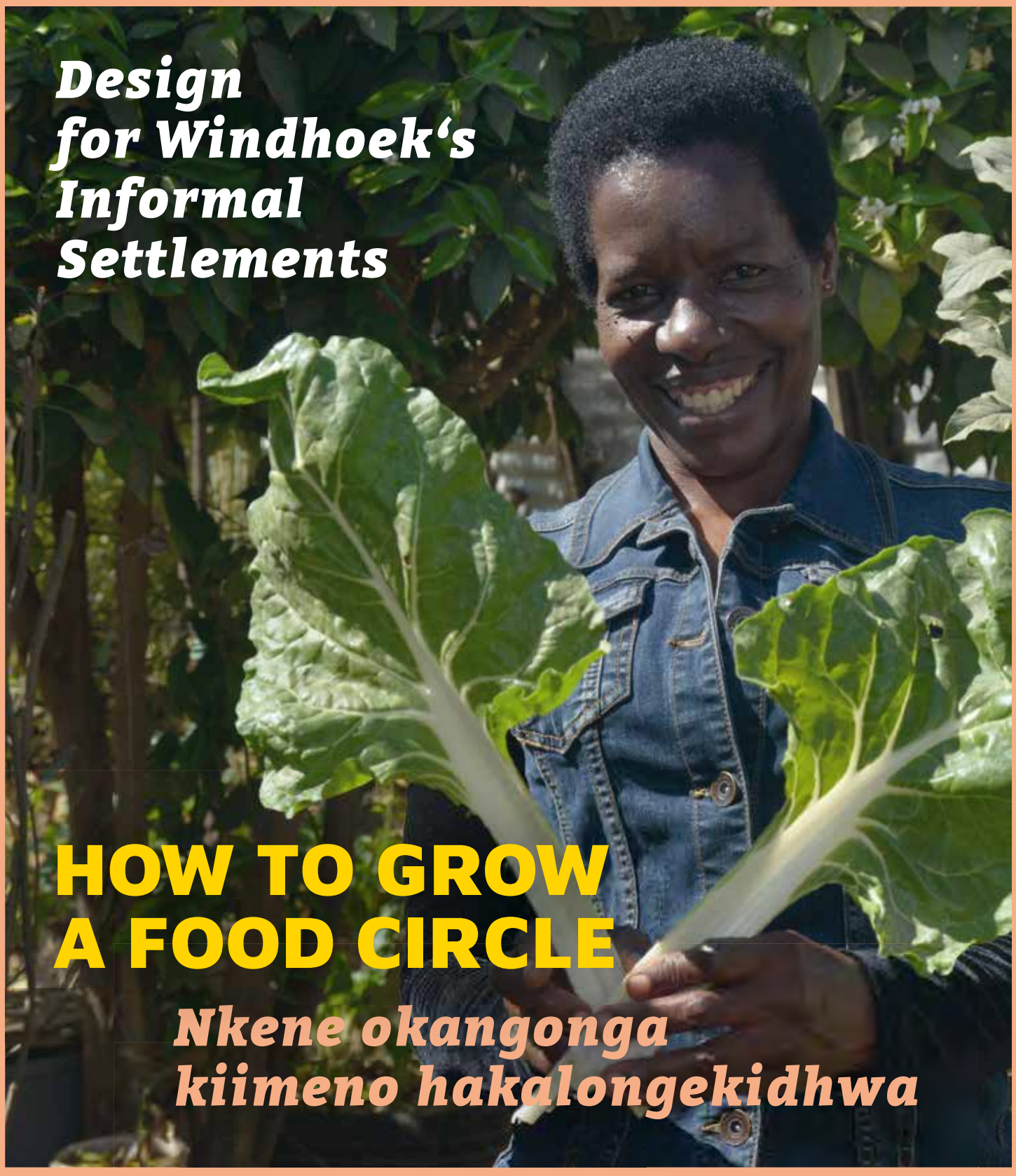
PERMACULTURE PLAYBOOK



Design for Windhoek's Informal Settlements

HOW TO GROW A FOOD CIRCLE

Nkene okangonga kiimeno hakalongekidhwa











Dear reader,

thank you for picking up the Permaculture Playbook. We hope you will enjoy it and will be inspired to try out permaculture at your home. Why are we publishing this booklet now?

Because we are already successful. With the food circle we have a system that is tried and tested in Windhoek's informal settlements. A food circle is a small garden based on a permaculture pit bed – a planting bed around a compost pit. People grow trees and vegetables using their grey water. Today, more than 250 people in Windhoek's informal settlements are growing food circles. At the Kambashu Institute, we have them all logged with satellite data and are in an ongoing conversation with these successful growers, our Star Club. Together, we are learning how to grow food in Windhoek – and we want to share our experiences with you in this booklet.

Because we are trying. There are a number of permaculture projects mushrooming across Namibia. People are testing solutions, connecting with each other and exchanging ideas. Knowledge creation is happening across the country. At the Kambashu Institute, we are moving into designing more permaculture based household solutions such as dry toilets and water batteries based on agroforestry principles.

Because change is coming. Climate change means rising temperatures, less rain, shorter rainfall seasons, in Namibia and elsewhere. Shorter growing seasons will bring traditional mahangu farming in the north under pressure. To feed ourselves, we need to design and test new systems that work in our very special climate. We need to produce food everywhere we can. We need to build up our soil so it can store more water. We need to grow shade.

Because we believe permaculture can help. Design-based thinking has an important role to play in the informal settlements of Namibia. Yes, people want to move out of shacks and yes, people must own the land. Meanwhile, design thinking can create solutions to make life better now. We believe there is a gap between people who want to improve their lives and their access to design. This is the gap we are addressing.

Enjoy your read!

Ina Wilkie
Director
Kambashu Institute

CONTENT

INTRODUCING THE **FOOD CIRCLE** AND ITS BASIC DESIGN

What is a food circle?

A food circle is a planting bed around a compost pit. With a food circle, you can grow food and trees using your grey water. In Windhoek, the main vegetables we grow are spinach, onion, kale, carrots and beetroot. We also plant herbs like parsley, mint, basil and dill. Our trees are mulberry, guava, lemon, pomegranate and moringa. A good food circle produces food for the family to eat and also produce to sell.

Grey water

In the informal settlements, people fetch water from the tap and water is expensive. Therefore, for the food circle, we use grey water. This is water we have used before: The sandy water from washing our vegetables we use to water our vegetables. The water from the bucket shower we use to water our trees. And the soapy water from washing dishes and clothes we put in the pit to make compost.

Compost

You cannot just put water onto sand and expect things to grow. You must grow healthy, living soil. We make our own compost in the pit. For that, we use kitchen waste, a mix of other biomass like grass, leaves or cardboard. We add worms and manure. Then we use our compost to fertilise our plants and grow our soil.

Okangonga kiimeno oshike?

Okangonga kiimeno oko okampungu moka hamu kunwa iimeno kadhingoloka okalambo kuuhoho. Mokangonga kiimeno oto vulu oku kuna mo iikwamboga nomiti tolongitha omeya ngoka galonga nale. Movenduka iimeno mbyoka hatukunu ongaashi; oomboga, oonyanga, uuna wandesha niingumutulu yilwe. Ohatukunu ishewe iigwanga ngaashi; parsley, mint, ndjilikau noodill. Omiti dhetu o gaashi; eeMulberry, omakwaava, oongongo, eePomegranate noomolinga. Okangonga kiimeno kasilwa nawa osjhimpwuyu ohakeetapo iikulya yaanegumbo opo yavule okwiipalutha nokulanditha.

Momalukanda aantu ohaa teke omeya kuupomba ndele nee omeya ogena ondilo, Onkene tse mokangonga ketu kiimeno,ohatulongitha omeya nga galonga nale, ngaashi omeya nga hatulongitha oku yoga iikwamboga yetu. Omeya nga twiiyogitha nago ohatu tekelitha omiti dhetu. Omeya nga gena etutu lyothewa olindji ohatu gatula mokalambo tuninge uuhoho wetu.

Itovulu ashike okutula omeya mevi ndee totegelele pumene sha. Owapumbwa okutekula evi likale lina uundjolowele no mwenyo. Ohatu ningi uuhoho wetu mokalambo moka hatutula iilongithwa yomelugo, noomwidhi, nenge iipakete. Tse tatu gwedhamo uuyokahi, omazinyo nuuhoho wiimuna. Nopo nee tatu longitha uuhoho mbuka twaninga nokutekula evi letu.

Notice how you can provide nearly all these needs by careful planning only. You do not need a lot of money.

What you need

MORNING SUN

Plants need sunlight to grow. They will not grow well in deep shade. The best sun for them is morning sun. For your plants to catch morning sun nicely, your food circle should be open to the sun towards the north-east. That way, it will catch morning sun both in summer and in winter.

AFTERNOON SHADE

Especially in summer, plants will suffer in the hot afternoon sun. This sun comes from the west and south-west. We want to provide shade from this hot afternoon sun. One way to do this, is to plant a tree into the west, south-west corner of your food circle. A mulberry, for example, will provide shade after only one year.

LEVEL GROUND

Water always travels downhill. Notice that when the rains come, the water washes everything downhill – seeds, soil, plants and sometimes houses. That is why we never plant on slope. You need to level your plant beds as best as possible. At the Kambashu Institute we can teach you how to make an A-frame and how to use this tool to handle slope.

SHELTER FROM WIND

Our winds are very dry and we should keep them away from our plants. In summer, the winds often come from the east and south, in winter from the west. However, the mountains of the Khomas Hochland influence the wind direction a lot. Where you are on a hillside will determine from where the wind hits your garden. Therefore, you need to notice where the wind hits your erf and put up some protection.

COVER AGAINST FROST

Warm air rises up; cold air falls down. Therefore, generally, the coldest places are in the river beds and the warmer places on the hills. In most places in Windhoek we need to protect our plants from frost in cold winter nights. This is especially important for young trees. Check the weather forecast in winter and when the night will get cold, cover young trees with an old T-Shirt or cardboard.

PROTECTION FROM PEOPLE AND ANIMALS

The biggest challenge for any gardening activities in the informal settlements is disturbance by passers-by, children, as well as animals such as dogs, baboons, chicken. Is there a place on your erf that you can protect with thorny branches, wire, zinc or cardboard?

BIOMASS

Plants need food to grow well. You can supply this food by making your own compost in the pit – the hole in the middle of your food circle. Fill the pit with kitchen scraps, cut dry grass, small pieces of cardboard and add some soapy water.

MULCH

We never leave soil bare; we always cover it with organic material like grass, leaves or woodchips. This cover we call mulch. Mulch has many functions: It keeps the soil cool in summer and warm in winter. It minimises erosion through watering and rain. It decomposes and feeds the soil.

SEEDS

You can grow mulberry trees from cuttings. You can grow guava, lemon, pomegranate and moringa from seeds. You can grow herbs from the seeds you harvest. For vegetables, it is better to use seeds from the shop.

WATER

You can use your grey water for most of your food circle's needs: Water from washing vegetables can be used to water vegetables. Water from the bucket shower can be used to water trees. The very soapy water from washing clothes and dishes can be used to make compost.

What you get

VEGETABLES

Spinach (Swiss chard) grows well in Namibia, both in summer and winter. The food circle might be a small garden. But if you plant a line of vegetables in the outer circle, you can have 6 metres of spinach and onions, for example. Refer to the planting plan for ideas what you can plant in summer and what in winter.

HERBS

Herbs such as parsley, mint, basil or dill help repel pests. Many herbs are also very healthy. Adding them to your food or making teas with them gives you extra vitamins, minerals and antioxidants.

TREES

Trees give us shade, protection from frost, leaves for compost as well as food. While watering your spinach you are automatically watering your tree. When the tree gets bigger, it will also pull water and nutrients out of the pit with its roots.

FLOWERS

Marigolds can make a person happy and that is also an important function of a garden. Marigolds also scare away pests with their smell.

COMPOST

In the pit you make your own compost. You only use what you have or what you can get for free: kitchen scraps, grass you cut, leaves and grey water. You are producing your own fertiliser and it does not cost you a dollar! This compost helps build up healthy, living soil which can handle soapy water better.

SHADE

Every food circle should have at least one tree and that tree will give you shade – for the other plants in the food circle, for your house and for you to sit in and relax after gardening.

INCOME

A well-loved food circle will produce vegetables, herbs and fruit for your family. Spinach, for example, can be harvested every few days. If that is too much spinach for you, sell it to your neighbours to earn some extra income.

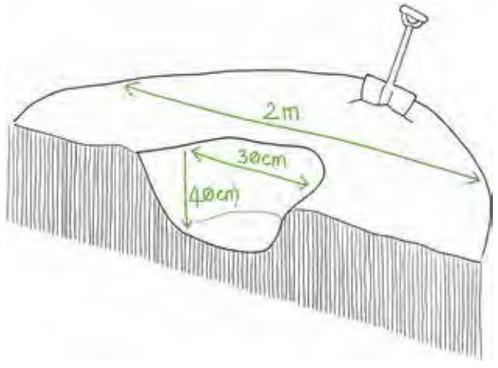
HOW TO MAKE **A FOOD CIRCLE**

Find the best place

This is the most important moment. You will now be a permaculture designer. Finding the right location for your food circle is the most important factor for your success.

- Stand on your erf and think about your water related activities: Where do you cook, wash clothes, shower? It is crucial that you build your food circle close to where you do these activities. Otherwise, it is unlikely that your food circle will benefit from your grey water.
- Stand on your erf and think about the movement of people and animals. Is there a place that can be easily protected from them?
- Stand on your erf and notice the movement of the sun. Are there places at which trees or houses give shade in the afternoon? If there is no place with afternoon shade, you can plant a tree into your food circle.
- Stand on your erf and consider the movement of rain water. Where does the water run during heavy rains? If rain water runs through the place of your food circle, you can dig a water battery to protect it.

Refer to the chapter on water batteries for more ideas.



Measure, dig and level

- Decide where your path to the pit will be. Imagine you are coming with a heavy bucket of grey water: Your path should give you the shortest way to the pit.
- Measure the pit. It should have a diameter of around 30 centimetres.
- Measure the planting bed. The easiest way is to attach a string to a pole that you hold in the middle of the pit and then rotate. If the string is 1-metre-long, you will create a circle with a 2-metre diameter.
- Dig the pit. It should be around 40 centimetres deep. Pile the earth around, creating a planting bed. Try to take out all the stones while you are doing that.
- Level the soil of the bed. It is very important that the planting bed is level so that the water sinks into the ground and never runs on top of the soil.

Fill the pit

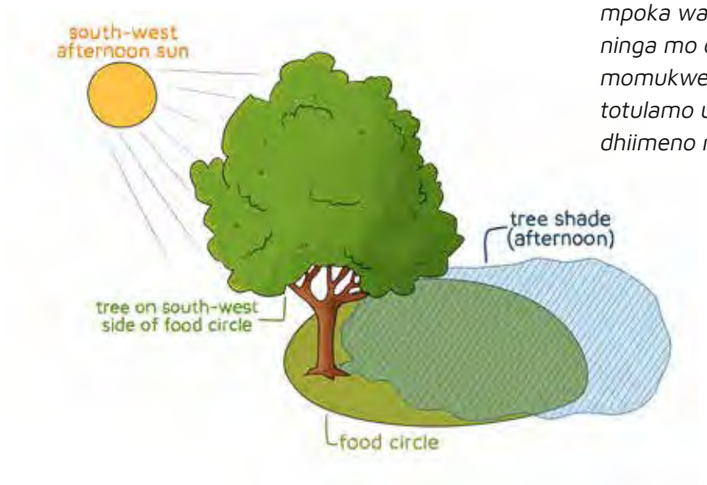
We always want our plates to be full so that we can eat. It is the same with the pit: You always want it to be quite full with a nice moist (but not too wet) mix of biomass. We want the pit to be a place into which plants like to put their roots and benefit from the water and nutrients in there.

At the beginning, fill your pit with a mix of small pieces of brown and green biomass and some grey water.

Refer to the biomass chapter to find out more about how to make a nice compost in the pit.

Prepare the planting bed

- Identify the south-west corner of your food circle. This is where you want to plant your tree, now or later. That way, it will shade your food circle from the hot afternoon sun. If you have a tree, plant it now.
- If you have seedlings, plant them now.
- Check again if the soil is level.
- Cover your planting bed with mulch. Refer to the mulch chapter to find out more about what this is and why we use it.
- Open up the mulch in lines where you want to plant. Fill these lines with some compost.
- Carefully add seeds and pinch the compost above the seeds.
- Make yourself a watering can and carefully water your seeds, seedlings and trees.



Nkene okangonga kiimeno hakalongekidhwa.

Oholongekidha ngiini okangonga kiimeno? Okukonga ehala ewanawa lyokangonga kiimeno osho oshinima sha simana. Tunga oka ngonga kiimeno keli popepi naampa holongele iinyangadhalwa yoye, ngaashi mpa hotelekele, mpa hoyogele iikutu, mpa hoiyogele kolutu, nosho tuu. Shika otashi kwathele elongitho lyomeya galonga nale meendelelo neyukililo mokangonga kiimeno.

Oshinima oshikwawo shasimana osho okutala nkene etango halyeende. Okangonga kiimeno oka pumbwa kamone oonte thetango ongula. Oka pumbwa woo oku gamenwa komutenya ngoka hagu kala gwapupyala noonkondo komatango, unene tuu pokwenye. Oto vulu okutsika nenge okukuna omiti dhadhingilila okangonga kiimeno opo dhi ka gamene komutenya.

Meta ndele tofulu oshilambo shadhingilila okangonga /okampungu kiimeno. Yelekanitha evi meni lyokangonga kiimeno opo omeya kaaga tondokemo, ashike gaye mevi. Moshilambo shoka shadhingilila okangonga kiimeno udhamo uupambu uushona wiiimeno iitalala niiikukutu, etoshashamo nomeya galonga nale. Tsika nenge kuna mo omiti, ndele tosiikile niiyagaya ehala ndjoka, naapehe mpoka wahala okukuna. Mokangonga kiimeno ninga mo oondjila nenge patulula iiyagaya momukweyo mpoka wahala okukuna iimeno, totulamo uuhoho ndele togwedhamo oombuto dhiimeno mbyoka wahala okukuna.

HOW TO CARE FOR **A FOOD CIRCLE**

Morning and evening

Give 10 minutes to your food circle every morning and evening.

- Harvest what you want to eat or sell.
- Check the leaves of your plants for pests. If you see pests, even just a few, act immediately. Do not wait until there are many. Refer to the pests' chapter for tips against pests.
- Mornings and evenings are good times to water.
- Check your pit. Does it have the right moisture?

Weekend check

- Cut flowers on vegetables: We do not want our vegetables to go into seed. We rather want them to produce more leaves that we can eat. So we want to cut off the stems with flowers.
- Harvest seeds on herbs: We can use the seeds of herbs for planting and sharing. So when the seeds are dry, carefully harvest them. Please share them with your neighbours and with the Kambashu Institute!
- Is it feeding time? If your plants look unhappy or are struggling with pests, carefully push some mulch to the side and add some compost from the pit to the soil around your plants. Cover again with the mulch and water.
- Add mulch where you see bare soil and carefully move the mulch away from the stems of the plants.
- Take out stones and plastic.

Seasonal intervention twice a year

Early spring (August / September) and late summer (February / March) are the times in Windhoek when we want to prepare for the new season. Cut back or dig out the plants that are not producing anymore and put in the seeds for the new season. Refer to the planting plan to find out what grows best in which season.

The food circle in your daily routine

- The food circle is the place to put your grey water. After rinsing your vegetables, fruit or even your feet, pour the sandy water under your vegetables. After your shower, pour the water under your trees. After washing clothes or dishes, pour the water into the pit. Refer to the grey water chapter for more information.
- Keep filling the pit as part of your daily routine. Try to add some biomass to the pit every day. If you don't have kitchen waste, you can cut some grass or add small pieces of cardboard. Never let the pit dry out.

WINDHOEK'S **BIG 5**

At the Kambashu Institute we have observed that these are the 5 big challenges for food circles:

The move

People are always looking for new opportunities and if these come, they will move – to another city, to a different house, back to the village. This is less the case in more formal settlements but happens a lot in new settlements. Ideally, the new inhabitant of the house comes to the Kambashu Institute to learn about growing food and makes the existing food circle their own.

The drunken neighbour

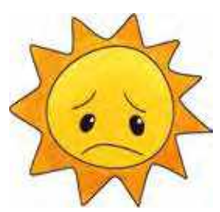
Food growing nicely outside a house can be tempting for some people. But most food circle growers don't mind sharing. It's the passer-by who just destroys who makes them angry. They have found that putting branches of thorn trees around the food circle helps quite well, not only against the drunken neighbour but also against cats and dogs.

The December holiday

A food circle is not a lamp that you can switch on and off. It needs soil that can handle soapy water and this soil is alive. If you go to the village for a month in December and there is not a lot of rain in Windhoek at that time, not only the plants but also the soil in the food circle will die. The food circle needs a friend in December. Talk to your family, friends and neighbours and get them involved.

Baboons and pests

The baboons have their own ways. They move through some settlements in Windhoek and never come into others. How close they get depends on how hungry they are. But generally they do not go into something they cannot see: If you have a fence made from shade cloth around your food circle, they are less likely to jump in. Also, they prefer onions, carrots and beetroot – so you might have to grow leafy greens if you are in an area with many baboons. Other unwelcome visitors are the Omalindi that come with the rainy season and aphids that like the dry season. Refer to the pests' chapter for tips against pests.



Too much shade

In Namibia, everyone everywhere tries to get out of the sun. Plants, however, do need sun to grow. Ideally, they get sun in the morning and shade in the afternoon. If you notice that your plants are growing thin, your food circle might have too much shade.

FOOD CIRCLE STORIES

The Kambashu Institute's monitoring team checks all food circles. If they have been growing well for at least half a year, we monitor them with satellite data. The successful growers are invited back to the Kambashu Institute twice year and we learn together what works well and how we can improve. In 2026, more than 250 people are growing food circles in Windhoek's informal settlements.

Maria Haitengeneka

Although I live far away from the tap, I am a successful gardener. I use grey water on my food circle and for the trees I grow. I leave the grey water in buckets overnight, so that the soap settles. Then I get up early in the morning and use it to water my plants.

I have planted guava and lemon trees on the south west side of the food circle and they shade it from the hot afternoon sun. I came to Windhoek in 2016 to make some money. Now I am actually making money from my garden by selling spinach!

Maria won a Gold prize for the best food circle in Windhoek in 2025.

Paulus Namwandi

I have a food circle here at my house that I'm really proud of. I come from the North, where I used to grow mahangu in the fields. But back then, I didn't know about other ways to grow food.

When I attended a workshop at the Kambashu Institute, I learned so many new things! I even encouraged others to build their own food circles at home. I grow cabbage, spinach, mint, dill, kale, beetroot, onions and rose geranium. I have a lemon and a pomegranate tree.

I'm really happy that my family and I can cook with what we harvest from the garden. Especially spinach - we eat it almost every day! When my neighbours are travelling, I make sure to look after their food circles or gardens, so all the plants stay healthy while they are gone.

Paulus won the Silver prize for the best food circle in Windhoek in 2024.

Lucia Haitembu

I moved to Windhoek in 2001. Since I built my house, I've always had a garden. I really enjoy eating from my garden. It also helps me support my neighbours and other families. On top of that, I earn some money by selling the fruit and vegetables I grow.

In 2020, I lost my job. That made me want to grow more food and learn new gardening skills. So, in 2021, I was very happy to get training at the Kambashu Institute. There, I learned how to make a food circle, which is a smart way to grow plants. When I came home, I built my own food circle right away. I collected mulch and compost and now it looks beautiful. I'm thankful to the Kambashu Institute. Even now, we still visit other gardens together, give advice and encourage more people to grow their own food.

In 2024, Lucia won the Gold prize for the best food circle in Windhoek.

SUN, SOIL, WATER

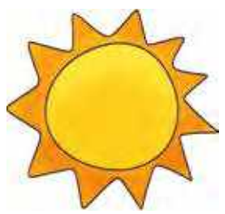
When do we like sun?

We like sun in the mornings, especially on a cold winter morning. Mornings are the best time to be in the sun.

Plants feel the same as we do. They need sun to grow. Mornings are the best time for them to catch sun.

Morning sun comes from the east and north-east. Make sure your erf lets in morning sun for your plants and yourself.

Invite the morning sun to your home.



When do we like shade?

We want shade in the afternoon.

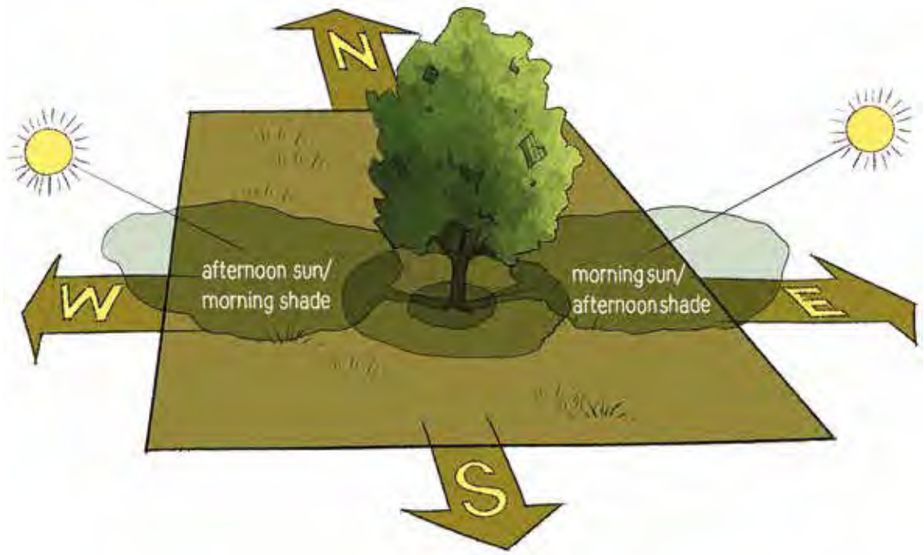
Plants feel the same. The afternoon sun in summer, from 2pm to 5pm especially, is so hot and dry that all vegetables and herbs will suffer if they get that sun.

Afternoon sun comes from the west and south-west. Make sure your erf, your house and especially your food circle get shade in that time.

You can either place your food circle in a way that it gets afternoon shade from a house or a big tree. Or you can plant a tree into the south-west side of your food circle. It will provide shade as it grows. If you do not have a tree, plant high growing plants on the south-west side of your food circle, like maize, sorghum, sunflowers or dill.

Shade out the hot afternoon sun.

The sun always rises in the east, travels through the north and sets in the west.



Auguste's Directions Song

to the tune of Frère Jacques

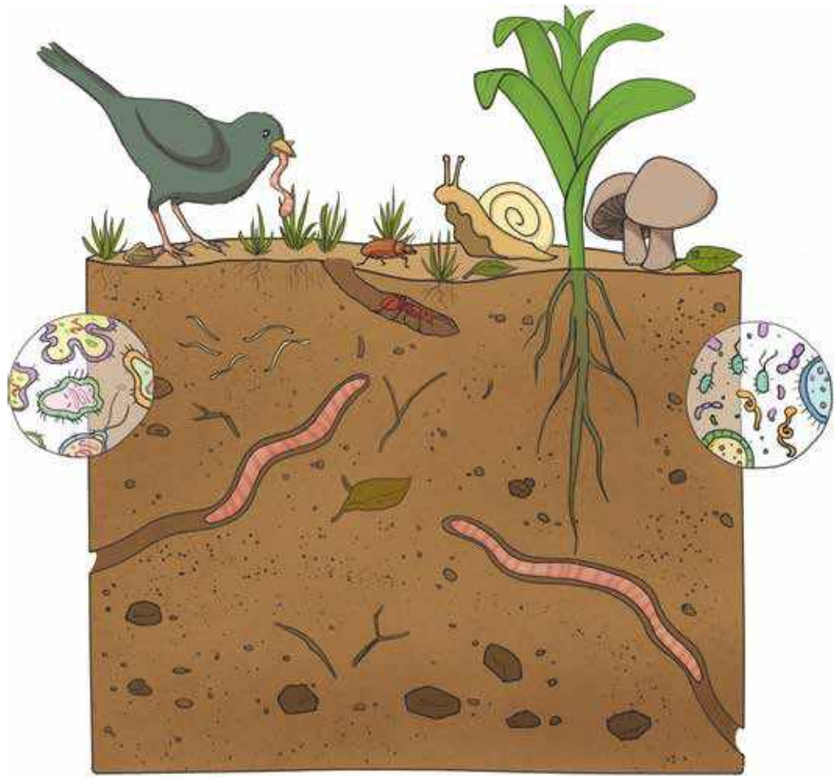
Have you lost direction, lost direction?
Stand still here,
stand still here!

Point with your right hand
where there is the sunrise
that is east, that is east.

Point with your left hand
where there is the sunset
that is west, that is west.

The front where your nose is
there is the hot place
that is north, that is north.

The back where your bum is
there is the cold place,
that is south, that is south.



Living soil

Soil is the world's largest, most diverse and complex life system. There are more soil microorganisms in a teaspoon of healthy soil than there are people on earth. Life in soil helps us grow healthy plants.

Plants produce chemicals that they give off through their roots. These are called exudates. Root exudates are in the form of carbo-hydrates and proteins.

Soil bacteria are attracted by root exudates and feed on them. Soil bacteria produce natural antibiotics that help plants fight disease. Bacteria can also help to make fertilising substances available to plants, like nitrates and nitrogen.

Fungi are an essential component of all ecosystems. They spread underground by sending long thin threads known as mycelium throughout the soil. You will be able to see these threads in soils and compost heaps. Fungi decompose organic matter and form a communication and nutrient exchange network in the soil. They assist plants in absorbing water and nutrients.

Nematodes and protozoa are bigger microbes which eat the bacteria and fungi. Their manure is absorbed by plant roots as nutrients. Insects eat nematodes and protozoa. Insects also hunt and eat other insects. Birds, mongoose and other animals eat insects.

Healthy soil is …

"…teeming with life – not just earthworms and insects, but a staggering multitude of bacteria, fungi, and other microorganisms. When we use chemical fertilizers, we injure the microbial life that sustains healthy plants, and thus become increasingly dependent on an arsenal of artificial substances, many of them toxic to humans as well as other forms of life. But there is an alternative to this vicious circle: to garden in a way that strengthens, rather than destroys, the soil food web – the complex world of soil-dwelling organisms whose interactions create a nurturing environment for plants."

Lowenfels, Lewis (2010): Teaming with Microbes.
The Organic Gardener's Guide to the Soil Food Web

Healthy soil is …

- ✓ full of biomass, rich in organic matter
- ✓ dark in colour
- ✓ smells like the forest
- ✓ lets water through easily
- ✓ with insects and small animals

- ✓ **cheap:** When we have healthy, living soils we do not need to buy fertiliser or other products from the shops. We do not need to give our money to big non-Namibian companies.
- ✓ **healthy:** Our families are already exposed to a lot of chemicals and we do not want to add more poison.
- ✓ **cleansing:** Life and biomass in soil take care of the soap, clean our grey water and make it available to the plants.

HOW TO GROW **LIVING SOIL**

Healthy plants grow in healthy, living soil.

Level

Soil needs to be level. Water needs to be able to slowly sink into the ground. If it is not level, water will run down the hill, taking soil, seeds and plants with it.

Take stones out

Plant roots can handle a few stones – but Windhoek's soil has too many stones and we need to take out as many as possible.

Add compost

In the food circle pit you are making your own compost. Roughly every three months you will be able to take compost from your pit. Spread it carefully around your plants. Make sure you put mulch on top so that the valuable compost does not dry out.

Never step on the bed

The sponge we use for washing dishes can hold a lot of water because it has many small pores. This is the type of soil we want to build. If you step on your garden soil, you squash all water out.

Water carefully

Water carefully and slowly around your plants. You can use an old tin to make a watering can. Make holes in the bottom and fill slowly from the top.

Mulch

We always want to have our soil covered.
We never want it to be exposed to the sun.

Mulch can be:

- leaves
- grass
- cardboard
- peels like onion peels
- wood chips

... and other organic material

Mulching has many functions:

- it protects the soil when you are watering
- it protects the soil from being washed away in heavy rain
- it keeps the soil and your plants cool in summer
- it keeps the soil and your plants warm in winter
- it creates a layer on top of the soil that will help filter out the soap in your water
- it decomposes and turns into soil

Sometimes you will notice that ants come and take the mulch away. That can actually be really helpful because they take this organic matter into the ground and help you build soil. As long as you do not have aphids, ants should not be a problem.

But: you have to keep adding more mulch

Mulching means covering the soil.

Grass makes good mulch

Iiyagaya

Iiyagaya yasiikila okangonga kiimeno. Evi olya pumbwa oku kala aluhe lyasiikilwa niiyagaya opo lyikale lyagamenwa komutenya. Iiyagaya oyo ngaashi:

- *Omafo*
- *Omwiidhi*
- *Omapakete*
- *Iipeta ngaashi yoonyanga*
- *Iiti yatekauka*

Noshotuu iikwawo yafa mpo.

Iiyagaya oyina iilonga oyindji:

- *Otayi gamene evi ngele totekele.*
- *Otayi gamene evi opo kaali kungululwepo komvula.*
- *Otayi kaleke evi niimeno mondjele yuupyu ombwaanawa uuna kwapyupyala nenge kwatalala.*
- *Otayi kwathele okudhindamo othewa momeya galonga nale.*
- *Ohayi nyanyukapo etayi ningi uuhoho.*

Thimbo limwe oto mono uudhidhi nenge uuhwa (termites) tawu kuthapo iiyagaya. Shika otashi vulu shikwathele okuteyagula noku nyanyagulila iiyagaya mevi. Shampa ashike iimeno kayina uupuka komafo nenge kiitayi, uudhidhi nuuhwa kuuna uupyakadhi. Kala noku gwedhamo iiyagaya mokangonga kiimeno.

HOW TO MAKE **COMPOST**

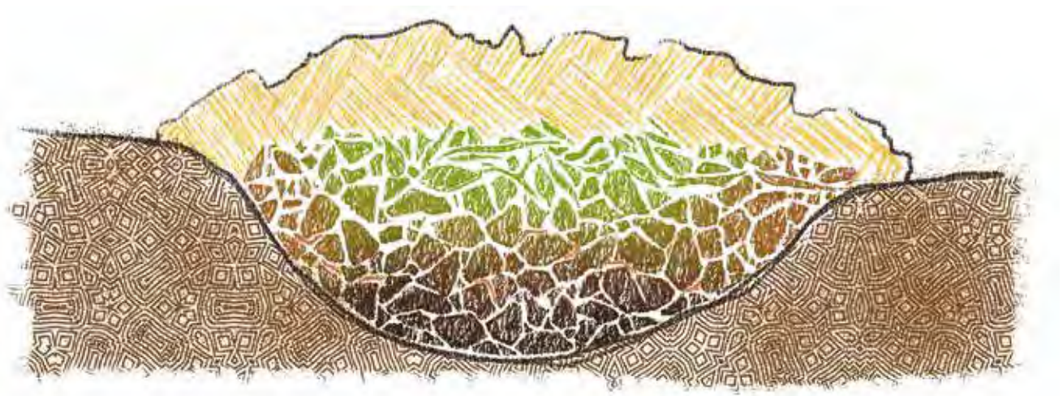
Generally, there are two ways to make compost: hot and cold.

Here, we are explaining **the cold compost method.**

The best place to make the cold compost is in your food circle pit. Imagine you are making a potjiekos. You want

- different things (not only butternut)
- small things (you will cut the butternut into small pieces before you put it in the potjiekos)

Never put plastic or metal into the pit.
Do not put cooked food waste (such as pap) or bones into the pit. This will attract cats and dogs and they will destroy your food circle.



Biomass

Ideally, add small pieces of biomass to your pit every day. You want your pit to be quite full and nice and moist.

Biomass is organic. It is made of material that comes from living organisms, such as plants and animals. We use brown biomass such as dry leaves, dry grass, small pieces of brown cardboard, newspaper.

We also use green biomass such as kitchen waste from preparing vegetables (potato peels, pumpkin skin, cut-offs from spinach and cabbage, fruit peels etc.), fresh grass.

You can add chicken or cow manure but use much less manure compared to brown and green biomass.

You can use a little bit of charcoal. Using ash from cooking can damage your plants. But if you have charcoal left over, then you can break it into small pieces and add it to the pit. At the Kambashu Institute we use bio-char. It is a special type of charcoal. Always put it in the pit and compost it first before you add it to your soil. Biochar in your soil is like a little water battery: it holds water and nutrients for a long time and gives it to the plants when they need it.

Worms

You can make your compost without worms – but it will go much faster when you add worms. Worms do not have teeth. They are not snakes! Worms are our friends. They eat the fungi and the microbes and poop out fertiliser – worm manure! They do not eat living plants or roots.

Worms need food. You can feed them kitchen scraps like potato peels, pumpkin skin, cut-offs from spinach and cabbage, fruit peels, eggshells. A bit of mould is not a problem. Worms need bedding. They like to live in unprinted cardboard, newspaper, dry grass, small woodchips.

Water

You can add your soapy water to the pit. Do not make a swimming pool! The organic matter in the pit (tiny creatures, bacteria, fungi, insects) will help you make your compost. They will die if there is too much water. If the biomass in the pit is already nice and moist and you have more grey water on that day, use it to water the trees directly.

THE DIFFERENCE BETWEEN **PLASTIC** AND **BIOMASS**

Biomass

Organic matter from plants, animals or microorganisms.
Turns into soil in the compost in 1 to 3 months.

Plastic

Mainly made from fossil fuels (petroleum, gas). It can poison the soil.
Lasts 20 to 500 years.

Tins and cans

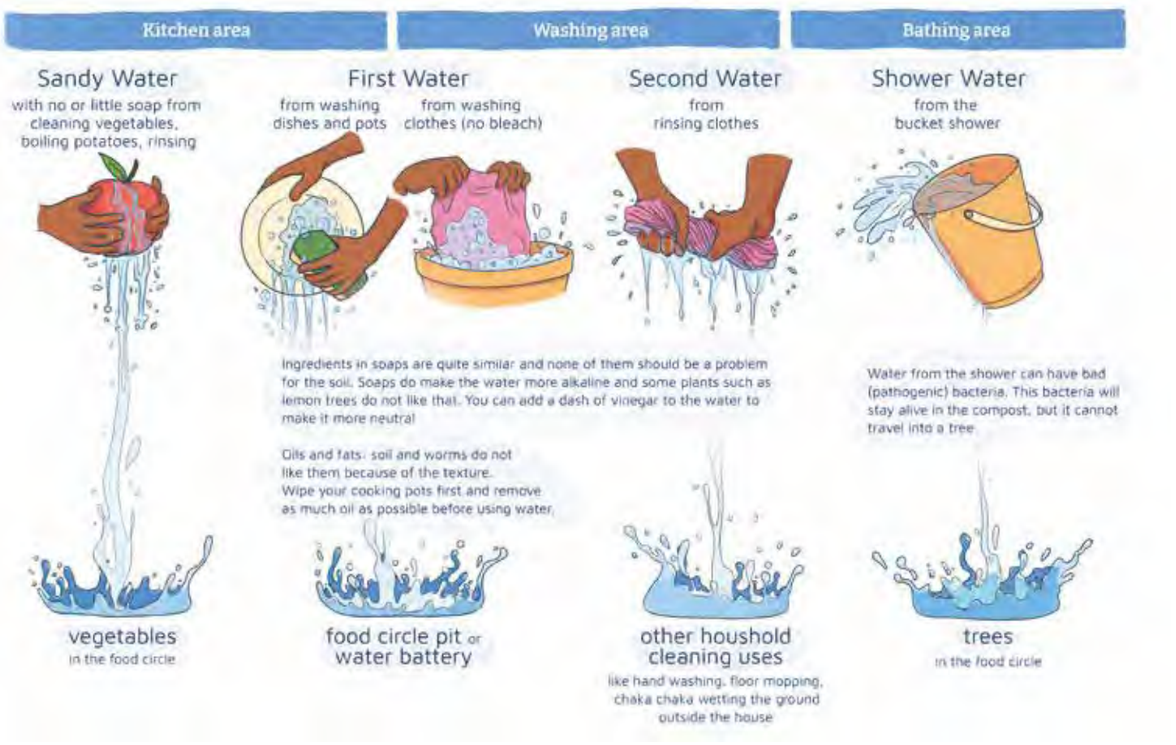
Made from metal.
Last 200 to 500 years.

Glass bottles

From natural minerals
but processed at high heat.
Can last 1 million years.

GREY **WATER**

Different types of grey water and how to use them in the house



Homes in informal settlements are not connected to a sewage system. All household grey water is therefore discarded into the soil – into the riverbeds, a corner of the garden or onto the street. In the riverbeds it mixes with waste and faecal matter and on the street it causes erosion. We want to address these problems by using grey water to grow trees and food with it. The organic matter and the life in healthy soil can handle the soap in grey water.

Which soapy water can I use in my garden?

- Is it soapy water that you would put on your skin like water with sunlight, omo etc? Yes, you can use it.
- Is it water that you **would not** put on your skin like water with bleach, handy andy? No, you cannot use it.
- Is it water that comes from a toilet? This water we call black water. No, you cannot use it.

What we call it in different languages

English	grey water	because its colour is grey from soap
Oshiwambo	omeya galonga nale	water that has been used
Oshiherero	omeya uo ndova	dirty water
Afrikaans	Gryswater	grey water
Khoekhoegowab	|Urixa ||gam-I	dirty water
Kweh	nkosa	water with things in
German	Schmutzwasser	dirty water

PLANTING CALENDAR
FOR WINDHOEK'S INFORMAL SETTLEMENTS

Planting calendar

months	1	2	3	4	5	6	7	8	9	10	11	12
Winter package												
spinach, kale, lettuce, beetroot	seed in				harvest							
onion, carrots	seed in						harvest					
dill, coriander, marigold, sunflowers	seed in					harvest			harvest seeds			
kohlrabi			seed in			harvest						
cuttings: lemon balm, lemon verbena, rose geranium, thai basil	plant											
Summer package												
sweet potato	harvest leaves				potato				plant			
beetroot, spinach, parsley	harvest								seed in			
omakunde, cow peas mix, maize		harvest							seed in			
onion, carrots, eggplant, butternut, pumpkin		harvest							seed in			
sorghum					harvest				seed in			
basil, marigold, sunflowers	harvest			harvest seeds					seed in			
omutete	harvest leaves					harvest seeds		seed in		harvest leaves		
moringa	harvest leaves				harvest seeds				seed in			
trees: mulberry, neem, lemon, guava	plant											

Windhoek has a very difficult climate for growing: We are on 1,700 metres altitude with hot summers (temperatures can easily go above 40° C) and cold winter nights (temperatures can easily go down to minus 10 °C).

We have tried many different plants and had to say good bye to some beloved ones like the pawpaw (papaya). Some very dedicated people manage to grow pawpaw in protected corners, but we lost too many in the frosts to include them in our package.

Winter season is the best season to grow

The best time to start a food circle is January to March. Rains have started and the air is less hot and dry. This is the time the Kambashu Institute runs food circle courses. We give seeds and compost to every participant and help them to start. If they plant seeds now, they will be able to harvest all through the winter. The winter season is the best growing season in Windhoek.

Oshikufuthinge olyo ethimbo ewanawa nokukuna iimeno.

Ethimbo ewanawa nokutameka okangonga kiimeno okuza mu Januali sigo omu Maalitsa. Omvula oyatameka, nombepo inayi pupyala unene, nongele owakunu oombuto dhoye pethimbo ndino, otovulu okuteya pokufu.

Spring needs systems

We have stopped running food circle courses in spring, because we realised we are setting people up for failure. In general, spring might seem like a good time to grow because the days are getting longer. But in Windhoek, spring also means hot days, strong winds and extremely dry air. It is not a good time to start a garden. However, you can be successful if you already have a food circle system running: Your tree(s) and some plants left over from the winter like dill will provide shade. Your perennials like rose geranium will provide shelter from the wind. In between you can start a new crop.

Okwenye okwa pumbwa omalandulathano.

Okwenye olyo ethimbo lyapupyala, lyakukuta, lina unene ombepo. Ndika kalishi ethimbo ewanawa nokutameka oshikunino. Ashike otovulu okukala wapondola ngele owaadhika nale wuna okangonga kiimeno. Omiti dhoye niimeno mbiyahupamo okuza moshikufuthinge ngaashi Dill, otayi gandja omuzile noku keelela ombepo, notovulu oku tameka nenge okutsikila niimeno iipe mokati kokangonga kiimeno.

GARDENING **GUIDE**

Prepare the soil

Loosen the soil with a stick so roots can grow easily. Remove stones. Cover the soil with mulch. Open planting lines in the mulch. Add compost to the planting lines.

Water gently

Water gently right after planting so the soil is moist but not washed away. Keep the soil consistently moist until seedlings appear. Don't let it dry out and don't flood it either.

Plant the seeds

For bigger seeds, poke a hole with your finger, drop a seed in and pinch the soil together above the seed. For smaller seeds like carrots, sprinkle on top and cover lightly with soil.

Mix it up!
Companion planting (different plants next to each other) is beneficial because every plant needs different nutrients. Mixing high and low plants also uses the available space better. Plant herbs like basil, dill or coriander and lots of marigold in between your vegetables as they help to control pests and attract beneficial insects.

Harvest vegetables and herbs

Cut the leaves of green vegetables like spinach or kale before they get very big. Harvesting regularly encourages the plant to produce more. Also cut flowering stems off if you do not want seeds.

Care for growing plants

Thin out seedlings if too many come up in one spot. Leave the strongest ones. Add a little compost around plants every few weeks for extra food. Watch for pests and remove them by hand if possible.

Harvest seeds from herbs, flowers and beans

We suggest that you harvest seeds from herbs and flowers only.

SEEDS

Harvest seeds

from dill, coriander, basil, rocket, marigold, sunflowers and beans

Harvest them when they are dry and keep them in a light place in a clear container. You can share them with your neighbours. Also, at the Kambashu Institute, we are always interested in buying these seeds from our Star Club.

Onion, beetroot, carrots, spinach, parsley

These plants need different seasons to produce good seeds, for example: 3 months crop production plus 3 months chilling phase (it must be cold) plus 3 months seed production.

Some are 'early bolters' which means they start flowering and produce seed early. But these are not the seeds we want! We buy seeds for these plants from the shop.

Butternut, squash, zucchini, chillies

These plants do not need a chilling phase. However, they are cross pollinators. This means that the seeds might not produce the same crop but possibly a cross with other plants from this group. We can use these seeds and hope for good produce.

Cabbage, mealies

These plants need one mother and many fathers. One needs at least 50 plants to have a situation in which one can save good seed.

TREES FOR **FOOD CIRCLES**

We carefully select which trees we suggest you plant in a food circle because you invest a lot of water, time and love into a tree. All trees on this list

- give us food (or have other advantages, like the neem tree),
- are frost tolerant – because it gets very cold in Windhoek. Trees that grow well in the north, like mango and avocado, struggle with Windhoek winters.
- can be grown from seeds (moringa, guava, neem, lemon), from stones (peach) or from cuttings (mulberry). Please note that other trees, like apple, will also grow from seeds but the tree will then probably not give us good fruit.

Mulberry

Morus spp

The mulberry is our superstar. It grows really well in Windhoek.

Food

Mulberries can bear fruit already after 2 years. The vitamin-rich berries can be eaten fresh from the tree. Use mulberry leaves as herbal tea for health and relaxation.

Plant

With mulberries, you can have male trees and female trees and they will need each other for pollination. Check which tree you have and check which trees your neighbours have. There are also trees that are both male and female.

You can take cuttings from a mulberry: Choose branches that are young but not green and thicker as a finger. Cut them into pieces that have 4 nodes. Stick 2 nodes into a pot filled with moist sand. Water daily. Do not plant Mulberry close to a house as its roots can lift up walls.

In Windhoek, moringa stems usually die off in winter. After the last frost, cut the stems carefully above ground and the tree will grow again from the root system.

Moringa

Moringa oleifera

Fast growing tree that does not need a lot of water. It dies back in the frost.

Food

Moringa leaves are extremely nutritious, healthy and can help with bacterial infections, gout, skin diseases. Harvest leaves every day. You can eat them raw, cooked like spinach or dried and crushed and added to soup. You can chop them and add to rice or macaroni like parsley.

Plant

Moringa grows well from seeds. You can get seeds from your neighbours who are already growing moringa. Put the seeds onto some wet paper into a plastic bag. They will germinate after only a few days and you can then plant them directly into the soil.

Lemon

Citrus limon

Food

Lemons and other citrus fruit are rich in vitamin C. The juice and peel are used in a wide variety of foods and drinks.

Plant

Lemon trees are sensitive to frost, but they grow in Windhoek in sheltered places. If your food circle is close to a river bed, rather plant a peach or a mulberry because the lemon might suffer from the cold. You can grow lemon trees from the seeds of any lemon. The fruit will not be the same but it will still be a good lemon.

Lemon trees grow bushy and slow. If you are looking for a faster growing tree, rather plant a mulberry.

Guava

Psidium guajava

Guava grow well in Windhoek but they are quite slow in their growth. They begin fruit production 3 to 4 years after planting only.

Food

Guava fruit are rich in antioxidants, vitamin C, potassium and fibre. This gives them many health benefits. Guava leaves can be used as a tea.

Plant

You can grow them from seeds (dry or fresh). Try to do this from January to March in pots at a sheltered place. Then transplant seedlings from August to September.

Pomegranate

Punica granatum

The pomegranate grows more like a bush, so it needs space.

Food

Pomegranates may help prevent chronic inflammation. Inside the thick-skinned fruit are edible seeds which can be enjoyed raw or processed into a juice.

Plant

The plant is very hardy. You can grow it on the windy side and it will protect other plants from the wind. Pomegranates can be grown both from seeds and from cuttings.

Peach

Prunus persica

Peaches grow well in the mountains. They need a cold winter.

Food

Peaches are delicious, have vitamins and other healthy ingredients.

Plant

Peach trees are quite new to Windhoek's informal settlements. We have selected them because they can grow from planting the stone and still produce nice fruit. These will be big trees that also give you a lot of shade.

Neem

Azadirachta indica

This is the only tree in our mix that does not produce food. However, we have added it because we can make pest control sprays from the leaves or the seeds.

The Neem tree itself repels mosquitos and other pests. It needs very little water and grows into a nice shade tree.

TIPS FOR **TREES**

Trees give us shade, food and biomass. Tree roots hold the soil in the rain. These are just a few examples of the benefits of a tree.

How to plant a tree

There are many ways to plant a tree. This is how we do it:

- Dig the hole. It should be square and at least 40 centimetres wider than the tree pot and 20 centimetres deeper. Add compost to the bottom of the hole. Carefully remove the plastic bag from the tree roots.
- Place the tree into the hole. Its own soil level should be a bit lower than the surrounding soil level. Fill the sides of the hole with compost. Compact the soil by carefully stepping on it.
- Mulch around the tree but keep the mulch away from the tree stem itself.
- Water well around the tree, also on the next three days.

How to prune trees

What to cut

Cut dead, diseased or damaged branches because they are a risk to the tree's health.

Cut branches that are weak, rubbing against each other or growing in a way that could cause future problems.

Cut branches growing inwards and downwards.

How to cut

Make clean cuts close to the trunk or another branch. Avoid damaging the bark because this creates an entry point for disease. Use sharp pruning shears for small branches and a saw for larger ones.

How not to treat a tree

This poor tree has been treated badly. Cuts are not close to the trunk and they have damaged the bark. The tree is now dead.

INSECTS:
PEST OR FRIEND?

In our gardens, we can see many insects. And often it is difficult to know if they are our friends or if they are destroying our food. The insect world is a little bit like the world of bigger animals:

We have plant eaters like goats. They like to eat the green plants. In the insect world we call them pests because they are eating the leaves we want to eat. The most common pests in Windhoek are aphids, red spider mite, caterpillars, grasshoppers and omalindi.

The good news is that the insect world also has predators like lizards, lions or leopards that like to eat the plant eaters. In the insect world, these are our friends and they will help us control the pests.

The insects that eat the pests are hunters. Most of them move around quickly.

Farmers' friends

Our favourite hunter insect is the ladybug. These pretty little bugs are natural enemies of many pests, especially aphids. A single ladybug can eat as many as 5,000 aphids in its lifetime.

Ladybugs lay small, bright yellow eggs. The female usually places them in clusters of 5 to 50 on the undersides of leaves, where they are safer from the sun, rain and flying enemies. A female can lay eggs many times during the season, adding up to around 1,000 eggs over her whole life.

After hatching, ladybugs enter the larval stage which lasts for about a month. At this stage, they are very hungry and feed on pests such as aphids, scale insects and the eggs of other insects. The larvae are black with yellow spots.

The third step in a ladybug's life cycle is the pupa stage. The pupa looks like an orange shell with black spots. Inside, the larva changes completely as it transforms into an adult ladybug.

After about 5 to 7 days in the pupa, the fully grown adult ladybug comes out. At first, its body is soft and pale yellow, with no clear spots. Within a few hours, its shell hardens and the familiar red, orange or yellow colours with black spots appear.

A **CLOSER LOOK** AT **PESTS**

Aphids

Aphids live in colonies on leaves and stems. They come in different colours like black, green, white or yellow. They do not like the winter so much but their number increases quickly in hot and dry weather, especially on green-leafed vegetables. Aphids are difficult to get rid of.

Here are some tips:

- Plant enough shade and mulch well, so that the plants are not heat-stressed.
- Harvest your green-leafed vegetables early, when the leaves are still fresh and small.
- Plant onions, chives, marigold. They help repel aphids.
- If plants are affected heavily, cut and burn them.
- If plants are only a little affected, use your home-made pest control spray.

Red spider mite

Spider mites are tiny pests that usually live under plant leaves. Dry weather helps them multiply quickly. Spider mites are very small and hard to see. You might only notice the fine silk webs they leave behind and the damaged leaves. They particularly like tomatoes and moringa, causing the leaves to dry out and turn brown.

Spider mites thrive in hot and dry conditions, so try and keep your microclimate humid and cool.

If the pest appears, spray the plants with water in the mornings, afternoons and evenings, for four to five days. If plants are affected heavily, cut and burn them.

Grasshoppers, crickets and Omalindi

These pests eat a wide range of crops and they eat fast. The best tip is to catch them by hand. This is easier in the morning when they are less active. Grasshoppers prefer laying eggs on bare soil, so this is another reason to make sure your soil is always mulched. They also prefer drier conditions, so keeping the soil moist also helps.

Omalindi are a type of corn cricket that are endemic to Namibia – which means these specific ones do not live anywhere else. They usually appear during February, but the exact timing depends on the rains. There is no way to stop them. It is best to carefully observe the Omalindi population in your area and wait with sowing seeds until most of them have died.

TIPS FOR **HAPPY PLANTS** AND **PEST CONTROL**

1. Prevent pests through living soil and healthy plants

Pests are attracted to unhealthy plants. Make sure your plants get enough water and nutrients so that they are happy and healthy. Don't just plant into the sand. Use compost and build up living soil. Apply mulch to cool the soil and reduce evaporation.

2. Know your friends

Diversity makes a system more resilient. Diversity means that you plant different plants together. Don't grow spinach only. Intercrop with strong smelling plants like onion, parsley, basil or marigold.

Know the difference between pests and hunter insects. Invite hunter insects to your garden. Do not use chemical pesticides. They will kill all insects – also those that are your friends.

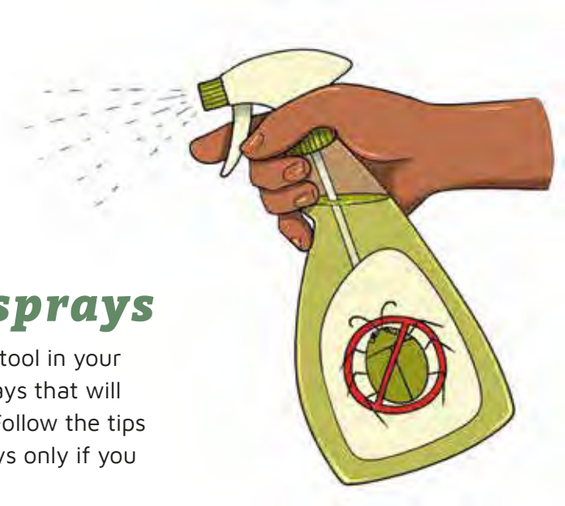
3. Manage and act early

Manage your garden. Check every day so that you can act early if there are any problems. Look at the leaves, both top and bottom. When you find pests like aphids, act quickly. The first step is to physically wash them off. You can use your soapy water.

In addition, you can make pest control sprays. At the beginning, you will have to spray every day. Make sure you spray the bottom of the leaves as well.

4. Start again

If leaves or plants are too infested, you might have to cut them out and burn them. Now start again!



Pest control sprays

These sprays can only be one tool in your belt. They are not wonder sprays that will magically get rid of all pests. Follow the tips for happy plants and use sprays only if you have to.

Soap

Soap sprays kill insects by dissolving their skin and by clogging their breathing pores. Whenever possible, spray only infested leaves. First test your spray on a small part of the affected plant. Sometimes plants will react negatively. If you see brown spots on the leaves, don't use it anymore and try another product.

1. Mix 1 tablespoon of sunlight dish wash into 1 litre of water.
2. Spray carefully onto the pests. The soapy water has to come into direct contact with the pests.

Neem

Neem sprays do not kill insects but cover the leaves with a substance the insects don't like. This can help against aphids, grasshoppers, caterpillars.

1. Chop up neem leaves.
2. Put 1-part neem leaves and 5 parts water into a bucket. Put a lid on and let it sit for 3 days. This will be smelly so do it away from the house.
3. After 3 days, filter through a cloth and add 1 tablespoon of cooking oil and 1 tablespoon of sunlight dish wash.
4. Spray carefully onto the leaves.

MAKING **CONNECTIONS**

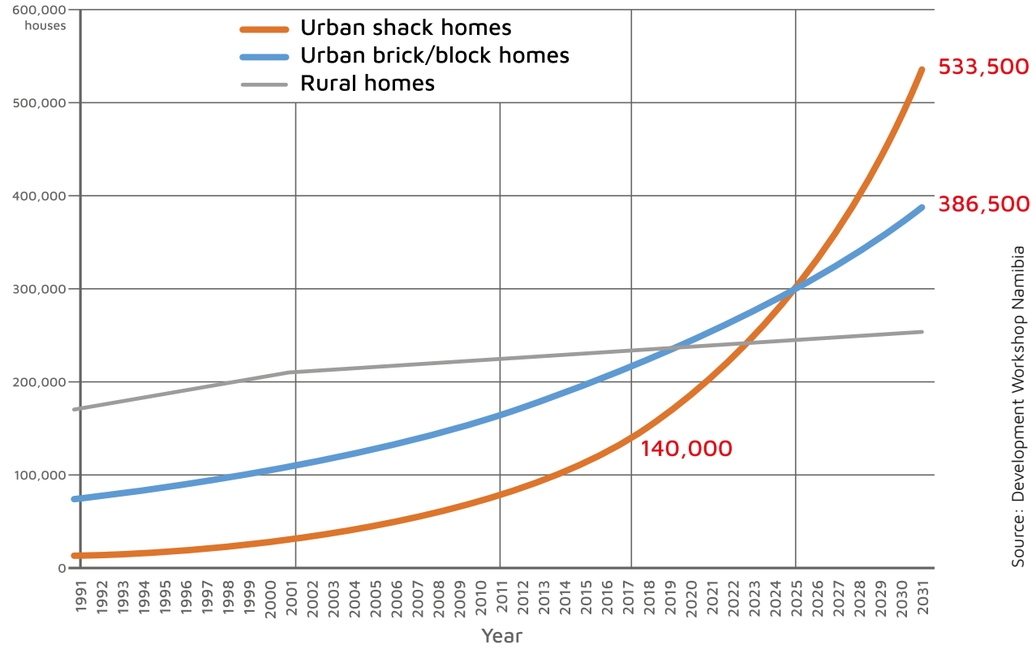
Informal settlements in Namibia

Nearly one million Namibians live in shacks, so called ‘kambashus’, which are mainly made of zinc. The last census reported 217,000 households in informal settlements. Based on an average household size of 3.8., this adds up to around 824,600 people.

The situation has been called a ‘meta crisis’, a ‘wicked problem’. It is complex and interconnected. Consequently, it needs to be addressed from many different angles, including land ownership, provision of serviced land, town planning and more.

Meanwhile.

With our permaculture approach we look at solutions that every person living in a shack can do right now. A lot is missing in informal settlements. One of those things is design.



PERMA**CULTURE**

Permaculture is a design system. It was invented in Australia in the 1970s by Bill Mollison. Permaculture gives us ethics, a set of principles and design guidelines.

It is very practical. To use it, you do not have to be a certified permaculture designer and you do not have to understand every aspect of it.

Here are some starting points:

Minimize external inputs and set up closed systems.

Permaculture is a great approach for people who do not have money. For example, you can make compost, free fertiliser, in your food circle pit by using only what you have. Also, growing food at home means you are less reliant on having a job to earn money. This gives more independence.

Create human habitats that are more similar to natural ones.

Permaculture wants to create human habitats which do not impact negatively on the natural environment. We do this by looking at nature's way to handle challenges and by imitating her solutions.

Actively regenerate and heal damaged ecosystems.

We want to create settlements that actively regenerate the environment and heal damaged ecosystems. Growing food where people live is a good example: If done in a permaculture way, this practice grows living soil, creates shade and cools the settlement. It reduces transport emissions, cooling requirements and plastic packaging. It benefits the local people who grow the food and eat it.

Respect all people.

We are all people, regardless of our tribe, our colour, our sexual orientation and we deserve to be treated with respect. This ethic also relates to caring for ourselves, our health and our mental and emotional wellbeing.

ENTRY POINTS FOR PERMACULTURE IN **INFORMAL SETTLEMENTS**

Windhoek's informal settlements are very diverse

In sprawling settlements like Goreangab, getting fresh water from the tap is a problem because the tap is far away. However, there are many suitable places for gardening because houses are spaced out. But, because the landscape is open, it is more difficult to protect these gardens against people and animals, especially baboons. It is also very windy on the open hills.

In dense settlements like Havana, most houses are much closer to taps. While options for gardening spots are limited in regards to space, it is often easier to protect these gardens. Baboons do not come into densely populated areas. People also move less in dense settlements because these are conveniently close to town. This can make gardening more successful.

Open defecation is the norm

Estimates are that 40% of Namibian's use river beds or containers as toilets. This percentage is likely higher in informal settlements.

Communal toilets are generally not a success story. In some areas, communal toilets have been installed – but because they are being used by many people they are neither a clean nor a safe space. Flush toilets are expensive and therefore not a success story either. Development organisations have built flush toilets at kindergartens, for example, but the teachers are hesitant to let the children use them because water is expensive. If the septic tanks are not pumped (which also costs money), these toilets will overflow.

No cash in the economy

People are often not able and generally very hesitant to spend money on anything that is not absolutely necessary on that day. This includes money for watering, seeds, fences, other building materials.

Of the participants of food circle courses who volunteered to fill out feedback forms in 2024, 63 % placed themselves in the household income bracket of zero to 1000 NAD monthly (26 % in 1001 – 3000 NAD and 11 % in more than 3000 NAD). Based on these feedback forms, on average 6 people live in the households we serve. This leaves us with NAD 166 cash (8 Euro) available per person per month. This data, however, should be treated with caution as it is based on voluntary information provided by the participants. But it does underline the point that Windhoek's informal settlements are a cash scarce economy.

THE **SOLUTION** LIES IN THE **PROBLEM**

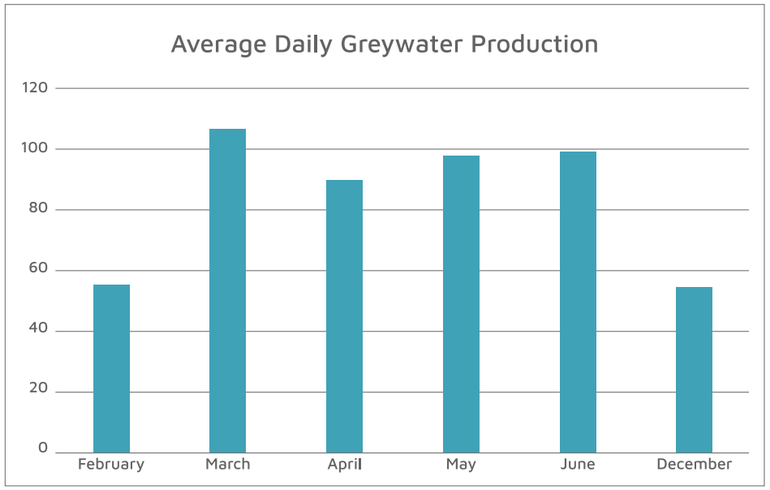
In permaculture we work with what we have

A closer look at a river bed in one of Windhoek's informal settlement shows us that it is mainly filled with three things: plastic litter, faeces and grey water.

In this mixture, it is actually the grey water that creates the most problems. Faeces would dry out quickly in the Windhoek climate, but if you add a lot of water to them, they will not. Obviously you cannot tip your used water onto your neighbour's erf. Grey water is either tipped onto the roads, which erode heavily, making access to the settlements even more difficult. Or grey water is tipped into the river bed where it mixes with faeces, creating a home for flies and worse.

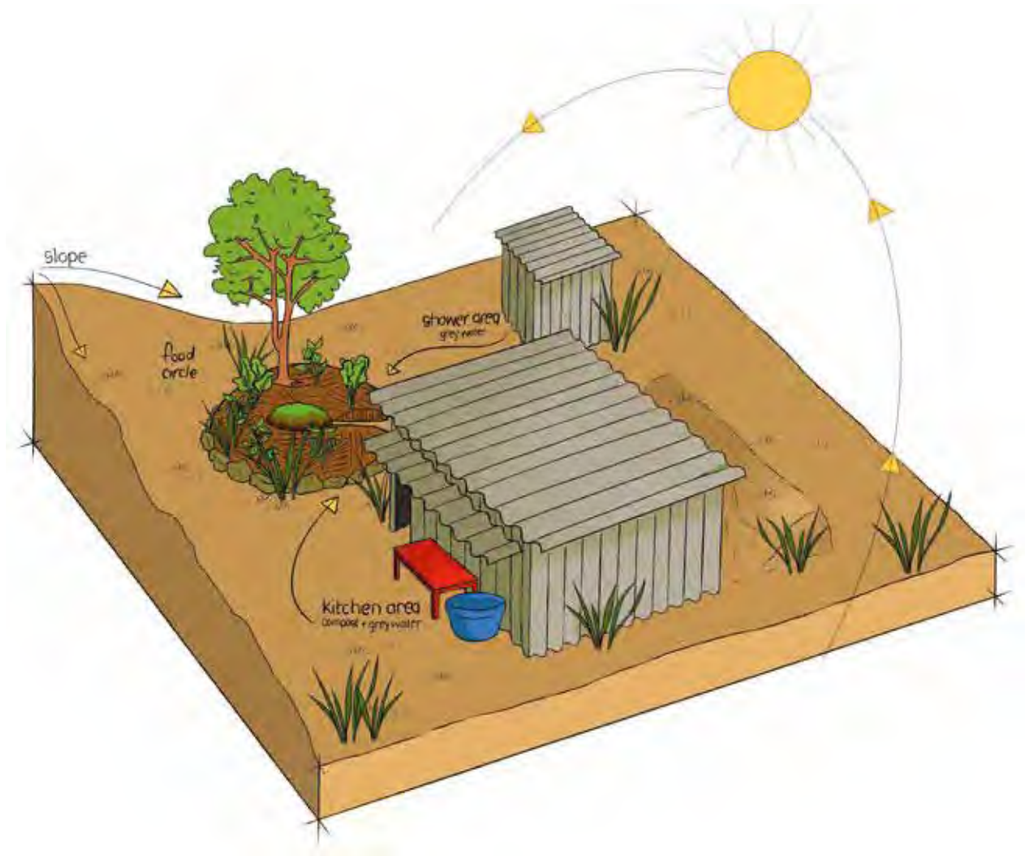
Mo permaculture ohatu longo naashoka tunapo

Ngele owa tala momilamba dhili popepi nalimwe lyomomalukanda ga Venduka, oto mono mo iinima itatu: iiyagata yoonayilona, oonyata, nmeya galonga nale. Miinima mbika itatu, omeya galonga nale ogo hageeta uupyakadhi. Oonyata oha dhi kukuta mbala monkalombepo ya Venduka, ashike ngele koonyata okwa gwedhwa omeya, itadhi vulu kukukuta mbala, nota dhi zi ezimba ewinayi.



A household in Havana informal settlement, with 1 adult, 2 teenagers and 2 small children has monitored their water usage. On average, the household produces between 50 and 100 litres of grey water per day.

PERMACULTURE AT YOUR **HOME**



Erf design

With permaculture, we can design our home spaces into a productive, useful and even abundant support system. We can make our homes more pleasant to live in, safer, easier. To design, look at your erf, consider different topics and how they impact your erf.

1 Scale of permanence

The idea here is that you rank components from easiest to change to hardest to change. A big tree is highly permanent – you will not be able to ever move it. A zinc house is quite permanent but easier to move than a tree. Thinking about permanence can help avoid big mistakes.

2 Sun and shade

The sun rises in the east, travels through the north and sets in the west. Ideally, you want to design your erf in a way that it only gets direct sun in the morning and has shade in the afternoon (especially in summer). Stand on your erf and notice the movement of the sun.

Notice where you would need to plant trees to get shade from the hot afternoon sun in summer. Put some sticks to mark the place.

3 Slope and rainwater

In Windhoek, it is nearly impossible to find a flat piece of land. Most certainly, one end of your erf will be higher than the other. We are already getting heavy rains and climate change will bring more weather extremes. It is therefore incredibly important that you check how the rain water travels across your erf.

The easiest way to do this is to stand outside when it rains and just watch the water. Look up the hill and observe how all the water that falls on your hillside runs. But also after the rain you can see how the water travelled if you look at the ground closely.

Ask yourself: Where could I stop the rainwater and sink it into the ground with a water battery so it waters a tree? Put some sticks to mark the place.

4 Paths and activities

Look carefully at the paths on your erf: Where do you enter and exit for carrying water, for going to town? Do other people cross your erf and where do they pass? You want your elements like a food circle or trees close to paths but not right in the middle of them.

Notice where you cook and produce grey water from the kitchen. Is there a place close to it that is good for planting?

Notice where you bath and produce grey water from washing. Is there a place close to it that is good for planting?

5 Wind and frost

Warm air rises up; cold air falls down. Therefore, the coldest places are in the river beds and the warmer places on the hills. But, sometimes, warm air gets caught on the side of the hill.

Our winds are very dry and we should keep them away from our plants. The mountains of the Khomas Hochland influence the wind direction a lot. Where you are on a hillside will determine from where the wind hits your garden.

Notice from where the wind hits your erf. If your food circle is in its path, you can plant a biomass line to protect it.

Notice which areas get very cold in winter nights. In these areas you will have to protect frost sensitive trees by covering them.

Example: design for a tree

People like to plant trees at the far corner of their erf next to their fence. This means they have to carry water to this far corner to water the tree. Also, they do not benefit from the shade the tree gives.

Is there a better place closer to the house where you can easily give the tree a bit of grey water from the bucket shower?

Maybe on the south-west side of the house so that the tree shades the house on a hot summer afternoon?

Also consider the scale of permanence: Once the tree gets bigger you cannot move it. So you do not want to plant it in a place in which you want to build another house.

Maria has planted trees uphill on the south west side of her erf. When the trees grow, they will shade her food circle and her house from the hot afternoon sun.

Biomass is the bottleneck in Windhoek's informal settlements, not water!

WATER BATTERIES

What we learned at the Kambashu Institute over the past years is that there is more water available than we thought. This can be rain water running on the ground, rain water running from the roof or grey water.

We need a lot of biomass for mulch and for compost. Food circles are too small to produce big amounts of biomass. We recommend to build water batteries to use available water to grow biomass.

Surface rain water battery

Rain water runs down the hills into the riverbeds. You can stop this water and sink it into the ground. The food circle in this photo got flooded during the rainy season. The owner decided to renew the food circle and build a water battery around it. This water battery catches the rain water running down the hill. The food circle will benefit from the water stored around it.

Roof rain water battery

Rain water runs off roofs and onto the ground if there is no gutter to catch it. The owner of this kambashu dug a water battery to catch the rainwater from his roof. He grew biomass and maize downhill from it.

Grey water battery

Some households produce a lot of grey water, more than a food circle can take. This food circle grower built a water battery on her erf which takes all her soapy water. She grew biomass and pumpkins next to it.

How to build a water battery

1. Dig 40 cm deep, 40 cm wide swales just off the drip line of zinc roofs, around your food circle or up-hill from your food circle.
2. If you are next to your house, place some dug-out soil against your wall to create a water barrier. Place the other dug-out soil in a levelled planting bed downhill from the swale.
3. Fill the swale with biomass on the same day you dug it. When filling the swale, heap the biomass so that it is 10 to 20 cm higher than the surrounding soil. Ideally use a good mix of biomass, also with branches, that do not compact easily. Include moist and dry branches from bushes and trees, wood, cardboard.
4. Plant into the planting bed or the food circle. The roots will enjoy the moisture in the water battery next to them. You can walk on the water battery and use is as your pathway.

How to be a biomass gardener

Because biomass decomposes, it needs to be replaced throughout the year. Prune all your biomass plants 3 to 4 times during the growing season, starting in late January.

Biomass is abundant during and at the end of the rainy season. Collect it then and store it in big amounts to use during the dry season.

Plants that grow well next to water batteries and give us biomass: trees, castor oil, sunflowers, sugarcane, maize, sorghum, amaranth, cowpeas.

Nkene to vulu okulongitha iimeno-yagaya (biomass) onga uuhoho

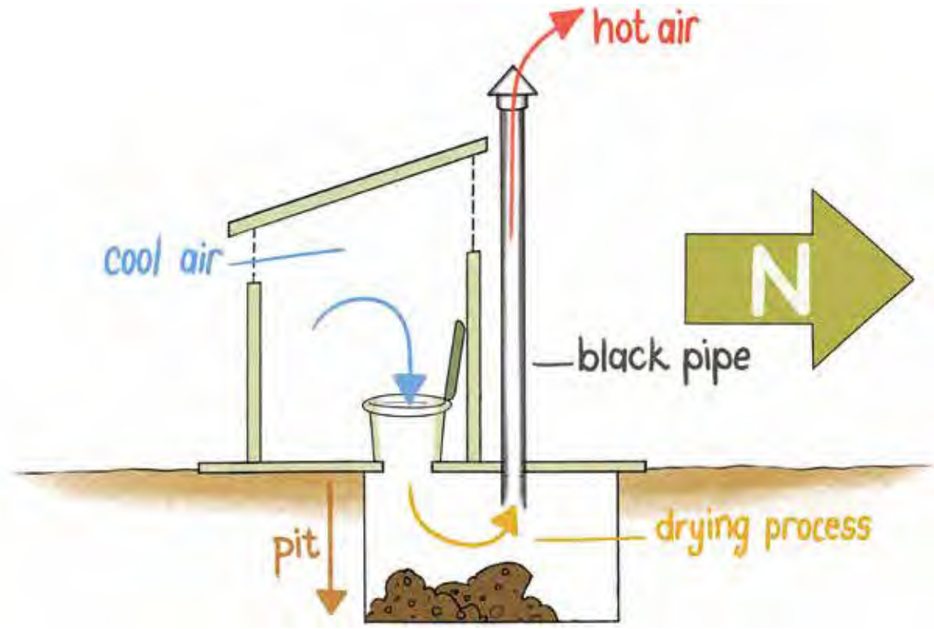
Molwaashoka iimeno-yagaya (omiti/iihwa, omwiidhi, noshotuu) oha yoolo nokulumbakana nevi, oyapumbwa oku gwedhwa ethimbo nethimbo momukokomoko gomvo. Iimeno-yagaya oha yi kala oyindji nawa ngele omvula yatameke okuloka. Kala nokugongela iimeno-yagaya oyindji ngaashi tovulu, yipungula nawa opo wu yilongithe pokwenye. Uuna to gongele omwiidhi, guteta ndele ino gu tudha nomidhi dhago oshoka shino ohashiningi evi likale epu, notali kungululwapo komvula sho tayi kaloka.

When collecting grass: Cut the grass. Do not pull out grass with the roots. This loosens the soil so that the rains will create erosion. This leads to more dongas (erosion gullies), road damage and the possibility of dangerous flooding.

DRY **TOILETS**

The idea

The toilet we are suggesting here is a dry toilet with a pit. The human manure is dried in the pit through a ventilation system featuring a black, north-facing pipe. You will not have to touch the manure again. The hot and dry Windhoek climate, together with a good design, will assist in a way that the pit will only fill very slowly. Maybe not at all. If it does fill, there are things you can do to quicken the drying and reduce the manure.



How does a ventilated pit latrine work?

Hot air rises up. The air in the north-facing black pipe gets very hot. The toilet kambashu should have open walls at the top so that it stays cool inside. This creates a constant air flow: A little bit of cool air gets pulled in from underneath the seat and flows out of the top of the black pipe. The air flowing through the pit dries the manure; the urine seeps into the ground.

The Kambashu Institute experience

We have built a number of prototypes with different designs and pit sizes for different family sizes. None of the toilets smelt bad. However, the ventilation did not work so well in a big, deep pit. Only the smallest toilet filled up after a year.

How to quicken the drying and reduce the manure

- Never put water into the toilet. Be careful when you clean and do not use a lot of water.
- Keep the lid on. You only want a bit of air streaming in from underneath the lid, otherwise the flow does not work well.
- If you experience some smell put some ashes from cooking into the toilet.
- If the pit starts to fill up, stick a long pole through the toilet hole and spread the manure. It will now dry quicker.
- Earthworms eat manure and they will also eat human manure. Add earthworms from your pit and some cardboard.
- Use Bokashi.

This toilet for a kindergarten at Okuryangava informal settlement has a bench. Only one side is used. Once that side of the pit fills up, it is closed and the other side used.

ABOUT **US**

Kambashu Institute

The Kambashu Institute is a permaculture learning centre for and by shack dwellers in Windhoek's informal settlements. We call ourselves a learning centre (not a teaching centre) because nobody really knows how to grow food in Windhoek or how to design an erf in the informal settlements well. We are learning it together.

We design with appropriate technology – and some drama!

The idea of appropriate technology is that people understand their own needs better than anyone else and can therefore invent the technological innovations necessary to meet those needs. The notion of appropriate technology goes back to Mahatma Gandhi. Low-tech self-sufficiency was reclaimed to subvert and ultimately prevail over the British Empire.

We work with a cycle of learning: designing, prototyping, testing, learning and re-designing. This means, we need to fail to learn. We know we are extremely lucky to have donors who understand this.

We use interactive theatre for design. Our participants need to be critical – and that is sometimes difficult for them. Interactive theatre is an approach in which the audience participates in the performance instead of being inactive viewers. It fosters critical thinking, social skills, problem solving skills and discovery learning.

Everything starts with a food circle

Permaculture calls for 'small slow solutions' and the food circle is your entry point into working with the Kambashu Institute. We run 2-day food circle courses in January to March because in Windhoek this is a good time of the year to start. The first course day happens at our centre and we invite participants to think about sun, soil, slope. The second day happens at a participant's house in the informal settlements. Everyone builds a food circle together. Every participant then receives a bag of compost and an envelope with seeds. Then people go home. Only, if they actually build a food circle, are they invited back to the Kambashu Institute.

In the next round, food circle growers attend our 'plants & pests' courses. In August, we go out and monitor new food circles with satellite data. Once you are monitored, you are a member of our Star Club and get invited back to the Kambashu Institute twice a year.

Star Club

Currently, we have over 250 food circle growers in the Star Club. All of them live in Windhoek's informal settlements. Kambashu Institute trainers look after a certain area each and support their Star Club 'buddies' in that area.

Star Club members are permaculture designers. They observe how the sun travels across their erf, how the rain water runs and how the winds blow. They collect and use their grey water. They harvest vegetables and cook healthy meals for their families. They are ready to build water batteries or dry toilets and to design new clever elements to improve life in Windhoek's informal settlements. They are called the Star Club for a reason.

Kambashu Institute trainers:
Enerstine Itungu, Aron Aron, Auguste Kankono, Olivia Michael, Annatolia Shipale, Anna Iimene, Maria Kauma (from left to right)

Our great kitchen team

DONORS, PARTNERS AND FRIENDS

The Kambashu Institute's operation is funded by **Liselotte Stiftung,** a small German foundation with a big heart. We would not be without them.

The foundation **Chancen für Kinder** supports our work in kindergartens and on dry toilets – because sanitation is a huge challenge for children in the informal settlements.

Fattoria la Vialla supports us to celebrate our Star Club annually with the Food Circle Prize.

Since 2026, the Kambashu Institute is a member of the **Development Workshop Namibia** family. We are looking forward to working together!

The **World Future Council** works to pass on a healthy and sustainable planet with just and peaceful societies to future generations. They have been our home and inspiration for many years.

We are located at **KAYEC** and partner with them on building projects.
It's amazing to have skilled carpenters, welders and plumbers on our doorstep!

We are a member of the **Namibian Organic Association** and embrace every learning opportunity they offer.

Further reading:

www.growyourfood.africa
A library made in Namibia, with practical knowledge, expert guidance and techniques to help people across Namibia grow their own food using climate-smart, water-efficient and regenerative agricultural methods.

https://noa.org.na/content/resources
Content library of the Namibian Organic Association

https://permacultureprinciples.com
Free download of information on permaculture.

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