CANADIAN HORTICULTURAL GROWERS' PERCEPTIONS OF BENEFICIAL MANAGEMENT PRACTICES FOR IMPROVED ON-FARM WATER MANAGEMENT

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ABSTRACT

What factors influence farmers' perceptions of Beneficial Management Practices (BMPs) and why does that matter? Determinants of farmers' adoption of BMPs have been extensively researched. This is how we know that a farmer's decision-making process of adopting a BMP is complex, and it can be influenced by many factors, which can be broadly categorized under farmers' personal characteristics, farm salient features, properties of the BMP considered for adoption, and other contextual factors – social, economic, political, ecological, etc. Although this body of knowledge is comprehensive, it lacks the exploration of factors that contribute to understanding farmers' perceptions of BMPs, which play an important role in adoption decisions. This article focuses on identifying factors that contribute to farmers' perceptions of BMPs as better alternatives for their farms. Data for this study were collected through an online survey, containing responses of 70 fruit and vegetable growers in Ontario and Quebec. An ordered logit regression model was constructed to identify the factors influencing farmers' perception of the proposed BMPs as better alternatives. Results suggest that farmers with more farming experience and higher levels of educational attainment, as well as those without exclusive financial goals, and who perceived the BMPs to be expensive, were less likely to perceive the proposed BMPs as better alternatives in the context of their farm. However, growers gaining a larger percentage of their revenue from the crop under study, and those who thought that making best use of scarce resources (by reducing water use) was important, were more likely to perceive the proposed BMPs as better alternatives. These findings are important because they can provide a glimpse into the determinants of these perceptions which in turn are so influential in the adoption decision-making process.

Keywords: agricultural water management, adoption diffusion, beneficial management practices, farmer decision-making, perceptions of BMPs, Eastern Canada.

1 INTRODUCTION

Without adaptation to the changing climate, farmers can become increasingly vulnerable. Across the world, climate change brings additional challenges to agricultural production. The predominantly agricultural areas, located in the southern parts of the Canadian provinces of Quebec and Ontario, are already experiencing water availability issues [1]. Furthermore, water availability is projected to further diminish under future climate conditions [2]. The regional water budget is likely to be deficient, since the increase in precipitation will not offset the increase in temperatures and evapotranspiration rates. These changes are likely to increase the vulnerability of communities and activities reliant on these resources [3]. This is especially the case for fruit and vegetable farmers in these areas, since their production relies on the availability of water resources for irrigation purposes. Adoption of on-farm adaptation strategies, also called beneficial management practices (BMPs), are important tools for farming communities, acting as potential safeguards to future changes [4].

In Canada, agri-environmental cost-share programs support farmers' adoption of BMPs [5], whole provincial (Ontario and Quebec) agricultural ministries enlist multiple BMPs that focus on environmental protection and climate change adaptation [6]. Water-management

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BMPs that can be adopted by farmers include not only cultural practices (i.e., irrigation scheduling, improved soil moisture testing techniques, etc.) but also technologies (i.e., drip irrigation systems, subsurface irrigation system, controlled drainage, etc.). The effectiveness and success of these policy responses depend primarily on farmers' adoption of these BMPs. Many past studies have focused their research efforts on understanding the factors affecting decision-making.

Decisions are typically based on perceptions of reality. The perception of the relative advantage of a BMP is an important driver of adoption, as noted by previous studies [7], [8]. Although we understand the role perceptions play in the adoption, limited research has been undertaken to understand what influences farmers' perceptions of a BMP being relatively advantageous. This study argues that many factors can contribute to the formation of perception. These factors can fall under one of the following categories: farmer characteristics, farm characteristics, cultural practice or BMP characteristics, and socio-economic and environmental context of the farm.

In the following section the theoretical foundations of the research are presented, including definitions of main concepts. The third section of the article contains the methodology, with information about the area of study, data sampling, collection and analytical framework. Section 4 presents result of this research, including recommendations. In the last section, major conclusions of the study are presented.

2 PERCEPTIONS OF BENEFICIAL MANAGEMENT PRACTICES AND LINK TO ADOPTION

While most past studies focusing on adoption of agricultural practices and technologies have highlighted the characteristics of individuals and the farms, along with other relevant socio-economic variables, a limited number of scholars have also suggested characteristics of innovations as determinants of adoption [8], [9], which are as perceived by farmers. Furthermore, while some studies have taken the approach of treating the different perceived characteristics of the BMPs suggested by Rogers [10] can be divided into five categories:

1. Relative advantage is "… the degree to which an innovation is perceived as being better than the idea it supersedes" [10]. The implication being that the likelihood of adoption increases as the innovation is being perceived as a better alternative. Although relative advantage of an innovation has been conceptualized in some studies as a financial indicator, other studies have used a broader definition, including non-financial considerations as part of the relative advantages an innovator receives from adoption [8].
2. Compatibility is "the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters" [10]. In this sense, compatibility goes beyond referring to a technical fit within an already existing agricultural system, but it refers to a broader fit, within the producers' individual norms, and, by extension, an alignment with social norms as well.
3. Complexity of an innovation represents "the degree to which an innovation is perceived as relatively difficult to understand and use" [10]. A high degree of technical complexity of an innovation can potentially hinder its rate of adoption, as it signals to the innovator that time needed to learn may be longer, which may deter its adoption.
4. Trialability is "the degree to which an innovation may be experimented with on a limited basis" [10]. In the context of agricultural systems, a technology with increased modularity has the potential to reduce risks of adoption, because it can be easily trialed on a smaller scale at which effects are also easier to manage. A trialable innovation allows the innovator to interact directly with it, and to understand its relative advantage, compatibility, complexity and observability, and a reduction in the risk [7].

5. Observability refers to “the degree to which the results of an innovation are visible to others” [10]. Individuals are more likely to adopt an innovation if benefits can be observed.

The relative advantage of the BMP being adopted, over the one that it supersedes, represents one of the most significant factors influencing this process [7], [8]. The relative advantage refers to the net benefits or marginal costs brought on by the new BMP. These benefits or costs can be either financial or non-financial in nature – environmental, social, and cultural advantages, etc. However, past studies have revealed that any BMPs with net financial benefits are more likely to be adopted, even though some exceptions were encountered [8]. Compatibility of a BMP with the agricultural system in which it is introduced, complexity of the BMP, possibility of testing the new BMP as well as the risk it poses, are other characteristics that directly impact its comparative advantage, and implicitly the adoption process [8]. There are multiple other factors that influence the actual and perceived relative advantage of a new BMP, such as: farm and farmer characteristics, governmental policies, establishment costs, and time between implementation and results [7]. Non-profitable BMPs are more likely to be adopted by farmers with stronger environmental protection convictions. However, under these circumstances, the scale of adoption is limited and in general, cost of adoption in these cases is relatively small in comparison to the scale of the farm’s financial situation.

The Theory of Diffusion of Innovation, developed by Roger [10], is one of the most comprehensive and most commonly used theoretical frameworks for studying the adoption of agricultural innovations. Although this theory was developed in the field of Rural Sociology, it has been accepted by a variety of other fields and has a long-standing tradition in agricultural economics in explaining farmers’ decisions regarding the adoption of innovations. According to this theory, the decision-making process is framed as “an information-seeking and information-processing activity, where an individual is motivated to reduce uncertainty about the advantages and disadvantages of an innovation” [10]. This process includes multiple stages: (1) knowledge, (2) persuasion, (3) decision, (4) implementation, and (5) confirmation [10]. In the first stage, the individual becomes aware that the innovation exists. In the second stage, the individual pursues the new knowledge gained, by acquiring information regarding the innovation of interest. This is also the stage at which attitude formation takes place – the individual can form a positive or negative attitude towards the innovation. Following these two stages, the framework proposes that individuals make a decision regarding the adoption or rejection of the innovation, after an evaluation of alternative options. This is the stage during which a choice is made. In the implementation stage, the individual tests the innovation, through trials or uses it on a small scale, where the impacts are minimal. The last stage, also known as the confirmation stage, is when a decision is reached to either pursue the innovation further and adopt it a at a larger scale, or the decision to cease its use [10]–[12].

3 STUDY METHODS

This study was based on a web survey of farmers in Ontario and Quebec growing one of the three vegetables – tomatoes, cranberries or onions. Tomato producers were located in Essex and Chatham Kent counties of Ontario, whereas cranberry farmers were surveyed in the region of Sherrington, Quebec, and onion farmers were located in the province of Quebec.

3.1 Data collection

Data collection in this study was based on the use of structured questionnaires and web-based technology. A questionnaire (in French language) was developed for each group of farmers, and pilot tested. Each survey instrument included six sections: (1) description of improved water management system; (2a) adoption: motivations, barriers and perceptions; (2b) non-adoption:

motivations, barriers and perceptions; (3) opinions: farmer-environment interactions; (4) policy changes for adoption (for non-adopters); (5) farmer personal information; and (6) farm background information.

3.2 Sampling design, respondent recruitment and collection procedures

Data were collected for a sample of producers, using a different procedure for the three regions. While for tomato producers, the sample was drawn only from the two counties, for cranberry and onion producers' surveys the samples were drawn from the entire province of Québec. In 2011, there were a total of 228 tomato producers in the Essex and Chatham Kent counties (prior to the closure of the HJ plant), and 1,422 tomato producers across the province of Ontario [13]. Across Quebec, in 2011, there were 72 farms that reported growing cranberries, while 358 farms reported growing dry onions [13].

Given the small number of total growers, it was not possible to use a random sampling method. The sample selection technique used in this study was a nonprobability sampling. Agricultural producers in Ontario and Québec, involved in tomato, cranberry and onion production were surveyed in June 2016, November 2016 and March 2017, respectively. The scope of the survey was to assess growers' opinions regarding their adoption decision related to specific BMPs and their perceptions of these proposed practices and technologies. All respondents were contacted by e-mail. A reminder was sent to them after two weeks from the date of the original message. All surveys were created using Fluid Surveys, a web-based survey programming tool. Based on available data, an estimated 210 growers were contacted, out of which 70 provided complete responses. The overall response rate was 35% (with 51% for tomato growers, 46% for cranberry producers and only 11.5% for onion growers).

3.3 Sample characteristics

For this research, data were collected from 70 farms – tomato (39), cranberry (19) and onion (12) farms, as shown in Table 1. A little over half (56% of total) of sample farmers were tomato growers. These farmers represented approximately 17% of the regions' growers, based on the number of tomato growers in Essex and Chatham Kent counties. Cranberry growers completing the questionnaire accounted for over 26% of Québec's growers. In addition to tomato and cranberry growers, 12 onion agricultural producers also participated in the study, accounting for over 3% of Québec's onion producers.

Table 1: Number of farms in the population and in the sample.

Farm type	Population	Sample	Sample from population (%)
Tomato farms	228	39	17.11
Cranberry farms	72	19	26.39
Onion farms	358	12	3.35
Total farms	658	70	10.63

3.4 Data analysis

An ordered logit regression model was used to model perceptions. In this study, assessment of factors influencing farmers' perception of a BMP's relative advantage was measured initially using a five level Likert scale – strongly disagree, disagree, neutral, agree, or strongly agree. This variable was later recoded into three levels – level one included both levels of disagreement, level two contained only the neutral responses, and level three contained the level of agreement, as shown in eqn (1). Collapsing categories helped eliminate cases with zero or a small number of observations. In relation to effect on estimation accuracy – false positive or Type I error, as shown by Murad et al. [16], this practice of collapsing adjacent categories does not influence the proportion of Type I errors – false positives (a condition is found to be present when in reality it is not).

$$y = \begin{cases} 1 & strongly\ disagree, disagree \\ 2 & neutral \\ 3 & agree, strongly\ agree. \end{cases} \tag{1}$$

Ordered choice models, like binary choice models, are grouped into probit and logit models. In the ordered probit model, errors follow a normal distribution, whereas in an ordered logit model, the errors are assumed to follow a logistic distribution [15]. There are only small differences between the ordered logit and the probit models, and these are inconsequential to the obtained results. In this study, an ordered logit model was used to analyze the effects of factors on farmers' perception of the relative advantage of a BMP.

In this model, y – the ordinal dependent variable, is perceived as an unobservable random variable, also referred to as latent variable and denoted by y*. The unobservable response variable can be related to explanatory variables, through the index model, shown in eqn (2). The vector of regression coefficients is denoted by β, x is the explanatory variables vector, and ε is the error term.

$$y_i^* = \beta x_i + \varepsilon_i. \tag{2}$$

Assuming that there are three choices available for the response variable, there will be two thresholds (α_1 and α_2) – also called cutoff points or category boundary. There are no intercepts in index models, because they would be collinear with $\alpha_1 and\ \alpha_2$. The dependent variable was specified as shown in eqn (3).

$$y = \begin{cases} 1 & strongly\ disagree, disagree & if \quad y^* \le \alpha_1 \\ 2 & neutral & if \quad \alpha_1 < y^* \le \alpha_2 \\ 3 & agree, strongly\ agree & if \quad y^* > \alpha_2\ . \end{cases} \tag{3}$$

The assumption that the error term in the index model y* follows a logistic distribution defines the ordered logit model. There are three different types of ordered logit model, in which the categories of the dependent variable are treated differently. These are: the adjacent-category, the continuation-ratio and the proportional odds models [14]. A typology of ordered logit models is provided by Fullerton [17] who divides them based on the approach to comparisons (cumulative, stage, and adjacent) and application of the proportional odds assumption (to all, some, or no independent variables).

The cumulative approach developed initially to be used for outcome variables was in an ordinal scale that represents an underlying continuous measure (for example a variable measured on a Likert scale [17]. This approach compares probability of an equal or smaller response [14]. Developed by McCullagh [18], the proportional odds model is the most frequently used ordered logit model and also the most common cumulative approach. It was developed with the scope of being used for ordinal variables and to address the issue of assigning values arbitrarily to variables. It assumes that the cut-off points between variables are not known [18].

Eqn (4) specifies the proportional odds model, where j is the category, x is a vector containing the independent variables, α is the cut-off point and β is a coefficients vector.

$$Log\left(\frac{\Pr\,(y\leq\alpha|x}{\Pr\,(y>\alpha|x}\right) = \alpha_j - x\beta \qquad 1 \leq j < J. \tag{4}$$

Then the probability for any given outcome category (J) in the proportional odds model can be specified as shown in eqn (5), with F denoting the logistic cumulative density function.

$$\Pr(y = j|x) = \begin{cases} F\,(\alpha_1 - x\beta) & j = 1 \\ F\,(\alpha_j - x\beta) - F\,(\alpha_{j-1} - x\beta) & 1 < j \leq J - 1\cdot \\ 1 - F\,(\alpha_{J-1} - x\beta) & j = J. \end{cases} \tag{5}$$

For modelling perceptions of the BMP, the most common ordinal logistic regression model was used, which is the cumulative odds ordinal logistic regression with proportional odds.

4 RESULTS

4.1 Producers' perceptions of BMP characteristics

Respondents were asked if they would adopt a given BMP to use on their farms. The proposed BMPs that respondents were asked questions about were subsurface irrigation in tomato production, subirrigation in cranberry production and triggering of irrigation using tensiometers in onion production. From the 70 completed responses, there was an equal split between farmers who were in favor of adoption, and those who were not. Farmers were also asked about their perceptions related to characteristics of BMPs. In the following section, answers of the two groups – adopters and non-adopters, are presented.

Adopters and non-adopters alike, predominately perceived the proposed BMPs, as profitable (80% of respondents, N = 70) but expensive (76%), as having the capacity to reduce water use in their operations (74%), and capable to improve crop yields (73%). Furthermore, approximately 57% of respondents perceived the BMPs as a better alternative than the practice or technology currently used on their farm. The same percentage also thought that the proposed BMPs, if adopted, would reduce production risks.

Respondents were also asked if they perceived the adoption of the BMPs as providing benefits to the local community and to society at large. Most farmers indicated that in the context of their farm they neither agree nor disagree that this would be the motivation for adoption – selecting the neutral answer choice. This response could also indicate uncertainty related to the effects of the BMP on the local community or on society at large, or that the BMPs are considered to have no effect. Fig. 1 summarizes these results.

4.2 Determinants of BMP perception

This section focuses on identifying the determinants of farmer's perception of the relative advantage of improved water management BMPs, using data from a survey of 70 fruit and vegetable growers in Ontario and Québec. Based on an ordered logit regression model farmer's past behavior, their farming goals, BMP's perceived characteristics, farm characteristics and economic context variables, were hypothesized to influence farmer's perception of a given BMP. The model variables are shown in Table 2. Measurement of these variables are presented in Appendix Tables A1 and A2.

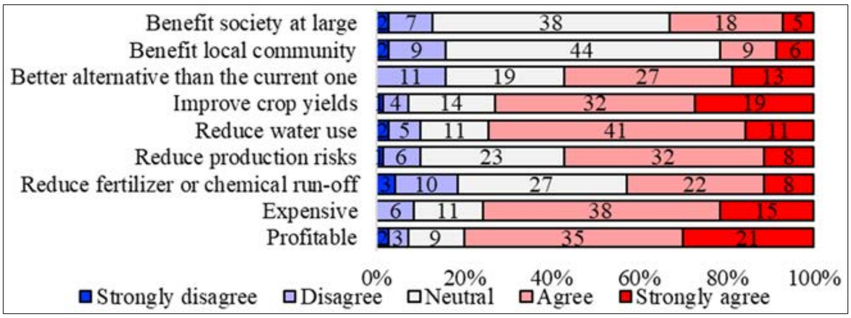

Figure 1: Respondents' perception related to BMP characteristics.

Table 2: Description of variables in the ordered logistic model.

Acronym	Description
BETTER	Perception of BMP as a better alternative than current practice
GOALS	Farming-related goals
EXPERIENCE	Years of farming experience
EDUC	Farmer's level of education
EXPENSIVE	Agreement level with the statement: in the context of your farm the BMP could be expensive
SOCIETY	Agreement level with the statement: In the context of your farm the BMP could benefit society
SALES	Farm's sales
BESTUSE	Agreement level with the statement: making best use of scarce resources is important
WATER USE	Agreement level with the statement: reducing water use in agriculture is important

4.3 Model specification

The data used for the estimation of this model were based on the questions in the agricultural producers' survey. Respondents were asked to state the level of agreement with the statement: "In the context of your farm the improved water management system could be a better alternative than the current one". Responses were coded as: 1 = Strongly disagree, 2 = Disagree, 3 = Neutral, 4 = Agree and 5 = Strongly agree. These categories were further collapsed into three: –1 = Strongly disagree and disagree, 0 = Neutral and 1 = Agree and Strongly agree. These measurements were saved under the variable entitled BETTER. The probability model was specified as shown in eqn (6)

$$\text{BETTER} = \beta_0 + \beta_1\, GOALS + \beta_2\, EDUC + \beta_3\, EXPERIENCE + \beta_4\, EXPENSIVE \\ + \beta_5\, SOCIETY + \beta_6\, SALES + \beta_7\, BESTUSE * WATERUSE + \varepsilon_i. \quad (6)$$

4.4 Model evaluation

Based on the model fitting information, log likelihood of the full model is –29.59. Compared to that of the null model (one that contains only the intercept) of –67.52, led to the rejection of the hypothesis that all of the regression coefficients in the model are zero, at the p-value

< 0.001. Several pseudo-squared values were also estimated to evaluate the power of explanation of the model, which indicate that the model explains somewhere between 56% to 74% of the outcome.

The estimated model is presented in Table 3, where a summary of the results along with parameter log odds estimates for the ordered logistic regression model for factors influencing fruit and vegetable growers' perception of relative advantage in Ontario and Québec.

Table 3: Parameter log odds estimates for the ordered logistic regression model for factors influencing fruit and vegetable growers' perception of relative advantage in Ontario and Québec.

Variable	Coefficient (log odds)	S.E.	Significance (p-value)	Confidence interval (lower)	Confidence interval (upper)
Goals	–2.67	0.96	0.01	–4.54	–0.80
Education	–1.84	0.73	0.01	–3.27	–0.40
Experience	–0.08	0.04	0.05	–0.15	–0.00
Expensive	–2.83	0.89	0.01	–4.57	–1.10
Society	2.63	0.71	0.01	1.26	4.00
Sales	5.01	1.76	0.01	1.57	8.45
Best use* water use	0.23	0.09	0.01	0.06	0.41

Based on the developed model, several variables had a negative influence on farmers' perception of the BMP as being a better alternative. Farmers without exclusive financial farming goals were less likely to find the BMP alternative as a better one. Like this variable, farmers with a higher level of education or more farming experience were less likely to see the proposed BMP as a better alternative. Farmers, who perceived the BMP as expensive were also less likely to perceive the BMP as a better alternative.

There were three other factors that influenced perception of the BMP in a positive way. Farmers, perceiving the BMP as providing benefits to society, were more likely to perceive the practice as a better alternative. In addition, respondents gaining a larger percentage of their revenue from the crop of interest were more likely to see the proposed water management system as a better alternative. Furthermore, growers who think making best use of scarce resources (such as water) is important and believe the proposed BMP reduces water use on their farm, are more likely to perceive the BMP as a better alternative.

In addition to reporting the log odds parameter estimates, marginal effects estimates were calculated and summarized in Table 4. A change in goals from financial to a higher order goal triggered a negative effect on the perception of the BMP, with the farmer being approximately 41% less likely to perceive the BMP as a better alternative. In other words, a farmer whose goals are not solely financial is less likely to perceive the BMP as being a better option. Results also suggest that if the level of education is increased by one unit, the respondent is 28% less likely to perceive the BMP as better; however, this results was contrary to the expected one – as education increases so does the likelihood of perceiving the BMP as a better alternative. In addition, an increase of one unit in the farmer's experience will decrease the better perception of the BMP by nearly 1.2%.

As previously mentioned, some factors also had a positive effect on the BMPs perception. An increase in the perception of the farmer that the BMP will benefit society as a whole increased the chance of a better perception of the BMP by over 40%. A 1% increase in the

Table 4: Marginal effect estimates for factors influencing fruit and vegetable growers' perception of relative advantage in Ontario and Québec.

Variable	Coefficient (B)	S.E.	Significance (p-value)	Confidence interval (lower)	Confidence interval (upper)
Goals	–0.41	0.15	0.01	–0.70	–0.17
Education	–0.28	0.14	0.03	–0.55	–0.02
Experience	–0.01	0.01	0.06	–0.02	0.001
Expensive	–0.43	0.12	0.01	–0.68	–0.19
Society	0.40	0.15	0.01	0.11	0.69
Sales	0.77	0.28	0.01	0.21	1.33
Best use* water use	0.04	0.02	0.04	0.002	0.07

proportion of sales coming from either tomatoes, cranberries or onions (depending on the farm), increases the likelihood of producers perceiving the BMP as a better alternative by nearly 77%. Farmers are 3.6% more likely to perceive the BMP as a better alternative, if it results in best use of scarce resources together with the belief that the proposed BMP will reduce water use.

5 DISCUSSION AND CONCLUSIONS

Respondents were asked about their perceptions related to the proposed BMPs. A large majority of farmers perceived the BMPs as being profitable, yet expensive, capable of improving crop yields and having the potential to reduce water use on their farms.

Farmers' perceptions of BMPs characteristics are key factors in adoption decisions. Given that one of the most important characteristics of a BMP in the adoption process is whether farmers perceive the BMP as a better alternative than the current practice, this variable was used as an outcome variable in understanding what influences perceptions. Based on the estimated model, several variables had a negative influence on farmers' perception of the BMP as being a better alternative. With higher order goals, farmers were less likely to find the alternative as a better one. Like this finding, farmers with a higher level of education were less likely to see the proposed BMP as a better alternative. Respondents with more experience were also less likely to perceive the BMP as a better alternative. Farmers, who perceived the BMP as expensive were estimated to assign a lower likelihood of the BMP being a better alternative.

There were three factors that influenced perception of the BMP in a positive way: (i) farmers perceiving the BMP as providing benefits to society were more likely to perceive the practice as a better alternative; (ii) the respondents obtaining a larger percentage of their revenue from the crop of interest were more likely to see the proposed water management system as a better alternative; (iii) the growers who think making best use of scarce resources is important and believe the proposed BMP reduces water use on their farm, were more likely to perceive the BMP as a better alternative.

APPENDIX

Table A1: Description of the dependent variable.

Acronym	Description	Type of measure	Expected sign
BETTER	Agreement level with the statement: in the context of your farm the BMP could be a better alternative than the current one.	Categorical, ordered as: –1 = Strongly disagree, disagree 0 = Neutral 1 = Agree, strongly agree	

Table A2: Description of independent variables considered for the ordered logistic model.

Acronym	Description	Type of measure	Expected sign
EDUC	Farmer's level of education.	1 = High school 2 = College/technical degree 3 = University or professional degree	+
EXP	Years of farming experience.	Continuous, numeric	-
GOALS	Farming-related goals.	0 = exclusively economic 1 = economic and non-economic	+
SALES	Farm's sale levels.	1 = Less than \$50,000 2 = \$50,000–\$99,000 3 = \$100,000–\$249,000 4 = \$250,000–\$499,999 5 = \$500,000–\$1,000,000 6 = More than \$1,000,000	+
SOCIETY	Agreement level with the statement: in the context of your farm, is the adoption of the BMP likely to benefit society.	Scale 1 = Strongly disagree/disagree 0 = Neutral 2 = Strongly agree/agree	+
BEXP	Agreement level with the statement: in the context of your farm the BMP could be expensive.	Scale 1 = Strongly disagree 2 = Disagree 3 = Neutral 4 = Agree 5 = Strongly agree	–
BESTUSE	Agreement level with the statement: making best use of scarce resources is important.	Scale 1 = Strongly disagree 2 = Disagree 3 = Neutral 4 = Agree 5 = Strongly agree	+

Table A2: Continued.

Acronym	Description	Type of measure	Expected sign
WATERUSE	Agreement level with the statement: reducing water use in agriculture is important.	Scale 1 = Strongly disagree 2 = Disagree 3 = Neutral 4 = Agree 5 = Strongly agree	+

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