

# **COMPOST**

The world's most productive soils are high in organic matter. Unfortunately, Hawaii soils are generally very low in organic matter, making them hard packed and low in nutrients.

Plants need food. There is more to soil health than N-P-K (Nitrogen-Phosphorus-Potash) found in chemical fertilizers. Chemical fertilizers such as 16-16-16, 10-30-10 or 21-0-0 are only half the story. Plants thrive or suffer depending on the organisms around their roots. Soil organisms create the food for plants, and continue to create that food as they are a living organism and have a long lasting effect, unlike chemical fertilizers which give a short term boost, and then wash through the root zone and eventually into our drinking water sources. All these organisms need food to stay alive, so they can help your plants grow. Good compost contains an enormous number of beneficial organisms. Good compost also contains an enormous amount of food for the organisms growing in it.

Beneficial soil organisms not only make nutrients available to plants, they reduce disease, reduce nutrient losses, and help degrade toxic compounds.

## **COMPOST. WHAT IS IT?**

Compost is a stable humus (nutrient rich matter) material created by combining organic wastes (e.g. yard trimmings, food wastes, manures) in proper ratios into piles, rows, or vessels; controlling temperature, moisture and oxygen to achieve accelerated decomposition; and adding bulking agents (e.g. wood chips), as necessary, to provide air space; allowing the finished material to fully stabilize and mature through a curing period

Composting is a natural form of recycling, which continually occurs in nature. An ancient practice, composting is mentioned in the Bible several times and can be traced to Marcus Cato, a farmer and scientist who lived in Rome 2,000 years ago. Cato viewed compost as the fundamental soil enhancer, essential for maintaining fertile and productive agricultural land. He stated that all food and animal wastes should be composted before being added to the soil. By the 19th century in America, most farmers and agricultural writers knew about composting.

## **HOW DOES COMPOSTING WORK?**

Composting is a natural biological process that accelerates the breakdown of waste materials. Composting is the transformation of organic material (ie: plant matter) through decomposition into a soil-like material called compost. Invertebrates (insects and earthworms), and microorganisms (bacteria and fungi) help in transforming the material into compost. This works best when moisture and oxygen levels are maintained. This accelerated, aerobic (oxygen rich) process naturally generates heat which must be monitored and controlled; these high temperatures also sanitize the finished compost, killing weed seeds and pathogens (harmful microorganisms). Decomposition is performed by naturally occurring microorganisms (e.g. bacteria, fungi) that utilize the organic materials for their food and energy sources. Proper primary composting involves temperatures

between 110° and 150° F, moisture content between 50 and 60%, and adequate oxygen for the microbes. It is complete when pile temperatures decline and remain below approximately 105° F. A subsequent curing period of 2 to 6 months is required for the compost to mature, after which it will not overheat or produce unpleasant odors during storage, and can be beneficially used.

Decomposition occurs naturally anywhere plants grow. When a plant dies, its remains are attacked by microorganisms and invertebrates in the soil, and it is decomposed to humus. This is how nutrients are recycled in an ecosystem. Composting is a dynamic process which will occur quickly or slowly, depending on the process used and the skill with which it is executed. A neglected pile of organic waste will inevitably decompose, but slowly. This has been referred to as "passive composting," because little maintenance is performed. Fast or "active" composting can be completed in two to six weeks. This method requires three key activities; 1) "aeration," by turning the compost pile and allowing oxygen to feed the aerobic (oxygen loving) organisms, 2) moisture, and 3) the proper carbon to nitrogen (C:N) ratio. Attention to these elements will raise the temperature to around 130°-150° F and ensure rapid decomposition. Some microbes require oxygen (aerobic), and others do not (anaerobic); those that require oxygen (aerobic) are preferable for composting as there are less odors.

The carbon to nitrogen ratio (C:N) refers to the balance of carbon and nitrogen. In nature many things contain carbon and nitrogen. In the composting process, nitrogen breaks down carbon until it is in balance, at approximately 20 parts carbon to 1 part of nitrogen (C:N ratio = 20:1). Carbon is high in the woody material of trees, nitrogen in the green leaves. Grass clippings are high in nitrogen, as are manures and food waste. Items with a high carbon:nitrogen ratio (ie: 100:1) will take a longer time to compost and if put into the soil will take away the nitrogen present in the soil to help it breakdown (compost) in the ground. This takes away the nitrogen which the plants need. Good composts are C:N balanced and stable at about 20:1. Redwood "soil conditioners", saw dust or uncomposted "mulch" have high C:N ratios.

## **WHY IS COMPOSTING BECOMING MORE POPULAR?**

We are running out of viable options for the disposal of our trash. As a nation we generate 180 million tons of solid waste each year, a figure that has more than doubled in the past 30 years. At the same time, existing landfills are quickly reaching their capacity and new ones are increasingly difficult to site because of more stringent environmental requirements and the NIMBY (not in my backyard) syndrome.

Composting captures nature's way of recycling. Composting turns the organic portion of what we throw away into a product that is valuable as a soil enhancer for agriculture and in potting soil, mulch and for other uses.

## **WHAT ARE THE BENEFITS OF COMPOST?**

Compost is used primarily as a soil conditioner or mulch material. When tilled into the soil it helps to retain moisture while allowing good drainage. Nutrients are better able to cling to the soil particles, so the need for chemical fertilizers can be reduced. Roots are able to penetrate deeper, resulting in healthier plant growth. The combination of less fertilizer being applied and better penetration into the soil reduces runoff into rivers and streams.

Without bacteria and fungi in the soil, most fertilizer you add will wash through the soil into the ground drinking water. Adding compost puts the organisms back into the soil that will hold onto those nutrients. Is fertilizer bad or a thing of the past? NO, but we need to stop the chemical nutrients from moving through the soil into the groundwater. The only way to stop that loss is to get the organisms back into the soil and get them to hold onto those nutrients. When nutrients are held in the soil by bacteria and fungi, those nutrients will become available to these plants in the future. Therefore, less fertilizer is required, and less money will be needed to clean up our drinking water.

As a mulch, on top of the soil, compost helps to control weeds, protects the roots of plants from temperature fluctuations in both winter and summer, and helps prevent the soil from drying out. Compost may be a way to help offset significant loss of topsoil from erosion. It is estimated that farm lands lose as much as one inch of topsoil each year.

What is the difference between organic matter and compost? Weed seeds and disease causing organisms are likely present in organic matter, and organic matter still needs to go through a nitrogen stabilizing phase. That is why using good, mature compost is very important.

Government agencies, such as state highway and parks departments, can use compost in construction and beautification of highways and parks. Compost also can be used on agricultural land, in plant nurseries and greenhouses, on golf courses and by landscapers and homeowners.

Compost added to gardens improves soil structure, texture, aeration, and water retention. When mixed with compost, clay soils are lightened, and sandy soils retain water better. Mixing compost with soil also contributes to erosion control, soil fertility, proper pH balance, and healthy root development in plants.

## **SOIL & PLANT IMPROVEMENTS**

- Improves soil structure
- Improves nutrient holding capacity
- Reduces soil compaction and crusting
- Reduces fertilizer requirements
- Increases ease of cultivation
- Improves root growth and yields
- Improves water infiltration and drought tolerance
- Protects plants from disease
- Increases microbial and earthworm populations

## **POLLUTION PREVENTION & REMEDIATION**

- Prevents erosion of embankments, roadsides, and hillsides.
- Binds heavy metals in contaminated soils
- Degrades many pesticides.
- Absorbs odors and degrades volatile organic compounds
- Diverts organics from landfills into compost, reducing waste burden and methane production.

### **Q Is compost a peat?**

A. No. Peat is harvested from bogs and dried. Peat is formed over long periods of time by the decomposition of plant materials into a carbonaceous form. Peat is a non-renewable, limited resource material, used mainly by the nursery industry as a soilless potting medium

### **Q. Is compost a mulch?**

A. No and Yes. Mulch can be either an inorganic or organic ground cover. Mulch can be pebbles, straw, shredded paper, bark, wood-chips, plastic, etc., that helps to retain moisture. Compost can be used as a high quality mulch, especially around new transplants.

### **Q. Is compost a soil?**

A. No. Soil is the uppermost layer of the earth. Soils are composed of various proportions of sand, silt, clay and small amounts of organic matter.

### **Q Is compost a chemical fertilizer?**

A. No. Chemical fertilizers are inorganic compounds, composed of specific proportions of nitrogen, phosphorus, potassium (and sometimes other nutrients), that are soluble and readily plant-available. Commercial fertilizer contains no organic matter.

### **Q. Is compost a manure?**

A. No. Manure is animal waste often mixed with bedding or sludge, and containing nutrients, weed seeds, and potential disease organisms. Raw or partially processed manure is not stable and can release nutrients (e.g. nitrogen, phosphorus) at less predictable rates than compost.

### **Q. Is compost a redwood “soil conditioner”**

A. No. Redwood “soil conditioners” are generally purely carbon (sometimes with added nitrogen) and has not been composted. It can be very unstable and rob the soil of any available nitrogen until it breaks down in the soil.

## HOW TO USE AND APPLY COMPOST

Compost can be used during installation of a new lawn & garden or to revitalize an existing lawn & garden.

### **Suggested uses:**

**Vegetable & Flower gardens:** Mix 1"-2" into top 6" of soil to promote root growth and slow nutrient release.

**New Lawns:** Spread 1"-6" and till into soil, to avoid compaction, improve water retention and add nutrients.

**Established Lawns:** As a top dressing, add 1/8" to 1/2" spread evenly over surface, and water in to improve water retention and to add nutrients

**Outdoor containers and nursery mixes:** Add one part compost to 3-4 parts screened soil. Blend with black cinder for additional drainage.

**Planting trees & shrubs:** Dig hole approximately twice the size and depth of the root ball or existing pot. Mix one part compost with 3 parts soil, and place some mixture in the bottom of the hole. Place tree or shrub in hole, and backfill with mixture.

**Mulching:** For weed control, water retention and slow nutrient release, place a 2"-4" layer of compost over vegetable gardens, flower beds, and around shrubs, hedges and trees.

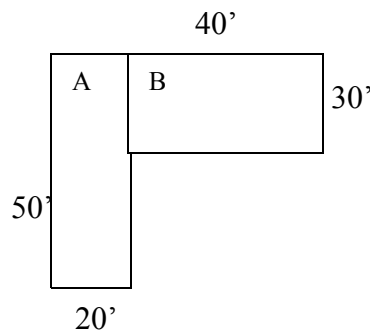
### ABOUT TOP SOIL AND WEEDS:

Good Compost is weed free. Most "top soil" sold in Hawaii cannot by its nature be weed free. Screening of soil cannot possibly remove microscopic weed seeds, and fumigating soil with dangerous chemicals has been banned in the United States. Compost made through a proper composting practice is weed free, as during the high heating cycle, weed seeds are killed. That's why its recommended that people use the soil they have, unless they do not have enough soil (i.e.: new homes built on coral beds with only 2-3" of top soil). Kill your own weeds first, till the soil you have and then incorporate quality weed free compost, rather than purchasing topsoil and someone else's weeds. If you do need to buy soil, buy the soil first, spread it, water it and encourage the weed seeds to germinate. Then kill the weeds over a period of 2-4 weeks, and then add your compost. Remember when spraying weeds that most weed killers have no soil activity... they should not be sprayed on the soil. They must come in contact with the green leaf of the weed to kill it. Always read and follow the label.

## CALCULATING HOW MUCH COMPOST:

Calculate the square footage you want to cover. Length x width of a rectangle gives you square footage. If your area is an irregular size, try and break it into rectangular portions so that you can take individual length x width portions, find the square footage of each of these rectangles, and then add them up.

For example, if your yard looks like this:



Portion A is 20 feet x 50 feet ( $20 \times 50 = 1,000$  square feet) and Portion B is 40 feet x 30 feet ( $40 \times 30 = 1,200$  square feet), so your total square footage is 2,200 square feet ( $1,000 + 1,200$ ).

1 cubic yard = 27 cubic feet (1 yard = 3 feet  $3 \times 3 \times 3 = 27$ )

If you were going to cover your lawn 12" (1 foot) thick, 1 cubic yard of compost would cover 27 square feet. One foot thick is not likely though. To figure how far the compost will go, decide how thick you want to apply. When application guidelines show a range (ie: 2"-6") use as much as your budget will allow, taking into account how good or bad your existing soil is.

6" thick?  $12''(1 \text{ foot}) \div 6'' = 2 \times 27 = 54$  sq ft. 1 cubic yard will cover 54 square feet 6" thick.

3" thick?  $12''(1 \text{ foot}) \div 3'' = 4 \times 27 = 108$  sq ft. 1 cubic yard will cover 108 square feet 3" thick.

1" thick?  $12''(1 \text{ foot}) \div 1'' = 12 \times 27 = 324$  sq ft. 1 cubic yard will cover 324 square feet 1" thick

Calculating how much compost you need based on your square footage:

Example: 4,000 square feet

6" thick?  $12''(1 \text{ foot}) \div 6'' = 2$ .  $4,000 \div 2 = 2,000 \div 27 = 74$  cubic yards of compost

3" thick?  $12''(1 \text{ foot}) \div 3'' = 4$ .  $4,000 \div 4 = 1,000 \div 27 = 37$  cubic yards of compost

1" thick?  $12''(1 \text{ foot}) \div 1'' = 12$ .  $4,000 \div 12 = 333 \div 27 = 12$  cubic yards of compost

## WHY LOCAL COMPOST?

**Buying Local compost supports recycling programs in Hawaii!** Local composts are generally as good or better quality and less expensive than imported products which have high shipping costs. Also adding local compost adds microorganisms which are part of Hawaii's ecosystem and are good for Hawaii's plants. Adding compost from somewhere else may provide microorganisms which are not the ones your Hawaii plants want and need.

## **References:**

**The Compost Foodweb**, Soil Foodweb Inc.

**Composting Q & A**, The U.S. Composting Council

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**Knowledge for the Commonwealth. Compost. What it is, and What's it to you,**  
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