



The biofertilizer manual

A step-by-step guide on how to make biofertilizer at home



ROCKIN SOILS

The biofertilizer Manual

A step-by-step guide on how to make biofertilizer at home

This manual provides step-by-step instructions on how to make biofertilizer at home in an easy and cheap way. It is targeted at smallholder farmers.

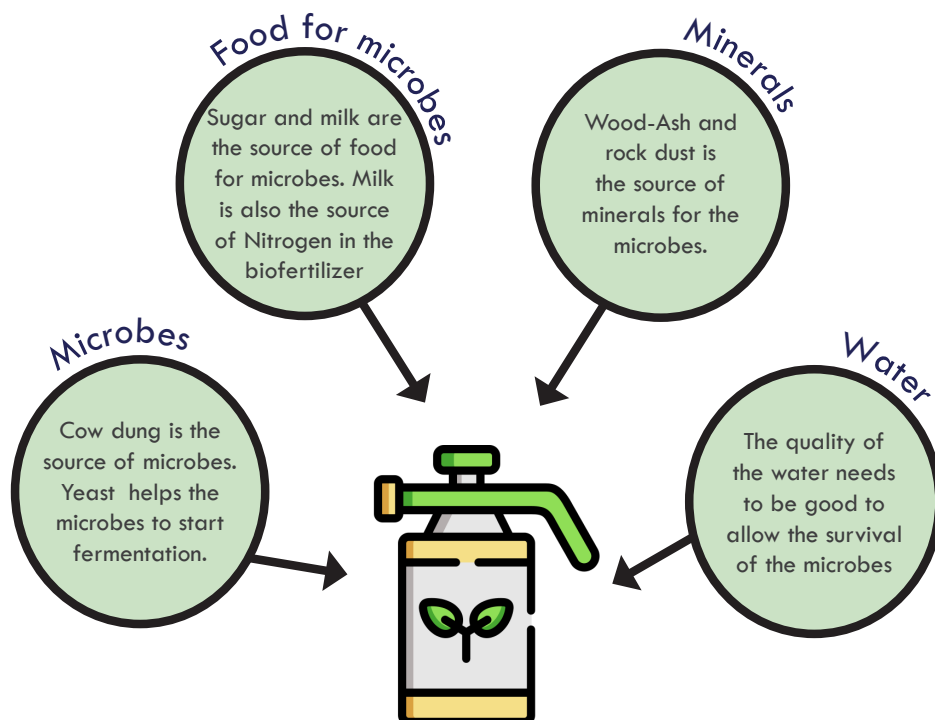
This manual is one of the many anticipated outputs of the Green Future Farming Program (GFF). The GFF is a 4 year program being funded by the IKEA Foundation. The program will focus on promoting and supporting regenerative agricultural practices, improved water management, and resilient circular rural economies. The project is being implemented by MetaMeta (Ethiopia), AidEnvironment (Uganda), and JustDigIt (Kenya) together with numerous local partners.

July, 2020

Introduction

Biofertilizers

Biofertilizers are a fermented product made from cow dung, milk, sugars, ashes, and rock dust mixed with water. After a month of fermentation, the solution will contain numerous minerals and compounds that feed and protect plants from insects and pathogens. Biofertilizers are a good alternative to chemical fertilizers for several reasons. Chemical fertilizers need to be bought, which means they depend on timely distribution and availability, and are a significant expense. Since biofertilizers are produced at home or on the farm, they are always available when needed and can be produced with locally available materials at minimal cost. Additionally, chemical fertilizers, while offering a short-term nutritional boost to the soil, leave the soil depleted of nutrients and soil life by the end of the growing season; these leaves the farmer dependant on buying and using more fertilizer every season! In contrast, biofertilizers nourish, regenerate, and reactivate the soil's life as the benefits build up with successive applications. This manual will show you how to make your own biofertilizers and break your dependency on imported chemical fertilizers by investing in your soil.



Biofertilizer Manual

1. Ingredients

All the ingredients listed here should be easily available around the home and farm. Follow the steps in the next section to learn more about how to use these ingredients to make your biofertilizers.



cow dung



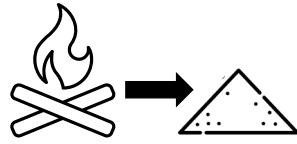
yeast



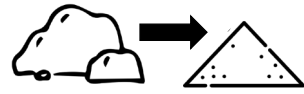
sugar



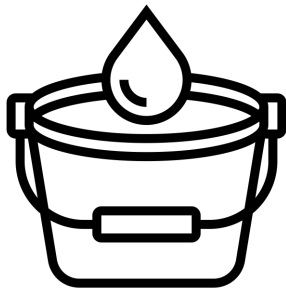
milk



wood-ash



rock dust



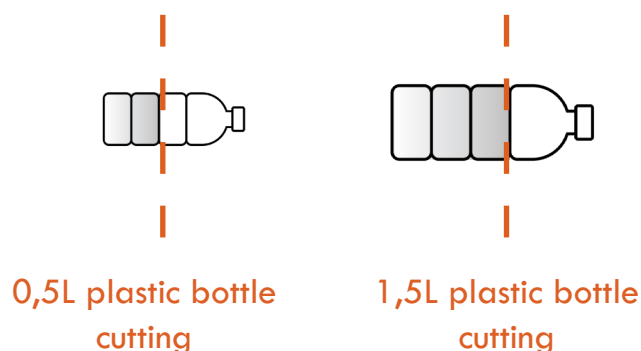
rain water

2. Equipment

Here is a list of the tools you will need to mix, ferment and apply your biofertilizers. Most of these tools should be easy to find around the farm and town at very low cost. Just make sure that the plastic container in which the biofertilizer will be fermented has an air-tight lid - the fermentation process is anaerobic so you want to avoid fresh air getting in there.



* The two plastic bottles and the knife are needed to set a measuring device. You cut the 0,5L plastic bottle in half to create two units of 0,25 L, which will be called 'U1'. Similarly, you cut the 1,5L plastic bottle in a way to create one unit of 1L, which will be called 'U2'.



3. Preperation

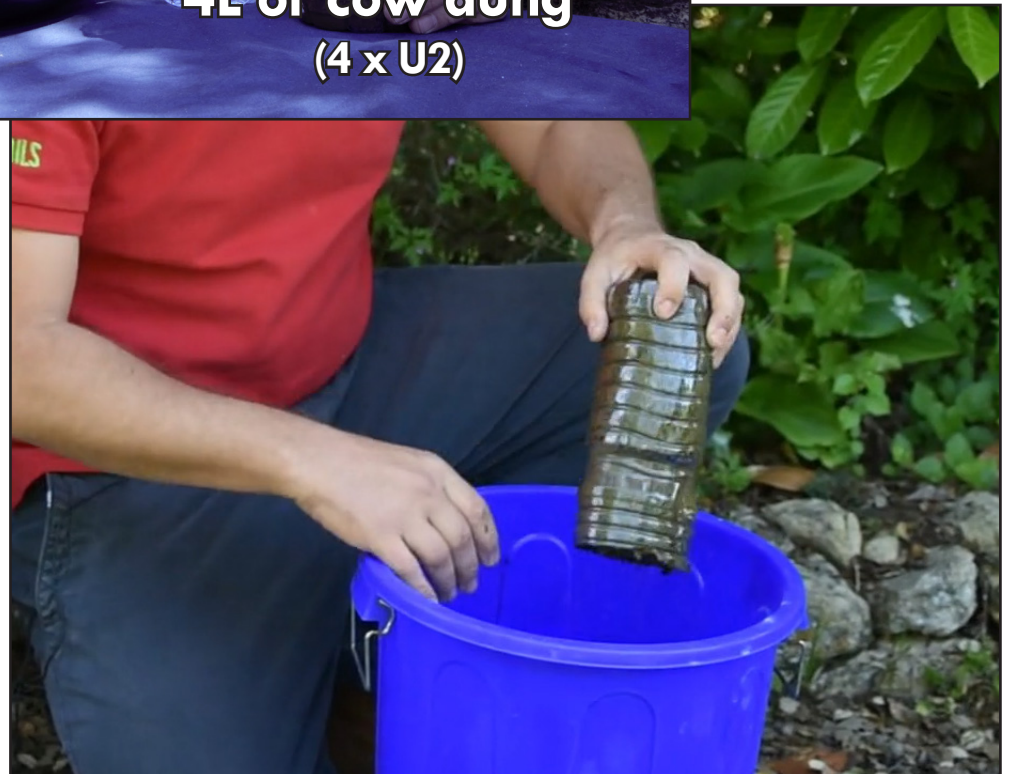
STEP 1

Mixing the ingredients

Add the cow dung in the big bucket by using the 1L measuring device 'U2'



You should use fresh cow dung from a healthy cow. Inside the cow dung there is a big variety of microbes that are experienced in breaking down organic matter and minerals into plant food.

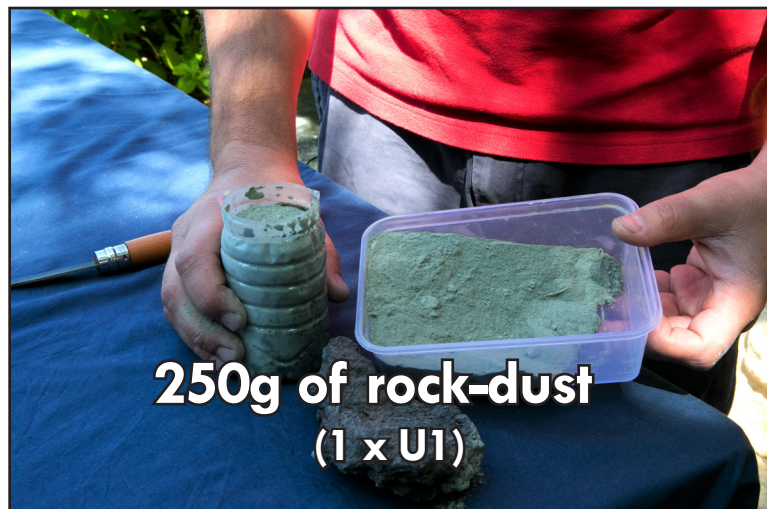


3. Preperation

STEP 1

Mixing the ingredients

Add the minerals in the bucket by using the 0,25L measuring device 'U1'



Wood-ash

The wood-ash can be collected from your kitchen. It is suggested to use natural woods with no paint or glues.

Rock-dust

To make the rock-dust, you crush the rocks with a hammer and then you sieve them with a piece of cloth. It is suggested to use volcanic rocks.

3. Preparation

STEP 1

Mixing the ingredients

Add water and we stir the mixture



Add Water

It is suggested to use a good quality of water (freshwater or rainwater) to ensure the survival of the microbes. We want to keep the microbes alive to ferment and produce the fertilizer.

First add 2-3 L of water and stir until the mixture becomes a paste and then add more water and stir again.



Stiring

Make sure to stir very well so that all the ingredients are evenly distributed in the mixture.

3. Preparation

STEP 1

Mixing the ingredients

Prepare the starter for the fermentation by adding milk, yeast and sugar in the small bucket and mixing them well.



Cow milk

Cow milk is food for the microbes and the source of nitrogen to your fertilizer. You can use fresh milk or sour milk.



Sugar

Sugar is food for the microbes. You can use all types of sugar (white sugar, brown sugar, molasses) depending on what you can get from your local store. It is recommended to use brown sugar or molasses since they are richer in minerals.



Yeast

Yeast will activate and start to ferment as soon as it gets in contact with the sugar and the milk.

3. Preperation

STEP 1

Mixing the ingredients

Add the starter to the buket with the mixture of the cow dung and the minerals and we mix well. Then add water up to a volume of 20L and stir until is well mixed.



Mixing is key

Mix until all ingredients are incorporated/evenly distributed

3. Preperation

STEP 2

Fermentation

Add the mixture in the fermentation tank and then close the tank well.

It is important to use a tank that has a rubber tip and to make sure that when it is closed no air can enter or leave the container. You can test this by closing the container and squeezing it, if it compresses then air is escaping, if you cannot compress it then the seal is air tight.



3. Preperation

STEP 2

Fermentation

Leave the fermentation tank in the shadow for 30 days.

Every day open the tank to release the gas and then close it again.



Store the fermentation tank in the shadow to protect the microbes from the sunlight because it can kill them. During the fermentation which lasts for 30 days, gas is produced. For this reason, you should open the tank every day to release the gas and then close it again. After 30 days you can use the biofertilizer but if you do not need it, you can store it for a long time well closed in the shadow.

3. Preperation

STEP 3

Application

Sieve the fermented biofertilizer by using a net.



Solid particulates would get stuck in the sprayer so it is important to remove them all before pouring the mix into your sprayer.

3. Preperation

STEP 3

Application

Add 1L of the sieved biofertilizer in the 20L sprayer, fill the rest with water and then close the sprayer.



If you have a 16L sprayer, the dilution has to be adapted as follows:
if 1:20 for the 20L sprayer, then 0,75:16 for 16L sprayer (half filled 1,5L water bottle).



3. Preperation

STEP 3

Application

We spray the plants!

How to apply the biofertilizer?

Spray the entire plant and in particular the underside of the leaves where the ‘stomata’ are located or in other words the mouth of the leaves, from where the nutrients can reach to the plant.

When to apply the biofertilizer?

The best time for spraying is either early in the morning or late in the evening. Do not spray in direct sunlight. The sunlight can not only burn your plants through the “lens effect” from droplets on the leaves, it can also degrade nutrients contained in your solution. In the evening, the plant’s stomata are fully open, which allows for a quicker intake as compared to during the day.

Avoid spraying when is too hot or too cold. In hot temperatures, your plant’s stomata will be almost closed, making the spraying less effective. On the other hand when it is too cold, spraying could promote fungal growth which might harm your plants. Also, avoid spraying when you expect bad weather (rainfall and wind storms) since this can wash away or dilute your biofertilizer solution.



3. Preperation

STEP 3

Application

We spray the plants!

How much biofertilizer to apply per hectare?

20L of biofertilizer per hectare is an aproximate volume but in reality the volume depends on biomass, which means that the large plants will need more product.

Application scedules:

In the table below you can see the number of applications during the cycle for different types of cultivations. Intervals between applications can be shortened according to crop peak demands (flowering and early fruiting).

Type of cultivation	Number of applications during the cycle
Nursery horticulture	3
Horticulture	5
Nursery perennials	7
Fruticulture & perennials	12
Annual wheat, maize, and beans	8



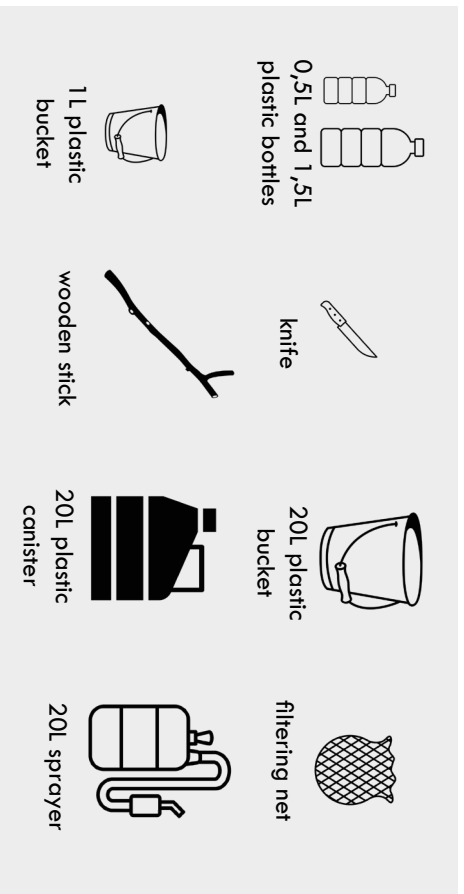
How to prepare 20L of LIQUID BIOFERTILIZER

Good for

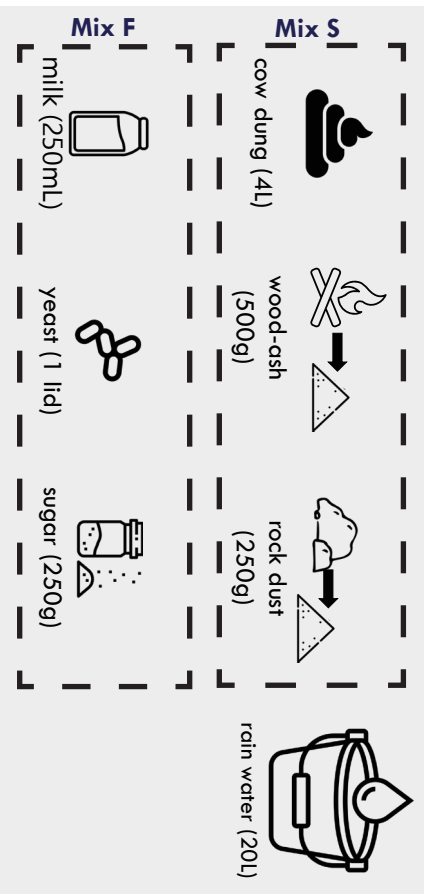


- Feed plants
- Protect plants from insects
- Stop pathogen growth

Equipment



Ingredients



Preparation

Day	Steps
1	<ol style="list-style-type: none">1. Find a place away from sun/rain2. Add mix S in the 20L bucket + stir3. Add water (2-6L) to the mixture + stir4. Add mix F to the mixture + stir5. Add water to the mixture until 20L + stir6. Transfer the solution to the plastic canister and close the lid tightly.7. Store the canister in a dark place and keep it away from children.8. Open the canister every day to release the gas and then close it again (for 30 days)
Day 30	

Test

Colour: brown or gold/never purple nor blue
Smell: fermentation/ never putrid
Application: Spray some plants and observe plant reaction before use

Application

- Spray on leaves (spray under to reach leaves' stomata)
- Spray early in the morning or late in the evening
- Spray when the weather is good (no rain/wind)
- Avoid spraying during flowering
- Apply approximately 20L of diluted biofertilizer per ha