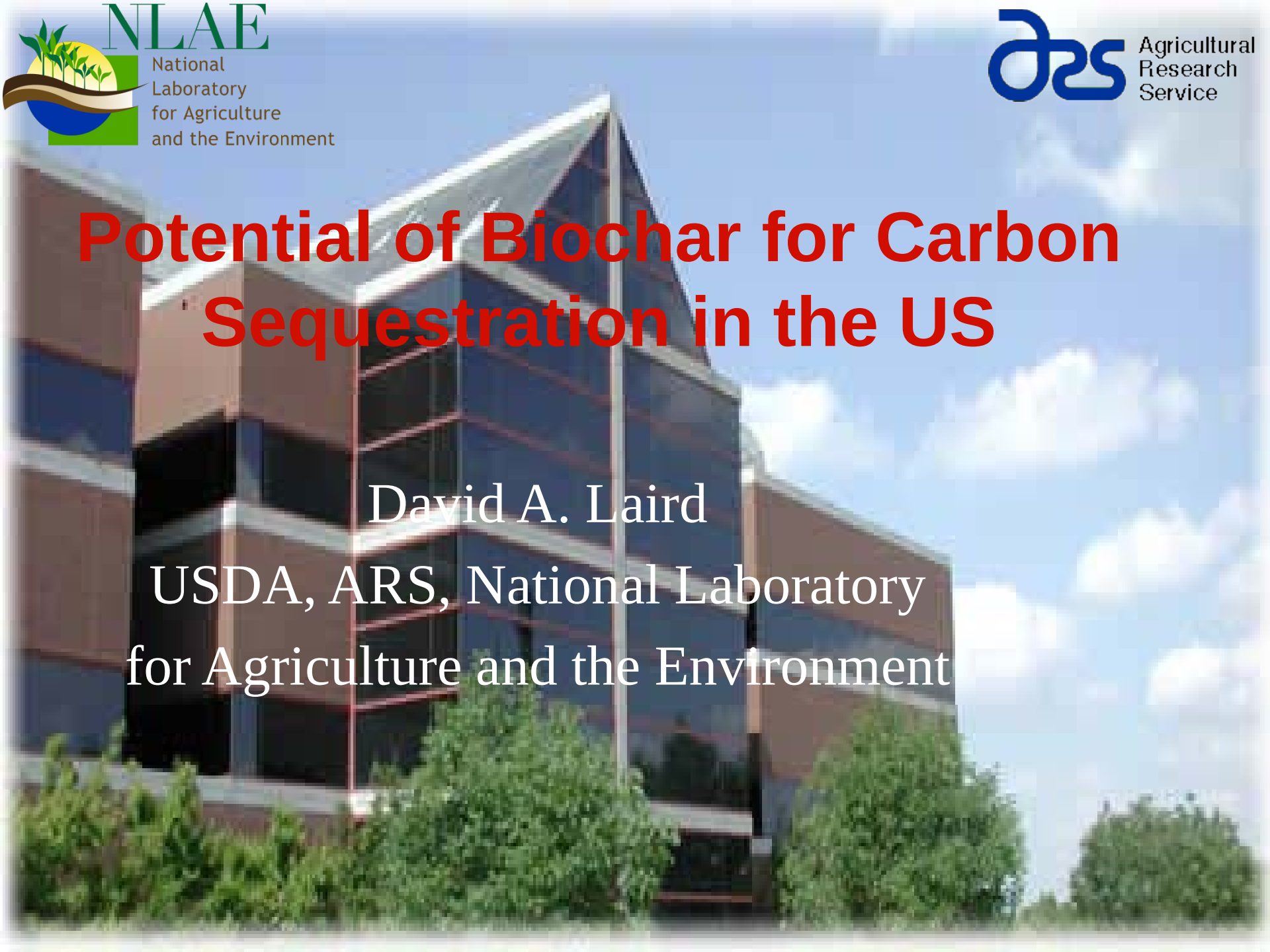

NLAE
National
Laboratory
for Agriculture
and the Environment
Agricultural
Research
Service
Potential of Biochar for Carbon Sequestration in the US
David A. Laird
USDA, ARS, National Laboratory
for Agriculture and the Environment

Pyrolysis

Corn stover
(~1.5 GJ m^{-3})

~450°C
$-O_2$

Sygas
(~6 MJ kg^{-1})

+

Bio-oil
(~22 GJ m^{-3})

+

Biochar
(~21 MJ kg^{-1})

Traditional steel kilns for Slow Pyrolysis

Modern fast pyrolyzers are optimized for production of bio-oil.

Dynamotive Energy Systems Co. 200 tpd Fast pyrolyzer in West Loren Onterio, Canada.

The Biochar Revolution

Terra Preta **Oxisol**

Glaser et al. 2001. Naturwissenschaften (2001) 88:37–41

Agricultural Research Service

Biochar Contributes about 5-50% of the Carbon in Soils

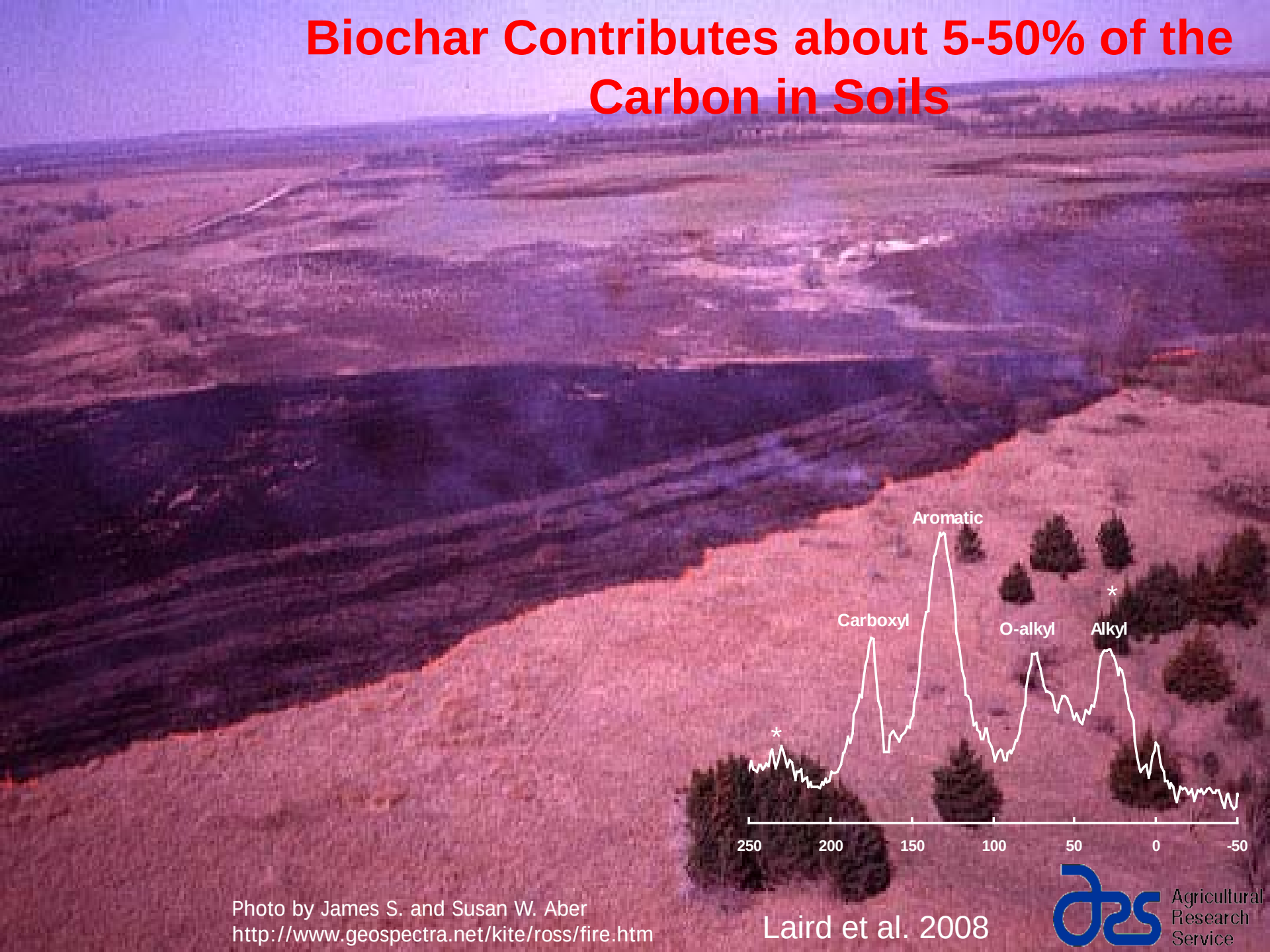
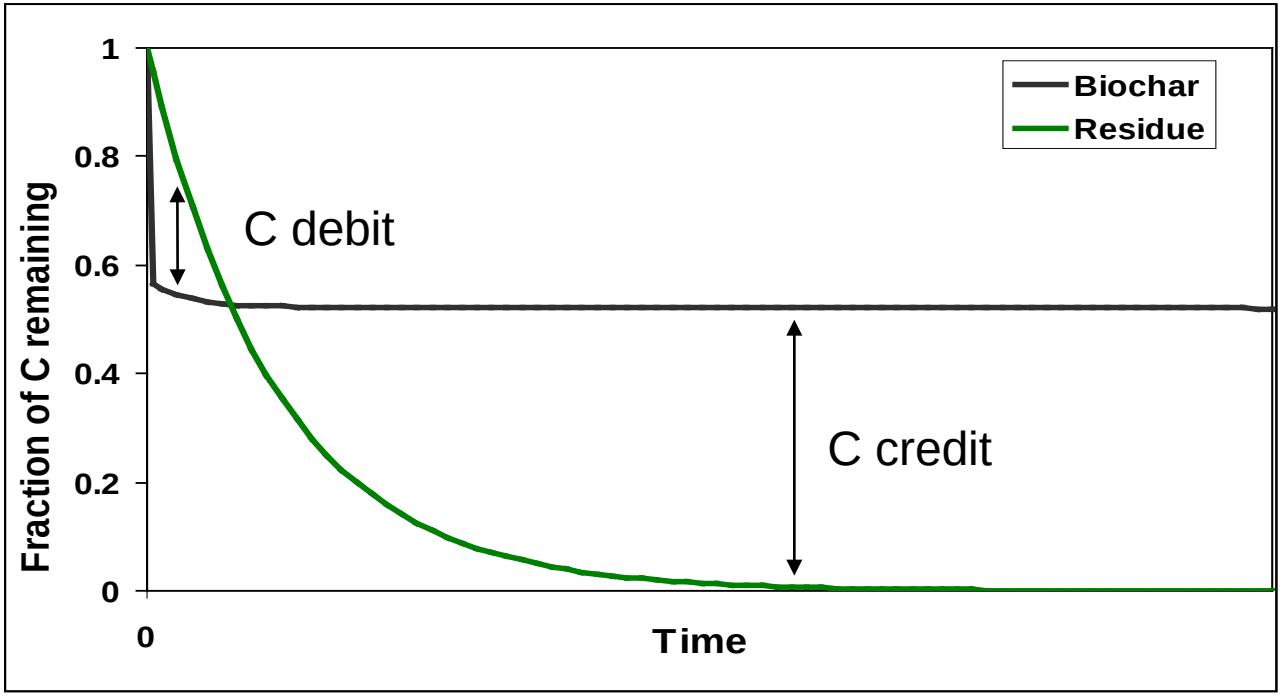


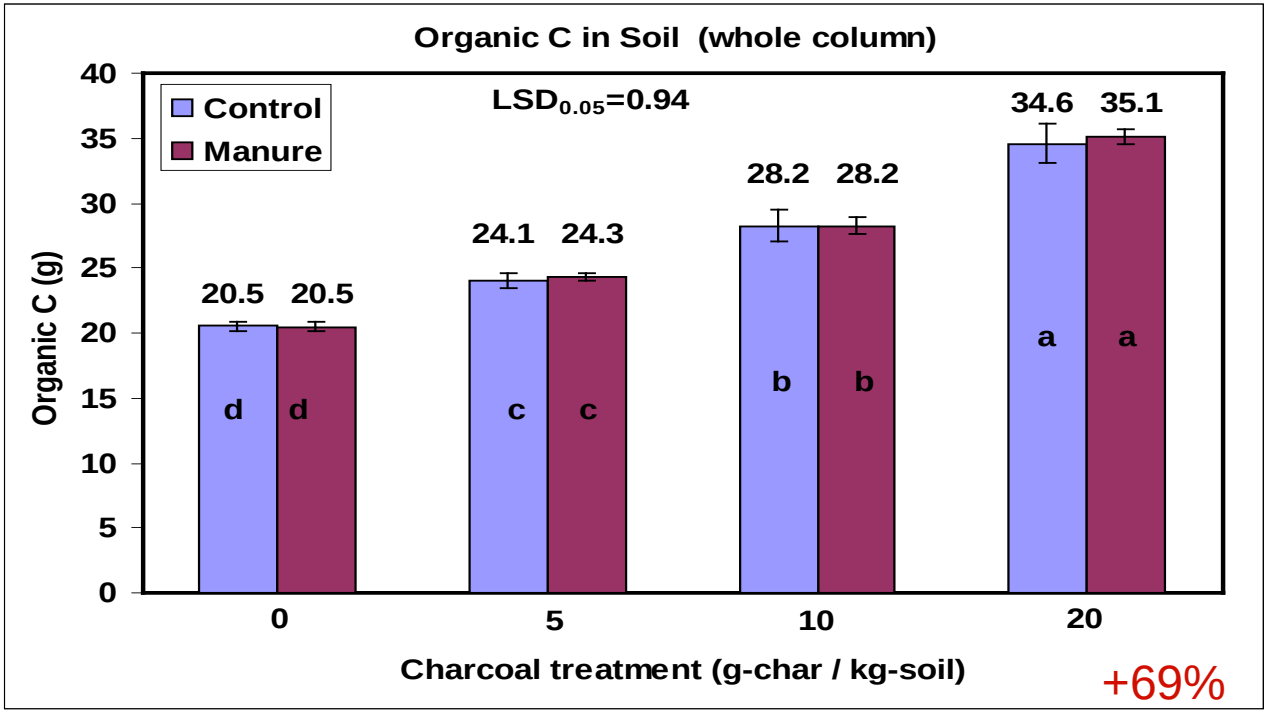
Photo by James S. and Susan W. Aber
http://www.geospectra.net/kite/ross/fire.htm

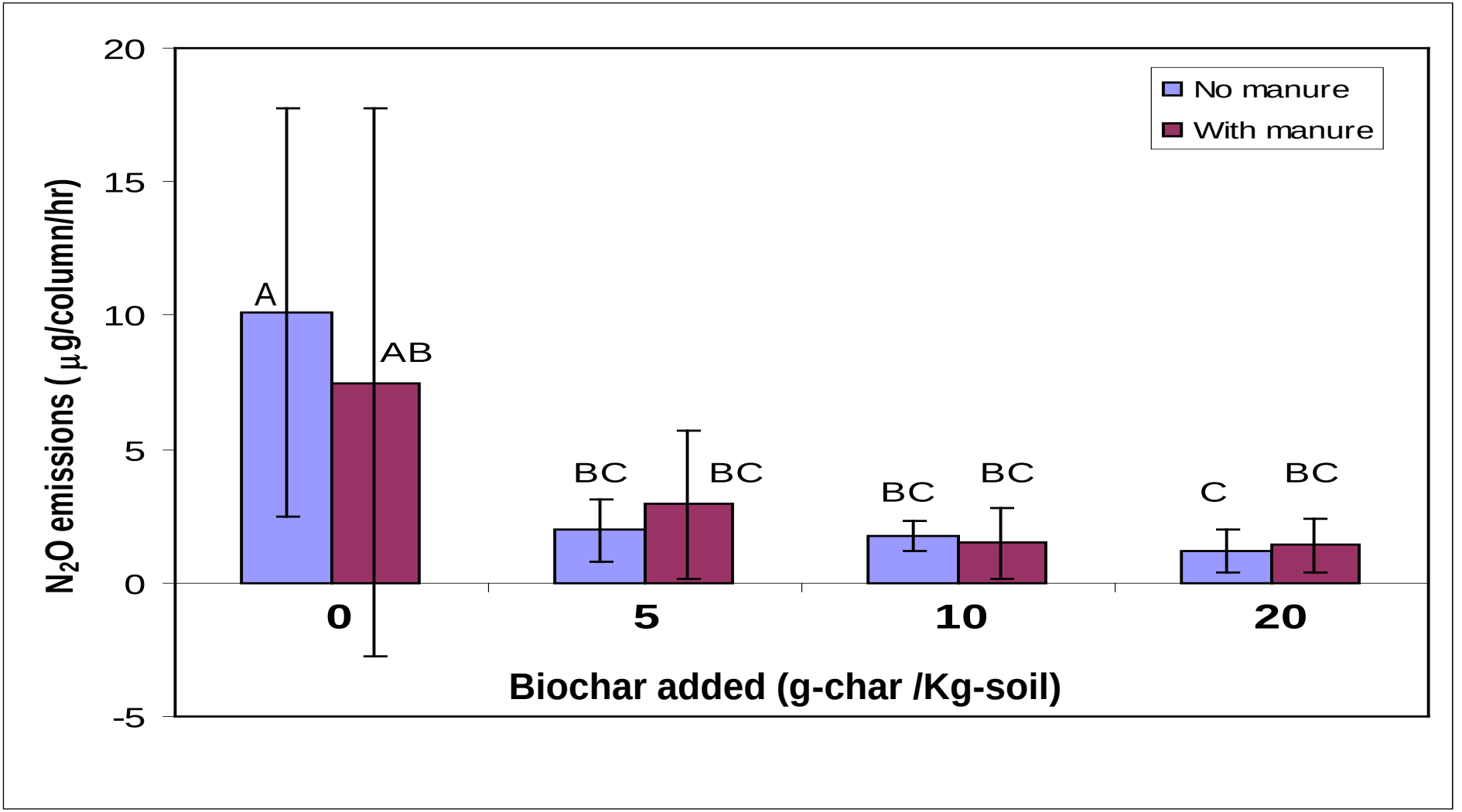
Laird et al. 2008

Agricultural Research Service

Biochar amendments sequester C in soils for millennia





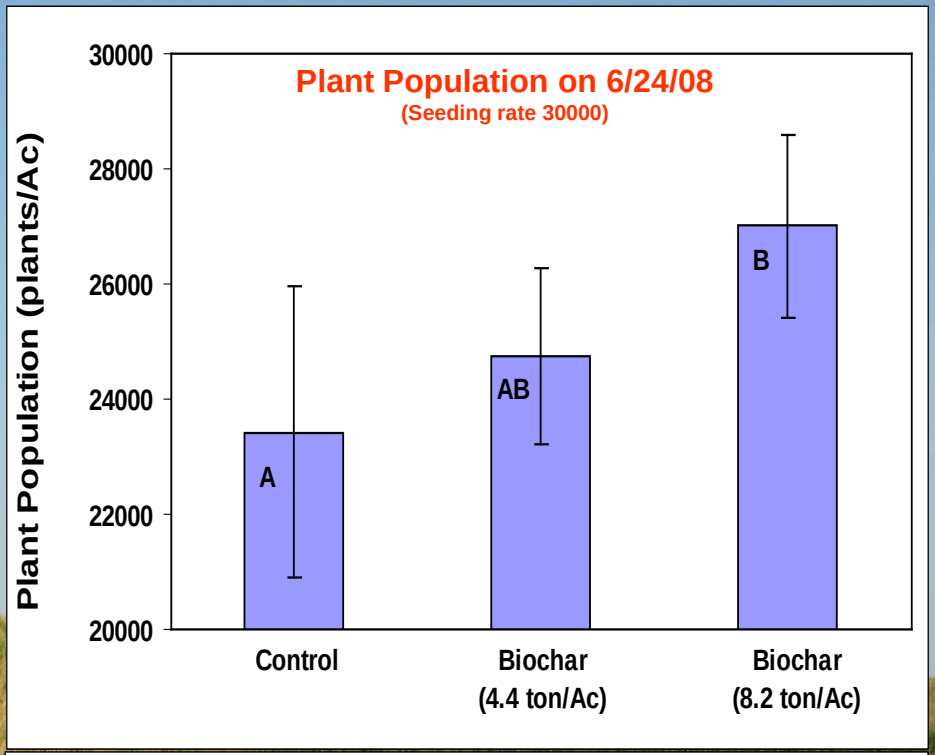


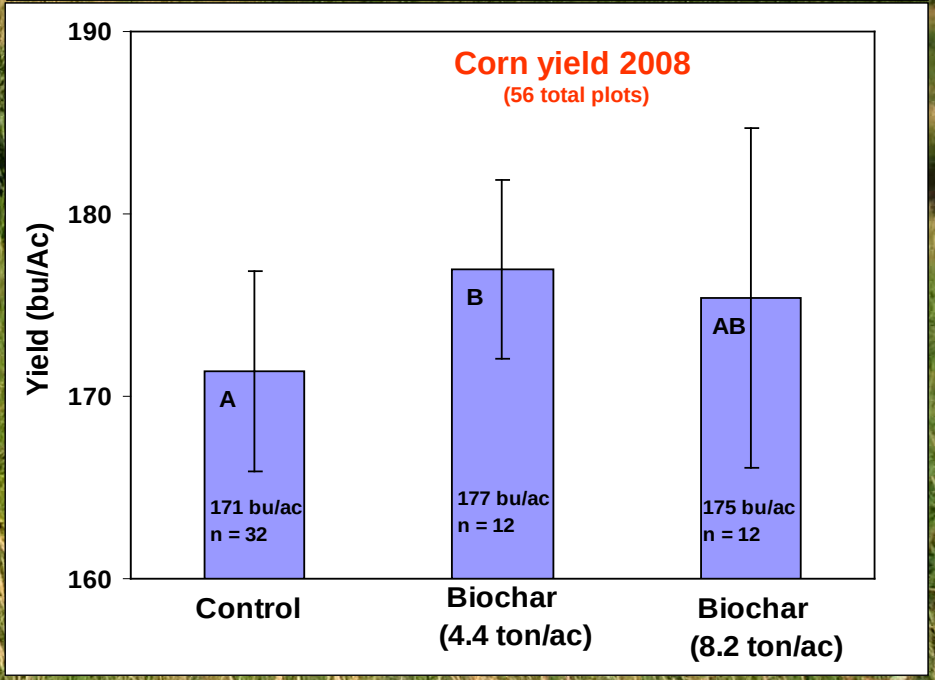
Preliminary reports suggest that biochar additions may reduce N_2O emissions from agricultural soils.

The impact of biochar additions on crop yields for high-quality soils in temperate regions is likely to be small.

First year trials in Iowa showed a 15% increase plant populations,

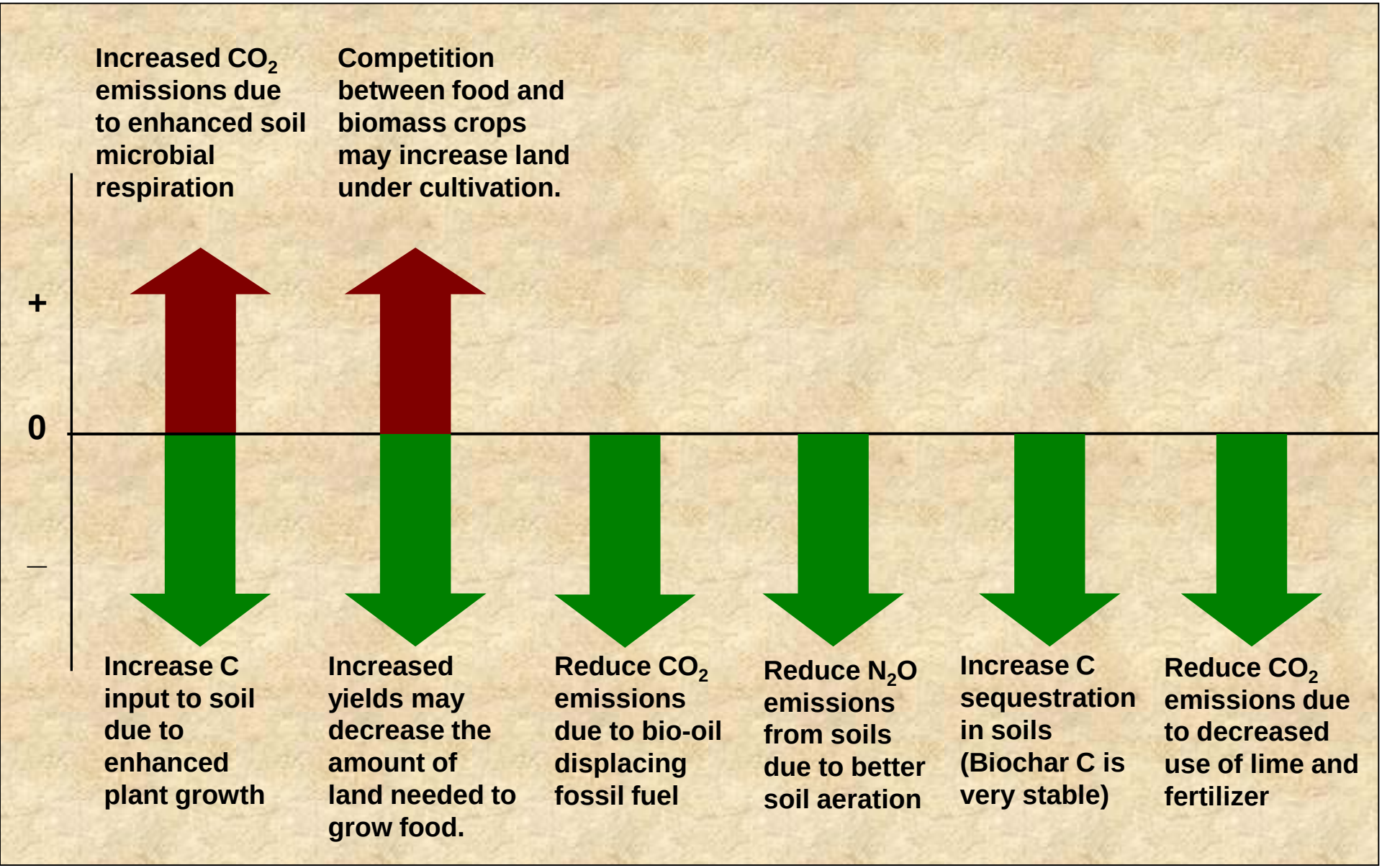
and a 4% increase in corn grain yield from biochar applications.*





Agricultural Research Service

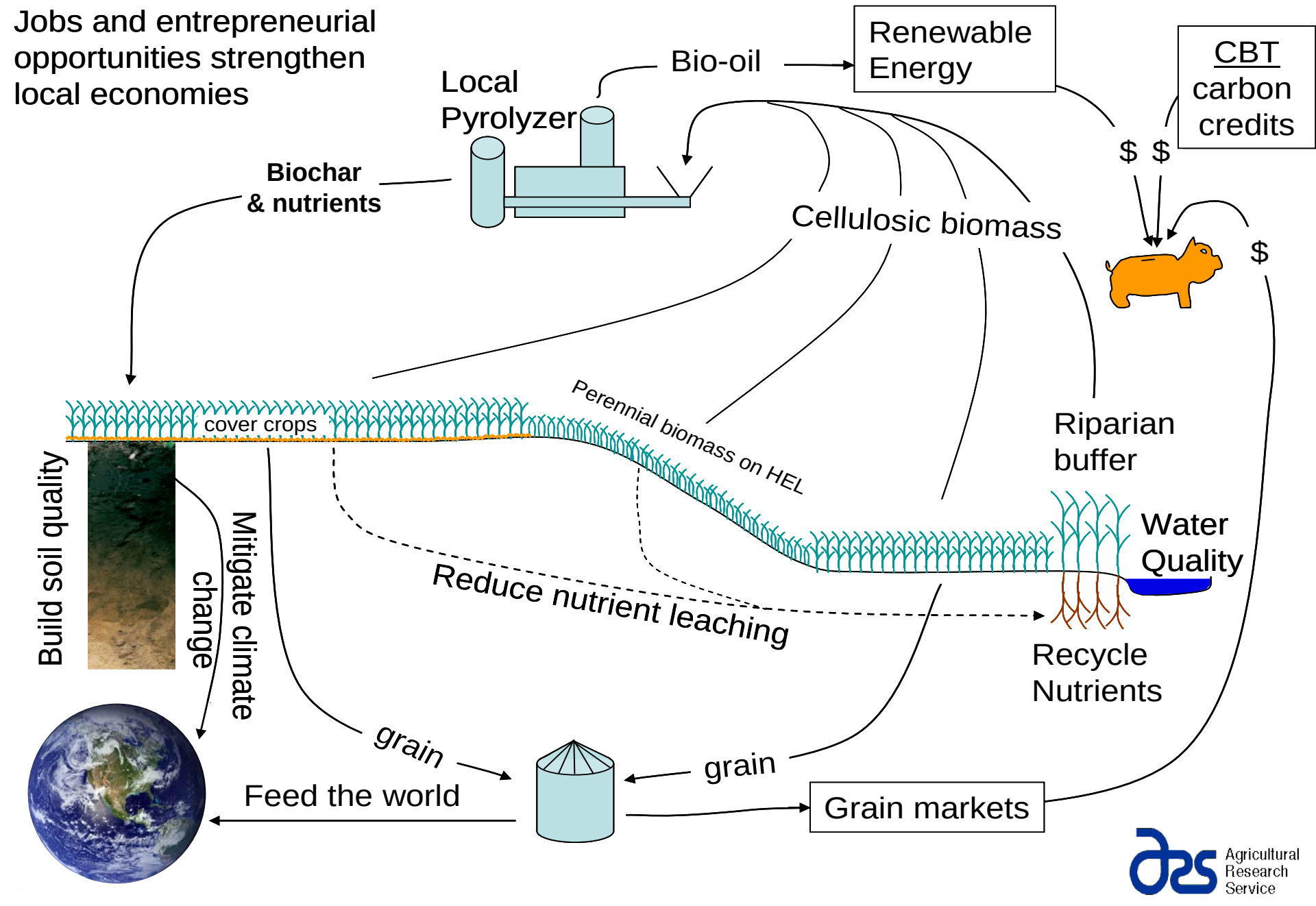
Impact of a Pyrolysis-Biochar Platform on GHG Emissions?



Laird et al., 2009.

Agricultural Research Service

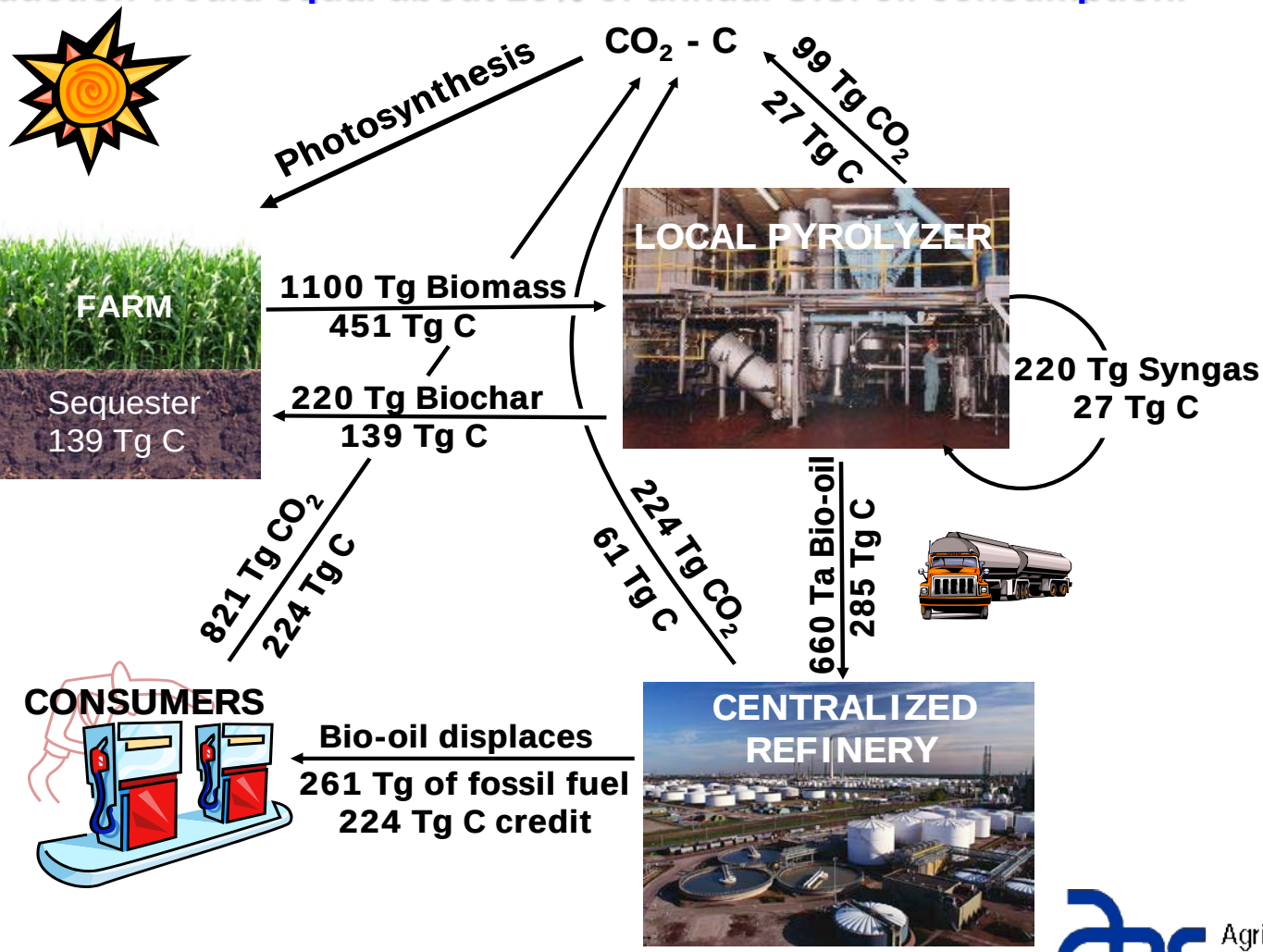
Vision for integrated food and biomass production systems



Agricultural Research Service

The Charcoal Vision

If the U.S. were to pyrolyze 1.3 billion tons of biomass each year, we could permanently sequester 139 Tg of C in soil and displace 1.9 billion barrels of imported oil with domestically produced bio-oil. The total C credit would be 363 Tg of C or about 10% of U.S. annual CO_2-C emissions and the bio-oil production would equal about 25% of annual U.S. oil consumption.



Laird, 2008

Agricultural Research Service