Willingness to Adopt Best Management Practices Among Beef Cattle Producers in Southeastern Tennessee

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Selected Poster prepared for presentation at the 2015 Agricultural & Applied Economics Association and Western Agricultural Economics Association Annual Meeting, San Francisco, CA, July 26-28

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Introduction

The adoption of best management practices (BMPs) by agricultural producers is largely voluntary. However, state programs funded under Section 319 of the Clean Water Act and U.S. Department of Agriculture (USDA) programs, such as the Environmental Quality Incentives Program (EQIP) and the Water Quality Incentive Program (WQIP), provide incentives to promote BMP adoption. This research analyzes the monetary incentives needed to encourage livestock operators to adopt BMPs.

Objective

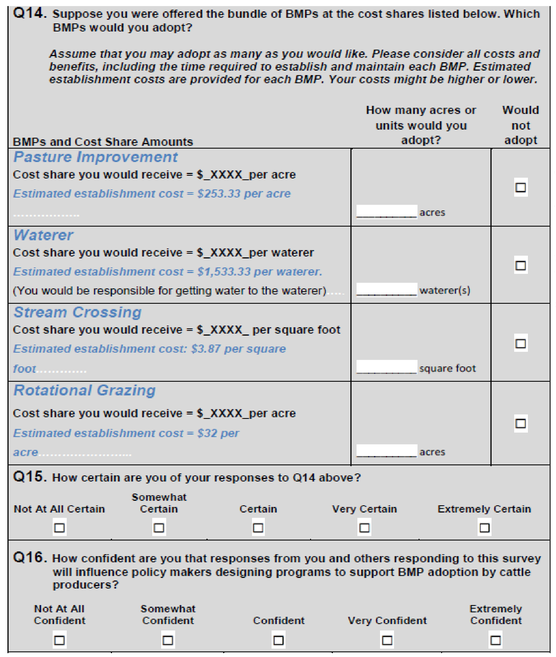
Examine the factors influencing willingness to adopt four BMPs: rotational grazing (*rg*), pasture improvement (*pi*), stream water crossing (*sc*), and water tank systems (*wt*). We control for hypothetical response bias by modality and consequentiality, i.e. the extent to which respondents believe their responses would influence policy.

Data

Data was collected with two mail surveys of farmland owners in McMinn, Bradley, and Monroe Counties in Southeastern Tennessee in 2011 and 2013.

Methods

- Respondents were asked if they would adopt each of the four BMPs (*y*) at a given cost share.
- Cost share amounts were referenced to Natural Resource Conservation Service (NRCS) estimates.
- Cost shares were determined at 63, 75, 88, 100, 112 and 125% of estimated NRCS costs (Figure 1).
- Additional factors examined include farm and farmer characteristics and farmer attitudes.
- The survey emphasized the role of responses in informing policy.
- Confidence (*c*) was measured using a Likert scale (1 = not all,…5 = extremely confident).



Q14. Suppose you were offered the bundle of BMPs at the cost shares listed below. Which BMPs would you adopt?

Assume that you may adopt as many as you would like. Please consider all costs and benefits, including the time required to establish and maintain each BMP. Estimated establishment costs are provided for each BMP. Your costs might be higher or lower.

BMPs and Cost Share Amounts	How many acres or units would you adopt?	Would not adopt
Pasture Improvement Cost share you would receive = $_XXXX_per acre *Estimated establishment cost = $253.33 per acre*	_____ acres	☐
Waterer Cost share you would receive = $_XXXX_per waterer *Estimated establishment cost = $1,533.33 per waterer.* (You would be responsible for getting water to the waterer)	_____ waterer(s)	☐
Stream Crossing Cost share you would receive = $_XXXX_ per square foot *Estimated establishment cost: $3.87 per square foot*	_____ square foot	☐
Rotational Grazing Cost share you would receive = $_XXXX_per acre *Estimated establishment cost = $32 per acre*	_____ acres	☐

Q15. How certain are you of your responses to Q14 above?

Not At All Certain	Somewhat Certain	Certain	Very Certain	Extremely Certain
☐	☐	☐	☐	☐

Q16. How confident are you that responses from you and others responding to this survey will influence policy makers designing programs to support BMP adoption by cattle producers?

Not At All Confident	Somewhat Confident	Confident	Very Confident	Extremely Confident
☐	☐	☐	☐	☐

Figure 1. Hypothetical valuation of BMPs and consequentiality proxy

Acknowledgements This research was supported by the United States Department of Agriculture National Institute of Food and Agriculture Award #2012-51130-20246, "Watershed Scale Project in Oostanaula Creek"

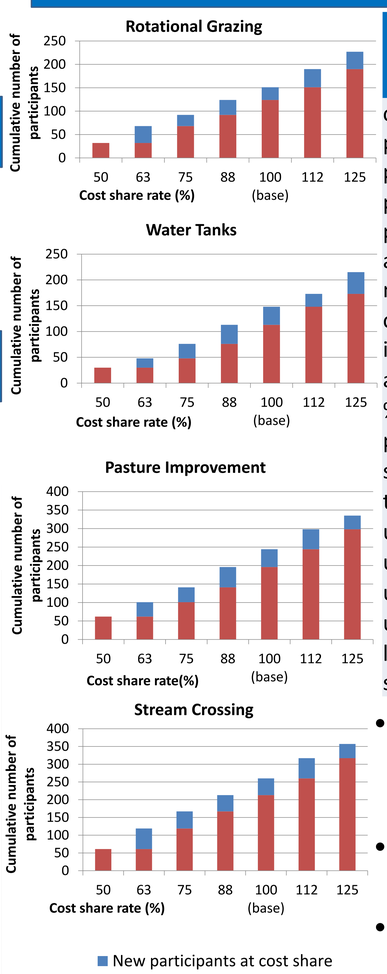
Model

A multivariate discrete choice regression models the decision-making framework. Subscript *i* indexes producers, *j* indexes technologies. Covariates are *x* and *z*, and **u** is an error vector, **u** ~ *MVN*(**0**, **R**), with correlation matrix **R**.

$$y_{ij}^* = x_i\beta_j + u_{ij}, y_{ij} = \begin{cases} 1, y_{ij}^* > 0 \\ 0, y_{ij}^* \le 0 \end{cases}$$

$$c_i^* = z_i\beta_c + u_{ic}, c_i = \begin{cases} 1 \; if \;\; c_i^* \le \kappa_1 \\ \vdots \\ 5 \;\; if \kappa_4 \le c_i^* \end{cases}$$

Results



N = 392	Units	Water Tank	Stream Crossing	Improve Pasture	Rotational Grazing
costant		-0.852	0.014*	-0.240	-0.938
price_rg	$/acre	0.009	0.182	0.002	0.025*
price_sc	$/sq. ft.	0.180*	0.000*	0.212*	0.208*
price_wt	$/unit	0.000	0.001	0.000**	0.000
price_pi	$/acre	-0.002	-0.009	0.000	0.000
age	years	-0.034*	-0.020	-0.012**	-0.018*
male	male = 1	0.263	0.295	0.049	-0.267
college	degree = 1	-0.155	0.258**	0.001	0.114
income	$/yr	0.171*	0.001*	0.112**	-0.063
acres	# owned	0.001**	0.003*	0.000	0.000
%past	% pasture	0.003	0.175	0.000	-0.002
passon	pass on = 1	0.265	0.205	0.764*	0.509*
stockden	cattle/acre	0.327*	-0.083*	0.054	-0.028*
tenure	own/farm	-0.013	0.056	0.000	0.029
use_pi	use = 1	0.748*	0.265	0.668*	0.736*
use_sc	use =1	-0.024	0.155	-0.145	0.079
use_rg	use = 1	-0.018	-0.524	-0.341*	0.161
use_wt	use = 1	-0.065	0.008*	0.078	-0.212
landval	$/acre	0.001	-0.077	0.178	0.001
slope	category	0.192*	-2.779	0.044	0.078

	Units	Confidence
health	index	0.149**
mngmt	index	-0.087
cost	index	0.127*
exper	index	0.230*
opinion	index	0.151*
appear	index	0.154*
point	Index	0.039
age	years	0.017*
male	male=1	-0.370**
college	Degre=1	0.370*
income	$/yr	0.105*
acres	# owned	-0.001
passon	pass on	0.179
tenure	%own	0.014

Notes:

*** significant at the 5% level**

**** significant at the 10% level**

- H0: $\rho_{jc} = 0 \; \forall \; j, c$; *p-value* = 0.105. Older, more experienced, college educated operators concerned about their farm appearance were confident their responses would impact policy.
- Stream crossing incentives positively influence adoption of all four BMPs.
- Cost share levels for rotational grazing are positively correlated with rotational grazing adoption.

Conclusions / Future Research

- These results are important for determining the allocation of limited conservation funds by:
  - targeting producers with a higher likelihood of BMP adoption,
  - encouraging additionality of environmental programs and farm operations, and
  - analyzing the impact of incentives on BMP practice bundling.
- Future research will integrate the econometric results with the biophysical-hydrologic Soil and Water Assessment Tool (SWAT) model.