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Water markets and sustainable water use in Almería, Spain – assessing the readiness for organizational change

Phillip T. Manno
Arizona State University, Mesa, Arizona, USA
Jesus Bravo
Department of Management, Information Systems, and Entrepreneurship, Washington State University, Richland, Washington, USA
Mark Manfredo
Morrison School of Agribusiness and Resource Management, Arizona State University, Mesa, Arizona, USA, and
Rafael C. Leon
Department of Economic and Business, University of Almería, Almería, Spain

Abstract

Purpose – Water availability and usage in agriculture suggests increasing scarcity. To ensure the long-term sustainability of water resources, efficient pricing and distribution methods must be considered. The role that market-based systems of water distribution can play in enhancing the management and sustainability of water resources has garnered attention. An important element that cannot be ignored when contemplating changes to established agricultural water delivery systems must be users' readiness for change. Thus the purpose of this paper is to examine factors that impact the readiness for organizational change to a system where users can buy and sell water in an open market.

Design/methodology/approach – Using data collected from a survey of greenhouse growers in Almería, Spain, a model of binary choice was developed to predict the probability of growers' readiness to buy and sell water in an open market.

Findings – The level of education of the grower, and the use of a euro per hour water metering system positively impacted the probability of the willingness to participate in formal water markets. Also, the degree of satisfaction in the administration of the growers' irrigation community, as well as their overall confidence in anticipated water supplies, had a negative impact on readiness to change.

Research limitations/implications – This research offers an interesting and unique scholarly contribution as it fuses the extant management literature on the topic of organizational change with issues related to natural resource management, thus contributing to the growing literature(s) related to resource sustainability and management.

Originality/value – This research provides insight into some important factors which may predict the readiness to change of agricultural water users toward more market-driven distribution systems.

Keywords Management, Sustainability, Agribusiness

Paper type Research paper

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Introduction

Water is one of the world's most precious natural resources. Threats such as pollution, quality degradation, and climate change have the potential to negatively impact global water supplies. These threats, coupled with a steadily increasing world population, puts unusual strains on world water supplies and systems of allocation and delivery. As such, sustainability considerations of such a valuable resource are imperative. Systems for allocating water among various users (industrial, agricultural, municipal) are very heterogeneous throughout the world. In most instances, governments (both national and local) and/or other quasi-governmental organizations are, at least to some extent, involved in the allocation and delivery of water to various entities. Under these "command and control" paradigms, water is often heavily subsidized (in particular for agricultural uses) and therefore the price of water may not truly reflect supply and demand fundamentals. Thus, misallocations arise resulting in a general loss of economic welfare. Given this, many economists, policy experts, and international organizations such as the United Nations recommend the turn away from command and control policy measures toward more market-based solutions, in particular the adoption of water markets, in order to encourage cost-effective conservation measures and ultimately improve the management and sustainability of water supplies (Adler, 2009; Bjornlund, 2003; Frederick, 2001; Appelgreen and Klohn, 1999). Bjornlund (2003) provides an excellent literature review for the justification and evolution of water marketing paradigms throughout the world.

While there are numerous economic, political, and societal issues to consider, an important first step in assessing the feasibility of implementing a water marketing paradigm is to gauge the "buy-in" from the major constituents. For the case of irrigation water for agricultural purposes, one of the main constituencies are the growers themselves as they are exposed to the risk of fluctuating water prices, as well as the variability of water supplies and quality. Indeed, for a market-driven system to work, the constituents (growers) must be willing to modify, or scrap altogether, their current system of water allocation and payment. However, such market-based redistribution of water may not ever occur unless the social and cultural attitudes toward water trade of said growers are understood (Tisdell and Ward, 2003). There may be an overall lack on the part of these constituents to change, especially if they are reasonably content with the status quo. This is particularly true if the command and control mechanisms and infrastructure have been in place for quite some time. In essence, an important element that cannot be ignored when contemplating changes to established water delivery systems must be potential participants' readiness for change. In today's dynamic and competitive world, embracing change is not only a business necessity, but organizations and their members must be in a continued state of change readiness in order to remain viable (Rowden, 2001).

Almería, a province of Andalucia, Spain, is home to one of the largest concentrations of greenhouse agricultural production in the world. Greenhouse production is water intensive, and the arid climate of Almería makes water resources especially scarce. A more liberalized water marketing paradigm, one in which the region's growers could trade water among themselves in an open market rather than relying on the current command and control policies in place, has been suggested as a way to promote the long-run sustainability of water resources in the region (Garrido and Llamas, 2007). Almería provides an interesting case study in assessing farmers' readiness

for organizational change – a change from a command and control water policy to a market-based one. A change toward a system of water marketing would necessitate significant changes in the way that growers conduct their irrigation practices and deal with their current irrigation providers. Indeed, for a water market to be successful in the region, the regions numerous and heterogeneous greenhouse growers would need to embrace the concept.

Therefore the objective of this research is to examine factors which may impact the readiness for organizational change (e.g. a change from current command and control policies) to one where growers can buy and/or sell water in an open market. In doing this, we used data collected from a large survey of Almería greenhouse growers to estimate a model of binary choice used to predict the probability of a greenhouse grower's readiness to buy and sell water in an open market. In addition to the modeling effort, in-depth interviews (McCracken, 1988) were conducted with a small sub-sample of individual growers and irrigation officials. The in-depth interviews were used to corroborate the insights provided by the modeling effort.

The remainder of the paper is organized as follows. First, a discussion of the readiness for organizational change literature is provided. This is followed by a brief overview of Spanish water policy and the water distribution system in Almería. The survey data used are then presented and discussed, followed by a description of the model of binary choice used in the analysis. Discussion of the results from the modeling effort, as well as a summary of findings from the in-depth interviews, is then presented, followed by summary and conclusions.

Theoretical background

Readiness for and resistance to change

The concept of readiness for change has been defined and investigated in many ways in the organizational change literature. Some researchers describe readiness for change as the extent to which individuals hold positive views about the need for organizational change as well as the extent to which individuals perceive that change will positively impact them and the organization as a whole (Armenakis *et al.*, 1993; Holt *et al.*, 2007; Jones *et al.*, 2005; Miller *et al.*, 1994). Others focus on change readiness from individuals' perceptions that their organization and its members are prepared to take on large-scale change efforts (Eby *et al.*, 2000). Scholars also suggest that in order for individuals to be ready for change, they must perceive the benefits of the change (Prochaska *et al.*, 1994) as well as understand the risks involved in failing to change (Spector, 1989). Regardless, most researchers agree that readiness for change involves a process whereby the attitudes and beliefs of members of an organization are altered to perceive a change to be both necessary and likely to be successful (Eby *et al.*, 2000; Lewin, 1951).

The critical role that readiness for change plays in a successful implementation effort is well documented in previous research in various sectors of work. In a longitudinal study of healthcare workers, Cunningham *et al.* (2002) found readiness for change was a good predictor of participation in a change effort in the healthcare industry. They found that the more ready for change individuals reported they were the more individual contribution they put forth in the change effort. Additionally, in a sample of state government employees, Jones *et al.* (2005) found that readiness for change predicted system usage after implementation of a new information

technology system. Their analyses also revealed that higher levels of change readiness prior to implementation had positive effects on levels of satisfaction with the system change after implementation. Arguably, the importance of readiness for change seems apparent for both acceptance and ultimate satisfaction of proposed change efforts. Accordingly, it seems appropriate to suggest that changing from the current water distribution system present in our sample to a more market-based approach would require potential participants to be cognitively ready for change in the first place.

On the other hand, research on resistance to change has typically focused on characteristics of the individual such as personality attributes, cognitive processes, and perceptions that individuals have regarding the provision of timely information regarding the change as well as decision-making involvement regarding the change (Jones *et al.*, 2005). Although resistance is often considered a natural response to change, in order to mobilize change or renewal efforts, it must be overcome so that an increase in participation and acceptance of change initiatives is realized (Eby *et al.*, 2000; Lewin, 1951; Wheatley, 1992). Scholars have suggested several strategies for dealing with resistance such as providing education, communication, participation, support, and negotiation and agreement opportunities to those impacted by the change (Kotter and Schlesinger, 1979). However, scholars also suggest that the reduction or mitigation of resistance can only occur by first producing readiness (Armenakis *et al.*, 1993). Moreover, some suggest that readiness for change is the cognitive precursor to either resistance or support (Backer, 1995). Nonetheless, assessing the readiness for change of growers in our sample seems like an important step in realizing the successful implementation of water markets.

Water distribution in Almería, Spain

Policy and regulation of water used for agricultural irrigation is handled through various Spanish governmental institutions. The Ministry of Environment handles the resource management while the Ministry of Health is in charge of maintaining water quality. In terms of water distribution, Basin Agencies are in charge of planning, constructing, and operating major water infrastructure such as dams (Garcia del Campo, 1999). Basin Agencies also set, monitor, and enforce water quality targets. They also grant permits to use water, and inspect water facilities for which permits were granted. They undertake hydrological studies, and provide advisory services to other entities at their request. There are a total of 15 Basin Agencies in Spain (Garcia del Campo, 1999). A president and board govern each Basin Agency. If water travels between autonomous communities then it is "Federal" jurisdiction, if the water remains in the autonomous community it is "State" jurisdiction. An autonomous community in Spain would be similar to a state in the USA; there are 19 in Spain, Andalucía being one of them.

In Almería, most of the water distributed to growers is ground water pumped from aquifers. Because of the difficulties for individual growers to drill and obtain the water, irrigation communities (known as comunidades de regantes or "regantes" for short) are put into place to drill wells, sell, and distribute underground water to the growers. An irrigation community can be defined as a grouping of owners of an irrigated area which benefits from the allotment of water granted by the government. Irrigation communities are granted internal autonomy and maintain their own governing structure (Garcia del Campo, 1999). While autonomous in their structure and governance, the individual regantes execute the command and control policies of the

Spanish government in terms of allocating water to end users. Thus the regantes play a critically important role in water distribution in Almería. It is also important to note that water rights are directly tied to the land and not the individual owner of the farm. Therefore, if a grower sells his or her land, the water rights go to the new owner.

Figure 1 provides a diagram of the above described system of water allocation. Ultimately, the individual regantes are responsible for the infrastructure of the water pumping, storage, and delivery system of irrigation water to the greenhouse growers that are members of the irrigation community.

Data

Data gathered through a comprehensive survey of Almería's greenhouse growers were used in estimating a model of binary choice described in the next section. The survey entitled "Questionnaire on the Usage and Management of Water and Technologies of Irrigation in the Horticulture of Greenhouses of the Tropical Coast of Granada"

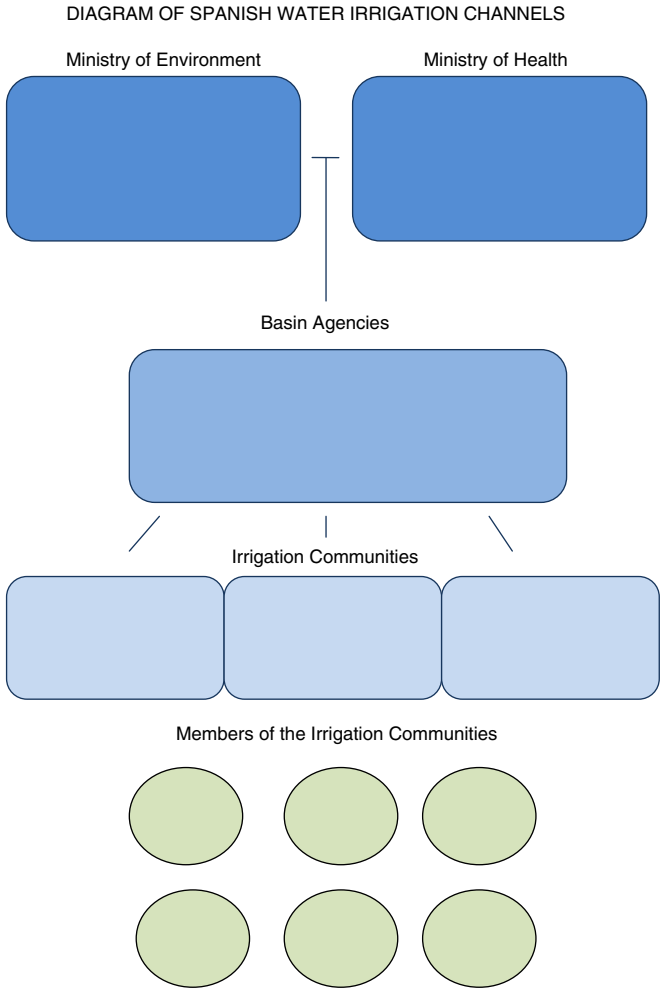

Figure 1.
Diagram of Spanish irrigation channels

(translated) was created and administered by faculty and graduate students of a university in the area. The survey, chartered and financed by the Center of Science and Technology Investigation and the Ministry of Education, was designed to garner general information on Almería's greenhouse industry including demographic information of the primary grower/decision maker, overall farm characteristics, management of hydrological resources, irrigation technologies used, opinions on the current system of water allocation, as well as questions designed to gauge insight into the attitudes of the growers toward water trading. The survey contained 64 questions that were categorized into four major groups: data on farm characteristics; management of hydrological resources; adoption of irrigation innovation; and grower demographics.

The survey data were collected using a rigorous data collection process. Collection of the survey data commenced in 2003, with completion in 2006. Each greenhouse grower represented in the survey was individually interviewed with answers recorded by an enumerator. There were 133 greenhouse growers interviewed, which ultimately yielded 127 usable responses for use in the modeling efforts. In total, 127 observations were used in the logit model described in the next section because some of the growers did not completely answer all of the questions linked to the variables in the model. Enumerators included graduate students and faculty from a local university. While the data collection process was intense and slow, the enumeration process allowed for a large, complete sample. Once the data were collected, they were coded for use in econometric modeling. Survey questions and responses were translated from Spanish into English for use in this research. A full list of the survey questions (translated) and the original copy of the survey instrument are available from the authors by request.

From the survey data, insight is gained into the overall characteristics of the Almería greenhouse industry. From the sample of greenhouse growers interviewed, 41 individual irrigation communities were represented in the region. In all, 35 of the growers were members of the largest irrigation community in the Almería region. The average farm size was 2.18 hectares, with a range of 0.5-8 hectares, and water consumption averaging 8,163 cubic meters of water per half year. Total hectares under cultivation for all respondents were 290 hectares, with over 1.05 million cubic meters of water used. Water usage is highly correlated with farm size. Of the 133 farms originally surveyed, there are 351 individual greenhouses in operation, with various crops cultivated throughout the year. Peppers represent the most popular crop, with 84 of the farms reporting that they grow peppers within a calendar year. Other popular crops include melons, cucumbers, squash, and tomatoes with 58, 56, 51, and 49 farms reporting that they grew these crops, respectively. Out of the farms originally surveyed, eight are charged a fixed euro amount (total) for their water, 61 are charged a variable rate based on euros per cubic meter of water used, and 63 are charged on a euro per hour of irrigation. The method that individual farms are charged for their water usage is dependent on the policies of their respective irrigation community.

When asked for their preference of charging method, however, an overwhelming majority of growers preferred a variable rate system or a mixed system compared to an outright fixed system of charging for water. Most of the growers interviewed (116) reported that farming was their full-time occupation. The average number of years farming of those included in the survey was 18.6 years, with 28 percent of the growers surveyed working in production agriculture for at least 20 years. Average age of the growers interviewed was 41, ranging from a minimum of 22 years to a maximum of 62 years. In terms of education, 56 percent of the sample has attended secondary school, with 23 percent having at least some university level education.

Model of binary choice

The questions from the survey were carefully examined in order to specify an econometric model which would provide insight into the growers' readiness to participate in water trading. Recall, readiness for change is considered the precursor to resistance or ultimate support of a change initiative. Hence, readiness to participate in water trading would represent a desire or willingness to change the status quo or the current system of water allocation. Specifically, a logit model of binary choice was used (Gujarati, 1995). The model was estimated where the dependent variable represents the readiness/decision to participate or not participate in the buying and selling of water, and the independent variables collectively represent an index which explains the probability of choosing to participate or not participate in water trading. The logit model is specified where the prediction of the dependent variable (D_i) is the log of the odds that D_i will equal 1, or in this case a response of "yes" to both buying and selling water (Greene, 2007). The general specification for the logit model is:

$$\ln\left(\frac{D_i}{1-D_i}\right) = \beta_0 + \beta_1 X_1 \ldots \beta_n X_n + \varepsilon \quad (1)$$

where ln is the natural logarithm, X_n reflects independent variables that describe the binary choice, and ε is the residual. In determining goodness of fit of the logit model, both the McFadden Pseudo R^2 and the χ^2-statistic were used. A pseudo R^2 value of 0.2-0.4 is considered to be a good fit for the model (Louviere *et al.*, 2000).

In a binomial logit model, the signs and the significance of the β-coefficients are of primary interest as the β's themselves cannot be interpreted directly. For example, if the β has a negative sign we can say that the variable has a negative effect on $D_i = 1$ (a yes response). Focus is also placed on the marginal effects of the coefficients (Greene, 2007). Marginal effects measure that for every 1 unit increase in the independent variable, holding all other variables constant, the probability that D_i will equal 1 will either increase or decrease by the percentage value of the marginal effect.

In general, it is hypothesized that the readiness to participate in water markets is driven by farm characteristics (e.g. farm size; amount of water used; crops grown; regante that the grower participates in), current delivery methods (e.g. charging rate; delivery technologies, etc.), attitude variables (namely attitudes toward the water delivery system, attitudes/opinions of the regante they are in, etc.), as well as demographics of the grower (age, education, years farming, etc.). In determining the final specification of the model, correlations between various variables derived from the survey were examined to avoid multicollinearity among independent variables. In the specification of the final logit model, the hypothesis is that readiness to participate in a system of water markets is a function of farm size, rate at which the grower is charged for water, confidence they have in their current water delivery system and the degree of respect they have for their irrigation community (attitude variables) as well as level of education.

Table I summarizes the variables used in the logit model. The dependent variable Buysell was created from two individual questions on the survey asking respondents about their readiness to buy and sell water in an open-market system. The first question asked the respondents to state either yes or no to their willingness to buy water from another irrigation community (regante) if they needed to. The second question asked the respondent to state whether they would be willing to sell water to another irrigation community if they did not need it for their own use. Thus the Buysell variable takes a 1 if

Variable	Description
Dependent variable	
Buysell	Dummy variable representing respondent response to question of willingness to both buy and sell water in an open market (1 = yes to buying and selling; 0 otherwise)
Independent variables	
Size	Total farm size in hectares
Rate	Dummy variable representing the euro per hour method of charging for water by the respondent's regante (1 = euro per hour; 0 otherwise)
Confidence	Scale measuring respondent's confidence that their farm's water needs will be met within a given year. Scale ranges from 0 to 10, with 0 representing no confidence that water needs will be met and 10 representing the highest confidence that water needs will be met
Respect	Scale measuring respondent's overall satisfaction with the operations of their respective regante. Scale ranges from 0 to 10, with 0 representing complete dissatisfaction and 10 representing complete satisfaction (could not be better)
Primary Secondary University	Dummy variables representing highest level of education (e.g. if highest level of education was "secondary", then Secondary 1, Primary 0, and University 0, respectively)

Table I.
Description of variables used in logit model

the respondent answered yes to both of the above questions and a 0 if they answered no to either of the above questions. A yes response to both the question of readiness to buy and sell (as opposed to just buying or just selling) reflects a better representation of the grower's likelihood to participate in water markets. Out of the 127 respondents, 114 said yes to just buying, 74 said yes to just selling, and 71 said yes to both buying and selling. This discrepancy between the readiness to buy and not sell could be due to the fact that greenhouse growers in Almería currently have little experience in selling water, or are inherently apprehensive in giving up a scarce and needed resource despite market forces which may encourage them to do so.

For the independent variables, Size represents the total farm size in hectares. Rate measures the type of charging system that the grower's regante utilizes in charging the grower for water. Thus Rate is directly correlated with the policies of the governing regante. In the model, Rate equals 1 for a euro per hour system, and 0 for the other two systems (euro per cubic meter and fixed euro allocation). Therefore, the impacts on the dependent variable of a euro per cubic meter and fixed payment systems are reflected in the intercept term. Confidence measures the level of confidence that the grower has toward the ability of their regante to deliver the necessary water needed to support their greenhouse operations. Respondents were asked to rate on a scale of 0-10; with 0 being the lowest and 10 being highest, their degree of confidence they have at the beginning of each year that they will have enough water to sufficiently irrigate their farm. In answering this question, respondents were specifically asked to reflect on their past experience with their regante in terms of their ability to provide needed water. Respect measures the grower's overall respect and satisfaction with the operations of their regante. Specifically, respondents were asked what degree of satisfaction and respect, from 0 to 10, do you have for the operation of your irrigation community, with 0 representing complete dissatisfaction and 10 meaning perfect, it could not be better. Finally, three 0-1 dummy variables were created to measure the impact of education on the willingness to participate in water marketing – Primary, Secondary, and University. These variables were created from a survey question asking the respondent to report how much formal

education they have obtained. Specifically, the question asked the respondent to report the number of years of schooling they had for each – primary, secondary, and university, as well as an option of "none." The highest level of schooling was coded as a 1, with all other categories 0. Therefore, if the respondent stated that they had two years of university education, University was coded as 1, and Primary and Secondary was coded as a 0, with the impact of "none" influencing the intercept term.

Lastly, in-depth interviews (McCracken, 1988) were conducted with a sub-sample of greenhouse growers in the region, as well as an engineer from one of the largest irrigation communities in Almería. These interviews were conducted in 2009, after the completion of the collection of the survey data. The insight gained from these interviews helped to shed additional light on the opinions and attitudes of greenhouse growers toward water markets, corroborate the findings from the econometric modeling efforts, and provide a broader picture of the current water allocation regime in Almería.

Empirical results

Table II shows the results of the binomial logit model. The McFadden Pseudo R^2 suggests that the model is a good fit at a value of 0.225. As well, the p-value from the χ^2-test is significant at the 5 percent level, also suggesting that the model is generally a good fit. The signs and significance levels, as well as the marginal effects shed considerable light on the readiness of the growers to participate in water markets. While Size has a negative sign, it is not statistically significant, nor does it have a large marginal effect on the log of the odds ratio. Rate, however, is positive and statistically significant at the 5 percent level. Therefore, if the grower is charged on a euro per hour basis, the marginal effect on the log of the odds ratio is 14 percent (0.142). In other words, if a grower is charged on a euro per hour basis, they are 14 percent more likely to say that they would both buy and sell water on the open market if they could. It is important to remember that the way a farm pays for its water (e.g. euro per hour) is a direct function of the regante to which they belong to. To charge on a euro per hour basis, the regante must have in place the proper water infrastructure and delivery technology (e.g. meters) to facilitate a variable rate system of charging for water. Indeed, having this infrastructure in place is a necessary condition for water markets to function. Thus the fact that the infrastructure is already in place to charge on a variable usage basis (euro per hour) may ultimately increase a growers readiness for organizational change as the necessary technology is already in place. In fact, growers charged on a euro per hour basis are often allocated a set number of hours that they

Variable	Coefficient	SE	p-value	Marginal effect	
Constant	7.000	1.709	0.000	1.218	
Size	−0.002	0.197	0.989	−0.001	
Rate	0.822	0.422	0.051	0.142	
Confidence	−0.474	0.192	0.013	−0.082	
Respect	−0.391	0.152	0.010	−0.068	
Primary	−0.449	0.527	0.395	−0.076	
Secondary	1.030	0.629	0.099	0.153	
University	29.760	0.994	0.000	0.424	
McFadden's R^2					0.225
χ^2 (p-value)					0.000

Note: n = 127

Table II.
Results from the binomial logit model

can irrigate by their regante. If the grower implements water saving irrigation and cultivation practices, they may not need all of the hours in their allocation, and can therefore sell (or buy if they are short) their excess allocations to other members of the regante. Indeed, some growers that are charged on a euro per hour basis may already have a form of water marketing available to them and are thus more ready to participate in a broader, more formal water market. The positive sign and significance of Rate may also have an additional interpretation which supports the likelihood that a grower would say yes to both the buying and selling of water in an open market. That is, growers charged on a euro per hour basis may perceive it as a sub-optimal charging system relative to a euro per cubic meter method which measures actual water use and thus may contribute to subsequent water sustainability. If this is indeed the case, growers charged on a euro per hour basis may be more willing to buy and sell water in an open market as they view a move toward a more market-orientated delivery system as ultimately leading to more optimal allocations of water.

Confidence and Respect both have negative signs and are statistically significant at the 5 percent level. Therefore, the higher the confidence that a grower has in their regante's ability to deliver their needed water, the less likely their readiness to participate in water trading. Similarly, the higher the level of respect they have for the operations and management of the regante, the less likely is their readiness to buy and sell water in an open market. The interpretation of these two variables is particularly interesting as it suggests that if a grower is satisfied with their current water allocations, price, and the management of their regante, they have little incentive to change to a system of liberalized water markets despite the potential for more optimal allocations for the region as a whole. Thus growers that have high confidence and high respect for their regante are likely not ready for organizational change despite the positive welfare effects that theoretically could be obtained under a system of water markets. In other words, they are satisfied with the status quo and are likely not to embrace change in the short run. On the other hand, confidence and respect in the regante may suggest that the regante could be instrumental in influencing the opinions of its grower/members to ultimately support a more liberalized water market. This may particularly be the case if the regante already maintains infrastructure and technology that can eventually facilitate water marketing (e.g. the ability to charge a euro per hour rate for water).

Interestingly, the level of education has the highest marginal effect on the readiness to participate in water marketing. Primary has a negative sign, but is insignificant. However, both Secondary and University are positive, with University significant at the 5 percent level. In fact, University has the largest marginal effect of any of the independent variables at 0.42. Therefore, if a grower has at least some university education, they are 42 percent more likely to answer yes to their readiness to buy and sell water in the open market. It is difficult to say why this may be the case. However, it is likely that growers with at least some university education have been exposed to some economic theory including the benefits of market mechanisms in allocating scarce resources. It may also suggest that more educated growers are more open to new ideas and innovations more generally.

Insights from in-depth interviews

Information garnered from follow-up interviews conducted with local growers and irrigation officials helped to confirm the overall findings from the econometric modeling effort. In total, five individuals were interviewed, including four greenhouse

growers and an irrigation community official. The interviewees were made available through contacts at a local university as well as through other local sources. Of the four growers interviewed, two of them belonged to the same irrigation community (regante), while the other two received their water from different regantes, respectively. Three of the growers were charged for water by their respective regante on a euro per cubic meter basis, while the other was charged a fixed euro per hour rate for their irrigation water.

Each of the growers that were charged on a euro per cubic meter basis expressed contentment with their payment and distribution system. In particular, the two growers that were part of the same regante, noted that they were quite happy with the operation of their irrigation community, and were quite adverse to the idea of water trading as it would be complicated and disrupt an already good system. Therefore, these growers appeared quite content with their current system and the operation of their regante. The irrigation community representative interviewed worked for the regante that these two growers belong to, and basically confirmed that most of their constituent growers are happy with their irrigation services. While the other grower from the different regante did express some interest in the idea of water trading, overall the readiness to change of the three growers charged on a euro per cubic meter basis, regardless of regante, was quite low. On the contrary, the one grower interviewed that was charged on a euro per hour rate from their regante was dissatisfied with the cost of their water delivery, and was generally displeased with the operation of their irrigation community. While it would initially seem that this grower would indeed be interested in water trading given their dissatisfaction with the status quo, the grower seemingly had little knowledge of the concept of water trading, and little knowledge of water rights in general.

Interviewing growers from different irrigation communities is crucial because it gives a sense of how the growers' opinions come about through the communities' specific regulations and rate of charging for water. It seems that when growers have a method of payment found to be not only satisfactory, but also to their liking, they are less ready to change or willing to participate in the trading of water. In other words, they do not perceive any benefit from changing the current system and they do not want to complicate their situation. The growers interviewed that were charged on a euro per cubic meter basis were completely happy with their method of payment. This contentment poses a problem when trying to get growers to embrace the idea of trading water. However, we see that this is consistent in the empirical (logit) model as well. The more confidence and respect the grower has for the operation of their irrigation community the less likely they are to participate in trading water.

Overall, the in-depth interviews confirmed the empirical results. That is, contentment with the status quo is likely an impediment to organizational change. Moreover, there is no impetus to change to a water marketing system that is perceived as more complicated and more variable than the current system in place.

Implications for research and practice

Even though economic theory suggests overall welfare gains, and ultimately more sustainable water supplies may result from moving away from command and control policies to a system of water markets, many barriers still contribute to the delay of their adoption. High transaction costs and key constituents' attitudes are a big deterrent in the widespread adoption of water markets. This research has emphasized the importance of creating readiness for change prior to initiating change and the

importance of needing the right skills and resources for successful change to occur. In our analyses, we see that approximately 55 percent of the famers are cognitively "ready" to buy and sell water, however, when asked directly if they had ever heard of any cases of water trading, most had said they had not. In fact, most had not even heard of the concept of water markets. This is interesting because it shows that even if growers say they would be ready to trade water, many of them are not familiar with what would be required to adopt such a model. As such, many do not see it being realized. This information, while specific to a subset of growers in Spain, provides a launching point for other researchers doing similar work in other parts of the world.

In the organizational change literature, creating self-efficacy (confidence in individual and organization's ability to make the change succeed) is a key component in promoting readiness through appropriate communication of the change message (Armenakis and Harris, 2002). As stated above, we can see from our interviews that not having the right knowledge about why a change would be beneficial or the confidence to realize such a change can thwart change efforts before they even begin. In essence, members must be told why change is needed and believe that the change is possible in the first place before they participate in change efforts. If water trading is ever to occur in Almería, arguably, creating both cognitive readiness for change as well organizational reshaping capabilities is critical. Beckard and Harris (1987) discuss the link between reshaping capabilities and readiness for change in their research on organizational transitions (Jones *et al.*, 2005). They suggest that although readiness for change involves the motivation and willingness to change, reshaping capabilities involve the knowledge, skills, and abilities of the organization as a whole to carry out what is needed for a successful change implementation (Beckard and Harris, 1987; Jones *et al.*, 2005). As such, creating the impetus to change alone without ensuring members of the organization are capable of handling the change would not be enough for a successful change effort.

In Almería, the current infrastructure, system of water rights, water management, and enforcement would all have to be modified in order to ensure a functional open water market. Doing so would not be possible without the appropriate support. This is a major undertaking because all interested parties must be at least in some agreement with the terms, costs, and potential outcomes of a more open market-orientated system of allocating water. Considering that the regantes hold much influence over the current system of water allocation, if change efforts are to be embraced by the growers, the regantes would need to play an important role in communicating the benefits and feasibility of a transition to a formalized water market. Regantes would need to promote the reshaping of the current structure to a more market-driven system.

Although the variables examined in this study are not necessarily things that can be readily manipulated by a policy maker, regulator, or others with an interest in successful adoption of a water market, in order to make recommendations to such parties, future research could explore the impact of education about markets or water shortages on ones' willingness to participate. This type of research could employ a longitudinal analysis and perhaps a field experiment with a manipulation that provides education in one region and not another and examine the difference in changes in willingness to change. Additionally, it would be interesting to examine populations in different countries/cultures – such as one with a long history of a market economy with strong property rights and another without such an economy. Doing so would give more variation and could provide additional insights. To our knowledge, this study is the first to examine the adoption of market-orientated water allocation

from the perspective of grower's willingness to change. Accordingly, the results must therefore be viewed as exploratory. However, the value of continued research in this area seems reasonably high.

Although there are research benefits to be realized through market-orientated water allocation, a major hurdle to its actual implementation is the lack of "buy-in" from growers themselves. This research makes some strides in trying to determine factors that may influence growers' readiness to participate in water markets. Our study shows that education becomes very important when trying to show current and next generation farmers the benefits of open water trade. From a practical standpoint, providing such knowledge to growers is not just specific to the current sample, but it can be applied to other countries as well. Change agents, whether they are growers, regantes, or governing bodies, need to understand that the link between readiness for change and a successful change implementation should not be overlooked. This is perhaps the most transferable practical implication gained from this research.

Creating readiness for change by communicating the incentives and benefits of open-market trade through education becomes vital whether in Spain or other parts of the world. Because natural resources such as water cannot be utilized indefinitely, ensuring the sustainability of such precious resources is imperative. Another important implication of this research goes beyond just understanding readiness for change as it relates to changing from current water distribution systems to more market-based systems. Our study suggests that designing, or redesigning, institutions and policies that can enhance the sustainability of water use patterns around the globe is of great import. Thus, practical insights from this research could assist in ensuring the long-term sustainability of water resources, efficient pricing and distribution methods in order to meet future water demands.

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About the authors

Phillip T. Manno is a Former Graduate Student in the Morrison School of Agribusiness and Resource Management at the Arizona State University.

Dr Jesus Bravo is an Assistant Professor in the Department of Management at the Washington State University. His current research and teaching interests include interpersonal processes as they relate to such topics as organizational justice, organizational change,

workplace aggression and employee careers. He holds a PhD in Business Administration from the University of Illinois at Chicago.

Dr Mark Manfredo is a Professor in the Morrison School of Agribusiness and Resource Management at the Arizona State University. His research and teaching interests are in the areas of agricultural and resource market performance, risk management, and commodity price analysis.

Dr Rafael C. Leon is a Professor in the Department of Economics and Business at the University of Almería, Spain. His research and teaching interests are in the areas of agricultural business and agricultural policy.