

The Integrated Microgarden Concept¹

Introduction

Microgardens are small scale production units (0.5 or 1 m²), which can help all people to produce and consume daily a variety of nutritious vegetables. These will usefully diversify their diet and protect their health against nutrition-linked diseases. Microgarden technologies enable the production of vegetables in very small spaces and are there for well adapted to the urban environment and high density populated neighbourhoods where access to space and water for irrigation are a constraint and can fit on balconies, patios and rooftops. Since growing microgardens doesn't require heavy physical efforts, it is an attractive activity for a broad range of people: women, man, children, elderly, disabled.

Microgarden systems are designed to allow families to grow at home a broad range of leafy vegetables as well as fruit vegetables, selected root and tuber crops, herbs and condiments for home consumption and neighbourhood marketing.

The integrated microgarden concept proposes the useful integration of production technologies with water saving and rainwater harvesting, sustainable soil fertility management through the recycling of kitchen waste into compost, improved nutrition through increased consumption of fresh vegetables and condiments, increased income through the doorstep marketing of production surplus.

Integrated microgardens are also proposed as a model for educational schoolgardens.

Component 1: MICROGARDEN TECHNOLOGIES and AGRONOMY

The type of technology by itself is variable and often depends on the creativity of the people. FAO proposes a 1 square meter of "table garden" as a standard unit and reference. Based on this model, people all over the world have developed and are using different types of containers using technologies adapted to the local environment and cultivating a broad range of species and cultivars according to their preference.

Species and cultivars:

Leafy vegetables: like lettuce ; cabbage ; karkade (Rosel) ; jute ; rocket lettuce ; spinach; amaranth ; cut lettuce ; swiss chard ; water cress; ...

Herbs and condiments: coriander, basil, celery, mint, thyme, dill...

Root or bulb type vegetables like carrot ;red beet ; bulb onion ; green onion ; cherry and other radishes;...

Pod vegetables: snap beans; snow beans

Fruit vegetables like: tomato; egg-plant; sweet and hot pepper; zucchini;

Small fruits: strawberry;cape goose berry

Flowers and ornamental plants

¹ By Wilfried Baudoin: FAO consultant AGPM, Horticulture specialist

Microgardens can be grown in mono-cropping or in mixed-cropping system (see annex 1: companion plants)

Size: Microgardens require little space: 1 m² or less.

Materials: Microgardens are based on simple low cost materials easily affordable by the poor people and make use of discarded materials. The standard microgarden technology is based on a “container” cultivation principle, which can be a table constructed from recycled wood (pallets); old car or truck tires; halved drum; different types of buckets, plastic sleeves, bottles, crates etc.

Insect and disease control:

Micro-gardens are usually protected by non-chemical pest and disease control methods. Insect-proof cloths are applied to avoid the use of pesticides. Other physical and mechanical devices are used to avoid insect damage viz. yellow and blue sticky traps.

Diversification:

Microgardens can eventually be combined with chicken raising providing eggs and meat as well as chicken manure, which can be usefully mixed with kitchen garbage and valued for compost making aiming at sustainable substrate fertility management.

There are also possibilities of combining microgardens, with fish rearing, by recycling the water of the fishpond which is rich in ammonium.

Yields

Microgardens are very productive. 1 table of 1 m² can yield up to:

- 36 lettuce every 60 days or
- 10 kg of tomato two times per year or
- 10 cabbages every 3-4 months or
- 100 onions every 4 months

Yields for leafy vegetables can reach up to 10 kg/m²/year, equivalent to 100 tons/ha

Yields for fruit and root vegetables can reach up to 20 kg/m²/year, equivalent to 200 tons/ha

Component 2: WATER for IRRIGATION

Microgardens require little water: With a closed (recycling) drainage system, an average of 1 m³ of water per 1 m² /year will suffice depending on the prevailing climate, type of crops and cropping calendar.

In the urban environment, tap water can be scarce and expensive. Its price ranges from 1 to 15 \$ US/m³. Water for irrigation needs to be secured and its cost and quality assessed. Rainwater is free of charge and of excellent quality.

E.g. a roof of 20m² can collect 2000 litre (2m³) for a rainfall of 100 mm, which is enough water to grow two microgarden tables of 1 m² each over a period of 12 months.

High water use efficiency is obtained by a combination of

- recycling of the drainage water
- rainwater harvesting
- the use of shade screens to reduce excessive heat and related evapotranspiration.
- applying a mulch
- recycling of kitchen waste water



Rainwater collection can be easily achieved by connecting a large clean water grade container to gutters and surrounding a building or house.

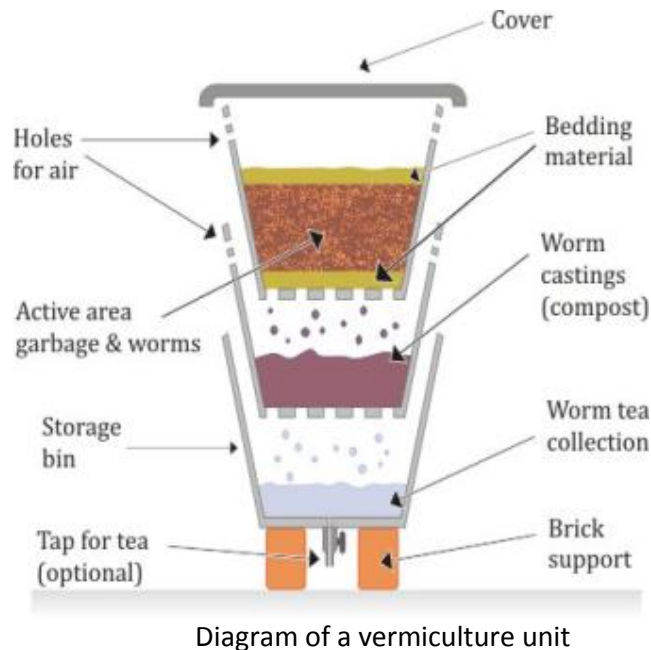
Component 3: SUSTAINABLE SUBSTRATE FERTILITY.

Growing medium: Ideally microgardens are filled with fertile soil (light alluvial soil). Alternatively, whenever fertile soil is not available, “substrates” can be used such as rice hulls, peanut shells, wheat burnings, sand, wood shavings or sawdust, coconut choir, cotton seed hulls, etc...

Mineral fertilisers are often expensive and not always readily available. Making compost out of kitchen garbage will enable to maintain the substrate fertility of microgardens at no cost. From the garden to kitchen and from kitchen to garden. A household composting unit is easy to manage. There are “ad hoc” composting bins that can be used at individual household level or in schoolgardens.

Alternatively, a typical community composting unit consists of three pits of 1m x 0.5m x 0.5m. The 3-pit unit is covered with a shade shelter of 2.5 x 1.5 m. and 2.00m high. It is covered for shading with a climbing plant like grape vine (*Vitis europeae*) or “Maracuja” (*passiflora edulis*) or Chayote (*Sechium edule*), or covered with woven mats e.g. from pennisetum grass or with a synthetic shade cloth.

Composting units are to be kept moist and need to be watered from time to time during the dry season. In case poultry or rabbits are raised, the manure can be composted in combination with the kitchen garbage.



Component 4: NUTRITION EDUCATION

Microgardens yield nutritious and safe vegetables, produced at home. No pesticides are used for plant protection. Nutrition education is suggested to help people diversify their diet and get best benefits from consuming daily several portions of fruit and vegetables in accordance to the FAO-WHO recommendations². Microgardens will help families to diversify their diets and combat malnutrition and nutrition-linked diseases. Microgardens are well suited as pedagogic tools to help children in primary and secondary schools become familiar with vegetable growing and their consumption as part of diet diversification for health.

Component 5: RECORD KEEPING

Record keeping is essential for cost-benefit assessment and traceability. Surplus of production can be sold on the doorstep or bartered with neighbours.

² FAO-WHO recommend a minimum daily intake of 400 grammes of a diversified assortment of fruits and vegetables.
www.who.int/dietphysicalactivity/fruit

Consuming vegetables from the home microgarden will substantially reduce daily expenditure for food. Income from 10 m² of microgardens are in the range of 0.5 to 1 US \$/day or more.

It is common that 30-40% of the yield is reserved for home consumption and 60-70% is sold.

It is recommended that the agronomic performances of crops grow in the microgarden be recorded on standard templates available in HORTIVAR, FAO's Horticulture database.

(www.fao.org/hortivar), using the simple data entry form (DEF).

Annex I: Companion planting chart

Table 1. COMPANION PLANTING CHART FOR HOME & MARKET GARDENING		
CROP	COMPANIONS	INCOMPATIBLE
Asparagus	Tomato, Parsley, Basil	
Beans	Most Vegetables & Herbs	
Beans, Bush	Irish Potato, Cucumber, Corn, Strawberry, Celery, Summer Savory	Onion
Beans, Pole	Corn, Summer Savory, Radish	Onion, Beets, Kohlrabi, Sunflower
Cabbage Family (Cauliflower, Broccoli)	Aromatic Herbs, Celery, Beets, Onion Family, Chamomile, Spinach, Chard	Dill, Strawberries, Pole Beans, Tomato
Carrots	English Pea, Lettuce, Rosemary, Onion Family, Sage, Tomato	Dill
Celery	Onion & Cabbage Families, Tomato, Bush Beans, Nasturtium	
Corn	Irish Potato, Beans, English Pea, Pumpkin, Cucumber, Squash	Tomato
Cucumber	Beans, Corn, English Pea, Sunflowers, Radish	Irish Potato, Aromatic Herbs
Eggplant	Beans, Marigold	
Lettuce	Carrot, Radish, Strawberry, Cucumber	
Onion Family	Beets, Carrot, Lettuce, Cabbage Family, Summer Savory	Beans, English Peas
Parsley	Tomato, Asparagus	
Pea, English	Carrots, Radish, Turnip, Cucumber, Corn, Beans	Onion Family, Potato
Radish	English Pea, Nasturtium, Lettuce, Cucumber	Hyssop
Spinach	Strawberry, Faba Bean	
Squash	Nasturtium, Corn, Marigold	Potato
Tomato	Onion Family, Nasturtium, Marigold, Asparagus, Carrot, Parsley, Cucumber, Basil	Potato, Fennel, Cabbage Family
Turnip	English Pea	Potato

Source: <http://permaculturenews.org/2011/12/02/companion-planting-information-and-chart/>