HOW TO MAKE URBAN AGRICULTURE MORE SUSTAINABLE

# CONTENTS

- About urban agriculture in Cape Town  
- About urbanGAPs agroecology - good practices for city farmers  
- Hazard tree for urban agriculture  
  1. Farm Planning and Site Selection  
  2. Production and Crop Planning  
  3. Seeds and Seedlings  
  4. Land and Soil Preparation  
  5. Soil Fertility  
  6. Fertilisation  
  7. Water Management and Irrigation  
  8. Plant protection - Prevention  
  - Pest and Disease Management and identification  
  - Pest and Disease Management and cure  
  9. Harvesting and Postharvesting Handling  
  10. Agroprocessing  
  11. Marketing and Pricing  
  Value of Food
ABOUT URBAN AGRICULTURE IN CAPE TOWN

Cities are melting pots of people, culture and food. In the rapidly-expanding informal areas, the design and implementation of a sustainable urban food system plays an especially crucial part for cities, and is one of the biggest challenges faced by policy makers, civil society, city planners and, of course, urban farmers in Cape Town. Urban Agriculture has always been practised by city dwellers, but it can’t be the sole answer to food and nutrition security. However, Cape Town’s urban agriculture shows its multidimensional benefits: community building, green and flourishing gardens within the townships, diet diversity for thousands of people growing around their homes, and an increasing consciousness for food justice among producers and consumers. A more environmentally-friendly urban agriculture, in line with good agroecological practices adapted to the urban context (urbanGAPs), has the potential to reduce the health and ecological risks associated with conventional urban agricultural practices, strengthen the benefits of urban production and provide more agrobiodiversity within the city.

Cape Town is the second-largest city in South Africa, with a population of around four million people. The number increases in the Cape Flats due to national migration in search of employment - mainly from the Eastern Cape province. The Cape Flats, the low-lying geographical area between the mountain ranges of the Cape, is not an easy area to farm. Poor soil fertility, heavy winds, a burning sun, water shortages due to Cape Town’s severe drought, and theft and vandalism are everyday challenges.

Thousands of backyard gardeners and hundreds of food-garden farmers in different townships in Cape Town are producing a wide range of vegetables, perennials, hedges and fruit trees, partly for self-consumption and partly for selling within the neighbourhood, but mainly to the city bowl through middlemen, which creates dependencies on market access. Farmers rarely sell “over the fence”, and are poorly regarded as food suppliers in their respective communities.

Farmers cite market access, transport difficulties, maintaining a continuously high-quality product and funding opportunities as their main challenges. In addition to those, investment in inputs (compost, seeds, mulching material) is high and farmers tend to invest more than they actually gain in their production. This manual is based on two years of participatory research with a group of farmers and aims to respond to production challenges such as pest and disease management, water shortages and access to fertile soil or healthy seeds. It aims to be a guideline along the production cycle, encouraging farmers to apply a set of principles to create holistic farming systems, and empowering them to be proud producers of incredibly healthy crops for their own communities.
What does it mean to farm in a city? Compared to rural conditions, there are several issues to consider before digging the soil.

This starts with site selection and research on the plot before converting it into agricultural land. What was the land used for in the past? The local councillor or neighbours could help to find out if the plot was formerly used as dump site as well as the land’s possible proximity to hazard risks like industrial areas, commercial livestock agriculture or polluted water sites.

A major risk for contamination in urban areas is heavy metals; residues can still be in the soil decades after the contamination. Health risks related to urban agriculture are often a consequence of insufficient sanitation such as polluted water, grey and wastewater, human latrines and possible pathogenic organisms that could affect the crops.

UrbanGAPs, short for Urban Good Agricultural Practices, aim to achieve a more sustainable form of urban agriculture in the context of agroecology relating to the global movement of nature conservation, diversity and social justice in agriculture and agrarian transformation. The guidelines serve urban growers with quality criteria and a checklist for the participatory guarantee system.

UrbanGAPs adapt good agricultural practices to city conditions, and provide the base on which to improve production to a more organic agriculture, while taking into consideration Cape Town’s severe, ongoing drought to more water stewardship in horticulture production. A crucial issue is access to land. Urban areas are of more economic interest than many rural areas. Urban agriculture is therefore widely seen as a temporary activity, and in competition with housing or other urban-development areas. In the long run, investment into soil, techniques and infrastructure for agriculture remains a risk for urban growers. This manual summarises the key aspects of production and aims to support farmers to implement the principles, techniques and methods of urbanGAPs.
Urban Agroecology goes beyond production guidelines. It is the philosophy and socio-political movement of ecology behind our food system and brings in the deeply-needed social aspects of sustainable farming, particularly in the context of an unequal and segregated city like Cape Town. Being a farmer and a food producer brings challenges which can only be addressed collectively as well as lobbying for a farmer-based seed system, simplified access to land and the long-term right to cultivate it, and having a voice in the value chain instead of being a price taker.

Urban Agroecology also addresses Food Justice and questions who deserves healthy food and who can afford it? It is evident that Cape Flats dwellers, even urban, farmers can’t. Urban Agriculture, under the umbrella of agroecology, can’t be a privilege of the wealthy – vegetables should remain in the Cape Flats, create local jobs, support the local economy and provide food for the community.

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To download the full guidelines and further information: http://www.ufisamo.org/en/urbangap/
Challenges of urban agriculture

- Access to land: No
- Access to market: Yes
  - Consider local markets
  - Exchange with others
- Access to water: Yes
  - Rainwater harvesting
  - Look for other land
- Access to finance and input: Yes
  - Exchange resources with others
  - Apply for funding
  - Search for support
- Having a plan: Yes
  - Create a vision
  - Prepare one
  - Search for land
- Transport: Yes
- Site history: Yes
- Soil contamination: Yes
- Latrines: Yes
- Livestock: No
- Exchange with farmers: Yes
  - Ask for help
  - Invite customers to the garden

Risks for urban production

- Don’t put all eggs in one basket
- Short value chains
- All risks resolved
- Start urban agriculture
- Investigate
- Evaluate
- Search for local community
- Search for support
- Search for land

Other notes:
- Calculate it into the price
- Cooperate with other
- External markets
- Access to land
- Access to water
A hazard tree is a decision-making tool that identifies risks and supports a systematic process and analysis in identifying possible future steps. Using the hazard tree as a tool for decision-making helps urban farmers to assess their plot according to possible urban risks for food production.

Starting from the top-left side of the tree, with the overall goal to practice urban agriculture, one can follow the different branches with the two twigs ‘yes’ and ‘no’ leading to the conclusion. The left part of the hazard tree asks for different criteria which need to be in place to start with urban agriculture. These are ‘access to land’, ‘access to market’, ‘having a plan or vision for the farm/garden’, ‘access to funds’, ‘inputs’ and ‘water’. If these conditions are not in place, the urban farmer has to rethink his or her farm plan. The right half of the tree focuses on site selection. Possible urban risks are ‘site history’, ‘contamination’, ‘latrines close to the plot’, ‘livestock close to the plot’, ‘pollution’, ‘theft and vandalism’ and ‘contaminated water’.

Let us look at an example:
I am a farmer. I want to do urban agriculture. I answered all the questions (farm plan or vision, access to land, market, funds, etc.) on the left branches with ‘yes’ and I accept the urban hazards I might be challenged with while farming in the city. I analysed the risk of contamination and because I know my plot used to be a dumping site, I assume the soil is contaminated, so my answer is ‘yes’. That means I have different options; I can test my soil to have a final proof, I can detox my soil, I can do container farming, I can look for new land, or I can replace the contaminated soil with new soil. If my answer is ‘no contamination’, I move to the next branch of the tree and analyse the next risk, e.g., ‘livestock’ or ‘pollution’.

HAZARD TREE
FOR URBAN AGRICULTURE
FARM PLANNING AND SITE SELECTION

Before starting, FARM PLANNING AND SITE SELECTION are the very first steps of urban agriculture and two crucial factors for safe and healthy production. A PLAN AND VISION are essential to stay focused on your journey of being an urban farmer.

To come up with a plan, consider the following:

How big is my plot? For whom do I farm? Do I want to farm for myself, my family, my community or for a market?

Could I supply a high-end market, such as a supermarket, a restaurant or a box scheme? What are my client’s needs in terms of quantity and quality and can I ensure these needs are met all year round? Who are my customers? What are their food habits? What are my costs, and how do I price my produce in order to make a profit?

Write up the purpose of the farm and aims you want to achieve in the first year, and then after three, five and ten years. This supports visionary thinking, and far-reaching and sustainable planning.

Consider the available time, labour resources and funding needed to make the farm run and to maintain it until the first income comes through. Don’t be scared of paper, however; a successful business plan can be simple, clear and short.

SITE SELECTION means that the farmer has to decide where the farmland will be located. Land is a challenging factor for urban agriculture as only limited space is available in cities. Soil and water availability, quality, status and safety are fundamental for agriculture. Water and soil quality should be tested. If the soil or water is contaminated, the area is unsuitable for vegetable production and should not be chosen. Consider urban risks when choosing land. Assessing the site history is important to identify possible sources of microbial and chemical contamination. Neighbours, or the city itself, can help to inform you what was on the land previously. The hazard tree is a helpful tool to decide whether the land is suitable for urban agriculture. Give it a try.

What to do and how to do it:

• Have a vision for your farm and stay focused on that plan. What is the purpose of your farm; market garden, education garden, community garden, self-supply?
  − You can define milestones, small steps you want to achieve in the near future.
  − Have a think about who could help you. Other farmers can share information and you can apply through the Department of Agriculture for basic tools and infrastructure.

• Consider your site history and earlier uses of the land: agriculture, animal feeding or domestic
animal production, garbage or toxic-waste disposal site, sanitary waste-management site, mining activities, oil or gas extraction, industrial waste site, serious flooding or uncontrolled treatment with organic or inorganic fertilisers and/or pesticides. Make use of the hazard tree.

• Assess your plot: plot size, logistics and transport facilities, accessibility, soil quality, water availability and quality, wind direction, course of the sun, existing vegetation. What are the advantages and disadvantages of your land?

• Draw a simple farm map. You can measure the length in steps. Next you can indicate your plots, paths, edges, buffer zones, compost area, water sources and infrastructure, distances to human settlements and latrines.
  – Give numbers to the plots and use this for your crop rotation plan.

• How do you want to do irrigation? Consider the water source – groundwater with borehole, JoJo tanks, water harvesting.

• Facilities, irrigation systems?

• Examine your soil fertility and nutrients status. Urban soils are considered especially nutrient-poor since almost no organic matter has built up. Do soil testing if possible and affordable. Develop a long-term plan on how to improve your soil. Consider frequent mulching, building up of organic matter to create humus, and implementing of compost heaps. Include regular sowing of green manure and legumes into your crop-rotation plan.

• Consider soil and water contamination which is mainly a problem in the urban context. If the soil is contaminated with heavy metals or bacteria, container gardening or a soil change could be an alternative. Look at changing the production site, if the contamination is too high. SGS and BEMLAB are experts in soil analysis. For more information, contact the PEDI team.

• Consider farm security. Urban areas attract theft and vandalism. Besides fencing, use a lockable container.

• Raising awareness in the neighbourhood brings the community closer to the garden, and alert neighbours may help with security.

• Plan your production for different markets, and be aware of the demand from your clients and those markets.

• Start keeping records of your farming activities, simply with the money spent and the income achieved. Note sowing and planting activities, inputs used (fertiliser, pest management, how and why) and harvesting. A simple cost calculation of inputs and outputs will show the profitability of your production.
PRODUCTION AND CROP PLANNING

For PRODUCTION AND CROP PLANNING, it is essential to consider what the farmer is planting for. Is it for self-consumption, local-community marketing or external markets? What are some of the products people want to eat and which products could you easily produce for a local, community market? What products can be planted all year round and what is seasonal? What is the budget to invest in seeds and seedlings?

It is recommended to plant a variety of crops, as this supports AGROBIODIVERSITY, attracts pollinators and supports the natural pest-management strategy of the farm. It is recommended, however, to focus on few best-sellers and crops, which the farmer has the expertise to grow.

Particularly in the urban context, good PRODUCTION PLANNING can contribute to a better use of the opportunities city farming provides; small value chains, short distances, a close link between consumer and farmer, direct trade, access to niche markets, and market choice (high value or niche products, smaller shops, restaurants or individuals). A very easy way is to have a list of all plots and the products you grow on those respective plots. This helps you to calculate how much yield you will have and which plots will be free for the next planting cycle. What comes in, what goes out when, and what comes in next? What inputs for production does the farmer need; compost and manure, organic fertilisers, water, seeds and seedlings?

Production planning also considers a CROP-ROTATION PLAN, usually for a cycle of three to four planting steps and in line with a soil-building plan, which simply means to consider the planting of legumes and green manure after every second or third harvest.

What to do and how to do it:

- Choose local varieties which adapt to the climate and conditions of your area
- Avoid water-intense crops during drought, like cabbage and cucumbers
- Practice crop rotation: make a crop-rotation plan for your plots for future years, such as a four-cycle rotation including root crops, brassicas, legumes, onions and fruit vegetables
- Let legumes follow fruit crops, leaf crops follow fruit crops, brassicas and root crops follow legumes
- Practice intercropping: grow two or more crops in the same field, plant crops in rows and in between legumes like peas, beans and lupins to fix nitrogen and increase soil fertility
- Plant at staggered times, every two weeks for example. This ensures there is harvestable produce at gentle interims and not all at once. This might solve the issue of having bulk harvest time and creating a lot of surplus

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No empty space, green manure, or cover crops

Plan rotation
- Green manure
- Leafy crops
- Legumes
- Fruit and root crops

Intercropping

Wind breakers

Diversity is abundance

Try to cover plants as much as possible from wind and sun

What/How much for whom?
Plan your nursery and consider quality of seeds:
- no GMO
- use untreated and chemical-free seeds
- consider local and traditional varieties
SEEDS AND SEEDLINGS

SEEDS is a global challenge for small-scale farmers and there is nothing else which symbolises the struggles farmers are facing as strongly as seeds – in all their variety and diversity. Seeds are telling the story of humankind and its relation to culture and food. Everything begins with seeds. In a farmer-based seed system the producers collect seeds from the best and healthiest plants from the current harvest to use for the next harvest. This makes farmers resilient within economic power relations and connects them more to their own crops. Agroecology encourages farmers to save seeds, to swap seeds and to establish small seed libraries at a community level.

SELECTION OF ON-FARM SEEDS AND OTHER PROPAGATION MATERIAL is a critical step in Good Agricultural Practices and Agroecology as the right selection determines the crop quality and can generally contribute to higher yields and improved quality. The planting of clean, healthy and disease-free seeds and seedlings gives a good head start to the crops.

Pure/untreated certified seed should be used to avoid diseases creeping into production. In the South African context, it is difficult to obtain organic-certified seeds. Large-scale, commercial seeds are treated with fungicides, and can be identified by their colourful coating, such as bright pink, blue and green.

If the farmer prepares his or her own SEEDLINGS in a nursery or raise bed, it facilitates seed planning. Seedlings can be directly transplanted, intercropped or sold if they are big and strong enough. A sunny place for seedling production is recommended, but covering the nursery with a net to prevent the young plants from burning in the strong sunlight is also a good idea. The nursery should be protected from strong winds. It is ideal to place the nursery inside a tunnel.

In recent years, SEED LAWS have been passed in South Africa, Mozambique, and many other parts of the continent. These laws govern the Intellectual Property (IP) of registered seed. One law in particular, the Plant Variety Protection law (PVP) governs the kinds of seeds that are available in a large-scale commercial market. As a result the seed market is dominated by patented and certified seeds, mostly hybrids and often genetically modified, coming from a few global seed companies. These seeds are often more expensive than seeds offered in the market that exists between smallholder-growers and farmers. The way the market is structured encourages a domination of this certified seed and discourages farmer-saved seed from entering or garnering the same kind of government or economic support. Another repercussion of the seed laws is that agrobiodiversity is threatened when the market is dominated by certain certified kinds of seed - mostly hybrids - and includes genetically modified seed like in South Africa.

Seed production and nursery – what to do and how to do it:

• Ideally, you should use organic seeds. You can obtain them from the organisation SEED

Transplanting/planting out – what to do and how to do it:

• Water the nursery sufficiently before transplanting
• The best planting time is at the end of the afternoon or when the sky is overcast
• Transplant seedlings at 5–6 real leaf stage, sort seedlings at planting – use short, stocky plants with large collars, that are vigorous and turgescent
• Prepare small holes for the seedlings and water holes (add liquid organic fertiliser like compost tea or earth worm tea once a week)
• Place seedlings in the holes, avoid open roots and cover them with soil, firm the soil around the hole
• Water moderately after planting
• Consider crop-specific spacing (enough space for the roots to settle, enough soil)
LAND AND SOIL PREPARATION

LAND AND SOIL PREPARATION are essential production stages for farmers in the context of urban agriculture, as many urban risks are related to the availability of fertile and uncontaminated soil.

LAND PREPARATION is the first step to put the farm plan into practice and to divide the farm into different sections such as a nursery, production section and composting area. In addition, a container provides space for the storage of garden tools, seeds and fresh produce. Next up, decide where your beds will be based on the availability of money, time, (wo)manpower, crop requirements and your farm layout.

SOIL PREPARATION requires input, energy and work, especially if the plot is on a newly-developed urban farm. Existing soil layers should be disturbed as little as possible during land preparation to build organic matter. It should enable the root system to spread to a depth of 40 to 60 centimetres for shallow-root crops to ensure good water and mineral supply to the plants. Healthy soil is a fundamental principle of organic agriculture and supports strong plants, nutritious crops and long-term investment in the farm.

What to do and how to do it:

- Prepare your site for production:
  - Clear and clean the area by removing plastics and other litter
  - Clear and clean the area by removing weeds, big rocks and residues, and level the plot
  - Create beds, paths, patterns, open space and infrastructure on the plot
  - Create buffer zones from the street to prevent the plot from traffic pollution (thick hedges)
or even nets, wood, bamboo poles or corrugated sheets should work well)

- Fence the fields to prevent livestock from entering, put safety measures against theft and vandalism in place, such as locks for the garden gate and container, and keep belongings locked way.

- Put measures in place for wind and erosion protection
  - Terracing or anti-erosion structures (bunds, terraces, grass strips, windbreaks, etc.) on steep or exposed terrain
  - Drainage systems with dry soil, especially in times of drought
  - Natural windbreaks like trees, hedges, scrubs (granadilla, pomegranate, dune spinach, rosemary, spekboom, leafy garlic, lemongrass), also nets or tunnels
  - Thick mulching or cover crops to prevent topsoil blowing away

- Consider your soil quality: salty, poor, compact soils need soil-building measures (organic matter, mulch, fertilisers)

- Decide on appropriate types of beds: seed bed for sowing, trench bed for sandy soils and heavy feeders, hugel bed during droughts, wicking bed or containers if no healthy soil is available

- Prepare beds for planting: remove weeds, stones, crop residues and waste, dig minimally with a fork spade to allow air into the soil, take a rake and level the soil
SOIL FERTILITY

Working with soil is an ongoing process. **SOIL MANAGEMENT** is the application of operations, practices, and treatments to protect the soil and enhance its performance and soil fertility. **SOIL FERTILITY** refers to the ability of soil to sustain agricultural plant growth and provide plant habitat, and result in sustained and consistent yields of high quality. Fertile soil has no toxic substances which inhibit plant growth or the ability to supply water. Nutrients are available in adequate amounts and proportions for plant growth and reproduction. The goal of soil management is thus to protect the soil and enhance its productivity for profitable farming. The **SOIL** is storage, filter, substrate and root space. It is a microcosm of microorganisms and the basis for the health of your plants.

Soil-management techniques like intercropping, mulching or crop rotation with legumes and soil-building measures, such as the application of compost or manure, are also soil-fertilisation techniques.

**What to do and how to do it:**

- Consider mulching with grass cuttings, green weed, newspapers, cardboard, organic residues, straw, wood chips to maintain soil and organic matter, and allow plant stalks to rot in the field.
- Do intercropping: planting crops in rows and in between legumes to increase the fertility, mainly with legumes like peas, beans, and lupins (nitrogen fixing).
- Consider using seaweed in coastal areas: collecting the seaweed, washing it of beach sand and fermenting it in water can go a long way to increase soil capacity. By chopping it and adding it to the subsoil, it can assist in increasing water availability to the plants and releasing nutrients at a slow rate.
- Use flowering plants for intercropping (marigolds, phacelia alyssum, coriander) to provide shelter and food for beneficial insects.
- Consider cover crops like spinach, rocket, sweet potato or dune spinach for soil protection and enrichment.
• Use green manure: growing green, not woody plants, or plant parts that can be incorporated back into the soil (lupins, cowpeas, clover, alfalfa, vetch, grains, oil radish, calendula, spelt grain, broad beans)

• Practise hoeing to aerate the soil: very shallow and near the surface to avoid damaging roots or destroying organic matter, and use clean tools

• Consider liming in acid soils: work calcium- and magnesium-rich materials (marl, chalk, limestone or hydrated lime materials) into the soil as they react as a base and neutralise soil acidity

• Manage sodium and salinity level and work gypsum into soil once a year before the rainy season.

• Grow more salt-tolerant crops like asparagus, beetroot, broccoli, cabbage, cucumber, squashes, and tomatoes. Crops that grow poorly in salty soil are beans, carrots, lettuce, onions and peppers.
FERTILISATION

Fertilisers are inputs that are applied to soil or crops to supply nutrients essential to the growth of the plants. Good soil needs an equilibration of the macronutrients nitrogen, potassium and phosphorus (NKP). The application of organic material (compost or manure) and liquid, organic fertiliser in correct amounts, at the right times, and according to agronomic and environmental requirements, is essential for the growth of strong and healthy plants.

In an urban context, especially in the Cape Flats, soil is generally sandy and compact and not rich in ORGANIC MATTER. The use of organic fertiliser, and ongoing soil management by building up organic matter, are fundamental tasks for urban farmers to increase natural soil fertility.

COMPOST PRODUCTION supports this efficiently, economically and naturally, since compost brings nutrients and microorganisms to the soil, makes crops healthier and tolerant, retains soil moisture, improves soil fertility, increases crop yields and keeps food produce free from chemicals. The use of compost and manure can bear the risk of microbiological contamination, specifically in urban areas. When animal manure is used without proper treatment, there is the danger of contamination of fruits and vegetables with pathogenic bacteria which can cause gastrointestinal illness and other health risks for humans.

Organic fertilisers – what to do and how to do it:

- Have your own compost production or earthworm farms to make your own compost
- Apply compost, earthworm tea from vermicompost or manure according to your soil quality and the respective crop requirements
- Follow the right rules for manure application:
  - apply only properly-treated/decomposed manure to avoid contamination
  - do not use manure from pigs, human beings or household animals
  - avoid using warm manure as this could burn the roots
  - apply near the roots (not on top of the plants) and cover with soil
  - don’t use organic fertilisers shortly before maturity and harvesting
Production guidelines for urban farmers

- prevent contamination of produce or production areas (store manure away from the production areas)
- cover manure piles with plastic or other materials and/or store it under a shed
- store small amounts in plastic bags

- Use home-made liquid fertilisers (teas from herbs, comfrey, nettle, manure, seaweed, earthworm compost and water) to support plant strength and soil fertility
- Avoid over-fertilising your soil: the dosage of each nutrient must suit the actual conditions in each field
- Apply fertilisers during light-weather conditions (no heavy rains, waterlogging, etc.)
- Mineral fertilisers are not recommended for small-scale production

**How to create a compost heap:**

- Build it in a sheltered place if possible, e.g., next to a wall or fence and in the shade.
- Loosen the ground with a fork and mark out the area with a spade (at least 1 metre wide and 1 metre long).

- Lay down the first layer of rough material, e.g., branches, mielie stalks, cabbage stalks and hedge cuttings.
- Next, put down a layer of brown material, e.g., dead leaves, dead plants and dry grass cuttings.
- Then put down a layer of green material, e.g., grass cuttings, green leaves and kitchen waste. Take care that the kitchen waste doesn’t attract mice and rats and keep it covered or closed.
- Next, add a layer of manure. After the manure, you can add two cups of bone meal and handfuls of gypsum, wood ash, mature compost or healthy soil.
- Water each layer well as you go.
- Keep on repeating these layers until the heap is 1 to 1.5 metres high.
- Water your pile regularly, turn it over with a fork every two to four weeks.
- It will take about six months until it is ready. It should be dark brown and crumbly.
- Keep the heap covered with a breathable material like shade cloth.
- In winter, cover the heap with plastic to protect it from rain.
Irrigation is one of the key activities in the garden, since water is a main input for plant growth. The severe and ongoing drought in Cape Town is forcing farmers to face many new challenges.

An appropriate water or irrigation-management system needs to consider the following:

• **WATER QUANTITY** – required quantity for optimal crop growth, avoid overwatering and drainage problems as well as underwatering;

• **WATER QUALITY** – ensure that the water is not contaminated. Surface water can be exposed to contamination coming from raw human and animal waste, or sewage-water discharges;

• **APPLICATION METHOD** – Most farmers in the Cape Flats use sprinklers; which requires electricity (pump) and access to borehole water or tanks. To reduce water usage, a drip irrigation system is recommended.

**What to do and how to do it:**

• Do irrigation planning and decide on the appropriate irrigation practice for your farm; surface (furrow or flood), overhead (sprinklers), trickle (drip or buried), micro sprinklers

• Sandy soil doesn’t keep water; irrigation should be more frequent than on heavier soils

• Clay or natural materials like branches, leaves should be mixed into the soil to increase water-holding capacity

• Mulching keeps the soil moist which reduces irrigation

• Ensure regular watering/ right frequency of irrigation to avoid water stress for plants

• Water at the right time; early morning and late afternoon

• Irrigate directly onto the plant; water should go to the roots, etc.
• Use water-harvesting techniques during winter; install JoJo tanks or other containers to save as much rain water as possible
• Plant water-wise plants and intercrop with succulents (e.g., spekboom) as they keep water in the soil, avoid planting water-intense plants during drought such as cabbage, lettuce, root crops and cucumbers
• Farming during drought:
  − respect water restrictions and do not use municipal water
  − consider stopping farming during the hot summer months if water restrictions are put in place
  − stop farming completely during severe drought if you do not have alternative water sources to municipal water
Crop losses due to pest and disease problems are usually very high. **Prevention is easier than cure.** Good agricultural practices include farming techniques that prevent problems during the cultivation period by giving the plants the best conditions in which to grow. The role of **Field Hygiene** - hygienic or sanitary measures, such as roguing, burying of infested crop residues and clean growing zones - cannot be overemphasised. Since weeds can serve as alternate hosts, regular **Weed Control** is inevitable.

The main goal of **Plant Protection** is ensuring healthy and sustainable production of crops. Many pest and disease problems can be avoided, minimised or managed by selecting the right production site and using recommended cultural practices, e.g., crop rotation, building of healthy soil and good irrigation practices. **Regular Monitoring** of the crops, and knowledge on pests and disease symptoms and their causes, enable the farmer to decide on appropriate prevention or control measures on a farm. Have a walk through your fields, observe what is happening on and under the leaves. There are six problems to look out for: pests, nematodes, fungi diseases, bacterial diseases, virus diseases and physiological diseases. Simply, make sure they don’t enter your farm.

### Prevention – what to do and how to do it:

- Inspect and monitor your plot on a daily basis
- Follow recommended urbanGAPs methods to prevent pests and diseases
  - practice crop rotation, intercropping and mulching
  - use healthy seeds
  - adopt appropriate planting distances and avoid overcrowding
  - adopt good soil-management practices
  - apply appropriate and balanced fertilisation (avoid too much nitrogen)
  - ensure balanced water supply and avoid water stress
  - avoid injury to plants to prevent entry points for pathogens and insect pests

### Curative control – what to do and how to do it:

- Monitor your field regularly and identify the pests and diseases affecting your crops – it is a precondition for applying the appropriate control method. If you are not sure, ask for help;
- Apply mechanical and physical control measures; remove pests and snails by hand-picking/collection, cover crops with nets, plant windbreaks, trap/catch crops as barrier plants, use oil emulsion or a mix of chilli, water and neem leaves to wash off pests, use sulphur and copper against fungus;
- Use biological pest control mechanisms; promote or release microbial pathogens/natural enemies that attack specific pests, grow flowering plants (marigold, phacelia, coriander) to provide shelter and food for beneficial insects like bees and wasps.
Observe and monitor the garden everyday.

Watch and remove pests, rotten and infected crop.
PEST AND DISEASE MANAGEMENT AND IDENTIFICATION

Sometimes it helps to imagine the living conditions of insects, bacteria and yeast to help prevent them choosing to live and thrive in the farming area. Often, when we cannot see the so-called pests (as we do moles, birds or rats), it is easy to avoid taking action until it is too late.

Weevils seem to appear out of nowhere but this is purely because their eggs are practically invisible and the larvae very small. We tend to only notice them when they are adult-size and the damage has already been done. Weevils prefer grain or seed and will burrow into the seed making characteristic holes. They lay eggs in protected areas, such as under pots, in the soil alongside plants or inside seed holes. To us, these may not seem like protected spaces, but they are most suitable for very tiny eggs. It is important to get rid of seed from weevil-infested stock as they will continue their life cycle within the plant cycle - you just may not be able to see them.

A spider mite clan is moving in under a few leaves in a pot in which you are growing coriander. If left unchecked and the environment (the pot in its position) remains the same, the spider mites will get comfortable and their population will grow, preventing the coriander from being sellable and, within a few weeks, not even usable. By simply changing the environment – this could be changing the area the pot is placed in, lowering the humidity or increasing air circulation – you will disrupt the comfort experienced by the spider mites and they will have to find somewhere else to go.

To think from the perspective of bacteria means to emulate the environmental conditions they like to live in. Most bacteria prefer warm moist conditions; some tomatoes left to rot in the field is a perfect example of this. Bacteria are microscopic, we cannot see them, only the damage they do. To prevent the spread of bacteria, it is a good idea to remove any potential breeding grounds, just like the rotting tomatoes.

In the heat of summer, snails tend to go into a kind of hibernation where they retreat into their shells, create a hardened mucus layer and spend some weeks waiting until the moisture and greenery arrives again and the nights cool down. Snails prefer a moist environment which better suits their soft bodies.

Snails, although slow, are able to move quickly over smooth surfaces and eat at a ferocious speed. They are attracted to certain smells more than others, and are particularly fond of yeast. This is why traps such as beer traps work very well, but one could put a small amount of yeast and sugar into tepid water to get a similar result.

Because of the soft-bodied nature of snails (even within their hard shells), they prefer to hide overnight, under a turned pot for example. Because they are targeted by birds and other animals, hiding gives them a better chance of survival. This also means they are easy to catch; if one lays a towel out overnight, the snails will cluster beneath it and be easier to pick up and move.
Homemade teas to strengthen the plants

**Earthworm**
Keep an earthworm farm and use the tea or “pee of the small guys” as liquid fertiliser. One part liquid, five parts water. Apply to the roots.

**Nettle**
Snails and downy mildew hate nettles. Put some nettles into a bucket of water and leave it for two weeks. Apply one part of the nettle-water mixture with four parts water and spray.

**Comfrey**
This is a booster. Let comfrey sit in a bucket of water for a couple of days and apply the liquid with two parts water to the roots.

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**Pests**
- Insects or small animals (snails, rats, mice, etc.)
- Insects like larvae of fruit- and leaf-eating caterpillar species
- Leaf- and flower-eating beetles, stinkbugs
- Leafhoppers
- Nematodes or roundworms
- Fungi diseases
- Soft rots, leaf and fruit spots, bacterial blights, vascular wilts or scabs

**Solution**
- Prevention is better than cure
- Soil fertility to grow strong plants
- Use healthy seeds
- Intercropping
- Field hygiene
- Use your virtual and real-life networks
- Ask a fellow farmer

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**Search for information**

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**Excess, deficiency, shortage**
- Unfavourable growing environments such as improper levels of light, ventilation, water/humidity, soil nutrients, moisture and/or acidity, oxygen, extreme temperatures.
It happened. You might have been away for a couple of days, you might have been busy or maybe you just forgot the monitoring. Snails are climbing high, the weevils are in paradise and your leaves have taken on all sorts of brown tones. Damn.

After the cause has been determined, there are various organic methods to control the pests and diseases. Organic methods solve problems, they do not solve them in one go. That means the application has to be repeated. If one is not sure whether it is a plague or some disease, the swarm intelligence will help. Many fellow farmers have similar challenges – questions help.

**PEST AND DISEASE MANAGEMENT AND CURE**

- plant windbreaks and natural barriers such as lemon grass, wild garlic, gooseberries, shrubs
- cover crops with nets to avoid pest infestation
- fence your farm to keep out animals and livestock which can cause crop losses
- use soap solutions to wash off pests (mix curd soap with water and apply it with a small hand distributor or with a rag and wash pests off. Repeat for a few days, especially if there were eggs or grubs on the crop). Don’t use Sunlight liquid only.
- hot water treatment of seeds against bacteria before drying and storing

**Organic Plant-protection Products:**

- mix neem leaves with water and let it sit for a few days. Use it to wash off pests, eggs and larvae
- mix garlic, chillies and curd soap and wash off pests, eggs and larvae
- mix milk and water to spray against red spider mites, caterpillars or mildew
- Add calcium to the soil, when your plants indicate deficiencies, i.e., when the blossom end of peppers and tomatoes are mouldy
- Add nitrogen to the soil, while planting more legumes if other leafy crops indicate nitrogen deficiency (yellow leaves)

**Pest and Disease Management – what to do and how to do it:**

- hand-pick/ collect the pests such as snails, caterpillars
- take the pests away from your farm and kill them to stop them from moving on to the next plant
- build a small fence with plastic or corrugated material to challenge the snails to come closer place egg shells around your plants to protect them from snails
- keep a dog, cat or brown snake to keep moles and mice away, or use traps
Production guidelines for urban farmers

**Caterpillar**

Take the caterpillars off the plant/s, take care to check under the leaves every day ideally - caterpillars love to hide under leaves. Wash eggs off with chilli mix at least once a week.

**Spinach rust**

Space your plants properly to encourage good air circulation, avoid wetting the leaves when watering plants. Remove all infected parts and destroy them.

**Snails**

Pick them off

**Deficiency**

Blossom end of peppers or tomatoes are mouldy - leaves are yellow.
HARVESTING AND POSTHARVEST HANDLING

At the end of the production cycle, there remains harvesting and preparing the produce for MARKETING, SELLING, SHARING OR CONSUMING. Harvest and post-harvest activities include harvesting, handling, cleaning, sorting, storage/cooling, processing, packaging, transportation and marketing of the harvested crops.

Losses of horticultural produce due to spoilage, shrinkage or contamination are major problems in the post-harvest chain. It is crucial, therefore, to adapt good handling practices to ensure harvested produce of a good quality and to avoid food waste and economic loss.

FOOD WASTE is a crucial issue in Cape Town’s urban agriculture. One reason is that food is not harvested at the right time and becomes rotten in the field. Another reason for food waste is the provision of subsidised seedlings for crops which are not eaten within the communities. A breakdown of the external market can make for unused surplus.

The production of crops, harvesting and post-harvest handling have to be properly planned. How much of the produce does the farmer need for own consumption?

How much produce (in quantity and quality) does the farmer need for which markets? To minimise the risk of food waste and loss of income for the farmers, it is recommended to have several marketing options.

Record-keeping during harvesting and marketing is very important to have an overview of the outputs of farming activities; the harvested quantities, qualities, current prices and income.

What to do and how to do it:

• Do selective picking to harvest vegetables at the correct, crop-specific period and quality required by the client (required size, maturity, colour, free from defects and diseases).
• Use appropriate, crop-specific harvesting techniques: harvesting methods vary with the different plant parts harvested (the whole plant or a part of vegetative growth).
Consider the right harvesting time and weather conditions: best during the coolest part of the day – early morning or late evening and under light conditions

• Follow hygiene and quality rules during harvesting and the post-harvest chain to avoid contamination
  • Use correct and clean harvesting tools; sharp and clean knives to prevent spreading of (viral) diseases from plant to plant
  • Use clean and appropriate containers; smooth, with no sharp edges or projections to damage the produce
  • Avoid contact between the harvested produce and the soil or contaminated surfaces, e.g., dirt, oil or chemicals

• Handle produce with care to avoid damages (cuts, bruises) or loss
  • Prevent overfilling of the containers/ bins
  • Prevent damaging the fruit, dropping the fruit into the containers at a distance and rough handling

• Protect harvested produce from rain, dust or sun by keeping it in a shaded environment or in a cool, temporary storage area

• If washing of very dirty produce is necessary, use clean tap water because borehole water can be salty. Not all legumes should be washed; some have to be kept dry, e.g., soft herbs and potatoes.

• Transport produce carefully to prevent damage. Avoid unnecessary delays. Continue following basic hygiene practices in terms of clean equipment and means of transport

Consider different markets, especially local communities

Harvest when crops are ready

Never leave rotten veggies. Avoid food waste. Harvest for family/friends and donations
AGROPROCESSING

Agroprocessing is a vital part of food value, but also in preservation, to save food past its season. It is also called “value-adding” as any processing we apply to our fresh produce adds extra value on the product market. It is not common to find products on the market that are produced from regenerative-practice farming, as this UrbanGAPS manual shares. When we find organic products on the market, they are usually through organic-certified processes which make them more expensive and cater to a specific market - those who can afford them. Agroprocessing is a great way to process surplus produce and diminish its volume. For example, the nature of Solanaceae family is to overproduce – this is true for chillis, brinjals, tomatoes and others. So when tomatoes are in season, there will always be a surplus of them. Tomatoes do not usually store very well, so a good way to deal with them is to diminish their volume by sun-drying them, making sauce or, even better, paste. Another example of diminishing volume is making pesto out of basil or other herbs.

Agroprocessing can be as simple as juicing or drying fresh fruit and vegetables. It can include canning and dehydrating, experimenting with recipes (desserts such as ice cream or using fruits and vegetables in the baking of bread) or trying more complex recipes such as fermenting (vinegar, sauerkraut, etc.) and pickling.

What to do and how to do it:

- Store produce at ambient or cold temperatures, depending on the produce. If the produce is soft, it is better not to pile one product on top of another as the produce below may get squashed and bruised.

- Certain value-adding recipes require produce to be fresh but others can use produce that is damaged, particularly those that require the fruit or vegetables to be cut up or broken down into liquid.

- It is better to process the produce to a finished product as quickly as possible. Sometimes this may seem overwhelming with the amount of work that processing takes but gathering a group of people, whether they are friends or employees, makes the job much easier. You will process for a few days depending on the amount of produce you are working with, but once the product is finished, you will fill your pantry and be able to eat for many months. Alternatively, you will prepare the products for a market.

- Marketable products need to adhere to certain parameters, such as labelling (which must include an expiration date), storage instructions, potential recipe uses perhaps, weight (in volume or grams), contact details, an ingredients list and potential allergies that could be caused by any of the ingredients. There are phytosanitary parameters to adhere to depending on the kind of product. For example, processes that use sugar require the sterilisation of jars as mould likes to grow in sugar environments.

- Some agroprocessing requires equipment but some can be done simply. An example of simple processing is to bunch clean herbs together and hang them where there is no direct light and ample air circulation. This allows the herbs to dry and be used in cooking throughout the seasons, as gifts or even as a marketable product.
The Germans popularised sauerkraut by using cabbage and salt as base ingredients, but fermentation of this style had been happening prior to this in some Asian countries. You can add almost anything to this base recipe. To make sauerkraut, you need to shred “juicy” vegetables or fruit (think apples, carrots, beetroot or cabbage) and add 2% of the vegetables’ weight in salt. By doing this, you release the juices contained within the produce. The finer you shred the vegetables, the more the cell walls will rupture, allowing the release of more liquid. Massaging, punching and working the shredded vegetables produces a similar effect, as does leaving it for a few hours or overnight.

**Ingredients**
- 2 heads of cabbage
- A good amount of salt - work at a teaspoon per medium head if you don’t have a scale
- Spices like dill, fennel, caraway and ginger, anything really, even nasturtium.

**Method**
- Shred cabbage finely. Think of it being easy to eat, so a shred-size that is easy to hold on a fork
- Weigh the shredded cabbage and add 2% of that weight in salt (or a teaspoon per head). You need it to be just saltier than salty, not uncomfortably so, but salty enough that it feels like you can’t eat too much of it as it is. This salt will mellow in time.
- Add the chosen spice to taste, a tablespoon or two should do it.
- Work that cabbage: massage, squeeze, pummel, beat, shake! Work it for at least 10 minutes, or as long as you can. You can let it rest to allow more liquid to be released. You need enough brine to cover the vegetables when you jar it up, it must be covered with liquid to ferment anaerobically.
- Stuff the shredded-cabbage mix into a jar and push it down, compacting it tightly. Work this way until you’ve almost filled the jar, leaving a small gap at the top. You should have released enough liquid already but add a bit more of the brine that was released while you worked the cabbage.
- If you do not have enough brine or if you have pieces floating on top of the brine, you will need a weight or cover as described above.
- Alternately, you may fill the jar all the way up to the top so that it just overflows and cap it tightly. You are creating a seal. This is not necessary but, in my experience, has a higher success rate.
- Now that you know, you can totally freak it:
- Add other ingredients, mix and match; spicy or not. Some ingredients develop flavour while others disappear, try test batches to see what works for you.
MARKETING AND PRICING

The biggest challenge for farmers is to market their produce, meet customer needs and determine a price for their crops. A multi-market approach is recommended to avoid dependencies on one market channel.

This requires some research on alternative opportunities. Local markets are a promising ‘place’ to sell - even though it may look more challenging at first glance. Possible buyers include local school kitchens, teachers and parents of children at schools, churches, local restaurants close to the taxi ranks, and local spaza stores that are willing to buy produce from farmers.

The price for one crop should include all inputs; the farmers’ labour, transport and marketing costs. It is a tricky calculation to break this down to one carrot or a handful of peas. Prices are also dynamic and depend on the season. If the demand is high, farmers can increase prices but if there is a massive production, farmers should decrease the amount.

To understand price dynamics, it is crucial to observe the market. What price is my retailer giving me? What are the prices in the local supermarkets and spaza stores?

Record-keeping is a central task that is often lost in the busy everyday life of farmers. It is nevertheless valuable to write down the weekly expenses (seeds, fertiliser, compost, material, manpower) and the weekly income from sales once a week. If you deduct the expenses from the income, you can calculate the profit. This should be higher because this is the farmer’s income; the fruits of the farmer’s daily working time and the effort put into cultivation of the crops. The diary or record also shows how much produce should usually be sold and what is leftover. If you also note what you have sown or planted on what dates, you can plan early sales.

What to do and how to do it:

- Join forces with other farmers; this gives you bargaining power
- Give some thought to starting a co-op. This helps you to sell produce as an independent group
- The closest market is an easy one. Approach schools and churches in your neighbourhood, the community and your extended family.
• The closest market is also a challenging one. You need to meet with your customers regularly and directly; to meet the quality needs of your regular customers is key.

• If you have a market stall, try to establish a weekly routine so that consumers get used to your service.

• Most people in your immediate neighbourhood might not consider the food garden as a source of food. The farmer needs to advertise and the most successful way is by word-of-mouth.

• Establish a growing group of direct clients and provide them with your availability on WhatsApp/SMS, on a blackboard in the front of the garden or when they are simply passing by.

• Restaurants are interested in fresh produce, particularly when farmers can find a way to deliver it, or do one of the first simple processing steps such as chopping.
VALUE OF FOOD

Urban agriculture has the potential, in a sustainable urban food system, to supply additional food and nutrition, increase income, contribute to “green cities”, and help alleviate urban poverty.

The close relationship between “farm and fork” provides opportunities, and can create short value chains or niche markets. Cities provide a very dynamic space for interaction between different actors and networking facilities. Urban agriculture is not only a source of food production or income generation; it is also a catalyst for social interaction. It puts people back in touch with nature, and educates people on food and ethical value chains.

In small-scale urban agriculture, it might be a step towards independency from subsidies if some farmers start to produce and sell within the farmer community. This creates small, micro businesses, spreads knowledge and increases horticulture expertise. Such interactions are important social and economic benefits of smallholder urban agriculture.

It is important for urban farmers to learn to value their role as growers and producers of healthy, local and fresh food. This starts with appreciation and consumption of their own produce, and confidence in the marketing of their product.
Since March 2016, the Federal Ministry of Food and Agriculture (BMEL) has supported a project on Urban Agriculture in Cape Town and Maputo: “UFISAMO-Urban Agriculture for Food Security and Income Generation in South Africa and Mozambique”. The objectives of the project are to research the contribution of urban agriculture to improving the Food and Nutrition Security of the disadvantaged urban population, and its impact on income through optimising production, processing and marketing of agricultural and livestock products.

This manual shows results of participatory research conducted in Cape Town in March 2018, by Nicole Paganini, Anja Kühn and Erik Engel, the urbanGAPs monitoring conducted by Zayaan Khan and further research by Anja Kühn, Zayaan Khan and Nicole Paganini in 2019. The full urbanGAPs guidelines are accessible on www.ufisamo.org/en/urbangap/.

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From seed to table - how to make urban agriculture more sustainable - a production guideline