Circular Economy Lab & Observatory

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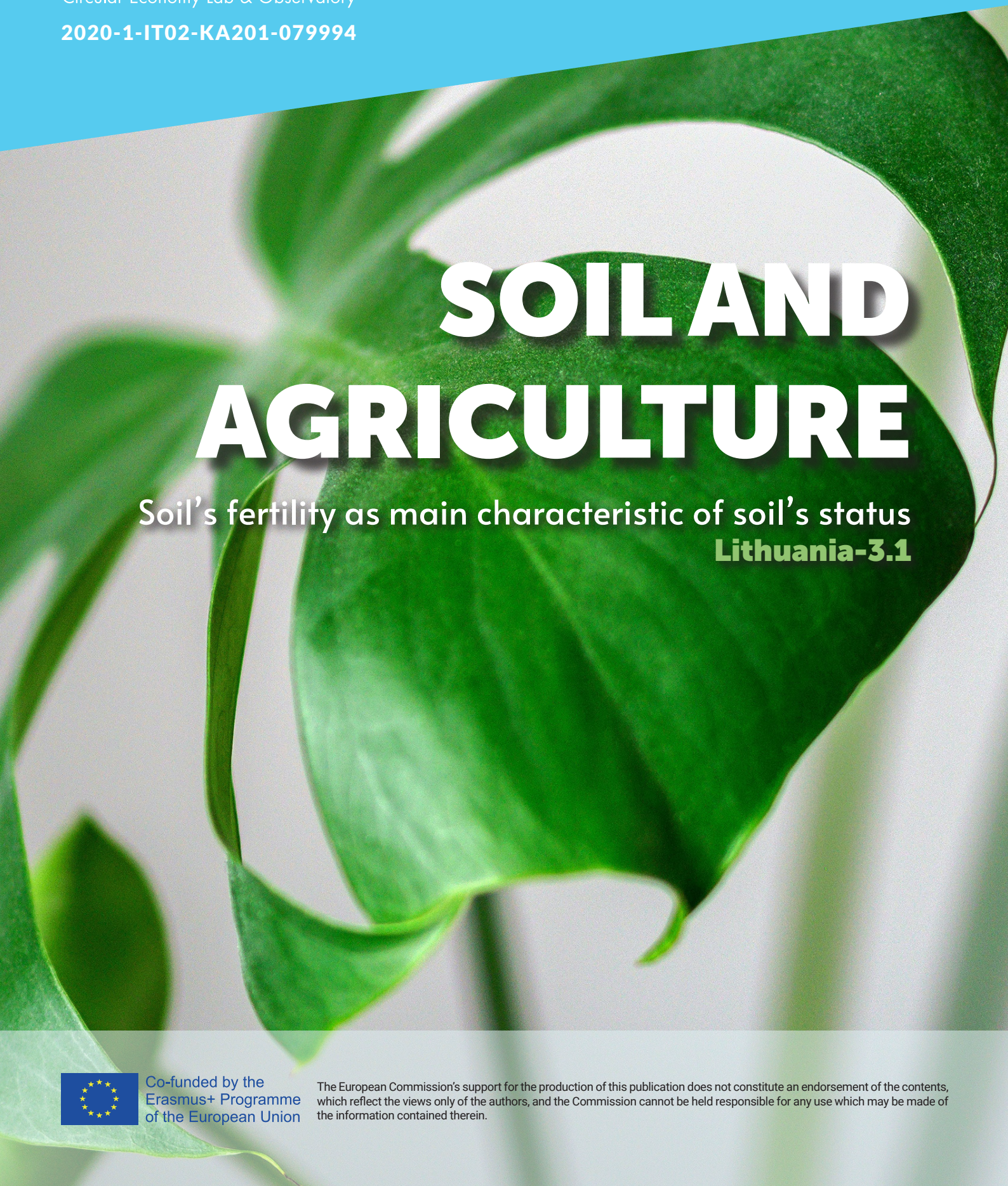

SOIL AND AGRICULTURE

Soil's fertility as main characteristic of soil's status

Lithuania-3.1

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The transition from hunter-gatherer societies to an agrarian lifestyle marked a significant turning point in human history and brought about irreversible changes to natural nutrient cycling in soils. The early utilization of fire for hunting and to clear forested areas played a crucial role in shaping the environment as the first major anthropogenic impact.

The early use of fire as a tool for hunting and clearing land had a significant impact, as it enabled hunting for herbivores grazing on the savanna and in the nearby woodlands while stunting the growth of undesirable plant species, making it easier to forage for edible plants. This, along with population pressures and climate change, helped to pave the way for the Agricultural Revolution, resulting in a substantial shift in the relationship between humans and the planet.

As humans began to plant and cultivate crops, the soil became a vital source of essential nutrients and played a crucial role in the development of human agriculture. Soil fertility is the ability of the soil to provide plants with mineral substances, moisture, provide their roots with enough air and create a favorable environment for growth. Fertility depends on various soil properties: soil-forming rock, grain size, humus content, humidity, human economic activity.

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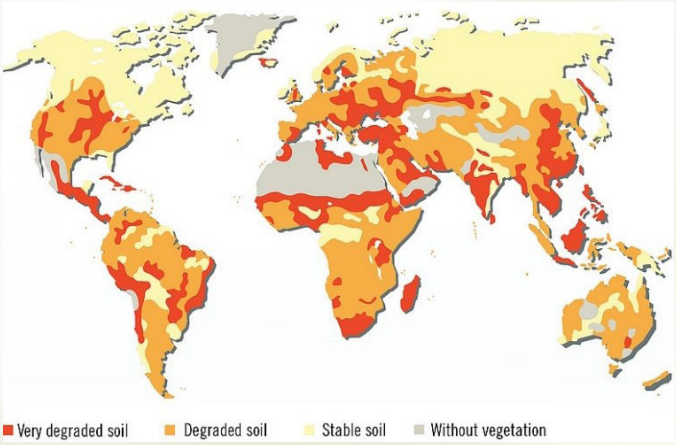
Soil is the upper layer of the Earth's crust, made up of mineral particles, organic matter, air and organisms. It is one of the oldest environmental formations. In addition, soil is one of the main natural resources on which the quality of the environment, food supply, and the country's income depend.

Finally, it is the main production medium in agriculture and forestry. Soil consists of mineral, organic and organic-mineral substances. The source of mineral substances is native rock. Organic matter in soil is of plant and animal origin. Complex organic-mineral compounds are formed due to the mutual interaction of mineral and organic. The mineral part of soils is usually 80-90%, and the organic part is less than 10%.

The organic part of the soil consists of organic remains and humus – dark-colored organic matter that evenly permeates the upper part of the soil horizon. The source of humus is the remains of higher plants, animals and microorganisms.

The depletion of soil fertility has become a significant issue in areas that have been utilized for agricultural production for the past two decades. Agricultural activities that focus mainly on concentration, intensification, and specialization of crop and livestock production have led to considerable degradation and irreversible damage to soil. Soil compaction, water and wind erosion, chemical degradation, and humus loss are just a few of the problems caused by the disregard of natural site-specific soil and climate conditions.

To achieve food security and maintain the sustainability of the environment in farming systems, it is vital to adopt an integrated approach to managing soil fertility that enables optimal crop production without draining the nutrient reserves of soil or degrading its physical and chemical properties.



This strategy will prevent land degradation, such as soil erosion, from occurring. Soil fertility management practices encompass a range of techniques, such as the application of fertilizers, integration of organic inputs, implementation of crop rotation systems that include legumes, use of high-quality germplasm, and adept customization of these methods to suit the specific local conditions.

Soil fertility decline also occurs when the harvested products remove more nutrients from the soil than the amount of nutrients accessible to the soil. In this situation, the nutrient requirements of the crop are met from soil reserves until these reserves cannot meet crop demands.

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Earth's fertility is a non-renewable or finite resource and is the bank of nutrients for plant growth. Most soils in the tropical region including Ethiopia are highly weathered and infertile due to lower organic matter content and open nutrient cycling systems.

These led to soil fertility depletion and crop productivity reduction in the country by different soil degradation agents. For this reason the analysis of depletions in soil fertility as well as the approach of available management options through the lens of crop production in Ethiopia is given below.

The major drivers of soil fertility depletion are population pressure, land use pattern, free grazing of animals, lack of energy sources, land ownership and poor government policy problems. The major causes of soil fertility depletion are inadequate fertilizer use, complete removal of crop residues, continuous cropping systems, climate and soil types, lack of proper cropping systems and soil erosion and continuous cultivation.

The promising technologies for improving soil fertility are integrated nutrient management, crop residue management, green manuring and cropping sequences, management of farmyard manure, applications of chemical fertilizers and soil amendments, agroforestry practices, applying conservation agriculture and application of soil-water conservation practices.

Therefore, it needs a great attention by the community and the government to use innovative soil fertility management options to sustain soil fertility and crop productivity for the coming generations in the country, forever enhancing nutrient input and recycling through following closed nutrient management systems in the cultivated lands. Misuse and abuse of soils happens very often.

It is high time for the planners and policy makers to frame laws to protect arable soils from ruination. Many agricultural lands are brought under urbanization or industrialization.

One can find numbers of brick kilns set up on fertile agricultural lands along highways. As these lands are privately owned, the government has practically no control on their use. Forestlands are also brought under urbanization and industrialization. Only about 17.09% of the total land area is under forest cover now.

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A great alternative to improving the soil is growing perennial grasses. As the area of crops increases and livestock on farms decreases, perennial grasses occupy a smaller and smaller share in the structure of agricultural land. Although perennial grasses increase soil fertility, they account for only 27% of land.

The protective function of perennial grasses in soils eroded by wind and water is especially important. The soil structure and humus content are also influenced by the method of tillage. If deep plowing is abandoned, the physical properties of the soil would change, its structure would improve, and more earthworms would appear in the soil.

Also, one of the ways to restore the structure of the soil in the fields is biological preparations that stimulate and intensify microbiological processes in the soil. Biological preparations not only improve the structure of the soil, but are also beneficial for the plants themselves, as they strengthen their immune system, increase their resistance to diseases and pests, especially when used together with the amino acid complex.

In addition, using biological preparations requires less insecticides for plant care.

The introduction of straw is one of the means to increase the amount of organic minerals in the soil, especially in farms of crop production.

Another source of soil organic matter is catch crops.

In the climatic conditions of some countries, during the long autumn and spring period, when positive air temperatures prevail and the soil is saturated with moisture, favorable conditions are created for nutrients to leach into deeper soil layers or drainage waters.

A catch crop left over the winter reduces nitrogen leaching during the autumn-spring period, when there is a large excess of rainfall. The nitrogen stored in the plant biomass during the winter is broken down by microorganisms and released just when the plants can already use it during intensive development.

The source of organic matter can also be manure, sapropel. Manure is the most important organic fertilizer – 4-10% of manure turns into humus in the soil.

Litter manure is the best, and its value depends not only on the number of materials in the litter, but also on the species, age, and feed composition of the animals.

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Sapropel excavated during the cleaning of water bodies can be used to enrich the organic matter of nearby fields, but it should be checked for heavy metal contamination.

Governments must prioritize and advocate for sustainable agricultural practices, technologies and management to enhance soil fertility and nutrient management. This can involve implementing approaches like Integrated Soil Fertility Management and Sustainable Soil Management.

The International Code of Conduct for the Sustainable Use and Management of Fertilizers advocates for practices that encourage nutrient recycling, agronomic and land management to promote soil health and the appropriate regulation of fertilizer sales, distribution and labeling, where relevant.

It also encourages the development of capacity-building and educational programs for everyone involved in the fertilizer value chain and advanced nations to assist others in developing infrastructure and capacity for managing fertilizers throughout their life cycle.

All things considered; soil fertility is main characteristic of soil's status. Fertility depends on numerous aspects. Adverse effects of plant growth: Primarily, it affects how arable land is. When unsuitable to support plant life, none will flourish when planted on such soil.

No matter the efforts put in, the garden will yield unfavorable results. Increased desertification: Drought and aridity set in when soil fails to support plant life. Consequently, the desertification process is highly amplified, and previously productive areas become arid. Increased flooding: The soil has less ability to hold water.

More flood instances occur as a result because the land is unable to soak and retain water. Based on this, it is clear how soil fertility can be a sensitive issue when it comes to landscaping. Nothing should be left to chance.

A qualified landscaping company with years experience can save you a great deal by helping your soil maintain its fertility through proper management. Because it is composed of a variety of inorganic minerals and the minority organic minerals that are unevenly distributed, it causes the complication of infertility we have raised.

But it is comprehensible that every problem has a solution by which we can reduce it or eliminate it altogether. By understanding the value of soil fertility, we can avoid related problems as much as possible and continue to take care of our health and the health of others.

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The importance of soil fertility for our survival is very high. Living organisms depend on it. Also, without mentioning other slightly smaller complications like soil pollution, erosion and more, we can strongly claim that soil fertility is the reason for the survival.

There are many cases, often forgotten, perceptions that predate present-day concepts that are accepted as essential for sound management of natural resources such as that of sustainability. The great progress in plant nutrition, which has been observed in recent years, is a result of the achievements in, among other things, sciences such as chemistry, chemical technology, physics, biology, physiology of mineral nutrition, and in the use of modern analytical techniques and using precise research equipment.

New, innovative research methods have revolutionized the possibilities of measurement of plant nutrition processes, from which proper conclusions can be drawn, thus eliminating the errors. The development of studies on mineral plant nutrition results, among other things, from the necessity to increase food production whose goal is to feed approximately 9 billion people by the half of this century.

It is an obligation to the society, and it must be met by, among others, farmers, biologists and chemists. One should agree with the opinion of Arnold Fink, an outstanding German agricultural chemist, that "Scientific theories and hypotheses can be used in agriculture as long as they find confirmation when confronted with nature".

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GROUP
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