Project Green Challenge Day 17: Soils

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Soil Leaders

John Tuxill is an Associate Professor at the Fairhaven College, Western Washington University in Bellingham, WA. One of his main research aims deals concepts surrounding ethnobotany, agroecology, and consequently, our interactions with the soil system. Recently, he has conducted research into intercropping and its effects on crop yield and soil health in central America. While I was at Fairhaven College, John was one of my most helpful mentors and advisors while studying the interdisciplinary field of agroecology.





Pete Robichaud is a Research Engineer with the USFS Rocky Mountain Research Station in Moscow, ID. His work deals primarily with observing, researching, modeling, and predicting overland soil erosion across many different ecosystems, from agricultural fields to burned forests. This work is extremely important for defining how our practices affect soil loss and downstream effects associated with increased sediment in our rivers.

Article

I chose to research more into how biochar can be used with soils to enhance their health by digging into the primary literature. The article, "Pelletized Biochar as a Carrier for AM Fungi in the On-Farm System of Inoculum Production in Compost and Vermiculite Mixtures" by David Douds (2014) looks at how biochar inoculized with *arbuscular mycorrhizal fungi* can both improve soil structure using AM fungi, but also increase carbon storage of the soils as well!

http://www.tandfonline.com/doi/abs/10.1080/1065657X.2014.941515?journalCode=ucsu20

Lesson Plan

The following is a short primer lesson on soils which combines a lot of the information we learned today!

What Down with Soil?

A Quick Guide to Under Your Feet and How to Protect It

Photo: PaGalGuy

What is Soil?

The soil environment is the combination of living and non-living materials that is created from:

- ✓ Parent Material
 - ✓ Bedrock
- ✓ Climate
 - ✓ Weathering
 - ✓ Precipitation
- ✓ Living organisms
 - ✓ Organic matter transformation)
- ✓ Time



The Soil Profile

Soil is made from a combination of layers, each with their own unique environment and purpose.

O - Organic

- ✓ Decomposing Plants
- ✓ Leaf litter

A - Topsoil

- \checkmark High biological activity and organic matter
- $\checkmark \quad \text{Rich in nutrients}$

B - Subsoil

Mostly minerals

C-Weathered Rock

✓ Parent rock material





What does soil do for us?

Benefits of Soil

Soil forms the backbone of our agricultural system (FAO)

✓ 95% of our food comes directly or indirectly from soil!

Healthy soil:

- ✓ Increases productivity
- ✓ Requires less external inputs pesticides, fertilizers
- ✓ Sequester carbon!
- ✓ Store more water!

How can we protect soil?

Agriculture - Tillage

- Conventional-Till:
 - Breaks apart the soil structure
 - Releases CO₂
 - Increases soil erosion
 - Decreases nutrients

- No-Till:
 - Regenerates beneficial fungal networks
 - Lowers the rate of soil erosion
 - Requires less fertilizer
 - Increases soil organic matter



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(Kiss the Ground)

Regenerative*

H²O

No-Till

*In concert with other regenerative practices can help rebuild healthy soil.

CONTRACT OF

*In general this practice leads to degeneration of soil health.

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Agriculture – Cover Crops

Bare Soil:

Cover Crops

- Leaves surface open to erosion
- Reduces organic matter
- Nutrients can be washed away

- Regenerates organic matter
- Stabilizes soil profile
- Can increase nutrient capacity

Degenerative*



CO² H²O

Bare Soil

*In general, especially on large land surfaces, this practice leads to degeneration of soil health.

(Kiss the Ground)

Regenerative*



CO² H²O

Cover Crops

*In concert with other regenerative practices can help rebuild healthy soil.

Sources

Kiss The Ground - https://kisstheground.com/

USDA NRCS - https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/edu/7thru12/?cid=nrcseprd885606

FAO - http://www.fao.org/soils-2015/news/news-detail/en/c/277682/

Regeneration International - <u>http://regenerationinternational.org/why-regenerative-agriculture/</u>

Rodale Institute - http://rodaleinstitute.org/our-work/soil-health/