Newly constructed Multistorey garden ready for planting. The center perforated pipe can be seen cleary with gravel in the inside of the pipe.. (Paul Kahiga (8444-00300 Nairobi Kenya))

Multistorey Gardens (Kenya)

Multistorey Gardens

DESCRIPTION

Multistory gardens refer to upright polythene sack filled with soil, in which food crops like vegetables, kales, carrots or onions grow on its sides.

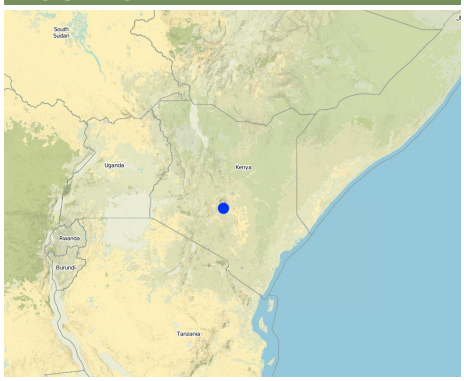
Multistory gardening is an innovative and exciting technology for year round vegetable gardening. Multi-storey farming not only makes efficient use of water but it is also safe from droughts and floods.

Purpose of the Technology: This micro-gardening concept being a low input activity is ideal where labor and other resources are scarce. Multi-storey gardens lead to development of self reliance in vegetables for nutrition and food security in the vulnerable households.

Establishment / maintenance activities and inputs: Materials required for multi-storey gardening include empty cereal bag or animal feed bag, one empty oil can or 6"PVC pipe with holes, 2buckets small stones, 6 buckets soil, 6 buckets manure, seeds, adequate water to irrigate the bag garden and gardening tools. The following procedure is used to set up the garden. 1) Mix the soil and well decomposed manure thoroughly. 2) Cut out the bottom of the oil can and make holes on the sides. 3) Fold back the bag and fill the bottom 15cm with small stones. 4) Place the can on top of the small stones in the center of the bag. 5) Fill the oil can with small stones 6) Fill the area between the oil can and the bag with the soil-manure mixture up to the can level. 7) Pull up the can to the level of the soil compost mixture with a tilting motion. Repeat steps 5, 6 and 7 until the bag is full and a central core of stones is formed leaving the tin at the top of the bag garden. Pour water into the tin through the central core till the soil is soaked.

Natural / human environment: Multistory gardens technology is suitable for urban gardening in Kenya where land for farming has greatly reduced due to urbanization.These bag gardens are also suitable for dry, non fertile areas where soils are not suitable for conventional gardening, areas with water scarcity..

LOCATION



Location: Embu, Eastern Province, Kenya

No. of Technology sites analysed:

Geo-reference of selected sites
- 37.47211, -0.53661

Spread of the Technology: evenly spread over an area (approx. < 0.1 km2 (10 ha))

In a permanently protected area?:

Date of implementation: less than 10 years ago (recently)

Type of introduction
- ☐ through land users' innovation
- ☐ as part of a traditional system (> 50 years)
- ☐ during experiments/ research
- ☑ through projects/ external interventions

-

CLASSIFICATION OF THE TECHNOLOGY

Main purpose

- [x] improve production
- [ ] reduce, prevent, restore land degradation
- [ ] conserve ecosystem
- [ ] protect a watershed/ downstream areas – in combination with other Technologies
- [ ] preserve/ improve biodiversity
- [ ] reduce risk of disasters
- [x] adapt to climate change/ extremes and its impacts
- [ ] mitigate climate change and its impacts
- [x] create beneficial economic impact
- [ ] create beneficial social impact

Land use

Cropland

- Annual cropping: vegetables - leafy vegetables (salads, cabbage, spinach, other), vegetables - root vegetables (carrots, onions, beet, other)

Number of growing seasons per year: 1

Water supply

- [ ] rainfed
- [x] mixed rainfed-irrigated
- [ ] full irrigation

Purpose related to land degradation

- [x] prevent land degradation
- [ ] reduce land degradation
- [x] restore/ rehabilitate severely degraded land
- [ ] adapt to land degradation
- [ ] not applicable

Degradation addressed

soil erosion by wind - Et: loss of topsoil

SLM group

- home gardens

SLM measures

agronomic measures - A1: Vegetation/ soil cover

vegetative measures - V2: Grasses and perennial herbaceous plants

TECHNICAL DRAWING

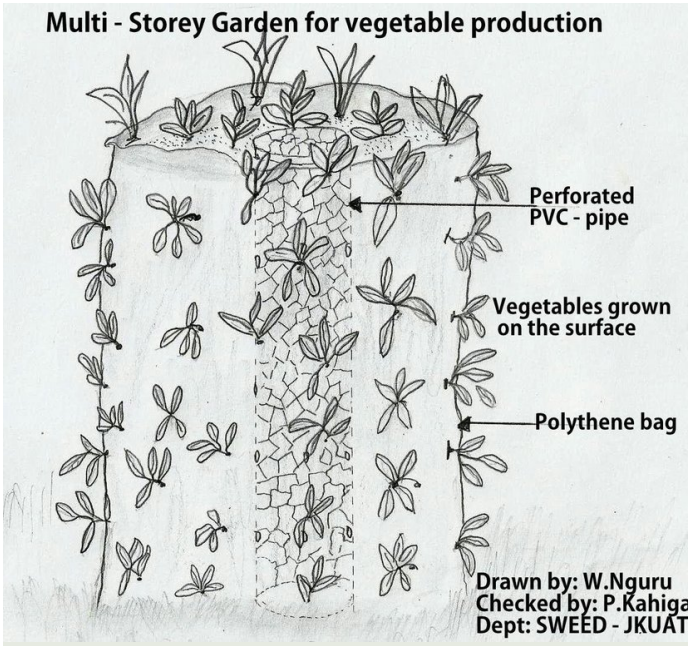
Technical specifications

This is a technical drawing showing a typical multi-storey garden technology for vegetable production. It comprises of a perforated polythene bag with a central Perforated PVC pipe (for water application) and vegetables planted on the outer surfaces.

Location: Mbeere South District. Eastern Province

Main technical functions: spatial arrangement and diversification of land use

Better crop cover
Material/ species: vegetables (kales and spinach)
Quantity/ density: 8
Remarks: per line



Author: Paul Kahiga, 62000-00200 Nairobi

ESTABLISHMENT AND MAINTENANCE: ACTIVITIES, INPUTS AND COSTS

Calculation of inputs and costs

- Costs are calculated:
- Currency used for cost calculation: **Kshs**
- Exchange rate (to USD): 1 USD = 100.0 Kshs
- Average wage cost of hired labour per day: 500.00

Most important factors affecting the costs

Labor is the most determinate factor affecting the costs.

Establishment activities

1. Purchase polythene bag (Timing/ frequency: None)
2. Purchase manure (FYM) (Timing/ frequency: None)
3. Purchase seedlings (Timing/ frequency: None)

Establishment inputs and costs

Specify input	Unit	Quantity	Costs per Unit (Kshs)	Total costs per input (Kshs)	% of costs borne by land users
Labour					
Labour	Labour per 10 bags	2.0	2.5	5.0	100.0
Equipment					
Tools	ha	1.0	20.0	20.0	100.0
Plant material					
Seedlings	Seedlings	320.0	0.00156	0.5	92.0
Fertilizers and biocides					
Manure		20.0	0.05	1.0	100.0
Construction material					
Polythene bag	Bags	10.0	0.25	2.5	100.0
Total costs for establishment of the Technology				**29.0**	
Total costs for establishment of the Technology in USD				*0.29*	

Maintenance activities

1. weeding (Timing/ frequency: 2)
2. harvesting (Timing/ frequency: 3 per week)

Maintenance inputs and costs

Specify input	Unit	Quantity	Costs per Unit (Kshs)	Total costs per input (Kshs)	% of costs borne by land users
Labour					
Weeding	Mandyas	3.0	0.8333	2.5	100.0
Harvesting	Mandays	1.0	2.5	2.5	100.0
Equipment					
Tools	Ha	1.0	2.0	2.0	100.0
Total costs for maintenance of the Technology				**7.0**	
Total costs for maintenance of the Technology in USD				*0.07*	

NATURAL ENVIRONMENT

Average annual rainfall
- [ ] < 250 mm
- [ ] 251-500 mm
- [ ] 501-750 mm
- [x] 751-1,000 mm
- [ ] 1,001-1,500 mm
- [ ] 1,501-2,000 mm
- [ ] 2,001-3,000 mm
- [ ] 3,001-4,000 mm
- [ ] > 4,000 mm

Agro-climatic zone
- [ ] humid
- [ ] sub-humid
- [x] semi-arid
- [ ] arid

Specifications on climate
Thermal climate class: tropics

Slope
- [ ] flat (0-2%)
- [x] gentle (3-5%)
- [ ] moderate (6-10%)
- [ ] rolling (11-15%)
- [ ] hilly (16-30%)
- [ ] steep (31-60%)
- [ ] very steep (>60%)

Landforms
- [ ] plateau/plains
- [x] ridges
- [ ] mountain slopes
- [ ] hill slopes
- [ ] footslopes
- [ ] valley floors

Altitude
- [ ] 0-100 m a.s.l.
- [ ] 101-500 m a.s.l.
- [ ] 501-1,000 m a.s.l.
- [ ] 1,001-1,500 m a.s.l.
- [ ] 1,501-2,000 m a.s.l.
- [ ] 2,001-2,500 m a.s.l.
- [ ] 2,501-3,000 m a.s.l.
- [ ] 3,001-4,000 m a.s.l.
- [ ] > 4,000 m a.s.l.

Technology is applied in
- [ ] convex situations
- [ ] concave situations
- [ ] not relevant

Soil depth
- [ ] very shallow (0-20 cm)
- [x] shallow (21-50 cm)
- [ ] moderately deep (51-80 cm)
- [ ] deep (81-120 cm)
- [ ] very deep (> 120 cm)

Soil texture (topsoil)
- [ ] coarse/ light (sandy)
- [x] medium (loamy, silty)
- [ ] fine/ heavy (clay)

Soil texture (> 20 cm below surface)
- [ ] coarse/ light (sandy)
- [ ] medium (loamy, silty)
- [ ] fine/ heavy (clay)

Topsoil organic matter content
- [ ] high (>3%)
- [x] medium (1-3%)
- [ ] low (<1%)

Groundwater table
- [ ] on surface
- [ ] < 5 m
- [x] 5-50 m
- [ ] > 50 m

Availability of surface water
- [ ] excess
- [ ] good
- [x] medium
- [ ] poor/ none

Water quality (untreated)
- [ ] good drinking water
- [ ] poor drinking water (treatment required)
- [x] for agricultural use only (irrigation)
- [ ] unusable

Water quality refers to:

Is salinity a problem?
- [ ] Yes
- [ ] No

Occurrence of flooding
- [ ] Yes
- [ ] No

Species diversity
- [ ] high
- [x] medium
- [ ] low

Habitat diversity
- [ ] high
- [ ] medium
- [ ] low

CHARACTERISTICS OF LAND USERS APPLYING THE TECHNOLOGY

Market orientation
- [ ] subsistence (self-supply)
- [x] mixed (subsistence/ commercial)
- [ ] commercial/ market

Off-farm income
- [x] less than 10% of all income
- [ ] 10-50% of all income
- [ ] > 50% of all income

Relative level of wealth
- [ ] very poor
- [ ] poor
- [x] average
- [ ] rich
- [ ] very rich

Level of mechanization
- [x] manual work
- [ ] animal traction
- [ ] mechanized/ motorized

Sedentary or nomadic
- [ ] Sedentary
- [ ] Semi-nomadic
- [ ] Nomadic

Individuals or groups
- [x] individual/ household
- [ ] groups/ community
- [ ] cooperative
- [ ] employee (company, government)

Gender
- [ ] women
- [ ] men

Age
- [ ] children
- [ ] youth
- [ ] middle-aged
- [ ] elderly

Area used per household
- [x] < 0.5 ha
- [ ] 0.5-1 ha
- [ ] 1-2 ha
- [ ] 2-5 ha
- [ ] 5-15 ha
- [ ] 15-50 ha
- [ ] 50-100 ha
- [ ] 100-500 ha
- [ ] 500-1,000 ha
- [ ] 1,000-10,000 ha
- [ ] > 10,000 ha

Scale
- [x] small-scale
- [ ] medium-scale
- [ ] large-scale

Land ownership
- [ ] state
- [ ] company
- [ ] communal/ village
- [ ] group
- [ ] individual, not titled
- [ ] individual, titled

Land use rights
- [ ] open access (unorganized)
- [ ] communal (organized)
- [ ] leased
- [x] individual

Water use rights
- [ ] open access (unorganized)
- [ ] communal (organized)
- [ ] leased
- [x] individual

Access to services and infrastructure
technical assistance

poor  good

IMPACTS

Socio-economic impacts

Crop production	decreased	✓ increased
risk of production failure	increased	✓ decreased
demand for irrigation water	increased	✓ decreased
diversity of income sources	decreased	✓ increased

Socio-cultural impacts

food security/ self-sufficiency	reduced	✓ improved
Improved livelihoods and human well-being	decreased	✓ increased

Improves dietary diversification

Ecological impacts

Off-site impacts

COST-BENEFIT ANALYSIS

Benefits compared with establishment costs

Short-term returns	very negative	✓ very positive
Long-term returns	very negative	✓ very positive

Benefits compared with maintenance costs

Short-term returns	very negative	✓ very positive
Long-term returns	very negative	✓ very positive

CLIMATE CHANGE

Climate-related extremes (disasters)

local rainstorm

not well at all ✓ very well

ADOPTION AND ADAPTATION

Percentage of land users in the area who have adopted the Technology

- single cases/ experimental
- 1-10%
- 11-50%
- > 50%

Of all those who have adopted the Technology, how many have done so without receiving material incentives?

- 0-10%
- 11-50%
- 51-90%
- 91-100%

Has the Technology been modified recently to adapt to changing conditions?

- Yes
- No

To which changing conditions?

- climatic change/ extremes
- changing markets
- labour availability (e.g. due to migration)

CONCLUSIONS AND LESSONS LEARNT

Strengths: land user's view

- Growing of vegetables all year round and less water is used for irrigation
- Labour efficient means of increasing food security

Strengths: compiler’s or other key resource person’s view

- Multi-storey gardens contributes to dietary diversification among the practicing communities.
- Contributes to income generation.
- Encourages self reliance and empowers women in rural areas.

Weaknesses/ disadvantages/ risks: land user's viewhow to overcome

Weaknesses/ disadvantages/ risks: compiler’s or other key resource person’s viewhow to overcome

REFERENCES

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n.a.

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