Research Update: Semi Arid Agricultural Systems Institute West Texas A&M University

Craig Bednarz

SAASI: Vision Statement

Develop scientifically sound and practical solutions for improved sustainability of rain fed and limited irrigation agriculture systems in the Texas Panhandle.

On Farm Research – Ralls, TX
10/04/20 – 7/11/21

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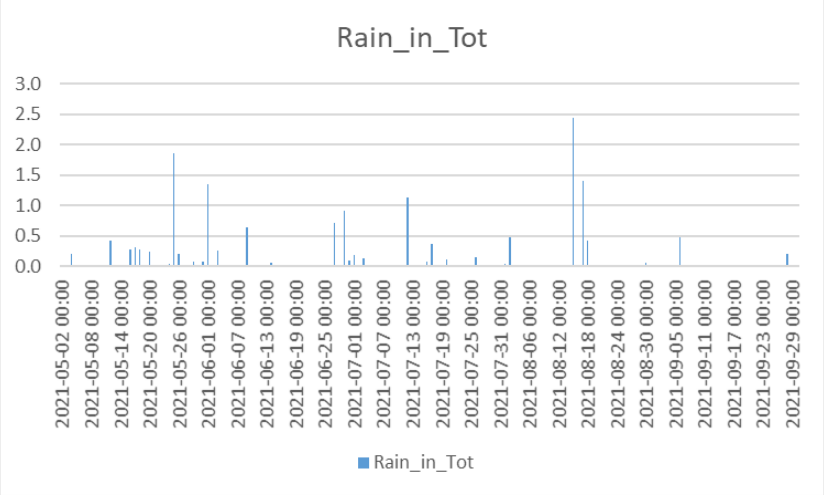
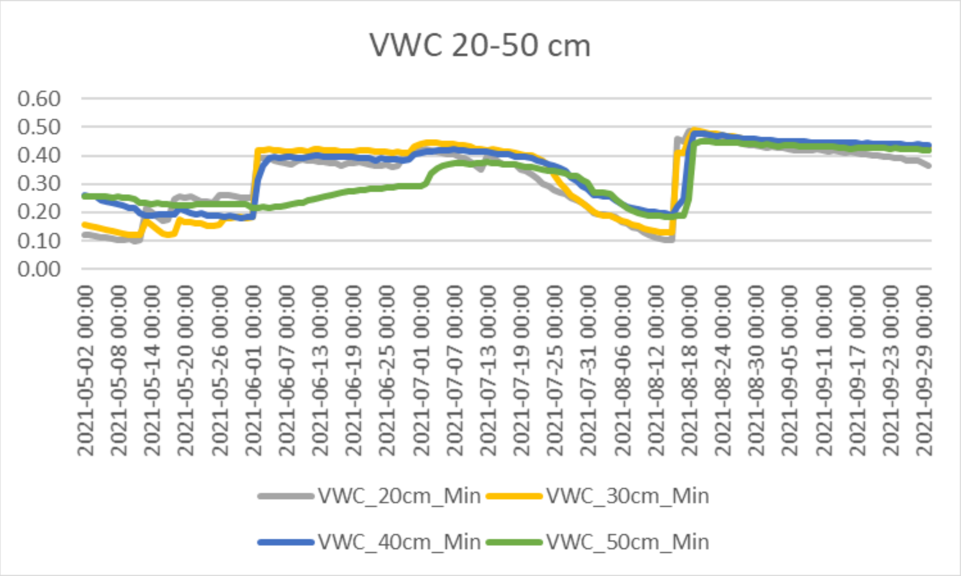
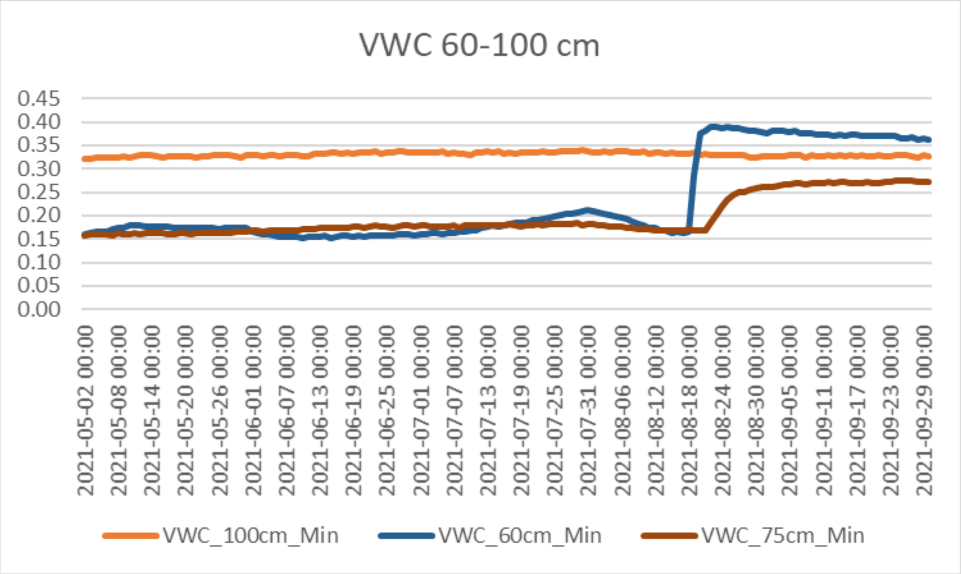
Depth (cm)	VWC (10/4/20)	VWC (7/11/21)	PAW (cm)
20-50	0.202	0.390	6.3
60-75	0.150	0.176	0
100	0.329	0.336	1.6

On Farm Research – Ralls, TX
05/01/21 – 9/30/21







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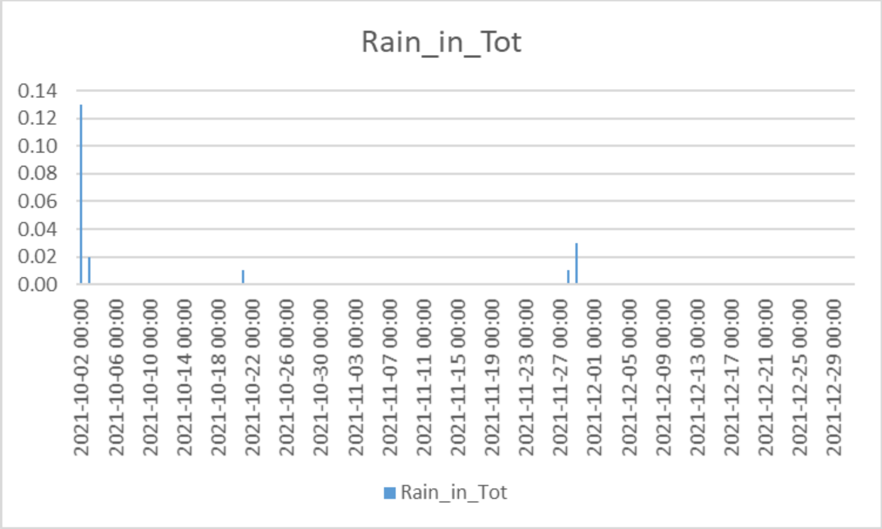
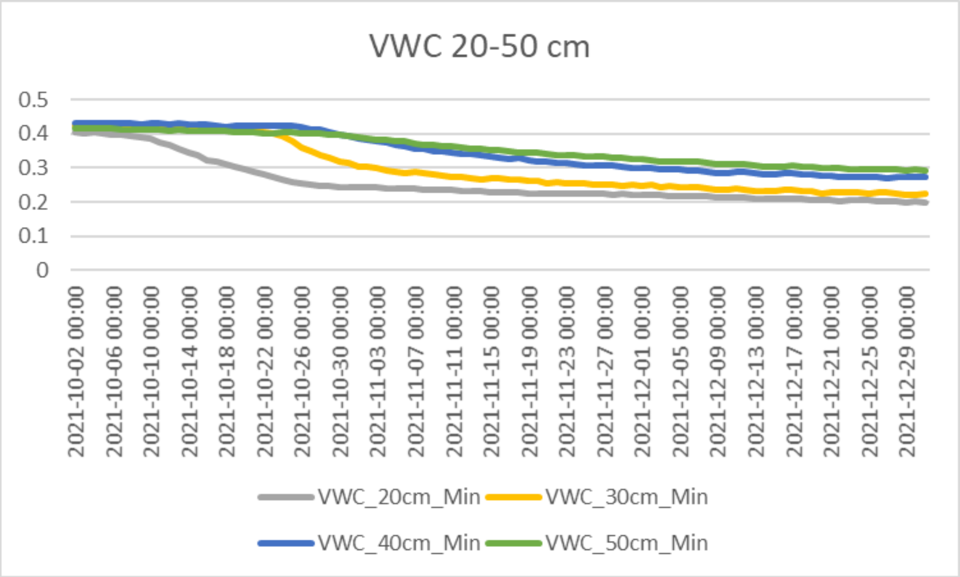
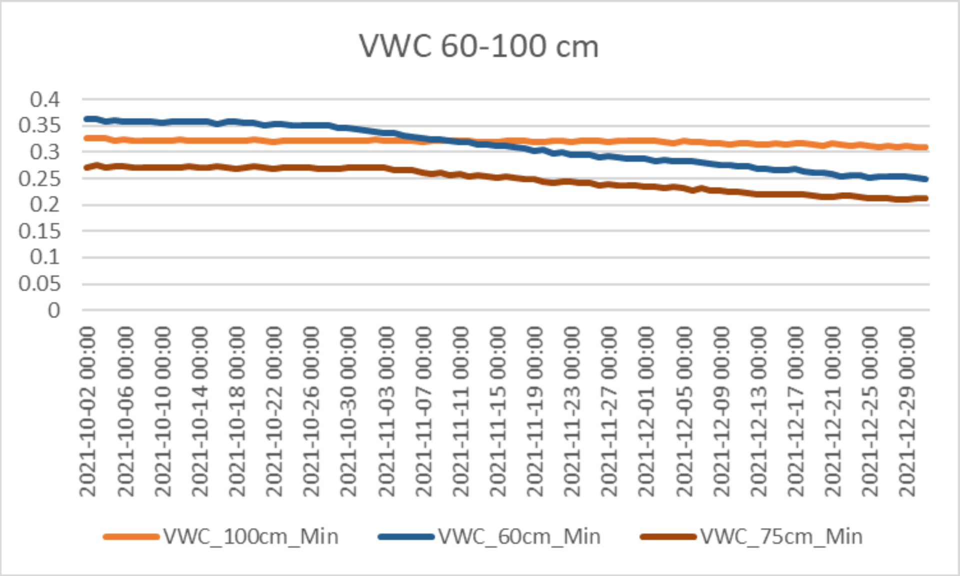
10/01/21 – 12/31/21







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Rain Fed Systems Research
Bushland, TX

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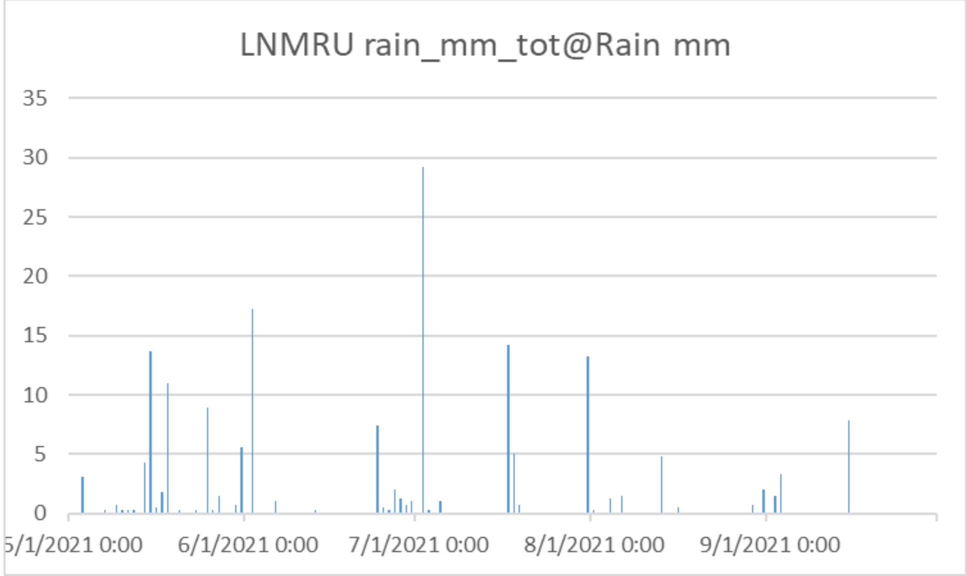
Rain Fed Systems Research
Bushland, TX



Type III Tests of Fixed Effects				
Effect	Num DF	Den DF	F Value	Pr > F
Crop	2	86	34.72	<.0001
Depth	5	86	35.98	<.0001
Crop*Depth	10	86	5.82	<.0001

T Grouping for Crop Least Squares Means (Alpha=0.05)		
LS-means with the same letter are not significantly different.		
Crop	Estimate	
Rye	0.2760	A
Wheat	0.2524	B
Cotton	0.2165	C

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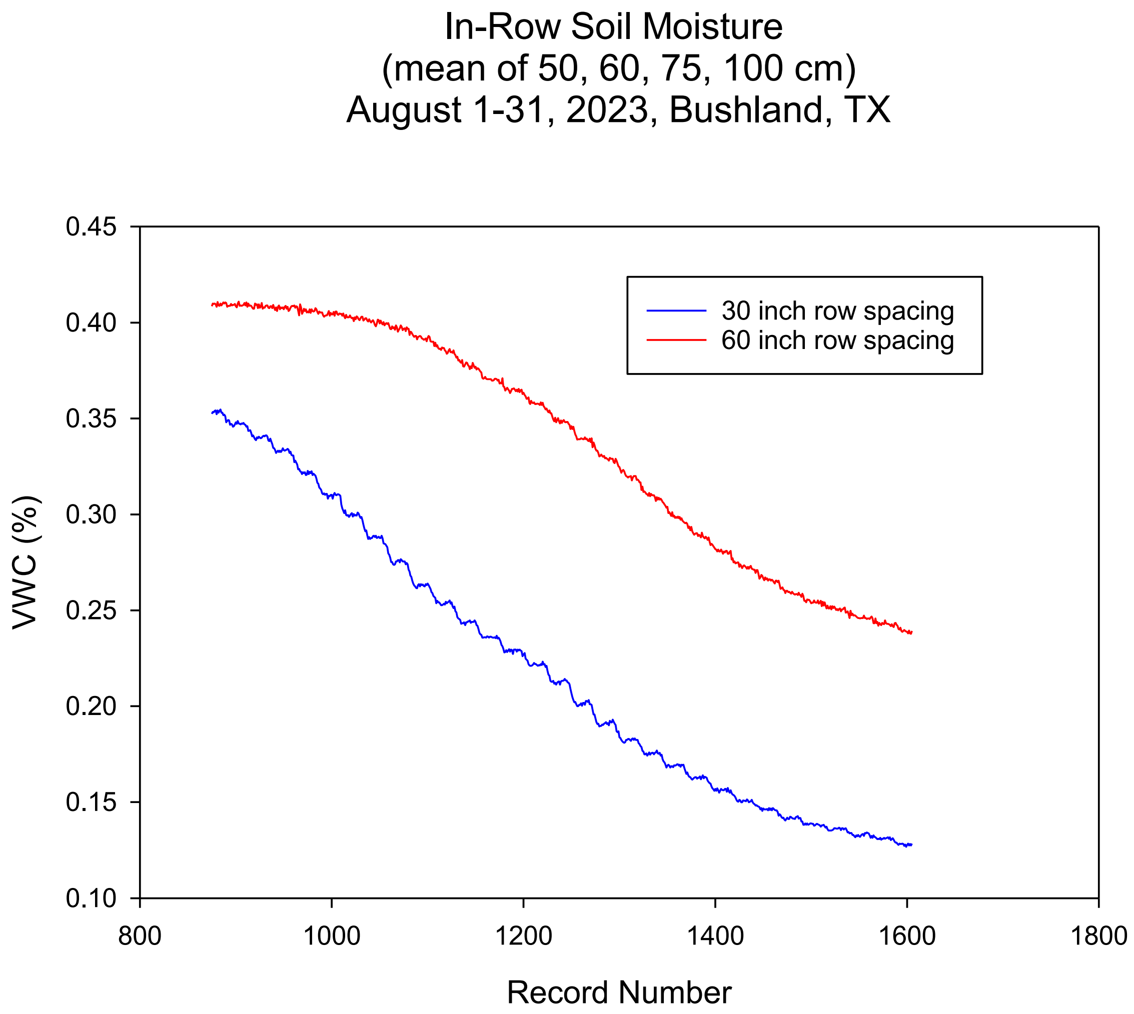
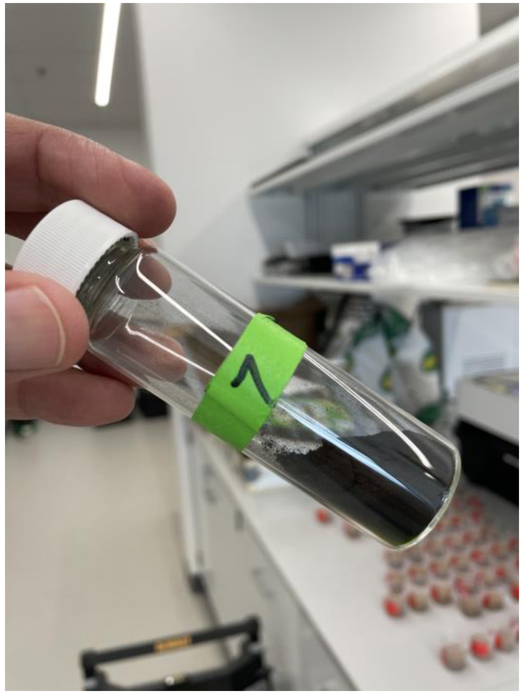
Rain Fed Systems Research
Bushland, TX
08/31/23
Mid Morning



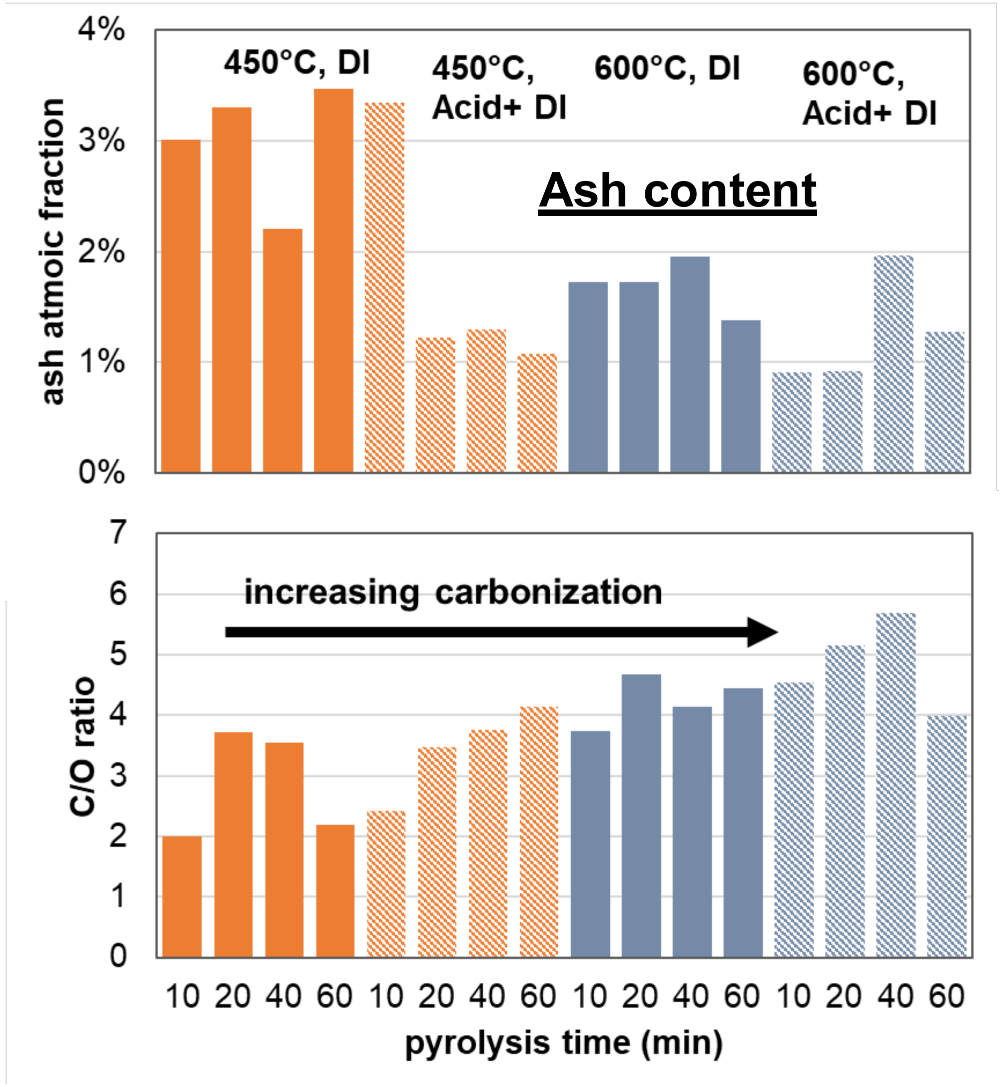
In-Row Soil Moisture
(mean of 50, 60, 75, 100 cm)
August 1-31, 2023, Bushland, TX
30 inch row spacing
60 inch row spacing
VWC (%)
Record Number
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
800
1000
1200
1400
1600
1800

Can we make something useful out of cotton gin trash?



Using Energy Dispersive X-Ray Spectroscopy (EDS) to Determine Elements in Cotton Gin Trash Biochar

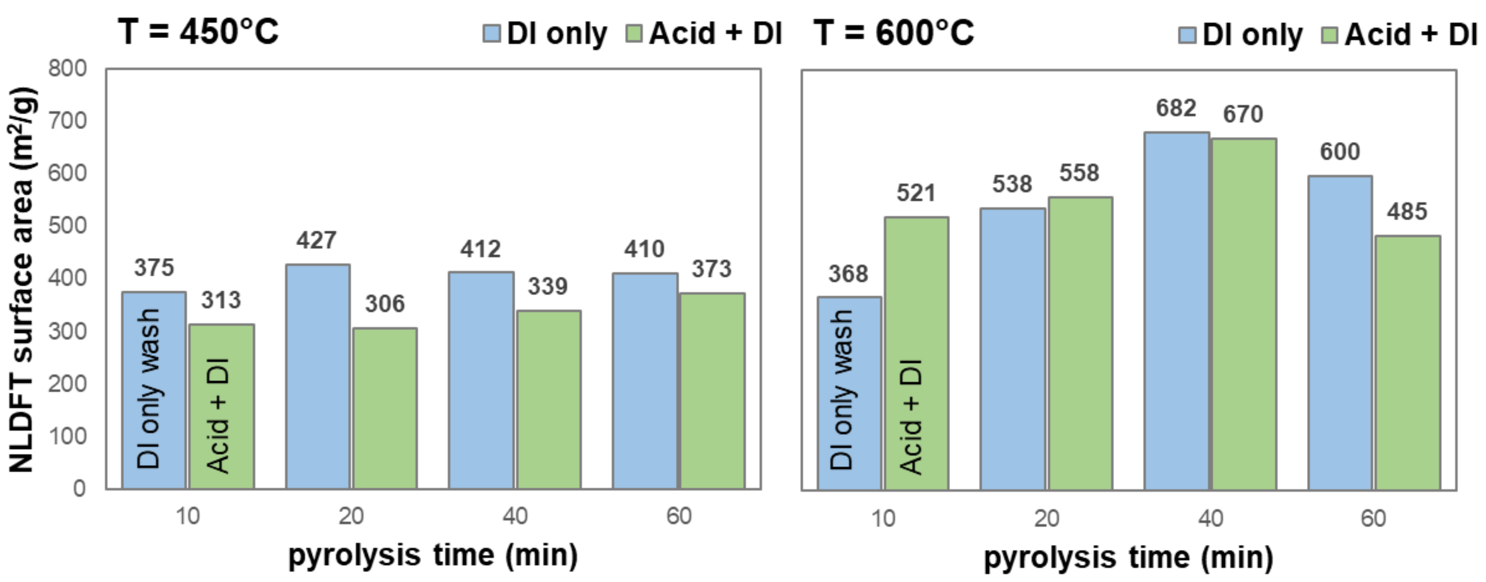
Nathan Howell and Sanjoy Bhattacharia - WTAMU Engineering



- More ash (minerals, Ca, Mg, Mn, S) present when you use
  - Lower temperature (450°C)
  - Easier wash (just DI water, not acid)
- Carbon content *increases* with
  - Higher temperature
  - Harsher wash (use of acid)
- For farmers
  - More minerals could mean biochar a slow-release fertilizer
  - More carbon might lead to more water-holding capacity
  - Benefits of different biochar ***still*** under investigation

Dosing Biochar with CO2 to Determine Pores

Nathan Howell and Sanjoy Bhattacharia
WTAMU Engineering

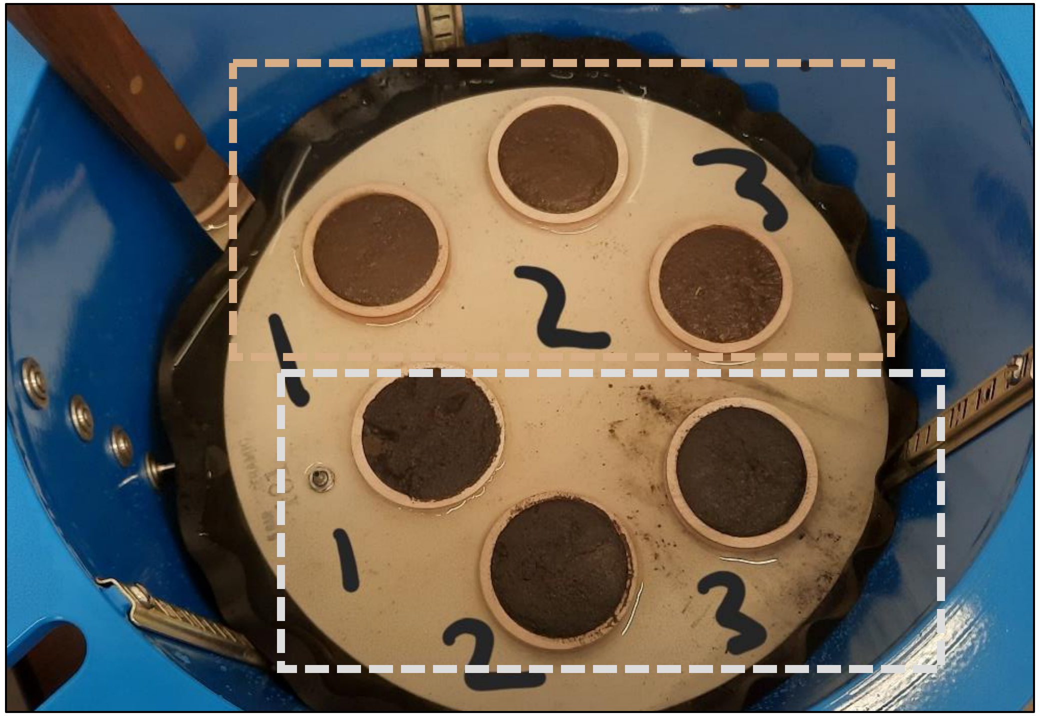


Biochar samples in these small tubes – subjected to CO_2 gas to examine pore structure

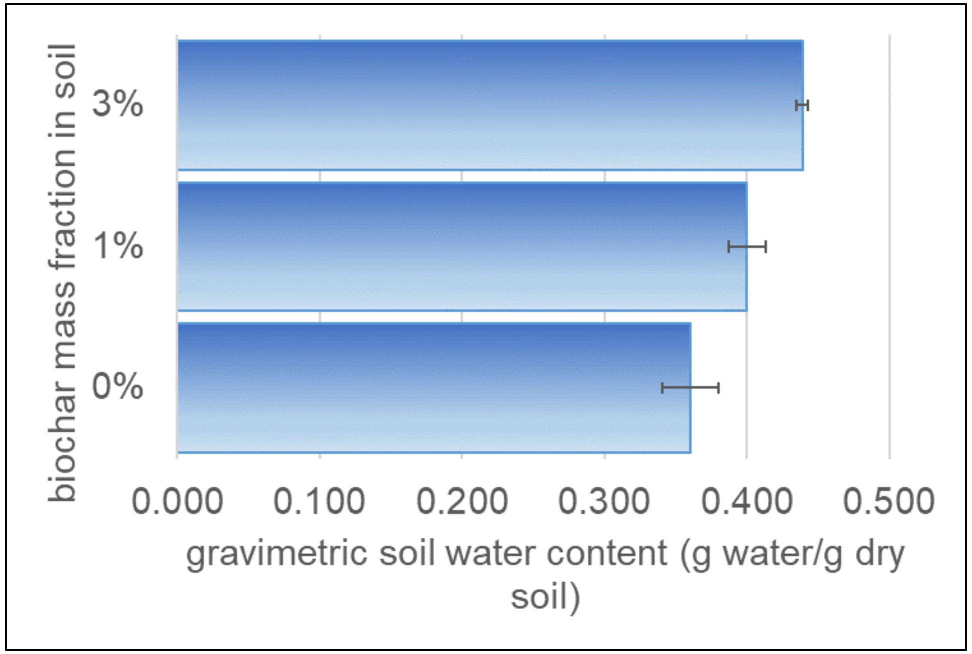
- Biochar like this is a microporous material. Pores in the material are 2 nanometer or smaller.
- A water molecule is about 0.3 nm in size. There are many small pore in biochar which can hold water.
- The biggest surface area (more pores) is at 600°C at 40 min of heating time. Could mean greater ability to hold water and higher cation exchange capacity (CEC).

Water Holding Capacity of Soil Amended with Biochar

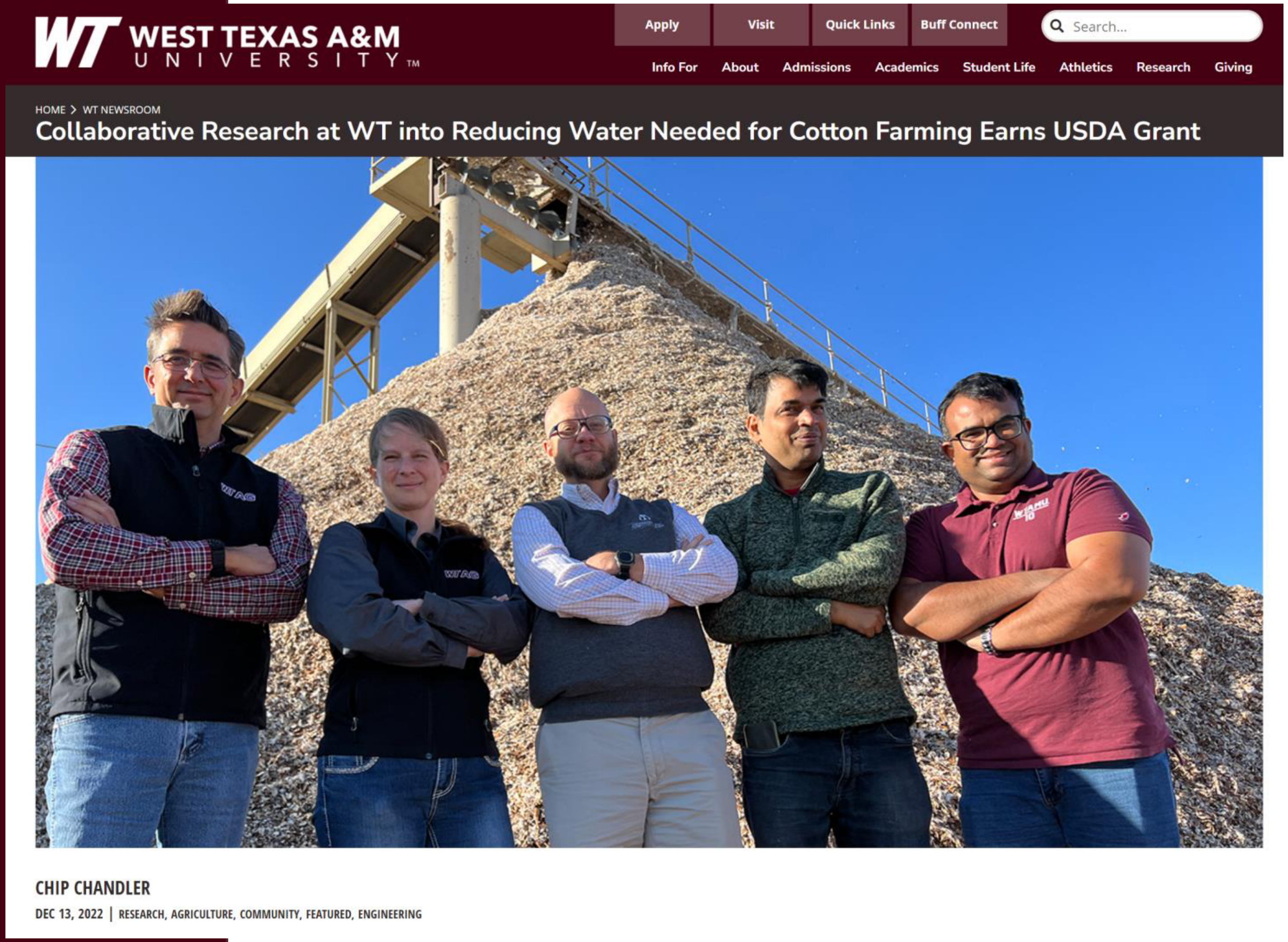
Original soil



Soil with 5% biochar



Soils at 1% and 3% biochar providing about 8-16% water holding capacity increase. Rates around 1.5-5 ton/acre of biochar



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Collaborative Research at WT into Reducing Water Needed for Cotton Farming Earns USDA Grant

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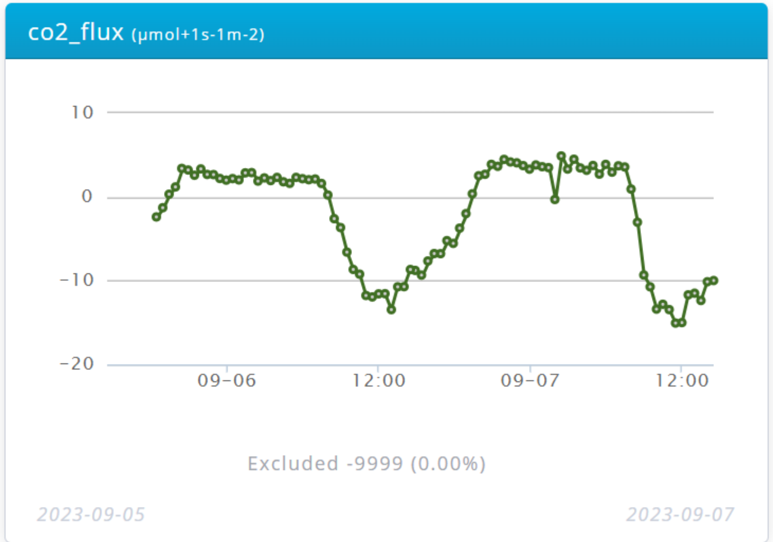
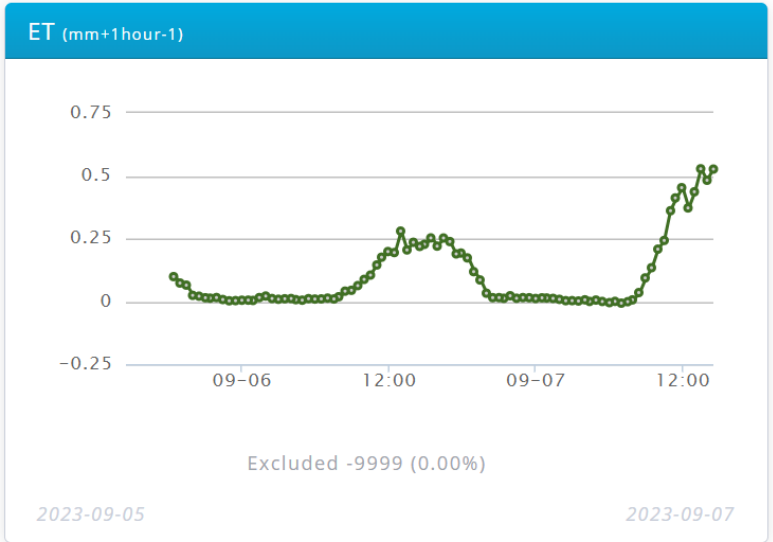
What is the carbon footprint of a dryland cotton field?





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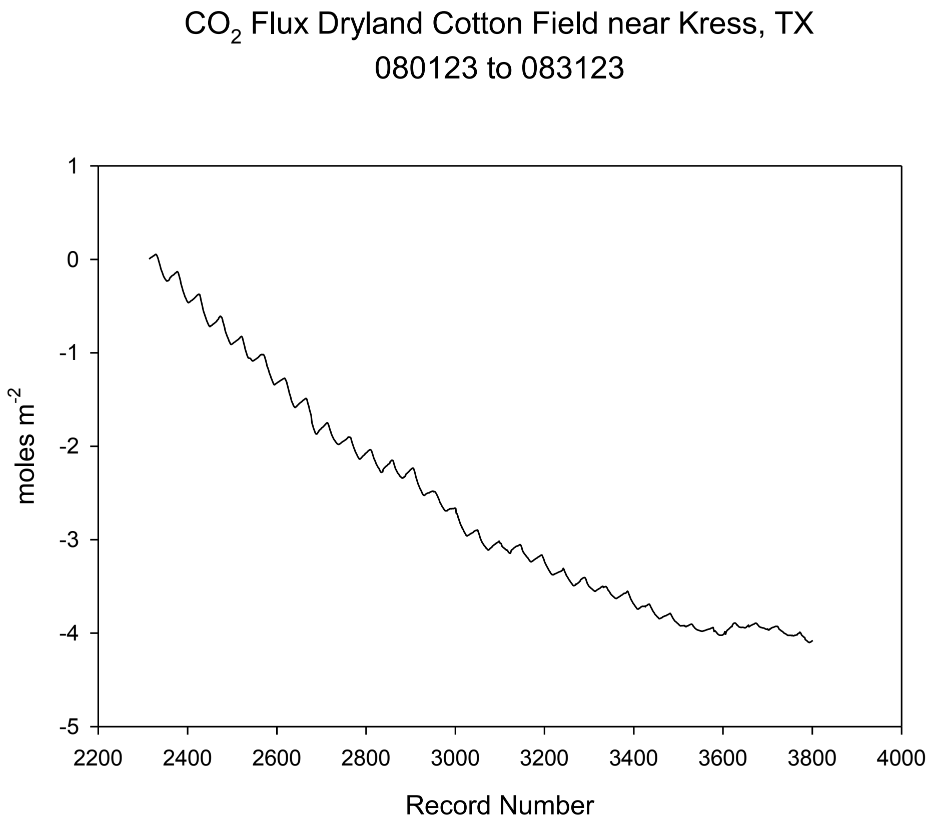

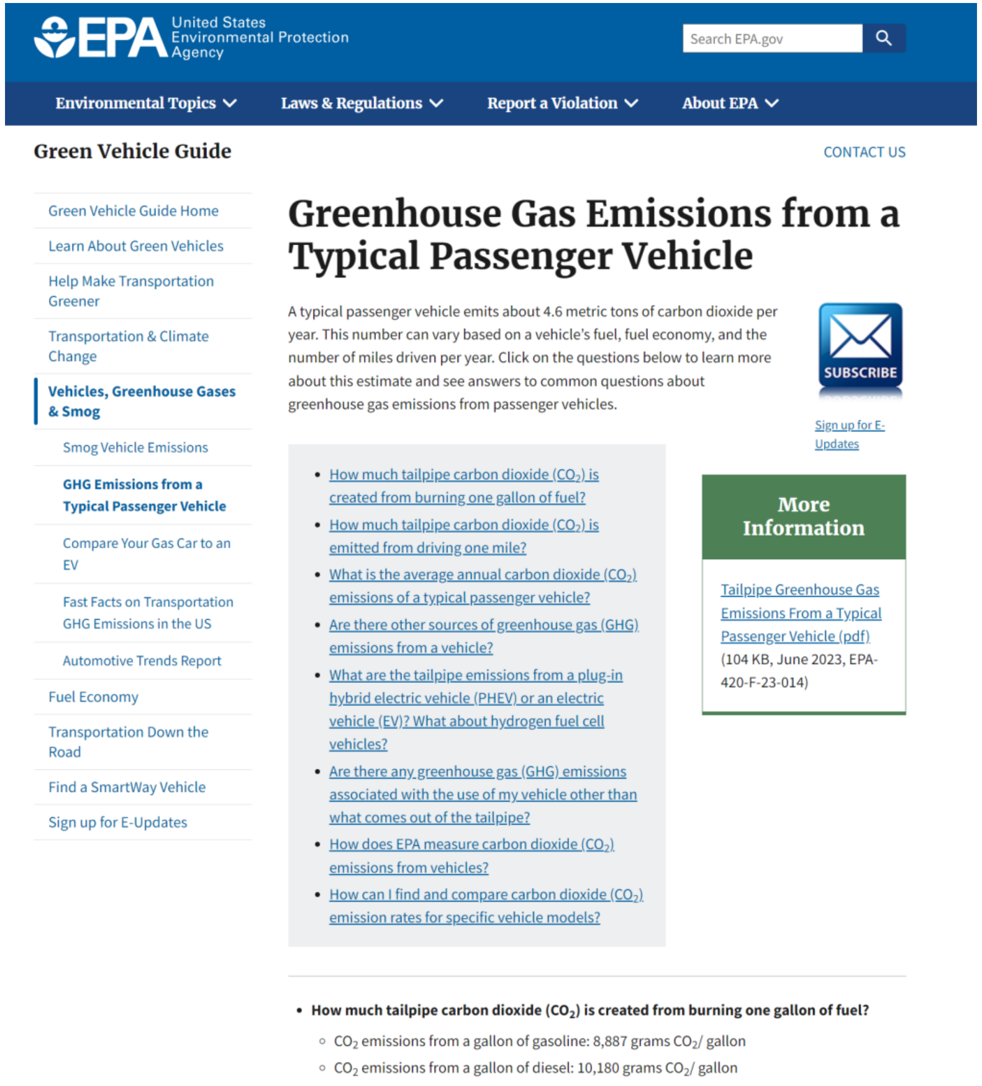
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Greenhouse Gas Emissions from a Typical Passenger Vehicle

A typical passenger vehicle emits about 4.6 metric tons of carbon dioxide per year. This number can vary based on a vehicle's fuel, fuel economy, and the number of miles driven per year. Click on the questions below to learn more about this estimate and see answers to common questions about greenhouse gas emissions from passenger vehicles.

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- How much tailpipe carbon dioxide (CO_2) is created from burning one gallon of fuel?
- How much tailpipe carbon dioxide (CO_2) is emitted from driving one mile?
- What is the average annual carbon dioxide (CO_2) emissions of a typical passenger vehicle?
- Are there other sources of greenhouse gas (GHG) emissions from a vehicle?
- What are the tailpipe emissions from a plug-in hybrid electric vehicle (PHEV) or an electric vehicle (EV)? What about hydrogen fuel cell vehicles?
- Are there any greenhouse gas (GHG) emissions associated with the use of my vehicle other than what comes out of the tailpipe?
- How does EPA measure carbon dioxide (CO_2) emissions from vehicles?
- How can I find and compare carbon dioxide (CO_2) emission rates for specific vehicle models?

More Information

Tailpipe Greenhouse Gas Emissions From a Typical Passenger Vehicle (pdf) (104 KB, June 2023, EPA-420-F-23-014)

- **How much tailpipe carbon dioxide (CO_2) is created from burning one gallon of fuel?**
  - CO_2 emissions from a gallon of gasoline: 8,887 grams CO_2/ gallon
  - CO_2 emissions from a gallon of diesel: 10,180 grams CO_2/ gallon

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