Factors Affecting the Adoption of Agricultural Beneficial Management Practices

Quebec study may have national applications

Across Canada, several major initiatives have been launched in recent years to encourage agricultural producers to adopt beneficial management practices (BMPs)—farming methods designed to minimize the potential negative impact on the environment.

Certain BMPs can help protect water quality by limiting leaching and runoff of nutrients, agro-chemicals and sediment into water bodies. However, while producers already employ many of these measures, the rate at which BMPs are being implemented can always be improved. In order for governments and other funding organizations to develop policies and design programs that will encourage further BMP adoption, it is necessary to gain a more complete understanding of what makes producers adopt BMPs.

The Study

In the Chaudière region of southern Quebec, economists surveyed 269[1] agricultural producers in 2007 to determine the impact of certain variables on the probability of producers adopting BMPs meant to address water quality problems.[2] This area was chosen because of its high concentration of hog, beef and dairy farms, and because it is typical of many intensively-farmed watersheds in Ontario and Quebec. The analysis also built upon existing Canadian and international literature related to agricultural BMP adoption.

The study was funded by Agriculture and Agri-Food Canada's **Watershed Evaluation of BMPs (WEBs)** program.

What is the Watershed Evaluation of Beneficial Management Practices (WEBs)?

A long-term research program initiated by Agriculture and Agri-Food Canada in 2004, WEBs evaluates the economic and environmental performance of BMPs at a small watershed scale. To gain a regional perspective, this information is being scaled up to larger watershed areas using hydrologic models.

WEBs findings are helping researchers and agri-environmental policy and programming experts to understand how BMPs perform and interact with land and water. This knowledge will also help producers determine which BMPs are best for their operations and regions.

WEBs studies are conducted at nine watershed sites across Canada. These outdoor living laboratories bring together a wide range of experts from various government, academic, watershed and producer groups. Many valuable findings have emerged, and research continues at all sites.

[1] The survey was sent to 1,319 producers. There were 269 completed surveys (20% response rate) in the final sample.

[2] Ghazalian, P.L., B. Larue and G.E. West. 2009. **Best Management Practices to Enhance Water Quality: Who is Adopting Them?** Journal of Agricultural and Applied Economics, 41,3 (December 2009): 663-682.

The BMPs examined in the survey are as follows, including the percentage of respondents implementing each BMP:

- crop rotation (66%)
- riparian buffer strips (57%)
- reduced herbicide use (42%)
- solid manure management (15%)
- liquid manure management (45%)

The variables influencing BMP adoption which were studied covered a range of socio-economic factors, farm characteristics and farm operational considerations.

Findings

Study results were consistent with existing literature and economic theory. The factors found to have an impact on the adoption of the BMPs being studied include: education, age, gender, farm residence, farm size, organic certification, membership in a watershed-based conservation group and price of labour (Table 1).

Table 1: Factors affecting adoption of five BMPs in Quebec

	Riparian buffer strips	Reduced herbicide use	Crop rotation	Solid manure management	Liquid manure management
Age	Older producers more likely to adopt	No significant effect	Older producers more likely to adopt	No significant effect	
Gender	Female producers more likely to adopt	No significant effect		Female producers more likely to adopt	
Education	More educated producers more likely to adopt	No significant effect	More educated producers more likely to adopt		
Farm residence	No significant effect			Producers residing on-farm more likely to adopt	
Large farms	More likely to adopt			Larger livestock farms and those with more machinery more likely to adopt	Larger livestock farms more likely to adopt
Small farms	Less likely to adopt				
Organic certification	No significant effect	Not applicable	No significant effect	More likely to adopt	
Watershed group	More likely to adopt		No significant effect	More likely to adopt	
Labour costs	No significant effect		Higher labour costs slightly reduce the likelihood of adoption	Higher labour costs slightly increase the likelihood of adoption	No significant effect
Other input costs	No significant effect				

Socio-economic factors

Education: A higher education was found to significantly increase the probability of adoption of most of the BMPs by producers, possibly because a higher education may result in an enhanced level of the management and decision-making skills needed to obtain optimal BMP results.

Age: As producers get older, they are more likely to implement crop rotation (probability of adoption increases by 1.3% per year of age) and riparian buffer strips (probability of adoption increases by 0.6% per year of age). This may be because even though older producers have shorter planning horizons than their younger counterparts, their lower farm debt makes it easier for them to financially support the costs of implementing BMPs. The age range of the producers surveyed was 18 to 81, with 49 being the average age.

Older producers are more likely to adopt riparian buffer BMPs.

Gender/residence: Women (4% of the survey respondents) and producers living on the farm (88% of the survey respondents) are more likely to adopt solid and liquid manure management practices. Both groups tend to have greater sensitivity to local water quality and odour issues due to concern for their family's and neighbours' health.

Farm characteristics

Farm size: Larger farms (defined in terms of number of acres, value of animal and crop production and machinery) are more inclined to adopt BMPs, likely due to economies of scale, greater financial flexibility, the challenges associated with greater soil and landscape diversity and because they may attract greater public scrutiny of their behaviour. Farms with more cultivated acres are more likely to implement crop rotation, riparian buffer strips and reduced herbicide use practices. Farms with large-scale animal production tend to implement crop rotation, riparian buffer strips and solid and liquid manure management. Farms with more machinery are more likely to adopt BMPs because machinery makes implementing BMPs easier and these farms tend to have higher income.

Smaller farms, on the other hand, are less likely to adopt BMPs than larger farms. Many smaller farms need off-farm income to support household expenditures and are usually less financially able to take on the added expense of implementing BMPs. As well, many of these producers may not have the time required to manage the BMPs. Yet most small farms in Quebec and Ontario are located in regions of high-density livestock and intensive farming, where water quality may be at greater risk.

Average cultivated area per surveyed farm was 50 hectares (124 acres), with farms ranging from 0.4-445 hectares (1-1,100 acres). Animal production value (live animals and milk) averaged $273,000, ranging from $0 to $3.5 million. Average farm machinery value was $143,000, with a low of $1,800 and a high of $800,000.

Larger farms are more inclined to adopt BMPs.

Organic certification: While only 3% of respondents had an organic production certificate, the analysis suggests that having this certification increases the likelihood of adopting solid and liquid manure management. Certified organic producers do not apply herbicides in crop production.

Watershed groups: Participation in a watershed-based conservation group increases the likelihood that producers will adopt most of the surveyed BMPs, although the effect was found to vary across BMPs. A majority (62%) of the survey participants were members of a watershed group. These groups transfer useful information about environmental issues and BMPs to producers.

Farm operational considerations

Labour costs: The price of labour does not have a significant impact for most of the BMPs, and has a slight varying impact on the probability of adopting crop rotation (slightly negative) and solid manure management (slightly positive).

Other input costs: The price of fertilizer and herbicide was not found to have a significant impact on BMP adoption. The reasons for this lack of impact are unclear.

Conclusions

This Quebec study revealed a number of factors that may be useful when developing BMP-related policies and cost-sharing programs. While regional variations need to be taken into consideration, the findings of this study could help tailor promotional efforts and incentives directed at achieving BMP adoption objectives in all parts of Canada.

Producers that are members of a watershed group are more likely to implement BMPs.

The findings from this study could help improve BMP adoption rates across Canada.

For more information

Visit www.agr.gc.ca/webs or contact WEBs at webs@agr.gc.ca.

AAFC 11712E
Aussi offert en français sous le titre : *Facteurs influant sur l'adoption des pratiques de gestion bénéfiques agricoles*