GREAT PLAINS BIOCHAR INITIATIVE (GPBI)

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NDFS - Forest Stewardship Manager

NRCS State Technical Committee meeting

Bismarck, ND

26 September 2019

WHAT IS BIOCHAR?

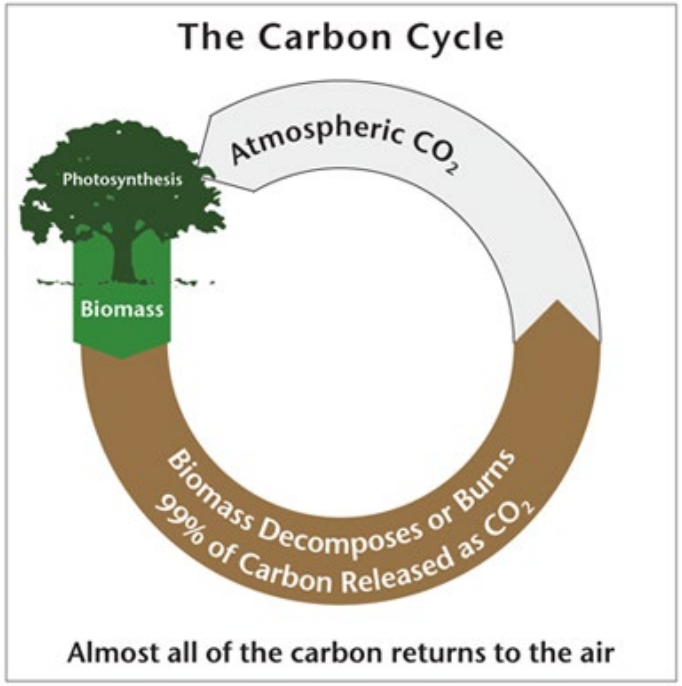
- Pyrolyzed biomass applied to a soil to:

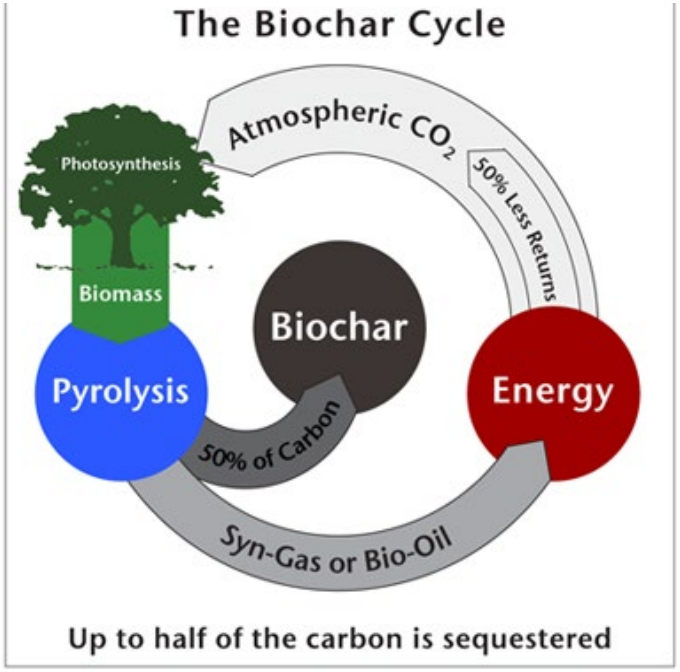
1) improve its **CHEMICAL**, **PHYSICAL** and/or **BIOLOGICAL** characteristics; and

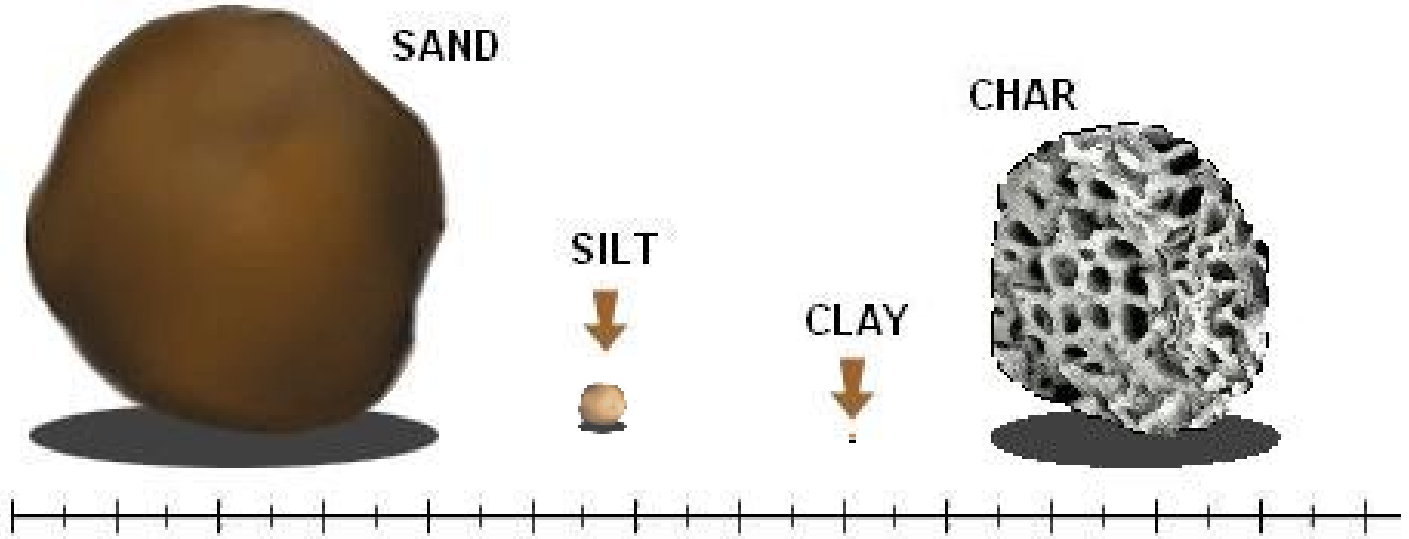
2) sequester atmospheric Carbon & increase soil Carbon

Pyrolysis is the thermo-chemical decomposition of organic material at **elevated temperatures** in the **absence of oxygen**.

From Greek words for **fire** "pyro" and **separating** "lysis".

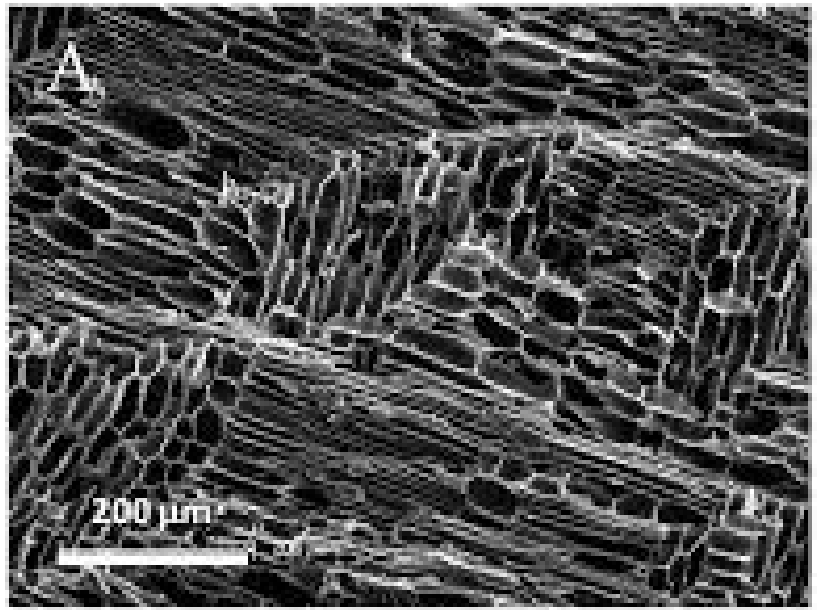


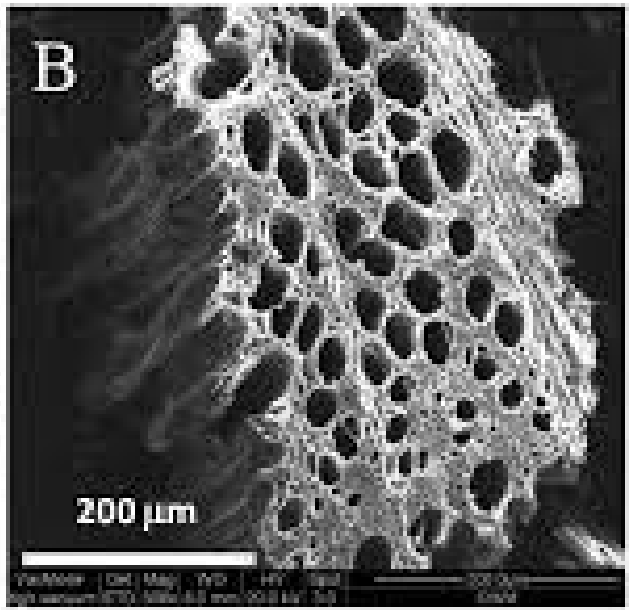




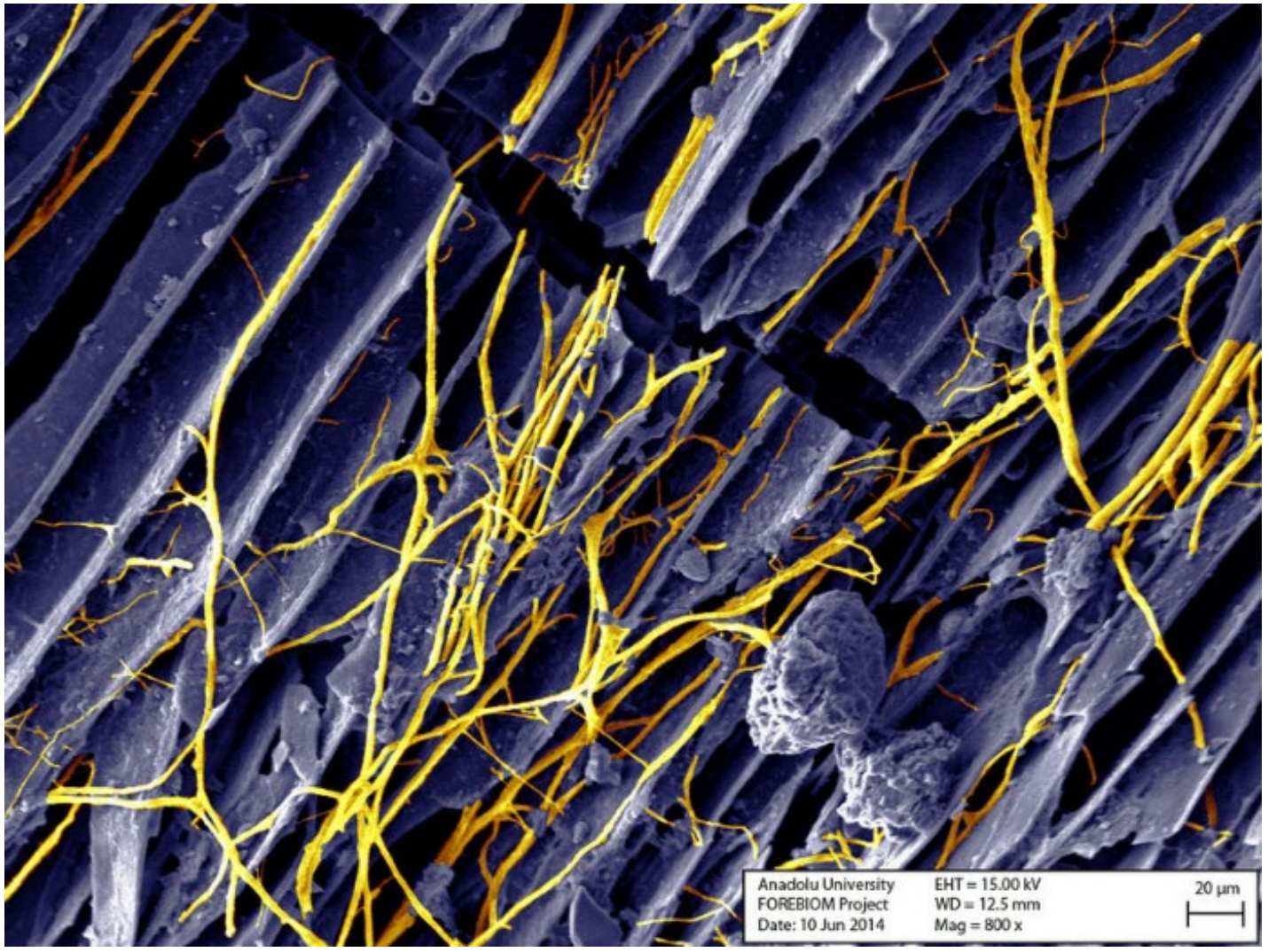
Source: www.prsi.ca/biochar-101/

each tick mark is 0.05 mm





Mycorrhizal filaments in biochar



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Terra Preta
(dark earth)

Source: www.biochar.info

IOWA SOILS – 50% OF SOIL CARBON IS CHARCOAL*

- Iowa soils – some of the most fertile in the world
- Why? Natural biochar from prairie fires
- Thick stems exclude oxygen, producing char, not ash
- Helped by Native American burning practices

*J.-D. Mao, R. L. Johnson, J. Lehmann, D. C. Olk, E. G. Neves, M. L. Thompson, and K. Schmidt-Rohr 2012 Abundant and Stable Char Residues in Soils: Implications for Soil Fertility and Carbon Sequestration. 9571-9576

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Great Plains Biochar Initiative

NEBRASKA FOREST SERVICE
University of Nebraska–Lincoln

KANSAS FOREST SERVICE
KANSAS STATE UNIVERSITY

NORTH DAKOTA N D STATE FOREST SERVICE

PAST WORK ON BIOCHAR IN ND

Converting Shelterbelt Biomass to Biochar

A Feasibility Analysis for North Dakota Forest Service

By Kelpie Wilson
Wilson Biochar Associates
WilsonBiochar.com
kelpiew@gmail.com
541-218-9890
February 2017

Funded by:
NDSU-NORTH DAKOTA FOREST SERVICE
916 E Interstate Ave, Suite #4
Bismarck, ND 58503

Newcastle, WY
2019 biochar pilot project

Annual savings for biochar conversion: **$12,212.70**

Value of biochar: $267.00 X 67yards= **$17,889.00**

FY2019: **$30,101.70 net gain**

BIOCHAR LABELING GUIDANCE DOCUMENT

Natural Resources Conservation Service

Completed by:
R. Alexander Associates, Inc.
Apex, North Carolina
www.alexassoc.net

For:
US Biochar Initiative
1470 SW Woodward Way
Portland, OR 97225 USA

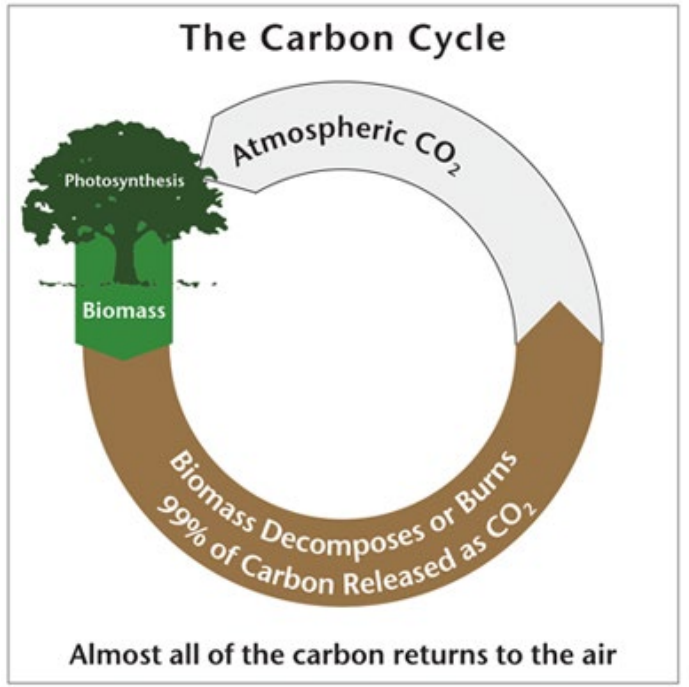
USDA
United States Department of Agriculture
Natural Resources
Conservation Service

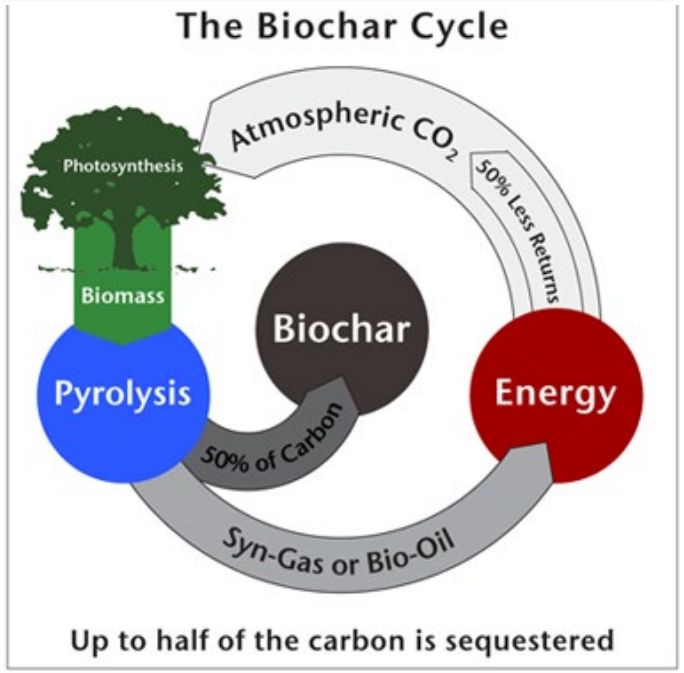
Collaborative Conservation Grant (CCG)

- 9 kilns fabricated: two-types, three designs
- 72 yards EPA-approved biochar purchased and distributed
- One 3-day intensive biochar workshop at Menoken Farm
- One short course at United Tribes Technical College

BIOCHAR APPLICATIONS

- Biomass management – woody or herbaceous
  - Water quality management
  - Compost management
  - Manure management
  - Livestock feed additive – *methane* ↓
  - **Soil quality management –*end use***


The Carbon Cycle
Atmospheric CO_2
Photosynthesis
Biomass
Biomass Decomposes or Burns
99% of Carbon Released as CO_2
Almost all of the carbon returns to the air


The Biochar Cycle
Atmospheric CO_2
50% Less Returns
Photosynthesis
Biomass
Biochar
Pyrolysis
Energy
50% of Carbon
Syn-Gas or Bio-Oil
Up to half of the carbon is sequestered

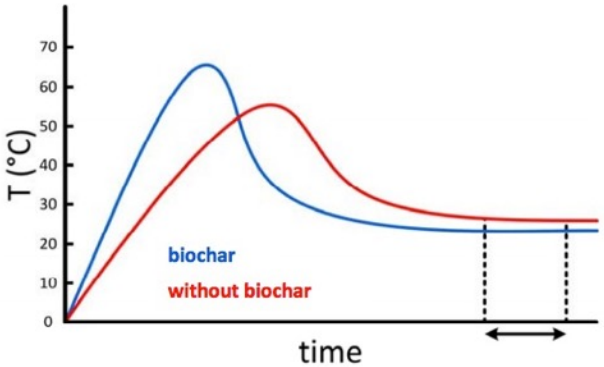
WATER CONTAMINANT REMOVAL

Solids Removed from a Dirty Water Solutions Using Biochar Now biochar Independent Test Results			
Solids		**Starting mg/L**	**% Removed**
Turbidity	NTU*	68 NTU	99.9%
Phosphorus	Non-soluble P	27	99.9%
Solids	SS	506	80.2%
Water holding capacity = 5.6 x the weight of biochar			

Ag Nutrients Removed from Dirty Water Solutions Using Biochar Now biochar Independent Test Results			
Nutrients		**Starting mg/L**	**% Adsorbed**
Phosphorus	non-soluble P	27	99.9%
Phosphorus	P	27	99.8%
Phosphate	PO4-P	284	86.6%
Ammonia	N	1.1	89.7%
Nitrate	NO3-N	52	64.3%

Biochar Now LLC - patented biochar Contaminant Removal System.

BIOCHAR + MANURE = FAST, HOT COMPOST



Biochar increases the temperature in a compost process, accelerating the time needed for material decomposition[4, 6, 7]

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Great Plains Biochar Initiative II: Supply & Demand for Biochar as a Cattle Feed Additive

- 90% of biochar produced in EU is used in livestock farming

- UNL study- **At 0.8% feeding rate**:

Methane production decreased by 10.7 percent in the growing study and 9.9 percent in the finishing study.

- Young cattle in Australia at **0.6% feeding rate**:

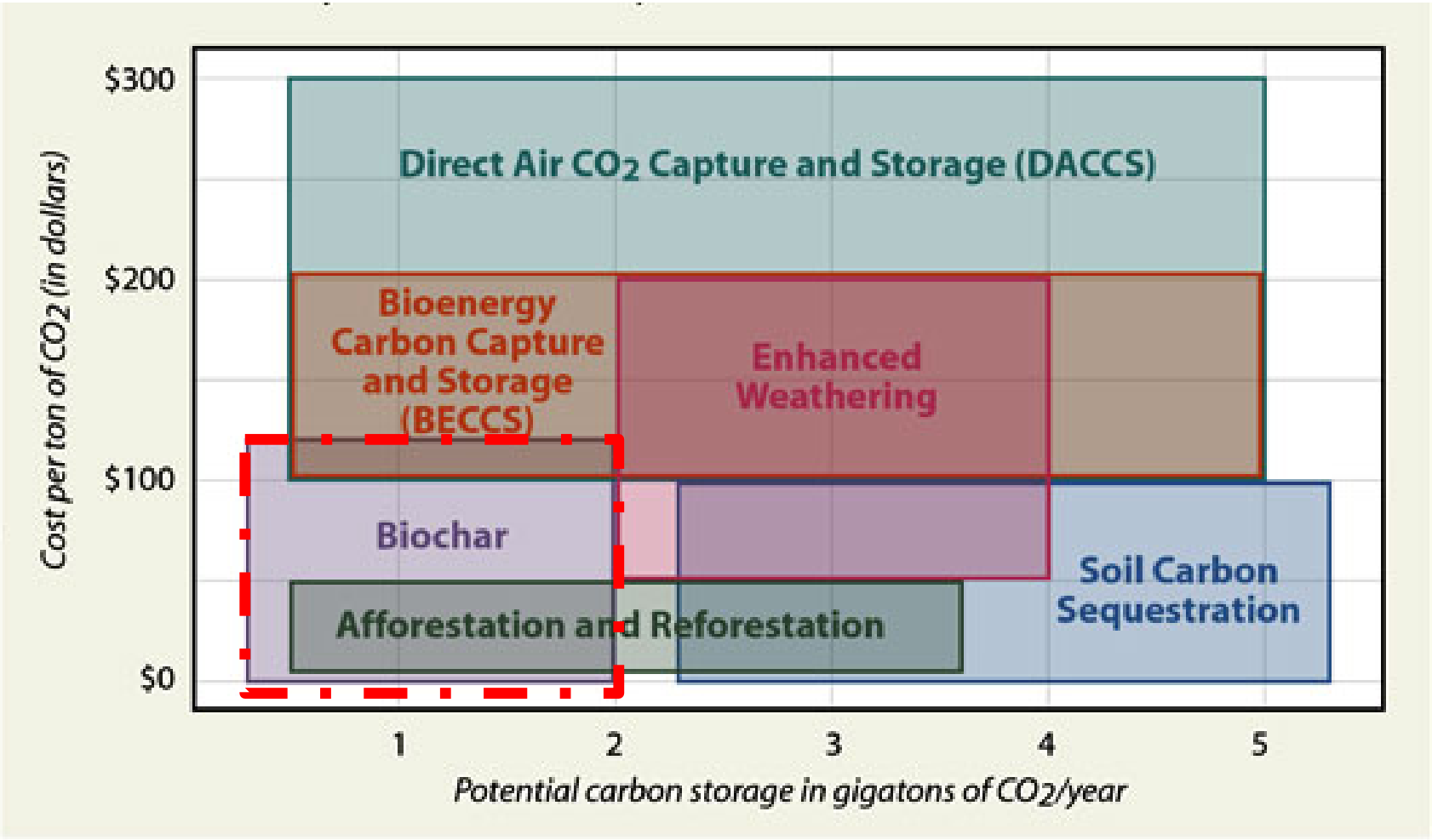
increased growth rate by 25% and reduced methane emissions by 22% per day without affecting feed intake.

(Leng et al., 2012, Leng et al., 2013, Hansen et al., 2012)

How Do Carbon Storage Techniques Stack Up?

Last year the IPCC reported that in order to hold to the Paris climate goal of 1.5 degrees Celsius warming, the world will have to increase the amount of carbon dioxide pulled from the atmosphere. It compared the costs and potential of six key methods of carbon dioxide removal. Not surprisingly, biochar is the cheapest and soll sequestration has the greatest potential for storage.

SOURCE: IPCC; InsideClimate News



WHAT'S NEXT..?

Winter 2019 Biochar Workshops

NOVEMBER 6 - WEDNESDAY

Lisbon (NDFS Lisbon Field Office) Biochar Workshop: biochar basics & focus on **gardening/ urban applications**)

NOVEMBER 7 - THURSDAY

Carrington (Carrington Research Extension Center): biochar basics & **use in livestock applications-** feed supplement, manure management, etc.

NOVEMBER 8 – FRIDAY

Cavalier (Icelandic State Park Biochar Workshop): biochar basics & **fuels mitigation and stand improvement**

NOVEMBER 9 – SATURDAY

Bottineau (Dakota College at Bottineau): biochar basics & **soil health and crop production**

THANK YOU FOR YOU INTEREST AND SUPPORT

QUESTIONS?