



Soil preservation and food production

FutEUre Food

Introduction

The most widely recognized function of soil is its support for food production. It is the foundation for agriculture and the medium in which nearly all food-producing plants grow. In fact, it is estimated that 95% of our food is directly or indirectly produced on our soils. Healthy soils supply the essential nutrients, water and oxygen. Soils also serve as a buffer to protect delicate plant roots from drastic fluctuations in temperature (FAO, 2020).

Soil health has been defined as the capacity of soil to function as a living system. Healthy soils maintain a diverse community of soil organisms. A healthy soil also contributes to mitigating climate change by maintaining or increasing its carbon content. (FAO, 2020).

FutEUre food

FutEUre food is a project for pupils from five secondary schools in five different European countries. The project will enable five exchange Science weeks. Each exchange involves 24 pupils from the host school and a total of 24 pupils from three of the other participating schools.

Science week in Bedekovčina

In May 2023, Science week took place at Bedekovčina school in Bedekovčina. A group of 50 pupils from Spain, Netherlands, Czech and Croatia worked together on researching different aspects of soil preservation for future generations and corelated problems in food production on the topic "Soil preservation and food production". Each team of

six pupils worked on its own topic and as a result they made a poster, write an article, and presented its pitch to younger students.

In short

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Soil- an oasis of life

Introduction

Soil is a complex ecosystem that is home to a wide variety of organisms. From bacteria and fungi to insects and earthworms. These organisms play a vital role in maintaining soil health and fertility, as well as supporting plant growth and food production.

Since the rise of agriculture and forestry, there has also arisen by necessity a practical awareness of soils and their management. The study of soil as a separate scientific discipline began about the same time with systematic investigations of substances that enhance plant growth.

This covers the structure, composition, and classification of soils and how these factors affect soil's role in the global ecosystem. In addition, the two most important phenomena that degrade soils, erosion and pollution, are discussed.

Organisms

Bacterias are some of the most abundant organisms in the soil. They are responsible for breaking down organic matter, such as dead plants and animals, into nutrients that can be used by other organisms. Some bacteria also form symbiotic relationships with plants, helping them to fix nitrogen from the air and convert it into a form that the plants can use. On the other hand, they can also cause plant diseases. Some bacterias produce toxins that can reduce soil fertility.

Fungi are another important group of soil organisms. They form mycorrhizal associations with plant roots, helping them to absorb nutrients from the soil. Fungi also break down organic matter and help to build soil structure by producing a network of thread-like structures called hyphae. But they can also produce toxins which can harm soil organisms.

Insects and other arthropods are also common in the soil. They play a variety of roles,

from breaking down organic matter to controlling pest populations. Earthworms are particularly important soil organisms because they help to improve soil structure by burrowing through the soil and creating channels for air and water to flow. But their main source of food are plant roots which can reduce crop yields and damage soil structure.

In short

In conclusion, soil is a complex ecosystem that is home to a wide variety of organisms. These organisms play a vital role in maintaining soil health and fertility, as well as supporting plant growth and food production. It is important to protect soil health in order to maintain healthy ecosystems and ensure food security for future generations.

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Types of soil in agriculture

Introduction

Soil is a crucial component for agriculture. It can be classified based on their physical and chemical properties which respond to their productive capacity and suitability for different types of crops. There are three main types of soil: clay, sand, and loam.

Sandy soil: Sandy soil has large particles and low organic matter content. It is easy to work with and warms up quickly in the spring, but it can be difficult to retain moisture.

Clay soil: Clay soil has small particles and is high in nutrients, but it can be difficult to work with due to its high density and poor drainage.

Loamy soil: Loamy soil is a combination of sand, silt, and clay particles, and has good drainage and water-holding capacity. It is often considered the ideal soil type for agriculture.

Peaty soil: Peaty soil is high in organic matter and nutrients, but it can be acidic and difficult to work with due to its spongy texture.

Chalky soil: Chalky soil is high in calcium carbonate and can be alkaline and poor in nutrients. It can be difficult to grow certain crops in this type of soil.

Saline soil: Saline soil has high salt content, which can be harmful to many plant species. It requires special management practices to grow crops.

Silty soil: Silty soil has small particles and is easy to work with. It is often fertile but can be prone to erosion if not managed properly.

Reasons why types of soil are important

Different plants thrive in different types of soil. Understanding the type of

soil can help in determining which plants will grow best in a particular area.

As far as water retention is concerned, soil types differ in their ability to retain water. Knowing the type of soil can help in determining watering schedules and irrigation needs.

In short

The types of soil are important in agriculture because they influence the growth and yield of crops. Different soil types have varying levels of nutrients, water retention, and porosity. Understanding the characteristics of soil types can help farmers optimize their resources and plan for sustainable crop production.

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for cleaner water and air, all without toxic pesticide residues. The role of the farmer is to grow as healthy food as possible in a way that does not use pesticides and chemicals for growing plant crops.

Climatic phenomena, seasonal changes, erosion, degradation but also people, can effect soil health. The most common soil pollutants are hydrocarbons, solvents, polyaromatic hydrocarbons, pesticides, lead, cadmium, mercury and other heavy metals.

Healthy ecosystem - Organic agriculture

Introduction

A healthy ecosystem is one of the most important ways of growing plants so that they can produce as healthy and better yields as possible without poisoning ourselves, the plants and the soil.

Scope

Ecosystem health is a concept that integrates environmental conditions with the impacts of anthropogenic activities in order to give information for a sustainable use and management of natural resources. An ecosystem depends on Biotic factors including plants, animals, and other organisms. Abiotic factors include rocks, temperature, and humidity.

Every factor in an ecosystem depends on every other factor, either directly or indirectly. A change in the temperature of an ecosystem will often affect what

plants will grow there, for instance.

The essential difference between organic and conventional farming is that conventional farming relies on chemical intervention to fight pests and weeds and provide plant nutrition. That means synthetic pesticides, herbicides, and fertilizers. Organic farming relies on natural principles like biodiversity and composting instead to produce healthy, abundant food. Conventional and organic farming methods have different consequences on the environment and people. Conventional agriculture causes increased greenhouse gas emissions, soil erosion, water pollution and threatens human health. Organic farming has a smaller carbon footprint, conserves and builds soil health, replenishes natural ecosystems

In short

In short, less and less people breed domestic animals, and without them, ecological agriculture is impossible. It's easier for people to get pesticides today, and it's much harder to find organic crops

Authors:

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Bees in the ecosystem

Introduction

Bees give us much more than just honey. They ensure that we can enjoy delicious fruits such as cherries, apples, blackberries, raspberries, and mango's. With around 100 types of plants that make up 90% of the world's food production, more than 70 are pollinated by bees.

If bees disappeared off the face of the earth, man would only have four years left to live.

How can pesticides and soil contaminants affect bees?

Pesticides and soil contaminants can negatively affect bees by being toxic to them, impacting their food sources, and harming their habitats.

Why are bees important in food production?

Honey bees are big food makers for the people. The social and hardworking insects produce hive products: honey, pollen, royal jelly, beeswax, propolis and venom. All collected and used by people for various nutritional and medicinal purposes.

What can you do to preserve a healthy ecosystem

To preserve a healthy ecosystem, individuals and communities can take a

number of steps, such as reducing their carbon footprint, conserving water, reducing waste, protecting natural habitats, and supporting sustainable practices. By making conscious choices and taking action, we can work towards ensuring a healthy and sustainable future for ourselves and the planet.

In short

It is important to take care of the bees because they help pollinate the crops of a large amount of food we produce. Without them we could have a serious problem with the lack of food.

Authors:

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Pesticides and pollutants

Introduction

Pesticides and pollutants are two types of chemical substances that can have harmful effects on the environment. Pesticides are chemicals that are sprayed onto plants to kill or control pests, such as insects and rodents. While pesticides can be effective in protecting crops and controlling disease-carrying insects, they can also have negative effects on non-target organisms such as bees, birds, aquatic-life, and human health. Pollutants, on the other hand, are any substances that contaminate the environment and have harmful effects on living organisms. They can include chemicals released from industrial processes, vehicle emissions and even household products. Pollutants can affect air quality, water quality, soil health and human health.

How does it work?

First, we will talk about pesticides. They work through various mechanisms depending on their type and target pest. Some pesticides work by directly contacting the target pest and causing harm upon contact. Other ones are designed to be absorbed by plants or animals and then

transported throughout their tissues. Pesticides can be formulated to be attractive to pests, such as bait or food laced with a toxic substance. Some pesticides target the growth and development of pests by interfering with their hormonal systems or reproductive processes.

Pollutants in soil can enter the environment through various sources, such as industrial activities, improper waste disposal, agricultural practices, and accidental spills. Once released into the soil, pollutants can interact with the soil particles, water, and organisms, leading to a variety of environmental and ecological impacts.

Effects on human health

Pesticides and pollutants can both lead to different health issues. Immediate effects of using pesticides can be nausea, dizziness, and vomiting. Prolonged exposure can lead to respiratory and neurological problems and long-term exposure can increase the risk of cancer, infertility and birth defects. Pollutants can cause respiratory diseases, heart diseases, neurological disorders



and cancer. Respiratory diseases are caused by air pollutants such as ozone or nitrogen oxides. Water pollution can cause gastrointestinal problems and skin problems. Neurological disorders are caused by exposure to lead and mercury. Other chemical pollutants can cause cancer or lead to chronic health problems. People with pre-existing medical conditions, children, pregnant women and the elderly are especially vulnerable to these harmful effects.

In short

Pesticides are chemicals that are sprayed onto plants to kill or control pests, such as insects and rodents.

Pollutants contaminate the environment and have harmful effects on living organisms.

Prolonged exposure can lead to respiratory and neurological problems and long-term exposure can increase the risk of cancer, infertility and birth defects.

Children, pregnant women, people with pre existing health issues and the elderly are at risk to the damage of pesticides and pollutants.

Authors:

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Beneficial and harmful organisms

Introduction

Beneficial organisms provide advantages to their hosts or the ecosystem where they live, increasing crop yields, improving plant health... While on the other side harmful organisms cause damage like economic losses and food insecurity.

What is the role of beneficial organisms in food production?

They help to maintain healthy soil and plant growth. For instance earthworms, mycorrhizal fungi and nitrogen-fixing bacteria. They help break down organic matter, improve soil structure and increase nutrient availability for plants.

How much damage harmful organisms do to agriculture every year?

According to a report by the Food and Agriculture Organization (FAO) of the United Nations, crop pests and diseases are responsible for an estimated 20-40% of global crop

losses, which translates to about \$220 billion in economic losses per year. This figure includes both pre- and post-harvest losses, as well as losses from livestock diseases.

What is the benefit of bees, ladybugs and other insects in food production?

They all play a crucial role in food production by helping pollination and pest control.

Bees for example pollinate plants: transfer pollen from the male part of the flower to the female one. Some crops like fruits, vegetables and seeds rely on pollination and without bees food production would be more limited.

Ladybugs are natural predators of pests that damage crops and by controlling them, ladybugs help reduce the need of pesticides that can affect negatively on both environment and human health.

Other beneficial insects such as lacewigs, hoverflies and parasitic wasps can maintain a healthy and diverse ecosystem which is essential for sustainable food production.

Do you know any natural enemies of other insects in agriculture?

Natural enemies can kill and reduce the number of other organisms.

Main ones are the parasitoids which live in or on the body of their hosts during a period of time. They insert their eggs into the host's body and the larvae develop on the outside of it and they also divide into different groups depending on what's their function.

In short

Beneficial organisms help improve soil and also they help plant grow. Unlike harmful organisms can damage soil and plants

Authors: Terezie Cerna, Karla Grandavec, Vlada Galic, Rafaella van den Berg, Luka Hudek and Natalia Basterrechea

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In short

biodiversity

Soil biodiversity refers to the wide variety of organisms that live in the soil, including bacteria, fungi, insects, worms, and other animals. These organisms play a crucial role in maintaining soil health and productivity, and in turn, support the growth and survival of plants and other organisms that rely on healthy soil.

Soil biodiversity

Introduction

In this article we will write about the biodiversity of soil and different types of soil [sand, silt and clay]

Soil is the upper layer of earth in which plants grow, a black or dark brown material typically consisting of a mixture of organic remains, clay, and rock particles.

Soil biodiversity reflects the variability among living organisms including a myriad of organism not visible with the naked eye, such as micro-organism (e.g. bacteria, fungi, protozoa and nematodes) and meso-fauna (e.g. earthworms and termites). Plant roots can also be considered as organisms in view of their symbiotic relationships and interaction with other soil components.

micro-organisms

Nature uses microorganisms to carry out fermentation processes, and for thousands of years mankind has used yeasts, molds and bacteria to make food products such as bread, beer, wine, vinegar, yogurt and

soil fertility

Bacteria provide large quantities of nitrogen to plants and nitrogen is often lacking in the soil. Many bacteria secrete enzymes in the soil to make phosphorus more soluble and plant available.

biodiversity

The diversity of organisms living within soils is critical to all earth ecosystems because soil organisms: are essential for the cycling of ecosystem nutrients, are necessary for plant growth and plant nutrition, improve the entry of water into soil and its storage in the soil.

algae

Advantages of using algae:

increasing the harvest and its quality, support of flower and fruit set, better taste, color and extended shelf life, acceleration of ripening by 3-10 days, natural nutrition, healthier and more vital planting.

Authors:

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Soil as a water filter

Introduction

There are various ways to filter water. One method of filtering water which you might not expect is by running dirty water through soil to create clean fresh drinking water. How can soil be used to filter water? What is the effect of agriculture on water, and can mineral rich water help recover soil?

How does soil filtrate water?

Water undergoes various physical, chemical and biological processes when passing through soil. Soil is made of a variety of minerals, organic matter and other particles that can interact with water. Soil can filter out pollutants in water like living organisms, dangerous chemicals and various minerals, leaving only clean water as the final product. The size of the soil particles also plays a role in the way they filter water. Smaller soil particles are better at filtering than big soil particles.

What effect can agriculture have on water quality?

Intensive agriculture and farming can have a strong effect on soil degradation by using for example excessive fertilization which can cause acidification and nitrification of soil. Improper use of pesticides also has a big effect on soil degradation. These supplements can have an effect on the quality of the groundwater. According to a report by the United Nations "Soil degradation is the most important cause of declining water quality, reduced water storage capacity and diminished water productivity, with far-reaching consequences for human health and the environment".

Can medicinal waters heal soil?

Medicinal water is natural water containing a high amount of minerals which can have a healing

effect on soil. However, medicinal water has only been proven to exist on the surface of the earth and not in the mantle. Medicinal water could be used on soil to improve the quality of the soil and reduce the effect of soil erosion by adding various salts and sulfur compounds.

In short

Water undergoes various processes when passing through soil. Which helps it hold onto pollutants and make the water safe for consumption. The effectiveness of the filtering depends on the particle size of the soil. Intensive agriculture and farming have an effect on the degradation of the soil quality. Medicinal water is water containing a lot of minerals and could help to restore natural minerals to soil. There is no proof that medicinal water exists in the mantle of the earth.

Authors: David Dugorepec, Marinela Belacic, Sara Jurman, Rens de Waard, Irene Lana, Poulava Bara



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