



YES! Project Guide

Category: Water Quality and Conservation	
Project Title: Soil Amendment – Nutrient Density and Carbon Sequestration	
Approximate Cost: Minimal (most materials can be acquired)	
Desired Results	
<p>Project Goal: Enhance understanding of soil science and how soil health influences sustainable agriculture practices. Learn how to apply soil health practices that impact food quality and climate change by increasing organic matter and storing excess carbon from the atmosphere.</p> <p>Water Quality and Conservation: Sustainable agriculture practices including building soil health decrease runoff by increasing water retention also leading to decreased water use on fields. Carbon storage balances the carbon and water cycle influencing weather patterns and extreme weather events.</p>	
<p>UNDERSTANDINGS</p> <ul style="list-style-type: none"> ● Introduce the principles of sustainable agriculture and how they are used on the farm. ● Introduce the terms “industrial/global” and “sustainable/local” agriculture. ● Understand that soil is a farm’s most important resource ● Identify the main components of soil, and understand the derivation and the function of each ● Understand how soil structure effect drainage and water retention ● Observe erosion and loss of topsoil and to experiment with ways to prevent it ● Understand that our activities on the land affect the quality of the soil. 	<p>ESSENTIAL QUESTIONS</p> <p>What is sustainable agriculture?</p> <p>What is soil science and what is the importance of soil?</p> <p>What are the components of soil and how can they be measured and modified to increase soil health?</p> <p>What role does soil health play in water retention, water quality, and erosion?</p> <p>What living organisms contribute to soil health?</p> <p>How do we “feed” soil and improve soil quality?</p> <p>What is organic matter and compost?</p> <p>How do we create a composting program?</p> <p>How do we measure and quantify the success of a composting program?</p> <p>What is soil carbon sequestration and why is it important?</p> <p>What are carbon farming practices?</p>

<ul style="list-style-type: none"> ● Observe that soil is alive and must be fed to maintain fertility ● Understand that it is possible to increase the quality and fertility of soil by adding organic material ● Learn how to make compost ● What is carbon sequestration? ● What are carbon farming practices? 	<p>How to implement a soil management plan using carbon farming practices</p>
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Knowledge and Skills Acquisition

<p><i>Students will know...</i></p> <ul style="list-style-type: none"> ● Sustainable Agriculture practices and terms ● How soil influences the climate and agriculture practices ● The science of soil ● Soil is living ● Practices to improve soil health ● Composting practices ● Carbon sequestration and carbon farming 	<p><i>Students will be skilled at...</i></p> <ul style="list-style-type: none"> ● Identifying and analyzing soil components ● Data collection of soil types and analysis of soil quality ● Composting best practices ● Implementing composting program ● Carbon farming practices and applying practices to a fictional scenario ● Presenting a successful “Carbon Farm”
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Data

Impact Evidence: Students use qualitative activities to build foundational knowledge and build practical skills in soil science. Students use quantitative data collection and analyses to evaluate a successful composting program.

Qualitative (observations and descriptive data):

- Scavenger Hunt (Soil Science Terminology)
- Soil Management Plan
- Soil Observation Activity
- Soil Composition Identification Activity
- Soil and Plants Activities (Drainage and Erosion)
- Compaction Activity
- Living Soil Activity
- Soil Structure Activity
- Composting Program Design and Implementation Plan
- Soil Carbon Sequestration Articles
- Carbon Farming Practices Article
- Creating a Carbon Farm (background, research, design and presentation) using Sustainable Farm Practices Reference

Quantitative (numerical data):

- Track amount of compost put into compost bins
- Measure output of soil each year
- Gather data on composition (organic matter) in compost – chemistry testing, water infiltration testing, and CO₂ storage testing

Timeline

Workshop 1: 2 hours - <https://thefoodproject.org/curriculum/sustainable-agriculture/> (Workshop 1 PDF)

Activities: Agricultural Terminology and Soil Management (20 min), Scavenger Hunt (1 hour), Soil Management Options (20 min)

Workshop 2: 1 hour (PREP: 3 months earlier set soil samples)

<https://thefoodproject.org/curriculum/sustainable-agriculture/> (Workshop 2 PDF)

Activities: Soil Composition (20 min), Drainage (20 min), Erosion (20 min), Compaction (20 min)

Workshop 3: 1.5 hours - Continuing <https://thefoodproject.org/curriculum/sustainable-agriculture/> (Workshop 3 PDF)

Activities: Living Soil (30 min), Soil Structure (15 min), How to “Feed” the Soil (30 min), Composting (Ongoing), Create a Composting Program

Workshop 4: 8 hours (Articles in the Reference Section)

Activities: Articles on Soil Carbon Sequestration and Discussion (1 hour), Article on Carbon Farming Practices (30 minutes), Practical Exercise: Creating a Carbon Farm (4 hours)

Process

Composed of Four Workshops: Delivering all four allows for the most comprehensive picture of soil science and systems understanding. However, they can be delivered individually as well.

Workshop 1: Introduction to Sustainable Agriculture and Food Systems

Workshop 2: Soil

Workshop 3: Compost

Workshop 4: Carbon Sequestration

Resources

The Food Project Curriculum: <https://thefoodproject.org/curriculum/sustainable-agriculture/>

U of M Soil Testing Lab: <http://soiltest.cfans.umn.edu/>

Soil Carbon Sequestration Articles: <https://www.nature.com/scitable/knowledge/library/soil-carbon-storage-84223790/>, <https://www.envirothonpa.org/documents/CarbonSequestration.pdf>

Carbon Farming Practices Article: <https://www.carboncycle.org/carbon-farming/>

Sustainable Farming Practices Reference:

<http://www.agriculture.gov.au/SiteCollectionDocuments/climate-change/carbon-farming/boosting-farm-productivity.pdf>