Rain- and Floodwater Harvesting Toolkit

For more detailed information, the project has developed the CuveWaters Rain- and Floodwater Harvesting Toolkit. It is intended for organisations and private persons interested in establishing rain- and floodwater harvesting projects and contains detailed information on their implementation as well as construction manuals for all kinds of storage tanks and irrigation infrastructure. The CuveWaters Rain- and Floodwater Harvesting Toolkit can be downloaded at: http://www.cuvewaters.net/Toolkits.112.0.html

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Factsheet

CUVE integrated water resources management waters

Rainwater Harvesting in Central-Northern Namibia

Challenge

Namibia is the driest country in southern Africa. The Cuvelai-Etosha Basin in central-northern Namibia is particularly affected: With about 850,000 people, almost half the Namibian population is concentrated here. The region's climate is characterized by a rainy season lasting from October to March, with a mean annual rainfall of 470 mm and a dry season lasting from April to September. The technology of rainwater harvesting was introduced to make harvested rainwater available during the dry season too, thus making horticulture possible year round. The challenge of introducing rainwater harvesting in the region was to successfully guide local novice farmers through processes of group building and governance, as well as the development of technical and management skills. Finally, the benefits and feasibility of private gardening and horticulture had to be demonstrated within the local organisational and institutional structures and implemented with locally available construction materials.

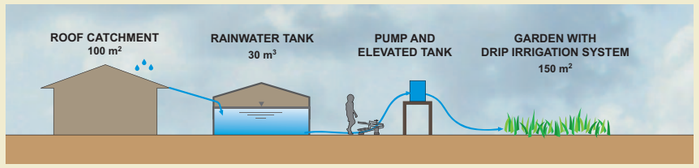
Approach

Facilities for rainwater harvesting have been piloted in the village of Epyeshona, near Oshakati, since 2009. During the short rainy season, rainwater is harvested on rooftops and concrete surfaces and stored in tanks and ponds. The harvested water is of fairly good quality and is mainly intended for gardening purposes, but can also be used for washing, cooking or watering livestock. Gardens were established next to the water storage facilities. Water-saving drip irrigation systems are driven by a pedal or hip pump, depending on the size of the irrigation area. As part of capacity development, the project provided training and enabled local people from the village to build, operate and maintain the facilities. Furthermore, people have learned to cultivate and manage gardens, and to make profits from the crops. CuveWaters has tested two technical and organisational options for rainwater harvesting: the household and the communal approach.

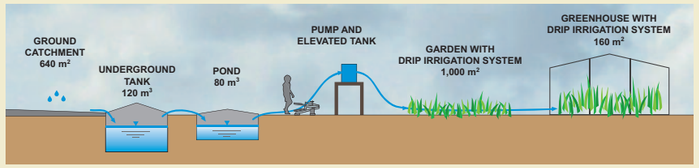
Rainwater harvesting facilities in the village of Epyeshona: household (top) and communal approach (bottom)

Household and Communal Approach

Up to 30 m³ of water are harvested from the roof of a single household and stored in above-surface tanks during a normal rainy season. The water is used to irrigate a small garden or a small greenhouse (upper figure).



The communal approach comprises five households that work together. It consists of an underground tank, a covered pond, a greenhouse and an open garden area. The greenhouse and parts of the outside garden are jointly operated, meaning that the farmers share their work and their gain in equal measure (lower figure).



Additionally, farmers have their own plot in the communal approach, which can be used for self-consumption or market production of fruits and vegetables. Advantages of greenhouses are the prevention of evaporation, temperature control and the protection of plants from wind and pests.

Findings

- The existing infrastructure in central-northern Namibia already offers good possibilities for harvesting rainwater, e.g. from the roofs of public and private buildings.
- Cost-benefit and sustainability analyses showed that on the household level, ferrocement tanks, and on the communal level, greenhouses with ponds are the most appropriate options.
- Nearly all materials for construction can be obtained from regional hardware shops.
- Tank, greenhouse and irrigation systems can be constructed by local staff supervised by trained technicians.

Type of costs	Household approach		Communal approach	
	Material costs for pilot plant	Calculated costs for roll-out	Material costs for pilot plant	Calculated costs for roll-out
Investments for construction				
Infrastructure (tank 30 m³, gutters, downpipes)	N$ 12,000-18,000	N$ 9,000		
Infrastructure (ground catchment, underground tank 120 m³, shade net covered pond 80 m³, gutters, downpipes)			N$ 110,000	N$ 82,000
Garden (90 m²), drip irrigation system	N$ 2,700	N$ 2,000		
Garden (750 m²), greenhouse (160 m²), drip irrigation system			N$ 40,000	N$ 30,000
Operation and minor maintenance (per year)				
Infrastructure (e.g. tanks, fences)	N$ 100	N$ 75	N$ 1,000	N$ 750
Garden (drip irrigation system, seeds, fertilisers, pesticides)	N$ 500	N$ 375	N$ 2,000	N$ 1,500

Minor maintenance includes repairs of cracks, fences and of the drip irrigation system. Not included are costs for renovations of the structures, such as necessary regular replacement (roughly every 5 years) of greenhouse roofs or drip lines. Due to varous reasons, costs during pilot plant implementation are much higher compared to calculated investment costs during roll-out. Calculated roll-out costs presume that materials for construction (initial investment and renovation) as well as for operation and maintenance are purchased in larger quantities and under optimal conditions. Calculations for roll-out show that costs can roughly be reduced by one quarter. The minor maintenance costs in both cases presume that good and regular maintenance work is carried out. N$ 1,000 ≈ € 77 (May 2015)

Benefits and Risks

Benefits

- Harvesting and storing water mitigates the risks of climate change, mainly dry spells during the rainy season, and allows almost continuous vegetable crop production during the dry season.
- The diet and health situations of families have improved.
- Knowledge about construction, agriculture and irrigation has been further developed.
- Jobs have been created as further plants have been built in the region by people trained during the project.
- Possible income for a household by selling crops is up to N$ 12,000 per year.
- Maintenance, gardening equipment, seeds etc. can be financed by the household and the community, respectively.

Requirements and risks

- The costs listed are material costs only. Additional costs during implementation for: local workers, construction management, tools, training in horticulture and team management.
- Governmental financial support is needed for the initial construction and later renovations of structures.
- Future rainwater harvesting projects must be linked to upcoming Namibian policies.
- Risk of project failing due to problems within the group, mismanagement, restricted financial resources or minor technical problems.

Building an underground tank for rainwater harvesting

Harvest of green peppers at Epyeshona Green Village

Success factors for implementation

Starting point

- Demand for additional water for local small-scale irrigation farming
- Sustained interest within the community to build and run rainwater harvesting tanks as well as gardens/small-scale farms

Social and organisational

- Training in group management: binding rules for common tasks, working times, how to market the products, maintenance
- Combination of different age groups of women & men to ensure continuity
- Women taking the chance to earn their own money and expand their skills, being supported to take over full responsibility
- Communication with the local group members in their native language
- Short distances to homesteads and customers
- Long-term guidance of the group in all activities for five years

Technical

- Assistance in accounting/bookkeeping and marketing the products
- Step-by-step farming training during at least one growing period: Fertilisation, pest control, building fences and daily maintenance
- Training in long-term maintenance of tools and other facilities to avoid extensive repairs
- Outside technical support from agricultural and technical extension services to solve technical problems
- Additional water supply to ensure that gardens are maintained during very dry years
- Sufficient soil quality
- Strong fence to protect against animals (> 1.5 m)
- Access to materials and spare parts in the region