Food and Agriculture Organization of the United Nations

Rainwater harvesting systems for cabbage growing in Uganda

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Sustainbale Development Goals	No poverty, zero hunger, industry, innovation and infrastructure, sustainable cities and communities, responsible consumption and production, climate chage and life on the land

Summary

This technology describes utilizing rooftop water harvesting facilities to increase the availability of water for domestic use and irrigation of backyard cabbage gardens. This measure allows small-scale farmers to harvest rainwater from roofs and store it in tanks, ensuring cabbage production even during the dry season. The combination of rainwater harvesting with other good practices (e.g. mulching, manuring) help increase productivity while reducing soil erosion, eventually strengthening the resilience of farmers to the impact of dry spells.

Description

1. Suitability

This measure was tested by households in rural districts in Uganda facing frequent water shortages. Rainwater harvested in tanks can be used for domestic purposes and to water cabbage gardens requiring little water to produce decent yields. If harvested water is managed carefully, it can be a reliable and significant water source during the dry season. Housing with an iron roof has an advantage in installing water harvesting tanks as it facilitates rainwater collection.

2. Composition and types of tank

Rainwater can be harvested from roofs by building gutters that guide the water into a harvesting tank (Figure 1). Water can also be harvested by putting inclined iron sheets directly on the tanks, in addition to the roofs (Figure 1, bottom).

Figure 1: Rooftop rainwater harvesting with gutter and tank



The water is then accessed with a pump (Figure 2). Several sizes of tanks were observed in the field, such as 7 000 litres; 30 000 litres; and 50 000 litres (Figure 3). The tank size depends on the needs, investment capacity of the farmer/community and the size of dwellings (medium sized tanks may be suitable for a dwelling that have a roof size greater than 25 m²).

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3. Major costs

At the point of writing the cost for establishing a tank system for rainwater harvest were as follows:

- 7 000 litre tank, UGX 2.3 million (USD 766 590);
- 30 000 litre tank with an inclined iron sheet, UGX 3.5 million (USD 1.17 million);
- 50 000 litre tank (compare Figure 3) costs UGX 4 million (USD 1.33 million); and
- Electronic pump (see Figure 2 for fuel pump) costs UGX 60 000 (USD 19 998).

4. Effectiveness and benefits

4.1 Socio-economic and ecological benefits

4.1.1 Shortterm benefits

- Saving time: water harvesting tanks give people easy access to water for domestic use and prevent them from walking long distances or queuing.
- Saving labour: instead of getting water, people will be available to do other tasks, e.g. working/attending school.
- Additional income: water can be sold at UGX 1 000 (USD 33.3) per jerry can.

4.1.2 Medium-term benefits

- An additional source of good quality water since other sources are polluted or depleted.

4.1.3 Long-term benefits

- Prevent water depletion from natural sources (groundwater, lakes, streams, swamp, etc.).
- Decrease erosion from surface run-off induced by heavy rains.

4.2 Gender and related benefits

Women are usually responsible for harvesting water. Hence, these techniques allow women to save time that can be used instead to produce food and/or to go to school. Rainwater harvesting can, therefore, have significant benefits for women and contribute to gender equality.

Figure 2: Pump to access water from the tank



4.3 Climate Change Adaptation-related benefits

Rainwater harvesting saves time and labour, provides an additional good source of water, helps to reduce erosion from heavy rains and limits water resource depletion, which is particularly important in a context of climate change where water resources are likely to become scarcer. Rainwater harvesting, therefore, offers opportunities to better adapt to climate change.

5. Side effects

Water harvesting tanks can have some negative side effects. If they are poorly constructed, the tanks can suffer from algae growth and pest invasion. They can also become a breeding ground for disease vectors if not properly maintained.

6. Major Barriers

There are usually no cultural or social barriers against water harvesting tanks.

However, very often communities face financial challenges to buy the tanks and sometimes technical challenges to build the related harvesting infrastructure.

Figure 3: Rooftop rainwater harvesting with elevated tank



7. Synergies

Rainwater harvesting can create synergies with other adaptation options such as:

- low-cost drip irrigation systems;
- water harvesting rock embankment;
- valley dams; and
- use of mulch and compost to increase water retention capacity of the soil and reduce evaporation.

8. Cumulative net benefits and benefit-cost ratios of good practice and local practice

Cost-Benefit Analyses were conducted based on quantitative data collected during the monitoring period in the 2016 dry season (Jun-Aug).

Cumulative net benefits and benefit-cost ratios were calculated over 11 years per m^2 of cabbage garden.

Data collected from good practice plots were compared with data collected from local practice plots where no rainwater harvesting facilities were installed.

Figure 4: Chart of cumulative net present value per square meter over 11 years



Source: FAO 2018

For good practice plots, the gross value of production is calculated considering that farms produce cabbages throughout the

year (except for the first year when the first six months are dedicated to installing the rainwater harvesting facility), while in local practice plots production is only possible during rainy seasons (6 months per year). Also, access to credit is key to ensure that farmers are able to invest in this good practice. Given the small size of the sample analysed, additional research would be needed to confirm the results.

9. Validation

9.1 The geographical area of practice validation

The practice was tested in Mubende and Nakasongola districts in Uganda. All farms were affected by dry spells during the monitoring period 2016 dry season (June to August). Rainfall was between 50 to 100 percent below normal in August, and land surface temperatures were 3 to 7 °C above average, reducing water availability.

9.2 Farmers' perception

The farmers interviewed for the evaluation of this good practice said they would replicate the good practice because they were able to grow vegetables also during the dry season. According to them, the practice helped increase production and income, while reducing work efforts to collect water. The farmers rated the good practice 5 out of 5 regarding its performance in the face of a dry spell.

10. Minimum requirements for successful implementation of the technology:

- inclined roof, preferably iron roof;
- ground space near the roof (approximately 6.5 square meters of space is needed to install a 7 000 litre tank);
- electricity for the pump if an electric pump is being installed; and
- initial financial investment to install the rainwater harvesting system (approximately USD 0.75 per m^2 of the plot).

11. Further reading

- FAO. 2012. Project Document: Global Climate Change Alliance (GCCA) - Uganda: Agriculture Adaptation to Climate Change. Republic of Uganda. 44 pp.
- Water Aid. 2013. Technical Brief: Rainwater Harvesting

12. Agro-ecological zones

- Tropics, all
- Subtropics, all