Producers Willingness to Adopt Best Management Practices in Upper Floridan Aquifer Region

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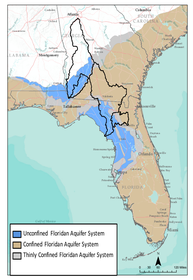
FOOD & RESOURCE ECONOMICS DEPARTMENT

Background

- State and federal water resource management programs are reliant on agricultural best management practices (BMPs) intended to balance agricultural productivity and water quality improvement (USDA, 2021)
  - Nationwide, the BMP adoption rate is relatively low for nutrient and irrigation management BMP (e.g., Osmond et al. 2014; Stubbs 2016; Babin et al, 2022)
- Converting agricultural land to forestry can improve water quality (e.g., Neary et al, 2009)
- Lack of information about producer views on the BMPs use and land use change
  - Extension programs – mostly focusing on BMPs agronomic research
  - Agricultural water quality policy design – lacking information about the minimum incentive payments needed to boost BMP adoption

Study Area: Floridan Aquifer Region



- Supplies drinking water for ~10 million people (USGS, 2016)
- Spans 15 counties in North Florida and 7 counties in South Georgia
- Supports a productive agricultural economy
  - Corn, cotton, and peanuts are the primary row crops
    - Major irrigated agricultural land use (e.g., Marella et al., 2016)
    - In 2019, Florida's field and row crop farmers generated
      - **$1.6 billion** in sales revenue
      - **33,077 jobs** throughout the state's economy (Court et al., 2021)
- Water quality protection and improvement is a priority for both agricultural producers and other stakeholders



Objectives

- To estimate incentive payment levels at which producers are willing to
  - Adopt agricultural nutrient and irrigation management BMP
  - Convert agricultural land to forestry
- To evaluate the determinants of BMP adoption decisions and incentive payment level
  - Farm characteristics, producers' demographic characteristics, risk preferences, etc.
- To understand the drivers of producers' current practices and identify impediments to the use of alternative practices

Methods: Discrete Choice Experiment

- Development of Attributes and Levels
  - Participatory modeling process
    - Involving three key stakeholder groups:
      - Agriculture & forestry
      - Environmental protection
      - Government agencies
  - Three focus group discussions:
    - Policymakers
    - Producers
    - Extension agents
- D-Efficient Design
  - 12 choice sets: 2 blocks – 6 choice sets/block
- Attributes and Levels


Program Feature	Levels
Nitrogen fertilizer application rate	• Implement Extension recommendation rate • Not implement Extension recommendation rate
Nitrogen fertilizer application method and source	• Banding with controlled-release fertilizer • Banding with conventional fertilizer • Broadcast through irrigation pivot with conventional fertilizer
Irrigation management	• Use Soil moisture sensor reading • Use calendar-based irrigation schedule
Cover crop	• Plant cover crop • Not plant cover crop
Incentive payment each year	• $50/acre/year • $100/acre/year • $150/acre/year • $200/acre /year

Methods: Model Specification

- Consumer Theory (Lancaster 1966) and Random Utility Theory (McFadden, 1984):
  - Every producer is a rational decision maker - maximizing utility
- Utility function for each producer (indexed by i) when choosing alternative j in choice set t

$$U_{ijt} = V_{ijt} + \varepsilon_{ijt} = \beta_i' X_{ijt} + \varepsilon_{ijt}$$

$$V_{ijt} = \beta_0 OptOut_{ijt} + \beta_p Payment_{ijt} + \beta Nrate_{ijt} + \beta Nmethod_{ijt} + \beta Irrigation_{ijt} + \beta Covercrop_{ijt}$$

- Mixed logit model: assume respondents are heterogenous in preferences for each attribute
  - Assumes β is randomly distributed as $f(\beta|\theta)$, θ is the parameter for the distribution of β
  - The probability that producer i chooses alternative j in choice set t: $P_{ijt}(j) = \int \frac{e^{\beta' X_{ijt}}}{\sum_{j=1} e^{\beta' X_{ijt}}} f(\beta|\theta) d\beta$
- Individual producer's willingness to accept (WTA) payment for management practice k: $WTA_{ik} = -\frac{\beta_{ik}}{\beta_{ip}}$

Methods: Contingent Valuation

Suppose there was a voluntary 30-year incentive program to convert part of the planted acres of your primary crop to production timber or restoration forestry

a. What is the minimum amount of compensation per acre you would be willing to accept to convert 50% of the planted acres of your corn/cotton/peanut to production timber? $_____/acre/year

b. What is the minimum amount of compensation per acre you would be willing to accept to convert 50% of the planted acres of your corn/cotton/peanut to restoration forestry? $ _____/acre/year

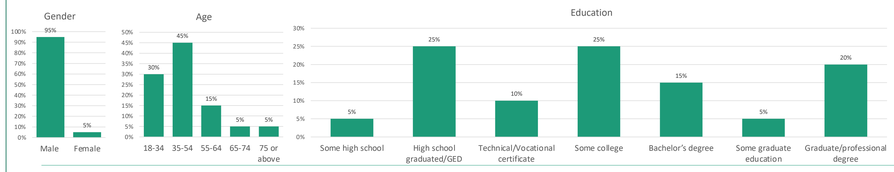
Methods: Mixed-Mode Survey

- Survey protocol approved by UF Institutional Review Board
  - Incentive: $50 Amazon Gift Card
- Target responses: 350 corn/cotton/peanut producers
- Mixed – mode survey (Link, 2011): 25 questions
  - In-person interviews
    - Producer dinner events
    - UF/IFAS Extension row crop field days
    - Florida Peanut Federation annual meeting
    - Florida Farm Bureau Federation producer conferences
  - Mail surveys
    - Postcard
    - Hard copy survey
    - Reminder postcard
  - Online surveys - Qualtrics

Preliminary Results*

*Results are preliminary and subject to change

- 20 responses total – demographic characteristics (n=20)

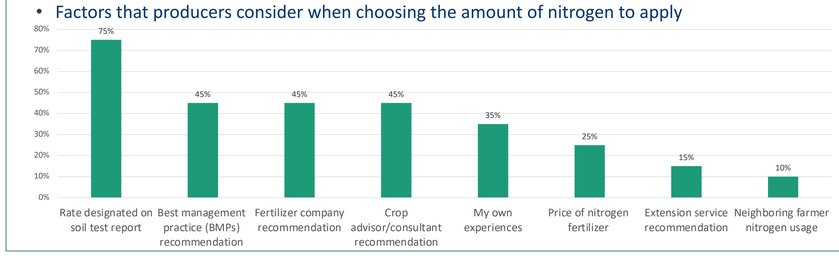


- WTA payment – converting 50% of crop to forestry

Unit: $/acre/year	Mean	Median	Min	Max	Standard Deviation
Production forestry (n=13)	711	800	200	1,250	397
Restoration forestry (n=13)	925	1,000	200	2,000	509

- 1 outlier: $900,000/acre/year
- 6 of the 20 producers are not willing to convert regardless the amount of incentive payment
- No statistically significant difference between producers' demographic characteristics and WTA payment

- Factors that producers consider when choosing the amount of nitrogen to apply



Next Steps and Conclusions

- Continue collecting data – Data collection: April to October, 2022
- Estimate producer WTA incentive payment levels: October, 2022
- Evaluate factors impacting the adoption of BMPs and WTA incentive payment levels: November, 2022
- By addressing knowledge gaps regarding producers' preferences of BMPs, this study is expected to
  - Inform policymakers and the general public about current practices related to water and nutrient management on farms
  - Improve BMPs adoption rates in both Florida and Georgia
  - Develop policy design recommendations to help ensure agricultural water security in Florida and Georgia

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