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Applying Behavioral Insights to Improve Water Security

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In the United States, the federal government and other organizations spend billions of dollars each year on agri-environmental programs. Between 2014 and 2018, for example, mandatory 2014 Farm Bill spending for conservation programs will amount to an estimated $28 billion (U.S. Department of Agriculture, 2017). Much of that money will be directed to projects broadly connected to water security, which has been defined as "the capacity of a population to safeguard sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human well-being, and socio-economic development, for ensuring protection against water-borne pollution and water-related disasters, and for preserving ecosystems in a climate of peace and political stability" (UN-Water, 2013, p. 1). To ensure that funds allocated to water security goals are spent cost-effectively, agricultural researchers and practitioners may wish to consider an approach that is increasingly being adopted in other public policy contexts: embed insights from behavioral sciences into program designs and then use randomized controlled trials to test how well these insights contribute to achieving water-security and other agri-environmental goals.

In recent years, federal, regional and local governments in a number of countries have begun to rely on insights from behavioral economics and psychology to develop programs that are more cost-effective. In several countries and cities, governments have established full-time "nudge squads" to facilitate this work. For example, in the United Kingdom, the national government assembled a Behavioral Insights Team with a goal of improving the cost-effectiveness of their policies and inducing better outcomes using ideas from the behavioral sciences. In the United States, the Obama administration created a Social and Behavioral Science Team (Obama 2015) and called for policies and programs throughout the government to be based on evidence from the behavioral sciences (Office of Management and Budget, 2013), a call that has recently been echoed in the Trump Administration (Office of Management and Budget, 2017). Within the U.S. Department of Agriculture (USDA), the Economic Research Service established the Center for Behavioral & Experimental Agri-Environmental Research (CBEAR) in 2014 to apply behavioral insights and experimental designs to improve water, agriculture, and environmental programs.

Adjustments to programs or policies based on insights from the behavioral sciences are commonly referred to as "nudges" because they tend to involve relatively small additions or changes to the decision environment that encourage, but do not force, changes in behavior. Nudges often consist of minor changes in how choices are presented to decision-makers, which are often referred to as changes to the "choice architecture" (Thaler and Sunstein, 2008). Nudges usually are not financial mechanisms, although they may involve changes in the way in which financial mechanisms are presented or constructed. Because they are often low-cost, not disruptive to existing programs, and preserve citizen choice, nudges have been attractive to program designers.

Nudges have been shown to be effective in inducing better decision-making in a variety of applications, ranging from one-time, life-changing decisions to everyday behavioral habits. Despite the success of a wide range of nudges incorporated into various social policy programs around the world, programs focused on water security have largely ignored the benefits that can be achieved through the power of nudges. Four characteristics of nudges make them potentially useful for addressing water-security issues.

1. Their ability to change policy-relevant behaviors is supported by a growing body of empirical evidence.
2. They are well-suited for programs that encourage voluntary actions, like adopting new technology or practices.
3. They typically require only small adjustments to a program, so they are often politically feasible and cost-effective ways to solve problems.
4. Their effectiveness can be easily tested in randomized controlled trials prior to large-scale implementation, providing evidence regarding what works best under specific conditions.

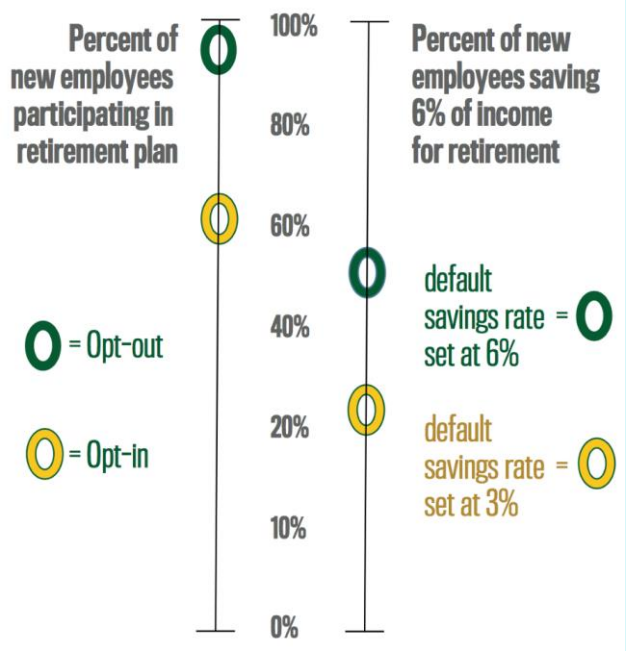
In the sections below, we describe key behavioral insights that have been used successfully in other contexts and briefly discuss how these insights can be used to improve water-security and other conservation objectives.

Defaults and Anchoring

When faced with making decisions, people are prone to inertia and tend to maintain the status quo—they do nothing or make the same kinds of choices they have made before. This tendency is referred to as status quo bias (Samuelson and Zeckhauser, 1988). Studies have repeatedly shown that people disproportionally stick with the status quo even when making significant life decisions.

An example is the default option offered to new employees regarding retirement saving plans. In most standard plans, employees must act (opt in) to enroll, but many more employees choose to participate when enrollment is automatic (the default) and they must act to not participate. Similarly, offering a high default saving rate under such plans increases the number of people who choose that rate relative to offering a low default saving rate and requiring them to act to select a higher one. Employees presented with a default savings rate of 6% were twice as likely to set aside 6% of their incomes as employees presented with a default rate of 3% (Figure 1, Beshears et al., 2009).

Figure 1. The Effect of the Default Choice in a Retirement Savings Plan



Source: CBEAR, 2015.

In an agricultural context, the power of defaults has been proposed as a reason why voluntary contributions to agricultural checkoff (marketing) programs were historically high (Messer, Kaiser, and Schulze, 2008). In this case, producers were automatically assessed a fee to support egg marketing efforts. If they wanted their money, they had to request it back. Similar defaults have also been shown to increase charitable donations to environmental programs (Zarghamee et al., 2017).

In agri-environmental programs, the attractive power of the default option could, for example, be harnessed in the sign-up process for the Conservation Reserve Program (CRP). In the CRP's current enrollment process, farmers compete for limited contracts on the basis of their Environmental Benefit Index (EBI), which reflects the conservation practices they have agreed to implement and their bid. The default starting point for the EBI is no conservation practices. Farmers can improve their ranking by agreeing to implement better, but generally more expensive, practices. Programs might do better, however, by setting the default starting point to the best practices and then allowing farmers to opt out of those practices.

The concept of defaults can be extended to ideas of "active choice." For instance, the USDA currently offers a number of computer-based and online technical-assistance services, such as the Conservation Client Gateway. These services seek to lower the costs of communication and program transactions for both farmers and the USDA. Yet participation in these platforms is low. To increase participation, USDA agencies could develop alternative choice architectures. For example, the default status for farmers is "traditional modes of interaction with USDA"—if farmers do not contact the USDA to register for the online platform, they will interact with USDA via traditional means: mail, phone, and local office visits. In other words, farmers must opt in to use the platform. An alternative default is active choice: every farmer is directly asked their preferred format for interacting with USDA—traditional or online. With active choice, more producers are predicted to participate in these new online programs, thereby increasing conservation benefits and cost savings.

Using Loss Framing

An important factor in economic decisions is loss aversion. Loss-averse individuals attach greater significance to losses than to gains (Tversky and Kahneman, 1991). For example, a manufacturing company that awarded incentive bonuses based on work teams' output found that how one frames an incentive payment affects how much people respond to it (Hossain and List, 2012). Although all of its teams worked under the same bonus system, some teams were randomly assigned to a gain frame and others to a loss frame. Gain-frame teams were told that they would earn a bonus for every week in which they met a performance benchmark, up to a maximum annual payment. Loss-frame teams were told that they would receive the maximum payment minus a deduction for every week in which they did not meet the benchmark. Teams presented with the loss framing produced greater output, on average, than teams presented with the gain framing.

Agri-environmental programs frequently use incentive payments and always present them through a gain frame. However, were these programs to present the incentives in a loss frame, landowners might deliver more conservation output. For example, voluntary conservation programs to reduce nonpoint source pollution could change the focus of their enrollment process from payments earned per additional practice or per additional ton of pollution reduced—a gain frame—to the maximum payment the participant could earn and how much the participant would lose for every practice not adopted or every ton of pollution not reduced. Rather than starting with where potential participants are and explaining how much better they can do, program managers can present the best the applicants can do and leave it to participants to reject specific actions or services. By changing the participants' reference point, program administrators can harness loss aversion to improve the cost-effectiveness of the program.

Social Comparisons and Social Norms

The concept of social comparison originates from Festinger (1954), who posited that humans judge the appropriateness of their behavior based, in part, on the behavior of others. In a field experiment, Allcott (2011) demonstrated that consumption of electricity could be reduced by informing people about their power use compared to their neighbors' and to that of "efficient users." In another field experiment, Ferraro and Price (2013) found that similar nudges based on social comparisons could reduce water use. Furthermore, the effects of these social comparisons remained detectable years after the programs started (Allcott and Rogers, 2014; Bernedo, Ferraro, and Price, 2014).

Social comparisons can be used in a similar way but are focused on developing descriptive norms rather than on comparisons of behavior—that is, they use descriptions of the way "most people" behave to influence other people. Studies have found that people often perceive decisions presented as the norm as likely to be effective and adaptive responses (Cialdini, Kallgren, and Reno, 1991). Therefore, people tend to follow the norm, particularly if they are not very familiar with the circumstances of the decision. Goldstein, Cialdini, and Griskevicius (2008), for example, showed that a social comparison treatment that presented people staying in hotels with a descriptive norm such as "the majority of people reused their towels" had a larger effect on their behavior than standard messages about the benefits of reusing towels. And the more the message related to their immediate situation, such as "the majority of people in this room reused their towels," the better it worked. Lab studies related to non-point-source water pollution have found similar results. For instance, Wu, Palm-Forster, and Messer

(2017) found non-point-source pollution-management programs could reduce pollution by presenting information to potential participants about decisions made by others like them in a similar situation.

The power of social norms and comparisons could be harnessed by conservation and stewardship programs to boost enrollment and the number or quality of practices adopted, and thereby significantly increase their ability to safeguard water resources and quality. Such programs have already been established, including Minnesota's Agricultural Water Quality Certification Program, where farmers, upon adoption of a set of core practices, earn the right to display a sign recognizing their farms as friendly to water or the environment. Programs in the Pacific Northwest identify farms that are "Salmon Safe" or that practice "Fish Friendly Farming". As more producers participate in these programs, publicizing this increasing level of participation can be used to encourage other landowners to participate in the programs.

Social comparisons and norms could also encourage participants to renew their conservation contracts or comply better with their contractual obligations. For example, Wallander, Ferraro, and Higgins (2017) showed how program administrators could test the effect of social comparisons on re-enrollment rates in the CRP. As another example, in counties where contract holders are substantially delayed in meeting their contractual obligations (often never actually completing the agreed-upon practices), notifying contract holders about the high percentage of producers in their state who are in compliance with their contracts could reduce the "late rate." When designing such nudges, research suggests that it is important to use comparison groups that the targeted participants care about, such as their neighbors in the county or other state residents, and to make clear that the desired behavior is common among members of those groups (or uncommon, if seeking to discourage a behavior).

Summary

Programs targeting water security consume billions of taxpayer dollars annually, so thinking about how to make them "smarter" and more cost-effective is important. Despite the fact that social and behavioral nudges have repeatedly been demonstrated as an effective approach for social policies, agri-environmental programs have mostly failed to adopt or test them.

In this article, we discussed a number of nudges that are well-grounded in behavioral economics and psychology and how they might be readily applied to solve water-security issues, including potential applications and tips for designing them. The majority of these nudges would require only subtle changes in how information is provided but could lead to significant increases in participation or effort, making the programs highly cost-effective and desirable to policy-makers. These nudges can also be tested on a small scale to identify the best approach before being rolled out on a larger scale, which is recommended to obtain the best possible result.

For More Information

Allcott, H. 2011. "Social Norms and Energy Conservation." *Journal of Public Economics* 95(9): 1082–1095.

Allcott, H., and T. Rogers. 2014. "The Short-Run and Long-Run Effects of Behavioral Interventions: Experimental Evidence from Energy Conservation." *American Economic Review* 104(10):3003–3037.

Bernedo, M., P.J. Ferraro, and M. Price. 2014. "The Persistent Impacts of Norm-based Messaging and their Implications for Water Conservation." *Journal of Consumer Policy* 37(3):437–452.

Beshears, J., J.J. Choi, D. Laibson, and B.C. Madrian. 2009. "The Importance of Default Options for Retirement Saving Outcomes: Evidence from the United States." In J.R. Brown, J.B. Liebman, and D.A. Wise, eds., *Social Security Policy in a Changing Environment.* Chicago, IL: University of Chicago Press, pp. 167–195.

Bigas, H., ed. 2013. *Water Security and the Global Water Agenda: A UN-Water Analytical Brief*. Hamilton, ON: United Nations University, Institute for Water, Environment & Health. Available online: http://www.unwater.org/app/uploads/2017/05/analytical_brief_oct2013_web.pdf

Center for Behavioral and Experimental Agri-Environmental Research. 2015. “The Power of Defaults.” CBEAR Behavioral Insight Brief 1.

Center for Behavioral and Experimental Agri-Environmental Research. 2016. “The Pull of Social Comparisons.” CBEAR Behavioral Insight Brief 2.

Center for Behavioral and Experimental Agri-Environmental Research. 2017. “Gains from Avoiding Losses: It’s Not Just How Much Incentive You Offer, but How You Offer it.” CBEAR Behavioral Insight Brief 5.

Cialdini, R.B., C.A. Kallgren, and R.R. Reno. 1991. “A Focus Theory of Normative Conduct: A Theoretical Refinement and Reevaluation of the Role of Norms in Human Behavior.” *Advances in Experimental Social Psychology* 24:201–234.

Ferraro, P.J., and M.K. Price. 2013. “Using Nonpecuniary Strategies to Influence Behavior: Evidence from a Large-Scale Field Experiment.” *Review of Economics and Statistics* 95(1):64–73.

Festinger L. 1954. “A Theory of Social Comparison Processes.” *Human Relations* 7(2):117–140.

Goldstein, N.J., R.B. Cialdini, and V. Griskevicius. 2008. “A Room with a Viewpoint: Using Social Norms to Motivate Environmental Conservation in Hotels.” *Journal of Consumer Research* 35(3):472–482.

Hossain, T., and J.A. List. 2012. “The Behavioralist Visits the Factory: Increasing Productivity Using Simple Framing Manipulations.” *Management Science* 58(12):2151–2167.

Messer, K.D., H.M. Kaiser, and W.D. Schulze. 2008. “The Problem of Free Riding in Voluntary Generic Advertising: Parallelism and Possible Solutions from the Lab.” *American Journal of Agricultural Economics* 90(2):540–552.

Obama, B. September 15 2015. Executive Order No. 13707 – Using Behavioral Science Insights to Better Serve the American People. The White House, Washington, D.C.

Office of Management and Budget. 2013. Memorandum M-13-17: Next Steps in the Evidence and Innovation Agenda, 26 July 2013. Washington, D.C.

Office of Management and Budget. 2017. Memorandum M-17-28: Fiscal Year (FY) 2019 Budget Guidance, 7 July 2017. Washington, D.C.

Samuelson, W., and R. Zeckhauser. 1988. “Status Quo Bias in Decision Making.” *Journal of Risk and Uncertainty* 1(1):7–59.

Thaler, R.H., and C.R. Sunstein. 2008. Nudge: Improving Decisions about Health, Wealth, and Happiness. New Haven: Yale University Press.

Tversky, A., and D. Kahneman. 1991. “Loss Aversion in Riskless Choice: A Reference-Dependent Model.” *Quarterly Journal of Economics* 106(4):1039–1061.

U.S. Department of Agriculture. 2017. *Background: Conservation Spending Seeks to Improve Environmental Performance in Agriculture*. Washington, DC: U.S. Department of Agriculture, Economic Research Service. Available online: https://www.ers.usda.gov/topics/natural-resources-environment/conservation-programs/background/

UN-Water, 2013. *Summary for Decision-Makers.* Available online: http://www.unwater.org/app/uploads/2017/05/water_security_summary_Oct2013.pdf

Wallander, S., P. Ferraro, and N. Higgins. 2017. "Addressing Participant Inattention in Federal Programs: A Field Experiment with The Conservation Reserve Program." *American Journal of Agricultural Economics* 99(4):914–931.

Wu, S., L. Palm-Forster, and K. Messer. 2017. "Heterogeneous Agents and Information Nudges in Non-Point Source Water Pollution Management." Paper presented at the 6th annual Association of Environmental and Resource Economists summer conference, May 31–June 2, Pittsburgh, Pennsylvania.

Zarghamee, H., K.D. Messer, J.R. Fooks, W.D. Schulze, S. Wu, and J. Yan. 2017. "Nudging Charitable Giving: Three Field Experiments." *Journal of Behavioral and Experimental Economics* 86:137–149.

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