

2021 Annual Report Executive Summary

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Project Title

Agricultural Water Security through Sustainable Use of the Floridan Aquifer:
An Integrated Assessment of Economic and Environmental Impacts

Project Director

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UNIVERSITY OF GEORGIA



Water Institute UNIVERSITY OF FLORIDA

FACETS Year 4 Report (2020-2021) Executive Summary

Project Goals and Objectives:

The goal of the USDA-NIFA Floridan Aquifer Collaborative Engagement for Sustainability (FACETS) project is to promote economic sustainability of agriculture and silviculture in North Florida and South Georgia while protecting water quantity, quality, and habitat in the Upper Floridan Aquifer (UFA) and the springs and rivers it feeds. Specific objectives to achieve these goals include:

1. Integrated Modeling Platform Development - Build a comprehensive modeling platform within a Participatory Modeling Process (PMP) to predict farm/forest-scale and regional-scale impacts of alternative land use and production practices on the water quantity, water quality, and economy of North Florida (FL) and South Georgia (GA).
2. Stakeholder Engagement and Social Science Research - Integrate stakeholders' experience with scientific data and models to explore economic-environmental tradeoffs among current and potential future climate, land use, Best Management Practice (BMP) adoption and policy scenarios to understand changes needed to achieve agricultural water security and environmental protection.
3. BMP Research and Extension Demonstrations, Tools and Training - Conduct BMP field research. Develop and deliver innovative Extension BMP demonstrations, digital decision toolkits and training programs for diverse stakeholders to bring about preferred changes in production systems and incentive programs.

For more information about project goals and objectives, [click here](#).

Click on the following links for more information on [Year 1](#), [Year 2](#) and [Year 3](#) project activities.

Summary of Year 4 Project Activities:

In year 4, the COVID-19 pandemic and consequent restrictions continued to cause challenges for conducting field research, in-person surveys, interviews, extension activities, project team meetings and stakeholder workshops and for disseminating the results of the project through professional meetings and other in-person venues. Nevertheless, virtual meetings and webinars enabled the project team to advance integrated research and extension activities and to work with stakeholders to co-develop scenarios and interpret model results. Twenty-one presentations of the project and its findings were presented to local, state, national and international communities of interest, seven peer-reviewed papers were published, and twelve manuscripts were submitted for review.

Details regarding year 4 project activities by objective are included below.

Integrated Modeling Platform Development

Economic and biophysical models at the farm/forest scale were refined based on stakeholder feedback and then extrapolated across the Santa Fe River Basin (SFRB) in FL and Lower Flint River Basin (LFRB) in GA using contemporary land use maps and a 30-year historical weather record. Water and nitrogen footprints and producer net returns were evaluated for production and management system combinations in FL and GA. Economic-environmental tradeoffs (i.e., nitrate leached, net recharge (percolation past the root zone minus irrigation), producer net returns) across various land use-crop management alternatives were co-evaluated with stakeholders over the 30-year weather record for the range of soils and landscape positions occurring in each watershed.

Development of regional-scale SWAT and SWAT-MODFLOW biophysical models and IMPLAN economic models for the Santa Fe and Lower Flint River Basins continued. Three simplified land use/land management scenarios (assuming a baseline land use of 2015 for GA and 2017 for FL) were used to exercise the regional models. These include: 1) all agricultural production systems use management system 1 (MS1 - lower input system); 2) all agricultural production systems use management

system 2 (MS2- medium input system); and 3) all agricultural production systems use management system 3 (MS3- higher input system). For FL, a fourth scenario was modeled that assumed that all agricultural land (row crops, hay pasture) was converted to slash pine forest production to provide an additional example scenario that incorporated changes in land use. For FL simple scenarios, forest land use was assumed to be slash pine MS1. For GA simple scenarios, forest land use was assumed to be loblolly MS1. No urban loads, septic tanks or wastewater treatment effluent were included in any of the simple scenarios. Results of the simplified scenarios were presented to PMP stakeholders at a Fall 2021 webinar to provide a basis for the co-development of a full suite of scenarios for each watershed.

An economic optimization model was developed to maximize aggregate landowner profit across the Little River Experimental Watershed in South Georgia via alternative land use choices subject to surface water quality restrictions. This work will serve as a potential template for related applications in the Lower Flint River Basin during year 5.

Two Willingness-to-Accept (WTA) surveys were deployed to determine the willingness of forest landowners to accept payment for the adoption of water conservation-based management practices. In the first WTA survey, GA forest landowners (members of the Georgia Tree Farm Program) were surveyed to determine the minimum payment they would accept to adopt practices such as thinning intensity and planting density aimed to increase water yields downstream. In the second WTA survey, forest landowners in the Suwannee River Basin in FL and Lower Flint River Basin in GA were surveyed to assess their willingness to accept payments to adopt water quality and quantity conservation practices. A separate WTA survey is under development for FL and GA agricultural producers. This survey will be deployed in Winter 2022.

A Willingness to Pay (WTP) survey was developed and deployed to understand the FL and GA general public's preferences for supporting a hypothetical program that incentivizes producers near the UFA to improve water quality and quantity through increased conservation practices.

Stakeholder Engagement, Social Learning and Communications Research

Four webinars were conducted with the PMP stakeholder group to provide updates on farm/forest-scale modeling results and initiate discussion about scenario development for regional modeling. Interviews and surveys were adapted and conducted with PMP participants to gather, track, and analyze perceptions of the modeling development process. Data collection primarily focused on social networking, levels of confidence in modeling results, and group satisfaction.

Communications research activities included the development of an “ordinary water science knowledge” (OWSK) assessment to measure recognition of water facts and scientific consensus at a level that would enable an ordinary resident of FL or GA to competently participate in water discussions and make citizen-level voting decisions on water topics. The public's water knowledge and beliefs were also assessed, which enabled the identification of water topics and sub-populations in which individuals actively reject what they perceive to be scientific consensus. A series of four fact sheets providing introductory information related to water challenges and solutions in the UFA region were published and made available to the public on the FACETS website to increase general awareness. The fact sheets were also used in the FL Water Schools to support outreach goals.

BMP Research and Extension Demonstrations, Tools and Training

Field research continued to quantify crop yield, water savings and nutrient loss across a range of irrigation, nutrient management and cover crop practices in FL and GA. In Florida, year 4 was the final year of field trials while in Georgia cotton and peanut field trials will continue in year 5.

Three on-farm demonstrations took place in FL including the demonstration of soil moisture sensors and other water saving BMPs/tools, demonstration of blue dye nutrient leaching, and side-dress fertilizer

application. One on-farm soil moisture sensor demonstration took place in GA.

Three formal Extension In-Service Trainings (ISTs) were hosted: two BMP ISTs were offered to train 57 UF/IFAS Extension agents on current BMPs in Florida, while in Georgia a “Basics of Irrigation” IST trained 25 UGA Extension agents. Additionally, informal soil and moisture sensor ISTs focused on data interpretation for farmers and agents were offered in Florida (15 Extension agents) and Georgia (55 participants).

The first series of Water Workshops for Decision-Makers in the Suwanee River Basin was planned and conducted. The Water Workshops provided information and tools that community leaders can use to make informed decisions about their communities’ water resources. Three two-hour sessions (Feb. 10, 17, 24, 2020) were designed to provide an opportunity to discuss water challenges, policies, and local priorities with regional and state agencies, allowing decision makers to network and exchange ideas. The workshop series was supported by 20 water resource experts from seven agencies/organizations and was attended by 18 local decision-makers and opinion leaders.

Additional opportunities for training and professional development in year 4 included mentorship of undergraduate students (2), graduate students (8), and post-doctoral associates (4). Six students completed their graduate programs (5 Ph.D., 1 M.S.).

Plans for Year 5

In year 5, the PMP will develop scenarios of potential climate, land use, and management system adoption to use in the regional biophysical and economic models to collaboratively assess impacts of alternative agricultural and silvicultural land uses and management systems on regional water quality and quantity and to evaluate economic and environmental tradeoffs. The producer willingness-to-accept and public willingness-to-pay surveys will be analyzed and results will inform the likelihood of scenarios being adopted as well as the development of potential incentive programs to motivate land-use change and management system adoption to meet environmental standards. The social learning research will collect data on changes in perceptions of the PMP members and the relationships involved. The communications research team will continue policy communication and environmental identities research and will develop a water communication guide with recommendations for effectively conveying project results. On-farm demos in Florida will continue to demonstrate the effectiveness of water and nutrient management and cover crop BMPs. The SmartIrrigation Corn App will be reevaluated and modified. ISTs will continue in Florida and Georgia, and the Water Schools in GA will be developed and delivered. Development of project key messages will begin through collaborative engagement with the PMP stakeholders, the PAC and the project team. Due to delays in project execution caused by the COVID-19 pandemic, a one year no-cost extension from USDA will be requested. It is anticipated that all proposed project activities will be completed by year 6.