
Building Bridges to Opportunity in Indian Economy



SOIL - A non-renewable natural resource



Wasting a natural resource is the most common human habit now a days. We waste and contaminate all most all the natural resources – water, forest, fossils, sand, food chain, ecological balance and even soil

By Madhukar Swayambhu

We see it all around, we used to play in it, plants grow in it, it creates dirt, it creates mud it was an integral part of everyday life before urbanization – it's the SOIL. I call it Solid Organic basis of Individual Lifeforms – SOIL.

Ever wondered what is it? Why is it essential? What are the usage? What is the effect of it in life?

Sometimes, certain things are so obvious, that we never even think about it. May be a few decades later, the urban kids will be shown some soil types in a museum – this was what used to be the skin of our earth. The way urbanization is happening, may be

people will forget the concept of soil one day.

But today, we have a need to understand it. Understand it deeply. Since we don't want to get in to such a dark future, where the people wouldn't even be knowing their own soil. But before that we need to know, what it is, why is it important and what can happen with this increasing level of ignorance?

What is it?

So let's understand from the basics. The WiKi definition goes like this; "Soil is the mixture of minerals, organic matter, gases, liquids, and the countless organisms that together support life on earth. Soil is a natural body known as the pedosphere and which performs four important functions: it is a medium for plant growth; it is a means of water storage, supply and purification; it is a modifier of the atmosphere of Earth; it is a habitat for organisms; all of which, in turn, modify the soil.

Soil is considered to be the "skin of the earth" and interfaces with its lithosphere, hydrosphere, atmosphere, and biosphere. Soil consists of a solid phase (minerals and organic matter) as well as a porous phase that holds gases and water. Accordingly, soils are often treated as a three-state system."

Soil is the end product of the influence of the climate, relief (elevation, orientation, and slope of terrain), organisms, and parent materials (original minerals) interacting over time. Soil continually undergoes development by way of numerous physical, chemical and biological processes, which include weathering with associated erosion. So we understand that soil is a resultant of a natural phenomenon of millions of years, in which rocks undergo weathering, get moist, get flattened,

expand, contract, get broken, then various physical, chemical and biological processes take place to give birth to the upper crust or the skin of earth which is known as SOIL.

This epidermis of earth is the basis of life on earth. This is what makes earth unique in the whole solar system. This is what makes the life for all flora & fauna possible on this beautiful planet, in short this is what makes earth into earth.

This is the most valuable natural resource, which is a resultant of the natural activities of millions of years. This has seen, many ice ages, many water ages, many floods, many draughts, many volcanos and many earthquakes and thus it sustains life.

Did you know how much years it take to make the basic soil? 1 centimetre of soil takes a minimum of 178 years of natural phenomenon to get created, and that is why it is a non-renewable natural resource. And to make the same soil fertile to grow plant like the upper crust it takes 2000 year for one centimetre. Refer <https://www.soil-net.com/> for further details.

International Communities on Soil

In United States, United States Department of Agriculture has a special body called Natural Resources Conservation Service for Soils, which defines Soil as “soil – The unconsolidated mineral or organic material on the immediate surface of the Earth that serves as a natural medium for the growth of land plants. OR, The unconsolidated mineral or organic matter on the surface of the Earth that has been subjected to and shows effects of genetic and environmental factors of: climate (including water and temperature effects), and macro- and microorganisms, conditioned by relief, acting on parent material over a period of time. A product-soil differs from the material from which it is derived in many physical, chemical, biological, and morphological properties and characteristics. Refer <http://www.nrcs.usda.gov/>

The subject is of such a high importance that, we have The International Union of Soil Sciences (IUSS) is the global union of soil scientists. The objectives of the IUSS are to promote all branches of soil science, and to support all soil scientists across the world in the pursuit of their activities. <http://www.iuss.org/> is a website especially constructed to provide information for IUSS members and those interested in soil science.

The IUSS website quotes, “In order to increase awareness and understanding of the importance of soil for food security and essential ecosystem functions, we must keep on sending to the public the following messages at the same time: “Soils sustain life” and “Soil resources are finite and thus should be treated as such”. Approach to the young generations would be especially important to continue and strengthen our activities in the future.”

World Soil day celebrates the importance of soil as a critical component of the natural system and as a vital contributor to the human commonwealth through its contribution to food, water and energy security and as a mitigated for biodiversity loss and climate change. It is celebrated particularly by the global community of 60,000 soil scientists charged with responsibility of generating and communicating soil knowledge for the common good. Many events focused on increasing the public awareness of soil and its contribution to humanity and the environment. It is held on December 5th because it corresponds with the official birthday of H.M. King Bhumibol Adulyadej, The King of Thailand, who has officially sanctioned the event.

So by now we know – what soil is all about. We know it takes millions of years to form, we know that its integral part of life on earth, we know it's very important and we know it's precious. But, as we using it wisely? Or are we wasting it?

Common Usage of Soil

The most common and natural use could be for growing crops / plants. Thus, Soil is used in agriculture, where it serves as the anchor and primary nutrient base for plants; however, as demonstrated by hydroponics, it is not essential to plant growth if the soil-contained nutrients can be dissolved in a solution. The types of soil and available moisture determine the species of plants that can be cultivated.

Soil material is also a critical component in the mining,

Construction – Soil serves as a foundation for most construction projects.

Landscape development industries.

The movement of massive volumes of soil can be involved in

- Surface mining,
- Road building and
- Dam construction.

Earth sheltering is the architectural practice of using soil for external thermal mass against building walls.

Many building materials are soil based.

Then we use the same soil for making bricks.

Also for making pots and potteries.

Those were what we humans do with such a precious natural resource. And what does nature do with it?

Soil resources are critical to the environment, as well as to food and fiber production. Soil provides minerals and water to plants. Soil absorbs rainwater and releases it later, thus preventing floods and drought. Soil cleans water as it percolates through it. Soil is the habitat for many organisms: the major part of known and unknown biodiversity is in the soil, in the form of invertebrates (earthworms, woodlice, millipedes, centipedes, snails, slugs, mites, springtails, enchytraeids, nematodes, protists), bacteria, archaea, fungi and algae; and most organisms living above ground have part of them (plants) or spend part of their life cycle (insects) below-ground. Above-ground and below-ground bio diversities are tightly interconnected, making soil protection of paramount importance for any restoration or conservation plan.

The biological component of soil is an extremely important carbon sink since about 57% of the biotic content is carbon. Even on desert crusts, cyanobacteria, lichens and mosses capture and sequester a significant amount of carbon by photosynthesis. Poor farming and grazing methods have degraded soils and released much of this sequestered carbon to the atmosphere. Restoring the world's soils could offset some of the huge increase in greenhouse gases causing global warming, while improving crop yields and reducing water needs.

Did you know that soil is not just important for plants, but it also helps to absorb atmospheric carbon dioxide, manage air pollution, reduce carbon footprints, play a major role in carbon cycle, helps in managing rainfall, rain water harvesting, manage the underground water table and play a major role in water cycle too?

Wastage & Contamination

Wasting a natural resource is the most common human habit now a days. We waste and contaminate all most all the natural resources – water, forest, fossils, sand, food chain, ecological balance and even soil.

A wastage is the action or process of losing or destroying something by using it carelessly or extravagantly or using it in a place where there are other alternatives as well, depending upon the value attached to the raw material or the end product.

For example – some usage of soil is inevitable and some usages are sheer wastage. Like for Agriculture, using soil is inevitable, but is it necessary for making bricks? Is it necessary for making pots & potteries? Is it worth wasting a non-renewable precious resources for ornamental usage? That's not just wastage, that's sheer abusing, that criminal not just for us, but for whole earth and for the future generations too.

Especially, when we have renewable, cheaper and better options available.

Option of a renewable resource

Let see what all options are available;

- **Bricks** – following types of bricks are the wastage of soil ;
- **Common Burnt Clay Bricks** –Common burnt clay bricks are formed by pressing in molds.
- **Sand Lime Bricks (Calcium Silicate Bricks)**- Sand lime bricks are made by mixing sand, fly ash and lime followed by a chemical process during wet mixing.
- **Engineering Bricks**-Engineering bricks are bricks manufactured at extremely high temperatures, forming a dense and strong brick, allowing the brick to limit strength and water absorption.
- **Concrete Bricks** – Concrete bricks are made from solid concrete.
- **Fly ash Clay Bricks** –Fly ash clay bricks are manufactured with clay and fly ash, at about 1,000 degrees C.

Why we call them wastage is very simple – there are better option too. So why waste a precious non-renewable natural resource, wherein a renewable, bio degradable, lighter and more effective raw material is available?

Eco-friendly organic Bricks – these are the bricks made out of organic renewable resource like Cow dung / coir / fly ash or lime stone kind of industrial waste etc. the advantage of these bricks are as under;

Lighter than the soil based brick. These organic bricks are up to 70 % lighter than the conventional brick, that'll make the building lighter and stronger. Perforation, as the cow dung bricks have air pore within, they make bricks capable of absorbing shocks – making the building earthquake resistant.

Thermal Conductivity – these bricks have about 60% lower thermal conductivity, keep the building 2-3°C cooler / warmer than the outside. Energy Efficient – these brick reduce the carbon footprints, being completely organic. Better air quality – the inside shall have a much better air quality, as the bricks go completely green, made out of organic material. Compressive Strength – they have a compressive strength 20% stronger than clay bricks.

Pots – we have various types of pots being used today, including the most common clay pots or soil based pots, apart from the plastic / ceramic and cement based pots. But the ideal is to work on eco-friendly green technology. So let's explore the green pots. An American Company completely dedicated to the cause of making these manure based pots popular has a website called "cowpots.com". There are many such organizations worldwide.

Eco-friendly organic Pots – these are the Pots made out of organic renewable resource like Cow dung / coir / fly ash or lime stone kind of industrial waste etc. the advantage of these pots over the clay pots are as under;

Usually we plant it in a pot and then put manure. Here we are planting it in manure itself, so you can imagine the growth rate of the plant. We plant in a nursery and then shift to pots, here the pot itself is as good as nursery. The manure pot is a very good absorbent of the atmospheric moisture, giving the default nutrition to the plant. It is a very good CO₂ absorbent too, giving support to the plant in photosynthesis and giving a clear environment around. Stronger than mud / plastic / cement pot, due to shock absorbing capability or flexible core. Deeper roots make a stronger plant. Heat resistance of the pot, give plant a better environment to grow healthy and stronger.

The website www.cowpots.com has been interacting and maintaining relationship with various international institutes and organization for various research projects and they quote on the website “CowPots have been rigorously tested and validated by numerous universities and many independent nursery partners. Testing has revealed that starting plants in CowPots can help shorten the growing cycle and increase fruit set by up to 10%!”

Like the [cowpots.com](http://www.cowpots.com), we have many other international organization working on the similar eco-friendly concept of replacing soil from many products and going green, as Soil is not a renewable resource.

To name a few, we have

<http://thepoopproject.org/> , <http://www.apartmenttherapy.com/> , <http://inhabitat.com/> , <http://www.greenhomeimprovement.com/> , and many more.

There are various other usages in which the soil usage could be reduced, wherein it is being wasted like making of tiles, making of gypsum board for false ceiling,

Bottom line is – like we’ve been very cautious about usage and saving of fossil fuels, as it costs dearly, we should be rather more cautious on saving the soil. Without fuel, we can live, but without soil, life can’t be sustained on earth. So let’s join hands in saving the soil.