INTRODUCTION TO SOIL FERTILITY IN GRENADA

Increasing Crop production through Eco-Agricultural Principles

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OUR SOIL, OUR GREATEST RESOURCE

A conversation with farmers and plant growers

ALL YOU NEED TO KNOW

Methods, Foundations, Guides Practical implementations

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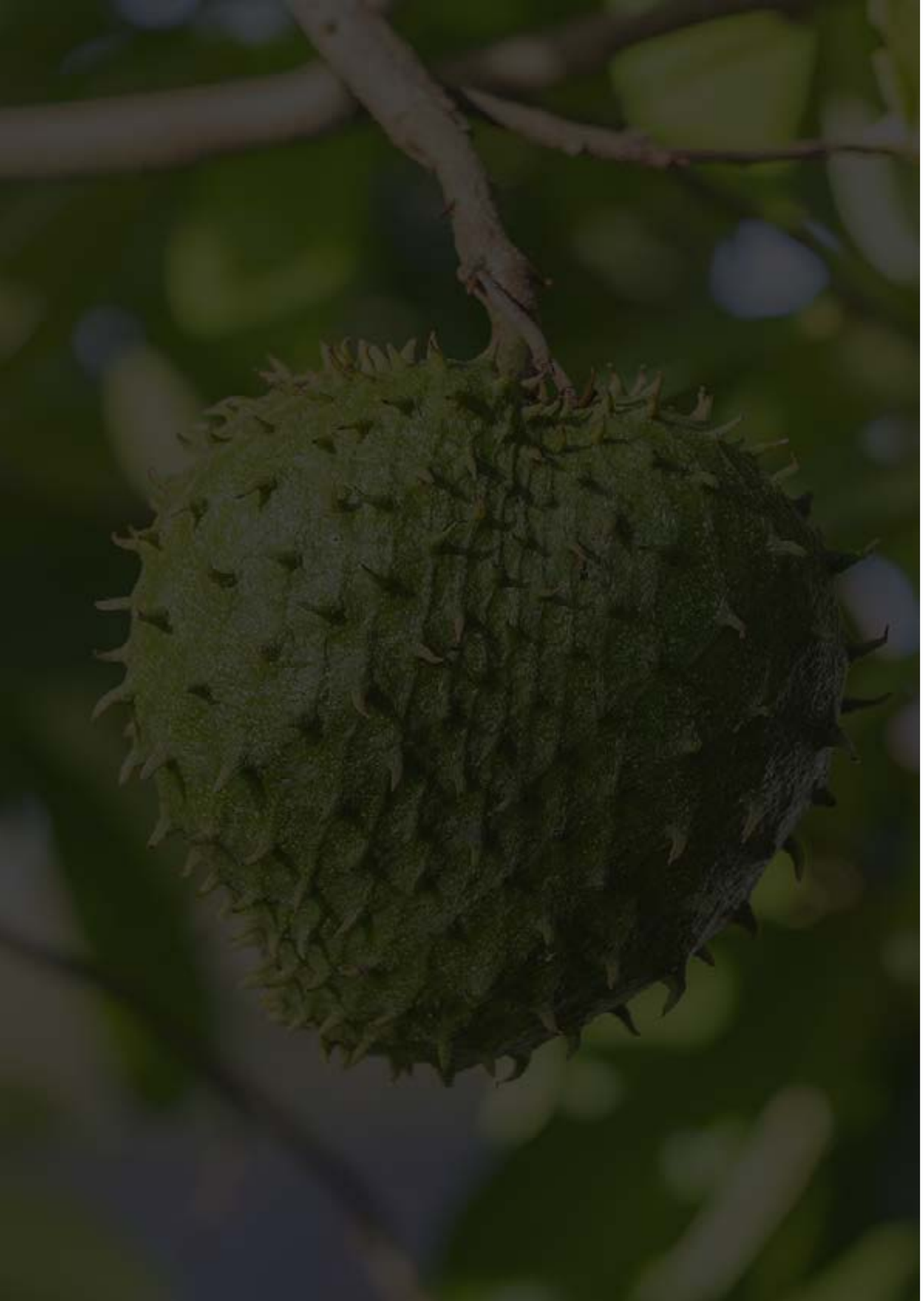
Soil Fertility & Biology



Soil Fertility & Biology

Soil fertility is an interesting, quite large, but however very necessary conversation. Unfortunately, this term is understood by different communities in different ways. However, I think it is through a clear and inclusive definition we may understand its importance.

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Soil fertility is soil performance, it is the ability of each of its main parts to function optimally; minerals, organic matter, water and air. The fertility of the soil speaks about the soils ability to encourage plant and animal productivity.

These soils should support adequate water and air quality fostering human health. we must note however, that the soil should be developing to its production potential instead of moving towards degradation or degradative qualities.

Unlike humans and animals, plants do not have a digestive system instead the soil serves as the organ for processing the food nutrients and food. A fertile soil allows plants to use water and nutrients in a better way giving us higher yield.

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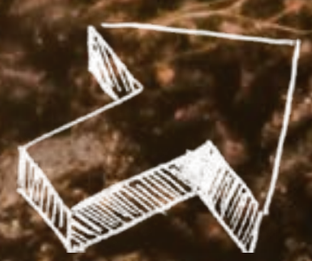
Production

Plant



Why Is Soil Fertility Important?

Well, improvement to soil fertility helps the entire growth process of any plant; it creates balance in the soil – A balanced root function, balanced overall plant composition, balanced nutrients and a balanced ecology. Soil fertility in many instances can be interpreted as ***Balance***.

A fertile soil improves the plant and soils ability to interact with each other. For optimal inprovement of these interactions we have to understand that soil has different dimensions; *(biological, chemical, physical)* that should all be addressed and considered .

The factors defining soil fertility can be divided into 4 groups:

- Soil biology
- Organic matter
- Inorganic matter
- System of planting.

Today, lets have a conversation about one of these factors, the one that has been neglected as it may be harder to understand yet, it stands as a foundation of soil fertility: ***Soil biology***.

What Is Soil Biology

When we speak of "Soil Biology" we actually refer to communities of microorganisms inhabiting our soils. It is important to understand that agriculture is in fact an ecosystem; it comprises many "hands clapping together". Different organisms interact with each other, they share, use and recycle different resources. It is often a disturbance of these "community interaction" that creates an infertile soil.

Soil biology has gained its importance through its role in maintaining soil fertility, while decreasing the need for agricultural inputs (these inputs are usually pesticides, fertilizer, additional labour) and increasing production volume or amount of yield.

“Soil biology” in our conversation speaks about the microorganisms in the soil and the communities they form. While they are small their impact is not microscopic, someone said that we can find more microorganisms in a handful of fertile soil than people in the planet (there are a lot of people on the planet).

“Biology
Determines
Fertility.

Role of soil Biology In Fertility

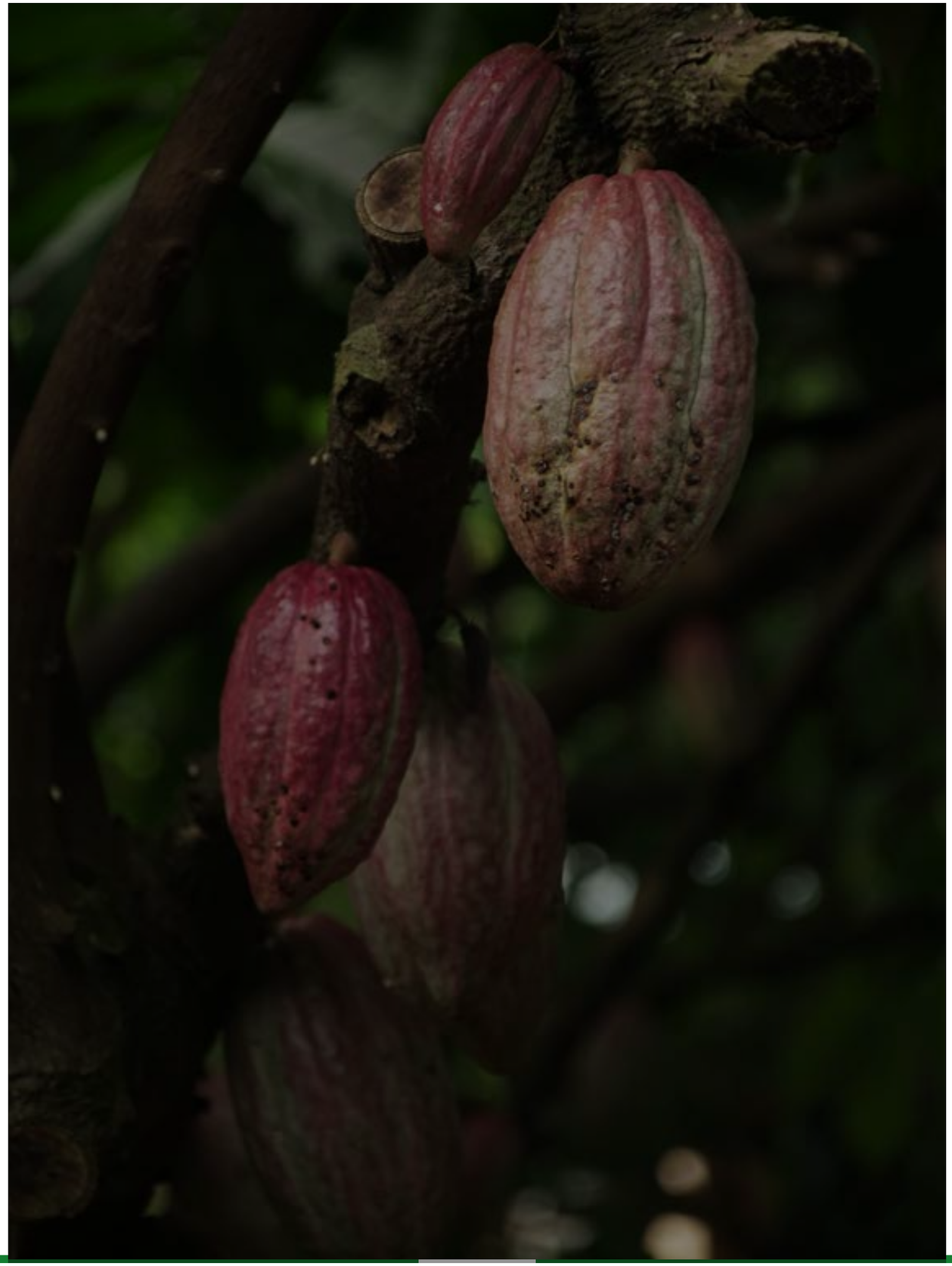
- Just how do these microorganisms affect soil?
- How do they improve crop and agricultural production?
- What role can these little organisms play in feeding our country and homes?

The Translators – Mineralization

Soil biology has the ability to make mineral nutrients in the soil (Phosphorus, potassium, Iron etc.) that may be trapped by certain soils more available to the plant. On many occasions, the soil may not struggle with having minerals present but instead the plant may have issues “feeding” because these minerals are in a “language” which the plants cannot understand. These soil microorganisms have the ability to translate these nutrients into forms that our plants can use.

The Tiny Workers – Nutrient Shuttling

These tiny little workers can play an even more direct role in plant “feeding”; they have the capacity to search for and directly transport water and nutrients into plant roots. Here, the plant does not have to spend energy developing an entire root system to get maximum use of the soil as labourers are provided that act as extended roots. These plants that are provided help with water and nutrient acquisition are usually more competitive, grows faster and healthier.



The Recyclers – Nutrient Cycling

These microorganisms are also responsible for the regenerative process of converting plant biomass and animal manure into soil organic matter – a soil-like construct that encourages microorganism life and builds several other qualitative features of the soil (a topic of a future conversation). If this decomposition doesn’t happen, many of those nutrients trapped in plant matter and manure is instead scattered into the air lost to our crop growing ventures.

The Construction Workers – Soil Particle & Colloid Adhesion

As if these tiny organisms were not playing a big enough role, they also have contracts in soil construction. Soil biology or soil microflora are have the capacity to excrete substances that acts as "glue", holding the soil structure together. This allows the right soil building materials to remain in the complex of the soil facilitating a more "sponge-like" structure.

This level of soil construction gives way to several functions of the soil:

You know those "heavy" soil, the ones that are really difficult to work when dry, well another function of this structural construction is to reduce the possibility of the soil being compact which now not only encourages easy working of the soil but encourages germination and allow roots to easily grow through it.

Another important aspect we cannot overlook is waterlogging; an environment that encourages disease and further crop loss. A better structural element reduces this excess build -up of water on the surface.

It allows more water infiltration and transportation; as the rain falls naturally water is absorbed into the soil and stored for plant use. Some soils because of poorer structure are too condense to allow water to flow through and looses that absorption ability, when this happens water quickly evaporates from the soil surface.

The soil now has a lower water storage ability. Through this, plants struggle to grow as there may be less water available in the soil and in many cases the soil develops a crust which makes future penetrations even more difficult. This leads to an increasing cycle of soil unproductivity. Greater infiltration and storage ability of water then allows agricultural production to become more resilient especially in a changing climate.

The Immune System – Pathological Protection

The soil has its own way of dealing with disease like damping off, blight and rots.
Nature has allowed for or expects that soil biology and plants live in a “give and take” or symbiotic relationship. Vaguely, Our plants release foods into the soil, microorganisms consume this food and maintain life. Like we would, these organisms protect their food source. They release enzymes and antibiotics that would suppress organisms that would harm the plant or disrupt the activities of their “kitchen”.

It is important to understand that each soil has some degree of soil biology that is able to help or harm the plant. What influences the role these organisms play is completely up to the environment. Under certain unfavourable conditions; waterlogging, poor food availability or through the presence of certain chemicals in the soil *(eg Glyphosate)* the microorganism community in the soil that should be potentially beneficial can be converted to perform destructed behavious.

A clear conversions would be a change of appetite; from feeding on dead plant material to actively attacking our live planted crops.

Here we understand that, if manipulated properly, soil biology do not only create fertile soils that promotes plant life but also creates an environment resistant to disease.

How do we encourage Soil Biology?

Well, these microorganisms are not very different than we are; they also require food, water, air and shelter, like we would.

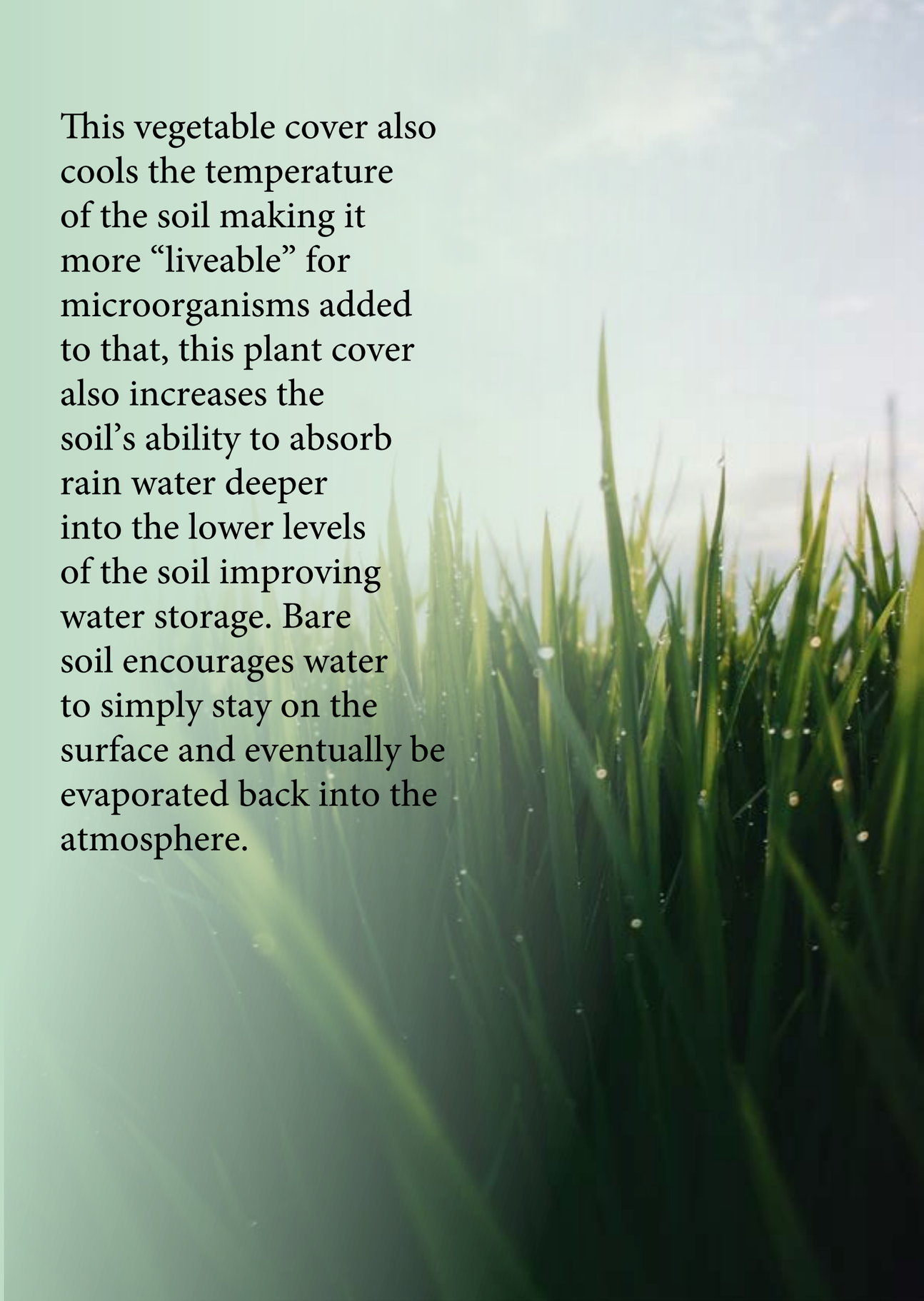
Covering The Soil. – Cover, Relay, Constant, Continuous Cropping

“ Poor soils do not cause the absence of plant growth, the absence of plant growth causes poor soils”.

Weeds do not grow only make our lives difficult, (*or at least we hope not)*. Naturally or ecologically, weeds serve as protection or a covering from the soil. A fertile soil mimics this function.

The soil biology requires food constantly. With this consideration we understand that the surface of the soil has to be covered with plant material providing microorganisms food (plants excretes “food” through their roots) throughout the entire year.

This vegetable cover also cools the temperature of the soil making it more “liveable” for microorganisms added to that, this plant cover also increases the soil’s ability to absorb rain water deeper into the lower levels of the soil improving water storage. Bare soil encourages water to simply stay on the surface and eventually be evaporated back into the atmosphere.



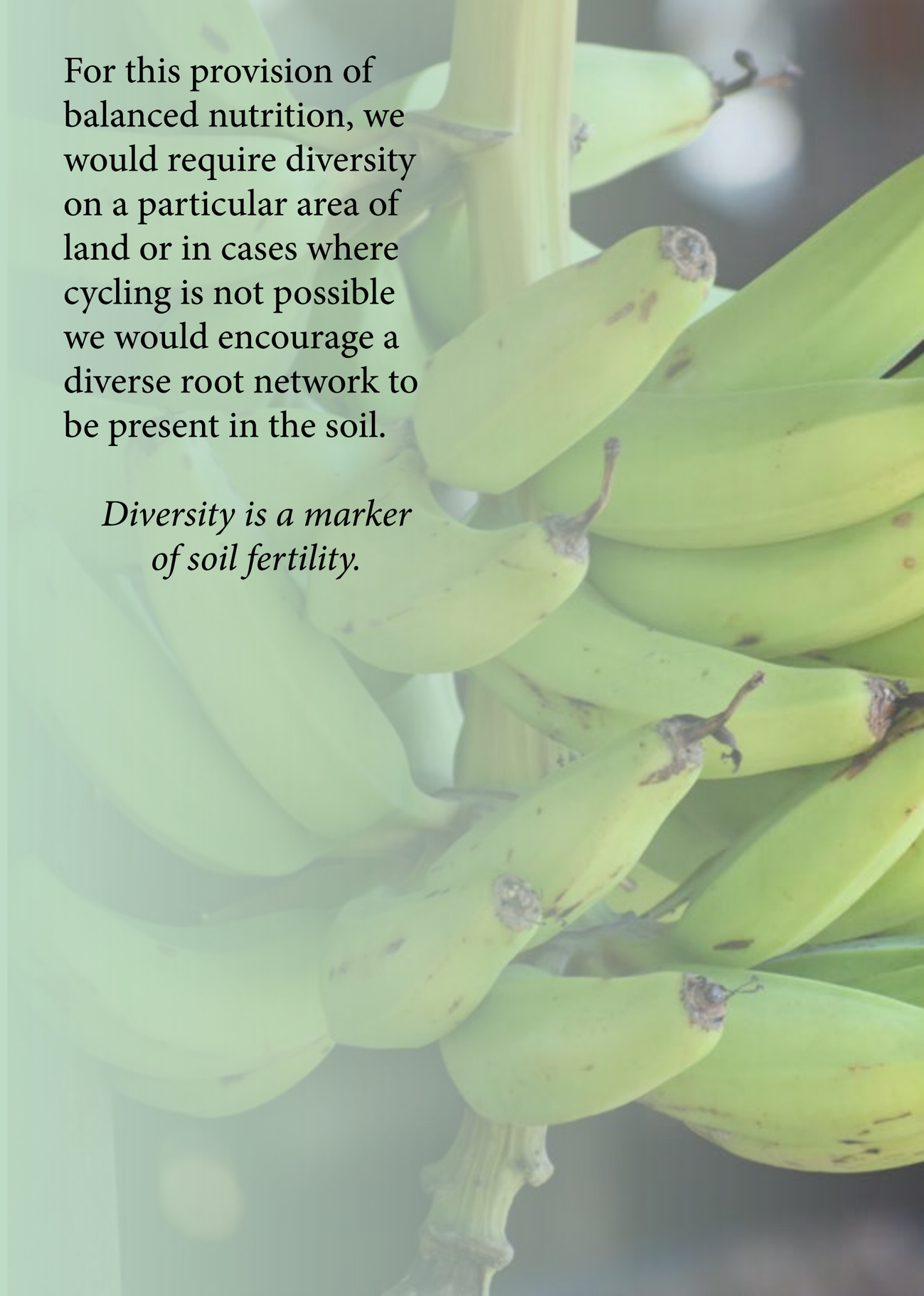
Planting Different Types Of Crops. - Diversity, Cycling And Rotation

One of the largest influence to biological soil fertility is food; through the availability of food, a harmonious balance and population control is maintained between these biological communities. We maintain balance through have a diverse crop profile on a particular piece of land.

Planting diversity or planting different types of crops would be important as each species or type of plant interacts with the soil differently, feeding different conditions and organisms encouraging the activities of a wide range of soil biology through their roots.

For this provision of balanced nutrition, we would require diversity on a particular area of land or in cases where cycling is not possible we would encourage a diverse root network to be present in the soil.

Diversity is a marker of soil fertility.



Building A Home. - The Organic Matter Conversation

Dead plant matter and animal manure are used as construction material for building the homes in which these microorganisms inhabit. A fertile soil has to encourage the regeneration and presence of organic matter in the soil. Our growing practice should encourage the application and presence of organic matter in the soil.

Measures such as excess tillage which allows too much oxygen into the soil and consequently destroy organic matter should be done through discretionary decisions.

Inputs like inorganic fertilizer application also take a toll on organic matter structures through both biological and chemical destructive measures. Another concern of in discretionary use is that of inorganic fertilizer due to their potential to decrease yield and make the soil more inhospitable in the drier seasons.

Herbicide use warrants a few words in this conversation as it renders plant material (leaves, roots) in accessible to microorganisms and biological decomposition which facilitates the cycling process of plant material into organic matter. Excess herbicide use has another function as it also has the potential to reduce soil biology up to 80% and with that suppress the production of plant supportive hormones (microorganisms make hormones that encourage roots to grow) and enzymes.

Each of these inputs should be utilized on the bases of weighed pro's and con's understanding the lack of sustainability in these practices.

Although small, soil biology has dominated a very large part in the conversation of soil fertility not only because of their influence on crop production and livestock nutrition, but also due to their capacity to perform further large crucial functions, reducing the need for inputs including pesticide and fertilizer having a huge economic impact on agricultural production.

> “Productive agriculture does not only require but demands local economical traditional and cultural support which should encourage and make demands for sustainable approaches and not instead put pressure on agriculture’s potential for production.