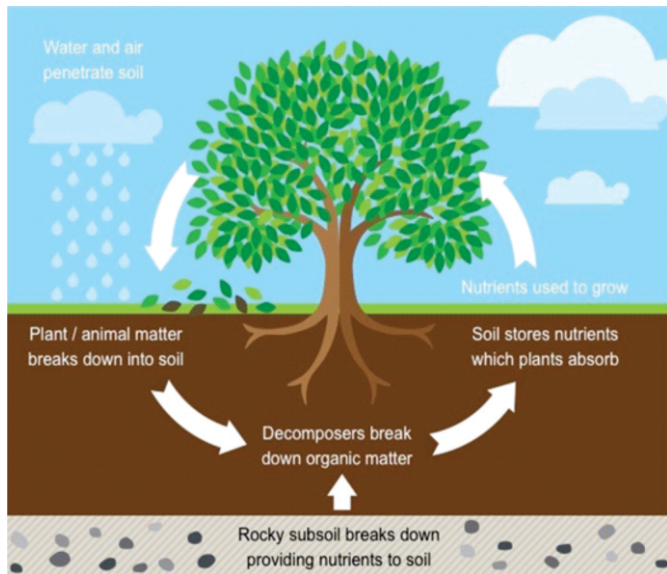


GUIDELINES FOR SOIL FERTILITY MANAGEMENT IN UGANDA

We walk on it, dig into it, and build with it. We depend on it to grow food, fuels, wood and clothing, to cleaning the water, and support the terrestrial life. Soil is essential to life, but what is it?



In short, soil is a mixture of minerals, organic materials, living organisms, air, and water. These five ingredients interact with one another in astonishing ways, making soil one of our planet's most dynamic and important natural resources.



<http://ib.bioninja.com.au/standard-level/topic-4-ecology/41-species-communities-and/nutrient-cycling.html>

Soil is a limited natural resource, but slowly renewable

Soils are limited natural resources. They are considered renewable because they are constantly forming. Though this is true, their formation occurs at extremely slow rates. In fact, one inch of topsoil can take several hundred years or more to develop. Soil formation rates vary across the planet: the slowest rates occur in cold, dry regions (1000+ years), and the fastest rates are in hot, wet regions (several hundred years).

Soils are amazing! Life as we know it would not exist without them. Besides that, they provide countless services that benefit all humans. Food, fuels, wood and clothing; clean air and water; habitat are just a few things we can thank soils for. These 'goods and services' provided by soils are called ecosystem services.



Typical Ugandan soil under agricultural cultivation

If we are not careful, soils can easily be lost by erosion and/or lost their fertility (soil exhaustion) more quickly than they form or recovered. In fact, one heavy rainstorm alone can remove an entire year's worth of soil development in just a few hours. Thankfully, there are numerous methods (best practices) that can be implemented in order to protect this important natural resource.



Agricultural cultivation without soil cover



Different moments of INPC-S methodology and the demo plots implementation in Busoba/Mbale, Uganda.

Soil degradation can affect the production and soil ecosystem provision (for example, nutrient cycling, soil formation and erosion control, water supply, quality and regulation). So, it is necessary to avoid this and enhance the soil ecosystem services!

But, for Ugandan farmers, what are the biggest challenges for soil agriculture management?

Using the INPAC-S (Participatory Knowledge Integration on Indicators of Soil Quality) participatory methodology, the farmers, technicians and researchers highlight together these challenges as follow:

Soil Erosion: detachment and movement of topsoil or soil material from the upper part of the profile by the action of wind or running water especially as a result of changes brought about by human activity (such as unsuitable or mismanaged agricultural methods).

Over Cultivation: the excessive use of farmland to the point where productivity falls due to soil exhaustion or land degradation.

Agricultural Drought: the water needs of crops during different growing stages. For instance, not enough moisture at planting time may hinder germination, leading to low plant populations and a reduction in yield.

Is possible to overcome these challengers? How?

In agriculture, the implementation of best practices is called sustainable resource management. Through these practices, growers use soils to maintain – or even enhance – quality and function over time.

An important practice is to use cover crops or mulches to protect soil. Soil never should be uncovered! So, during the fallow periods, this practice will avoid the soil detachment and, consequently, will help to avoid soil erosion. And, during the crop season, this practice will improve the soil organic matter, soil humidity and biological activity of soils.

Others practices include rotating crops from year-to-year, avoiding the soil exhaustion and the incidence of pest

and diseases; and also helps maintain soil fertility and microbial diversity.

The Ugandan users of INPAC-S methodology identified a set of agriculture practices as the more indicated for the farmers such as:



- Addition of organic manure
- Use of green manure / cover crops
- Mulching
- Intercropping with leguminous crops
- Biochar
- Agroforestry

However, the farmers should consult an agriculture technician before start the practices implementation to get specific guidelines, suitable for each case.

Based on this participatory building knowledge, some of these agriculture practices were implemented as demonstration and experimental plots: addition of organic matter; mulching; green manure; intercropping and biochar. These experimental plots are open to visitation in Mbale Epicentre (Busoba Subcounty).

Recommended literature

Barrios et al , 2012 <http://www.worldagroforestry.org/downloads/Publications/PDFS/B17459.pdf>

<https://www.livescience.com/21469-drought-definition.html>

<https://geographyfieldwork.com/GeographyVocabularyGCSEFarming.htm>

http://www.scielo.br/scielo.php?script=sci_arttext&pid=S1516-35982012001000002

http://www.fao.org/fileadmin/user_upload/agn/icm12.pdf

<http://www.fao.org/docrep/014/i2230e/i2230e14.pdf>

<https://www.ethz.ch/en/news-and-events/eth-news/news/2014/04/biochar-is-there-a-dark-side.html>

<http://www.fao.org/forestry/agroforestry/80338/en/>

The possibilities to improve soil quality through the adoption of those practices are innumerable!

Green manure/cover crops (GMCCs) are plants that are grown in order to provide soil cover and to improve the physical, chemical, and biological characteristics of soil.

Organic manure: cow, dung, sheep, goat or chicken droppings can be used as fertilizers. Each one has different characteristics that have to be considered before its use. Avoid manure from dairies and other industries where the animals receive a lot of salt.

Mulch is a protective layer of a material that is spread on top of the soil. Mulches can either be organic -- such as grass clippings, straw, bark chips, and similar materials -- or inorganic -- such as stones, brick chips, and plastic.

Intercropping is a cultivation system that involves the planting of two or more species in one area, so that one of the cultures can cope with the other during all its cycle, or at least part of it.

Biochar has been defined as charcoal-like by-product produced during the thermal conversion of biomass to energy. Biochar is mostly composed of carbon and ash, but the overall composition and characteristics depends on the type of biomass used as feedstock and the production conditions.

Agroforestry is a collective name for land-use systems and technologies where woody perennials (trees, shrubs, palms, bamboos, etc.) are deliberately used on the same land-management units as agricultural crops and/or animals, in some form of spatial arrangement or temporal sequence.

Reduce need to use herbicides and pesticides

Improve quality of the following crops

Prevent soil erosion

Improves the moisture-holding capacity of soil

Improves the moisture-holding capacity of soil

Provide nitrogen to the soil

Improve soil fertility

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