

## **Poster Presentation**

Title: Comparison of P load reductions of selected farms in the EAA basins under similar Best Management Practices

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Best Management Practices (BMP) in the Everglades Agricultural Area have successfully reduced phosphorus (P) loads that enter the drainage systems. Since the adoption of the BMP program, P load reduction has ranged between 25-75% in comparison to pre-BMP. Research has shown that P load reductions depend on various factors including farm water management practices, irrigation water quality, soil physical and chemical properties, as well as land use and cropping systems. Each farm has certain intrinsic challenges and conditions that impact the performance of implemented BMPs. Here we present preliminary data on three farm pairs with similar BMPs and discuss variability in their P load reductions and explore potential drivers for differences in BMP performance. Results from this study will provide insight for better management of selected farm pairs and will improve our understanding of agricultural management practices that are designed to reduce the impact on water quality.

## **Effects of Cover Cropping with Legumes and Non-Legume Species on Soil Quality in Florida Citrus Production**

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Cover crops can help to reduce soil erosion, build soil organic matter (SOM), improve nutrient availability, enhance soil water retention, and improve soil microbial activity. Southwest (SW) Florida's soil has low organic matter and extremely low water and nutrient-holding capacities. The main goal of this study was to evaluate the impact of different cover crops mixes (CCs) on the soil quality of citrus orchards in SW Florida. The effects of CCs were analyzed using the following treatments: 1) cover crop mix # 1 (legume+non-legume), 2) cover crop mix #2 (non-legume), and 3) no-treatment control/grower standard. Soil ammonium ( $\text{NH}_4^+$ ), nitrate ( $\text{NO}_3^-$ ), exchangeable macronutrients, and SOM were measured under the tree canopy and within the row middles (RM) of two orchards South Grove (SG) and North Grove (NG) located in SW Florida. Phosphorus (P), Calcium (Ca), Magnesium (Mg), and  $\text{NH}_4^+$  did not present statistically significant differences among treatments for under the canopy and in the row middles. Concentrations of  $\text{NO}_3^-$  and SOM were significantly greater in the RM for both CC treatments compared with the control in NG only after seven consecutive cover crop plantings. This research provided valuable insights into multispecies of cover crops that can be incorporated into citrus production systems and the potential benefit in Southwest Florida's sandy soils.

# Soil quality assessment of cultivating flooded rice on Histosol under varying flood depths

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## **Abstract:**

Rice (*Oryza sativa L.*) is widely cultivated globally, and continuous flooding irrigation (CFI) is a commonly adopted practice. However, the optimum flood depth for soil quality is still poorly reported. Therefore, this study evaluated a two-year field experiment to assess the soil quality across flooded rice fields cultivated on Histosols by CFI under four different flooding depths- 5 cm, 10 cm, 15 cm, and 20 cm. In this study, nine soil quality indicators (SQI) were analyzed to evaluate the soil quality, including bulk density (BD), maximum water holding capacity (MWHC), pH, CEC, total phosphorus (TP), total Kjeldahl nitrogen (TKN), organic matter (OM), active carbon (AC), and soil protein (SP). Each of the soil quality indicators was calculated using various scoring functions, including total data set (TDS), minimum data set (MDS), linear (SQI<sub>L</sub>), nonlinear (SQI<sub>NL</sub>), weighted (SQI<sub>W</sub>), and unweighted (SQI<sub>UW</sub>) scoring methods. Thus, a package of soil quality indices (SQI) was approached, including Cornell Comprehensive Assessment of Soil Health (CASH), Florida Soil Health Assessment (FSHA), SQI<sub>TDS-L-W</sub>, SQI<sub>TDS-L-UW</sub>, SQI<sub>TDS-NL-W</sub>, SQI<sub>TDS-NL-UW</sub>, SQI<sub>MDS-L-W</sub>, SQI<sub>MDS-L-UW</sub>, SQI<sub>MDS-UL-W</sub>, and SQI<sub>MDS-UL-UW</sub> to analyze the soil quality under different flood depths. In this study, the results indicated that SP, AC, and TKN are the critical soil quality indicators for evaluating soil quality on Histosol soil in Florida. Moreover, we recommended SQI<sub>MDS</sub> as the optimum index since the sensitive indicator showed SQI<sub>MDS</sub> (352%) with a greater value than CASH (3.65%), FSHA (4.93%), and SQI<sub>TDS</sub> (4.01%).

## Coffee Agrosystem Diversification Improves Near-Surface Soil Health Indicators in Brazil

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Coffee cultivation plays a crucial economic and social role in Brazil. However, the majority of Brazilian coffee systems are monoculture, which can degrade soil health. Our goal was to evaluate the impact of long-term diversified coffee agroforestry systems (AFS) on key soil health indicators (aggregate stability and organic carbon (OC)) within the 0–10 cm soil layer in Brazil. The treatments were a coffee monoculture (Control), a native forest (NF), and three diversified AFS: cedar, *sibipiruna*, and coffee (AFS-CS), mahogany, banana, and coffee (AFS-MB), and biodiverse (AFS-BIO). Aggregates were separated on-site into aggregation size classes (<2 mm, 2–4 mm, 4–6 mm, and >6 mm). In all AFS, there was a significant difference in OC contents between aggregate classes. NF had a higher average OC in whole soil than the other systems except for the AFS-MB. The lack of significant OC difference between AFS-MB and NF can be linked to soil structure and biological activity in those systems, which were similar. Among the coffee AFS, the AFS-MB had the greatest soil health condition. OC content was higher in the largest aggregates (class >6 mm). The AFS-BIO had more aggregates larger than 6mm, while the NF showed a predominance of aggregates in the 6–4- and 4–2-mm classes. The AFS-CS showed a greater contribution to the < 2 mm class, followed by MN and AFS-MB, which did not differ from the NF. Overall, this study showed that improving coffee system diversification increases aggregate stability and OC and can lead to greater soil health.

**Abbreviations:** AFS, agroforestry system; OC, organic carbon; AFS-BIO, biodiverse coffee agroforestry system; AFS-MB, agroforestry system with mahogany, coffee, and banana; AFS-CS, agroforestry system with cedar, *sibipiruna*, and coffee; NF, native forest

## **Contrasting effect of protease on the enzymatic hydrolysis of dissolved organic P in constructed wetlands**

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Phosphorus (P) inputs affect the natural trophic status of wetlands, including the Everglades ecosystem in South Florida. Constructed wetlands such as the stormwater treatment areas (STAs) have been effectively used to reduce P concentrations in the Everglades. However, a significantly higher proportion of dissolved organic P fractions in these waters make P reduction efforts very challenging. Recently several studies have explored the use of a hydrolytic P enzyme intervention approach to assessing the bioavailability of dissolved organic P. This study adds to this effort by evaluating the effect of proteases on the effectiveness (efficiency) of phosphomonoesterase (PME) and phosphodiesterase (PDE) activity in site water from the Everglades STA. Results suggest a contrasting effect of protease on the two phosphatase enzymes, with a positive effect on PME and a negative effect on PDE in STA site water. For example, protease addition increased the alkaline phosphatase activity in PME amended site water by 13% compared to PME alone. Likewise, protease addition decreased the Bis-P activity in PDE amended site water by 15% relative to PDE alone. Further examination of the direct effect of protease on PME and PDE on dissolved organic matter (DOM) free water revealed that the negative effect of protease on PDE was higher than on PME suggesting a higher affinity of protease to PDE. Considering the implications of these findings, where factors influencing phosphatase enzyme activity in STA site water are identified, a mechanistic examination of protease interaction with phosphatases in the presence of DOM is warranted.

## **Oral Presentation**

Effect of floating aquatic vegetation on canal water quality and drainage discharges

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### **ABSTRACT:**

Floating aquatic vegetation (FAV), proliferate in farm drainage canals at the Everglades Agricultural Area (EAA), in southern Florida. FAVs produce detritus material that accumulates on canal sediments and contribute to the farm phosphorus (P) discharges. Control of FAVs in farm canals not only improves drainage water conveyance and irrigation water throughout the farm, but also may lead to further reductions in farm P load. In this study, farm drainage discharges were monitored between 2011-2020 from eight participating commercial farms. FAV coverage was evaluated every two months and canal sediment was collected twice annually for evaluating P content. Multivariate statistical analysis techniques including Spearman correlations, Stepwise regression, and Principal Component Analysis (PCA) were performed to assess the relationship between FAV coverage and canal sediment properties, with canal drainage water P concentration and loads. Drainage water total dissolved P (TDP) and particulate P (PP) concentrations had a significant positive correlation with FAV coverage, and sediment total P (TP) concentration had a significant positive correlation with drainage water PP concentration. This shows that both FAVs and canal sediment can act as sources of P and contribute to the drainage water P loads. Controlling FAVs and sediment removal in agricultural canals could reduce the risk of P loading from agricultural drainage.

### **Author Bio**

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