



Ministry of Electricity, Dams, Irrigation and Water Resources

# Planning, Construction and Operation of Water Harvesting Structures in South Sudan



## TECHNICAL GUIDELINES



Food and Agriculture  
Organization of the  
United Nations



UNEP



United Nations Peacebuilding Support Office

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The guidelines have been prepared by Eshetu Abate Legesse, FAO SS Consultant and it was enriched by 32 trainees from 16 State Ministries responsible for rural water provision and livestock, and four National Ministries responsible for water, environment, gender and livestock (MEDIWR, MoE, MGCSW, and MoLFI of the Republic of South Sudan).

# Acronyms

EES . . . . . Eastern Equatoria State

FAO . . . . . Food and Agriculture Organization of the United Nations

FGDs . . . . . Focus Group Discussions

KII . . . . . Key Informant Interviews

MEDIWR . . . . . Ministry of Electricity, Dams, Irrigation and Water Resources

MGCSW . . . . . Ministry of Gender, Child and Social Welfare

MoE . . . . . Ministry of Environment

MoLFI . . . . . Ministry of Livestock and Fisheries

PBF . . . . . Peace Building Fund

RSS . . . . . Republic of South Sudan

UNEP . . . . . United Nations Environment Programme

WES . . . . . Western Equatoria State

WH . . . . . Water Harvesting

# Definition of terms

**Boma** . . . . . The lowest administrative unit in South Sudan after payam.

**Haffir** . . . . . Arabic word for a pond.

**Payam** . . . . . An administrative unit in South Sudan below county administration and equivalent to district administration.

**Rock catchment** . . . . A structure that uses a large barren rock surface to collect rainwater like a roof water catchment structure. The collected rainwater is stored in a separate reservoir.

**Sieve analysis** . . . . . Sieve analysis is the procedure used to assess the particle size distribution of a granular material. The size distribution is often of critical importance to the way the material performs in use. A sieve analysis can be performed on any type of non-organic or organic granular materials including sands, crushed rock, clays or granite. The results will be put in a table with determined percentages of grain sizes of each particle.

**Water barrier/pan** . . . . An impounding structure formed by a micro/small earth dam.

**Water harvesting**<sup>1</sup> . . . . Water harvesting encompasses all activities where water is collected, stored and utilized in either the blue or green form. It includes harvesting rainfall directly, as well as floodwater harvesting. It is achieved in many ways, and the water can be stored in tanks, ponds, and dams or channeled into the soil profile. Therefore, water harvesting is a general term that encompasses rainwater harvesting and/or floodwater harvesting.

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<sup>1</sup> "Best Practices for Rainwater Harvesting from Open Surfaces with Storage in Structures", Bancy M. Mati, 2012: Training Manual 2. NBI/NELSAP - Regional Agricultural and Trade Programme (RAIP), Bujumbura, Burundi.

# 1 Introduction

While the drivers of conflict in South Sudan are numerous, conflict over natural resources, particularly competition over access to traditional grazing lands and water rights, remains a fundamental challenge to peace and stability in the country. Various approaches and strategies are required to manage and resolve conflicts depending on the sources of the conflict. However, there is a general understanding between the Government, conflict-affected communities and development partners that resource-based conflicts can be mitigated or addressed through a combination of development and conflict transformation interventions. To this effect the Government of South Sudan and the international community have been investing in livestock water provision, including *haffirs*<sup>2</sup>, over the last several years as a means to mitigate the conflicts arising from dry season water demand. Developing water facilities for livestock is an expensive intervention. Such investments should be accompanied by activities that aid in understanding the dynamics of pastoralists in conflict-prone areas for better planning, design, organization and management of water facilities. It is equally important to understand the effectiveness of *haffirs* in reducing conflicts between communities as well as other socio-economic and environmental impacts.

To better understand the effectiveness of water harvesting (WH) interventions in livelihoods improvement and conflict reduction and to contribute to policy discourse on WH in South Sudan, the Food and Agriculture Organization of the United Nations (FAO), in collaboration with the United Nations Environment Programme (UNEP), has embarked on a joint project entitled “Assessment of water harvesting structures for sustainable livelihoods and peacebuilding in South Sudan”, financed by the United Nations Peacebuilding Fund (PBF) for South Sudan.

Based on the assessment findings<sup>3</sup>, lessons learned and best practices, FAO and UNEP developed guidelines for livestock WH in South Sudan to maximize impacts on conflict reduction and peacebuilding. The guidelines addressed: technical issues (feasibility study, implementation, and operation and maintenance), natural resource management, environmental and social impact assessment and gender mainstreaming in livestock WH structures. The guidelines are intended to contribute to capacity building in the planning and implementation of WH interventions by the Government and other stakeholders through training and knowledge sharing.

After the assessment, four separate guidelines (technical, gender mainstreaming, natural resources management, and environmental and social impact assessment) have been prepared. This set of guidelines only covers technical aspects, but should be used in full conjunction with the other three sets of guidelines.

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2 Haffir is an Arabic word for a pond.

3 Refer to Section 3 for details on the assessment.

## 2 Major findings of technical issues related to water harvesting structures

The technical<sup>4</sup> aspect of the assessment revealed that there are different sources for dry season livestock watering – both natural and manmade. Manmade WH facilities, however, have different technical issues that affect their functionality and sustainability. The major findings are listed below:

- Dry season livestock watering in South Sudan is carried out through both natural and man-made means. The natural sources are perennial rivers/streams, swamps (locally known as *toic*) and ponds. Man-made sources are community ponds, roadside dugout pits, rock catchments, water barrier and *haffirs*. The natural sources currently provide more water than the man-made facilities, which are technically limited in terms of functionality and sustainability.
- Of the man-made WH structures that have been implemented, some, like the *haffirs* in Jonglei, were preceded by feasibility studies whereas others, like the *haffirs* in Lakes State, were carried out without feasibility studies.
- Those *haffirs* without feasibility studies were found to have fundamental design problems related to sizing, location and lack of components.
- There is a lack of harmonization among the stakeholders with regard to the designs of *haffirs*, particularly the type, size, number of components and minimum standards.
- The current standard designs for 30 000 m<sup>3</sup> and 40 000 m<sup>3</sup> capacity *haffirs* need revision as these facilities are experiencing problems relating to water abstraction, siltation basin, number of cattle troughs as well as type and size of power supply.
- There is a need for more technical expertise in operating *haffirs* by management committees/operators.

These major findings suggest that WH structures are hampered by technical issues relating to sustainability.

Stakeholders such as funding development partners, Government ministries and non-governmental organizations (NGOs) have assisted pastoral communities by implementing *haffirs* as a means of peacebuilding. However, they must ask themselves “why only *haffirs* and why not other types of WH structures?” Construction of *haffirs* is expensive and requires a well-equipped (with different types of earth moving machineries) and experienced contractor.

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