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Understanding farmer decision making in performance-based PES programs through the Vermont Pay-for-Phosphorus program

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Executive Summary

The Vermont Pay-for-Phosphorus (PfP) program facilitated by the Vermont Agency for Agriculture, Food and Markets (VAAFM) offers a novel and innovative approach to compensating and motivating farmers to reduce non-point sources of phosphorus based on the modeled effect of their management practices. Detailed nutrient management records, soil samples and extensive technical assistance have been critical to the program's implementation. Site specific inputs are entered into the digital interface (Farm-PREP) and an algorithm simulates the interaction between the natural environment (e.g., geochemical characteristics of soils, biological characteristics of crops) and human management actions (e.g., tillage practices, fertilization).

Interviews with farmers participating in the PfP program across Vermont in 2023-2024 highlight a number of perceived strengths and weaknesses of the program (see accompanying SWOT analysis).

Farmers general praised the payments-based approach of the program, with one noting that the program pays well for what the model recognizes. Other participating farmers emphasized the value of not only seeing trends in soil health and nutrient loss/gain over time at the field-level themselves, but also being able to share evidence on practices with neighbors (social benefits). Others noted the program's focus on verifiable record-keeping and science-based metrics offered a sense of security (potential legal benefits).

Challenges cited included less-than-expected payments for some farmers, with participants noting that payment amounts are unlikely to be enough to incentivize more costly changes in practices where these might be needed. Others noted some perceived unfairness in payments in favor of large farms versus smaller diversified farms whose practices might not be captured by the current model. The process of data entry under the PfP program was described by producers as both overly simple and challengingly complex – farmers noted interaction with the decision support tool requires trusted support staff communicating the complexities, caveats and uncertainties of the model. Expanded staffing (and additional training for support staff) were highlighted as critical needs.

Farmers also provided a number of suggestions for improving the program, including expanding the options for management practices (which might help address some of the perceived unfairness in payments in favor of certain farms). A mechanism to appeal modeling outcomes and provide clarification on model results was also proposed. More generally, increasing the ease of data entry and more clearly explaining the relationships between inputs and outputs were seen as opportunities for enhancing farmer satisfaction with the program as well as agronomic and environmental decision-making.

> "I think people are putting their information into farm-PREP, what they're doing and then it's spitting out a result. And… then you get paid based on the results. And so I think the next phase would be getting back to the farmer and letting them know if there's areas where you can improve."
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> - Participating Farmer, Vermont PfP Program

Ultimately, as a first of its kind, the performance-based Vermont PfP program makes novel use of data to inform farm management. The program allows for more site-specific management and provides compensation for management practices that reduce phosphorus runoff from the chosen baseline. Although requiring time and effort for data collection, in many cases the necessary data are already mandated by the State to be collected and reported for many farms. Participating farmers suggest efforts to further improve the program should focus on expanding technical assistance relating to Farm-PREP, as well as reforms to the user interface and model to be more transparent, inclusive and analytical. Ease of use was especially emphasized – including extension of technical support via in-person on-farm visits to help farmers understand how the PfP program can help them meet production and environmental goals.

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SWOT Analysis: Strengths, Weaknesses, Opportunities, & Threats
of the Vermont Pay for Phosphorus Program

Summary Findings from Interviews with Farmer Participants in the Vermont Pay for Phosphorus Program (PfP) – Fall 2024

Strengths	Weaknesses

• Economic incentive for performance (direct payments)
  o Pays well for what the model recognizes
• Environmental outcomes monitored
• Ability to model outcomes
• Ability to share environmental outcomes (including potential social and legal benefits)
• Flexibility in management
• Technical assistance provided
• Incentivizes good record-keeping
• Encourages farmers to look at and think about nutrient management at the field level on a regular basis
	• Payment less than expected, little ability to correct or change payment and results
	• Payments not enough to support/attract farms to transition into new practices
	• Non-response bias (only those who choose to participate – not necessarily those who might benefit most, or have greatest potential for improved practices)
	• Model uncertainty, farmer concerns around accuracy of measurement
	  o Limitations around management practices (e.g., some practices not considered)
	  o Complexity of natural environment (e.g., soil types)
	• Lack of transparency surrounding backend of the model / black box, model calibration
	• Administrative burden (data input and paperwork)
	  o Data entry “clunky”, not user friendly
	• Not enough TA providers for the complexity of data entry
	  o Additional training needed for TSP (TA) and for farmers in the program
	• Not a lot of publicity of what is being done with the program

Opportunities	Threats
• Expand management options o Injection depths, chemical additives, dribble bar • Expand payment structure (two tier structure so that if you reach the cap there is a next-level payment, i.e., premium) • Expand data entry to emphasize new practices • Adapting to different farming environments • Explainability of the back end of the model • Ways to reduce labor of data input • Visualization and analysis of field level trends • Data integration with various sources • Artificial Intelligence (AI) if used responsibly, could also threaten autonomy and agency • More transparency on how the program can benefit farms • A central hub for farm information automatically sharing programs a farm might qualify for • Simplify data collection (e.g. a single form for each field to keep on each field. • Empirical measurement, not just models from outside from Vermont	• Concerns surrounding the financial longevity of program past initial funding • Perceived bias toward certain production types, noting the program does not work well for diverse, small-scale producers (some feel systemically excluded and/or their efforts not rewarded) • Lack of understanding of the program by farmers • Concerns about potential for losing the program due to the lack of participants • Risk of losing program integrity due to “loose” or overly generalized modeling • Reality that when farmers get short on time or money the work associated with program gets moved to the back burner

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