

The Patents and Companies Registration Agency

RUN-OFF RAINWATER HARVESTING PROJECT, ZAMBIA

A Presentation by

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INTRODUCTION

- Requested assistance from WIPO and started working on this project after signing agreement with WIPO in 2012;
- Formed NEG chaired by PACRA with membership from Agriculture, Health, Science and Technology, and R&D institutions;
- Appointed local National Consultant;

INTRODUCTION CONT'D

- Held a number of meetings to come up with appropriate areas of intervention;
- Used the 6th NDP of Zambia, vision 2030 and other documents to identify areas which needed intervention;
- Received training in patent searches from WIPO;
- Identified problem of lack of abundant water in some parts of the country.

INTRODUCTION CONT'D

- Settled on Two projects:
 - Run-off rainwater harvesting
 - Solar water distillation
- Carried out Patent searches to identify appropriate technologies in public domain and adapted to our local situation;
- Siavonga identified as the place where the projects can be implemented on pilot scale;
- Developed a Landscape Report and a Business Plan Report for the implementation of the project;
- Commenced implementation after approval from WIPO.

INTRODUCTION CONT'D

- We are now in the process of implementing our innovative run off rain water harvesting technology in the drought stricken area of Simamba Village in Siavonga on a pilot scale after seeking permission from DC and Senior Chief;
- Implementation committee formed in the DC's office;
- Preliminary investigative scientific and technical surveys concerning the area's geographical location, topography, current impoundment capacity, foliage, evaporation rates and seepage tests were conducted.

INTRODUCTION CONT'D

- These surveys were taken in order to determine the causes of premature drying up of the impoundment before the onset of the rains and to assess the suitability of the area for implementing the innovative run off rain water harvesting technology.
- The impoundment dries up earlier than anticipated each year before the onset of the rains and this trend has negatively affected animal rearing and agricultural productivity in the area.
- The surveys were conducted over a period of two weeks by agriculture, sociology and irrigation experts.

WATER DEMAND IN THE SIMAMBA VILLAGE

- According to the hydrological survey, the water demand in Simamba area is categorised in 2 consumption groups as follows:
- Domestic Use 1,512 m³
- Animal Use 6,930 m³
- The loss of water in the impoundment at the moment through evaporation and seepage accounts for more than 50 per cent of the stored capacity.
- Evaporation 4,221 m³
- Seepage 2,612 m³

TOPOGRAPHY OF THE CHOSEN SITE

- The land in the area recommended for application of our technology slopes at approximately 5° to the south west and it is characterised by several ephemeral channels that become loaded with water during the rainy season and flows towards the impoundment.
- The topography within the Zambezi rift valley is undulating to flat with isolated elongated north east south west trending ridges composed of more resistant out crops of the basement rocks.

TOPOGRAPHY OF THE CHOSEN SITE

- Siavonga is located on the southern side of a prominent hill formed of Precambrian basement rocks up to 900m above mean sea level.

RAIN FALL PATTERN

- The rainy season starts in the month of October and continues up to March.
- The Siavonga area which is located in the Southern Province in general receives very little rain fall compared to the northern, eastern, western and central parts of the Zambia.
- The climate is hot and dry reaching a maximum peak in October and November, the mean annual temperatures is around 25° C.
- The rainfall patterns are often erratic and the mean annual rainfall ranges between 300mm to 800mm.

TYPE OF FOLIAGE

- Siavonga has the savannah type of grassland with mainly alluvial sands supporting the growth of Mopani woodlands.
- Stunted elephant grass (*Hyperennia*) and trees are symbolic of low rain fall experienced in the area.
- Siavonga has the Mopani woodlands with such trees as *kigelia*, *lonchocarpus* and *trichillia* becoming prominent in the area.

EVAPORATION

- One of the major causes of drying up of the impoundment is evaporation which is responsible for about 40% of total water losses.
- Evaporation is normally enhanced when there are high temperatures as well as high wind speeds.
 - Temperature

The average temperature in Siavonga ranges from a low of 29° C in April and increases to an average of 44° C in October.

EVAPORATION

- Wind speed
- High wind speeds in the area are responsible for evaporation even though there are some shrubs around the impoundment acting as wind breakers.
- The wind speed is estimated at an average of 15km per hour during the month of July and August.

IMPOUNDMENT

- Capacity

The current capacity of the impoundment at the peak of the rainy season is 4,000 m³ which falls short of the recommended demand of 20, 000 m³. This means that in future, the government will have to consider meeting this demand to satisfy the needs of the community.

- Seepage

The rate of seepage depends on the type of soil of the impoundment floor and for this particular site; the soil is sandy loam which has a seepage rate of 2mm per day.

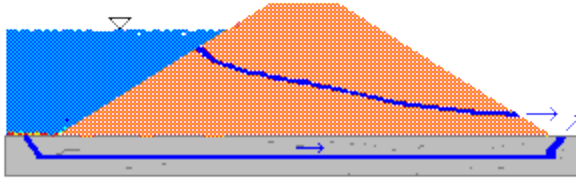
REMEDIAL MEASURES

- Seepage
- The problem of seepage cannot be ignored wherever you have a dam, pond, lake or any pool of water collected.
- Seepage can be controlled by putting a layer of bentonite on the floor of the impoundment or using dam lining.
- However, considering the rate at which the water was lost even when temperatures and wind speeds were low this year, we cannot rule out another form of loss of water called piping.

REMEDIAL MEASURES

- Piping is loss of water caused by soil erosion through the embankment which is a very common feature for such water impoundments that use earth barriers

REMEDIAL MEASURES



Piping is started by soil erosion which normally occurs at the downstream toe and forms channels or pipes through the embankment. The bottom of the impoundment as well as the curtain receives a lot of water pressure due to sloping of the floor creating a deep end effect.

REMEDIAL MEASURES

- Evaporation
 - Evaporation of water from impoundments can be reduced using chemical monolayers for large impoundments but for small impoundments, floating or suspended evaporation barriers can be used and these range from grass thatch covers and floating cloth membranes, timber, used tyres are placed on the surface of the water to reduce contact of wind with water.

Examples



Used Tyres



Aqua cap

Examples



Raftex cover



Reed Mats



Evap Cap

Recommended Cover

- The use of local reed mats as an evaporation barrier has never been used anywhere in the world and therefore, this has been recommended as part of the PACRA innovation.
- The problem of piping once proven will be addressed next year because it involves land grading using a bull dozer which should be budgeted for later.

Current Position

- Work has commenced with the clearing of trees and shrubs around the impoundment;
- The laying of the dam lining to prevent seepage water through the ground is currently being done;
- This will be followed by laying of Reed mats to prevent/reduce evaporation;
- Local labour is being engaged for the work.

Photo Gallery



Senior Chief Simamba XI



Gallery – team meeting the senior chief



Gallery- survey of area



Gallery – impoundment in rainy season



Gallery – impoundment in dry season



One of the channels leading to the impoundment



One of the villages near the dam



Part of the survey team



END

- Thank you for listening !!!