

Barriers and Incentives to Adopt Blockchain in Ontario's Agriculture

Jamie Westover * Getu Hailu †

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1 What Is the Issue?

The adoption of new technology is well-documented in the agricultural economics literature. This study examines the relative importance of select technology adoption incentives among farmers. Research on technology adoption in the literature shows that the incentives driving the diffusion of innovations in agriculture can vary depending on the desired outcome of adopting, the characteristics of potential adopters, and the perceived risks associated with using an innovation.

This research uses the adoption of blockchains in Ontario's agricultural industry as an example to examine what incentives drive the adoption of new technology in Ontario's agri-food sector. This research uses the adoption of blockchains in Ontario's agricultural industry as an example to examine what incentives drive the adoption of new technology in Ontario's agri-food sector. Blockchains are digital databases that introduce a new method of accounting for value transfers in a secure and permanent way without the need for third-party intermediaries. The literature on the economics of blockchains describes the technology as a transparent ledger that can allow individuals, institutions, and governments to digitally exchange goods and information ([Abadi and Brunnermeier, 2018](#); [Yermack, 2017](#)). Studies also suggest that blockchains may be used to digitally automate transactions between parties, thus reducing the transaction costs and information asymmetries that characterize the exchange of value ([Davidson, De Filippi, and Potts, 2016](#)). In a review of the applications of the technology, [Bailis et al. \(2017\)](#) posit that blockchains may give way to a new economy in which markets approach total decentralization and the economic rents currently extracted by third-party-intermediaries are minimized, if not eliminated.

*Graduate Student, Department of Food, Agricultural & Resource Economics, University of Guelph,
email:jwestove@uoguelph.ca

†Professor, Department of Food, Agricultural & Resource Economics, University of Guelph,
email:ghailu@uoguelph.ca

In agriculture, researchers note that blockchains may have implications for enhancing food traceability and improving the transparency of agri-food supply chains ([Kim and Laskowski, 2018](#); [Tripoli and Schmidhuber, 2018](#)). The adoption of blockchains offers opportunities to primary producers to manage and store valuable agricultural data, share information about the production of food with business partners and consumers, and meet international trading and verification requirements ([Ganne, 2018](#); [Ge et al., 2017](#); [Lucena et al., 2018](#)). For example, [Tse et al. \(2017\)](#) note that blockchains can help governments and food firms track, monitor and audit the food supply chain and assist manufacturers in recording information for the purposing of verifying the authenticity, safety and quality of agricultural goods. Additionally, in response to the growing demand for enhancements in product traceability, food safety, and food quality, industry stakeholders in Canada are calling for research on how blockchains can be used by producers, distributors, and retailers across the country ([AAFC, 2017](#); [StaCan, 2016](#)). As blockchains have only recently been introduced to the agricultural sector, producers knowledge of the technology may be limited, thus suggesting that risk attitudes and access to information may play a role in farmers propensity to adopt and may influence their preferences for different adoption incentives.

2 What Did the Study Find?

The barriers to adoption: We find that lack of awareness and uncertainty regarding blockchains' ability to meet marketing and customer needs are identified as the main barriers to adoption. This may suggest respondents unfamiliarity with blockchains and their benefits; and that respondents are uncertain about how blockchains can help primary producers meet customer demand for food. Barriers with the least concern to producers are traceback concerns, not seeing a need for blockchains on the farm, and uncertainty regarding blockchains ability to improve food safety. Seventy-six percent of the respondents report that traceback concerns, referring to contaminated or unsafe food being traced back to an individual producer, would not dissuade them from using blockchains on their farm. As described in its Unleashing the Growth Potential of Key Sectors report, [Self-published \(2017\)](#) notes that a fundamental strength of the Canadian agricultural industry is trusted food safety. Therefore, traceback concerns may not be considered a significant barrier to adoption as Canadian producers continue to be globally recognized for the safety and quality of their agricultural products. Although uncertainties about the benefits of blockchains present the main barriers to adoption when presented with the statement I dont see a need for blockchains on my farm, 70% of survey respondents disagree with this statement. This may suggest that despite uncertainty, farmers still see value in introducing blockchains on their farm. Lastly, less than half (45%) of farmers surveyed indicate that they are uncertain about the ability of blockchains to improve food safety.

Incentives to adopt: We find that increasing market share, managing farm data and mandated use by buyers are the three most important incentives that may motivate Ontario producers to adopt blockchains on their farm. This is followed by reducing legal liability and the availability of a

government subsidy to lower the cost of adoption. Each of these incentives was chosen as most important more often than least important. These incentives are followed by farm product differentiation, improving brand image, reducing insurance costs, and government recommendation. Each of these incentives has negative Standard BWS scores, indicating that when answering BWS choice sets, survey respondents selected these incentives as the least important more often than most important. This suggests that product differentiation, improving brand image, reducing insurance costs, and government recommendation are not likely to motivate respondents to adopt blockchains on their farm.

3 How was the Study Conducted?

A survey of Ontario farmers is conducted to elicit the relative importance of nine different incentives for blockchain technology adoption. This study uses a Best-Worst Scaling (BWS) method, introduced by [Louviere and Woodworth \(1991\)](#), to elicit producers individual preferences for various incentives that may drive the adoption of blockchains in Ontarios agri-food sector. The BWS method allows one to observe what incentives are most important to producers. BWS experiments also provide information on the relative importance of adoption incentives to examine the degree to which certain incentives are preferred over others. This information may then enable policy-makers to target efforts on promoting the specific adoption incentives that may be most effective in encouraging the uptake of blockchains.

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