



AGRICULTURE AND
NATURAL RESOURCE
ECONOMICS PROGRAM

Florida Best Management Practice Use: Examining Multiple-BMP Use

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The views expressed in this presentation are those of the researchers and not those of the Florida Department of Agriculture and Consumer Services.

Introduction:

Growers' Multi-BMP or BMP Bundle Use

BMP Bundle: Simultaneous use of stable combinations of BMPs

Motivation: Several BMPs are thought to have additive benefits when used simultaneously.

Rationale: Growers who already use BMPs may be more likely to use additional practices than growers who do not use.

Objective: To examine BMP bundles (the simultaneous use of multiple BMPs).

- Identify the frequency of BMP bundle use
- Identify specific BMP bundles

Potential Impact: BMP bundle use may

- ✓ Improve water quality through increasing BMP use,
- ✓ Increase BMP benefits or acres on the same farms or fields, and
- ✓ Reduce the cost of BMP education or conservation program implementation.

Introduction

Florida growers use multiple production systems.

Different production systems will require different BMPs:

- ✓ Plasticulture – BMPs that maximize the use of plastic mulch.
- ✓ Bare ground – BMPs that help with bed preparation.
- ✓ Sugarcane – BMPs for muck farming regions.
- ✓ Hay and silage – BMPs for management of crop maturity to harvest.

We focus on Irrigation and Nutrient management BMPs
in plasticulture production.

Why plasticulture?

- The most used production system for high-value vegetable crops.
- Florida leads in use of plasticulture.



Florida's Agricultural Best Management Practices Program

Florida designed a unique agricultural BMP program to protect water resources.

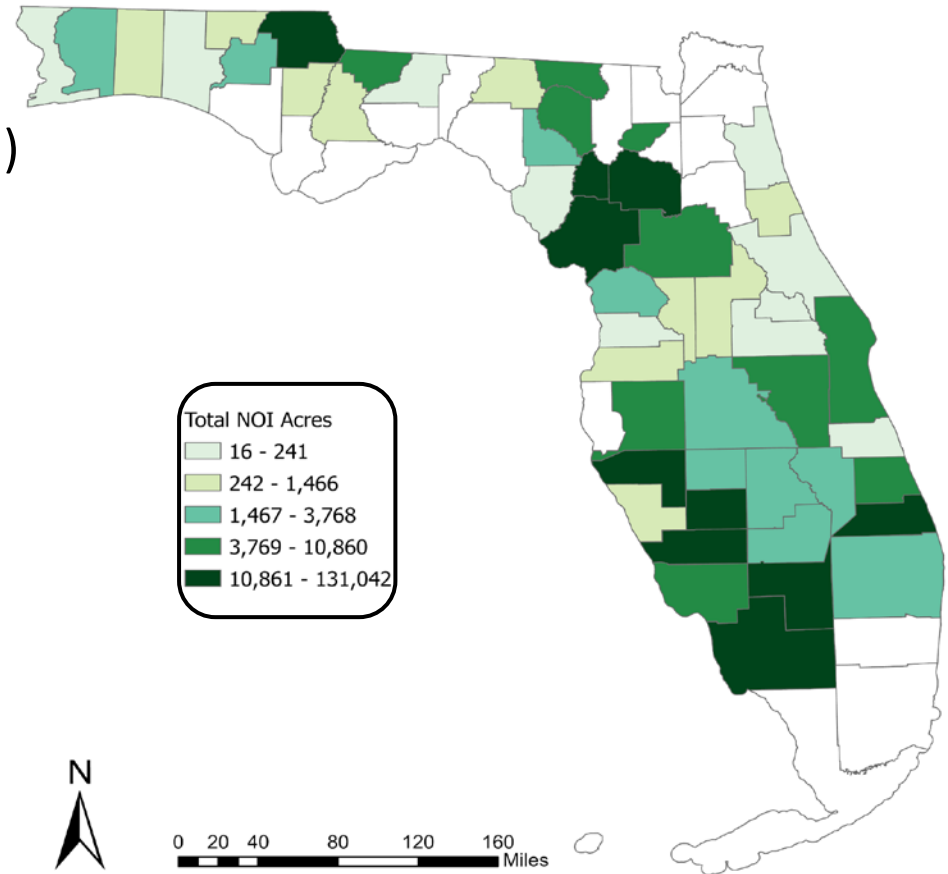
- Field staff from the Florida Department of Agriculture and Consumer Services (FDACS) visit farms and identify applicable BMPs.
- BMPs come from FDACS BMP manuals.
- Growers then sign Notices of Intent (NOI) to indicate if they have (or will) implement the practices.
- Growers are required to keep records that demonstrate BMP implementation.
- Participating growers are presumed to be compliant with the program requirements.
- Participation in the program outside of a Basin Management Action Plan (BMAP) is voluntary.
- Participation makes growers eligible for cost-share funds.
- FDACS visits farms every 2 years to verify BMP use.

In 2021, 61% of the agricultural acreage in Florida (excluding silviculture) is enrolled in the BMP Program (FDACS 2022).

Data

Statewide analysis of BMP use by vegetable and agronomic crop (VAC) producers using plasticulture

- Statewide “Notice of Intent” (NOI) database
 - ✓ Vegetable and Agronomic Crops BMP manual (2015)
 - ✓ Collected in May 2020
 - ✓ Florida:
 - 911 growers; 444,209 acres
 - ✓ Farm-level data
- FDACS cost-share enrollment



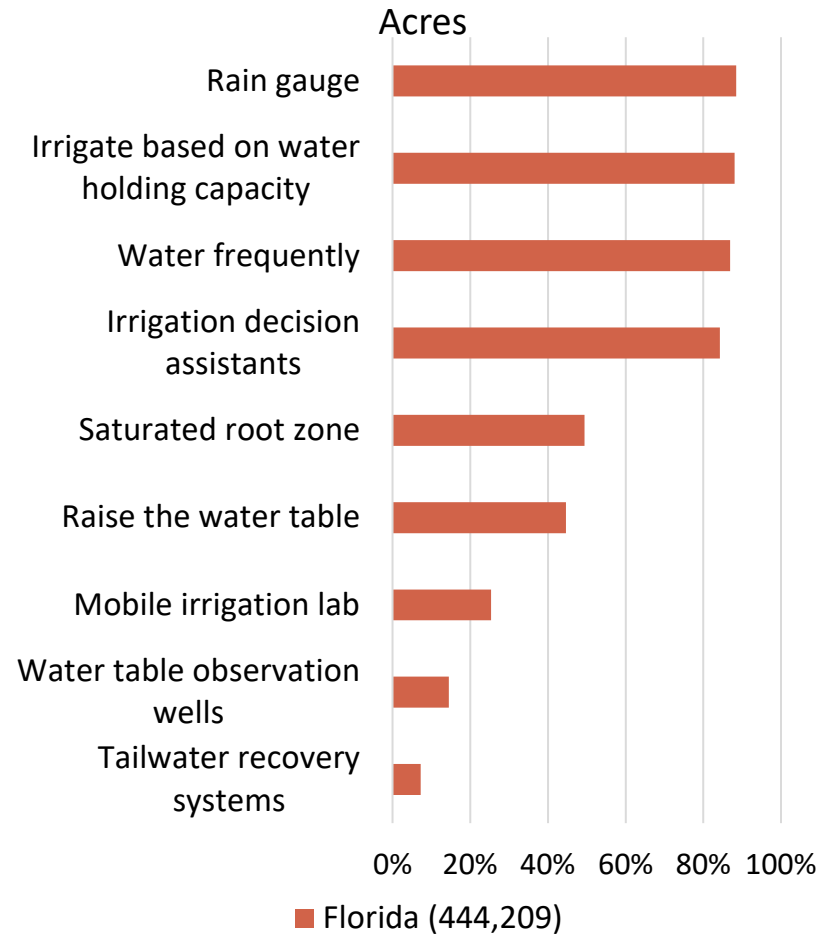
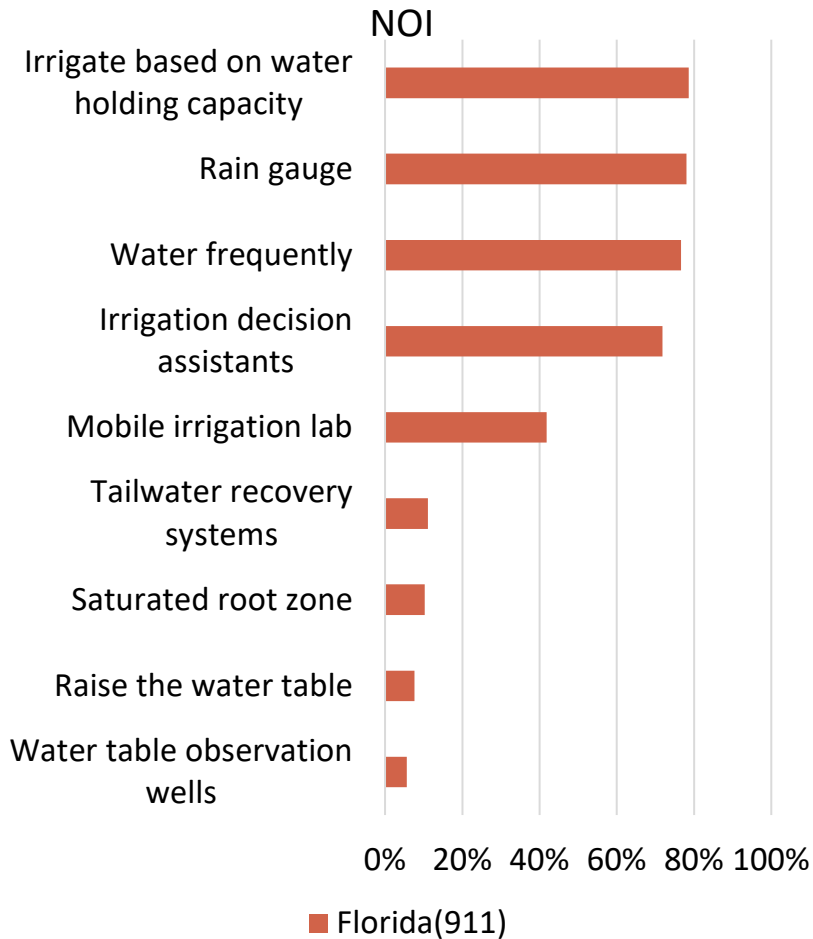
Plasticulture BMPs in the 2015 Vegetable and Agronomic Crops (VAC) Manual

| Irrigation Management BMPs (9) | Nutrient Management BMPs (11) |
|--|-----------------------------------|
| Rain gauge | Keep nutrient application records |
| Irrigate based on water holding capacity | Calibrate fertilizer equipment |
| Water frequently | Soil tests |
| Irrigation decision assistant | Remove plastic |
| Saturate root zone | Consult UF's rate recommendations |
| Raise the water table | Tissue tests |
| Mobile irrigation lab | Linear bed foot system |
| Water table observation wells | Incorporate nutrients in the bed |
| Tailwater recovery systems | Soil sample |
| - | Field consultation |
| - | Retain surface water |

Source: <https://www.fdacs.gov/Agriculture-Industry/Water/Agricultural-Best-Management-Practices>

VAC Growers' Use of Irrigation BMPs

Four BMPs are used by about 50% of Florida growers.



* The percentage is number of NOIs (acres of farm) using each BMP over total number of NOIs (total acres of farm)

Irrigation BMPs With Cost-Share

*Based on this sample,
Florida growers with large farms and cost share use BMPs at higher rates.*

| BMP | Florida | | |
|--|---------------|----------------|---------------|
| | Small (31) | Medium (45) | Large (45) |
| Rain gauge | 83.9% | 73.3% | 93.3% |
| Irrigate based on water holding capacity | 80.6% | 71.1% | 91.1% |
| Water frequently | 80.6% | 68.9% | 88.9% |
| Irrigation decision assistants | 77.4% | 64.4% | 86.7% |
| Mobile irrigation lab | 41.9% | 35.6% | 44.4% |
| Saturated root zone | 3.2% | 6.7% | 33.3% |
| Raise the water table | 0% | 6.7% | 28.9% |
| Water table observation wells | 0% | 4.4% | 17.8% |
| Tailwater recovery systems | 6.5% | 11.1% | 15.6% |

* Small: 0 < acres < 180, Medium: 181 < acres < 500, Large: 501 < acres

* The percentage is number of NOIs using each BMP with cost-share over total number of NOIs in each farm size

Irrigation BMPs Without Cost-Share

Growers with large farms and without cost-share use most BMPs at higher rates.

| BMP | Florida | | |
|--|----------------|-----------------|----------------|
| | Small (525) | Medium (164) | Large (101) |
| Rain gauge | 75.8% | 77.4% | 84.2% |
| Irrigate based on water holding capacity | 78.9% | 72.6% | 84.2% |
| Water frequently | 76.2% | 72% | 83.2% |
| Irrigation decision assistants | 71.2% | 66.5% | 78.2% |
| Mobile irrigation lab | 46.5% | 29.9% | 38.6% |
| Saturated root zone | 3.8% | 11.6% | 34.7% |
| Water table observation wells | 1.7% | 6.1% | 21.8% |
| Raise the water table | 3.2% | 9.8% | 19.8% |
| Tailwater recovery systems | 11.4% | 11.6% | 7.9% |

* Small: 0 < acres < 180, Medium: 181 < acres < 500, Large: 501 < acres

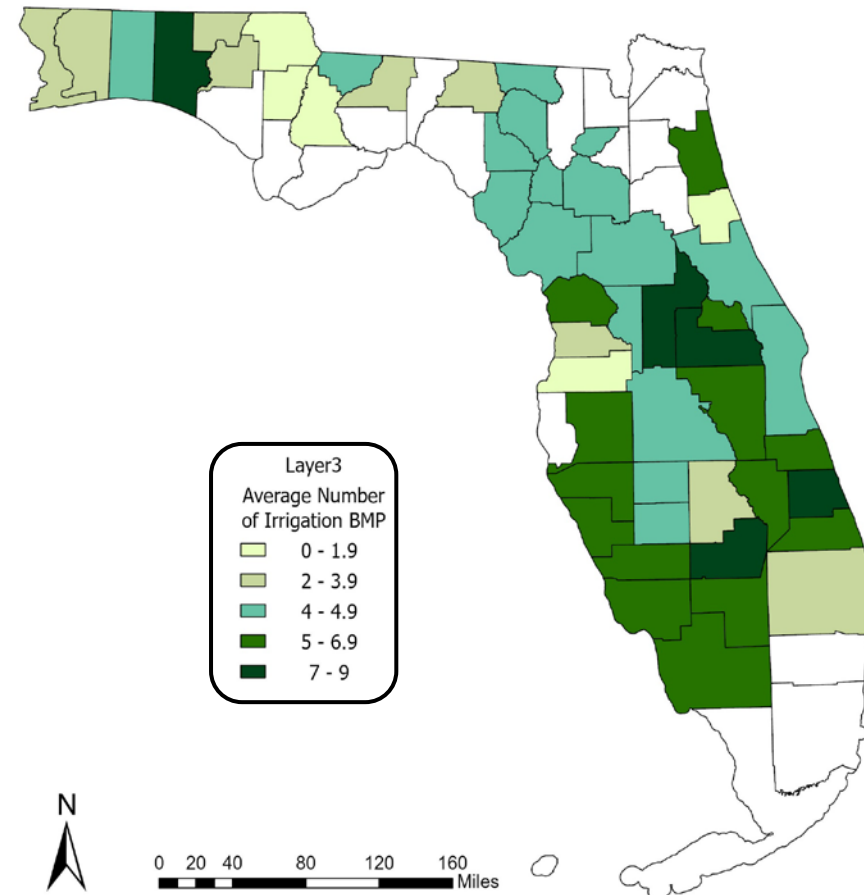
* The percentage is number of NOIs using each BMP without cost-share over total number of NOIs in each farm size

Multiple-BMP Use: Number of Irrigation BMPs Used

*For those who use more than 1 BMP – 80.6% of Florida growers
Most of Florida growers use 4 BMPs simultaneously*

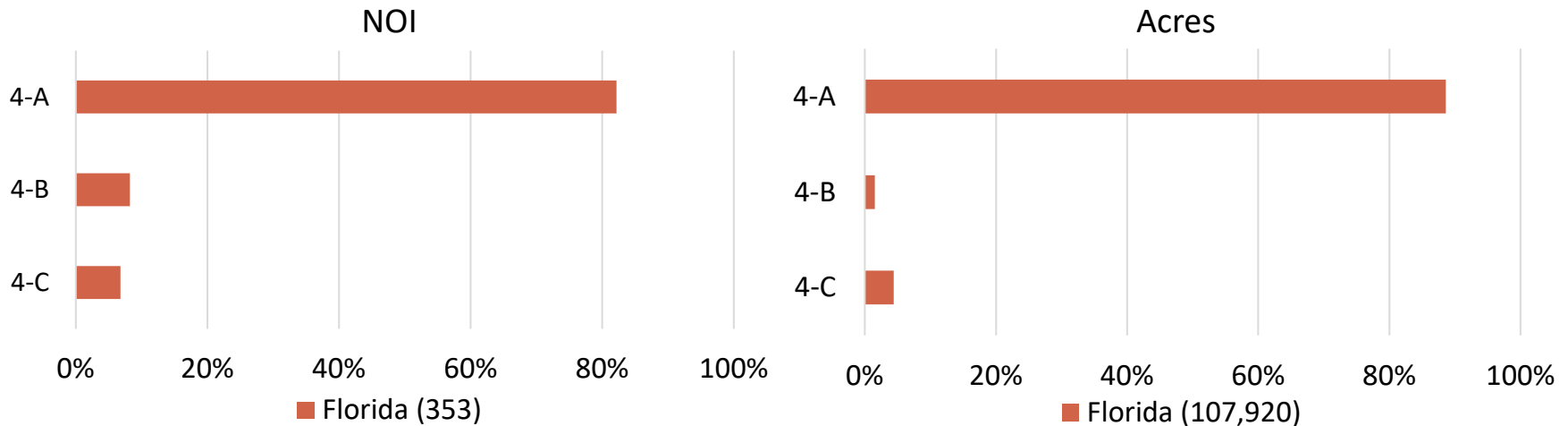
| Number of BMPs | NOIs (911) | Acres (444,209) |
|----------------|-------------|-----------------|
| 1 | 4.1 | 2.1 |
| 2 | 1.8 | 1 |
| 3 | 2.9 | 1.5 |
| 4 | 38.7 | 24.3 |
| 5 | 22.2 | 11.7 |
| 6 | 9.7 | 37.1 |
| 7 | 3.1 | 10.4 |
| 8 | 0.9 | 1.1 |
| 9 | 1.4 | 2.2 |

Average Number of Irrigation BMPs per Farm



Irrigation BMPs Bundle Use

For VAC producers who use 4 BMPs - 82% of growers use Bundle 4-A.



4-A: Rain gauge / Irrigate based on water holding capacity / Water frequently / Irrigation decision assistants

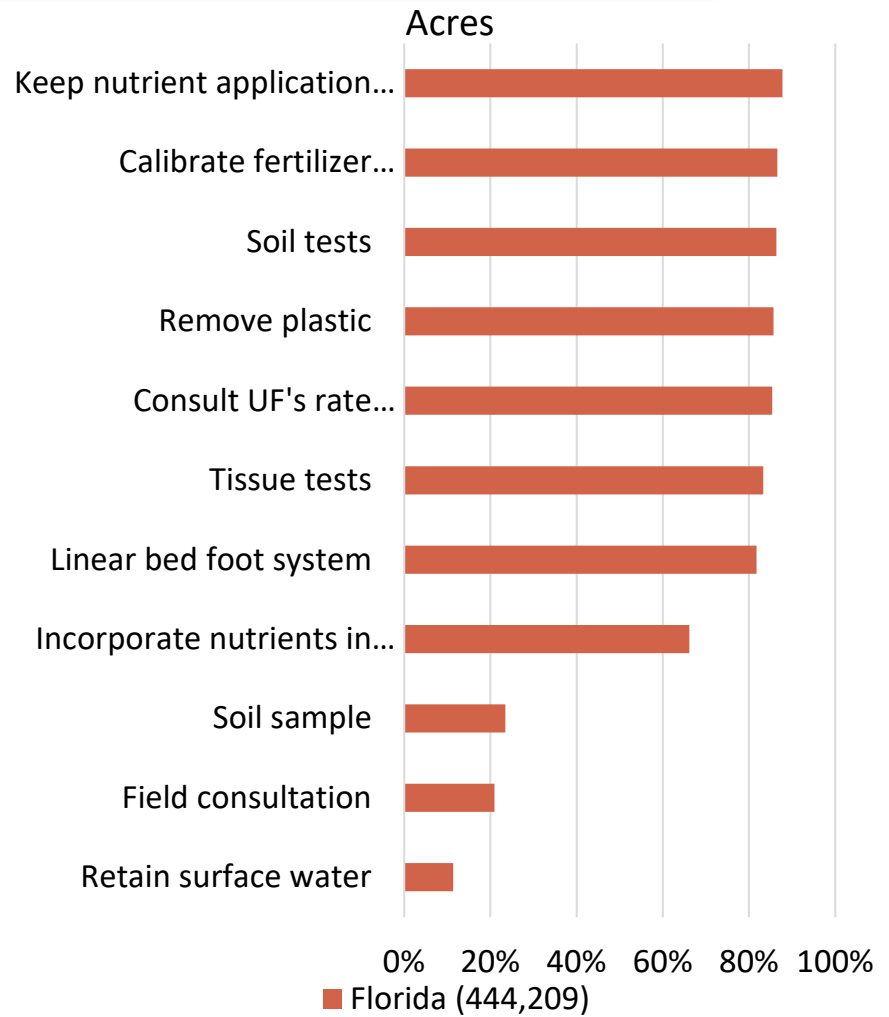
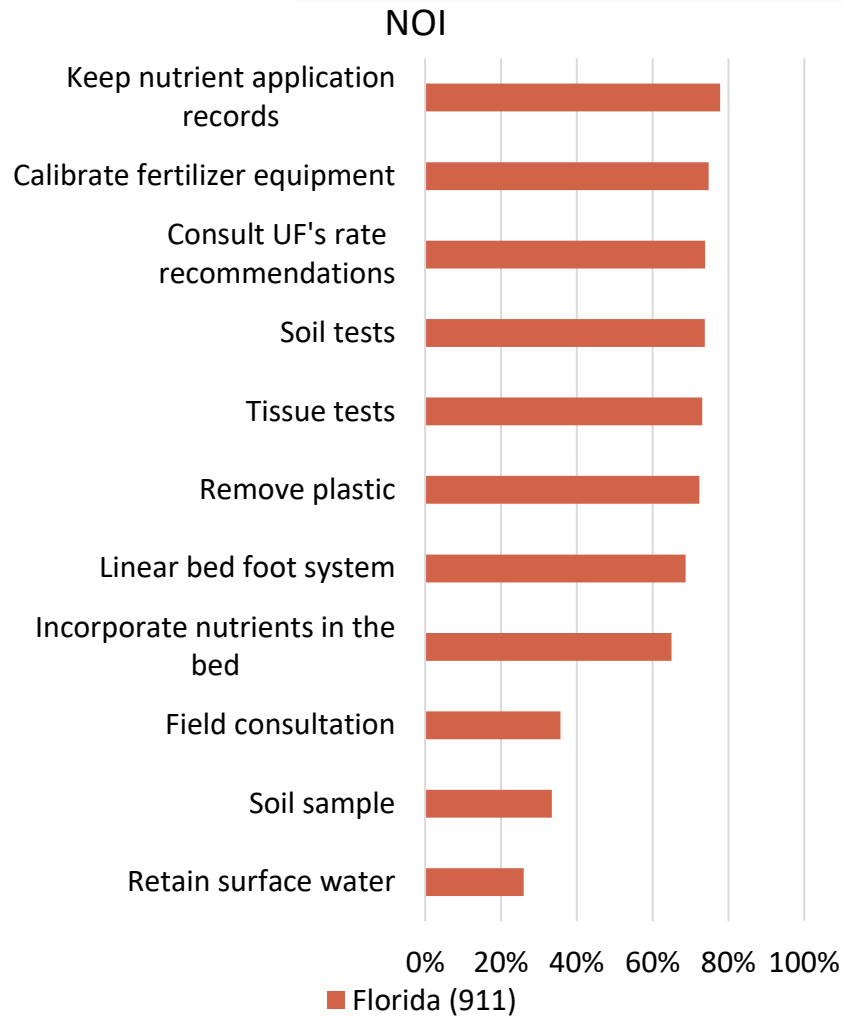
4-B: Irrigate based on water holding capacity / Water frequently / Irrigation decision assistants / Mobile irrigation lab

4-C: Rain gauge / Irrigate based on water holding capacity / Water frequently / Mobile irrigation lab

* The percentage is number of NOIs (acres of farm) using each BMP bundle over total number of NOIs (total acres of farm)

VAC Growers' Use of Nutrient Management BMPs

Eight BMPs are used by almost 70% of Florida growers.



* The percentage is number of NOIs (acres of farm) using each BMP over total number of NOIs (total acres of farm)

Nutrient BMPs With Cost-Share

*Based on this sample,
Florida growers with large farms and cost share are more likely to use BMPs.*

| BMP | Florida | | |
|-----------------------------------|---------------|----------------|---------------|
| | Small (31) | Medium (45) | Large (45) |
| Keep nutrient application records | 80.6% | 75.6% | 88.9% |
| Calibrate fertilizer equipment | 77.4% | 71.1% | 86.7% |
| Soil tests | 77.4% | 68.9% | 86.7% |
| Remove plastic | 74.2% | 64.4% | 86.7% |
| Consult UF's rate recommendations | 77.4% | 68.9% | 86.7% |
| Tissue tests | 67.7% | 68.9% | 82.2% |
| Linear bed foot system | 74.2% | 66.7% | 82.2% |
| Incorporate nutrients in the bed | 64.5% | 60% | 80% |
| Field consultation | 29% | 35.6% | 28.9% |
| Soil sample | 35.5% | 26.7% | 22.2% |
| Retain surface water | 16.1% | 33.3% | 20% |

* Small: 0 < acres < 180, Medium: 181 < acres < 500, Large: 501 < acres

* The percentage is number of NOIs using each BMP with cost-share over total number of NOIs in each farm size

Nutrient BMPs Without Cost-Share

Growers with large farms and cost share are more likely to use BMPs.

| BMP | Florida | | |
|-----------------------------------|----------------|-----------------|----------------|
| | Small (525) | Medium (164) | Large (101) |
| Keep nutrient application records | 77.5% | 73.2% | 82.2% |
| Calibrate fertilizer equipment | 73.7% | 71.3% | 81.2% |
| Soil tests | 72.8% | 69.5% | 81.2% |
| Remove plastic | 72% | 65.9% | 81.2% |
| Consult UF's rate recommendations | 73.3% | 59.5% | 79.2% |
| Linear bed foot system | 66.1% | 67.7% | 77.2% |
| Tissue tests | 73.7% | 70.1% | 74.3% |
| Incorporate nutrients in the bed | 65% | 58.5% | 71.3% |
| Soil sample | 38.1% | 22% | 34.7% |
| Field consultation | 39% | 34.1% | 25.7% |
| Retain surface water | 28.4% | 29.9% | 9.9% |

* Small: 0 < acres < 180, Medium: 181 < acres < 500, Large: 501 < acres

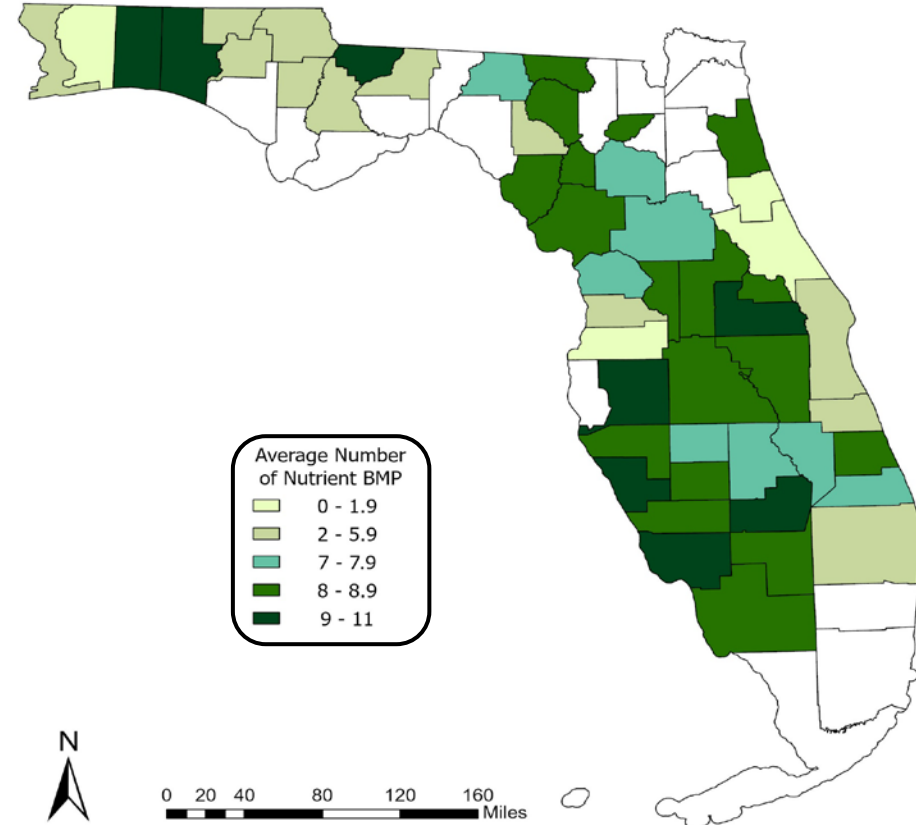
* The percentage is number of NOIs using each BMP without cost-share over total number of NOIs in each farm size

Multi-BMP Use: Number of Nutrient BMPs Used

*For those who use more than 1 BMP - 91.8% of Florida growers
Most of growers use 8 nutrient BMPs simultaneously*

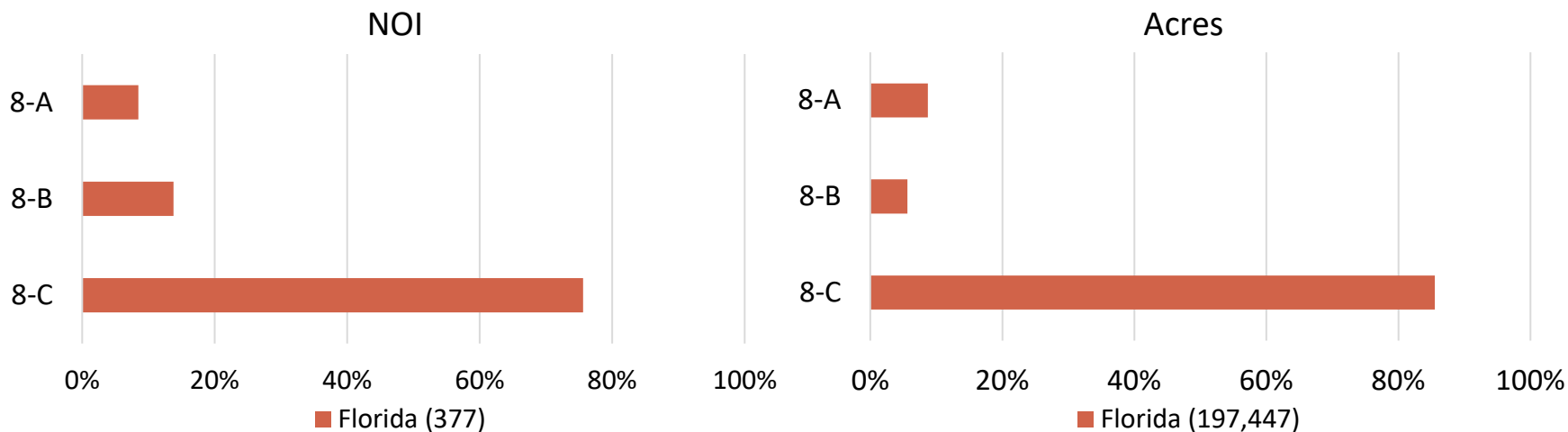
| Number of BMPs | NOIs (911) | Acres (444,209) |
|----------------|-------------|-----------------|
| 0 | 6.1 | 5.4 |
| 1 | 2.1 | 1 |
| 2 | 14.2 | 5.8 |
| 3 | 2.1 | 0.5 |
| 4 | 1 | 0.6 |
| 5 | 0.7 | 0.1 |
| 6 | 1.4 | 1.1 |
| 7 | 4.2 | 20.5 |
| 8 | 41.4 | 44.4 |
| 9 | 13.6 | 10.3 |
| 10 | 6.9 | 8.2 |
| 11 | 6.4 | 1.9 |

Average Number of Nutrient BMP per



Nutrient BMP Bundle Use

For VAC producers who use 8 BMPs - 85% of growers use Bundle 8-C.



8-A: Keep nutrient application records / Calibrate fertilizer equipment / Soil tests / Remove plastic / Consult UF's rate recommendations / Tissue tests / Incorporate nutrients in the bed / Soil sample

8-B: Keep nutrient application records / Calibrate fertilizer equipment / Soil tests / Remove plastic / Consult UF's rate recommendations / Tissue tests / Linear bed foot system / Soil sample

8-C: Keep nutrient application records / Calibrate fertilizer equipment / Soil tests / Remove plastic / Consult UF's rate recommendations / Tissue tests / Linear bed foot system / Incorporate nutrients in the bed

* The percentage is number of NOIs (acres of farm) using each bundle over NOIs (total acres of farm) using 8 nutrient BMPs

Summary

- If BMPs have additive benefits, then bundling can help improve water quality.
- Growers use multiple BMPs:
 - ✓ 80.6% use 2 or more irrigation management BMPs.
 - ✓ 91.8% use 2 or more nutrient management BMPs.
- Farm size and cost-share
 - ✓ Growers with large farms are more likely use BMPs and enroll in cost-share programs.
 - More applicable BMPs
 - Better able to take advantage of the cost-share programs
- We can identify specific bundles:
 - Irrigation BMP bundles with 4 practices
 - Nutrient BMP bundles with 8 practices
- Identifying BMP bundles can help design conservation policy (e.g., incentives for multi-BMP use or encourages good stewardship).

Acknowledgements

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Reference

Florida Department of Food and Agriculture Customer Service (FDACS). 2022. *Status of Implementation of Agricultural Nonpoint Best Management Practices Report*. FDACS Office of Agricultural Water Policy, Tallahassee, FL. July 1, 2022. FDACS-P-01924 07/22. Available at <https://www.fdacs.gov/ezs3download/download/104912/2726091/Media/Files/Marketing-Development-Files/09124-FDACS-OAWP-Annual-Report-2022.pdf>

Questions???



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