiatives.

Proposed change to recommendation #1:

Require and support a site-based approach that assesses the most likely dominant transport characteristics/pathways for the basis of BMP selection, in alignment with existing stewardship plans, programs and policies that support a site-based approach (e.g., environmental farm plans, watershed management plans and 4R nutrient stewardship).

Recommendation #2 on assessing the efficacy of BMPs

No proposed changes.

Recommendation #3 on adopting risk-based framing for BMP assessments

There was positive feedback on reframing the issue for the farmer as a risk-based approach, by acknowledging the factors and trade-offs involved in producing a crop that is both economically viable and environmentally sustainable.

However, the term “risk” was interpreted differently by respondents. It was not clear to them whether risk-based framing implied financial risks to the farmer or the government for crop yield, other factors, risks to the environment, or all of the above. There was additional discussion on whether the approach relates to shared risks assumed by the government and farmers, or the overall risks associated with soil erosion, degraded water quality, flooding and drought conditions, etc.

While the synthesis document provides more context leading up to the recommendation to take a risk-based approach, based on prior work with the technical advisory group and workshop discussions, the risk should be broadly defined as all of the above.

In addition to risk, there are also economic opportunities for cost savings, particularly related to nitrogen. Farmers are responsive to aspects positively impacting their bottom line. Service providers play an important role in implementing and promoting BMPs on the ground, and should be noted in the recommendation.

Proposed change to recommendation #3:

Adopt a risk-based framing for BMP assessments, discussions and outreach that recognizes the different risk management considerations, including financial and environmental risks, to better recognize and align risk-sharing frameworks among producers, service providers, and regulators.

In addition to ensuring that science informs a risk-based approach, respondents indicated that it is important to consider farmers’ perspectives on the benefits and risks associated with adopting

different BMPs. It was suggested that Table 3 (pages 19 – 20) in the original synthesis document be updated and expanded to reflect the risks to farmers (both real and perceived) as well as the costs, benefits and overall preferences of farmers who would be implementing the BMPs.

If we are seeking to adopt or promote use of a risk-based framing for BMP assessments, a more detailed understanding of costs, risks, benefits and barriers from the farmer's perspective may help shape the approach to outreach and extension (see proposed change to recommendation #5, below). Appendix A, authored by Melisa Luymes (Ontario Soil Network and Headlands Ag-Enviro), provides a more in-depth analysis of the importance of incorporating farmers' perspectives on risks associated with BMP implementation and the implications for improved extension.

Recommendation #4 on knowledge base for measurements like soil-test P

Some respondents expressed concern that data collected on soil-test P will lead to prescriptive regulations limiting nutrient application, which could result in hesitation to share data. Groups expressed concern that the risk should not be placed on farmers alone. It was suggested that crop advisors and retailers need resources to become 4R-certified and assume responsibility for the right amount applied.

Soil-test P provides information on the probability of a crop response. We have fairly good data on the relationship between soil-test P and crop response, but lack information on the relationship between soil-test P and environmental risk. Uncertainty is often used as a reason not to act.

Farmers need to know where P is being lost on the landscape, and whether and when they are doing enough to reduce nutrient loading while balancing crop yields. Several groups asked about the status of ongoing updates and improvements to Ontario's P index (proposed name change to PLATO, Phosphorus Loss Assessment Tools for Ontario). This index was originally designed to help characterize the risk of P loss and assist in selecting management strategies and setback requirements to reduce the risk. Improvements are expected to focus on 4R nutrient stewardship principles. However, there is confusion as to whether the new tools will be evidence-based and readily accessible to farmers, as well as proving helpful in making decisions about appropriate BMPs that ensure yields and reduce environmental impacts.

To promote the use of P management tools by the farming community (who must balance a number of time and resource demands), tools need to be easy to use, with an interactive, visual map-based application. They must be pragmatic in helping the farm community predict P loss from the land while not being totally prescriptive. It is important to continue working closely with the farm community to improve new tools and provide confidence that what they are doing is working to retain P on the land where it is most beneficial. Based on discussions about the usefulness and implementation of this recommendation as originally written, it has been changed below to focus on PLATO.

Proposed change in focus of recommendation #4:

Work with the farming community to further develop a P index (e.g., PLATO) that takes a pragmatic, practical and science-informed approach to prioritizing actions to mitigate P loss that will have the most value.

Recommendation #5 on education and training

As mentioned, several groups pointed to the need for additional support for extension, although there was not a clear consensus in the preliminary evaluations on how the messaging should be developed and who should be involved in the delivery. Some respondents suggested that the government take the lead in developing messages and providing tools and resources for those working on extension. Others suggested farmer-led exchange of ideas, success stories, and local lessons learned through community networks. A peer-to-peer approach is essential to agricultural stewardship, but resources are needed to support farmers to avoid burnout and facilitate greater uptake. In addition, “outreach and extension” are more palatable than the top-down perception implied by “education and training,” so the wording should reflect this. It was not surprising to hear that outreach and extension are priorities for the farming community. Informal farmer-to-farmer exchanges, such as those conducted by the Ontario Soil Network and Yahara Pride Farms in Wisconsin, are highly effective.

Proposed change to recommendation #5:

Increase support for outreach and extension regarding the best application of source control options (e.g., 4R nutrient stewardship), and structure incentives as well as regulations to recognize and reflect the realities of decision needs for producers.

Recommendation #6 on highlighting success stories and lessons learned

Case studies are a means to communicate the effectiveness of BMPs in a given context. Members of the farming community indicated that the extent to which this recommendation is helpful depends upon the nature of the BMP. For example, if there is a new technology that has been proven and made available — and will work in a particular context — an on-farm demonstration would be useful. However, given the advent of multiple new technologies and increasing options for stewardship, farmers may choose to implement different practices from their peers. There was no proposed change to the wording for this recommended approach.

Revised recommended approaches

1. Require and support a site-based approach that assesses the most likely dominant transport characteristics/pathways for the basis of BMP selection, in alignment with existing stewardship plans, programs and policies that support a site-based approach (e.g., environmental farm plans, watershed management plans and 4R nutrient stewardship).
2. Structure further work and research assessing the efficacy of BMPs in the context of transport mechanism groupings. Investigate the potential to develop tailored regional or sub-regional assessments and characterizations that group main transport pathways, types of agricultural activity (e.g., crop types vs. livestock) and conditions for an area to better prioritize comparisons and the selection of BMPs.
3. Adopt a risk-based framing for BMP assessments, discussions and outreach that recognizes the different risk management considerations, including financial and environmental risks, to better recognize and align risk-sharing frameworks among producers, service providers, and regulators.
4. Work with the farming community to further develop a P index (e.g., PLATO) that takes a pragmatic, practical and science-informed approach to prioritizing where actions to mitigate P loss will have the most value.
5. Increase support for outreach and extension regarding the best application of source control options (e.g., 4R nutrient stewardship) and structure incentives as well as regulations to recognize and reflect the realities of decision needs for producers.
6. Advance initiatives that better highlight success stories and learnings from BMP applications, not specific to assessment or promotion of individual technologies or practices, but that advance knowledge of what has been learned through successes and failures about the ability to manage transport.

Appendix A: Farmer perceptions of risks, costs and benefits of BMP implementation