Food and Agriculture Organization of the United Nations

Rainwater harvesting systems for tomato growing in Uganda

Source	FAO Strategic Objective 5 – Resilience, in FAO
Keywords	Disaster prevention, drought, tomato (plant), vegetable growing, rainwater, harvesting
Country of first practice	Uganda
ID and publishing year	8922 and 2017
Sustainable Development Goals	No poverty, Zero hunger, sustainable cities and communities and life on land

Summary

This technology describes utilizing rooftop water harvesting facilities to increase the availability of water for domestic use and irrigation of backyard tomato gardens. This measure allows small-scale farmers to harvest rainwater from roofs and store it in tanks, ensuring tomato production also during the dry season, when it would be otherwise impossible. The combination of rainwater harvesting with other good practices (e.g. staking, 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 that face frequent water shortages. Rain water harvested in tanks can be used for domestic purposes and to water tomato gardens as they need only 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 iron roof would have an advantage in installing the water harvesting tanks as it facilitates the collection of rain water.

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, Tank 1).

Water can also be harvested by putting inclined iron sheets directly on the tanks, in addition to the roofs (Figure 1, Tank 2). The water is then accessed with an electronic pump (Figure 2).

Figure 1. Different types of tanks for rainwater harvesting

Several sizes of tanks were observed in the field, such as: 7 000 litres (Tank 1); 30 000 litres (Tank 2); and 50 000 litres (Figure 1, Tank 3).

Tank size depends on needs, investment capacity of the farmer/community and size of dwelling (For instance, medium sized tanks may be suitable for a dwelling that have a roof size greater than 25 m²).

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Figure 2. Treadle pump to access water from tank

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Figure 3. Rooftop rainwater harvesting with gutter and tank

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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 litres tank (Figure 1, tank 1) = 2.3 million UGX
- 30 000 litres tank with inclined iron sheet (Figure 1, tank 2) = 3.5 million UGX
- 50 000 litres tank (Figure 1, tank 3) = 4 million UGX

4. Effectiveness and benefits

4.1 Socio-economic and ecological benefits

4.1.1. Short-term benefits

- Saving time: water harvesting tanks give people easy access to water for domestic use and prevent them from walking long distances or waiting in line to get water from boreholes everyday.
- Saving labour: instead of getting water, people will be available to do other tasks, e.g. working in the fields or going to school.
- Additional income: water from the tanks can be sold at 1 000 UGX per jerry can.

4.1.2. Medium term benefits

- Additional source of good quality water when other sources farmers usually take the water from 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 related benefits

Women are usually the ones responsible for harvesting water. Rain water harvesting techniques allow women to save time that can be used instead to produce food and/or going to school.

Rain water harvesting can therefore have significant benefits for women and contribute to gender equality

4.3 Climate change adaptation related benefits

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

7. Synergies

7.1 Synergies created by rain water harvesting with other adaptation options

- low cost drip irrigation systems
- valley dams
- water harvesting rock embankment
- 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

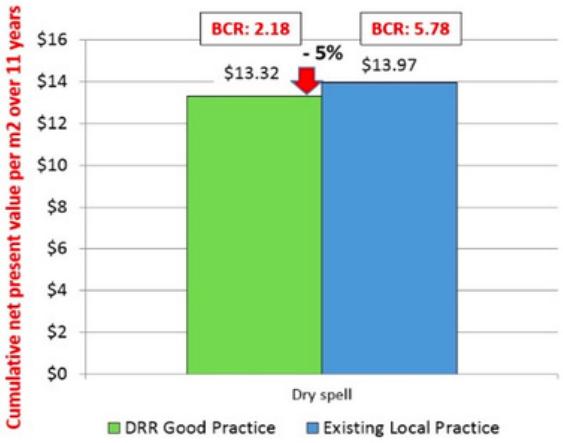
Cost-Benefit Analyses were conducted based on quantitative data collected during the monitoring period in in the 2016 dry season (Jun-Aug). Cumulative net benefits and benefit-cost ratios were calculated over 11 years for tomato per square meter of tomato garden. Data collected from good practice plots were compared with data collected from local practice plots where no rainwater harvesting facilities were installed.

For good practice plots, the gross value of production is calculated considering that farms produce tomatoes throughout the year (except for the first year when the first six months are dedicated to install the rainwater harvesting facility), while in local practice plots production is only possible during rainy seasons (6 months per year).

Figure 4 shows that, in dry spell conditions, the good practice brings slightly lower cumulative benefits than the local practice. Benefit-cost ratios are also higher under local practices than good practices. This is due to the higher capital and running cost involved in the implementation of the good practice, such as additional labour and capital cost of purchasing rainwater harvesting facility and water pump. 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 results.

Figure 4. Cumulative Net Benefits and Benefit Cost Ratios of Good Practice and Local Practice (USD per m² per year)



Source: FAO 2017

9. Validation of the practice

9.1 Geographical area of practice validation

The practice was tested in Mubende, Nakasongola and Sembabule 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, causing a reduction in 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 good practice helped increase production and income, while reducing work efforts to collect water. Both farmers rated the good practice 5 out of 5 regarding its performance in the face of dry spell.

10. Minimum requirements for the successful implementation of the practice

- Inclined roof, preferably of iron
- Ground space near the roof (approximately 6.5 m² of space is needed to install a 7 000 liters tank)
- Initial financial investment to install the rainwater harvesting system (approximately 0.75 USD per m² of plot)

The costs mentioned in this technology refer to the time of writing and the specific geographical location.

11. Further reading

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

12. Agro-ecological zones

- Tropics, warm

13. Objectives fulfilled by the project

13.1 Labour-saving technology (LST)

13.1.1 saving time

Water harvesting tank gives people easy access to water for domestic use and prevent them from walking long distance or waiting in line to get water from boreholes everyday.

13.1.2 Saving labour

Instead of getting water, people will be available to do other tasks such working in the fields or going to schools.

13.2 Women-friendly

Women are usually the ones responsible for harvesting water. Rain water harvesting techniques allow women to save time that can be use instead to produce food and/or going to school. Rain water harvesting can therefore have significant benefits for women and gender equality.

13.3 Resource use efficiency

Rainwater harvesting improves access to water also for domestic use, and it reduces pressure on groundwater reservoirs. Farmers noticed that soil erosion was reduced after the adoption of the good practice.