What is Composting?

Composting is a pretty amazing thing. Composting is nature's recycling system. And nature's recycling campaign wasn't funded by big corporations, so you know it's legit.

Composting is a way to return nutrients to the soil by decomposing certain types of organic waste to make vital nutrients from that waste available to growing plants and a diverse collection of living organisms in soil. Composting also prevents organic waste from being sent to a landfill, where it would otherwise break down to produce heat-trapping greenhouse gases like methane (*hello…global warming*).

How Does Composting Address the United Nations Sustainable Developments Goals?

Composting food scraps and yard waste is an important sustainable living habit and supports several United Nations Sustainable Development Goals (SDG). While many of the SDGs are intertwined and sustainable living activities propel us toward multiple SDGs, here are just a few ways composting helps us achieve certain Sustainable Development Goals.

SDG 2: No Hunger

Composting helps reduce food waste and also builds healthier soil to grow more nutritious food for our communities. Hyper-local food and farming systems, built on healthy soil and regenerative agriculture practices like composting, can help address food apartheid and food deserts.

Furthermore, topsoil around the world is eroding. Some estimates suggest that, without intervention, we could run out of topsoil for agriculture in less than sixty years.

SDG 11: Sustainable Cities and Communities

Community composting is an integral component of reducing waste and creating sustainable communities for a sustainable future. Particularly in dense, urban areas, community composting programs can help manage massive waste streams, reduce carbon emissions, and support opportunities for urban farming.

SDG 13: Climate Action

Composting reduces waste sent to landfills which limits greenhouse gas emissions from transportation and decomposition or incineration. Composting also creates healthier soil which sequesters more carbon from our atmosphere than less healthy soil.

SDG 15: Life on Land

Composting provides nutrients to millions of microorganisms living in soil and fosters greater biodiversity in our soil, something that benefits all life on our planet. Healthy soil full of biodiverse life also retains more water and helps plants and animals survive through a drought.

Composting Basics + Compost Ingredients

The four compost ingredients are:

- Oxygen
- Water

●Greens

●Browns

Every compost heap must have these four ingredients to properly break down and turn into valuable humus (or finished compost).

Soil in a Compost Heap

It’s also helpful to add some soil to the pile. Soil acts as an inoculator and helps the compost break down more quickly because there are already many living organisms in the soil that can help the compost ingredients break down.

Composting Requires Heat

A compost pile also needs heat to process. Heat can be generated from the sun and from the bacteria and other microorganisms in the soil. Although the science of composting can be quite specific about proper temperatures for ideal and efficient breakdown of food scraps and organic waste, simple composting at home does not need to be as precise. Sun and heat from active microorganisms will manage heat requirements for casual composting.

Composting Greens and Browns

Oxygen, water, soil, and heat are pretty straightforward elements of a healthy and thriving compost system. Composting greens and browns, however, can be more complicated. A compost pile needs a balance of greens and browns in order to break down properly, so it’s helpful to know the difference between greens and browns in a compost heap.

Composting Browns

Carbon-rich materials are commonly called “browns” due to their appearance. Most carbon-rich organic waste elements are brown in color because they have been dried. Composting browns include organic materials such as dry leaves, cardboard, and brown paper. Paper egg cartons are also a great source of carbon for composting.

Composting Greens

Nitrogen-rich materials are commonly called “greens”. Not all “greens” are actually green in color. Unlike their brown counterparts, composting greens contain a higher content of water as well as more nitrogen. Examples of composting greens include fresh fruit, vegetable scraps, coffee grounds, grass clippings, and other residual plant matter like stems and vines left over from a garden at the end of a season.

Dig Deeper into the Chemistry of Composting

Now that we know the difference between greens and browns, we can dig a little deeper into the chemistry on how the decomposition of plants works and why it’s vital to soil health. We will discuss how nitrogen, a vital element to plant growth, is made accessible to vegetation in two simple steps:

- When plants decompose, they create ammonia (NH_3).

- Ammonia is converted into nitrate ions (NO_{3+}) by reacting with oxygen in a 2 step process.

Nitrate is the form of nitrogen that plants must have to survive and thrive! Here’s what the chemical equations look like:

Here's the process:

$$2NH_3 + 3\,O_2 \rightarrow 2NO_2^- + 2H^+ + 2H_2O$$

$$2NO_2^- + O_2 \rightarrow 2NO_3^-$$

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Composting Addresses Climate Change

Not only is composting good for the soil and our food supply, it’s also an important way to mitigate the production of methane, a potent greenhouse gas.

Let’s use an apple to demonstrate how composting reduces methane production and benefits the environment.

When an apple is composted, it decomposes in the presence of oxygen and oxygen-breathing (aerobic) bacteria. This decomposition process creates nutrients (nitrates and phosphates), carbon dioxide, and water.

When an apple is composted:

apple

+ O_2 +

oxygen

aerobic bacteria

NO3
PO4

nutrients

+ CO_2 +

carbon dioxide

+ H_2O

water

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When an apple is thrown in the trash and sent to a landfill, which is devoid of sufficient oxygen, it decomposes by non-oxygen breathing (anaerobic) bacteria in a multi-step process that creates carbon dioxide and methane.

When an apple is sent to a landfill:

apple + no oxygen + anaerobic bacteria

a multistep process

carbon dioxide + methane

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Methane is a gas that has a Global Warming Potential (GWP) that is ~25 times greater than carbon dioxide. That means that methane is ~25 times better at trapping heat in our atmosphere than carbon dioxide. In other words, when we compost food instead of sending it to the landfill, we significantly reduce the potent greenhouse gases rising into our atmosphere and causing the planet to heat up.

Furthermore, finished compost is a nutrient-rich and natural fertilizer for the soil. Compost as a soil amendment helps to create a healthy environment for plants to thrive.

While composting reduces the generation of greenhouse gases, it also helps soil draw down carbon already present in the atmosphere. Healthy, nutrient-dense soil pulls carbon from the atmosphere and stores it in the soil, a process called carbon sequestration.

So, by composting our food scraps, we:

- Mitigate the production of methane gas in a landfill

- Build nutrient dense soil which sequesters carbon from the atmosphere

- Create healthy soil for plants to thrive, increasing food production rates to tackle global hunger

By composting and taking action to replenish essential elements like nitrogen in the soil through natural processes, we begin to address the issues of soil erosion, the climate crisis, and food apartheid, all of which are excellent topics to introduce to the young learners in our lives!

What's not to love about composting? There are many ways to get kids involved in composting. The lesson below is just one simple way to teach children the basics of composting and help them get excited about

sustainable living habits they can implement in their own homes and communities.