Digging Into Soil Health: Farmers' Perspectives on Climate-Smart Practices

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Introduction

According to the United States Department of Agriculture (n.d.), soil health is defined as "the continued capacity of soil to function as a vital living ecosystem that sustains plants, animals, and humans" (para. 2). Practices like cover cropping, conservation tillage, and crop rotation enhance soil health, providing clean air, water, crops, wildlife, and landscapes (Carlisle, 2016; Miner et al., 2020; USDA, n.d.). Researchers have identified an adoption gap for these practices despite the numerous economic and environmental benefits. To bridge this gap, studies suggest several vital considerations for increasing the adoption of soil health practices among farmers: a) tailoring outreach strategies for different adoption groups; b) recognizing the interrelated nature of soil health practices; c) addressing economic barriers while acknowledging that farmers often prioritize non-economic motivations; d) understanding that existing policies and support systems can influence adoption; and e) differentiating between incremental and transformative changes in farming practices (e.g., Carlisle, 2016). The most promising approach to fostering the adoption of soil health practices involves combining research, education, and policy to support local conservation networks (Carlisle, 2016; Orem et al., 2024).

Theoretical Framework

Our study was guided by the theory of planned behavior (Ajzen, 1985) and aimed to explore farmers' behaviors toward soil health practices. Traditionally, the theory of planned behavior comprises three components: attitudes, subjective norms, and perceived behavioral control (Ajzen, 1985). More recently, additional norms have been explored, including descriptive, injunctive, and in-group norms (White et al., 2011). White et al.'s (2011) study investigated the proposed predictors of recycling intentions and found that injunctive norms and descriptive norms increase recycling intentions. Thus, we sought to understand how descriptive norms, injunctive norms, outcome expectations, and identity influence farmers' behavior toward soil health practices?

Methods

Our study is part of a larger NRCS-funded study, so similar methods may appear elsewhere. Our study employed a cross-sectional survey distributed online and via mail to U.S. wheat producers. To distribute the survey online, we used e-newsletters or email lists from 10 wheat and grain associations by modifying Dillman's methods (2014), which gathered 46 usable responses. Due to a minimal response, we converted it to a mail survey. We followed a modified version Dillman et al.'s (2014) tailored design method to collect mail survey data from wheat farmers through the USDA Farm Service Agency payment list. All data were collected between January and April 2023, and we combined the 46 online responses with the 124 usable mail responses. We used Coberley et al. (2020) survey items for participants' behaviors related to cover crops and reduced or no-till practices (12 items; 5-point Likert scale from strongly disagree to strongly agree) and expert consultation to ensure content validity. We analyzed the data using a simultaneous multiple linear regression model with soil health practice behavior as the dependent variable and descriptive norms, injunctive norms, outcome expectation, and identity as predictors.

Results

Farmers strongly agreed that they use soil health practices (see Table 1). They perceived that other farmers somewhat use soil health practices (descriptive norms) and felt some social

pressure regarding how they should use soil health practices (injunctive norms). Additionally, they expected positive outcomes from using soil health practices and felt strongly about needing to protect and improve soil, which influenced their decision to use soil health practices (identity).

Table 1

Descriptive Statistics and Correlations of the Independent and Dependent Variables (N = 170)

	M	*SD*	1	2	3	4	5
Behavior (1)	4.16	0.70	1				
Descriptive norms (2)	3.43	0.82	.21**	1			
Injunctive norms (3)	3.19	0.77	.22**	.58***	1		
Outcome expectations (4)	3.36	0.65	.32**	.21**	.29***	1	
Identity (5)	4.07	0.57	.47***	.18*	.12	.51***	1

Note. *** indicates $p < .001$; ** indicates $p < .01$; * indicates $p < .05$.

The regression model accounted for 25.44% of the variance in farmers' soil health practice behaviors (adjusted $R^2 = 23.63\%$; see Table 2). The model explained a statistically significant amount of variation in the dependent variable ($F(4, 165) = 14.08$, $p < .001$). Holding all other variables constant, each additional point in identity is associated with a statistically significant average increase in behavior of .520 ($t(165) = 5.34$, $p < .001$). Descriptive norms, injunctive norms, and outcome expectations did not significantly influence farmer's behaviors.

Table 2

Results from the Regression Model with Behavior as the Dependent Variable (N = 170)

Predictors	Soil Health Practice Behavior (α = .76)			
	B (S.E.)	*t*	*p*	*β*
Intercept	1.332 (.382)	3.84	< .001	--
Descriptive norms (α = .77)	.054 (.072)	0.75	.452	.063
Injunctive norms (α = .85)	.101 (.077)	1.31	.192	.111
Outcome expectations (α = .65)	.060 (.088)	0.68	.500	.055
Identity (α = .69)	.520 (.097)	5.34	< .001	.421

Discussion and Conclusions

Identity was the only significant factor influencing farmers' soil health practice behavior. Therefore, farmers' intention to adopt soil health practices strongly relies on how they identify as soil health practitioners. Since identity was the only significant predictor, efforts to encourage soil health practices would be more effective if we included personal and community identity aspects in Carlisle's (2016) suggestions for increasing the adoption of soil health practices. Moreover, farmers are adopting soil health practices; yet, they face social pressure regarding their implementation. This indicates a need for more educational resources and programs to alleviate this pressure and enhance farmers' understanding of the advantages of soil health practices. We encourage agricultural leadership, education, and communication professionals to investigate further the influence of norms, outcome expectations, and identity within various groups of farmers or ranchers—such as cotton, cattle, or corn producers—to identify potential differences. Moreover, it is essential to explore the most effective data collection methods for farming and ranching communities.

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