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Encouraging Engagement in Water Conservation: Can Trust from Extension Create Change?

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Abstract

Extension educators seek to provide scientific research and perspective to farmers and the public. The connection that Extension educators foster between farmers and consumers can be capitalized upon to build trust and ultimately encourage behavior change through social capital. Agricultural educators have recognized the need for consumers and farmers to develop trust and mutuality in order to combat complex issues such as water usage. Agriculture is the greatest user of water in the United States; therefore efforts to encourage agricultural water conservation have been explored. Unfortunately, they are largely unsuccessful because of the increased production cost associated with conservation passed on to consumers. This study explored how U.S. consumers' related their willingness to pay for products conserving water with their level of trust that farmers are good conservationists. The findings revealed that trust that farmers will conserve water is predicted by the degree of positive and negative relationships that consumers identify. The findings imply that by developing relationships between consumers' trust and their willingness to pay, Extension educators can encourage engagement in agricultural water conservation practices.

Keywords: Extension, trust, social capital, public perception, water conservation

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Introduction

Extensive educational programs are provided by Extension educators and promoted through collaborative efforts made between the local, state, and federal government (Terry & Osborne, 2015). Extension educators strive to provide the public with quality research to assist in developing informed decisions on critical issues at all levels. The types of relationships Extension educators create between the public and the agricultural, food, fiber, and natural resource industries are significant to combatting the fragmented communication between the groups (Duffy, Fearne, & Healing, 2005). In order to be successful in this endeavor, mutual trust must exist between leaders, followers, consumers, and farmers alike (Mwangi, 1998). These integral relationships develop social capital, which can be used to address complex environmental issues, and has shown to be an underappreciated tool for conservation (Pretty & Ward, 2001).

As well, we know water scarcity is an ever-growing global issue that must be addressed directly and thoughtfully. While water may encompass 66% of the Earth's surface, freshwater

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makes up only 2.5% of which 69% of the freshwater is captured in the polar ice caps (Engelman et al., 1993). Of the small percentage of freshwater that is available for use, 8% is used in households and 23% is used by industry; leaving agriculture as the greatest drain on the water supply (69%; Engelman et al., 1993). Further, water extraction for domestic, food, and industrial uses has had a major impact on ecosystems and this affect will only be exacerbated by the growing demand for water (Rijsberman, 2006). While many believe the issue of water scarcity will create international conflicts, it has been recognized that the larger risks are the conflicts within countries (Ohlsson, 2000). These conflicts will stem from the institutional changes required to adapt to water scarcity (Ohlsson, 2000). Additionally, consumers are sensitive and resistant to higher water prices (Olmstead & Stavins, 2009). However, a possible solution to water scarcity is reducing demand of water by changing consumer preferences for water use ("Shift in Demand Curve: When Price Doesn't Matter", n.d.). Consumer preferences can be reformed through educational programs, such as those Extension provides. In addition, the literature is clear that Extension educators must address the complex issue of water scarcity in the near future if it wants to remain relevant (Huang & Lamm, 2015a; Huang & Lamm, 2015b; Huang, Lamm & Dukes, 2016; Lamm, Lamm, & Carter, 2015).

Non-formal education can be defined as "any intentional and systematic education enterprise in which content is adapted to the unique needs of the students in order to maximize learning" (as cited in Etling, 1993, p.73). The connection Extension educators build between consumers and the farmer is typically through non-formal education programs and can be used as effective avenues for creating trust between the parties ("Extension", n.d.). Non-formal education creates collective actions and experiences that work to meet needs and solve issues (Kindervatter, 1979). Users of non-formal education programs have developed improvements to social, economic, and political standings. Thus, by understanding the function of Extension and how Extension educates the public, initiatives can be taken to develop desirable traits within the consumers.

According to Rogers, Silva, and Bhatia (2001), water is an economic good and the way to promote equity, efficiency, and sustainability of water is addressed conceptually through water pricing. However, Martinex-Espineira and Nauges (2006) identified water consumption as an elastic and inelastic good, making the issue of water conservation more difficult to regulate. While water pricing alone is not a valid means of encouraging water conservation, it can be used in conjunction with consumer trust to resolve water scarcity (Yang, Zhang, & Zehnder, 2003). The greatest issue facing agricultural water conservation is the cost of water efficient technologies. The high entry cost of water conservation technology discourages many farmers from participating because of a reduction in profitability (Seo, Segarra, Mitchell, & Leatham, 2007). Seo et al. (2007) stated that in order to save water, current farmers need to be convinced to replace old irrigation systems with new ones (2007). The cost of innovation will be reliant upon consumers' willingness to pay for conservation practices. This study focuses on encouraging farmers to implement water-conserving practices by better understanding why consumers are more or less willing to pay for the cost of these practices.

Many studies have tested the validity of increasing water prices to encourage water conservation and the findings have shown hesitation and dissatisfaction among consumers and farmers (Olmstead & Stavins, 2009; Seo et al., 2007; Yang et al., 2003). While farmers may be hesitant to switch to water efficient practices (Seo et al., 2007), they can find solace in consumer support that will allow for higher prices for the sake of water conservation. Extension, as a non-formal education program, can be used as an effective tool for trust development between the two groups ("Extension", n.d.) serving as a natural bridge between farmers and consumers (Duffy et al., 2005). Ultimately, this study sought to address two priorities from the national research agenda for agricultural education (Roberts, Harder, & Brashears, 2016). Those priorities include "public

and policy maker understanding of agriculture and natural resources" (p. 13) and "addressing complex problems" (p. 57).

Theoretical Framework

This study utilized social capital theory (Lin, 2001) as a means of identifying solutions to the growing concern of water scarcity. Social capital theory illustrates the notion that an investment in social relations will bring an expected return in the marketplace (Lin, 2001). Lin (2001) explained there are four main ways social capital brings about change, including (a) the reduction of transaction costs and stronger rewards, (b) the exertion of influence on agents, (c) the accreditation of actors, and (d) the reinforcement of identity and recognition (Lin, 2001). While consumers are hesitant to accept increasing water prices (Olmstead & Stavins, 2009; Seo et al., 2007; Yang et al., 2003), they could be more inclined to pay for water conservation practices if they have developed social capital with farmers.

Several studies have used social capital theory to investigate different phenomenon within the agricultural and natural resource realm. Cramb (2005) found significant support for the concept that social relations and ties could encourage soil conservation (Cramb, 2005). The study focused on the establishment of a Landcare Program. The Landcare groups were composed of farmers and community members alike and were used to construct bridges of social capital to identify and improve issues regarding soil conservation. The study concluded that the success of the Landcare groups did not lie within the multitude of farmer trainings, cross-farm visits, or information sessions, but in the community social ties that were developed and the creation of social capital (Cramb, 2005).

A study that examined citizens' perception of water conservation policies, and the influence of social capital on these perceptions, concluded that where social capital was low, citizens perceived the price of water as high (Jones, Evangelinos, Gaganis, & Polyzou, 2011). Social trust was found to be a noteworthy factor when determining the perception of costs to consumers. In addition, an increase in social collaboration was found to be an explanatory variable in perceived low costs and also created policy support. While water consumption policies are often observed as ineffective measures toward conservation, the policies can gain traction through social capital, which can be used as a tool for confronting issues. This study recommended that if prior to policy implementation there was a social capital assessment than many ineffective elements in the policy could be addressed (Jones et al., 2011).

Another study addressed how source credibility affected attitude formation and perceptions of the public regarding agricultural water use (Lamm, Owens, Telg, & Lamm, 2016). The study showed four identical videos of a speaker explaining how farmers can use best management practices to reduce water consumption; the only differing factor was the source treatment given to each video. The study revealed the public was generally open to agriculture taking the necessary water conservation steps, regardless of increased food prices. In fact, when the source treatment was a farmer, which was deemed as more trustworthy, there was a statistically significant higher score associated with the impacts farms have on the environment. Lamm et al. (2016) accredited this to the farmer being an individual with expertise in their domain but trust also played a significant role and needed to be explored further.

Social capital theory could provide a potential solution to water scarcity that is outside of the ineffective, redundant initiatives that have used public financial responsibility as a driver. While past efforts mentioned by Olmstead and Stavins (2009), Seo et al. (2007), and Yang et al. (2003) have shown to be feeble, social capital theory provides a new frame for this complex issue (Lin,

2001). Extension educators are an established group of professionals ready to address water issues by building social capital between farmers and consumers (Duffy et al., 2005).

Purpose and Objectives

The purpose of this study was to determine if the degree of trust consumers have in farmers being conservationists impacts consumers' willingness to pay for water conservation. The following research objectives guided this study:

1. Describe consumers' trust in farmers as conservationist.
2. Describe consumers' perceptions of farmers being conservationists.
3. Describe consumers' willingness to pay for water conservation.
4. Determine if consumers' perceptions of farmers being conservationists predicts their trust in farmers.
5. Determine if consumers' trust in farmers and their perceptions of farmers being conservationists predicts their willingness to pay.

Methodology

A survey distributed online was used to accomplish the research objectives. The survey was based upon the 2012 RBC Canadian Water Attitudes Study (Patterson, 2012) and the Government Style Questionnaire (Green-Demer, Blanchard, Pelletier, & Béland, 1994). While part of a larger study, four sets of questions were specifically used in this study to measure the following indices (a) perception of farmers as conservationists, (b) trust in farmers, and (c) willingness to pay for conservation practices. In order to uphold the survey's integrity and validity, a panel of experts specializing in public opinion research, water issues, and survey design reviewed the survey prior to distribution. Panel members included the Director of the UF Water Institute, the Chief Executive Officer of Florida Nursury, Growers, and Landscape Association, an Extension specialist in water economics and policy, the Director of the UF/IFAS Center for Landscape Conservation and Ecology, the associate director of the UF/IFAS Center for Public Issues Education, and an assistant professor specializing in agricultural communication.

The target population of interest was US residents aged 18 or older. After expert panel review and revision, a pilot test was conducted with 50 respondents representing the target population to approve the validity of the constructs. The Cronbach alpha levels for each of the constructs were greater than .80 in the pilot study so they were deemed appropriate measures. Using a non-probability opt-in sampling technique, a survey research company distributed the finalized survey nationally. A total of 2,704 individuals were invited to complete the survey. Quotas for the study were established *a priori* to ensure the sample would be representative of the US population and attention filters were integrated. Respondents had to fill the required quota and pass the attention filters for their responses to be accepted as complete. The data collection methods utilized resulted in 1,050 complete surveys, equating to a 42% participation rate.

Recognizing the potential for selection, exclusion, and non-participation biases due to using a non-probability sampling method, a post-stratification weighting method was applied to ensure the analyzed data properly represented the population of interest (Baker et al., 2013; Kalton & Flores-Cervantes, 2003). Data was weighted using the 2010 US Census data ensuring residential state, age, gender, and race/ethnicity matched the national population.

Table 1

Demographics of Respondents (N = 1,050)

	n	*%*
Gender		
Female	538	51
Male	512	49
Ethnicity		
White	703	67
Black	122	12
Asian/Pacific Islander	52	5
Native American	7	1
Multiracial	15	1
Other	151	14
Age		
20 - 39	370	35
40 - 59	383	37
60 or older	296	28
Education Level		
Some high school	18	2
High School degree/ GED	227	22
Some college	261	25
2-year degree	139	13
4-year degree	275	26
Graduate/ Professional degree	130	13
Political Affiliation		
Democrats	274	38
Republicans	400	26
Independents	266	25
Non-affiliated	104	10
Other	5	1
Income Level		
Less than $24,999	228	22
$25,000 - $49,999	300	29
$50,000 - $74,999	254	24
$75,000 - $149,999	223	21
More than $150,000	45	4

Respondents were asked to indicate their perception of farmers being and not being conservationists, their trust in farmers as conservationists, and their willingness to pay for conservation practices each on a five-point Likert-type scale. The scale had ranges including 1= *Strongly Disagree*, 2 = *Disagree,* 3 = *Neither agree nor disagree,* 4 = *Agree,* or 5 = *Strongly Agree.* In addition, respondents were able to identify *Does Not Apply*. *Does Not Apply* responses were considered missing values for the study. The perception that farmers are/are not conservationists indices were both created with five questions, trust in farmers had three questions, and the willingness to pay construct had three questions. The indices were created by calculating the average of the scores that could range from one to five. Each of the indices had reliable Cronbach's alpha coeffecients with a .84 for farmers are conservationists, .86 for farmers are not conservationists, .74 for respondents' trusting farmers as conservationists, and .84 for respondents' willingness to pay for conservation practices. Lastly, respondents were asked to answer several questions based upon their demographics. Descriptive statistics were used to achieve the first three objectives and multiple linear regression was used for objectives four and five.

Results

Objective 1: Trust in Farmers as Conservationists

Respondents were asked to indicate their trust in farmers as conservationists using three statements (see Table 2). Most of the respondents' agreed or strongly agreed farmers were concerned about water when they were making important decisions about farming (86%). Only 3.5% disagreed or strongly disagreed with the statement. The three statements were averaged to create the trust in farmers index (= .74). The trust in farmers index had a mean of 3.83 (*SD* = .72).

Table 2

Trust in Farmers

		Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
	N				*%*	
I know farmers will be concerned about water resources when they make important decisions about farming	1019	.7	2.8	10.3	37.3	48.8
Sound principles seem to guide farmers' behavior when it comes to water use	998	1.7	6.8	29.1	44.5	17.9
Farmers can be relied upon to keep their promises when it comes to water use	989	2.7	10.6	35.8	35.7	15.2

Note. *N* for each item varies based on the option to select does not apply that was coded as missing data.

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Objective 2: Perceptions of Farmers being Conservationists

Respondents were asked to identify how well farmers conserve water by responding to ten statements. The first five statements were positive and written as farmers being conservationists (see Table 3). The last five questions were negative and written as farmers being non-conservationists (see Table 4).

Within the farmers being conservationist set, the statement that farming protects our natural environment was the one statement most strongly agreed upon (18.7%). However, the second statement that farm lands or privately owned agricultural lands allow water to return to and recharge groundwater resources had the highest amount of agreeance, a combination of agree and strongly agree percentages, with 60.2%. An index was created by taking the average of the five statements (□□= .84). The mean score of the index was 3.50 (*SD* = .77).

Table 3

Perceptions of Farmers as Conservationists

		Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
	N			*%*		
Farming protects our natural environment	1005	2.3	9.2	29.3	40.5	18.7
Farm lands or privately owned agricultural lands allow water to return to and recharge groundwater resources	911	1.4	5.6	32.8	41.7	18.5
Farmers only use as much fertilizer as necessary on their fields and crops	957	5.6	12.4	38.0	29.1	14.9
Farmers only use as much pesticides as necessary on their fields and crops	953	6.1	14.2	35.1	30.9	13.7
Farmers conserve water	967	2.6	10.7	40.2	34.2	12.2

Note. *N* for each item varies based on the option to select does not apply that was coded as missing data.

When asked to respond to negatively framed statements that imply farmers are not conservationists, the majority of respondents indicated they believed farmers use pesticides on farms that pollute natural water sources. Only 8% disagreed or strongly disagreed with the statement (see Table 4). The farmers are not conservationists index was created by taking the average of the five statements (= .86). The mean of the index was 3.49 (*SD* = .79).

Table 4

Perceptions of Farmers as not Conservationists

	N	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
		%				
Pesticides used on farms pollute natural water sources	994	2.1	5.7	23.5	41.4	27.3
Fertilizers used on farms pollute natural water sources	982	2.5	7.1	29.0	37.7	23.7
Animal waste produced on farms pollutes natural water sources	979	3.1	12.5	30.3	32.9	21.2
Farming causes water runoff	947	3.9	15.6	36.3	35.9	8.3
Farming causes soil erosion	942	4.8	23.8	33.8	29.7	8.0

Note. *N* for each item varies based on the option to select does not apply that was coded as missing data.

Objective 3: Willingness to Pay for Conservation

Respondents most strongly agreed with the statement that farmers should use fewer pesticides even if the consumer would have to pay more for food. Thirty-nine percent of the respondents strongly agreed with the statement and only 3% strongly disagreed with paying more for food in order for farmers to use fewer pesticides in production (see Table 5). The willingness to pay index was the average of the responses to the three statements (= .84) and had a mean of 3.82 (*SD* = .92).

Table 5

Willingness to Pay for Conservation

	N	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
				%		
Farmers should use as little pesticides as absolutely necessary even is it means I have to pay more for the food I purchase	1024	2.8	6.3	22.0	29.7	39.3
Farmers should use as little fertilizer as absolutely necessary even if it means I have to pay more for the food I purchase	1024	3.1	8.1	28.0	29.9	30.9
Farmers should save as much water as possible when irrigating crops even if it means I have to pay more for the food I purchase	1023	3.3	7.0	30.6	31.6	27.5

Note. *N* for each item varies based on the option to select does not apply that was coded as missing data.

Objective 4: Predicting Trust in Farmers

A linear regression model was used to determine if perceptions (both positive and negative) of farmers as conservationists could predict trust. The farmers are conservationists construct was a significant predictor of consumers' trust (b = .63, p = .00). The farmers are not conservationists construct was not a significant predictor. The model explained 40% of the variance in trust (see Table 6).

Table 6

Predicting Trust in Farmers as Conservationists

	Trust	
Variable	*b*	*p*
Farmers are conservationists	.63	.00
Farmers are not conservationists	-.01	.83

Note. R^2 = .40.

Objective 5: Trust in Farmers and their Willingness to Pay

Trust in farmers (b = .22, p = .00) and farmers are not conservationists (b = .41, p = .00) were significant predictors of willingness to pay. The belief that farmers are conservationists was not a significant predictor. Twenty-one percent of the variance in consumers' willingness to pay was attributed to these predictors.

Table 7

Predicting Willingness to Pay

	Willingness to Pay	
Variable	*b*	*p*
Farmers are not conservationists	.41	.00
Trust in farmers	.22	.00
Farmers are conservationists	.05	.20

Note. R^2 = .21.

Conclusion and Implications

Previous literature by Pretty and Ward (2001) may have identified social capital as a forgotten tool for conservation, but this study identified increasing social capital as an effective avenue for engaging the public in water conservation. These key findings revealed consumers' trust and willingness to pay could be predicted by their respective constructs. Forty percent of the variance in respondents' trust in farmers as conservationists can be determined by knowing the respondents perception of farmers as conservationists. In addition, an increase in consumers' perception of farmers as conservationists was found to result in an increase in consumers' trust.

Consumers' willingness to pay for conservation practices can also be determined through significant predictors such as consumers' trust in farmers and the belief that farmers are not conservationists. Therefore consumers were more likely to be open to paying for conservation practices if they trusted farmers as conservationists, as well as if they identified farmers as poor conservationists. This study indicated the more consumers know about farming practices, the more likely they are going to be willing to pay for stronger conservation practices, regardless if the farmer was perceived to be a poor or a strong conservationists of water resources.

The social capital ideology that social relations will bring an expected return in the marketplace (Lin, 2001) is supported by this study where the key findings reflected an increased willingness to pay from consumers despite perception of farmers. A poor perception on farmers as conservationists would create a natural assumption that consumers are unwilling to pay for increases in food. However, this study found that a growing negative perception of farmers as conservationists positively incentivizes consumers to pay more for food in turn for seeing stronger conservation practices. Previous research conducted by Lamm et al. (2016) supported the notion that the public is in favor of agriculture increasing conservation efforts, despite increasing food prices. Further, Lin (2001) described the main ways that social capital creates change should be considered. Lin stated that upon developing social capital, agents of change may begin experiencing

influence. Agents of change, such as Extension educators, can develop social capital with consumers by exerting influence on consumers' spending habits.

Farmers may be hesitant to switch to water efficient practices because of high start-up costs, but they may be convinced to update practices with the right incentives (Seo et al., 2007). Likewise consumers are unlikely to change their water consumption due to water pricing alone (Yang et al., 2003) because of water's complex elasticity model (Martinez-Espineira et al., 2006). Prior literature agreed with the results from this study, implying the influence of social capital on willingness to pay. Studies conducted by Jones et al. (2011) and Hoyman, McCall, Paarlberg, & Brennan (2016) supported social capital as an avenue for developing economic shifts in consumption of resources. This study supported the creation of social capital as an effective method of encouraging water conservation.

The findings imply Extension educators can foster consumers' willingness to pay by developing mutual trust between respondents and farmers (Mwangi, 1998). Non-formal education develops social relations between parties, which can be used to solve problems (Kindervatter, 1979). ion educators' ability to share information and build connections can serve as an invaluable asset for increasing consumers' willingness to pay for conservation practices. As consumers are taught about agricultural water practices their perception of farmers being or not being conservationists will change (see Table 8). Regardless, if their views on farmers' conservation practices are positive, consumers' willingness to pay will increase.

Recommendations

Water consumption will only grow and be exacerbated in the future due to the increasing population (Rijsberman, 2006). Conflict both internationally and domestically are sure to arise (Ohlsson, 2000), therefore agriculture, as the number one user of freshwater, must be proactive in conservation efforts. However the cost of implementing water conservation practices is a natural deterrent for farmers, therefore the need for incentives and support of farming efforts is key to creating change. Extension clearly has a role to play in creating support for farmers through collaborations with consumers and farmers (Duffy et al., 2005). Based on the results of this study, it is evident that social capital is created through consumers' trust in farmers and their perceptions of farmers as conservationists.

Extension educators should work with consumers and farmers to create mutual trust and understanding (Mwangi, 1998). For example, Extension educators creating a water-care program, such as the Landcare program, would encourage water conservation through an increase in social relations (Cramb, 2005). While a water-care program would be an effective avenue for sharing information and for trainings, Cramb (2005) found these to be of less importance when compared to the real catalyst of change, social capital. This study supports work conducted by Cramb (2005) because the key findings indicated that regardless of positive or negative perceptions on farmer's conservation habits, consumers would be more willing to pay for water conservation practices. Since water conservation is a universal issue, which will require curbed habits from consumers and farmers alike, a water-care program would provide initiative to all groups.

It would also be recommended that Extension educators increase their influence on policy development with water conservation through social capital investments (Jones et al., 2011). Since Extension educators are already building social capital within their respective communities they should be used as assessors of the public that in turn advocate their findings to policymakers. Having messages delivered to policymakers, consumers, and farmers from an accredited source is an effective strategy for proper policy development (Lamm et al., 2016). The collaboration between

groups (Extension educators and consumers) would add validity when encouraging decision makers' adoption of effective water policy (Lamm et al., 2016). These social capital assessments should be comprehensive to help identify limiting factors that later can be addressed in policy. Policy implementation in the future will be a significant influencer on water consumption and it is imperative social capital has a role to play in its creation (Jones et al., 2011).

Future studies should be conducted based upon these findings. Research should be conducted on the best environments for developing social capital through the proposed water-care programs. This study could include collecting information on offering education in formal versus non-formal group settings and the purpose of the group (Hoyman et al., 2016). Understanding the purpose of the group, whether created for social or economic interests, may change the effectiveness of water conservation behavior change and acceptance of sustainable practices. Therefore, Extension educators should be aware of such information as they develop programs of this type. Researchers should also evaluate the amount of social capital created through already existing water protection policies and programs. This future study could apply the research conducted by Lamm et al. (2016) in order to develop messages from accredited sources and develop as much social capital as possible.

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