



MINISTRY OF LAND WATER AND ENVIRONMENT

**STRATEGIC APPROACH OF RAIN WATER HARVESTING
USING ROOF CATCHMENTS: The Eritrean Experience**

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INTRODUCTION

Eritrea is located over the horn of Africa extended from latitudes 12.5⁰ to 18N⁰ & Longitude 36.50⁰ E to 44⁰ E .A narrow strip of highlands with altitude exceeding 2000 meters run from south to North surrounded by a large portion of low lands to the East and West. The State is bordered to the East with the Red sea to the West and to the North with the Republic of Sudan and to the South with Ethiopia and Djibouti.

Eritrea is an arid and semi-arid country and is not endowed with rich water recourses. Further more being part of sahelien Africa it has been the victim of recurrent and devastating droughts. It is also a country predominantly dependent on rain fed agriculture. The majority of the population depends on ground water as its main water supply source.

Rainfall in Eritrea is torrential, is of high intensity over a short duration very unpredictable and occurs sporadically. Owing to the rugged nature the high lands (highest rainfall areas), thin soil formations, and new largely forested terrain most of the rain develops in to flash floods. Thus soil-water filtration is very low.

In the low lands areas even though there are favorable geological formation, infiltration is also low owing to high evaporation rates and lower intensity rainfall.

Urbansation is increasing very fast in Eritrea, as is population growth in general. At the same time, land degradation, industrialization, and the consequent negative implication on water recourses, are increasing. Eventhough water is recycled by the mechanism of hydrologic cycling, the overall picture for Eritrea is that waters is in essence a scarce resource. Optimal allocation of this basic necessity is of crucial importance, as the demand for water is increasing across every sector. This is particularly relevant for Eritrea, which has deprived water recourses.

NEED FOR RAIN WATER HARVESTING FROM ROOF CATCHMENT IN ERITREA.

The major source of dinking water supply in Eritrea is ground water. The ground water is replenished through the annual rainfall occurrence and the subsequent run off that prevails in each locality with the increase in the frequency of recurring drought situations and in the further elongations the drought the scarcity of ground water has worsened in recent years. The topography of the country particularly the rugged and very steep ground surface features in the high lands .In the low lands the ground water recharge is result of fast flowing runoffs which have very limited retention period for water percolation and ground water recharge in the highlands. In the low lands the ground water recharge is restricted along the riverbed and the adjacent riverbanks. Thus is most of the country a large portion of the rain water is lost fast as run off water beyond the reach of communities in order to over come domestic water supply scarcity there is an urgent need to retain and use the rain water directly at point where it is generated mainly at household and community level-from roofs of buildings. Through such interventions it is possible to

obtain a supplemental water source to prop-up the ground water sources that are being depleted with the passage of time. It would be essential to have rain-water harvesting facilities at all dwellings and public buildings where the rainwater falls and flows as retainable run off. In this regards it is required to make it mandatory for dwelling and public building where the rainfalls and flows as retainable runoff. In this regards it is required to make it mandatory for dwellings and public buildings to have rain water-harvested facilities in their plans at the time of their construction where appropriate rainwater harvesting facilities should be provided also in already existing building.

JUSTIFICATION AND STRENGTHING OF THE IDEA

Many of the wood, earth and thatch made rural houses even in the remote areas of the country are now being substituted with galvanized and corrugated iron sheet roofing. The reason is that the wood of the old houses has worn out and there is no forest where people can get good size lumber for rehabilitating their house as well as for constructing new ones.

Deforestation coupled with drought has turned the nearest water source to disappear and thus obliged people to fetch water from far distance valleys and riverbed excavations which resulted into adverse effect of water scarcity through time. It has as well resulted into difficulties of long travel hours up and down from hill top villages in search of few liters of water particularly to women and the young. In this context the best remedy is hence, to introduce roof catchments rain water harvest by sensitizing training and formulating pilot projects.

The pilot projects may have to be accomplished in such away that people can benefit by accepting realities such as: -

- They can get clean water just from out side their doors.
- They reduce arduous method and time spent to fetch water
- They ensure health and sanitation of their women and children

- They spend comparatively small initial cost and by assumption recover it through along time.
- They get better amount of water as compared to carrying out from far places though out their life,
- They are ensured for at least six months supply of the year depending on economically they use it.

HISTORRICAL BACKGROUND ON RAIN WATER HARVESTING

Rainwater harvest has been practiced for more than 4000 years and in most developing countries is becoming essential owing to the temporal and spatial variability of rainfall. Water harvesting is necessary in areas having significant rainfall but lacking any kind of convectional or centralized water supply system in areas where good Quantity fresh surface water or ground water is lacking

Cisterns are an ancient method of water harvesting; dating back to the early Roman civilization. Cisterns are usually built to provide water storage. Water is collected in the from of runoff from roacklined catchment or other suitable, non porous surface

In a place called Arberobus the Italians built a cistern. The aim of the cistern was initially to harvest water and supply for the steam driven locomotive. When the rainwater transportation was stopped the people of Arberobus continued to use this cistern for domestic water supply. Today about five hundred families are using water from the cistern for their life activities according to water resources analysis Estimate of water that can be harvested for 5mm runoff from 200ha-2km² represents 10 millions liters .If Evaporation see page remove 75% the reinforcement still enough to supply the in home needs of people for 18 months.

The Cistern method requirements protection on

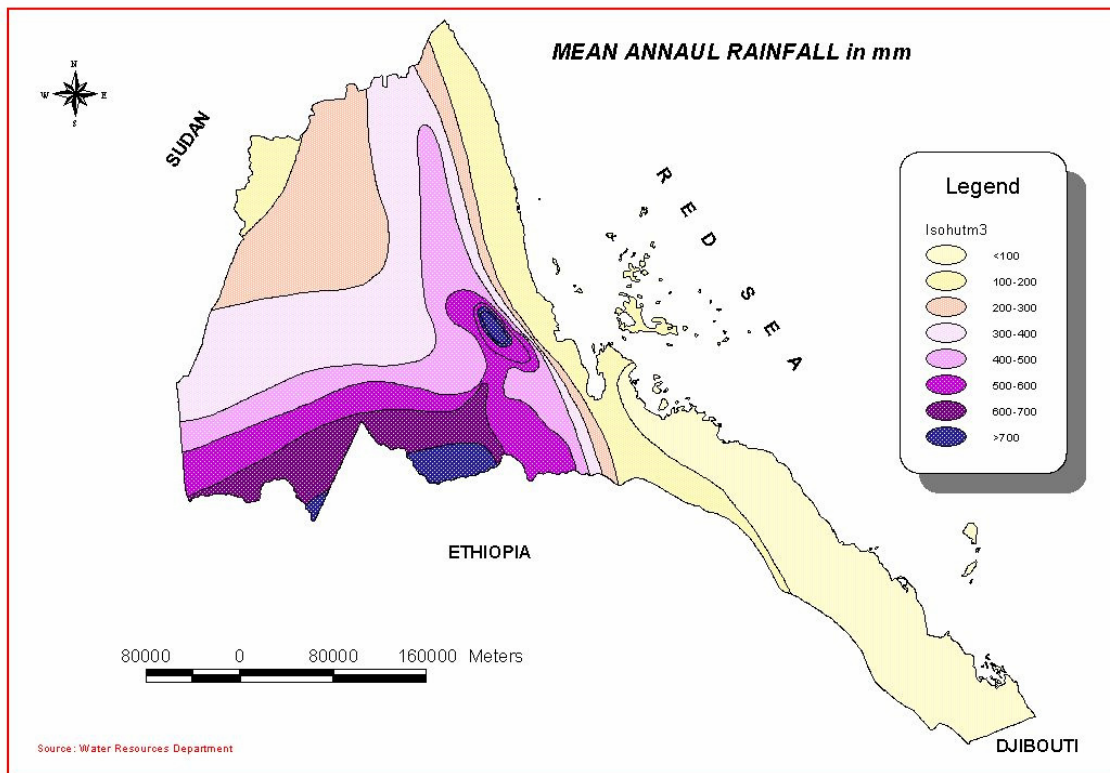
- Minimize evaporation & Seepage.
- Prevent physical, chemical & Biological Contamination.
- Diseases prevention should be as an integral part of any water recourses development projects.

This technology is widely used in the eastern escarpment of Eritrean, Particularly in Semenawi Bahri .

RAIN WATER HARVESTING THROUGH ROOF CATCHEMENT TECHNIQUE.

Rainfall data assessment

Assessment of average annual rainfall was made to characterize and categorized roof catchments harvest applicability in the country. Therefore an average low range of 250mm and 500 mm higher range are taken for both mid-highlands with Semi-arid climate and highland of semi-humid climate respectively. Based on the assessment yet more than 30% of the country spatial area can benefit from roof catchments rainwater harvesting .The assessment is based on maximum 20 years data available collected from meteorological stations.



Map 1. - Mean Annual Rainfall Pattern For Eritrea

DELINEATION OF ROOF CATCHMENT ZONES.

Considering the topographic contrasts and Elevation as well as their relation ship to rainfall intensity as a main criteria, it is assumed that population residing in almost 40% of the country are able to benefit rainfall roof catchments harvest. The area comprises part of the south Eastern as carpment around Senafe in Regali river watershed, upper reaches of Aligheder river Escarpment of She-ib Wadilaca extending up to Nakfa mid highland and areas of gash barka south of Kerekebet up to the border of Setit (Tekeze) river. Arid lands along the Sudan border and the whole coastal stretch are excluded.

Pilot Roof catchment Harvest introduction in Town of Mendefera

The Zoba Dehub administration in collaboration with its infrastructures Department (Engineering Service and project Management unit) and town administration has introduced incorporation of underground water collecting tanks from roof catchments as a must in its new housing development areas .The obligation is entered between individual house building or during authentication of their building design. The guideline is being applied on 65% efficiency particularly at Mendefera town new housing constructions.

A minimum collecting tank volume of 10m³ permitted while the maximum depends on The free area of the building compound and owner affordability. Monitoring of the constructions is usually done through each town Engineering unit experts.

METHODS OF RAIN WATER ROOF CATHCMENT HARVESTING

Roof catchments can be of many types but few of the most applicable are given below in relation to their recommendable water quality.

- Galvanized corrugated iron sheet as most preferable but with non toxic painting
- Corrugated plastic and smoothened tiles as secondary preference
- Smoothened and reinforced cement concrete as good when kept clean.
- Palm or hay thatched roofs can be used, while they are less preferable due to discoloring of accumulated dust inside the thatches.

SUSTAINABILITY OF THE PROJECT

Comparison of initial investment with long term cost reduction benefits

In Semi-arid and semi-humid climate condition of Eritrea it is possible to construct collecting tanks by at least 30% local material. That is because stone and sand of good quality are available near the beneficiaries. It is well possible to Construct low cost Ferro cement tanks of rectangular or prism shape. The crude cost Comparison is given below: -

Material	Cost In Nakfa
Initial Cost of 10m ³ Ferro-cement tank	8000 – 9000 Nakfa
Initial cost of 20m ³ brick or stone masonry tank	14,000 – 15,000 Nakfa
Cost Recovery at a rate of 5nakfa/m ³ /family size of 6/per life span.	20 x 219 = 4380 Nakfa

N.B According to Commercial Bank Exchange rate 1USD = 15 Nakfa

Training

Trainings have been given to focus group town dwellers in order to sustain the implementation of the program successfully.

Training mainly focused on:

- Cultural issues related to customs and beliefs of the indigenous society.
- General issues focus on women to participate in every aspect and level because responsibility of carrying water and its economic management has direct impact on their life and health.

- Political issues that involves levels at house hold village committees directly, related offices regional council line ministries, bilateral agencies and international organizations
- Community participations sensitizing that the community in the project.
- Awareness raising by making the communities participate in e.g. water tank construction demonstration and extension campaigns on the technology etc.

POLICY

The water resource department in the ministry of Land water & Environment in consultation (collaboration) with the ministry of public works and other line ministries prepared a national directive & Guideline on rain water Harvesting from roof catchments through active participation water law experts engineers, environmentalist and decision makers and by forming relevant committees.

CONCLUSION

The Pilot project was carried out in Zoba Dehub administration region mainly in town Of Mendefera .The pilot experiments under taken so far have prove to be extremely successful and demonstrated very promising result with different Environmental Economic and social benefits.

The future plan is to expand the implementation of Rainwater harvesting through roof catchments approach in all over the country