Healthy Soils

Greenleaf Communities

Issue

The demand for increased agricultural yields in the United States has led to widespread depleted soils. Nearly all of U.S. soils are at least somewhat degraded and much of the Midwest's soil is very degraded.[1] Poor soil correlates with fewer crops, less nutritious plant crops, and reduced uptake of nutrients, such as phosphorus and nitrogen. While ensuring uptake of nutrients in doses that are beneficial, it is also important to minimize uptake of elements that are harmful in excess, such as arsenic. Over-application of fertilizers and pesticides further stresses soil integrity and quality. Depleted soils do not retain water. Consequently, runoff from agricultural fields is a major source of nutrient loading that can contaminate waterways and is correlated with eutrophication and algal blooms, compromising the health of aquatic life, water quality, and public health.

Whole systems approach and sustainable agriculture practices

Healthy soil is the foundation of successful farming. It also has the potential to improve the health of lands, plants, and water on a large scale. Greenleaf Communities suggests a suite of sustainable agriculture practices that will improve soil and water quality, reduce erosion and runoff, conserve water, and increase crop yields and nutrient uptake.

No or low-tillage results in increased organic matter and diverse beneficial soil organisms, enhanced water infiltration, conserved water content, regulates soil temperature, and improved soil density.[2]

Cover crops can reduce soil erosion and compactions and result in increased organic carbon and water infiltration, recycled nutrients, and reduced weed density.[3]

Crop rotation contributes to replenished nitrogen in soil and increased organic matter.[4]

Soil amendments improve the physical qualities of soil and add nutrients. See gypsum.

Healthy soils lead to healthy foods

Soil health is vital for nutritious foods. Stressed soils retain fewer nutrients, reducing crop production. Nutrient values decreased by as much as forty percent in produce grown at the end of the twentieth century compared to crops grown in the middle of the century. Decrements in nutrient retention were correlated with worsening soil conditions over the same period.[7]

Gypsum: One approach to improving soil quality is by the addition of gypsum, used as a fertilizer for centuries.[5] While gypsum is found naturally in sedimentary rocks, a more economical gypsum source is in the waste from coal fired power plant heat stacks. In many soils, gypsum can be effective in enhancing water infiltration, which supports water conservation, improves soil structure, and increases nutrient uptake, resulting in higher crop yields. Gypsum also reduces soil runoff and erosion, and minimizes eutrophication, reducing algal blooms.[6]

Gypsum is effective in improving physical and chemical soil properties by remediating problematic soils such as sodic soils and acidic subsoil. Application of gypsum can increase yields. A study boosted corn yields by as much as 26.2 bushels an acre.[6]

1 (ISRIC)
2 (Scott and Ford)
3 (Hoorman, 2009)
4 (USDA, 1996)
5 (Crocker, 1922)
6 (Chen et. al, 2008)
7 (Scientific American, 2011)
Photo courtesy of Darrell Norton

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About Greenleaf Communities

Greenleaf Communities is a 501(c)(3) nonprofit organization that engages multi-disciplinary teams to investigate problems that affect health of humans and the environment. We transfer that knowledge to develop and promote best practices and policies on issues such as water and food security, and climate change.

Team

Greenleaf Communities facilitates multi-disciplinary teams by collaborating with leading soil and health scientists to conduct research on practices and products to better inform policies that seek to improve soil and nutritional health.

Collaboration includes:

Janet Hock, Maine Institute for Human Genetics and Health

Darrell Norton, Retired - USDA/ARS National Soil Erosion Research Laboratory

Britt Burton-Freeman, Institute for Food Safety and Health

Warren Dick, Ohio Agricultural Research and Development Center at the Ohio State University

Ron Chamberlain, Gypsoil

Greenleaf Communities' Offerings

Greenleaf Communities offers solutions that are sustainable—environmentally, economically, and socially. We provide:

- Strong, multi-disciplinary research teams with the capability to do field and laboratory testing
- Well-established networks in agricultural and environmental fields
- Expert advising on benchmarking and best practices
- Excellent project management
- Stakeholder facilitation and outreach
- Technical capacity to develop tools and models
- Solution based, tailored answers, and technical assistance with implementation