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Abstract

Rain barrel owners may represent a target audience with whom Extension agents could engage in specific ways. The study reported here identifies unique attributes of rain barrel owners and may help develop programming to decrease residential water use. Clientele of a county Extension agent were surveyed about landscaping and water conservation efforts. Rain barrel owners reported performing significantly more water conservation behaviors, both outdoors and indoors, than those without a rain barrel. We conclude rain barrel ownership is related to additional water conservation behaviors in this audience. Implications for Extension programming, delivery strategy, and future research are discussed.

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Introduction

Conserving water used outdoors for landscape irrigation in residential areas represents both an opportunity and a challenge for water resource managers and Extension agents. In Florida, one study found that between 46% and 75% of a household's water is used outdoors (Dukes, Miller, & Haley, 2005). When addressing water conservation, Extension agents should understand that certain groups of residents may have different attitudes towards conservation and, therefore, have different educational needs. Knowing these attributes of Extension audiences can help agents develop landscape water conservation programs that meet the different needs among distinct groups, or segments, of the general public.

Audience segmentation is a technique that is commonly used in the field of social marketing to identify individuals who are more likely to adopt recommended behaviors (Andreasen, 1995; Mailbach, Maxfield, Ladin, & Slater, 1996; Slater, 1996; Weinreich, 2011). Agents can apply this strategy to identify and profile specific targeted audiences to engage with programming designed to change behavior (Monaghan, Ott, Wilber, Gouldthorpe, & Raceviskis, 2013). The purpose of the study reported here was to investigate how homeowner water conservation behaviors (WCBs) in yards can be used to identify and segment Extension audiences into distinct groups. Specifically, we wanted to know if owning a rain barrel (RB) is related to attitudes and behaviors that help identify audiences likely to conserve water in other ways.

RBs are usually 55-gallon plastic containers that collect stormwater runoff from rooftops and gutters (United States Environmental Protection Agency, 2009). The water collected can be stored and later used to irrigate gardens, potted plants, and lawns. Collecting stormwater can also reduce erosion and pollutant runoff. However, there is little evidence that RBs can consistently meet irrigation needs of residences (Ando & Freitas, 2011; Bakacs et al., 2013; Jones & Hunt, 2010). Most RBs designed for residential use lack the capacity to meet the water needs of turfgrass, the dominant groundcover in many yards (Milesi et al., 2005; Mustafa, Smucker, Johns, Ginn, & Connely, 2010; Robbins & Birkenholtz, 2003).

Regardless of the limitations of the technology, RB workshops hosted by Extension faculty in Florida and elsewhere have been popular (Bakacs et al., 2013; Southwest Florida Water Management District, 2009). RB use may be a visible indicator of "green attitudes" or a "water conservation ethic" (Ando & Freitas 2011; Barnett 2011; Mustafa et al., 2010). Even if the actual water savings from individual RBs are insignificant, RBs can serve as visual cues that water conservation is a social norm among some members within a community (McKenzie-Mohr, 2011; Stern, 2000). The visibility of RBs could also influence the spread of the technology and other recommended landscaping behaviors within their neighborhoods (McKenzie-Mohr, 2011, Rogers, 2003).

If RB owners are a unique audience in terms of their commitment to reduce water in landscaping, Extension programs may increase adoption of landscaping best management practices (BMPs) by targeting programming specifically to them. Further, RBs may be a catalyst for homeowner adoption of other BMPs that conserve water (Bakacs et al., 2013). The research investigated specific attributes of RB users and whether RB usage is associated with the use of other WCBs.

Methods

In 2010, our team, which included an environmental horticulture agent, state specialists, and a graduate research assistant, created a 26-item Internet-based questionnaire to examine landscaping practices related to water conservation. The survey elicited respondent demographic data; home ownership status; features of the neighborhood; information on residential irrigation practices; use of landscaping contractors; fertilizer application; and information about RB ownership, use, and satisfaction.

We created two variables from two sets of survey questions regarding indoor and outdoor conservation behaviors. The indoor conservation variable was the number of indoor behaviors respondents indicated they performed from a list that included having low-flow toilets and shower heads, taking

short showers, turning off the faucet when brushing teeth or scrubbing dishes, using aerators to reduce faucet flow, and owning an Energy Star washing machine. The outdoor conservation behaviors variable was the number of behaviors, including landscaping with plants that conserve water, mulching around plants to reduce evaporation, watering the yard early in the morning or late in the evening, and having a shut-off nozzle on their hose.

The survey population was a nonrandom sample of 1,500 people who had provided their email addresses at Alachua County Extension programs and outreach events over a period of 10 years. The programs included landscaping workshops, native plant sales, and sales of compost bins and RBs at a reduced cost. The Extension agent emailed a newsletter to these constituents monthly. This time, the agent emailed them an invitation to participate and a reminder email with a link to the online survey four weeks later. The response rate was 36% (n=545), though not all participants answered all of the questions.

We used multiple imputation to address the problem of missing values (Schafer and Graham, 2002). Specifically, we used the Proc MI procedure in the Statistical Analysis System (SAS) 9.3, to create 10 sets with imputed data (Yuan, 2010). These data were then analyzed using the standard procedures for calculating frequencies, means, and regression parameter estimates for each imputed data set. We calculated statistical significance by chi-square or t-test and their associated probability levels. Effect size was based on Cramer's V, Pearson's correlation coefficient, or R-squared, as appropriate (Vaske, 2008).

In order to address the focal issue of the study, the extent to which RB ownership is associated with the number of water conservation practices in the yard and in the home, we used multiple regression. We hypothesized that demographic predictors (age, years in Florida, education, income, and living in a neighborhood organized by a homeowners association [HOA] or not), behavioral measures (including Extension contacts, fertilization frequency, having an irrigation system, irrigation frequency, and hiring a lawn service), and RB ownership would be associated with a larger number of WCBs reported by respondents in their yard and home. We conducted the regression analysis as a block model to examine the effects of each set of predictors (Table 2).

Our approach treated the demographic variables as exogenous factors and focused on the mediating effects of RB use (Baron & Kenny, 1986). With our final analysis step we estimated the results across the 10 imputed datasets using Proc MIAnalyze (Yaun, 2010).

Results

The initial phase of the analysis compared respondents who used a RB with those who did not. As shown in Table 1, the two groups were similar in their demographic attributes, including respondents' age, years of residence in Florida, and educational attainment. There was a tendency for non-adopters to be more likely than RB owners to have a household income over $150,000 and to live in a neighborhood organized by an HOA, though P-values did not meet the 0.05 threshold for statistical significance.

There were statistically significant differences between RB owners and non-adopters regarding landscape maintenance behaviors and water conservation practices (Table 1). For example, non-

adopters were more likely to have a permanent irrigation system (P=0.002) and to employ a lawn care service (P<0.001). Non-adopters also fertilized (P<0.001) and irrigated (P=0.002) the lawn more often than RB owners. In contrast, RB owners reported using significantly more water conservation practices in the yard and in the home (P<0.001). However, the frequency of contacting Extension for information was not substantially different between RB owners and non-adopters (P=0.106).

Table 1.

Profile of Respondents by RB Adoption (n = 523 unless otherwise noted)

	RB (n = 189)	No RB (n = 334)	T-statistic or Chi-square	P-value	Effect Size
Age (mean, in years)	54	55	-1.65	.100	-.074
Years living in Florida (mean)	31	30	0.51	.612	.001
Education (%, n = 514)			2.522	.641	.070
Some high school	0.5	0.3			
Completed high school	6	6			
Completed high school	15	17			
Some college	44	38			
Advanced degree	34	40			
Annual Household Income (%, n = 442)			8.576	.073	.139
Under $30,000	15	11			
$30,000 - $49,000	28	24			
$50,000 - $74,000	26	25			
$75,000 - $149,000	19	16			
More than $150,000	12	23			
Lives in HOA (%)	34	43	3.77	.052	-.085
Permanent irrigation system (%)	34	49	10.11	.002	-.140
Use a lawn care service (%)	17	36	21.13	<.001	-.201
Contact Extension for information last year (%, n = 515)			6.128	.106	.109
Never	47	54			
Once per year	24	21			
Two or three times per year	14	16			

More than three times per year	15	9			
Fertilization frequency (%, n = 515)			25.312	<.001	.222
Never	38	31			
Less than once per year	13	13			
Once per year	20	11			
Two times per year	22	26			
3-4 times per year	4	17			
More than 4 times per year	2	2			
Irrigation frequency (%)			14.822	.002	.169
Never	65	50			
Once per week	15	16			
Twice per week	17	31			
More than twice per week	3	4			
Mean number of conservation behaviors used in the home (of 7)	4	2	-11.52	<.001	.425
Mean number of conservation behaviors used in the yard (of 5)	4	1	-24.91	<.001	.698

Our models regressed WCBs (dependent variable) on respondents' demographic predictors, behavioral measures, and RB ownership (independent variables) for both WCBs in the yard and in the home (see Models 1 and 2). When compared with the non-adopters, RB ownership was significantly associated with reported adoption of three additional water conservation practices in the yard and two additional water conservation practices in the home. There was a relationship between the demographic predictors of education and age, and the number of reported WCBs respondents performed inside the home. One behavioral measure, outdoor irrigation frequency, was also significantly associated with adoption of indoor WCBs. We also calculated R-squared, or the percent of variation in the dependent variable that is accounted for by the predictors. The adjusted R-squared for water conservation practices in the yard was 49.2% (or .492) and for water conservation practices in the home, 20.4% (or .204).

Table 2.

Multiple Regression of Demographic Predictors, Behavioral Measures, and RB Ownership on Number of Water Conservation Behaviors

	WCBs in the Yard	**WCBs in the Home**
Parameter	Model 1	Model 2

Demographic predictors:		
Intercept	.081	-.036
Age	.007	.026*
Years in FL	.006	-.002
Education	.125	.219*
Income	.049	-.025
Live in an HOA	.073	-.197
Behavioral Measures:		
Extension contacts	.009	.010
Fertilization frequency	.008	.031
Have irrigation system	.017	.215
Irrigation frequency	-.079	-.326**
Use lawn service	.158	-.362
Ownership: Have RB	2.874***	2.007***
Adj. R^2 minimum	.491	.199
Adj. R^2 mean	.492	.204
Adj. R^2 maximum	.493	.207
*p ≤ .05 **p ≤ .01 ***p ≤ .001		

Discussion

Our impression that RB ownership can be used to identify a unique Extension audience segment was supported by data suggesting that among Extension landscaping newsletter recipients, RB owners were significantly less likely to hire a lawn service, to have a permanent in-ground irrigation system, or irrigated their yard less often. These data suggest that RB owners are more aware of the water needs of their landscape or wish to conserve water. If that is true, these findings have several implications for Extension programming.

If RBs are an indicator of a water conservation ethic, this audience could be open to additional Extension conservation programs such as Florida-Friendly Landscaping™ and Sustainable Floridians (Florida-Friendly Landscaping™ Program, 2009; University of Florida IFAS Extension, 2008). This audience may also be interested in other water conservation programs such as drip irrigation workshops, for example. RB owners may be more aware of their landscape in general if they are more

aware of the water needs of their landscape than non-adopters in this sample. RB owners as an audience may receive other pro-environmental programming less directly related to water conservation, such as landscaping for wildlife, better than audiences who have not adopted RBs or who exhibit less environmental awareness. Further, focusing on those who have adopted a variety of recommended landscaping practices may yield insight into how they made these changes and what motivated them. That insight could be used to evoke changes among audiences who have yet to adopt water conservation behaviors.

Finally, the study also demonstrates the benefit of conducting research about unique audiences and their needs. The methods used to collect this data were relatively time and resource efficient. Surveying Extension constituents, including recipients of electronic newsletters, is a method that could be used on a broader scale with little cost to obtain data on a targeted sample. There are several limitations specific to the study, however, including the measure of the number of conservation behaviors. While we counted having a shut-off nozzle on their hose as a conservation behavior, this measure did not capture those people who did not have or did not use a hose, for example.

Another limitation was due to using a sample that was not randomly selected; the participants were solicited based on their previous contact with the Extension service and self-selected to participate. This meant we had no way to assess nonresponse bias, and these results should not be generalized to a broader population of Extension constituents or the general public. Future survey research could be performed with clients in other regions to see how they compare with this group. Further, the survey could be administered with a random sample of Extension clientele or the general public to investigate the representativeness of these findings.

Future research on WCBs could benefit from pairing self-reported water use data with actual water use data from utilities or metered wells. Research should be done to explore motivations, attitudes, and needs of RB owners. The tendency of non-adopters to be wealthier should also be explored by future research on RBs and WCB.

Conclusion

The research reported here helps us understand the technology adoption process and should lead to better Extension programming. Understanding specific audiences such as RB owners and non-adopters can help strengthen Extension by helping agents target existing programming, make effective use of scarce resources, and increase their impact. More than a stand-alone water conservation solution, RBs can be used by Extension agents as a way to help disseminate and normalize conservation behaviors across communities. While RBs alone may not ensure an adequate supply of clean water for the future, they highlight pro-environmental attitudes and can be a valuable piece of the water conservation puzzle.

References

Ando, A. W., & Freitas. L. P. C. (2011). Consumer demand for green stormwater management technology in an urban setting: The case of Chicago rain barrels. *Water Resources Research*, 47(12), 1-11. doi: 10.1029/2011WR011070

Andreasen, A. R. (1995). *Marketing social change: Changing behavior to promote health, social development, and the environment*. Jossey-Bass, San Francisco, CA.

Bakacs, M. E., Haberland, M., Mangiafico, S. S., Winquist, A., Obropta, C. C., Boyajian, A., & Mellor, S. (2013). Rain barrels: A catalyst for change? *Journal of Extension* [On-line], 51(3) Article 3RIB6. Available at: http://www.joe.org/joe/2013june/rb6.php

Barnett, C. (2011). *Blue revolution: Unmaking America's water crisis*. Beacon Press, Boston, MA.

Baron, R. M., & Kinney. D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, 51(6), 1173-1182. doi: 10.1037/0022-3514.51.6.1173

Dukes, M., Miller, G. L., & Haley, M. B. (2005). *Residential Irrigation Efficiency Assessment Monitoring Final Report* (SJ2006-SP15). Gainesville, Florida: University of Florida Agricultural and Biological Engineering Department. Retrieved from: http://www.sjrwmd.com/technicalreports/pdfs/SP/SJ2006-SP15.pdf

Florida-Friendly Landscaping™ Program. (2009). Florida-Friendly landscaping™. Retrieved from: http://ffl.ifas.ufl.edu/

Grimm, P. (2010). Social desirability bias. *Wiley International Encyclopedia of Marketing*. John Wiley & Sons, Ltd. doi:10.1002/9781444316568.wiem02057

Jones, M. P., & Hunt, W. F. (2010). Performance of rainwater harvesting systems in the southeastern United States. *Resources, Conservation, and Recycling*, 54(10), 623-629. Retrieved from: http://dx.doi.org/10.1016/j.resconrec.2009.11.002

Mailbach, E. W., Maxfield, A., Ladin, K., & Slater, M. (1996). Translating health psychology into effective health communication: The American healthstyles audience segmentation project. *Journal of Health Psychology*, 1(3), 261-277. doi:10.1177/135910539600100302

McKenzie-Mohr, D. (2011). Fostering sustainable behavior: Community-based social marketing. Retrieved from: http://www.cbsm.com/public/world.lasso

Milesi, C., Running, S. W., Elvidge, C. D., Dietz, J. B., Tuttle, B. J., & Nemani. R. R. (2005). Mapping and modeling the biogeochemical cycling of turf grasses in the United States. *Environmental Management*, 36(3), 426-438. doi: 10.1007/s00267-004-0316-2

Monaghan, P., Ott, E., Wilber, W., Gouldthorpe, J., & Raceviskis, L. (2013). Defining audience segments for extension programming using reported water conservation practices. Journal of Extension. Retrieved from http://www.joe.org/joe/2013december/pdf/JOE_v51_6a8.pdf

Mustafa, D., Smucker, T. A., Johns, R., Ginn, F., & Connely, S. (2010). Xeriscape people and the cultural politics of turfgrass transformation. *Environment and Planning D: Society and Space*, 28(4). 600-617. doi: 10.1068/d13108

Robbins, P. (2007). *Lawn people: How grasses weeds, and chemicals make us who we are*. Temple University Press, Philadelphia, PA.

Robbins, P., & Birkenholtz, T. (2003). Turfgrass revolution: Measuring the expansion of the American lawn. *Land Use Policy*, 20(2), 181-194. Retrieved from: http://dx.doi.org/10.1016/S0264-8377(03)00006-1

Rogers, E. M. (2003). *Diffusion of innovations*. 5th ed. Free Press, New York: NY.

Schafer, J. L., & Graham, J. W. (2002). Missing data: Our view of the state of the art. *Psychological Methods*, 7(2), 147-177. doi:10.1037/1082-989X.7.2.147

Slater, M. D. (1996). Theory and method in health audience segmentation. *Journal of Health Communication: International Perspectives*, 1(3), 267-284. doi:10.1080/108107396128059

Southwest Florida Water Management District. (2009). Rain barrels growing in popularity, make an impact on water conservation. *Water Matters Magazine*. Retrieved from: https://www.swfwmd.state.fl.us/documents/publications/watermatters/mar-apr2009/8.html

Stern, P. C. (2000). Toward a coherent theory of environmentally significant behavior. *Journal of Social Issues*, 56(3), 407-424. Retrieved from: http://search.ebscohost.com/login.aspx?direct=true&AuthType=ip,uid&db=aph&AN=3997994&site=ehost-live

United States Environmental Protection Agency. (2009). How can I make a rain barrel? Retrieved from: http://www.epa.gov/region03/p2/make-rainbarrel.pdf

University of Florida IFAS Extension. (2008). Solutions: Sustainable living. Retrieved from: http://solutionsforyourlife.ufl.edu/sustainable_living/

Vaske, J. (2008). *Survey research and analysis: Applications in parks, recreation and human dimensions*. Venture Publishing, State College, PA.

Weinreich, N. K. (2011). *Hands-on social marketing: A step-by-step guide to designing change for good*. 2nd ed. Sage Publications, Los Angeles, CA.

Yuan , Y. C. (2010). Multiple imputation for missing data: Concepts and new development (Version 9.0). Retrieved from: http://support.sas.com/rnd/app/papers/multipleimputation.pdf.
