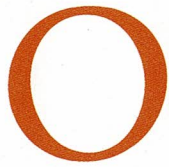


FERTILIZING *tropical* LANDSCAPES

BY: MICAH BAKER





Often when I pose this question to a member of our landscape industry: what are the top 3 essential elements for plant growth? The most common response I get: is it Nitrogen, Phosphorus, and Potassium also known as N,P,K? Now, I admit it's sort of a trick question, and N,P,K are indeed the top three macronutrients required by plants. However N,P & K are not the top 3 essential elements needed for plant growth.

The top 3 elements, which are the raw materials of all living things and comprise a whopping 95-98% of what plants are made of is...Carbon, Hydrogen, and Oxygen. That's right, the majority of what plants are made of comes right out of the air and water - Carbon dioxide from the air, and Hydrogen and Oxygen from water. All other elemental plant nutrients Nitrogen, Phosphorus, Potassium, Calcium, Magnesium, Sulfur and so on are needed in relatively small quantities compared to the top 3 essential elements C,H,O.

This is an important concept to grasp when choosing how to provide fertility to the landscape and nutrients to your plants. Who "fertilizes" the mighty amazon forest in South America or the giant sequoia forests of California? On the Big island we often see the mighty Ohia tree sprouting up abundantly straight out of the soilless lava fields. How are these plants and trees growing without human intervention? Don't they need our N,P,K fertilizer?

Plants have been growing on Earth for the last 500-700 million years, and through evolution have developed the ability to acquire everything they need to grow directly from their immediate environment. If this is the case, why is our landscape industry so focused on providing plant nutrients from a 50lb. store bought sack? Moreover, how might we as landscape managers create landscapes that flourish naturally without indefinite applications of imported fertilizers? These are important questions that have shaped my personal evolution as a landscape manager. After 15 years in the landscape industry, and many exper-

iments, my team and I have developed resort landscapes that have moved closer to a naturally functioning ecosystem. The result is a dramatic reduction of ongoing fertilizer applications.

Tropical soil fertility, as we have in Hawaii is much different from temperate soil fertility as occurs on the mainland USA, and Europe. A key difference for Hawaii's soil fertility is that 85% of plant nutrients are held in the plant biomass. Biomass means plant materials - both living and dead. In the tropics, nutrients are found stored in living plant matter and decomposing organic materials on the forest floor, also known as mulch. Tropical soils are typically easily leached of nutrients due to high rainfall and the year round rapid decomposition of mulch materials. In tropical climates the soil simply does not store nutrients well, and so our primary strategy in providing ongoing fertility is simply to apply compost and mulch on the surface of the soil. It is the decomposing organic materials, as well as the soil life that work to provide fertility to our plants.

Supporting this natural method of fertility is our primary goal when developing a sustainable landscape. Surface mulching, which mimics the forest floor found in nature is of primary importance. Simply mulching the ground increases microbial life by 60%, provides a home for soil organisms, protects the soil from desiccating sun rays, and serves as a food source for beneficial soil organisms. There are many options for mulch materials such as grass clippings, shredded green waste, straw, and wood chips. We prefer using wood chips, which produces a clean looking landscape bed, lasts longer than non-woody materials, and provides an excellent food source for important soil microbes such as fungi. When applying mulch in a residential setting we recommend a layer of 3 to 4 inches maximum so we do not encourage a habitat for undesirable insect build up. Thin layers of mulch WILL NOT promote insect infestation. Pest problems associated with mulching come from mulch that is left in a pile, mulch layers that are too thick, and from piles of loose dry leaves or other light materials.

Quality finished compost is next in line as the most important primary material we use to provide fertility in the landscape. Compost can be applied both to lawns as well as shrub beds. The main benefits of compost include nutrients for plant growth, beneficial microbial communities for enhancing and balancing soil, and stabilized organic matter called humus, which retains nutrients in the soil. A liquid extract can be made from compost and applied to the landscape to provide foliar feeding to plants, as well as inoculation of beneficial micro-organisms. Another microbial inoculant called Effective Micro-organisms, also known as EM-1 can be very helpful at bringing the soil into balance and assisting the breakdown of organic fertilizers and mulch.

We prefer organic fertilizers as a way to provide concentrated nutrients for the landscape. The nutrients in organic fertilizers become available after a process where they are consumed, utilized, and excreted by soil organisms. In contrast, water soluble chemical fertilizers are absorbed by plants immediately. However, they are easily leached out of the soil and require ongoing indefinite use which leads to environmental pollution, soil life imbalances, soil pH problems, and poor plant health in the long term. With organic fertilizers, you are literally feeding the soil life, which allows the nutrients to be held in the soil and used over time as needed. Organic fertilizers are a long term sustainable choice for providing nutrients and need for applications will diminish over time as the soil becomes healthier and more productive.

Occasionally, and usually in the beginning of our program we apply a liming material to provide calcium and, if needed, help adjust pH. However, pH is best adjusted slowly over time through your soil building techniques and not immediately with a liming material. Any rapid adjustments will have a harmful effect on soil life. Balanced and healthy soil life is of paramount importance to success in the landscape. A local option is a crushed coral product from BEI that can serve as a liming material. This material is a calcium carbonate and will work slowly to increase pH in acidic soils while adding calcium. If your working in the

arid leeward areas of the islands then we suggest using calcium sulfate also called gypsum. Gypsum is used in soils that are already high in pH to add calcium without a significant increase in pH due to a pH lowering sulfur component. Again, any adjustments through liming should be done slowly over time, and it is a good idea to follow up liming with a microbial enhancer such as compost, compost tea, or other microbial inoculants to help support healthy and balanced soil life.

Trace minerals are also very important and we typically use a product called Azomite to provide an assortment of minerals for our landscapes. Azomite is a natural product mined from an ancient mineral deposit and is a soil remineralizer for plants. It is reported to improve root systems, crop yields, and plant vigor.

Neem cake is another key ingredient in the sustainably managed landscape; it serves both as a source of nutrients as well as pest control for the soil. Neem cake is the residue obtained from neem seed kernels which have been crushed to extract the oil. It is an excellent organic amendment that reportedly aerates soil, promotes pest resistant plants, and balances alkaline soils. We highly recommend neem cake especially when growing fruit trees.

It may seem like a lot of work to apply so many different materials, so for ease of application we recommend using a wheelbarrow or large tub as a mixing vessel. First, do your research on the rate of application for each material, and the total landscape area you need to cover, then measure out the amendments and mix them into one easy to apply fertilizer blend. This blend can then be evenly spread over the landscape or another option is to mix this blend into compost and then apply the compost to planting beds and/or turf. The final step is to apply a layer of woody mulch to cover the soil and allow nature to get to work.

As landscapers we are on the frontline of urban land management in Hawaii. The health of the environment is literally in our hands, and these tropical soils



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require a different management approach compared to temperate soils. Creating healthy soil will happen over time from the application of organic amendments, compost, microbial inoculants, and mulch. And while these techniques may seem a little daunting at first, in the long term you will produce healthier, more vibrant landscapes while demonstrating impeccable stewardship of these treasured islands we call home.

Micah Barker runs the conservation landscape company Bio-Scape Hawaii, is a Principal at Sustainable Land Company, and Director of Hawaii Island Landscape Association.



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