

FOOD FOR OUR FUTURE

Soil & Health



HUMAN ECOLOGY
PROJECT
THE PERSONAL IS PLANETARY


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The Human Ecology Project is dedicated to illustrating the connections between human actions and their effects on individual health, society, animals, and environmental impact. The unifying factor is the food we eat.

This is a **Human Ecology Project Workbook**



We hope you can find a group of friends and watch the video together and discuss the issues presented in it. We have supplied some questions to get the ball rolling if you need them, and supplied a full text of the video with references to some studies and articles if you want to carry your studies deeper.

A photograph of a large agricultural field filled with rows of young green leafy plants, likely lettuce or similar vegetables, growing in neat, parallel lines across the landscape.

We believe that soil quality, use and preservation is a fundamental issue in creating a sustainable environment. How we treat the soil is a direct reflection of the choices we make when we buy food for ourselves and our families.

Remember: The Personal Is Planetary

WATCH THE VIDEO: FOOD FOR OUR FUTURE, PART TWO - SOIL AND HEALTH

<https://www.youtube.com/watch?v=pZvWRauGTtU&t>

The Life Beneath our Feet

We make every effort to purchase only food that has been grown organically. We are fortunate that we live in an area where this is readily available, not everyone has that opportunity. Many people we talk to assume that our focus on organic is because of personal health issues. Who would choose food that had been grown in and sprayed with toxic chemicals? Of course, that is true but there is another reason that has equal importance.

In **Part one**

of Food for Our Future, we talked about some of the influences on how we choose the foods we ate in the past and some major changes in our food in the last century.

In **Part two**

we want to look at the source of our food—the soil it is grown in and why that's important for planetary as well as personal health.

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Agriculture is the management of the plants we grow to eat and the soil we grow them in. It is the foundation of modern society. The future of both human and non-human life depends on our wise use of these resources. Let's take a closer look at plants and soil.

The birth of life

What we see here is the miracle of plant growth. Specialized cells on root tips guide the roots into the darkness of the soil to find water filled with minerals while cells in the leaf guide it upwards toward the light of the sun and the atmosphere. It is the balance of these two forces that produce photosynthesis.

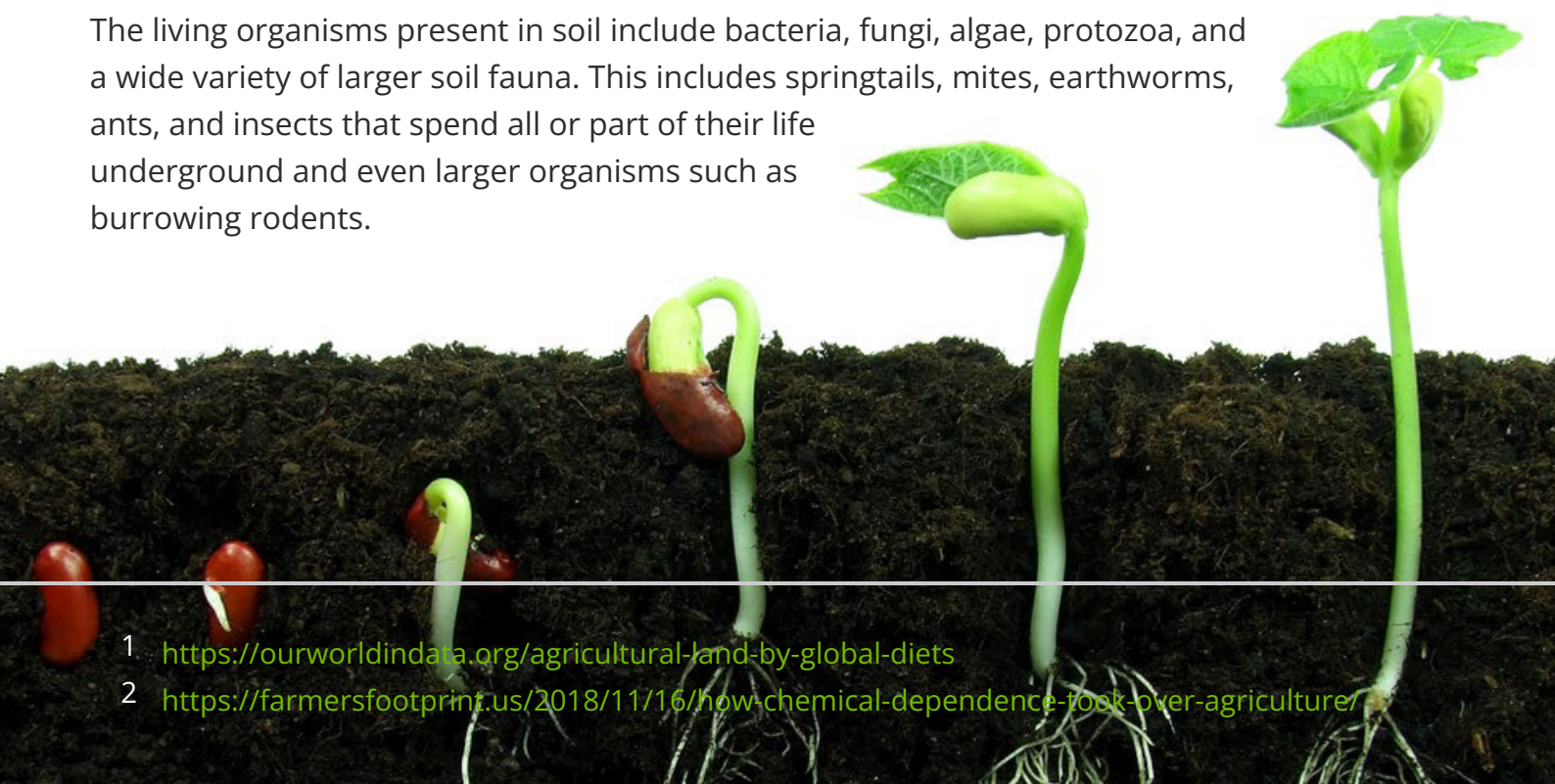
It is photosynthesis that allows plants to create the nutrients that animate the animal kingdom. Vegetables are autotrophic. The vegetable kingdom is the source of all animal life on planet earth. It is vegetation that can combine the features of water, air, sunlight, and soil to create the essential for all other life forms.

Our bond with the soil is the foundation of food quality. Soil is often forgotten in our race to increase productivity. This drive for increased land is not to feed humans, it is to feed to cattle, chickens, pigs, farmed fish, and other animals.¹

We are sucking the life out of the soil not to meet our own needs, but to fatten up animals to eat for our pleasure. In doing this we waste the energy of the soil and create dirt.

Dead soil is dirt. Dirt is not the life source of a living planet. We cannot base our future on dead soil that we artificially enhance with petrochemicals.² When we don't take care of the soil, it doesn't take care of us.

The living organisms present in soil include bacteria, fungi, algae, protozoa, and a wide variety of larger soil fauna. This includes springtails, mites, earthworms, ants, and insects that spend all or part of their life underground and even larger organisms such as burrowing rodents.



¹ <https://ourworldindata.org/agricultural-land-by-global-diets>

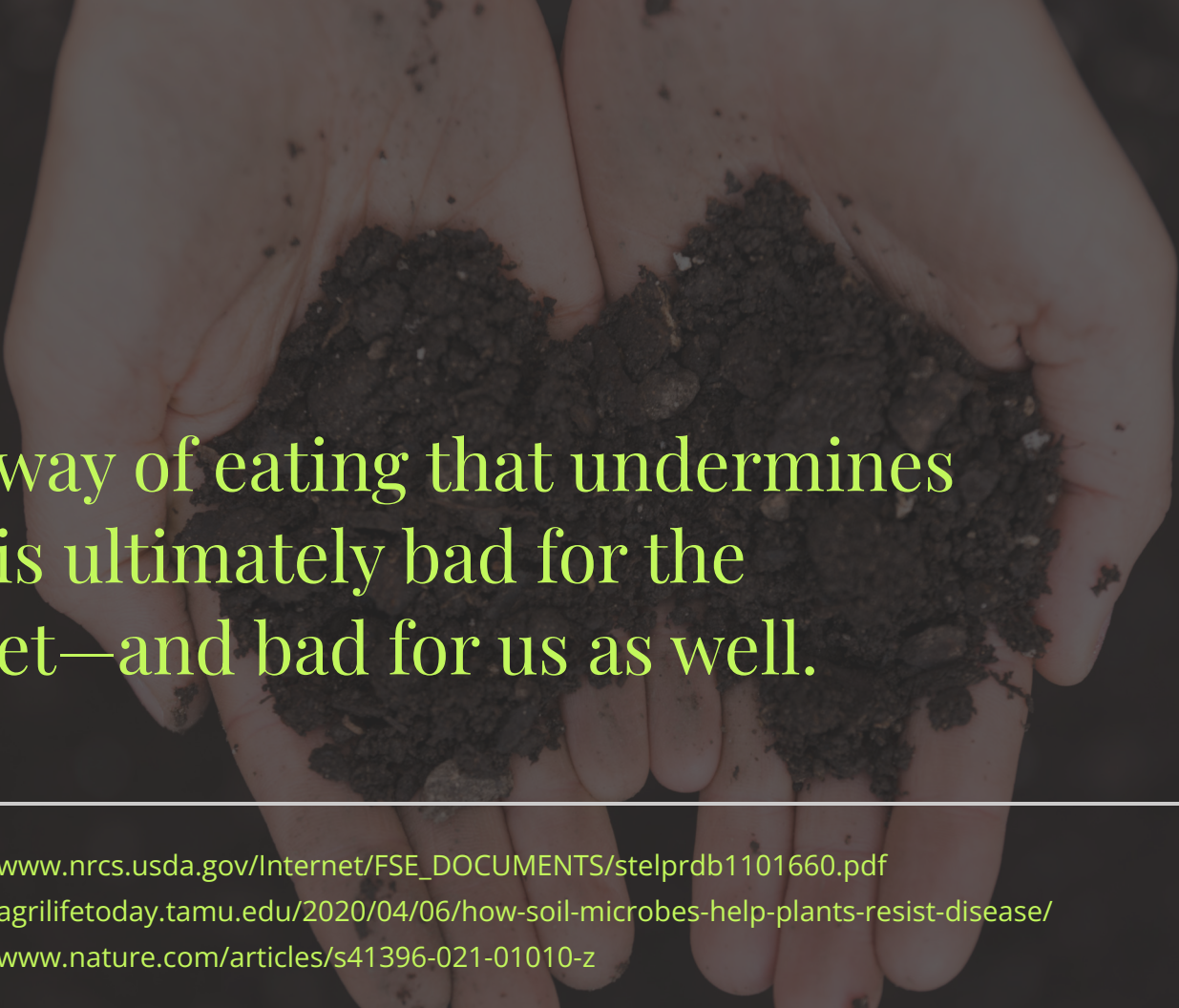
² <https://farmersfootprint.us/2018/11/16/how-chemical-dependence-took-over-agriculture/>

A teaspoon of living topsoil can contain more microorganisms than there are humans on the planet.³ Healthy soil serves as a digestive system for the environment by breaking down organic material into a form that can be absorbed by root systems.

This helps plants to maintain health. Soil microbes not only digest nutrients, but they also protect plants against pathogens and other threats.⁴ Microbes develop a symbiotic relationship with plants.

Within the soil, root systems of plants develop intricate relationships with fungi. The fungi function as a communication system. It can even alert plants about the presence of harmful insects or pathogens.⁵ Utilizing these relationships increases plant health. Soil is a living community.

The terrestrial food chain begins with the soil. More creatures live within the soil than in any other environment on the planet. It is the single most diverse ecosystem. All this life is essential for creating the texture, water retention, availability of nutrients, and general fertility of healthy soil. Healthy plants with high nutrient density are dependent on healthy soil.



Any way of eating that undermines this is ultimately bad for the planet—and bad for us as well.

³ https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1101660.pdf

⁴ <https://agrifetoday.tamu.edu/2020/04/06/how-soil-microbes-help-plants-resist-disease/>

⁵ <https://www.nature.com/articles/s41396-021-01010-z>

The Chemical Earth

Naturally occurring nitrogen is an essential product of healthy soil and farming practices.⁶ It is required for production of amino acids, proteins and is vital for the creation of proteins and photosynthesis. One of the hallmarks of modern agriculture is to apply this chemical to increase crop production.

It is estimated that global nitrogen fertilizer use will increase threefold by 2050 to meet the growing drive for production.⁷ The problem is that use of chemical fertilizers is often accompanied by inefficiencies that result in pollution and soil degradation.⁸

The type and quantity of fertilizer affects physical, chemical, and biochemical properties of soil as well as organisms that live in and produce healthy soil. Nitrogen is the most common inorganic fertilizer.

The problem is that it is washed away through erosion because of intensive farming. It ends up in rivers, streams, and lakes, contaminating them with farm fertilizers and pesticides.⁹

The natural life of the soil is killed by the chemical application of fertilizer, herbicides, and insecticides.¹⁰ This same template has been used all around the world with the same drastic results: **Dead soil and dead water.**

⁶ <https://www.cropnutrition.com/nutrient-management/nitrogen>

⁷ <https://www.nature.com/articles/ncomms4858>

⁸ <https://www.environment.co.za/environmental-issues/how-do-fertilizers-affect-the-environment.html>


⁹ <https://www.fao.org/3/i7754e/i7754e.pdf>

¹⁰ <https://www.scientificamerican.com/article/pesticides-are-killing-the-worlds-soils/>

This trend for chemical solutions for agriculture shot forward when industrial processes were developed for making nitrogen to be used in weapons during World War two.¹¹ Following the war these processes were used to produce cheaper and more available nitrogen fertilizers. The weapons of war were now focused on the soil, artificially promoting faster growth.

The **Green Revolution of the 1960's** introduced new, aggressive approaches to farming, increasing use of chemicals, creation of large land holdings, and hybrid and genetically modified crops to gain higher yields.¹² The short-term benefits soon exposed some serious errors.

The primary benefits of the movement were to the chemical industry.¹³ These moves were expensive and drove many small farmers out of business. It often seems that one of the goals of big agriculture is to eliminate natural soil and generate food from chemical growth mediums. The greatest tragedy was the loss of healthy soil. Generating three centimetres of topsoil takes 1,000 years. But we are losing over 36 billion tons of soil each year.¹⁴



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¹¹ <https://www.chemistryworld.com/features/chemists-at-war/7568.article>

¹² <https://ourworldindata.org/yields-vs-land-use-how-has-the-world-produced-enough-food-for-a-growing-population>

¹³ <https://www.globaljustice.org.uk/news/the-cost-of-indias-green-revolution/>

¹⁴ <https://www.scientificamerican.com/article/only-60-years-of-farming-left-if-soil-degradation-continues/>



Learning from the Past

It is often useful to go back in time to avoid future mistakes.

No one knows for certain when humans started their development of agriculture. The usual date is set around 10,000 BC but recent discoveries on the banks of the Sea of Galilee are pushing that date back another 10,000 years.¹⁵ The researchers found agricultural tools and evidence of domesticated plant types.

Similar early planting evidence exists along river-banks in several parts of the **Fertile Crescent** and Africa.

More organized agriculture appeared independently in **Mesopotamia, China, South America, Central America,** and **Eastern North America**.¹⁶ There is some evidence that it may have also been present in New Guinea and **sub-Saharan Africa**.

The great agricultural societies were challenged with creating a new relationship with the environment.

The resources of water and soil required more focused attention and stewardship. For agriculture to succeed, we needed to create a different bond with nature. That bond has often been broken and continues to be damaged because of our poor understanding of the soil biome and the environment. As food supplies became more abundant, human populations grew.

¹⁵ <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0131422>

¹⁶ <https://www.nationalgeographic.org/article/development-agriculture/>

Agriculturists Overpopulated¹⁷

There came an unintended problem with the more settled way of living—due to permanent or semi-permanent structures, and the increased use of small numbers of animals in proximity. More children were needed to till the fields. More land is then needed to be cleared for additional mouths to feed.

To give an idea as to the urgency of our need to rethink the way we grow food— consider this: It has been estimated that in the next 40 years we will have to produce the same amount of food as the past 8,000 years.¹⁸

Many of the challenges presented by the **Neolithic Revolution** are still unresolved and are even more urgent today with increased populations.

Healthy soil can produce centuries of life-giving food, including all the fruits and vegetables and the grains and beans we need for a healthy life.



Productive soil can feed a whole community.
When this is neglected, tragedy happens.
Major civilizations have neglected this fact to their peril.

¹⁷ <https://www.nature.com/articles/16339>

¹⁸ <https://www.nationalgeographic.com/foodfeatures/feeding-9-billion/>

Empires have fallen because of damage to the soil.

Civilizations that collapsed due in great part to **destructive soil practices include** the:

- Anasazi and Cahokia within the boundaries of the modern U.S.,
- Mycenae and Minoan Crete in Europe,
- Great Zimbabwe in Africa,
- Angkor Wat and the Harappan Indus Valley cities in Asia,
- and Easter Island in the Pacific Ocean.¹⁹

This can happen today. These cultures failed because they ruined the source of their food. It is easy to view these disasters as ancient failings but examples from this past century can be found.

Between 1936 and 1940, over 3.5 million people migrated out of the American plains, moving primarily to California. It was the largest human migration in the history of the Americas. Millions of people were left homeless and destitute. The cause of this tragedy was bad farming. The farmers on the Great Plains did not understand the ecology of the soil.

Ploughing deeper using the new technology of mechanized plows, eliminating natural grasses that held moisture, and burning off the fields, farmers managed to kill the soil biome and create loose and fragile soil.²⁰ Following a drought and high winds, the soil became dust. This dust rose in huge clouds, moving millions of tons of topsoil. Storms blew powdery sand from Kansas to as far north as Boston and New York.

The resulting destruction of small farms meant that large corporations moved in and took over. They used artificial pesticides, fertilizers, and water from deep aquifers, establishing the pattern for the mechanized high-tech operations we see today. The agribusiness replacement is even more destructive than the previous model. There was a focus on increased yield with increased planting of single crops and chemical fertilizers and herbicides.

The world grows **95%** of its food in the uppermost layer of soil, making topsoil one of the most important components of our food system.

But thanks to conventional farming practices, nearly half of the most productive soil in the world has disappeared in the last **150 years.**²¹

¹⁹ <https://www.history.com/news/6-civilizations-that-mysteriously-collapsed>

²⁰ <https://www.aaas.org/dust-bowl-wake-call-environmental-practices>

²¹ <https://www.anthropocenemagazine.org/2020/09/global-soils-are-in-decline-but-simple-conservation-measures-could-preserve-them-for-thousands-of-years/>



Britain has already lost 85 per cent of its fertile topsoil since 1850.²²

Government subsidies of poor farming practices, excessive production and support for nutritional non-essentials such as dairy, sugars and meat have a central role in the support of big agriculture and the steady decrease in healthy soil.

There are effective and practical ideas for reversing this situation.

They are not new ideas, but they do involve learning from the past. Organic agriculture can reverse many of the problems of the excessive use of chemicals in farming. Organic farming encourages the use of natural, organic compounds to fertilize soil, maximizing the content of microorganisms that enliven the soil biome. The direct benefits of organically grown food on human health are important, but the long-term environmental benefits may be even greater.

These benefits challenge many modern concepts including the view held by many, that animals are essential in agriculture. Some supporters of soil regeneration consider this, using manure from cattle is simply pushing vegetation through the digestive system of an animal. This process is exactly what happens in healthy soil. If you leave vegetation on the ground the earthworms, termites and other organisms break them down and return the nutrients for recycling without the animal.²³

²² <https://www.bbc.co.uk/news/science-environment-47203344>

²³ <https://www.theguardian.com/lifeandstyle/2019/jan/12/were-humus-sapiens-the-farmerswho-shun-animal-manure>

The Organic Revolution

In 1937 American President **Franklin D. Roosevelt (FDR)** said in response to the tragedy of the **Dust Bowl**, *"The Nation that destroys its soil destroys itself."*

Modern agriculture seems focused on killing off the environment and then building a man-made replacement. This is obvious in the myopic focus on chemical fertilization, pest control and the stubborn refusal to abandon animal agriculture.²⁴

Some of the ideas that drive the modern organic agriculture movement in the modern era come from the work of **F. H. King**. King was an agricultural scientist. His masterwork, **Farmers of Forty Centuries** was published in 1911 and was based on his studies and experience of farming in China, Korea and Japan.

King recorded how farmers in the far east were able to benefit from crop production off the same land for thousands of years using efficient irrigation, crop rotation, and human waste management. His work was a guide for many farmers in the organic food movement of the 1960's and continues today as a valuable resource for building healthy soil.

Animals were brought into service to pull ploughs and to provide additional food sources. Animal diseases such as measles and smallpox, were easily transferred to the human population.²⁵



*The Nation that destroys
its soil destroys itself.*



²⁴ <https://www.resilience.org/stories/2012-03-23/farmers-forty-centuries-organic-farmingchina-korea-and-japan/>

²⁵ https://sphweb.bumc.bu.edu/otlt/mph-modules/ph/ph709_transmission/ph709_transmission6.html

Cover crops, crop rotation, and the avoidance of chemicals promote living soil. It is not unlike creating a healthy gut biome. Organic farming not only saves the soil but enriches it. It increases productivity and produces healthier crops.

A study on the nutritional value of organically grown food was carried out at Newcastle University in the UK. The study showed significant, meaningful differences, with the range of antioxidants being substantially higher—in some cases as high as 69 percent in organic food.²⁶

The study, based on an analysis of 343 peer-reviewed studies from around the world, was published by the British Journal of Nutrition. It examined differences between organic and conventional fruits, vegetables, and cereals.

The higher antioxidant levels are important. Plants produce many of their antioxidant compounds to fight pest attacks. Antioxidants strengthen plant immune functions. Higher levels of antioxidants in organic crops may result from their lack of artificial, chemical protection, in the same way that children living on farms exhibit fewer allergies, or that the overuse of antibiotics undermines natural resistance. The movement toward organic growing is wise for individuals, society, and the planet.

Many of us have the luxury of available food with a broad range of choice. The goods and services we choose to support have a direct influence on the world. Choosing to support local and regional organic farmers is not only a wise choice in terms of eating fresh and healthy food but it is supporting the creation of healthy soil.

Small farmers produce about 30% of the food used around the world.²⁷ All small farmers need support and are the most likely to pursue plans to improve soil quality and benefit from the production of organic produce.

Any discussion of soil must also address the issue of how much land is needed to feed the world. At present, over 9 billion acres of land are used to feed us, if a vegan diet were adopted, we would only need 2 billion acres.²⁸

The move to organic promotes biodiversity,
a reduction of chemical pollution and creates jobs.

We can all be part of the solution.

Whenever possible, support organic growers, especially local sources. Use your power as a consumer to make a difference.

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26 <https://research.ncl.ac.uk/nefg/QOF/crops/documents/Organic%20vs%20non%20organic.pdf>

27 <https://www.sciencedirect.com/science/article/pii/S2211912417301293>

28 <https://earth.org/veganism-land-use/>

Possible Discussion Topics

- 1. How did agriculture effect human social evolution?**
- 2. What are the main problems with modern agriculture?**
- 3. Why are people resistant to buying organic food?**
- 4. Is your experience of using organically grown food that it is more expensive?**
- 5. Would switching to a vegan diet really affect climate change?**
- 6. How can we contribute most to promoting organic living?**
- 7. Is it possible to share information about healthy living without offending other people's choices?**

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Registered Charity Number 1201615 (UK)

Email: billandmarlene@humanecologyproject.com

www.humanecologyproject.com