# **Estimating BMP Adoption Rates**

## Using the ADOPT model to identify the relationship between policy and adoption rates

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## Background

AAFC launched the Ontario Living Laboratories Initiative in 2018 as part of the broader Living Laboratories Initiative. The focus of the Initiative is to accelerate agricultural innovation and adoption of sustainable practices in Canada. The lab aims to bring together farmers, scientists, and other collaborators to co-develop and test innovative practices and technologies to address agri-environmental issues. In Ontario, some of the BMP's of focus are Cover Cropping and 4R Nutrient Management. These BMP's can help promote agricultural resilience and adaption to climate change by bettering soil health, water quality, increasing biodiversity and improving watershed management. Currently, the science team is focused on evaluating the environmental impacts of adopting these practices, while the socio-economic research team is examining the farm-level economic impact of adopting these practices and studying the socio-economic factors that may influence the decision to adopt them.



#### **Key Findings**

- As the ADOPT model has been validated in the Australian Agricultural sector, the goal
  was to test how accurately the model would estimate adoption for the two existing
  practices of Cover Cropping and 4R Nutrient Management in Ontario, Canada.
- Preliminary results of the ADOPT model suggested that for cover crops, the peak adoption level would be 25% of producers in our "population" with approximately six years to hit that peak level
  - Farm Management Survey Cover Crop Result (2017): 30%
  - Slight differentiation between the ADOPT and Farm Management survey results can be attributed to different sample audiences
- These findings suggest that ADOPT may be an appropriate tool for prediction adoption of new agricultural practices.

# **Policy Implications**

- Broader goal: in alignment with AAFC's objective of increasing the sustainability and resilience of the Canadian agricultural sector by encouraging the adoption of beneficial management practices, like cover crops.
- Consistency between Farm Management Survey results of current adoption rates, and the ADOPT model estimation would suggest that we reached a maximum level of cover crop and 4R Nutrient Management adoption.
- In order to further accelerate the adoption of BMPs like cover cropping, this model suggests that
  improving the profitability of these practices is key.
- The profit variable has the most significant impact in the decision to adopt practices
- These research findings are aligned with the newly announced ACS On-Farm Climate Action fund that will help support farmers adopt these practices by offering a cost-share program.
- Other policies can also be implemented to address other socio economic factors which influence the decision to adopt.
  - ex: to address Risk Adversity, a BMP insurance can be introduced to further incentivize the practice

### **Research Question**

- 1. What are the primary factors that influence adoption and non-adoption of the BMP's such as Cover Cropping and Nutrient Management?
- 2. When is the likely peak adoption level and estimated time to peak adoption for Cover Cropping and Nutrient Management?

ADOPT Model (Adoption & Diffusion Outcome Prediction Tool)

The ADOPT model methodology was published in 2017 by seven Australian economists: Geoff Kuehnea, Rick Llewellyna, David J.Pannell, Roger Wilkinson, Perry Dolling Jackie Ouzmana and Mike Ewinge. The tool predicts the speed and peak level of adoption by farmers of new practices. The methodology is based on Roger's Theory of Diffusion of Innovation and meta-reviews of relevant literature. ADOPT's conceptualized framework is categorized into 4 Quadrants: Relative Advantage of the Practice, Learning of the Relative Advantage, Time to Peak Adoption and Peak Adoption Level - which each incorporate a range of socio-economic variables. Within the quadrant are twenty-two variables related to the practice such as, risk adversity, characteristics of the farmer, ease and convenience of the practice, profit maximization, farmer networks, and environmental concern. ADOPT is used by R&D funders, extension agents, scientists and policy advisors as way to develop a deeper understanding of the adoption process. ADOPT aims to create predictive quantitative models of adoption for use by those planning agricultural research, development, extension and policy. ("Predicting Farmer Uptake Of New Agricultural Practices: A Tool For Research, Extension And Policy". Agricultural Systems, vol 156, 2017, pp. 115-125)



#### **Population**

- Figure 2 highlights the Living lab sites in South-western Ontario
- The farms of focus are field crops with 1000 acres + of land
- The lake Erie basin is a sensitive indicator of agricultural impacts on the natural environment

## **Data Sources**

- 1. **Farm Financial Survey (2017):** Used data on farm assets, liabilities, revenues, expenses, investments and capital sales, to determine key farmer characteristics and management horizons.
- 2. **Farm Management Survey (2017):** Used data about production, farm management practices and business management (ex: labour, computer technology, environmental planning), to establish baseline adoption levels.
- 3. **Census of Agriculture (2017):** Used census data to determine population information for specific regions (ex: farmer gender, farm size, tenancy, farmer to farm ratio, farm capital).
- 4. **Soil Health Workshop (2021):** Conference hosted by OSN and AAFC economists, academics, farmers and external partners discussed their experiences with Cover Crop and Nutrient Management adoption and answered key ADOPT questions.
- Literature Review (2021): Researched information on the science and technology of Cover Cropping/ Nutrient Management, the environmental & economic costs, and Ontario specific incentives.