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Floridan Aquifer Collaborative Engagement for Sustainability

# Agricultural Producers' Willingness to Accept Payments for Improving Water Resources in the Florida Aquifer

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# The Floridan Aquifer

- Among largest & most productive aquifers
- Supports urban, ag, forestry, & environmental water uses
- Not meeting state and federal environmental standards
- Need for a transformative modifications in regional production systems

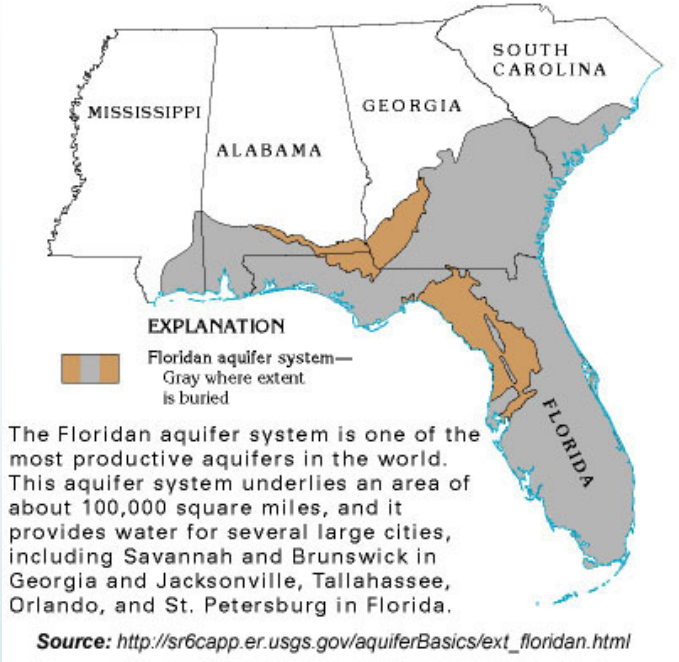


Fig: Upper Floridan Aquifer Region

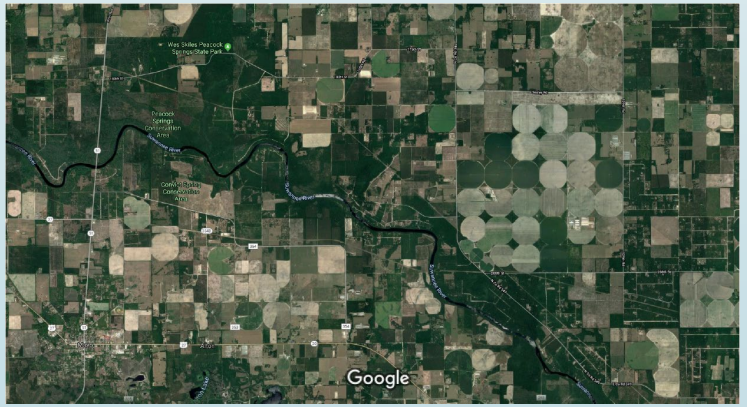


Fig: Aerial view of land within the UFA region

Source: Google Maps

# Study Area

- Lower Suwannee river basin area
- Predominantly planted pine, pasture and agronomic crops (e.g. corn, peanuts, cotton, hay)
- 9000 farms in the region covering 1.3 million acres (Athearn, 2017)
- Around 1.9 million acres of pine forest, of which 83% represented by private forestland (FIA EVALIDator, 2020)

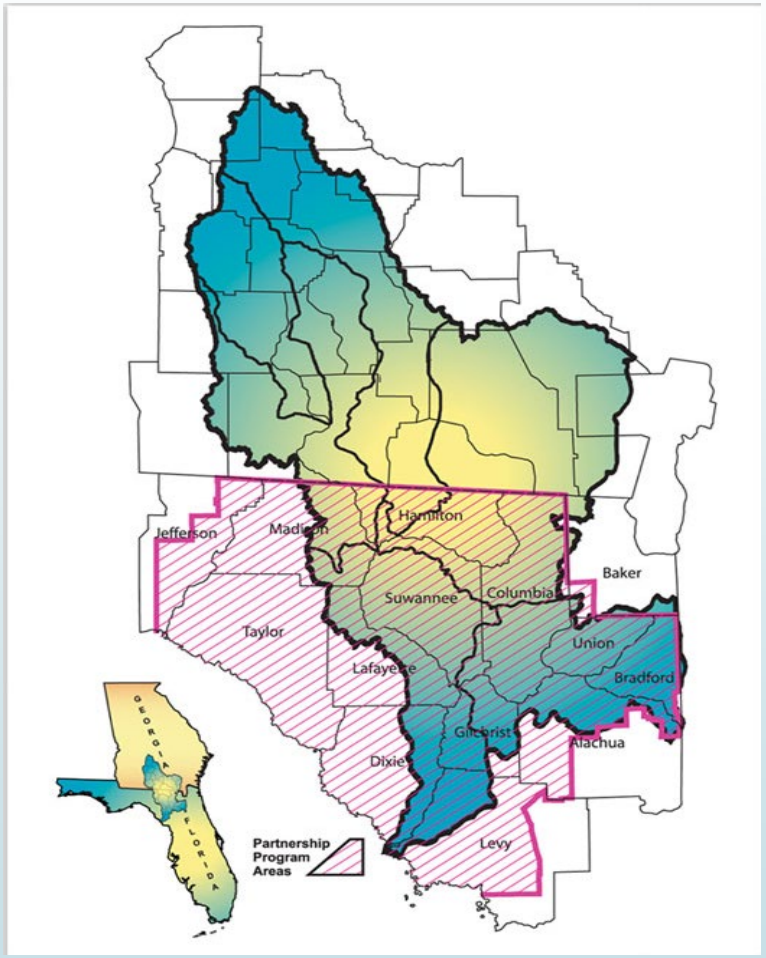


Fig 3: Suwannee river basin area (FL)

Source: http://www.wwals.net/maps/basin/

# Focus of the study

- Analyze row crop and forest landowners' preference for conservation-based incentive programs
- Estimate their willingness to accept (WTA) payments to incentivize BMP adoption
- Generate a supply curve for alternative management scenarios and water resource outcomes

# Enterprise-level economics of row crops, stochastic modeling

| Crop | Progressive System | | | Semi-progressive System | | | Conventional System | | |
|---|---|---|---|---|---|---|---|---|---|
| | Min | Max | Mean | Min | Max | Mean | Min | Max | Mean |
| Corn | | | | | | | | | |
| w/o fixed cost | ($195) | $573 | $173 | ($227) | $618 | $141 | ($148) | $562 | $194 |
| w/ fixed cost | ($442) | $315 | ($75) | ($479) | $369 | ($110) | ($398) | $327 | ($52) |
| Peanut | | | | | | | | | |
| w/o fixed cost | $69 | $857 | $449 | $75 | $783 | $459 | $67 | $836 | $412 |
| w/ fixed cost | ($243) | $547 | $139 | ($229) | $474 | $150 | ($264) | $508 | $81 |

**Note:** Parenthesis () represents negative values

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# Enterprise-level economics of pines, stochastic modeling

| Crop | | Intensive System | | | Semi-intensive System | | | Semi-intensive System w/ pinestraw raking | | | Natural System | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Min | Max | Mean | Min | Max | Mean | Min | Max | Mean | Min | Max | Mean |
| Slash pine | EAV | $8 | $62 | $33 | $6 | $66 | $31 | $44 | $72 | $51 | $4 | $49 | $26 |
| | Rotation age | 23 | 27 | 25 | 23 | 28 | 25 | 18 | 19 | 18 | 21 | 29 | 25 |
| Loblolly pine | EAV | $9 | $94 | $57 | ($4) | $76 | $43 | - | - | - | $9 | $73 | $40 |
| | Rotation age | 19 | 26 | 21 | 20 | 29 | 23 | - | - | - | 17 | 25 | 21 |
| Longleaf pine | EAV | - | - | - | - | - | - | $3 | $41 | $24 | ($9) | $22 | $7 |
| | Rotation age | - | - | - | - | - | - | 30 | 42 | 37 | 33 | 41 | 39 |

**Note:** Parenthesis () represents negative values; EAV represents Equivalent annual value

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# Economic and Environmental Tradeoffs

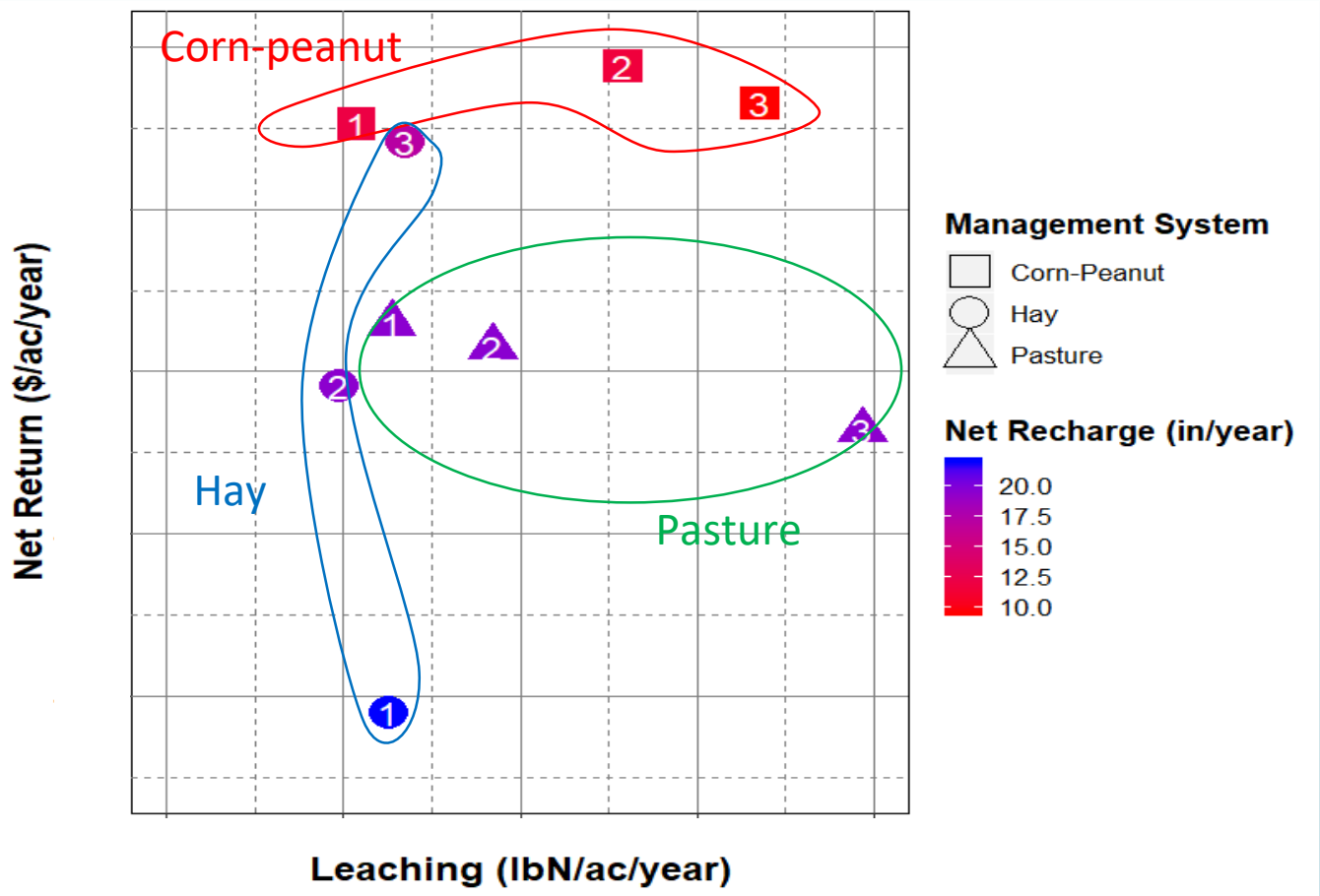


Fig: Relationship between net returns, nitrate leaching and net recharge for major crops in the UFA region

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# Best-Worst Choice Method

- Combines discrete choice experiments (DCE) and Best-Worst scaling (BWS)

- Allows comparison of utility of bundle attributes as well as produce WTA compensation estimates (Soto et al. 2016)

| Attributes | Level |
|---|---|
| **Net return** | $20/acre decrease in net return |
| **Yields** | 5% increase in yield |
| **Cost-share reimbursement** | 85% cost-share reimbursement |
| **Enrollment** | Availability of technical assistance |

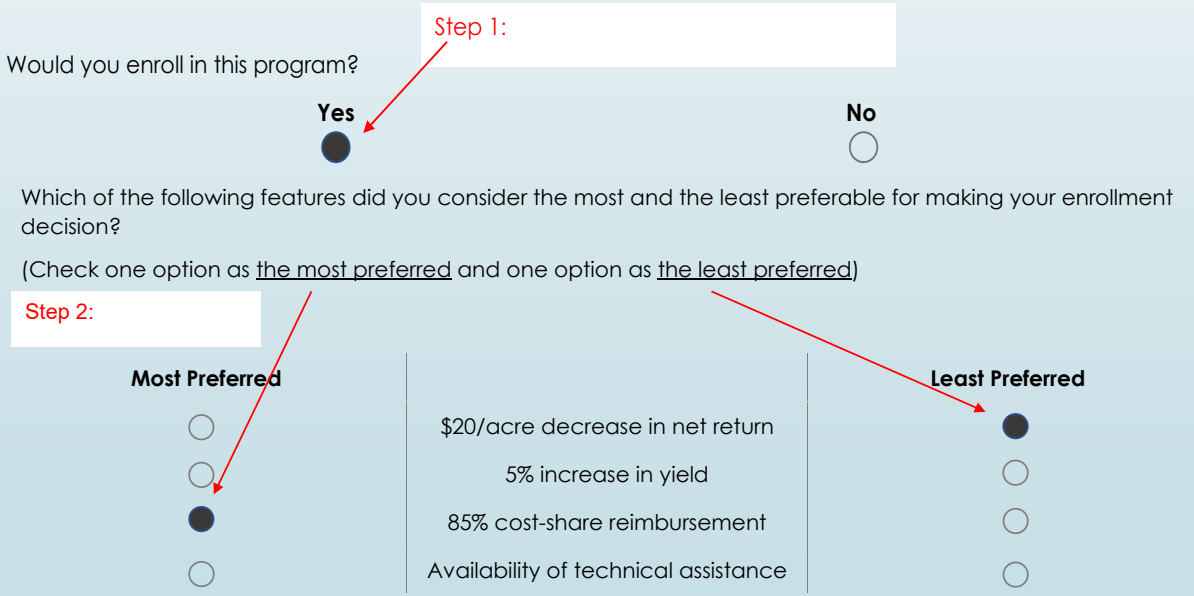


Fig: Best-Worst Choice example

# Survey Attributes and levels

## Row crops survey

| Attributes | Description | Levels |
|---|---|---|
| **Net return** | Change in net return on investment for a crop in one growing season under BMPs required by the program | - $20/acre decrease<br>- $10/acre increase<br>- $20/acre increase |
| **Yields** | Change on yields for a crop in one growing season under BMPs required by the program | - 5% decrease<br>- No change<br>- 5% increase |
| **Cost-share reimbursement** | Percentage of the cost associated with BMPs start-up and/or installation that is reimbursed | - 60%<br>- 75%<br>- 90% |
| **Enrollment** | Provisions to help ease the cost-share program enrollment process | - Availability of technical assistance<br>- Minimal paperwork requirements<br>- Minimal eligibility requirements |

## Forest crops survey

| Attributes | Description | Levels |
|---|---|---|
| **Net return** | Change in net return on investment (in terms of Net Present Value) over a single rotation under management practices required by the program | - $100/acre decrease<br>- $100/acre increase<br>- $150/acre increase |
| **Reduction in production cost** | Change in production cost under management practices required by the program | - $25/acre increase<br>- $25/acre decrease<br>- $50/acre decrease |
| **Incentive amount** | Incentive amount provided for participating in the program | - $5/acre/year<br>- $15/acre/year<br>- $30/acre/year |
| **Enrollment** | Provisions to help ease the incentive program enrollment process | - Availability of technical assistance<br>- Minimal paperwork requirements<br>- Minimal eligibility requirements |

# Expected Outcomes

- Estimate the influence of specific program features on the likelihood of participation
- Estimate WTA for different attributes and their levels
- Help inform landowners choices about incentive program design and expected social value associated with policy interventions

# WTA estimates from previous literature

| Literature | Practice | WTA |
|---|---|---|
| Matta et al. 2016 | Delaying timber harvest up to 50 years | $53/ha/year |
| | Prescribed burning every 2-3 years | $9/ha/year |
| Joshi et al. 2013 | Forgo harvesting that cause substantial environmental quality effect | $116/ha/year |
| Mutandwa et al. 2019 | Delaying harvest by 10 years with light thinning and enhanced provisions of ecosystem services | $448/ha/year |

# WTA and Participation

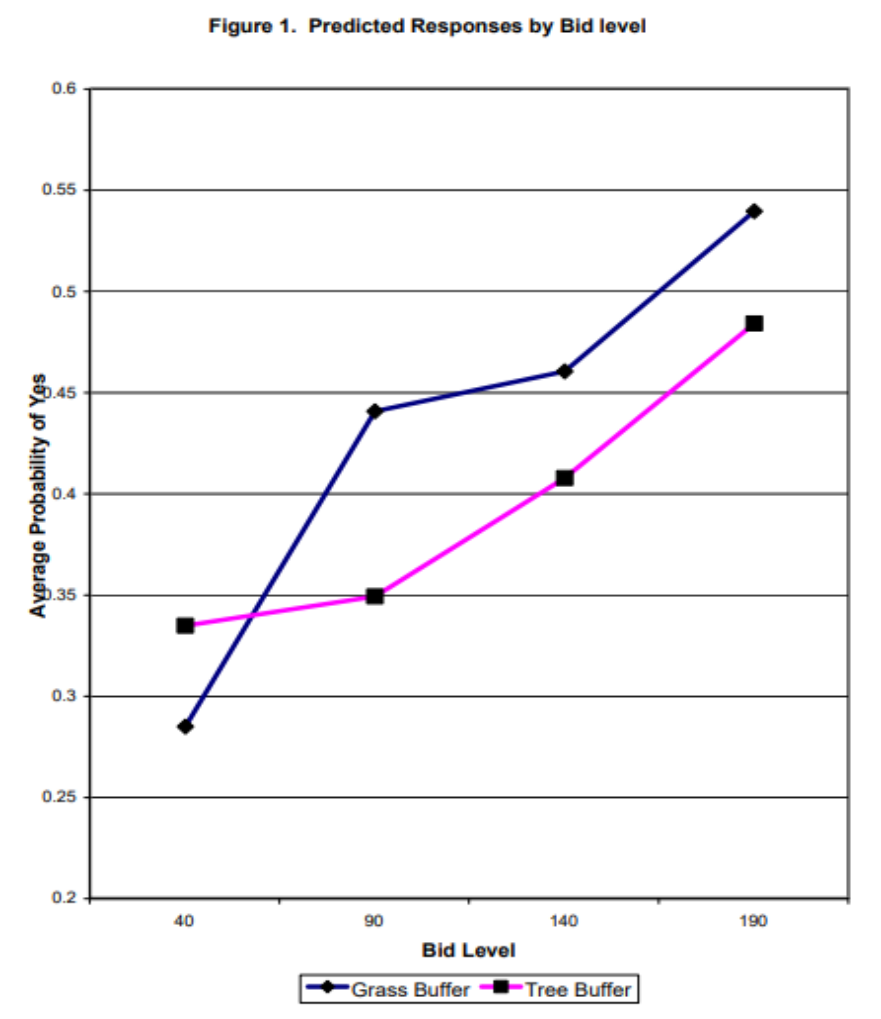


Fig: Agricultural landowners' Willingness to Participate in Streamside protection program based on incentive bid amount (Lynch et al. 2002)

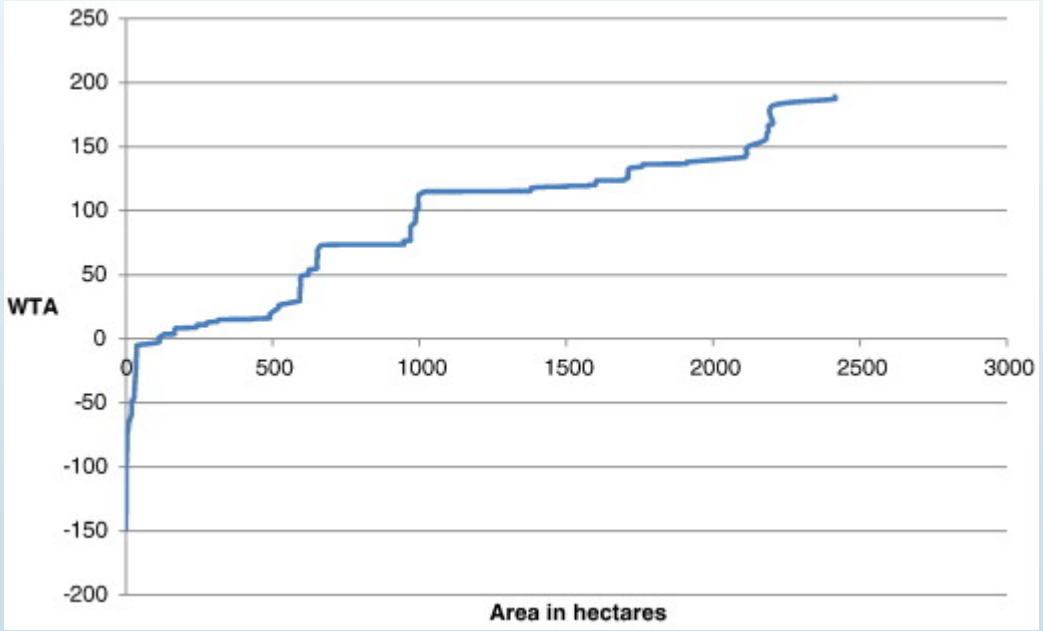


Fig: Relation between forest landowners' WTA and forest area set aside undisturbed (Vedel et al. 2015)

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# Thank you!

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