# Soil and/or Foliar Applied nutrients on Water uptake, vegetative growth, and nutrient Accumulation on HLB Affected 'Valencia' Citrus Trees

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**"Abstract.** Florida is ranked first in the USA followed by California for all orange production accounting for 57% and 43%, respectively. However, citrus industry had been challenged since 2005 by huanglongbing disease (HLB, citrus greening). The study was conducted at the University of Florida, Southwest Florida Research and Education Center, Immokalee, FL during 2016 and 2017 seasons. The main objective of the study was to assess whether soil and /or foliar applied nutrients influence water uptake, growth, and leaf nutrient concentrations of HLB affected citrus trees. The experiment was set up in split-split plot design comprising of two type of rootstocks, three nitrogen rates (150, 200, and 250 lbs $ac^{-1}$), and four foliar and /or soil applied Manganese (Mn) and Zinc (Zn) at 8 lbs $ac^{-1}$ each and Boron (B) (0.25 lb $ac^{-1}$). Results indicated that stem water potential was significantly lower on lower than higher micronutrient rates of Swingle rootstocks and trees budded on Volkameriana than Swingle rootstocks. Trees on Volkmaraina showed persistently and significantly greater canopy volume while trees on Swingle significantly greater leaf area index than Volkameriana rootstocks. Leaf N had significantly the highest concentration on the highest N rate of Swingle than Volkameriana rootstocks. Similarly, leaf Mn and Zn concentration showed the highest on treated than the control untreated citrus trees. While leaf B was above the optimum range regardless of the seasons and treatments. The study suggested foliar application of micronutrients was sufficient to meet crop nutrient than the untreated and the highest rates."

Biochar from varying feedstocks as phosphorus fertilizer sources

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Biochar is a product of biomass combustion under low- or complete absence of oxygen. It has gained world-wide attention for its multiple potential benefits as a soil amendment, including enhancement of soil fertility. The overall objective of my research was to assess the potential of animal- and plant-based feedstocks to serve as an alternative to commercial inorganic phosphorus (P) fertilizer. We evaluated P release from biochars from different feedstocks, including pure maple, mixed hardwoods, poultry litter and biosolids, using solid state and solution procedures. Poultry litter biochar (PLB) had very high P concentration, with P in the form of a sparingly soluble calcium phosphate mineral. Therefore, PLB is expected to provide P to plants on a long-term basis while simultaneously reducing nutrient leaching relative to the more soluble commercial fertilizer. In a separate field study, we evaluated the effects of PLB added at the same rate as inorganic P fertilizer, at two locations differing in soil type (Entisols vs. Spodosols) with a sequential cropping cycle of rye, silage corn, and sorghum. Crop yield, nitrogen (N) and P in plant tissue and soil P storage capacity (SPSC, a measure of the amount of P a soil can hold prior to releasing P) were determined after each crop was harvested. Results showed no negative effect of PLB on yield (often enhanced yield) or on N and P in plant tissue, suggesting PLB as an alternative to inorganic P fertilizer.

# Constructed Wetland Maintenance in South India

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Treated wastewater may provide a reliable source of water for rain-fed, semi-arid regions of India. Rural, southern India has limited infrastructure for wastewater treatment. The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) introduced constructed wetlands (CW) as part of the Water4Crops project to south India to provide a low cost, low maintenance, and low technical solution to wastewater treatment for agricultural irrigation. Little information is known about extension communication related to the long-term maintenance of constructed wetlands. This case study examines maintenance of six constructed wetlands in four communities in south India. The research uses the framework of mental models to examine stakeholder communication related to maintenance of the CWs. Mental models are perceptions of how the world functions and are used in decision making to predict outcomes. Forty-three semi-structured interviews were used to elicit scientists', extension agents', farmers', neighbors', and local maintenance individuals' mental models. Influence diagrams were constructed to represent expert and non-expert mental models of function and maintenance of the CWs. Comparison of the stakeholders' mental models showed cognitive dissonance and gaps in knowledge related to ecological knowledge and maintenance of the CW between the experts and non-experts. Non-experts need to understand why and how to maintain CW. Participatory involvement in the design of the CW may yield an improved design that matches the maintenance capacity of rural communities, specifically non-expert stakeholders. Participatory dissemination activities between experts and non-experts involved in the project may help construct a shared mental model for constructive wetland maintenance.

# Background and Bioaccessible Concentrations of PAHs in Florida Urban Soils

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Soil cleanup standards for contaminated soils can be based on either soil background concentrations or risk-based values. Polycyclic aromatic hydrocarbons (PAHs) are ubiquitous organic contaminants coming from biogenic, petrogenic and pyrogenic sources in the environment. The objective of this study was to determine the total and bioaccessible concentrations, distributions, and sources of PAHs in Orlando and Tampa urban soils. The results showed the soils were dominated by high molecular weight PAHs in both cities. The averages of 7 carcinogenic PAHs based on the benzo[a]pyrene-equivalent (BaP-EQ) concentrations in Orlando and Tampa were 452 and 802 μg $kg^{-1}$, respectively. BaP-EQ concentrations in 60-62% samples were higher than the Florida Soil Cleanup Target Level (FSCTL) for residential soils at 100 μg $kg^{-1}$ and 20-25% samples were higher than FSCTL for industrial soils at 700 μg $kg^{-1}$. In addition, understanding contaminant bioavailability in soils is necessary for accurate assessment of contaminant exposure to humans via oral ingestion pathway. Orlando soils had relatively higher bioaccessible PAHs and BaP-EQ concentrations than Tampa soils, ranging from 0 to 93%. The bioaccessible BaP-EQ concentrations in both cities were under industrial FSCTL. Based on molecular diagnostic ratios and PMF modeling, major sources of PAHs in both cities were similar, mainly from pyrogenic sources including vehicle emissions, and biomass and coal combustion. Based on ArcGIS mapping, PAHs concentrations in central business district and areas near high traffic roads were significantly higher than the other areas in both cities.

# What controls Ecosystem $CO_2$ Fluxes in North American Wetlands?

**Yan Liao  Stefan Gerber**

**Abstract**

Carbon sequestration is one of the many ecosystem services wetland ecosystems provide. However, the organic carbon in wetland soils is considered to be fragile and vulnerable to global change factors such as sea level rise, temperature increase and shifts in precipitation patterns. The Green House gas emission from wetlands is important for predicting the biospheric feedbacks between terrestrial ecosystems and climate change. There is no commonly accepted agreement if wetlands currently are carbon sources or sinks and no clear concept of the "level" of carbon budget of different kinds of wetland across the continental scale. Further, global warming and drying conditions could potentially alter the balance between ecosystem production and respiration. The complex interactions that occur among photosynthesis, respiration, temperature and moisture make it very difficult to accurately predict the response of different wetland ecosystems to future climate change. With the ascent of eddy flux towers, measurements of high frequency, yet multiyear observations of carbon exchange between surface and atmosphere became possible. Here, we integrated more than 5.2 million observation points from eddy flux towers in 20 wetlands across the continental North America to evaluate seasonal and annual pattern of $CO_2$ fluxes and its relationship with major environmental variables, including temperature, radiation, and water table. Four of the 20 studied wetlands are small carbon dioxide sources, while the coastal mangrove wetland is the most productive wetland ecosystem. The statistical analysis indicates both NDVI (normalized difference vegetation index) and radiation are essential variables that control both the annual and monthly carbon fluxes across all 20 sites, while, interestingly, the water table depth did not show a significant effect on the $CO_2$ exchange. The relationship among environmental variables c and wetland $CO_2$ exchange shifts when evaluation is based on specific regions or a particular sites. This makes sense in that there are various levels of variability of environmental drivers across the continent. Overall, the strong dependence on NDVI suggests that plant coverage may be a crucial factor that determines the carbon balance of wetland ecosystems.