GREENHOUSE GALLERY

July 1st – August 19th

eARTh

CELEBRATING SOIL & THE ROLE OF POLLIINATORS

Living Soils: A Call To Action

By increasing the quantity of carbon contained in soils by 0.4% a year, we can halt the annual increase in CO_2 in the atmosphere, which is the major contributor to the greenhouse effect and climate change.

Albrecht Durer – 1503
The Great Piece of Turf

History reveals that civilizations rise and fall on how well they treat their soils. The earth's topsoil provides us with 95% of our food, animal feed, fuel and fibres for clothing.

Soil regulates flooding, provides a home for a quarter of all known species and contains more carbon than the Earth's atmosphere and vegetation combined.

Less than one sixth of the land on Earth is suitable for growing crops. Yet one third of the world's arable soils are now 'degraded' and three quarters of that third is now 'severely degraded'.

It can take a thousand years for just one centimetre of topsoil to accumulate. Today, agricultural erosion is depleting soil faster than it can be replenished. Roughly one third of our arable land has been lost since 1960 as a result of soil degradation.

COVER THE EARTH - GROW GREEN MANURE

Green manures are crops that are grown to improve soil fertility. Some are legumes, such as clover, which fix nitrogen from the air using Rhizobia (beneficial bacterial which live in nodules on plant roots). Once incorporated into the soil, the nitrogen becomes available to the next crop.

Deep rooted green manure crops open up the soil as they grow, improving water penetration. Adding them to soil increases levels of organic matter and improves water absorption. Green manures and cover crops can also out-compete and suppress weeds (reducing the need for pesticides and other chemicals).

Below ground, the deeper roots of perennial plants stabilise and anchor the soil. They bring up nutrients from deep in the soil profile and relocate them to the surface, where they become available to annual crops. This also reduces nutrient loss from leaching into groundwater and streams.

Soil organisms also benefit from the use of crop barriers, inter-cropping and crop rotation which are all natural (non-chemical) methods of pest control.

International Decade of Soils 2015-2024

eARTh - 0.4%

CARBON SEQUESTRATION IN SOILS FOR SECURITY AND THE CLIMATE

The quantity of carbon contained in the atmosphere is currently increasing by 4.3 billion tons every year. The world's soils contain 1500 billion tons of carbon in the form of organic matter. If we increase the quantity of carbon contained in soils by 0.4% annually, we can halt the current rise in CO_2, the major contributor to the greenhouse effect. The more fertile the soil, the more it can cope with drought and flooding and the effects of climate change. The more the soil is covered with plant life, the richer it will be in organic material, and therefore in carbon. This exhibition is part of an ongoing series of shows and events inspired by the Soil Association's campaign to increase the organic matter in our soils (an important measure of soil health) by 20% over the next 20 years.

eARTh : AGRO-ECOLOGY

is a system of agriculture and land management that looks to natural ecosystems to inform agricultural practice by feeding the soil, which in turn feeds the plants and addresses the damage done by agribusiness and intensive farming.

Carbon farming is a term used to describe a suite of agricultural practices that sequester (capture and store) carbon in the soil and in above-ground perennial biomass. If widely implemented, these practices have the capacity to sequester hundreds of billions of metric tons of carbon from the atmosphere in the coming decades. In the UK, and particularly here in East Anglia, we have precious peaty soils with a high carbon content that act as crucial carbon stores and sinks when managed sustainably.

Greenhouse gas emissions to date have already committed us to a changed climate. However, if we combine carbon farming with a massive global reduction in fossil fuel emissions, we may still be able to step back from the brink of disaster. Unlike high-tech geo-engineering strategies, these practices also feed people, create more fertile soils and contribute to wider ecosystem health.

Our demand for ever cheaper food is increasing soil degradation. Food producers have become reliant on artificial fertilizers, herbicides and pesticides. These are undermining our health and damaging the vital ecosystems on which life depends. Whether we are motivated by personal health concerns, or the wider state of the environment, we need to protect and recreate healthy soils.

Between 1940 and 1991, levels of essential minerals in UK fruits and vegetables fell by up to 76%. Governments and policy makers are not doing enough to reverse our modern, unhealthy, de-natured diet and lifestyle choices.

SUPPORT soil-friendly organic farming with your shopping choices. Your money will then support farmers and growers who do not use pesticides and who put soil health and care for the environment at the core of their business.

RECONSIDER how we value and manage our soils as part of our path to a healthier future. Whether we have a window-box, a garden, an allotment, a smallholding or a farm, we can all protect the soils that we rely on.

LOOK AFTER the soil in your garden and community spaces. The most environmentally-friendly and soil- friendly way to feed yourself is to grow your own food in an allotment or garden, recycling as much nutrient and water as possible.

RAISE AWARENESS and discuss the issue of soil degradation with friends and family. It is a sobering thought, but many local allotments have better soil quality than Norfolk's agricultural farmland. Whether or not we manage soils personally,

their quality affects us all, and everyone has a role to play. Industrial farming practices destroy the complex food webs that naturally exist in soils. We need to manage soils with their natural biology in mind. The biodiversity of the soil is as important at that above ground and it's benefits are severely understudied. However, we are beginning to grasp its potential benefits. Recently, new forms of antibiotics and anti-depressants have been discovered in soil.

SUPPORT the call to invest in research into understanding soil organisms, their role in food production, how they are affected by industrial farming and how we can protect them. Productivity and sustainability studies should include non-commodity benefits, such as evaluating the carbon stored in peat soils and their ability to soak up excess rainwater. In the UK, and particularly here in East Anglia, we have precious peaty soils with a high carbon content. These are crucial carbon sinks when managed sustainably.

THE TIME TO ACT IS NOW!

In September 2016, a UK parliamentary committee scrutinised soil quality and agricultural strategy. The evidence presented revealed that:

- *30% of climate emissions will be due to farming by 2050*
- *40% of food production will be lost without pollinators*
- *95% of neonicotinoid pesticides end up in the soil but there has been no research into their impact on the soil, or on ourselves. They have been shown to harm bees and other pollinators.*

Soils control pollution.

Soils rich in microorganisms can interact with and break down harmful chemicals, reducing levels of contamination and thereby reducing pollution.

Soils regulate climate change.

Already acting as a reservoir for more carbon than the atmosphere and vegetation combined, many soils have the potential to store even more carbon, which could significantly help fight climate change. Carbon is added to soil as organic matter, either naturally from plants or applied directly as organic fertilizers, such as farmyard manure or green waste composts.

The variety of life in our soils is amazing

Just one teaspoon of soil contains around 10,000 different species and more organisms than there are people on the planet. This variety is essential to life on Earth and to human prosperity. Plants are essential for capturing energy from the sun but it is soil organisms which break down plant litter, releasing nutrients for root uptake and transfer back to plants. Life in soil is an essential part of the web of life.

SOIL DEGRADATION

is caused by inappropriate or ill-timed agricultural, industrial or urban practices. These produce erosion, loss of organic matter, decreased fertility, damaged soil structure, salinization, pH changes, toxicity, flooding and drought.

We are now discovering how these problems affect both the organisms which live in the soil and the vital ecological processes they perform. Organisms in the soil need to flourish for it to be healthy. Industrial agricultural practices, such as continuous cultivation, mono-cultures, hedge removal, reliance on inorganic fertilizers, over-grazing and repeated use of heavy machinery, have resulted in land degradation, reduced plant and animal species diversity, increased susceptibility to disease and lost livelihoods. They have also dramatically reduced the nutrient content of food.

Failure to return organic matter to the soil depletes its quality, reduces its water-holding capacity and damages its structure. Intensive livestock farming often results in over-grazing, removing the protective layer of vegetation from soil and increasing its compaction. Repeated use of inorganic fertilisers makes soils more acidic.

Salinization caused by climate change is a new threat to soil in the UK. All soils contain salts but salinization represents a significant increase, usually due to human activity. More common in arid and semi-arid regions, it can result from mismanaged irrigation systems or from the use of salty water.

Although deforestation may not seem relevant to the UK, the demand for livestock feed, particularly soya and maize grown in countries like Argentina and Brazil, is causing deforestation and so increasing climate change.

THE PRESSURE ON SOIL: WORLDWIDE

is great and this can only increase as the Earth's population is uprooted by famine, flood and wars fought for scarce food and resources. The UK also contributes to soil damage overseas by virtue of its farming and consumption practices, importing both animal feed and some of our food.

When soil degradation is severe, food yields are often drastically reduced. Bare or damaged soils are more at risk of erosion and the soil that is washed away clogs up rivers and lakes, increasing the risk of floods. Unhealthy soils also store less carbon.

In our towns and cities, we have concreted over large areas of land. ‘Sealing’ soil in this way reduces its quality and that of our air and living environment.

SOIL LIFE AND BIODIVERSITY OF ORGANIC MATTER

The physical and chemical effects of industrial farming are now well known. However, the latest area of concern is its adverse effect on soil biodiversity. Biological soil degradation can be defined as a decline in the amount and diversity of organisms and organic matter in the soil. Agricultural intensification reduces the abundance of soil organisms and changes the way that soil ecosystems function. The reasons for this include:

- *Reliance on inorganic fertilizers, which reduces levels of organic matter and habitat quality for soil organisms.*
- *Repeated cultivations, which physically disrupt soil organism habitats.*
- *Increased monoculture use, which fails to provide the diverse conditions needed for soil organisms to thrive.*
- *Pesticide use, which kills not only the intended target but also beneficial organisms.*

Several pesticides are known to persist in soils long after cropping. For example, the three neonicotinoids currently under an EU moratorium, which are known to affect bees and other pollinators (clothianidin, imidacloprid and thiamethoxam) also reduce soil biodiversity and produce poorer soils.

Non-organic farms in the UK use around 31,000 tonnes of chemicals every year to kill weeds and insects and control disease. In contrast, organic farming methods actively maintain soil health and nutrients. Previous UK Governments have said that organic farming is better for wildlife, causes less pollution from spraying and produces less CO_2 and fewer dangerous wastes.

Intensive land use adversely affects soil organism ecosystems. The more inorganic fertilizer applied, the more dependent on it the soil becomes. Reducing the number of organisms in soils also reduces its natural ability to provide nitrogen to crops.

SAVE OUR SOILS – IMPERATIVE FOR AGRICULTURE

To save our soils, we need to combat physical, chemical and biological degradation. We need to improve soil processes, nutrient sourcing and water management and protect soil biodiversity.

Water scarcity is one of the main limitations to crop growth. UK climate change projections indicate longer periods of scarcity so it is vital that we improve the soil's capacity to absorb and retain water. This can be done by increasing levels of organic matter and is the reason that organic farming improves drought tolerance in soils.

Agro-ecology feeds the soil, so that the soil can feed the plant. A 20% increase in organic matter soil content is thought to be achievable within 20 years. Our national and regional ambition should be to make farmed soils as healthy as allotment soils. Improvements in farm, park, garden and allotment soils can be used to promote, educate and celebrate organic food production and the global benefits of agro-ecology.

eARTh

Turning images and books into organic matter !

DONATE BOOKS OR PICTURES

Help raise funds for eARTh

and the Greenhouse Trust's Climate Change Challenge

"The health of soil, plant, animal and man is one and indivisible"

Lady Eve Balfour, Soil Association founder

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