



Florida Producers' Perceptions of Nutrient Agricultural Best Management Practices Profitability

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Agricultural best management practices (BMPs) have public and private benefits. Public benefits include maintaining or improving water quality, while private benefits include reducing agricultural inputs or increasing yields. BMPs that help improve fertilizer use efficiency and reduce leaching events can have direct impact on both water quality and farm profitability. The dynamics of crop growth and the nutrient cycle make timely and adequate applications of fertilizers important. Though cost share exists for BMP adoption, producers largely absorb the cost and risks of using BMPs. We conducted a statewide survey of Florida producers to learn their perceptions of nutrient BMPs profitability and barriers to use. The survey examined agronomic crops, citrus, and fruits and vegetable producers' use of controlled release fertilizer, calibrating fertilizer equipment, and cover crops. We found that an average of 73%, 65%, and 40% of agronomic crops, citrus, and fruits and vegetable producers agree that these BMPs are profitable. Also, an average of 31%, 16%, and 14% of respondents reported that they are not implementing BMPs because the practices are too expensive, not applicable on their farms, and they do not expect a yield benefit. We found that BMP use varies by crop category. Interestingly, we also found that few respondents think that they do not have enough time to learn about new practices. Understanding producers' perceptions of BMP profitability and barriers to adoption is important to designing effective conservation programs.

Population growth and crop production are the largest drivers of freshwater demand in Florida. The demand for water resources increases as the population increased by more than 15 million people in the past 80 years (Fletcher and Borisova 2017). Also, the number of farms and the average farm size increased during this period (Her et al. 2017). In the agriculture sector, water use is expected to increase by 3.65% between 2020 and 2040. The state is therefore expected to spend between \$0.31 billion and \$1.77 billion by 2035 to satisfy water needs (EDR 2020).

Several technologies or practices are utilized to meet the demand for clean water in Florida. Agriculture best management practices (BMPs) are designed to mitigate agriculture's effect on the environment by controlling water runoff and nutrient leaching (Braune and Wood, 1999; Lam et al., 2011). BMP adoption also has private benefits, as improving nutrient management efficiency can increase yield and decrease input costs. For example, BMPs that help improve fertilizer use efficiency and reduce leaching events can have direct positive impacts on farm profitability. The dynamics of crop growth and the nutrient cycle make timely and adequate applications of fertilizers important in increasing both public and private benefits.

While these practices have both private and public benefits, producers voluntarily adopt BMPs that are applicable to their production systems, sometimes without fully understanding the suite of costs and benefits. State and Federal agencies offer finan-

cial incentives, such as cost share, to help shoulder the burden of BMP costs but producers largely adopt BMPs at their own cost and risk to their operations. To better understand the socioeconomic factors that affect adoption we conducted a statewide survey that asks producers to list specific nutrient BMPs they have adopted and to provide their perceptions on profitability and barriers to adoption. These survey results can be used to develop strategies for increasing BMP adoption in Florida.

Survey Design and Methodology

We conducted a statewide survey of specialty crop producers to better understand their adoption and perceptions of specific nutrient BMPs, including controlled release fertilizer (CRF), calibration of fertilizer equipment (CFE) and use of cover crops (CC). These are a few of many BMPs which may have substantial effects on water quality. The survey has three primary sections: costs and benefits of CRF, CFE, and CC, barriers to adoption, and farm demographics. The instrument was designed with input from University of Florida/IFAS horticulture faculty, extension faculty, citrus and vegetable specialists, and producers. The survey was administered online by the Florida Survey Research Center (fsurveyresearch.center.ufl.edu), emailed to UF/IFAS extension agents and grower association listservs, in person, and via the postal mail from March 2018 to June 2019. This method is appropriate given the diversity of Florida crops.

For producers' two most widely grown crops, the questionnaire asks what crops they grow, on how many acres the BMPs are being applied, when they were first implemented, the additional cost of implementing the BMPs, and the estimated yield effect from using the BMPs. In addition to these three BMPs,

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researchers asked respondents to identify other BMPs they are adopting. Barriers to adopting all BMPs are revealed with questions asking if they did not implement the practice because of lack of knowledge, lack of experience, the practices are too labor intensive, the practices are too expensive, they do not perceive a yield benefit from using the practice, they do not have time to learn a new practice or the practices are too data intensive.

We received 151 completed surveys of which 80 reported growing a second crop. Because practice adoption in this sample varies by crop, we assume that each producer makes separate adoption decisions for each crop and treat those 80 responses as separate decision makers (or producers). Doing this allows us to increase the study sample to 231 respondents representing 386,900 acres where the average farm occupies 1675 acres. Our

respondents grow citrus, agronomic crops, fruits and vegetables, forages and other crops. Our analysis focusses on producers who grow agronomic crops, citrus, and fruits and vegetables, leaving 146 respondents representing 299,958 acres where the average farm is 2054 acres.

Results

Figure 1A–C display the respondent’s perceptions of BMP use on profitability for each crop category. We see that 50 to 89% of the agronomic crop producers and 28 to 56% of vegetable produces who adopted CRF, CC, and CFE agree that these BMPs are profitable. Also, 50% and 82% of citrus producers agree that CFE and CRF are profitable. The figures also show that for those practices where benefits may be harder to quantify, like CFE and CC, up to 45% are not sure how the practices affect profitability (Fig. 1C). That most respondents indicate that these BMPs are

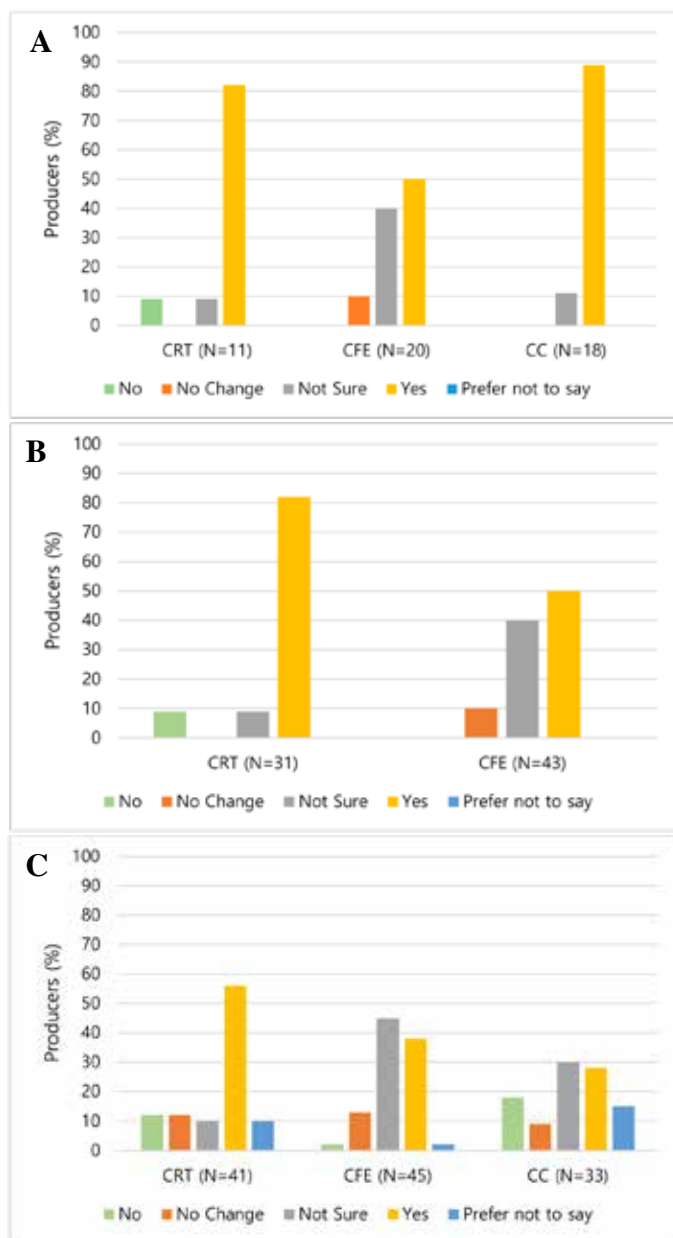


Fig. 1. (A) Florida agronomic crop producer’s perceptions of best management practices profitability. (B) Florida citrus producer’s perceptions of best management practices profitability. (C) Florida fruit and vegetable producer’s perceptions of best management practices profitability. CRT = controlled release fertilizer, CFE = calibration of fertilizer equipment, and CC = use of cover crops.

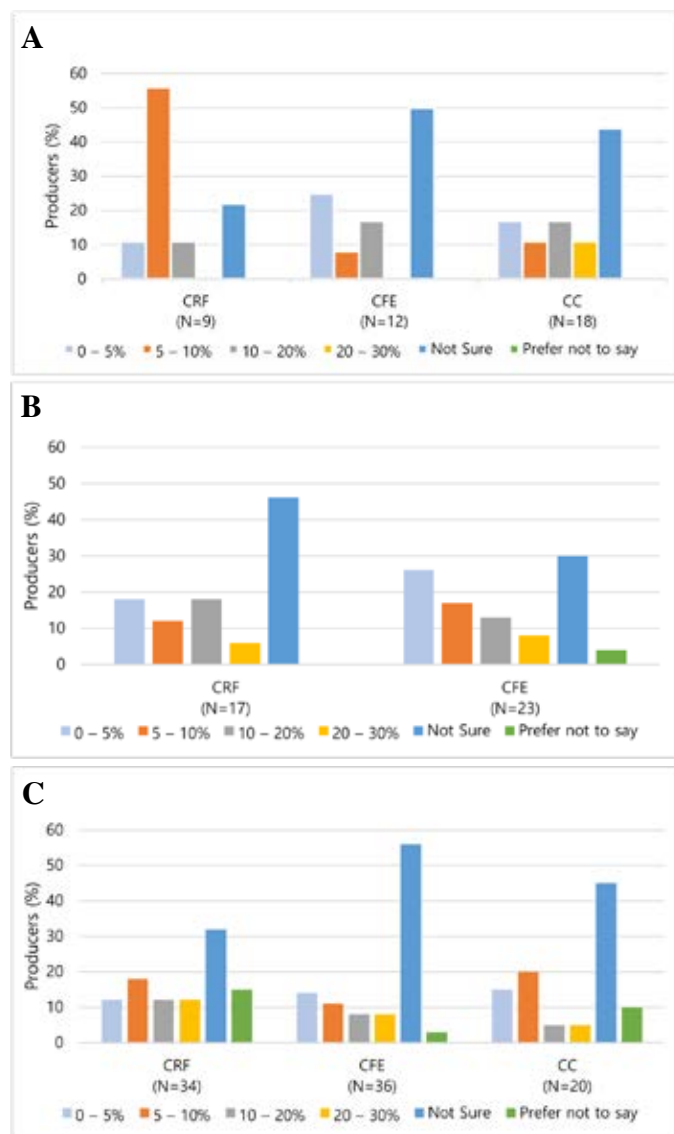


Fig. 2. (A) Florida agronomic crop producer’s perceptions of yield increase with best management practices use. (B) Florida citrus producers’ perceptions of yield increase with best management practices use. (C) Florida fruit and vegetable producer’s perceptions of yield increase with best management practices use. CRF = controlled release fertilizer, CFE = calibration of fertilizer equipment and CC = use of cover crops.

profitable may also be due to selection bias (which we did not address in our methods). Most respondents use BMPs and likely do so because of measured or perceived private benefits.

Respondents were also asked to indicate the percent yield increase attributed to the use of nutrient BMPs (Fig. 2 A–C). Figure 2A shows that 56% of agronomic crop producers indicate the CRF increased yields by 5-10%. However, 50% and 44% of agronomic crop producers indicate that they are not sure how CFE and CC affects their yields. Similarly, “Not Sure” is the largest category for citrus and fruit and vegetable producers (Fig. 2 Band C, respectively). While the large number of “Not Sure” responses leaves questions about whether the need for more information on how to calculate the benefits from CFE and CC,

most respondents indicate no or positive increases from the use of these BMPs.

In addition to CRF, CFE, and CC, respondents were asked to identify other nutrient BMPs they used and their barriers to BMP adoption (Figs. 3 and 4). In Fig. 3, we see that BMPs related fertilizer use (i.e., use University of Florida/IFAS [UF/IFAS] recommended fertilizer rates, base fertilizer applications on soil or tissue tests and keep nutrient application records) are more widely adopted than some other BMPs. The most widely adopted BMP is to keep nutrient application records, which is adopted by 56%, 84%, and 78% of fruits and vegetables, agronomic crops and citrus producers, respectively, followed by using UF/IFAS recommended fertilizer rates. Figure 4 shows reasons

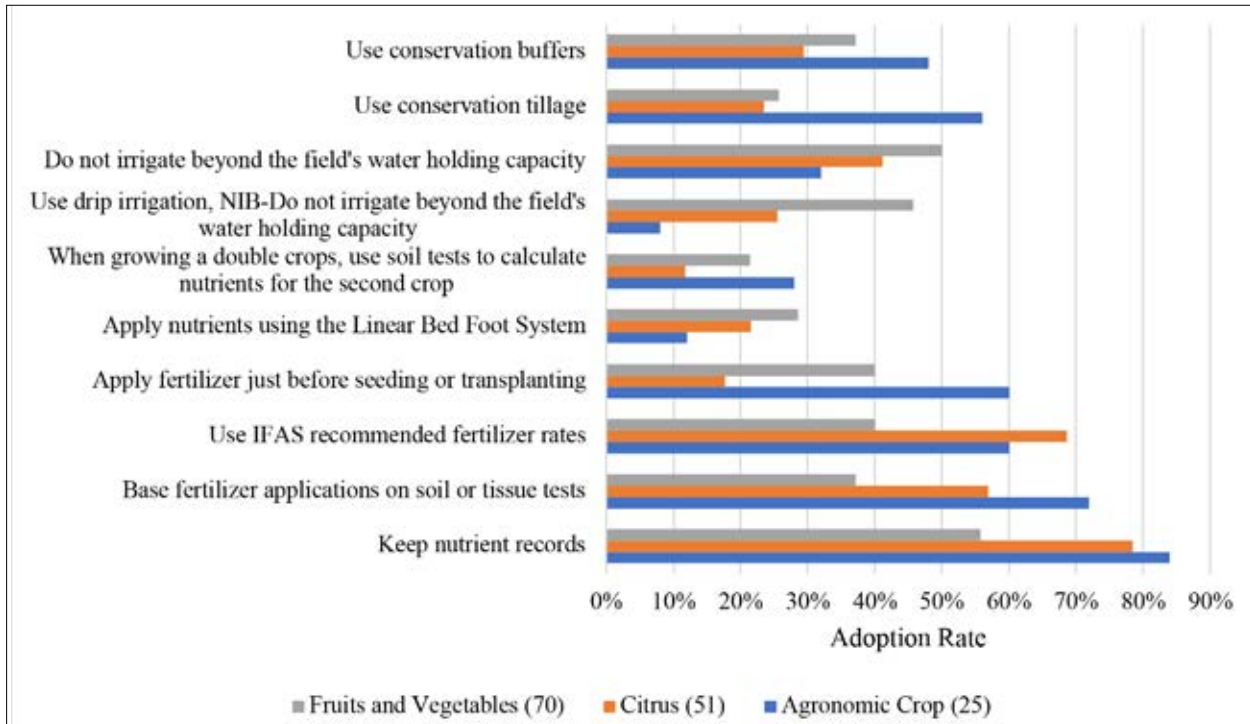


Fig. 3. Florida crop producer's use of other best management practices, besides controlled release fertilizer, calibration of fertilizer equipment and the use of cover crops.

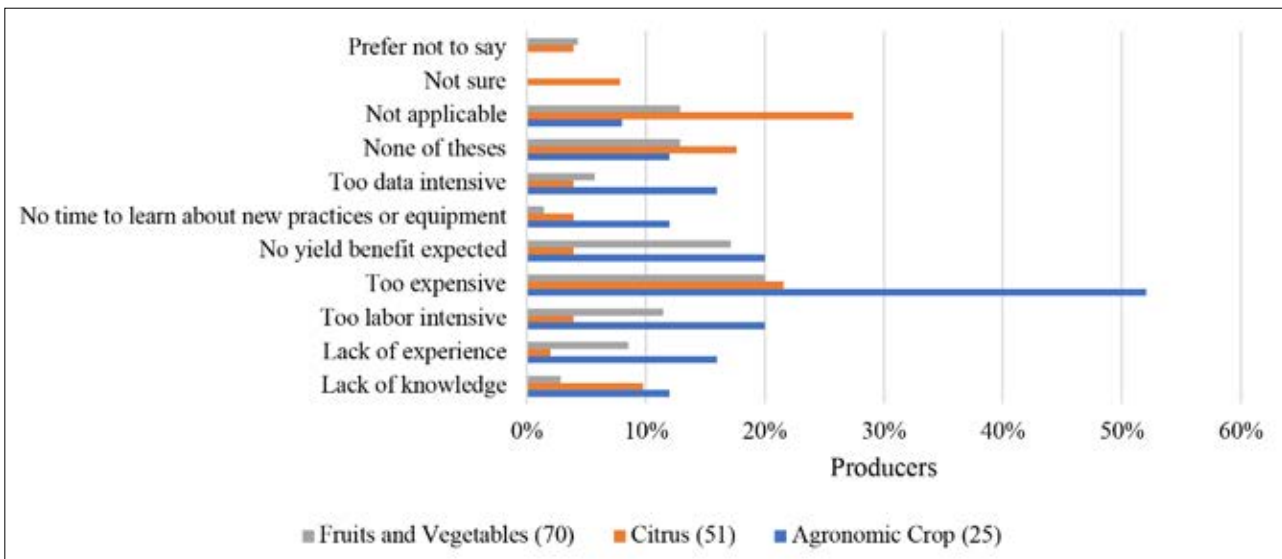


Fig 4. Florida crop producer's reasons for not implementing best management practices.

for not implementing BMPs, in general. Here, an average of 31% of respondents said that BMPs are too expensive to implement and only 6% indicated that they did not have time to learn a new practice. Also, an average of 16% and 14% of producers think that BMPs are not applicable on their farm and no yield benefit expected, respectively.

Conclusion

These findings reveal that while producers think CC, CRF, and CFE are profitable, they are uncertain about the effect on yield. This identifies producers' information gaps in calculating the costs and benefits of BMPs. While BMP adoption has clear public (or environmental) benefits, producers should understand the full suite of costs and benefits to them when making adoption decisions. Understanding the barriers to adoption will help to identify growers' needs and highlights other areas where more education is needed. These results identify barriers to adoption but also show areas of opportunity for extension and conservation programs interested in increasing BMP adoption.

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