



Are Homeowners Willing to Pay a Price Premium for Environmentally Friendly Lawn Fertilizers?

HAYK KHACHATRYAN^{1*}, ALICIA RIHN¹, MICHAEL DUKES²

¹*Food and Resource Economics Department, Mid-Florida Research and Education Center, University of Florida, 2725 S. Binion Road, Apopka, FL 32703-8504*

²*Department of Agricultural and Biological Engineering, University of Florida, 205 Frazier Rogers Hall, P.O. Box 110570, Gainesville FL 32611-0570*

ADDITIONAL INDEX WORDS. Choice experiment, willingness-to-pay, lawn care, urban landscaping

Urban sprawl in the past decades has substantially increased the area of maintained urban landscapes in the United States. In 2005, the area devoted to turfgrass was estimated at 40 million acres, which accounts for a quarter of the total urban area and a third of any irrigated cropland. Previous research discussed social and economic benefits associated with well-maintained residential lawns, mostly focusing on support for green ecosystems, community development, and real estate values. However, a host of research papers also pointed out improper landscaping practices, such as excessive fertilizer application, which may result in substantial negative impacts to the environment. This study investigates homeowners' preferences for environmentally-friendly lawn care practices, specifically focusing on homeowners' choice of lawn fertilizers in Florida. Using an online survey questionnaire, over 300 homeowners were asked to choose fertilizers from a number of hypothetical choice scenarios. Attitudinal and a standard set of socio-demographic variables were collected. Results from the mixed logit regression analysis showed that, on average, homeowners were willing to pay price premiums for fertilizers with controlled release nitrogen, phosphorus free, natural, organic, and "pet-friendly" attributes. Implications for relevant urban policies are discussed.

Urban sprawl has increased the area of maintained landscapes and has resulted in environmental, social, and economic benefits and consequences. Maintained landscapes provide the benefits of improved physical and psychological well-being and better property value (Hall and Dickson, 2011). However, excessive fertilization or irrigation can result in chemical leaching and runoff into waterways resulting in water pollution, ecosystem imbalance, algae blooms and eutrophication (Hart et al., 2004).

Florida is no exception with almost 4 million acres of residential and commercial lawns (Trenholm et al., 2011). Additionally, farm land accounts for approximately 9.5 million acres with a total of 2.7 million acres in crop production (USDA Census of Ag, 2012). Many of these acres are in close proximity to surface and underground water sources. Further compounding the issue, Florida's climate has frequent, heavy rainfalls and many residences' over irrigate their lawns (Haley, 2011). Consequently, the local climate and landscape management practices may cause fertilizer runoff.

Florida has passed several rules and guidelines to limit fertilizer runoff. Local ordinances provide guidelines for landscaping practices and banning fertilizer applications during the rainy season. The Urban Turf Fertilizer Rule [5E-1.003(2) Florida Administrative Code] clearly indicates how fertilizers need to be labeled to better educate consumers about proper fertilization practices (FDACS, 2007).

This information raises the question, are there economically-feasible alternatives (to restrictive policies) that would lead to the desirable outcome? We explore this question in this paper. The primary objectives were to 1) investigate consumer preferences and willingness to pay (WTP) for eco-friendly lawn fertilizers in

Florida and 2) provide empirical evidence to support the urban/residential landscaping related to regulatory decision making.

Materials and Methods

A choice experiment and survey were used to collect data. The choice experiment consisted of participants evaluating three different lawn fertilizer options with pre-selected attribute levels (Fig. 1). They were asked to select which fertilizer they would purchase. Each choice set also contained a 'would not buy' option in case the participant would not purchase any of the available products. Each fertilizer option consisted of a 25-lb bag of lawn fertilizer that covered up to 4500 ft² of lawn. Other attributes included application type, source, nitrogen release form, phosphorus free, pest control, pet and kid friendly, and price. For attributes and attribute levels see Table 1. The attributes were defined for participants prior to the experiment (Fig. 2). The remainder of the survey addressed lawn care practices and standard socio-demographic questions.

Data was collected using an Internet survey hosted by Qualtrics Online Survey Software in Dec. 2013. A total of 310 single-family homeowners in Florida participated in the study. Single-family homeowners were of interest because they are more likely to have lawns, gardens and/or landscapes that need maintenance. Participants were asked three screening questions to insure they had a lawn, cared for their own lawn, and purchased and/or applied fertilizers in the past 12 months. Thus, the sample consisted of core consumers of lawn fertilizers. Upon completion of data collection, the results were analyzed using a mixed logit regression model in STATA software. The WTP estimates were generated from the mixed logit regression model coefficients to assess consumer interest and valuation of fertilizer traits.

*Corresponding author: phone (407) 410-6951; email: hayk@ufl.edu

Scenario 1. Please choose your most preferred lawn fertilizer option:

	A	B	C	D
Application Type	Liquid	Granules	Water Soluble Powder	I would not buy any of these three lawn fertilizers.
Source	Natural Organic	Natural Inorganic	Synthetic Organic	
Nitrogen Release	31% ~50% Controlled	76% ~100% Controlled	15% ~20% Controlled	
Phosphorus Free	---	Yes	Yes	
Insect Control	---	Yes	Yes	
Weed Control	Post-emerged	Pre-emerged	---	
Pet Friendly	Yes	---	Yes	
Price	\$15.99	\$30.99	\$35.99	

I would choose:



Fig. 1. An example of a choice scenario.

Table 1. Attributes and attribute levels used to generate choice scenarios.

Attribute	Attribute Levels
Product type	Liquid (base)
	Water soluble powder
Source	Granules/pelleted
	Natural organic
	Natural inorganic
	Synthetic organic
Nitrogen release	Synthetic inorganic (base)
	Fast release (base)
	Controlled release (15% to 20%)
	Controlled release (21% to 30%)
	Controlled release (31% to 50%)
	Controlled release (51% to 75%)
Other	Controlled release (76% to 100%)
	Phosphorus free
	With insecticide
	With weed control (pre-emergent)
	With weed control (post-emergent)
	Pet friendly
	Would not purchase

Note: “Base” variables are used for comparison purposes in analysis. For example, if the coefficient of granules/pelleted is positive, participants were more likely to choose granules/pelleted fertilizer than liquid fertilizer.

Results and Discussion

The average age of participants was 51 years-old. Forty-eight percent of participants were female and had completed “some college” at the time of the study. Their 2012 household income was \$63,354 and the average household size was 2.75 people. Eighty percent of participants were white/Caucasian with the remainder consisting of Hispanic, African-American, Asian, and other ethnicities. Most participants (61.3%) owned their house and had a mortgage, 29.7% did not have a mortgage, and 9% rented their residence. Sixty percent of participants lived in suburban areas, followed by urban areas (22%), and rural areas (18%).

Survey questions were used to assess participants’ background knowledge on lawn fertilizers. The majority of participants (94%)

Nitrogen Release Level		
Fast-Release	21% ~30% Controlled	51% ~75% Controlled
15% ~ 20% Controlled	31% ~50% Controlled	76% ~100% Controlled

Fast Release vs. Controlled Release
Controlled-release (or slow-release) means that the nitrogen in the fertilizer is released into the turf gradually, as opposed to immediate release, which is labeled as “Fast-Release.” The percentage ranges shown above refer to the proportion of nitrogen that is available for a gradual release into the turf.
Controlled-release nitrogen fertilizers contain coating materials or are formulated to delay the release of nitrogen after its application thus resulting in reduced nitrogen losses. For example, fast-release nitrogen fertilizers release all of the available nitrogen into the soil immediately after application. In contrast, controlled or slow-release nitrogen fertilizers release nitrogen over time.

Phosphorus Content		
Phosphorus Free	Yes	No phosphorus if contained in the fertilizer
	---	The fertilizer contains phosphorus

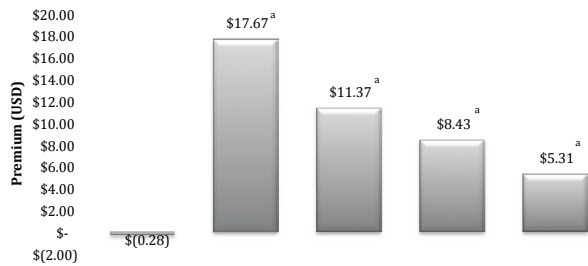
Weed Control		
Weed Control	Pre-emerged	Controls and prevents weeds BEFORE they are germinated
	Post-emerged	Eliminates weeds that are ALREADY established and growing
	---	Weed control is NOT included

Fig. 2. Attribute definitions provided to study participants.

knew the numbers on a fertilizer label stood for N-P-K and are required by law. However, 26% did not understand what the number values meant (i.e. percent by weight of the nutrient). These results indicate there is potential to educate consumers about fertilizer labels and components.

The WTP estimates were used to assess consumer interest and valuation for different fertilizer attributes. Regarding product type, participants were willing to pay a \$17.67 premium for granules/pelleted fertilizer when compared to liquid fertilizers (Fig. 3). Water soluble powder was not significantly different from liquid fertilizers indicating a similar level of interest. Fertilizer type preferences are likely influenced by ease of use and what type works with the consumer’s fertilizer applicator. Granules/pellets are likely easier to use than the other options. Nutrient source also influenced participants’ valuation of the different fertilizers (Fig. 3). Compared to fertilizers made from synthetic inorganic sources, participants were willing to pay the highest premium for natural organic (\$11.37), followed by natural inorganic (\$8.43), and synthetic organic (\$5.31) alternatives. Consumers’ preferences for organic and natural fertilizer sources was likely due to organic and natural products being perceived as more eco-friendly than conventional or synthetic alternatives.

Nitrogen release and phosphorus content affected participants’ WTP for lawn fertilizers. Not surprisingly, participants were willing to pay the highest premium for controlled release nitrogen with the highest percentage (i.e., 76% to 100% controlled release; \$14.00) when compared to fast release fertilizers (i.e., under 15% controlled release; Fig. 4). They were willing to pay the next highest premium (\$13.18) for controlled release 51% to 75% rate, followed by controlled release 31% to 50% (\$10.92), controlled release 15% to 20% (\$9.64), and controlled release 21% to 30% (\$8.75). A controlled release fertilizer option is convenient since it gradually releases nutrients over several months instead of needing to be reapplied often. When compared to fertilizers containing phosphorus, participants were willing to pay \$3.11 more for a phosphorus free option (Fig. 4). Recently, phosphorus has been banned in many states due to runoff causing pollution in waterways and endangering aquatic ecosystems (FDACS, 2007;



^aSignificance $P \leq 0.05$.

Fig. 3. Respondents' willingness-to-pay for various fertilizer types and nutrient sources (n=310).



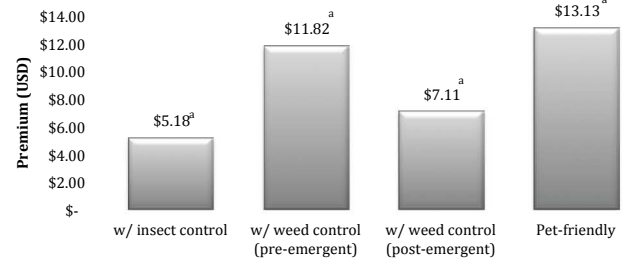
^aSignificance $P \leq 0.05$.

Fig. 4. Respondents' willingness-to-pay for fertilizer nitrogen release and phosphorus content (n=310).

Hart et al., 2004). Our results likely reflect consumer knowledge of problems related to phosphorus runoff.

Regarding additional value-added fertilizer options, participants were willing to pay the highest premium (\$13.13) for pet-friendly fertilizers when compared to fertilizers without a pet label (Fig. 5). Fertilizers may contain chemicals that are toxic to pets. These results show people are interested in lawn fertilizer options that are not toxic to pets. Participants were also willing to pay premiums to obtain pest control with their fertilizers. They were willing to pay the highest premium (\$11.82) for fertilizer containing pre-emergent herbicide, followed by fertilizer containing post-emergent herbicide (\$7.11), and insect control (\$5.18; Fig. 5). Often combination products (i.e. fertilizer/pesticides) are perceived as being more convenient and efficient since consumers only need to apply one product instead of several to accomplish a well fertilized and pest-free lawn.

Respondents' Willingness-to-pay for Fertilizer Add-ons (n=301)



^aSignificance $P \leq 0.05$.

Fig. 5. Respondents' willingness-to-pay for fertilizer add-ons (n=310).

Overall, our results provide empirical evidence for policy related decision making. First, the results weigh in on the conversation of slow-release nitrogen fertilizer usage versus banning fertilizers and/or fertilizer components with strong consumer preference for slow-release options. Additionally, results can be used to formulate labeling legislation. Specifically, that fertilizer labels need to clearly indicate their attributes so consumers can make informed decisions. There may also be a need for more educational programs for homeowners. The programs could focus on economic and environmental outcomes. Consumers' [mis] perceptions about organic, natural, and synthetic fertilizers needs to be understood and addressed in order to improve sustainability.

Literature Cited

- Florida Department of Agricultural and Consumer Services (FDACS). 2007. Labeling requirements for urban turf fertilizers. Accessed July 2013. <http://consensus.fsu.edu/fertilizer-task-force/pdfs/Urbun_Turf_Fertilizers_Rule.pdf>.
- Hall, C.R., and M.W. Dickson. Economic, environmental, and health/well-being benefits associated with green industry products and services: A review. *J. Env. Hort.* 29(2011):96–103.
- Haley, M.B., M.D. Dukes, S. Davis, M. Shedd, and B. Cardenas-Lailhacar. 2011. Energy efficient homes: The irrigation system. Univ. of Florida, Electronic Data Information Source, Doc. FCS3274. Accessed July 2013. <<http://ufdc.ufl.edu/IR00002113/00001>>.
- Hart, M.R., B.F. Quin, and N. Nguyen. 2004. Phosphorus runoff from agricultural land and direct fertilizer effects. *J. Env. Qual.* 33.6(2004):1954–1972.
- Trenholm, L.E., E.F. Gilman, G. Denny, and J.B. Unruh. 2009. Fertilization and irrigation needs for Florida lawns and landscapes. Univ. of Florida, Electronic Data Information Source, Doc. ENH860.
- USDA Census of Ag. 2012. 2012 Census Publications. Accessed July 2013. <<http://www.agcensus.usda.gov/Publications/2012/>>.