



Thematic Brief 1

Water Accounting



Brief prepared for the Entry phase of the project:

Strengthening Agricultural Water Efficiency and Productivity on the African and Global Level

The Project

The GCP/INT/166/SWI “Strengthening Agricultural Water Efficiency and Productivity on the African and Global Level” has the aim to improve Agriculture Water Management (AWM) practices and mainstream AWM in national frameworks and processes on the African and global level. The project is funded by the Swiss Agency for Development and Cooperation (SDC) and is composed of three phases: Entry Phase, First and Second Implementation Phases.

The overriding goal of the entry phase is to share the project document with a broad range of stakeholders and beneficiaries in each of its countries, in order to refine it in accordance to their interests and priorities, and to ensure that the final document is endorsed by the concerned parties. The First Implementation Phase will focus on Africa and will be implemented in the three countries – Burkina Faso, Morocco and Uganda - within three years. The Second Implementation Phase will have a global focus and will expand to other three countries in Africa, the Middle East and South East Asia. The purpose of this phase is to develop country cooperation to promote knowledge transfer and experience sharing in improving AWM practices and mainstreaming them into national frameworks and processes.

This thematic brief is part of the Entry Phase work and relates to the project’s proposed output – *National water audits prepared for Burkina Faso, Morocco and Uganda* which will lead to a comprehensive assessment that forms the basis for countries’ future water management and water policy. It will complement the other thematic areas of work of the project and will serve as a reference for analysis.

Water Accounting

Water Accounting refers to the systematic examination of the current status and future trends in water supply, demand, accessibility and use within a specific domain. In order to find sustainable AWM practices, a thorough understanding of the elements of the water balance - including the supply and demand for water and its spatial and temporal dimensions - must be understood. It is used as basis for decision and policy making by providing evidence of, for example:

- the underlying causes of imbalances in water supply and demand;
- the sustainability of the current level of water consumption; and
- the possible externalities for improving water efficiency and productivity.

Water accounting requires a problem-focused approach to address specific challenges in AWM - some of which this project will work on. The level of analytical detail will be tailored to the needs of the project.

When conducting water accounting in its countries, the project will benefit from FAO’s vast experience and conceptual approach that has been practically applied in a number of countries in Africa and other regions.



**Food and Agriculture
Organization of the
United Nations**



AgWA

Partnership for agricultural water for Africa

Water supply

- Average annual rainfall in the country is 748 mm/year;
- Total renewable water resources are estimated at 12 500 million m³/year;
- Groundwater renewable resources are estimated at 9 500 million m³/year; and
- There are about 1 200 water storage structures with an approximate capacity exceeding 5 000 million m³.

Water demand

- The percentage of renewable water resources withdrawn in the country is estimated at 10.6%, a number which doubles in dry years;
- Agriculture accounts for 51% of total water withdrawals;
- Total water demand for the irrigation sector is estimated at 323 million m³/year;
- Water use in small-scale irrigation is estimated at 15 000 m³/ha/year; and
- The bulk of agricultural water demand is met with surface water.

Water use in small-scale irrigation

- The total extent of small and medium scale irrigation schemes are estimated at 13 700 ha and 3 237 ha respectively;
- About 60-65% of the total storage capacity is currently available for small-scale irrigation;
- The total irrigation potential is estimated at 233 500 ha;
- Water for irrigation (including small-scale) is predominantly serviced by surface water; and
- Sprinkler irrigation is mainly used for sugarcane (3 900 ha).

Governance and socio-economic aspects

- Burkina Faso adopted a strategy for integrated water management through the **Plan d'Actions pour la Gestion Intégrée de la Ressource en Eau-PAGIRE (Action Plan for the Integrated Management of Water Resources)** in 2003. The strategy aims to restructure the water sector. The action plan is divided in eight areas of action including those related to: (i) the development of a water information system (ii) the research/development to understand specific patterns and influence them, if necessary; and (iii) emergency measures to restore the environment; and
- To compliment PAGIRE, the **Conseil National de l'Eau -CNEau (National Water Council)** was created for an inclusive participation.

Proposed improvements for AWM

- **On water resources information: (1)** Carry out studies on the impacts of climate change on water resources availability and use, including salinization issues.
- **On supply management: (1)** Favour the development or maintenance of (small) structures for storing, taking into account multiple uses and socio-economic context; and **(2)** Favour infrastructure development for water storage in areas with low evaporation and infiltration rates.
- **On groundwater development: (1)** Establish protection zones around water points; and **(2)** Significantly improve knowledge on groundwater supply and demand, including water quality.

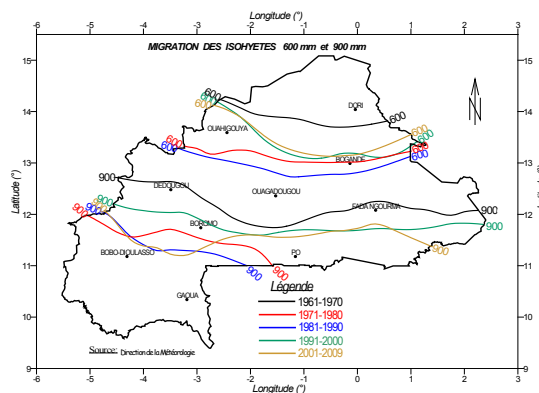


Figure 1 - Migration of isohyets (600 mm and 900 mm) between 1961 and 2009



Water supply

- Average annual rainfall in Morocco is 346 mm/year;
- Internal renewable resources are estimated at 22 000 million m³/year
- Groundwater resources potential is estimated at: 4 000 million m³/year; and
- Morocco has 135 dams with a total storage capacity of more than 17 500 million m³ and a regulatory capacity of about 8 300 million m³/year, mainly used for agriculture.

Water demand

- The percentage of renewable water resources withdrawn in the country is almost 50%;
- Agriculture accounts for 87.3% of total water withdrawals;
- Total surface and groundwater withdrawal is estimated at 12 000 million m³/year;
- Most agricultural water demand is met by dam infrastructures (85%); and
- Total water demand for the medium-scale irrigation sector (PMH) was 3 108 million m³/year in 2000, projected 4 025 million m³/year for 2020.

Water use in small-scale irrigation

- Small and medium scale systems (PMH) cover approximately 484 000 ha (35% total irrigated areas) with 2 927 systems;
- This type of irrigation contributes to a significant proportion of agricultural production (up to 58% for vegetables, 25% for fodder, 23% for citrus and 21% for legumes); and
- The total irrigation potential is estimated at 1 664 000 ha of which 1 364 000 ha annual and 300 000 ha for seasonal irrigation; approximately 90% of this potential is currently developed.

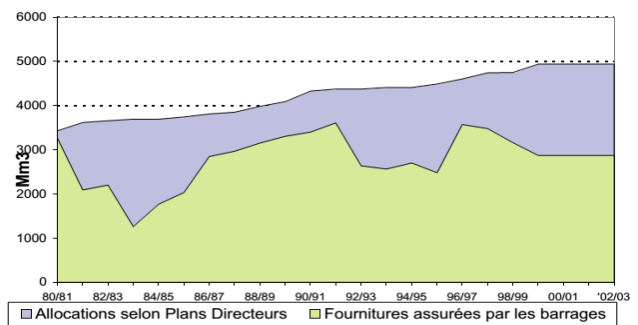


Figure 2 - Gap between allocated and supplied water from reservoirs over time

Governance and socio-economic aspects

- Small-scale irrigation is managed in a participatory manner under *the Associations d'Usagers des Eaux Agricoles-AUEA (Association of Agricultural Water Users)*;
- Current water basin assessments show that conventional water supply policies lack the capacity to guarantee supplies in the medium and long-term; and
- Observed deficits in the country's southern, eastern and central basins are gradually moving towards other basins. This issue is addressed by the *Strategie Nationale de l'Eau-SNE (National Water Strategy)* which will be implemented by the Moroccan public authorities.

Proposed improvements for AWM

- **On water resources information:** (1) Invest in monitoring of flows to improve knowledge of water resources; and (2) Systematize monitoring of existing dams to evaluate maintenance needs taking into account multiple uses.
- **On demand management:** (1) Support the conversion to technologies for improved efficiency of irrigation water use; and (2) Capacity development for farmers.
- **On groundwater development:** (1) Monitor and apply restrictions on groundwater use; (2) Promote artificial recharge of aquifers; and (3) Improve knowledge on groundwater resources and use.



Water supply

- Average annual rainfall in Uganda is 1 180 mm/year;
- Internal renewable resources are estimated at 43 300 million m³/year, 85% of which are originated in the Lake Victoria basin;
- Dam capacity is estimated at 1 million m³; and
- The estimated groundwater resources availability currently exceeds the demand.

Water demand

- The percentage of renewable water resources withdrawn in the country is 0.5%;
- Agriculture accounts for 40% of total water withdrawals;
- Total surface and groundwater withdrawal is estimated at 300 million m³, of which 120 million m³ is for the irrigation sector; and
- Agriculture mainly relies on rainfall.

Water use in small-scale irrigation

- The total land under small-scale irrigation is 300 ha;
- Estimated water use for small-scale irrigation is 10 000 m³/ha/year;
- There are several irrigation potential estimates ranging from 90 000 ha to 400 000 ha; and
- Uganda's National Irrigation Master Plan of 2011 aims to develop small-scale irrigation to supplement rainfall during moisture-deficit periods. However, the lack of purchasing power among smallholders, coupled with the long-held belief that rainwater suffices, undermine efforts to develop small-scale irrigation.

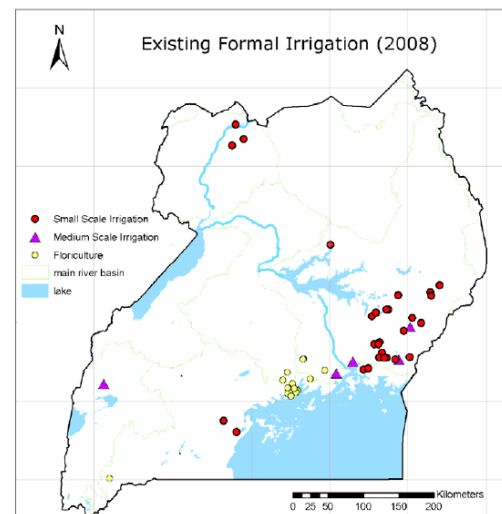


Figure 3 - Formal irrigation schemes distribution

Governance and socio-economic aspects

- The **National Water Policy** adopted in 1999, provides the overall policy framework for the water sector, promoting the principles of integrated water resources management. The amended Water Policy, drafted in 2013, promotes a catchment based approach to water resources management;
- Since July 2011, Uganda has embarked in an ambitious program to deconcentrate a number of resource water management functions to decentralize them to four **Water Management Zones (WMZ's)**.

Proposed improvements for AWM

- **On water resources information:** (1) Of the around 200 hydrological stations working in the 1950's, only 65% are operational. It would be necessary to restore the 45% that are non operational; and (2) Most of the country is ungauged and relies on secondary information. It would be important to develop systems that allow for primary information sources.
- **On developing irrigation:** (1) Capacity development: demonstration sites for small scale irrigation technologies, farmer field schools; and (2) Improved access to credit for smallholders.
- **On wetlands development:** (1) Assess the possible externalities of wetlands development, including impacts on flood control and water quality.

Water Accounting COMPARATIVE ANALYSIS



BURKINA FASO

MOROCCO

UGANDA

Water supply and demand

- Predominantly rain-fed;
- The percentage of renewable water resources withdrawn is 10.6%;
- Agriculture accounts for 51% of total water withdrawals; and
- Agricultural water demand is primarily met by surface water.

- Predominantly irrigated;
- The percentage of renewable water resources withdrawn is estimated at 50%;
- Agriculture accounts for 87.3% of total water withdrawals; and
- Agricultural water is primarily supplied through storage infrastructures (85%).

- Predominantly rain-fed;
- The percentage of renewable water resources withdrawn is 0.5%;
- Agriculture accounts for 40% of total water withdrawals; and
- Water demand is met with rainfall.

Small-scale irrigation

- The total extent of small and medium scale irrigation schemes are estimated at 13 700 ha and 3 237 ha respectively (7.2% of total irrigation potential); and
- The total irrigation potential is estimated at 233 500 ha (MAHRH estimate).

- Small and medium scale irrigation systems (PMH) cover approximately 0.3 million ha with 2 927 systems; and
- Groundwater use is increasing, particularly in private irrigation.

- The total land under small-scale irrigation is 300 ha (less than 1% of total irrigation potential); and
- The total irrigation potential is estimated at 90 000 ha (study in 2003). Other studies varied from 200 000 to 400 000 ha.

Water accounting related issues

- Conflicts for surface water around reservoirs and rivers, and in densely populated areas (peri-urban) arise; and
- Identifying alternative sources of water for different uses could help addressing these conflicts.

- Groundwater use needs to be monitored to avoid overexploitation; and
- Morocco is characterized by severe water stress, with a large diversity of small-scale systems. Impacts of climate variability on these systems needs to be better understood

- Agriculture largely relies on rainfall, but scope for developing irrigation exists;
- The country has a low water resources monitoring capacity; and
- Wetlands development externalities need to be understood.



BURKINA FASO

On water supply:

- Develop a national land and water inventory and monitoring database using GIS software and hardware;
- Develop an up-to-date database on irrigated areas;
- Design a national strategy for the development and improved management of storage capacity; and
- Develop a spatially distributed water accounting tool linked to the database to design water accounting scenarios.

Irrigation Use:

- Assess potential groundwater use for irrigation and map out areas.

Capacity Building:

- Conduct a training programme for relevant personnel on the management of the land and water resources database; and
- Conduct a training programme for relevant personnel on the management of the water accounting tool.

MOROCCO

On water supply:

- Carry out studies on the impact of climate change and salinization on surface and groundwater availability and stress;
- Promote sustainable water harvesting practices; and
- Assess the level of hydric stress that the country faces and support in the development of national strategies to minimize risk of water shortages.

Irrigation Use:

- Conduct an evaluation of the country's groundwater use for irrigation and explore potential sustainable irrigation practices to minimize risks of overexploitation; and
- Carry out an evaluation of the country's dams and the spatial distribution of water towards irrigated areas to assess efficiency.

Capacity Building:

- Conduct a training programme for personnel on the systematic updating of the assessment and maintenance of dams.

UGANDA

On Water Supply:

- Promote sustainable water management practices through rainwater harvesting to increase water storage capacity in suitable areas; and
- Design a national strategy for the construction of infrastructure to increase storage capacity and its respective maintenance.

Irrigation Use:

- Support the development of new irrigation schemes;
- Design a strategy for investment in small-scale irrigation; and
- Rehabilitate and expand existing irrigation schemes.

Capacity building:

- Conduct a training programme for personnel on the systematic updating of the assessment and maintenance of dams.