

# Utilization of biochar to improve fertility of SC Coastal Plain soils



Norfolk loamy sand without biochar



Amazonian dark earth - terra preta

Left a nutrient-poor oxisol; right an oxisol transformed into fertile terra preta - photo courtesy of Bruno Glaser

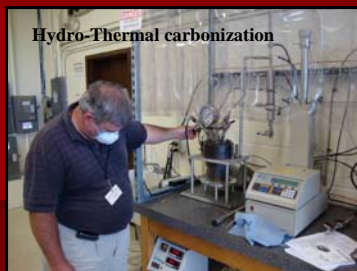


Norfolk loamy sand treated with poultry litter biochar

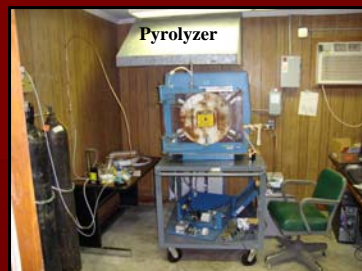
## SC Bioenergy Conference, PDREC Jeff Novak

### ARS-Florence Location

1. Physical equipment: Computer controlled Lindberg oven for pyrolysis of feedstocks, Hydro-Thermal carbonization, digesters, pelletizers (soon)
2. Laboratory equipment: TGA, ICP, LECO, GC, contract for FT-IR, NMR, SAA, etc.
3. Feedstocks: switchgrass, pecan shells, hardwood, peanut hull, poultry litter, swine manure, rye grass, bermuda grass cotton gin trash, forestry products



Hydro-Thermal carbonization



Pyrolyzer

## Scientists at Florence with Biochar

- Jeff Novak and Warren Busscher – evaluation of designer biochar to influence specific soil and physical properties,
- Kyoung Ro -Producing bio chars using hydrothermal carbonization processes, sorption reactions with metals and gasses,
- Keri Cantrell -producing biochars using pyrolysis of different feedstocks and evaluating their thermal chemical signatures,
- Tom Ducey – biochar influence on soil microbial populations and nutrient turnover processes.
- Pat Hunt– agronomic impact of biochars on row and vegetable crop production.

## Biochar experiments



## Norfolk mean fertility (after 67 d)

(Novak et al., 2009; Soil Sci.)

<u>Soil property</u>	Norfolk soil + % biochar			
	<u>0</u>	<u>0.5</u>	<u>1.0</u>	<u>2.0</u>
pH	5.2a	5.6b	5.9c	6.4d
K (mg kg <sup>-1</sup> )	26a	47b	49c	69d
Ca (mg kg <sup>-1</sup> )	392a	462b	537c	692d
CEC (cmol <sub>c</sub> kg <sup>-1</sup> )	5.2a	5.4a	5.6a	5.9a
Ex. Acid (cmol <sub>c</sub> kg <sup>-1</sup> )	2.4a	2.1a	2.0a	1.5b

## Location specific accomplishments

- Biochar incubation in Norfolk Ap
  - a. (2007) pecan shell biochar lab incubation
    1. Soil Science (2009)-shows soil fertility improvements
    2. Soil Science (in review)-soil strength improvements
    3. Geoderma (accepted)-shows biochar C & N biochemistry
  - b. (2009) high/low temp biochar lab incubation
    1. Annals of Env. Sci. (accepted)-shows biochar characterization
    2. AIChE Proc. (2009)- shows increase in soil water holding capacity after biochar additions.