Compost
Just the very Basics!

Extracted from Sustainable Nutrition Manual: Part 2  Healthy Environments

Sustainable Nutrition Flyers are adapted from the:

Sustainable Nutrition Manual (SNM)
Food, Water, Agriculture & Environment

World Food Programme

Endorsed by Malawi’s
Ministry of Agriculture, Irrigation and Water Development
Agricultural Technology Clearing Committee
2016 February 27th.
First published by World Food Programme (WFP) Malawi as:

Additional electronic copies are available from:

Ministry of Agriculture, Irrigation and Water Development
Department of Agricultural Extension Services (DAES), Nutrition Unit
PO Box 594, Lilongwe, Malawi
Agricultural Communication Branch
Phone: +265 (0) 1-751-221
Email: AgricNutrition@gmail.com

World Food Programme Malawi
Post Office Box 30571, Lilongwe, Malawi
Phone: (+265) (0) 1-774-666, fax: (+265) (0) 1-773-785
Website: http://www.wfp.org/countries/malawi
E-mail: wfp.lilongwe@wfp.org
Facebook: www.facebook.com/wfpmalawi1
Twitter: WFP_Africa

NeverEndingFood
Post Dot Net, x-124 Crossroads, Lilongwe, Malawi
Facebook: https://www.facebook.com/nordinmalawi
Twitter: https://twitter.com/NeverEndingFood

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Compost: Nature's Digestive System

Compost mimics nature to put together a mixture of different types of organic matter that breaks down quickly, decays and becomes nutrients for the soil and for the plants that grow in that soil. Compost is food for the soil.

Composting is very important in Permaculture and Sustainable Nutrition but is not, on its own, the answer to most soil problems. Composting will have little effect on soil fertility if people carry on burning, over-sweeping, mono-cropping, and throwing plastics into the soil. So it is best to improve the site in many different ways. Reduce the amount of sweeping, tilling, burning and increase the amount of mulching, using nitrogen-fixing legumes and animal manures of all kinds. Remember that Nature always has diversity!

Let us remind ourselves of how the Nature Cycle and Human Body digest and absorb the nutrients from food. Composting speeds up this process:

- **Food variety**: Nature covers the soil with lots of different organic matter (dead plants and trees, animals and insects). Nature, like humans, gets all the nutrients it needs when there is a variety of different foods to eat.

- **Chewing**: Insects and animals, weather and climate 'chew' the organic matter into smaller pieces, as we do with our teeth. When moisture is present from dew or rain, the organic matter disappears into the soil quickly. This is just like the juices in our mouths, with the saliva helping us to swallow food.

- **Digestion**: The smaller pieces mix with micro-organisms in the soil and release the nutrients from the organic matter. This is similar to the chemicals (enzymes) in our saliva and stomach that mix with the foods and break it down to release the nutrients.

- **Absorption**: Most nutrients go in to the plants and trees through the roots. They give the plant energy to grow, flower, make seeds and fruits and protect itself from disease and insect attack. This is similar to how we absorb nutrients in our intestines to give us the energy we need to grow, work, play, heal ourselves or fight off illness.

**What to put on compost piles**

- **Almost all natural (organic) materials** can be composted: leaves, grass, sticks, kitchen scraps, manure, urine, bones, blood, feathers, fur, hair, natural man-made items such as baskets, mats, rugs, cloth, wool, leather, paper, cardboard and metals that can rust. They all take different amounts of time but will all break down eventually and feed the soil. (Glass and broken pottery could go in a compost heap but they break down slowly, they might be coated in chemicals, and can be dangerous when people handle the compost. So be sure to consider each item before adding it.)
Artificial materials should never be put on the compost pile: fossil fuel based plastics, nylon, Styrofoam, batteries, chemicals or mineral oil products. They will not decompose properly and if they do break down the smaller parts are likely be poisonous to your plants.

Air, water and heat are vital to the composting process. If one of these is missing or there is not enough, or too much, the process will not work or it will be slow. The amount of air, water and heat should be well balanced, a skill that will be learned with time, practice and monitoring the compost.

Micro-organisms speed up the decomposition. These could be taken from nature as humus (the organic-matter rich top layer of soil) or using compost from another pile, or from worm castings.

Chopped up materials will make decomposition work faster, but the chopping is more work so decide if it is worth it. (It is good exercise if you need to be more active!)

Adding a little charcoal can also help the composting process.

**Where to build the compost sites**

Choose one or a few sites for your compost and think about where you put them carefully. (Remember the 80:20 rule!) Make them easy to make, manage and use, so you can make best use of the nutrients.

- **Near your kitchen** so you can put kitchen scraps on easily. The finished compost can be used on the food beds near your kitchen.
- **In the orchard and under trees** so the compost will be shaded. It will not dry out so fast and it will feed the trees as nutrients seep out and into the soil.
- **On fallow beds** in your garden or fields, while the soil is ‘resting’ or lying fallow. Add nutrients to the area by building compost piles. You can leave an area fallow for just one season or for several years.
- **In your fields.** As you are harvesting the crop residues can be layered in the compost and spread out in the field at the start of the next season.
- **Near animal pens or edges of ponds.** To make the easiest use of your animal manure the compost can be made inside animal pens. The animals help in breaking down the organic matter by digging, scratching, chewing and adding their urine, manure and feathers.
- **As part of your family’s, or community’s, toilet system.** We will look at composting toilets in detail in the next topic.

**Making and using compost**

Composting is so easy! There are many methods and whether you compost in a pile, in bins or in a pit, all composting is done using the same principles. We will begin with a compost pile, as it is usually the easiest one to make. If you have enough composting materials get several piles going at once. If you can start a new compost heap, pile or pit every week, you are likely to always have a supply of wonderful compost to feed your soil.

Make the first bottom layer out of the largest pieces of compostable material as they take longest to decompose, like large bits of wood and tin cans. Big pieces help to let air into the pile, which is needed for the process. If the pile is too compacted it will just sit there doing almost nothing. For the next layer, add dry materials like grass, crop residue, leaves, etc. Then add a layer of wet materials like kitchen scraps, manure, urine, etc.
Lay alternate wet and dry layers until the pile is a metre or 1.5 metres tall. The compost pile in the picture is just an example, but every compost heap is a bit different.

**Include a lot of nitrogen material** in your mix, like leaves, seeds or pods from legume plants, as this is the nutrient that plants need the most.

**Add a bucket or two of water** to get the compost heap started; if the pile is dry the materials won’t break down quickly. Re-used water from washing clothes or dishes or from cooking is less wasteful.

**Finish with a layer of dry mulch** so that the wet layers do not attract flies and insects. If your area is very dry, you might want to cover the pile with large fresh banana, palm or papaya leaves, or with mud to help keep moisture in the pile.

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The different layers are listed from the ground up:

- On the bottom of the pile: Large pieces
- Organic matter (dry)
- Manure (wet)
- Grass (dry)
- Kitchen scraps (wet)
- Soil (dry or wet)
- Repeat until it is a height that is comfortable for you (1.5 meters or so), the pile will reduce by almost half as it breaks down into soil.
- Pour on water so everything gets damp, or even better, put urine on it, which is wet, full of nitrogen and speeds the decomposition
- Cover the whole pile with leaves to hold in the moisture and protect the pile from losing nutrients to the air and sun. The leaves can be a layer of dry mulch or use large leaves such as banana leaves.
Temperature stick: Take a long wooden pole or branch and poke it into the middle of the heap. After few days pull the pole out and see if it is hot or warm. As the pile decomposes it generates heat, so if the pole is hot, it is working nicely!

Put some water on the pile about once a week in the dry season. Re-use washing water from the kitchen or laundry. You can also put urine straight onto the pile.

After about 3 weeks turn the pile. Use a spade, or other method useful to you, to turn it upside down while moving it from where it is to the space next to it. Move the top of the pile and put it on the ground next to the pile, then continue moving the pile, layer by layer, until it is all in the new place, next to where is was before. Essentially you turn the pile upside down. This copies what animals do in nature to mix up the materials with fresh oxygen and help the decomposition.

Put large un-rotted pieces, and hard items like metal, in another place to become the bottom layer of a new pile. Let chickens and other animals scratch around in the compost. It helps mix up the different materials and the chickens get to eat a very good diet and add their manure and feathers. Add some water when the pile has been turned. Leave it for another 3 weeks and turn it again.

The compost will probably be ready to use after 1-2 turns (6-9 weeks), depending on your local weather conditions and what you’ve used to make the pile.

Compost pit

A pit compost is just the same but you put the compost in a hole in the ground instead of on top. Digging the compost out of the hole is harder work than the pile method, but if there is already a hole left from brickmaking or some other purpose, it may be a useful way to use the space. There are also other benefits to having a compost pit:

- A compost pit does not need to be turned over, but it will usually take longer to decompose than a pile (12-16 weeks).
- A compost pit does not need water added every week because the pit does not dry out as much as a pile, but adding water every few weeks can help. Adding urine directly to the pile is easier when it is in a pit, especially for women!

So think about it, then choose the method that is right for you, or choose several different methods!

Using finished compost

The amount of nutrients in the compost depends on what it was made with. The more diverse the ingredients, the more diverse the compost will be. Good compost will be a dark colour, it will feel crumbly, a little bit damp and it will smell rich and earthy. Compost can be used like this:

- Dig a handful or more of compost into the soil when planting seeds or seedlings to give them a really good start.
- For a tree dig a bucketful or more of compost into the planting hole.
- As a top dressing, spread the compost on top of the soil around growing seedlings or plants. Then cover the compost with some mulch to protect the nutrients from sun, wind or rain. This called top dressing.
- Make compost tea using the recipe for green or animal manure tea. You will have a really good liquid fertilizer for areas that need extra nutrients.
- Put compost in paper or cardboard tubes or directly in a seed nursery bed. Seeds will be given a healthy start to life.
- Use a bit of compost in fishponds to enrich the water for the fish.
Natural sources of NPK

Each item listed in the table below contains NPK plus other useful nutrients and fibres (hair, fur and feathers, etc.) that really help the soil's structure and micro-organisms. You do not get all this in a sack of NPK!

These are the three most important nutrients, but remember that all 15 nutrients are important for the soil. Your soil will have all the nutrients it needs if it gets a diverse diet, supports many types of plants, trees and animals (appropriate for your area) and if you take care to conserve your soil.

<table>
<thead>
<tr>
<th>Source Type</th>
<th>Nitrogen (N)</th>
<th>Phosphorus (P)</th>
<th>Potassium (K)</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Sources</td>
<td>• Manure and urine of small animals: bats, pigeons, rabbits, worms, etc.</td>
<td>• Decomposition of all sorts of organic matter</td>
<td>• Ashes</td>
</tr>
<tr>
<td></td>
<td>• Human manure and urine, fish and blood, hoofs, horns, animal hair and feathers</td>
<td></td>
<td>• Molasses</td>
</tr>
<tr>
<td></td>
<td>• Leguminous plants, tea leaves, tobacco</td>
<td></td>
<td>• Tobacco</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Blood</td>
</tr>
<tr>
<td>Medium Sources</td>
<td>• Manure and urine of medium sized animals: chickens, dogs, rabbits, etc.</td>
<td>• All parts of small animals and manure</td>
<td>• Urine</td>
</tr>
<tr>
<td></td>
<td>• Bones, coffee grounds</td>
<td></td>
<td>• Potato tubers, some grasses, straw</td>
</tr>
<tr>
<td>Lower Sources</td>
<td>• Manure and urine of larger animals: cows, horses, sheep, pigs, ducks, etc.</td>
<td>• Manure from larger animals: cows, goats, horses, pigs, sheep</td>
<td>• Animal manures</td>
</tr>
<tr>
<td></td>
<td>• Egg-shells</td>
<td></td>
<td>• Plant scraps</td>
</tr>
</tbody>
</table>

Green Manures

Green manure means feeding the soil nutritious green plant matter. Green manures are often legumes, but not always. As well as legumes, there are other types of plants called nutrient accumulators, like tithonia or amaranthus (bonongwe) that gather together different nutrients in their leaves and stems. Feeding these plants to your soil gives it extra vitamins and minerals. There are many ways to use green manures.

- **Mulching with green manure trimmings** is when fresh green material is trimmed off plants and trees and laid on the ground as mulch. Green manures can be inter-planted or put on the edges of gardens and farms to make it easy to add green mulching all year. They could be added as hedges, contour strip planting or dotted throughout your design. They are especially useful when they are leguminous species.

- **Incorporating the whole young plant into the soil** - plants are allowed to grow for a while and then they are cut down when they are still green and either used as mulch or dug back into the...
soil. With this method you do not eat the plant, or you only eat a little of it. Most bean leaves are nutritious food that can be shared with your family and your soil!

- **Cover cropping** is often used to protect the soil after the main crop is harvested. They are usually legumes but not always. It keeps the area covered in the ‘off’ season, protecting the soil from wind and water erosion, and it boosts the fertility of the soil for the next season. Which plants you use as cover crops would depend on the weather, the amount of water available and which seeds are available. They are often dug back into the soil when the next cropping season arrives, or cut back drastically and used as mulch. The timing of all this would depend on the species, area and farm designer.

- Green manure tea is when green plant material is put in water and allowed to sit until it ferments. Use about 1 handful of green material per litre of water. The green manure is stirred occasionally (usually every day) to make sure the plant material mixes well with the water. It is usually quite smelly! After 2-3 weeks you can start using it by diluting it at about 250 ml of green manure tea to 10 litres of water. This same recipe can be used with animal manure or with compost.

**Animal Manures**

Different manures have different strengths but, very often, the smaller the animal (worms, bats, termites) the stronger the manure is; using manure from small animals makes a big impact! The manure of large animals like elephants and cows have much more fibre in them and is not as nutritious for the soil, but it still adds a variety of nutrients in smaller amounts, and improves the soil structure.

**Using animal manures**

**Use well-rotted manure.** Most fresh manure, especially from the stronger manures, must have time to fully decompose or ‘age’ (rot down) before using it on plants and trees. This so the nutrients have time to change into a form that plants can use easily.

**Always wash your hands** after handling fresh manure because it has germs, and can carry plant and human diseases. When manure has been composted properly the germs are killed, leaving only nutrients for the soil. You should always wash your hands after working with soil (even if you have not been using manure) because there might be germs in it.

**Manure should be used as a layer in compost piles.** Composting is covered in more detail on page 43, but basically you make piles that are layers of different types of plant organic matter and animal manures. Never use fresh manure or fresh kitchen scraps as the top layer as it attracts flies, and easily loses its nutrients to the air, heat and water / rain (the same inputs we talked about that harm or steal nutrition during food processing and storage) so always cover it with soil or dry organic matter.

**Using bedding (straw or dry plant material) in animal pens** to help soak up urine and make it easier to collect the manure. After some time, take out the used bedding and use it as a layer in the compost pile or as mulch directly on your field. Put another layer of mulch over it to help the nitrogen to enter the soil and not be lost to the air. Add new fresh bedding for animals. Different animals will need different types of bedding and different timings for changing the bedding.
Make liquid manure using a similar process as for green manure teas (see page 36). Add a 10 L pail of manure to a 50 L drum of water and stir it every day for 30 days. It is easy if you put the manure in a cloth, mesh or net bag (or plastic with some small holes in it) and hang it in the water so you do not have to strain the manure out at the end of the process. It will smell so put the drum somewhere that you do not mind having the smell! Make sure the drum is covered to keep insects away. After about 30 days, dilute it at about 250 ml of manure tea to each 10 L of water for application – depending on the crop it is being applied to.

Maintaining Good Soil

Do not tread on the soil or compact it

Now that you have made fertile and well-structured soil, do not ruin it by walking on the soil and squashing it!

When a path is walked on over and over it gets really hard. Water cannot easily soak into it and roots find it hard to grow through it. Little creatures will go somewhere else where the soil is easier to tunnel through. You do not want this to happen to your soil if you want plants and trees to thrive!

Make well-marked pathways and roads for people, bikes, carts and motor vehicles. We will discuss this more under design, but it is good if you start thinking about it now.

Do not dig or hoe unless you really need to

Hoes, spades, forks, shovels and tractors all disturb the soil and animals, roots and insects that keep soil crumbly so it can absorb water. If you mulch, compost and plant a good variety of plants and trees and mix in some animals, you will hardly need to dig at all.

Look after the land whether you own it or not

All land belongs to all of us in the world and future generations. If your parents and grandparents took care of your area and thought ahead, then you may have a nice area to live. If not, then you have a lot of repair work to do so that you leave things better for your children or whoever takes care of your land after you.

Treat the land with care and respect, and encourage others to do the same. It would be good if every person who lived in a place could improve it. You do not have to spend a lot of money – sometimes the changes that need to be made are completely free! You just have to take care of it, improve it for your own benefit and for the people that will live there in the future.
Your notes
Sustainable Nutrition Manual
Food, Water, Agriculture & Environment

This manual is for people who eat, grow or buy food and who want to improve their lives, their community and the environment that they live in. It has been written for, and by, people living in Malawi. It will show you how to eat and live better and guide you in designing a sustainable future. The manual aims to show that by thinking differently and thinking sustainably you can improve your heath, diet, lifestyle and surroundings easily and cheaply and gain an understanding of the term Sustainable Nutrition.

Use the ideas in this manual and you will be able to:

- Improve your diet and health
- Save money that was spent on food, medicines and chemicals
- Double or triple yields and harvests (or even more!)
- Reduce the amount of watering in your gardens and orchards
- Reduce the amount of work done on your land and in your home
- Have healthier plants and animals
- Reduce infertile and unproductive areas of land
- Use free resources to improve soil and water in your area

Part 1 - Healthy Humans is about the human body and nutrition. You will also learn about food choices and the benefits of diversity in diet. It has lots of useful ideas to improve life and many delicious recipes and suggestions for tasty, healthy meals.

Part 2 - Healthy Environments is about natural systems and sustainability. You will learn about the Nature Cycle and the Water Cycle and natural sustainable systems. You will be introduced to Permaculture ideas and gain an understanding of the benefits of diversity in Nature.

Part 3 - Healthy Designs is about designing for sustainable living. This book brings parts 1 and 2 together and guides you to make a personalised plan for Sustainable Nutrition. This book is a practical one to use to design everything on your land. There is lots of information in the appendices about foods of Malawi and other resources that will be useful as your design develops.

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