Prospects for Weather-Indexed Insurance for Blueberry Growers in British Columbia

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INTRODUCTION

- Agricultural producers cannot control weather and other natural outcomes or effectively control for this type of risk. Hence, a main concern of farmers is how to mitigate the adverse impacts of weather risk on production and finance.
- Agricultural insurance is commonly considered to be a useful tool that farmers can use to mitigate the volatility of revenue.
- Blueberry quality is highly sensitive to heat units and precipitation, and their timing, but traditional crop yield insurance often fails to protect growers against quality risk.

GOALS/OBJECTIVES

- 1. Examine the conceptual feasibility of using weather-indexed insurance (WII) to complement existing crop yield insurance to hedge against non-catastrophic but quality-impacting weather conditions.
- 2. Develop a theoretical model and then use the results of a survey of blueberry producers in British Columbia to analyse the demand for a WII product.
- 3. Identify key weather factors that likely affect blueberry yields and quality; construct an index that has the potential to be used to develop a WII product that would represent the effects of weather on blueberry quality.

STUDY AREA

- A survey was conducted, targeting blueberry growers in British Columbia. Over 90% of commercial blueberries are produced in the lower mainland area in BC.
- The historical weather data are from one weather station in Abbotsford (see Figure 2).

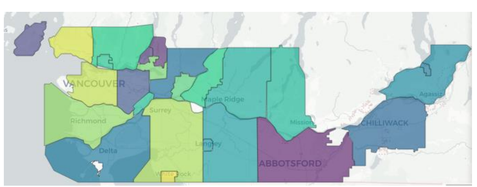

Figure 1: Lower Mainland

Figure 2: The location of the weather station

THEORY AND METHOD

Theory for Demand Analysis

- The third generation of prospect theory (PT3) is applied to investigate the feasibility of WII from the demand side [2].
- The key argument based on prospect theory is that farmers treat insurance products as a stand-alone investment, instead of a risk management tool [1] [3]. The premium is considered as a loss and the negative impacts of a loss may lead farmers to take risks, instead of buying an insurance product.

Method for Estimating Blueberry Quality Index

- The method of Partial Least Squares Structural Equation Modeling (PLS-SEM) (see Figure 3) is implemented to investigate the relationship between key weather factors and potential quality indicators.

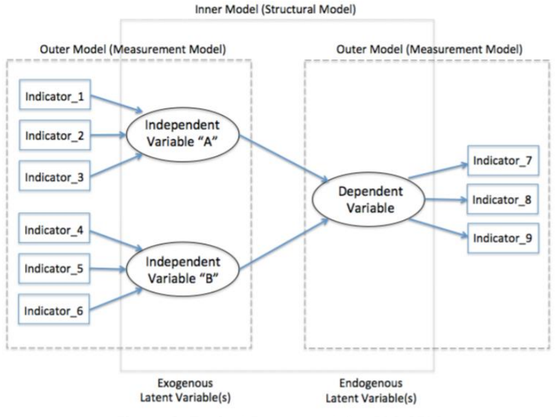

Figure 3: Typical Framework for PLS-SEM
Source: Wong (2013, p.2)

RESEARCH FINDINGS

Results

- The theoretical model demonstrates that: a farmer's willingness to pay is less than fair premiums; insurance demand decreases with basis risk.
- The survey results show that the level of farmers' willingness to buy a weather-indexed insurance product is not high. Even if farmers choose to purchase such a product, their willingness to pay is only a fraction of the actuarially-sound premium (see Figure 4).
- The estimation applying the PLS-SEM method demonstrates that an index using a group of variables related to yields and the monetary values of blueberries sold in the fresh and processed markets could be used to represent blueberry quality (see Figure 5) [5].
- Overall, the development of a WII product is possible, but education and government subsidies are two key factors that will influence its acceptance.

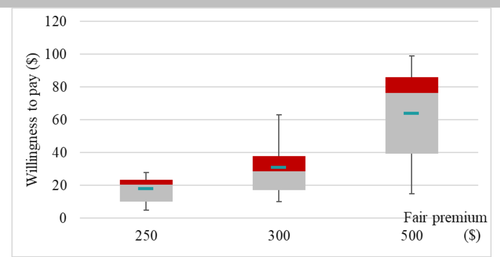

Figure 4: The distribution of farmers' WTP for a WII product

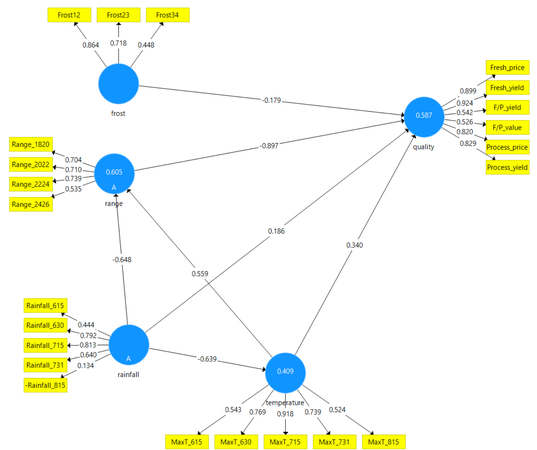

Figure 5: The diagram for the PLS-SEM estimation

Further Areas of Research

- Need to apply econometric models to model temperature and rainfall and then apply Monte Carlo simulation to explore the distribution of the WII payments to further study the feasibility of a WII product from the supply side.

REFERENCES: [1] Babcock, B.A. 2015. "Using Cumulative Prospect Theory to Explain Anomalous Crop Insurance Coverage Choice." American Journal of Agricultural Economics 97(5):1371–1384. **[2]** Schmidt, U., C. Starmer, and R. Sugden. 2008. "Third-generation prospect theory." Journal of Risk and Uncertainty 36(3):203. **[3]** Feng, H., X. Du, and D.A. Hennessy. 2020. "Depressed demand for crop insurance contracts, and a rationale based on third generation Prospect Theory." Agricultural Economics 51(1):59–73. **[4]** Wong, K. (2013). Partial least square structural equation modeling (PLS-SEM) techniques using SmartPLS,. Marketing Bulletin, 24, 1–32. **[5]** Ringle, C. M., Wende, S., and Becker, J.-M. 2015. "SmartPLS 3." Boenningstedt: SmartPLS GmbH, http://www.smartpls.com.

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