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# USE OF GREYWATER FOR FOOD PRODUCTION IN HOMESTEAD GARDENS OF SOUTH AFRICA

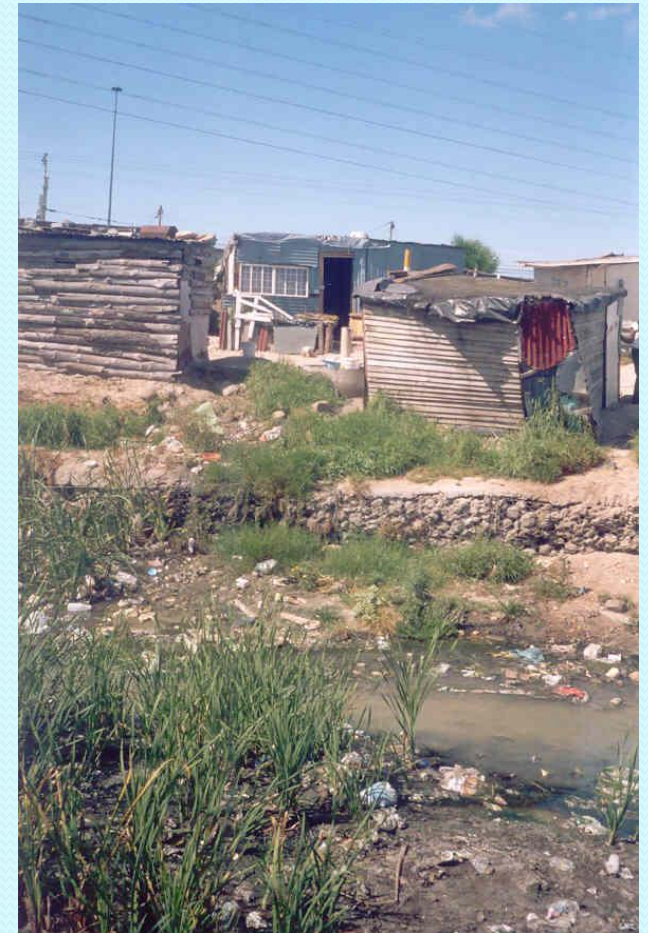
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South Africa

# What is greywater?

- All non-toilet domestic wastewater:
  - Bath / shower / handbasin
  - Laundry
  - Kitchen
- Toilet wastewater (blackwater) NOT included.
- Some definitions also exclude kitchen wastewater.
- Sewered areas: greywater represents about **65%** of total wastewater.  
Unsewered areas: greywater represents up to **100%** of total wastewater.

Uncontrolled greywater is an environmental and health hazard.



Photos K. Carden, UCT

# Why use greywater for irrigation?

- Water scarcity.
- Pressure on freshwater sources.
- Potential benefit of greywater use for irrigation
  - reliable source of water.
  - food security, informal employment.
  - improved health, environmental quality.

# Concerns about the use of greywater for irrigation

- Human health.
- Plant growth and yield.
- Ability of soil to support plant growth.

# Guidance for greywater irrigation

- Managing Uncertainty and Risk
- Guide to Greywater Constituents (Greywater Quality)
- Guide to Mitigation of Greywater Quality by Treatment or by Agricultural Practices
- Guide to Irrigation Volumes

# Managing Uncertainty and Risk

- A hazard becomes a risk only when people, plants or soil come in contact with it (exposure).
- For example:
  - Hazard may be health-related bacteria, e.g. *E. coli*.
  - Risk of illness exists if *E. coli* ingested by people.
  - To prevent the risk (illness)
    - remove *E. coli* from greywater.
    - prevent *E. coli* from coming into contact with hands or crops.
    - make sure that *E. coli* on hands or crops are removed or killed.

# Managing Uncertainty and Risk

- So risk can be managed by:
  - Removing hazards in greywater (improve quality).
  - Preventing people/plants/soil from coming into contact with hazards in greywater (exposure barriers).



# Managing Uncertainty and Risk

- Three categories, depending on how risk is managed.

## **Category 1:**

No greywater analysis or treatment; Strict barriers to exposure.

## **Category 2:**

Minimum greywater analysis so that greywater quality is controlled; Slightly less strict barriers.

## **Category 3:**

Full greywater analysis; Least strict barriers.

# Examples of Restrictions

- **Restrictions relating to human health**  
e.g. avoiding direct contact of greywater with edible crop; washing, peeling and cooking crop.
- **Restrictions relating to impacts on plant growth and yield**  
e.g. avoiding contact with leaves; leaching to minimise salinity.
- **Restrictions relating to impacts on soil**  
e.g. addition of gypsum to soil.

# Guide to Greywater Quality

- ***Minimum analysis***
  - Electrical Conductivity (EC)
  - Sodium Adsorption Ratio (SAR)
  - *E. coli*
  - pH
  
- ***Full analysis***
  - ***Minimum analysis plus***
    - Boron
    - Chemical Oxygen Demand (COD)
    - Oil and grease
    - Suspended solids
    - Total inorganic nitrogen
    - Total phosphorus

# Mitigation of Greywater Quality

- Integrated mitigation practices (part of irrigation and agricultural practice).  
Physico-chemical constituents, e.g. boron, EC, pH, SAR.
- Greywater treatment systems.  
Organic and biological constituents, e.g. COD, oil and grease, suspended solids, health-related bacteria.

# Guide to Irrigation volumes

- **Quantitative estimate** of maximum water use based on
  - Reference evapotranspiration
  - Crop factor (based on plant water use)
  - Area irrigated

Presented as **lookup tables** to be accessible to users with little technical background.

- **Qualitative** considerations for
  - Type of soil, hence frequency and means of greywater application
  - Adjustment for recent rainfall

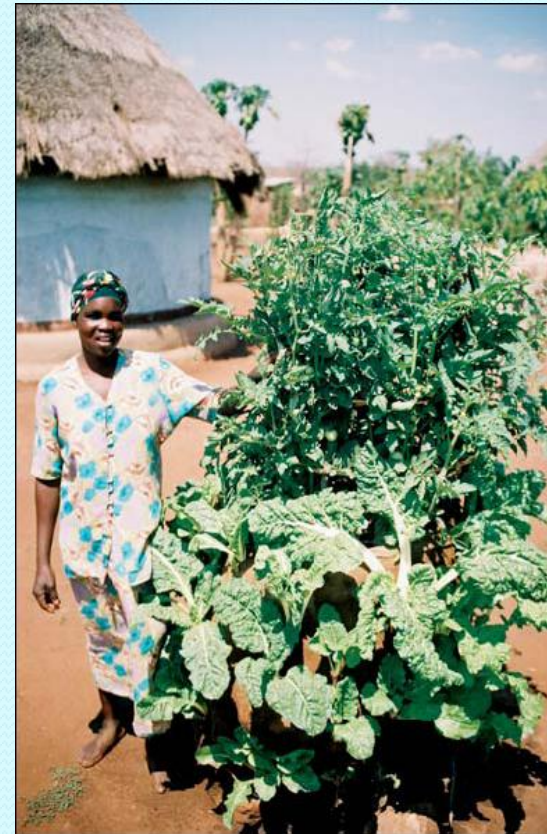
# Rural / semi-rural small plots



eThekweni Municipality

# Greywater treatment systems: Examples

## Tower gardens - Rural villages



From Crosby C. (2005). *The Water Wheel*,  
January/February 2005, 10-13.

# 'Agritubes' – informal settlements



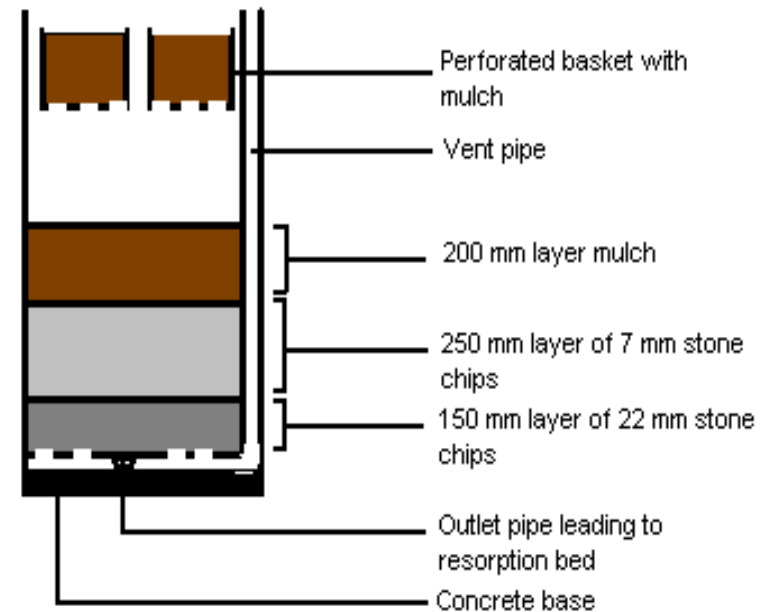
eThekweni Municipality



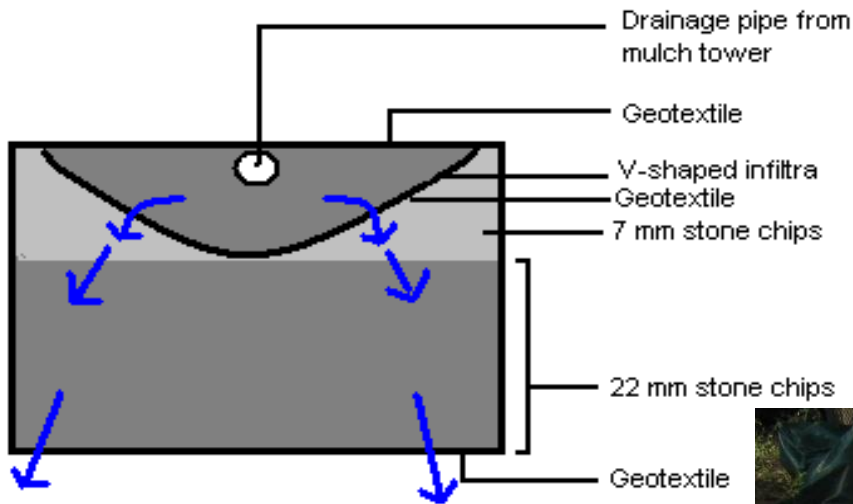
# Greywater treatment: Mulch tower



Buffalo City Municipality;  
UKZN pilot study



# Greywater treatment: Resorption bed, infiltration zone



Buffalo City  
Municipality;  
UKZN pilot study

# The importance of people!!

- Greywater irrigation works only if the people using it are committed to making it work.
- Commitment means:
  - Greywater use holds value for the users.
  - Users are involved from the beginning.
  - Users are given the information and training to use the system properly.
  - Users have somewhere to go with questions and problems.

# Sustainable Use of Greywater in Small-Scale Agriculture and Gardens in South Africa

## GUIDANCE REPORT

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