



**INTER-GOVERNMENTAL AUTHORITY ON DEVELOPMENT (IGAD)**

**THE BIODIVERSITY MANAGEMENT PROGRAMME IN  
THE HORN OF AFRICA (BMP)**

**RAINWATER HARVESTING FOR ENHANCED BIODIVERSITY MANAGEMENT**



**Tangeni Community- Based Runoff Pond System, a case study  
Lamu County, Kenya**

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## **Executive Summary**

The biodiversity of the original coastal forest belt is preserved in a number of protected areas. Witu Forest Reserve in the south is drastically decreasing in size owing to immigrants illegally settling along its buffer zones and gradually encroaching into the forests for livelihood support that include timber, traditional medicine fuel wood and charcoal burning. The forests in and around Boni and Dondori National reserves has also been shrinking in size due human settlements who engage in slash and burn agriculture.

The primary beneficiaries of these forests are women, children and youth who derive their livelihoods from them and will be the first to be adversely affected by continued degradation. As a response to these threats, various program based operations are working to establish conservancies, strengthen land tenure, and improve livelihoods whilst maintaining the ecosystem integrity of the forests in Lamu County. The Lamu county government also supports this cause through awareness creation, training and incentives to preserve indigenous trees and support development of market value chains.

ICRAF is implementing an EU funded IGAD Biodiversity Management project which aims to support the activities of these various stakeholders. Tangeni Rain Water Harvesting demonstration project is a community based runoff pond system implemented by ICRAF, BMP Project in Lamu west Sub-county in Lamu County in collaboration with Ministry of Agriculture and Kenya Forestry Services. Group approach has been applied thus targeting to work with and through Back to Eden Youth and Women cooperative. The proposed site is about 5km from Witu town. It is estimated that the project shall cost Ksh 200,000 with 40 % being group contribution and is estimated to take 2 calendar months to complete. Recovery period is estimated at four (4) cropping calendars. The demonstration is aimed at capacity building the community to harness rainwater in order to improve productivity, green the environment and subsequently result in enhanced biodiversity management.

## **Introduction**

Tangeni Rain Water Harvesting demonstration project for the runoff pond system lies under private land that has been donated by one of the group members Mr. Makanga. This site was identified in collaboration with Department of Agriculture and Irrigation, Lamu County and KFS. Tangeni sub location is in an area that was once part of Witu Forest. A land Agreement form has been signed between the land owner and the group members. Similarly, a memorandum of understanding between the group and ICRAF is signed and a participatory work plan developed by group, Kenya Forest Service, Ministry of Agriculture and World Agroforestry Center-ICRAF. The site also lies in a natural depression reported to be collecting and briefly storing surface runoff collected from a large catchment area during rainfall periods.

Tangeni community in Back to Eden group members have grown horticultural crops on a rain-fed crop production system which has resulted in productions that have fallen far below the potential production levels in the area due to rainfall variability during critical growth phases. The group is registered as a self-help group which has horticultural farming as its core activity. Crops grown by the group include kales, tomatoes and amaranth which have a ready market in the nearby Witu town. Introducing agroforestry practices in the area is meant to ease pressure on encroachment into Witu Forest.

Water issue was placed as number one in the community Action plan drawn during Broad Based Survey exercise in 2010/2011 financial year. To support horticultural farming Rainfall remains the main source of water and efforts to promote RWH could significantly enhance access to water for human, livestock and crop production. Subsequently, ICRAF designed a 120m<sup>3</sup> pond for demonstration purposes and together with the County Agricultural Engineer, Witu forest manager and local administration mobilized the group to provide all unskilled labour required for pond excavation, fencing, land preparation and crops establishment/management. ICRAF was expected to support with dam liner, pumping /irrigation mechanism and offer technical support.

A reservoir capacity of 120m<sup>3</sup> with a sand filter inlet was deemed sufficient for the demonstration purposes. The designed capacity will be enough to hold water to meet the average monthly demand for supplemental irrigation of tomato crop on a 0.25 acres plot for a period of 45 days of dry period and more if introduced technologies are well adopted and applied. The facilities constructed will include 120m<sup>3</sup> reservoir, silt trap and spillway. Abstraction and conveyance system will require a treadle pump. One acre of land will be developed, part of which will have supplemental irrigation and the rest put under rain-fed system. Agroforestry practices will be given great emphasis.

The average rainfall in the Lamu is 900mm per year. This rainfall is enough to fill the excavated water pond during rainy periods of the year. The region is classified as fairly hot to very hot, the average daily maximum and minimum temperatures are 30°-36°C and 24 -30°C respectively while the mean annual temperature is 22-34°C. Mean annual humidity ranges from 70% to 80%.

Farming is the main source of income of the community in the project area. Crops grown in Back To Eden site are groundnuts, maize, green grams, cowpeas, simsim, cotton, mango, cassava, cashewnuts, vegetables, pawpaws, citrus species, bananas, water melons, pineapples, kales, pumpkins. The main classes of livestock are goats, poultry, and local cows and among pastoralists.

### **1.1 Topography of the water pond site**

Water pond site was located in a narrow part of the natural waterway; just downstream of a Relatively wide stretch.

### **RWH POND SYSTEM SPECIFICATIONS**

#### **120 m3 Reservoir Dimensions**

Slope angle to vertical = 45 degrees (1:1)

Depth = 2.30 m

Water depth = 2 m

Slope length = 3.2 m

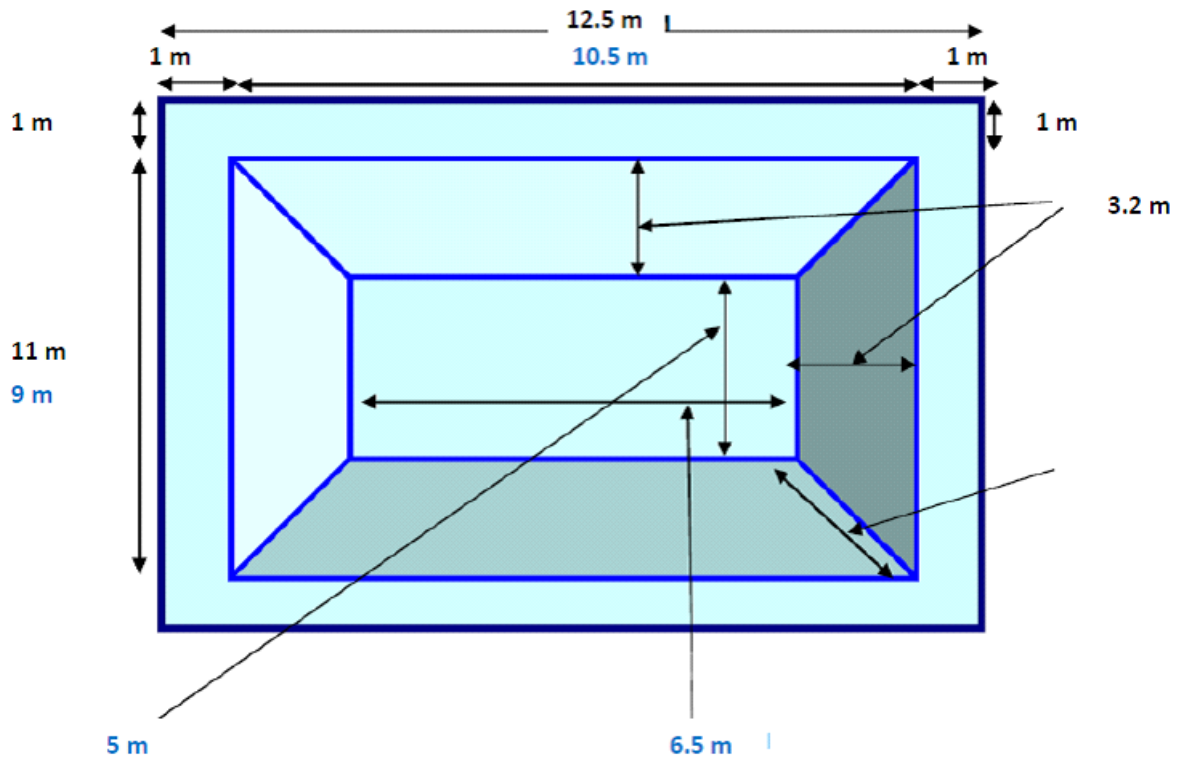
Actual water volume = 120 m3

Reservoir liner area = 214 m2 (anchorage and overlap allowance included)

Sheet dimensions = 13.6 m by 15 m

Irrigation potential = 0.25-0.4 ha (higher with good water m

### 120 m<sup>3</sup> Reservoir Dimensions



Slope angle to vertical = 45 degrees (1:1)

Depth = 2.30 m (0.3m free board inclusive)

Water depth = 2. m

Slope length = 3.2 m

Actual water volume = 120 m<sup>3</sup>

Reservoir liner area = 214 m<sup>2</sup> (anchorage and overlap allowance included)

Sheet dimensions = 13.6 m by 15 m

Irrigation potential = 0.25-0.4 ha (higher with good water management)

***Assuming uniform trapezoidal shape***

Volume of water in the reservoir= Volume of trapezoidal section + (Volume of a wedge at the inlet + Volume of wedge at)

$$= 1/2(6.5+11.5) \times 2.5 \times 5 = 112.5 \text{ m}^3$$

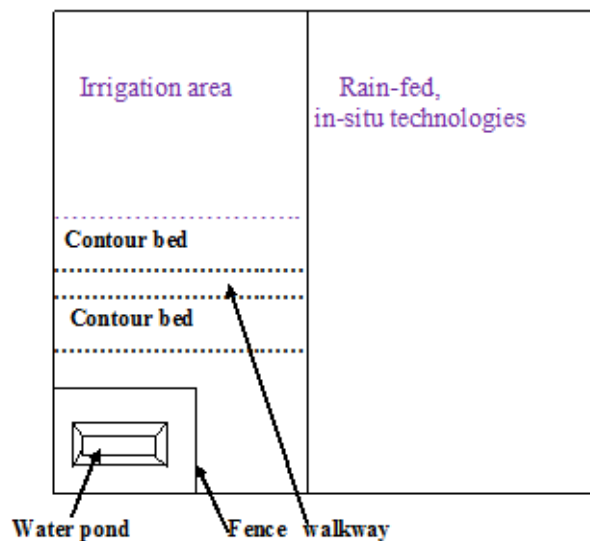
$$= 1/6 (6.5+12) \times 2.5 \times 2.5 = 19.27 \text{ m}^3$$

$$= 1/6 (6.5+12) \times 2.5 \times 2.5 = 19.27 \text{ m}^3$$

Therefore, Volume of water in the reservoir = **112.5+ (19.27+19.27) = 151.04 m**

Hence the reservoir capacity is approximately **120 m<sup>3</sup>**

**Site Layout**



## Methodology

The following approaches were used;

- **Community mobilization**

Tangeni youth and women cooperative was identified during a BMP RWH community mobilization mission in Witu Ward August 2015. After a successful meeting with group members and stakeholders on mission, a transect/site identification mission was planned.

- **Training**

Capacity building started with a participatory review of group activities followed by a participatory transect/site identification exercise. Several sites were visited, validated and ranked. All group members are involved at all levels including excavation/sloping, lining, fencing, land preparation and crop establishment and management. The site will be used as a training ground for runoff pond system



1



2



3



4

Photo 1,2,3,4 show the process followed

1. Community sensitization meeting,
2. Participatory feasibility survey/transect walk involving beneficiaries,
3. Beneficiaries engaged in provision of labour during pond excavation as part of their Contribution,
4. Contour bed preparation for tomato production by members.



## Photo review



1



2



3



Runoff pond system site (Tangeni, Back to Eden Youth and Women SHG). Training process on pond excavation (photo 1), water collection/storage (photo 2), contour bed (photo 3), direct seeding (photo 4), nursery establishment and management of tree seedlings

and tomatoes (photo 5) has been going on. Water from pond is drawn with a bucket and transported to crops in the same, a tedious job.

**Challenges encountered**

Climate change; a 3-season rainfall failure has been experienced. There was no water to sustain establishment of the raised tree seedlings. Tomato production cycle was cut short too. Production of a short growing crop was planned targeting to use runoff collected during the rains if rainfall falls.

**Observation and lesson learnt**

Rainfall in Lamu is not only erratic but also unreliable. Farmers have gone for ground water with a lot of success. Groundwater have proved the best option for building resilience to the two climate extremes. 80% of vegetables consumed in Lamu County is produced by farmers who have developed shallow wells.