



AGRICULTURE AND
NATURAL RESOURCE
ECONOMICS PROGRAM

Florida Best Management Practice Use: Examining Multiple-BMP Use

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Quarterly Meeting
June 11, 2021

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 drivers of BMP bundle use
- Identify practices that growers treat as complements

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.

Introduction

Today we explore:

- Distribution of BMPs and BMP bundles use
 - ✓ Florida and SW district
- Factors that affect BMP bundle use
 - ✓ Farm size?
 - ✓ Cost-share?

Florida's Agricultural Best Management Practices Program

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

- BMP coordinators 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 is voluntary.
- Participation makes growers eligible for cost-share funds.

Currently, 56% of the agricultural acreage in Florida (excluding silviculture) is enrolled in the BMP Program (FDACS 2020).

Data

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

- Statewide “Notice of Intent” (NOI) database

 - ✓ Vegetable and Agronomic Crops BMP manual (2015)

 - ✓ Collected in May 2020

 - ✓ Florida:

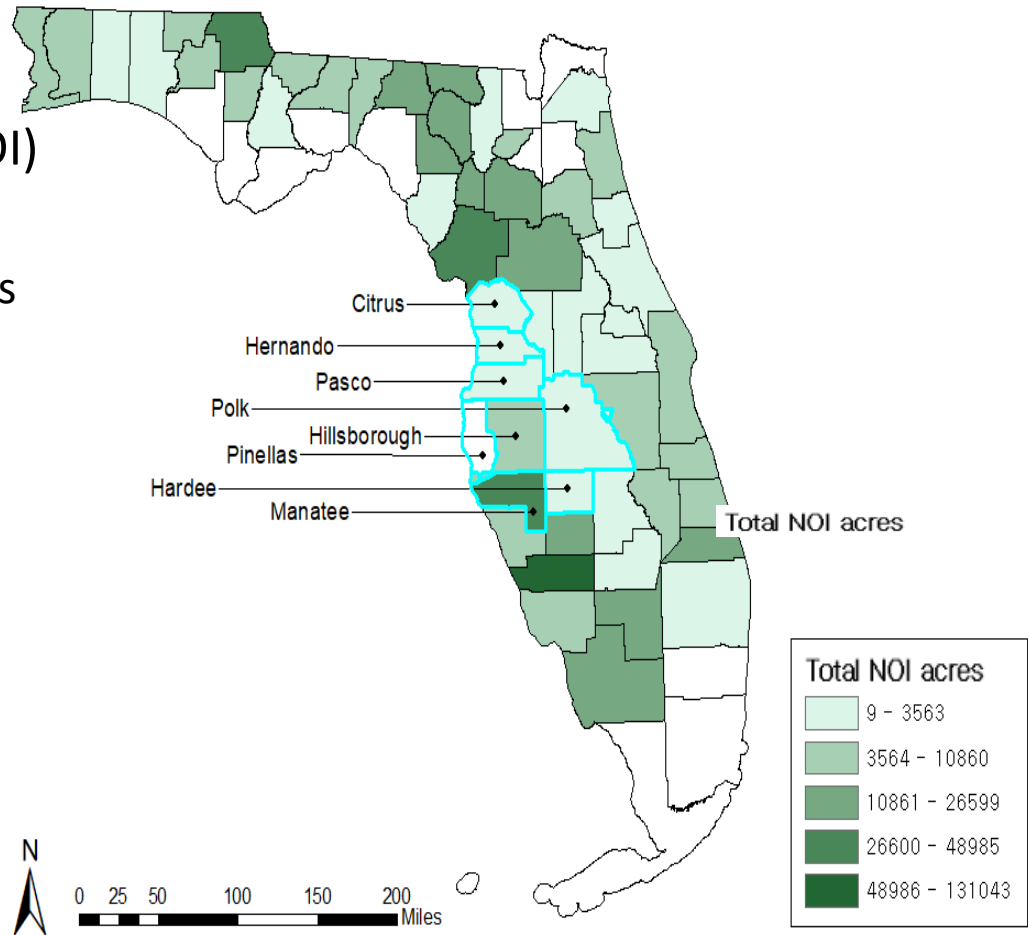
 - 1,342 growers; 591,251 acres

 - ✓ SW District:

 - 201 growers; 50,484 acres

 - ✓ Farm-level data

- FDACS cost-share enrollment



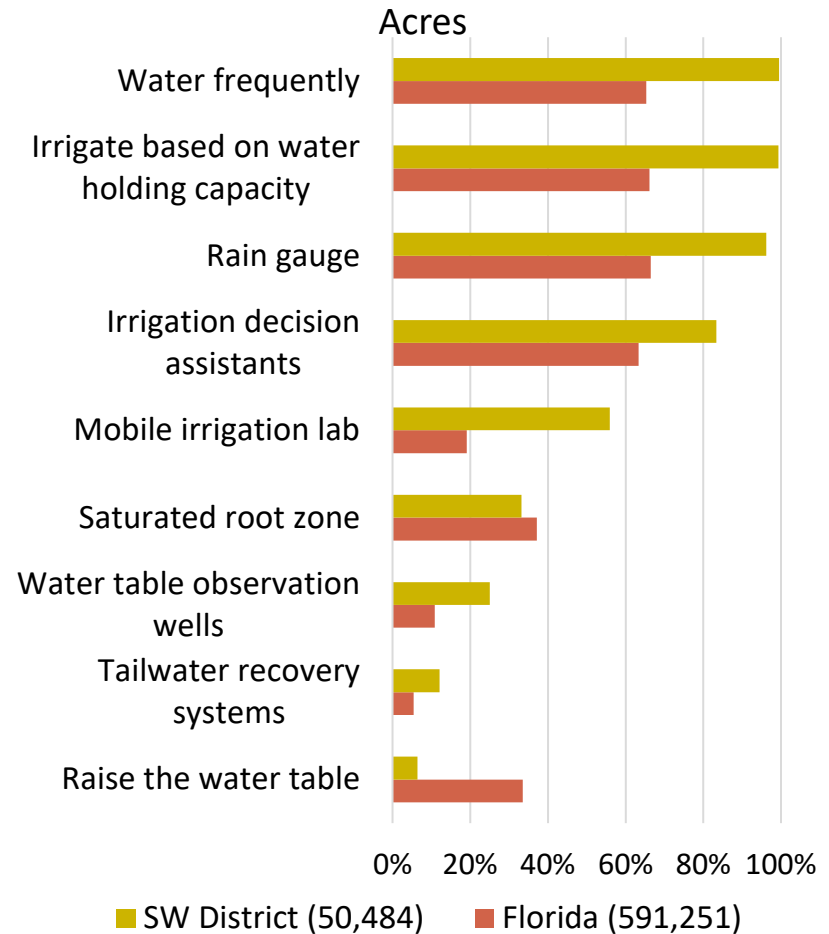
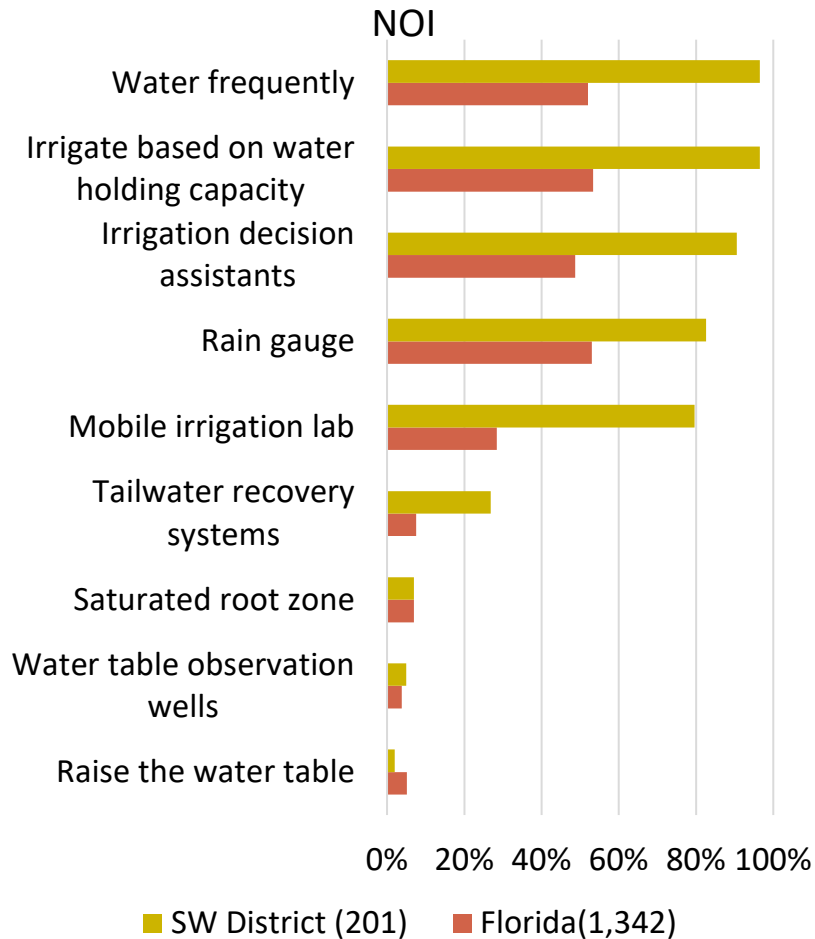
Plasticulture BMPs in the 2015 Vegetable and Agronomic Crops Manual

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>

Growers' Use of Irrigation BMPs

*Four BMPs are used by about 50% of Florida growers.
The same BMPs are used by 92% of SW District 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

*In Florida, growers with large farms and cost share are more likely to use BMPs.
In the SW District, growers with medium sized farms and cost share are more likely to use BMPs.*

BMP	Florida			SW District		
	S (816)	M (326)	L (200)	S (162)	M (16)	L (23)
Rain gauge	3%	10%	21%	4%	25%	17%
Irrigate based on water holding capacity	3%	10%	21%	4%	25%	17%
Water frequently	3%	10%	20%	4%	25%	17%
Irrigation decision assistants	3%	9%	20%	3%	19%	17%
Mobile irrigation lab	2%	5%	10%	3%	25%	13%
Saturated root zone	0%	1%	8%	0%	0%	4%
Raise the water table	0%	1%	7%	0%	0%	4%
Water table observation wells	0%	1%	4%	0%	0%	0%
Tailwater recovery systems	0%	2%	4%	1%	13%	4%

* 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 small farms and without cost-share are more likely to use BMPs.

BMP	Florida			SW District		
	S (816)	M (326)	L (200)	S (162)	M (16)	L (23)
Rain gauge	49%	39%	43%	75%	69%	83%
Irrigate based on water holding capacity	51%	37%	43%	92%	75%	83%
Water frequently	49%	36%	42%	92%	75%	83%
Irrigation decision assistants	46%	33%	40%	89%	69%	65%
Saturated root zone	2%	6%	18%	2%	6%	35%
Raise the water table	2%	5%	10%	1%	0%	4%
Mobile irrigation lab	30%	15%	20%	80%	56%	43%
Water table observation wells	1%	3%	11%	2%	6%	26%
Tailwater recovery systems	7%	6%	4%	26%	31%	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 - 54.7% of Florida growers
- 98% of SW District growers*

*Most of Florida growers use 4 BMPs simultaneously
Most of SW District growers use 5 BMPs simultaneously*

NOI

Number of BMPs	Florida (1,342)	SW District (201)
0	42.5	2.0
1	2.8	0
2	1.2	0.5
3	1.9	2.5
4	26.3	30.8
5	15.1	34.8
6	6.6	26.4
7	2.1	2.0
8	0.6	0.5
9	1.0	0.5

Acres

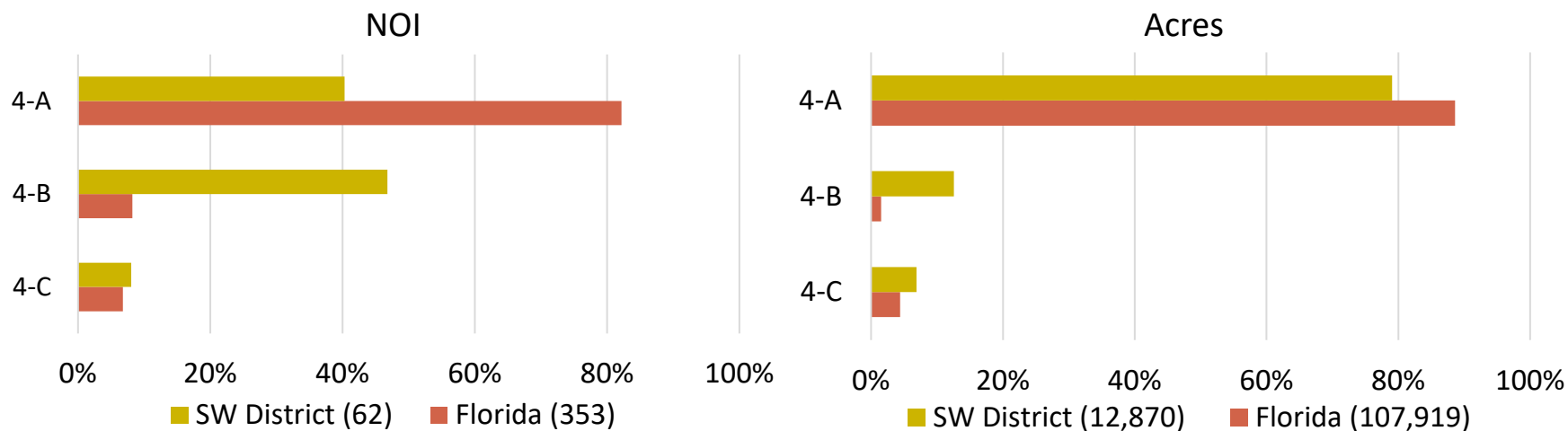
Number of BMPs	Florida (591,251)	SW District (50,484)
0	31.2	0.3
1	1.6	0
2	0.8	0.1
3	1.1	7.2
4	18.3	25.5
5	8.8	26.9
6	27.9	27.7
7	7.8	12.0
8	0.8	0.1
9	1.7	0.2

Irrigation BMPs Bundle Use in Florida

For those who use 4 BMPs - 82% of Florida growers use Bundle 4-A.

- 46% of SW District growers use Bundle 4-B.

In the SW District, those who use bundle 4-A have larger farms and those who use bundle 4B have smaller than average farms.



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

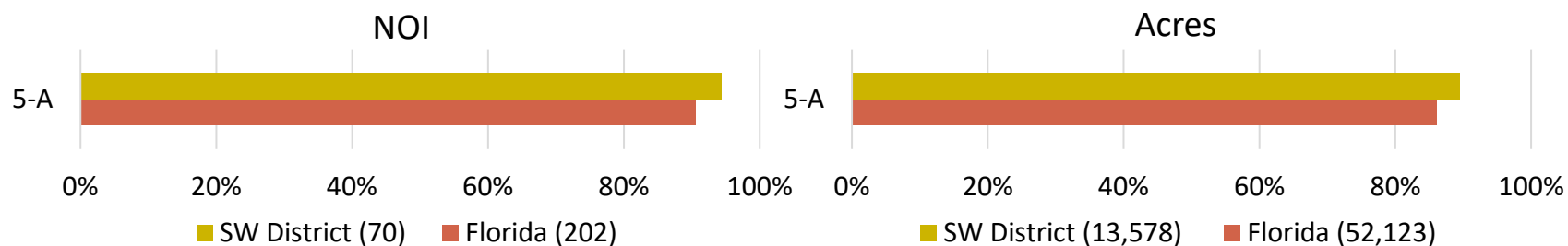
4-B: Irrigate based on water holding capacity / Water frequently / Irrigation decision assistants / Mobile irrigation lab

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)

Irrigation BMP Bundle Use in the SW District

*For those who use 5 BMPs - 94% of Florida growers use Bundle 5-A.
- 90% of SW District growers use Bundle 5-A.*

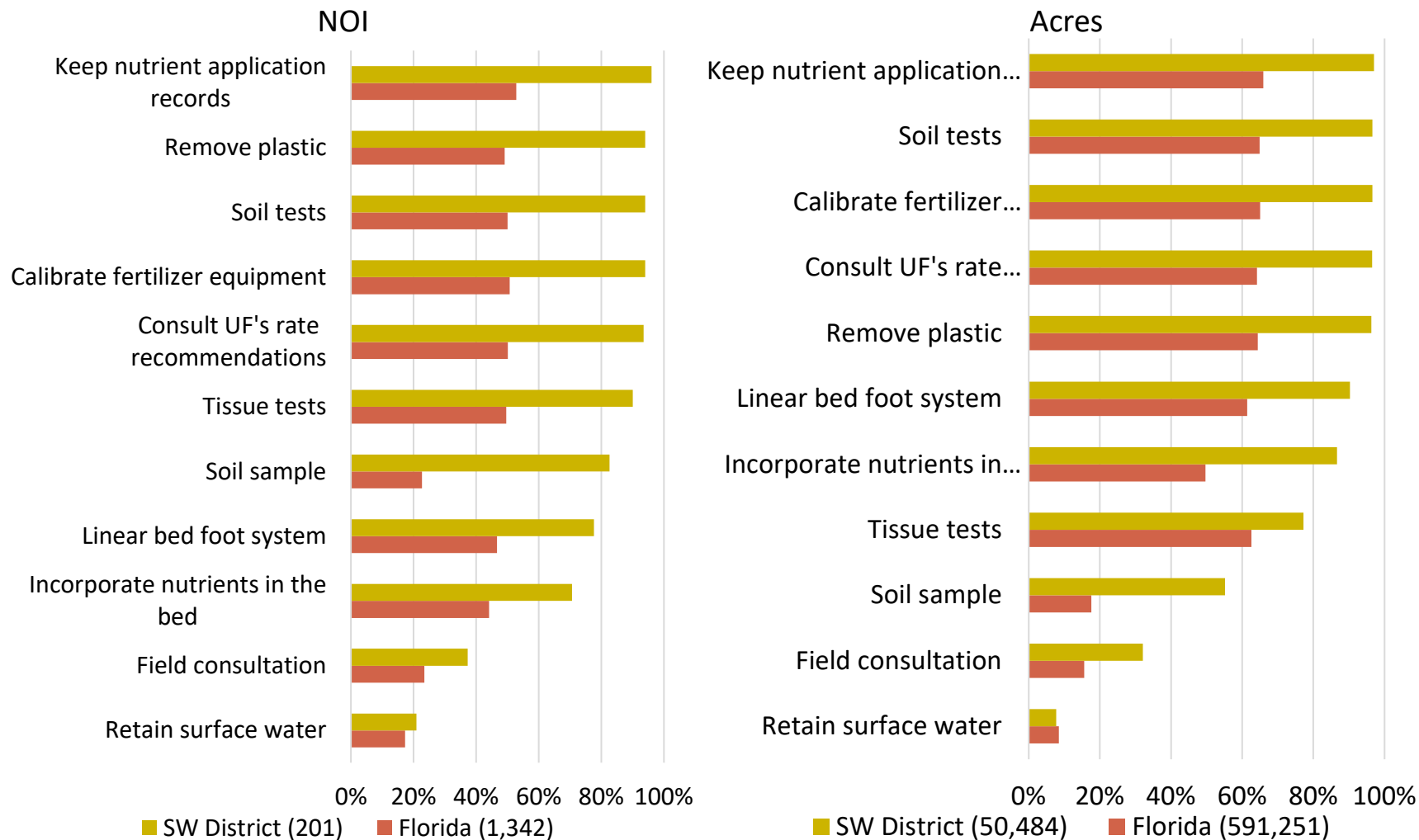


5-A: Rain gauge / Irrigate based on water holding capacity / Water frequently / Irrigation decision assistants / Mobile irrigation lab

- * The percentage is number of NOIs (acres of farm) using each BMP bundle over total number of NOIs (total acres of farm)
- * Bundles with three or less growers are omitted to avoid disclosure issue.

Growers' Use of Nutrient Management BMPs

*Six BMPs are used by about 50% of Florida growers.
The same BMPs are used by 93% of SW District 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

*In Florida, growers with large farms and cost share are more likely to use BMPs.
In the SW District, growers with medium sized farms and cost-share are more likely to use BMPs.*

BMP	Florida			SW District		
	S (816)	M (326)	L (200)	S (162)	M (16)	L (23)
Keep nutrient application records	3%	10%	20%	4%	25%	17%
Calibrate fertilizer equipment	3%	10%	20%	3%	25%	17%
Soil tests	3%	10%	20%	3%	25%	17%
Remove plastic	3%	9%	20%	3%	25%	17%
Consult UF's rate recommendations	3%	10%	20%	3%	25%	17%
Tissue tests	3%	10%	19%	3%	25%	13%
Linear bed foot system	3%	9%	19%	3%	25%	13%
Incorporate nutrients in the bed	2%	8%	18%	1%	13%	13%
Soil sample	1%	4%	5%	2%	25%	13%
Field consultation	1%	4%	7%	0%	0%	9%
Retain surface water	1%	4%	5%	0%	0%	0%

* 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 small farms are more likely to use BMPs.

BMP	Florida			SW District		
	S (816)	M (326)	L (200)	S (162)	M (16)	L (23)
Keep nutrient application records	50%	37%	42%	93%	69%	78%
Calibrate fertilizer equipment	47%	36%	41%	90%	75%	78%
Soil tests	47%	35%	41%	90%	75%	78%
Remove plastic	46%	33%	41%	91%	69%	78%
Consult UF's rate recommendations	47%	35%	40%	90%	75%	78%
Tissue tests	47%	35%	38%	89%	69%	61%
Linear bed foot system	43%	34%	39%	71%	69%	78%
Incorporate nutrients in the bed	42%	29%	36%	69%	50%	74%
Soil sample	25%	11%	18%	84%	63%	39%
Field consultation	24%	17%	13%	40%	19%	26%
Retain surface water	18%	15%	5%	23%	19%	4%

* 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 - 61.8% of Florida growers
- 96.5% of SW District growers
Most of growers use 8 nutrient BMPs simultaneously*

NOI (%)

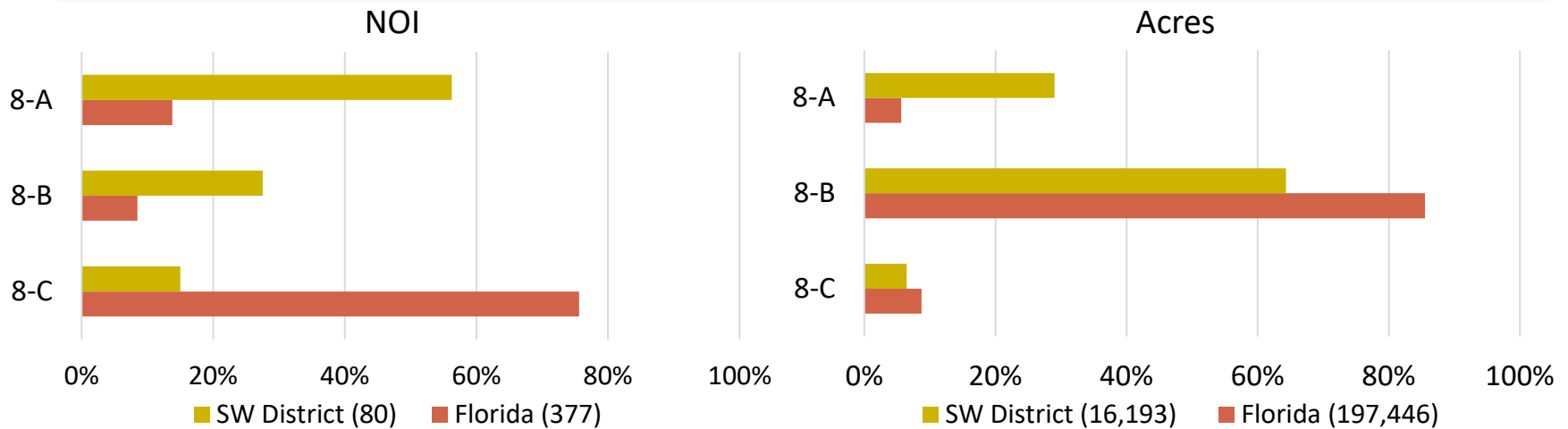
Number of BMPs	Florida (1,342)	SW District (201)
0	37.0	0.5
1	1.0	3.0
2	9.2	1.0
3	1.4	1.0
4	0.7	0.5
5	0.4	0
6	1.1	1.0
7	2.8	4.0
8	28.1	39.8
9	9.2	18.9
10	4.7	15.4
11	4.3	14.9

Acres (%)

Number of BMPs	Florida (591,251)	SW District (50,484)
0	29.1	0.1
1	0.6	2.6
2	4.3	0.2
3	0.4	0.5
4	0.5	0.4
5	0.1	0
6	0.8	3.6
7	15.4	15.7
8	33.4	32.1
9	7.8	15.1
10	6.1	25.6
11	1.4	4.2

Nutrient BMP Bundle Use

*For those who use 8 BMPs - 75% of Florida growers use Bundle 8-A.
 - 56% of SW District growers use Bundle 8-C.
 Bundle 8-B is used by few growers on large acres.*



8-A: 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-B: 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-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 BMPs can help improve water quality.
- Growers use multiple BMPs:
 - ✓ 54.7% use 2 or more irrigation management BMPs.
 - ✓ 61.8% 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.
- FDACS cost-share enrollment in SW District is lower than the average in Florida.
- We can identify specific bundles:
 - Irrigation BMP bundles with 4 or 5 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

- Collaborator: Dr. Tatiana Borisova; Food and Resource Economics Department; UF-IFAS
- We appreciate the data and the feedback for the study provided by Yesenia Escribano, Norman Doxford, and other personnel at the Florida Department of Agriculture and Consumer Services.
- This research was partially funded by the U.S. Department of Agriculture National Institute of Food and Agriculture under award no. 2016-67024-24755 and the multistate research project W4133

Reference

Florida Department of Food and Agriculture Customer Service (FDACS). 2020. *Status of Implementation of Agricultural Nonpoint Best Management Practices Report*. FDACS Office of Agricultural Water Policy, Tallahassee, FL. July 1, 2020. FDACS-P-01924 07/20. Available at <https://www.fdacs.gov/ezs3download/download/92076/2598590/Media/Files/Agricultural-Water-Policy-Files/BMP-Implementation/Status-of-Implementation-of-BMPs-Report-July-2020/6120Status-of-Implementation-of-BMPs-Report-v3.pdf>

Questions???

Please complete the Evaluation Survey:

https://ufl.qualtrics.com/jfe/form/SV_bQHui1y83Ep4c6O



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