



Thematic Brief 2

Water Productivity



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 proposed output of the project - *Enhanced capacity for improved water productivity in small scale agriculture*. This will be achieved by applying an FAO Crop Water Model, known as AquaCrop, which will eventually help farmers in project countries manage rain-fed and irrigated agriculture areas more effectively with the overarching objective to reducing hunger and increasing food security.

Water Productivity

Water Productivity is a measure of the economic or biophysical gain from the use of a unit of water consumed in crop production. With rising competition of finite water resources, uncertainties linked to climate change and the steady rise in demand for agricultural commodities, increasing water productivity is essential to achieving water and food security.

AquaCrop

To identify viable ways for increasing the productivity of water use, the yield response of crops to water must be known. FAO has, therefore, developed a model to assess the yields of major herbaceous crops as a function of water supply (AquaCrop). AquaCrop is a companion tool for a wide range of users and applications including yield prediction under climate change scenarios. The model helps to: intensify crop production, close the yield gap in many regions of the world, quantify the impact of climate variability and change on cropping systems, use natural resources more efficiently, and minimize negative environmental impacts.



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



AgWA

Partnership for agricultural water for Africa

Climate

- Burkina Faso is located in the **semi-arid tropical** zone in West Africa.
- The country is characterized by **high rainfall variability**, which ranges from 400 mm in the North East to 1 200 mm in the extreme southwest, and **high temperatures**, increasing from the south to the north, particularly during the dry season.

Agriculture

- Burkina Faso is a large agriculture sector country but it still falls within FAO category of "**low-income food deficit countries**".
- **Millet and sorghum, maize, and occasionally rice** (in low and wet lands) are the main food crops.
- Other **food and cash crops** in the country include groundnut, cowpea, sesame, soybean, sweet potato, and a variety of marketable vegetables, tubers and starch crops when water availability allows.
- **Cotton** is the typical cash commodity crop in the country.
- **Mango** trees are also grown.

Farming systems

- Most of the **agricultural production is rainfed**.
- Farmers are typically **traditional subsistence farmers**.
- **Smallholders** are developing **irrigated vegetable** plots in areas with water and good market connections.
- Livestock production supplements crop production for livelihood and social returns.
- **Irrigation** has become a very important alternative to the hazardous rainfed agriculture.
- Most farmers are still using **traditional irrigation surface methods**.

A comprehensive assessment of water management in agriculture revealed that:

- The country is facing very **low productivity**;
- Low, unreliable (high inter-annual variability) and **declining rainfall threatens crop production**;
- **Small-scale irrigation initiatives** are now **expanding rapidly**;
- The need for **irrigation practices to be monitored** has grown;
- Still **optimal yields are not being obtained** and irrigation is not well managed in terms of frequency and duration;
- **Massive degradation of soil status** constitutes another threat to agricultural production; and
- Soil degradation occurs in most provinces, owing to the **declining use of fertilizers**, and to erosion.

Evidence-based examples for water productivity enhancement in the country



1. Improving water productivity of rainfed sorghum through the enhancement of soil conservation practices and fertility management.
2. Improving water productivity of small vegetables through drip irrigation.



Climate

- **Morocco's climate is very diverse**, varying with the season and region.
- **The coast has a warm Mediterranean climate** while inland areas have a hotter, drier, continental climate.
- **The south is very hot and dry** throughout most of the year.
- Rain falls from November to March in coastal areas, and the country is mostly dry with high temperatures in the summer.

Agriculture

- **Cereal production** is the most significant agricultural resource.
- **Wheat and barley** are the most commonly grown cereals and are of paramount importance in the national economy.
- **Food legumes** (mainly faba bean, chickpea and lentil), **maize and oilseed** crops are also produced.
- **Perennials** include olive, almond, fig, pistachio and fodder trees.

Farming systems

- **Farming systems** integrate crop and livestock production.
- **Irrigation** concerns primarily perennial crops, then industrial crops, forages and vegetables.
- **Irrigation is managed at different levels**, mainly through large irrigation schemes, medium to small schemes or smallholders farms.
- **Surface irrigation methods** are dominant in the country despite the introduction of localized irrigation techniques that started to expand in different regions.

A comprehensive assessment of water management in agriculture revealed that:

- The **productivity** of rainfed and irrigated farming systems is often **low**;
- **The country depends heavily on irrigation**, particularly on **supplemental irrigation of rainfed systems**;
- **Dry spell occurrences** during seasons and in between seasons have severely undermined food security;
- **Uncontrolled irrigation** has led to serious water deficits that threaten agriculture sustainability;
- For most gravity irrigation networks, **irrigation scheduling is not well practiced**; and
- Although a **lot of research was conducted** in the country aiming to optimize agronomic management, varieties, time and amount of supplemental irrigation, soil enhancement practices, yet the yield gaps between the current farmers' yield and the researcher managed plots are high.

Evidence-based examples for water productivity enhancement in the country



1. Adapting to climate change: Testing sustainable water management practices to stabilize production and improve water productivity of rainfed systems in the country.
2. Improved cereal water productivity through supplemental irrigation.



UGANDA

Climate

- Uganda is characterized with **Tropical climate** with two rainy seasons in most areas (March to May, September to November) and two dry seasons (December to February, June to August).
- **In Southern Uganda**, rainfall (1200 - 1500 mm) is bimodal and it allows two crops annually.
- **In Northern Uganda**, the two rainy seasons gradually merge into one (900 - 1300 mm).
- **Dry periods** at the end of the year become longer, and thus restricting the range of crops that can be grown.

Agriculture

- **Agriculture is practiced** in various parts of the country.
- **Cash crops:** coffee, cotton, tea, cocoa, tobacco, sugar cane, exported flowers and horticulture.
- **Food crops:** banana-all types, maize, cassava, sweet potatoes, beans, sorghum, rice, finger millet, groundnuts, soya beans, wheat, and peas.

Farming systems

- There are **nine rainfed farming systems** in the country that support different crops and livestock production.
- **Irrigated farming systems** are limited to some nurseries around Kampala, and to three newly rehabilitated irrigation schemes: Mubuku, Doho and Agoro.
- **The major irrigated crops** are rice, maize, onions, mangos, millet, beans, sweet potatoes and groundnuts.
- **Surface irrigation** methods are used.
- **About 15 sites have been identified** for the development of irrigation schemes.

A comprehensive assessment of water management in agriculture revealed that:

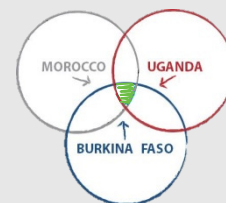
- Farmers in Uganda are facing **large yield gaps** for major rainfed and irrigated crops. The obtained yields are greatly less than the yields obtained on controlled stations;
- **Climate change/variability** is a major challenge to a good crop harvest in many parts of the country, particularly the **delay in rainfall onset and rainfall variability** during the cropping season;
- Land is continuously ploughed which has resulted in a **great loss of land productivity**;
- **Inadequate awareness by the farmers** on the role of fertilizers and their misuse in agricultural production; and
- **Small-scale informal irrigation** has been practiced without planning.

Evidence-based examples for water productivity enhancement in the country



1. Incorporating rainwater harvesting and soil fertility enhancement practices to promote production of dairy cattle drought tolerant forages and production of vegetables (280 smallholders women farmers involved).
2. Improving maize water productivity through the development of Mobuku irrigation scheme.

Water Productivity COMPARATIVE ANALYSIS



BURKINA FASO

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Need to enhance water productivity

- Both rainfed and irrigated farming systems

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Need for AquaCrop

- To model the potential for closing yield gaps of main field crops under varying water availability
- To assess the impact of different irrigation methods and scheduling on crop yields
- To assess the impact of different soil fertility levels on crop yields
- To assess the impact of climate change and variability on crop production

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Need for more efforts to transfer knowledge to farmers

- Farmers lack adequate knowledge of the range of agricultural water management options because they are rarely provided with sufficient technical and financial advice or given demonstrations

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Project Development RECOMMENDATIONS

BURKINA FASO

Rainfed farming systems

- Promote sustainable water management practices through rainwater harvesting, enhancing soil conservation practices, soil fertility management and improved varieties. Activities to be developed through demonstration experiments and implementation at farmers' fields.

Irrigated farming systems

- Promote micro-irrigation technologies.
- Support community-based irrigation management through the rehabilitation and expansion of existing irrigation schemes as well as through the development of new schemes, improving irrigation practices (method, timing and amounts), managing water allocation for cropping systems.

Capacity building and awareness campaigns for farmers

MOROCCO

Rainfed farming systems

- Promote sustainable water management practices through supplemental irrigation, enhancing soil conservation practices, soil fertility management and improved varieties. Activities to be developed through demonstration experiments and implementation at farmers' fields.

Irrigated farming systems

- Promoting irrigation water-saving techniques (micro-irrigation technologies).
- Support community-based irrigation management through the elaboration of deficit irrigation strategies as a measure to cope with water scarcity and improve water productivity.

Capacity building and awareness campaigns for farmers

UGANDA

Rainfed farming systems

- Promote sustainable water management practices through rainwater harvesting, enhancing soil conservation practices, soil fertility management and improved varieties. Activities to be developed through demonstration experiments and implementation at farmers' fields.

Irrigated farming systems

- Rehabilitation and expansion of existing irrigation schemes, improving irrigation practices (method, timing and amounts), managing water allocation for cropping systems.
- Support the development of new irrigation schemes.

Capacity building and awareness campaigns for farmers