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# Irrigation Development in the Nile Basin

## Policy Brief 2022-01

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Recommendations for the sustainable expansion of planned irrigated agriculture in the Nile Basin.

### Key findings

- Driven by the need to ensure food and nutritional security of the growing population under an uncertain climate, irrigation development is a key action in the Nile Basin.
- Enhanced Agricultural Water Management, incl. increased water use and improved irrigation efficiency, coupled with maintaining and improving soil and water quality are vital to ensure the sustainability of irrigation, produce more with less and improve adaptation to climate change.
- Collective action by the riparian states is necessary to harness the opportunity provided by the Nile and minimize mutual risks.

### Background

This policy brief provides recommendations for the sustainable expansion of planned irrigated agriculture in the Nile Basin. It has been prepared as part of the study: Benchmarking Irrigation Performance and Projection of Irrigation Water Demand in the Nile Basin which was carried out by the International Water Management Institute (IWMI) on behalf of the Nile Basin Initiative (NBI). The preparation of this policy brief has benefited from the findings of the study, the vast experience of IWMI in irrigation systems management, several consultations with key actors and the rich deliberations from the webinars organized as part of the sixth Nile Basin Development Forum.

The intended broad target audience for this policy brief is the stakeholders involved in the planning and decision-making of irrigated agriculture in the Nile Basin. Within the context of NBI, the policy brief targets the Nile Council of Ministers (Nile-COM) and the Nile Technical Advisory Committee (Nile-TAC), the governance and senior management of the NBI Subsidiary Action Program institutions who are also involved in the NBI program design as well as the development partners.

## **Retrospect and Prospects of Irrigation Development in the Nile Basin**

The Nile Basin is one of the biggest and most complex transboundary river basins in the world and is shared by Burundi, the Democratic Republic of Congo, Egypt, Eritrea, Ethiopia, Kenya, Rwanda, South Sudan, Sudan, Tanzania and Uganda. The total population of the riparian countries is estimated at 487.3 million and is projected to reach 860.5 million by 2050. The combination of the expanding population and the expected growth in the economies of these countries is projected to lead to rapid growth in water demands for domestic uses, energy and food production.

Currently, irrigated agriculture is the largest consumer of the water withdrawn from the Nile and its tributaries with an increasing trend of irrigation expansion in the basin. Total withdrawals for irrigated agriculture are about 78% of the peak flow of the Nile River at Aswan. Besides, most of the basin population depends on rainfed agriculture that is considerably low in yield. As a result, along with several other associated factors, most countries of the Nile Basin are net food importers. In many parts of the basin, there are high levels of poverty, and there are areas abound with chronic food insecurity. A combination of these factors contributes to the status of low food and nutritional security in the basin. Low land and water productivity from irrigated and rainfed agricultural systems, periodic weather extremes (mainly droughts and floods), inadequate water storage (small and big), low-level adoption of agricultural water management technologies and a lack of access to markets all merge to contribute to substantially low yields in most of the Nile Basin countries.

The expansion and intensification of agriculture (irrigated as well as rainfed) to grow more food and cash crops is a key policy ingredient of many riparian countries in building more sustainable and resilient food systems. For instance, faced with food insecurity challenges (among others) for a

rapidly growing population and economies in a climate crisis, the Nile Basin riparian states have put in place policies and development plans aimed towards an expansion of irrigated agriculture. Plans from the Nile riparian countries reviewed as part of Benchmarking Irrigation Performance and Projection of Irrigation Water Demand in the Nile Basin study also demonstrate a substantial increase in irrigated areas in the coming two-to-three decades. Based on planning data obtained from the Nile Basin riparian states, a scenario-based irrigation expansion projection illustrates an increase of irrigated land in the range of 6.6 million to 10.8 million ha under the Business-as-Usual Scenario, a figure equivalent to 63% of the estimated total irrigated area in the basin as of 2018. The overall situation entails the need for rethinking irrigation development in the basin to maintain the Nile system's productivity.

While food insecurity is a global challenge, it disproportionately affects countries in Sub-Saharan Africa, a region to which most of the Nile Basin countries belong. Consequently, several regional and global initiatives have attempted to enshrine by some means, the objective of food security in their goals, visions and missions. Reliable access to sufficient quantity and quality of water is recognized as a critical constraint to agricultural production and a priority in the drive to eradicate poverty. Expanding irrigated agriculture is one of the intervention areas promoted to enhance food production within the current context of the climate crisis. With the same in mind, agricultural water management, in general, and sustainable irrigation development and management have been the subject of several national policies and regional and continental level strategies.

To ensure that the policy recommendations provided in this document are well aligned with and complementary to those at the national (NBI Member States), regional and global levels, the chief policy contexts from national and continental level guidance

documents have been reviewed. An outline of these is provided below<sup>5</sup>.

At the continental level, the Framework for Irrigation Development and Agricultural Water Management in Africa (IDAWM) was formulated in 2020 by the African Union (AU); it recognizes the critical role played by reliable access to sufficient quantity and quality of water for agricultural production and poverty eradication. Considered as an expression of interest by the AU Member States in Agricultural Water Management, the Framework is a significant document, which identified four 'Pathways' and several interventions, with the former as follows: PATHWAY 1 – Improved water control and watershed management in rain-fed farming; PATHWAY 2 – Farmer-led irrigation development; PATHWAY 3 – Irrigation scheme development and modernization; and PATHWAY 4 – Unconventional water use for irrigation. These are meant to provide overall directions for improving agricultural water management and advancing the irrigation development agenda in Africa. Furthermore, these are expected to be contextualized and applied according to the diverse local conditions in the Member States, which can be summarized as follow.

The irrigation policy of Ethiopia is part of the country's water resources management policy (1999). While its main objective is 'to develop the huge, irrigated agriculture potential (of the country) for crop production and production of raw materials for agro-industries', issues of water use efficiency and sustainability of irrigation systems are highlighted. Accordingly, the 'promotion of water use efficiency and control of wastage' is the fourth detailed objective of the policy. The overall aim of the Rwanda Irrigation Policy and Action Plan is to bridge the fundamental performance gaps in the irrigation sector and to propose key reforms. The creation of an environment that fosters good irrigation water resource management is also a focus of the Irrigation Policy. In the case of Sudan, one of the objectives of its National Water

Policy is to 'ensure that the water resources of Sudan are properly managed, protected, and efficiently utilized for the benefit of all.' Thus, efficient utilization of water resources is at the core of the national water policy. The main objective of the National Irrigation Policy of Tanzania is to ensure the sustainable availability of irrigation water and its efficient use for enhanced crop production, productivity and profitability that will contribute to food security and poverty reduction. Promoting efficient water use in irrigation systems is the specific objective (iii) of the policy. Within Uganda, the goal of the National Irrigation Policy is to ensure sustainable availability of water for irrigation and its efficient use for enhanced crop production, productivity and profitability – all contributing to food security and wealth creation. One of the Guiding Principles focuses on the promotion of water use and irrigation system efficiency towards which water-efficient irrigation technologies and practices shall be promoted. In Egypt, the National Water Resources Plan will pursue four objectives: i) Improve the enabling environment for IWRM, planning and implementation; ii) Rationalise water use (more crop per drop, reduce household use, more productivity per unit of water); iii) Improve the water quality; and iv) Enhance the availability of freshwater resources (reduce losses, rainwater harvest, desalination, and wastewater reuse).

Two takeaway messages, substantiating the argument of rethinking irrigation development in the Nile Basin, have been drawn from the high-level review of relevant documents summarized above that are relevant to this policy brief. First, driven by the need to ensure food and nutritional security of the growing population under an uncertain climate, undertaking irrigation development is understood to be a key action. Second, enhanced Agricultural Water Management, including increased water use and improved irrigation efficiency, coupled with maintaining and improving soil and water quality are vital to ensure the sustainability of irrigation,

produce more with less and improve adaptation to climate change.

As demonstrated by the NBI Strategic Water Resources Assessment, water is likely to be a key constraint in irrigation expansion in the Nile Basin. Therefore, options that maximize the utilization efficiency of the water available are critically needed to sustainably meet the food and nutrition demands of the growing basin population in the coming decades. The Strategic Water Resources Assessment has identified and explored several technical solutions towards this end. Some of these options, such as improving irrigation efficiency at the scheme level, can be achieved locally and are the subject of national irrigation policies as shown above. Others, including maximization of water use efficiency across the basin (e.g., regionally optimal crop selection), require regional collaboration by the Nile Basin riparian states, which are not generally addressed by the national water/irrigation policies at the individual state level.

Keeping in mind the same, the policy recommendations provided herein are intended to address these gaps, and primarily focus on leveraging the opportunities provided by transboundary water cooperation in the Nile Basin. Through these recommendations, the NBI aims at supporting its Member States in achieving the food and nutritional security of their citizens in a much more efficient and sustainable way. Details of this enabling environment are provided in NBI 2021.

### **Context of this Policy Brief**

The Nile Basin offers considerable opportunities to substantially increase food production by making use of its available land and water resources. However, from a basin perspective, as illustrated by the projected irrigation area expansion, there is also a high risk that water demand could outstrip available water resources unless the Nile Basin riparian states utilize available water resources more judiciously

and efficiently. There are several measures the riparian states can undertake — individually and collectively — to maximize the overall productivity of the Nile Basin water resources while minimizing adverse impacts on the environment. As part of the Water Resources Assessment, the NBI Member States have analyzed several options for addressing the growing water demands in the Nile Basin for consumption, food and energy production. Many of these options focus on water saving from irrigated agriculture — the sector that consumes most of the water withdrawn from the Nile; some of these alternatives include optimizing crop selection to ensure water-friendly cropping patterns across the basin, enhancing irrigation efficiency, reuse of drainage water, and adopting deficit irrigation. A detailed description and contribution of each option towards filling up the gaps between water demand and water availability are described in the respective technical documents.

The aggregate impact of implementing these options on the ground can be enhanced through collective action by member countries, be it in improving the performance of existing schemes or through the adoption of water-efficient technologies for new schemes. These recommendations are intended to serve as inputs to policy-level dialogue among the NBI members on sustainable and more efficient development and management of irrigated agriculture in the Nile Basin — as such, this brief is an attempt by the NBI to highlight key policy-level interventions.

### **Pillars of policy recommendations**

These policy recommendations are developed basis the technical reports produced as part of the irrigation benchmarking projects. The recommendations are particularly structured around key ingredients of the policy recommendation report which synthesized the findings of the different technical reports. Consequently, the policy recommendations are organized along five

pillars. These pillars are intended to provide mutually complementary policy directions to maximize the benefits from the utilization of Nile Basin water resources for irrigated agriculture.

**Pillar 1: Maximize utilization of water.** This pillar focuses on increased efficiency in the utilization of water for irrigated agriculture at different scales, from individual farms to irrigation systems and the national level, thereby contributing to basin-wide water use efficiency.

**Pillar 2: Sustainable expansion and intensification (including technology adoption).** The primary focus here is on improved planning for new irrigation development and intensification. It aims at ensuring that the new irrigation systems along with the expansion and intensification of existing schemes are leveraged to implement more water-efficient systems.

**Pillar 3: Irrigation schemes performance management.** The emphasis of this pillar is on enhancing cross-country learning and collaboration in the planning, construction and management of irrigation schemes.

**Pillar 4: Enhance gain from synergetic and complementary effects of rainfed irrigation system continuum.** This pillar looks at operationalizing the system continuum.

**Pillar 5: Capacity development and collaborative learning.** Under this pillar, recommendations are provided to help in fostering mutual learning among professionals, address capacity gaps and thereby contribute towards improved irrigation systems in the Nile Basin. A long-term target would be to operationalize irrigation benchmarking.

## Policy recommendations

The policy recommendations are provided along the five pillars presented earlier.

**Pillar 1: Maximize utilization of water:** In achieving enhanced efficiency in water utilization, the chief policy recommendations of this pillar are:

- Adopt irrigation technologies that maximize overall irrigation efficiency (at farm, project and system levels)
- Enhance the use of drainage water from irrigation
- Promote Water Deficit Irrigation in commercial farms
- Improve and promote cost recovery in irrigation systems through service fees
- Extending wastewater management and treatment as well as developing incentives for water quality management
- Enhance rainwater harvesting for small-scale and farmer-led irrigation systems

**Pillar 2: Sustainable expansion and intensification:** The primary focus of this pillar is on improved planning for irrigation expansion and intensification. The policy recommendations include the following:

- Improve harmonization of water and irrigation policies among countries
- Develop and adopt common standards on irrigation technologies, irrigation infrastructure design, construction and maintenance
- Adopt basin-wide optimized cropping systems for maximizing utilization of the available water
- Undertake crop selection optimization at the within-country level
- Enhance virtual water trade (mainly crop trade) to exploit comparative endowments of countries on land and water

- Promote engagement of the private sector in irrigation technology provision, irrigation services and investments

**Pillar 3: Irrigation schemes performance management:** This pillar regards the enhancement of cross-country learning and collaboration in the planning, construction, and management of irrigation schemes.

- Adopt common irrigation performance benchmarking standards to guide irrigation development and agricultural water management
- Generate annual (or decadal) water accounting to identify various opportunities for conserving water and enhance water productivity
- Improve inclusion (among different social groups, including women, youth and other marginalized communities) in the management of irrigation schemes

**Pillar 4: Enhance complementarity of rainfed irrigation system**

**continuum:** The focus of this pillar is to operationalize the system continuum and achieve better gains from synergetic and complementary effects.

- Enhance in situ soil and water conservation measures to improve the effectiveness of rainfall in rainfed-irrigation systems
- Identify and promote smart financing mechanisms to conserve natural resources

**Pillar 5: Capacity development and collaborative learning:**

Under this pillar, the focus is on promoting mutual learning among professionals, fill capacity gaps and contribute towards improved irrigation systems within the Basin.

- Provide regular platforms (e.g., forums, country-to-country visits) for experience exchange, cross-learning, and improvement among those engaged

in irrigation planning and management of irrigation schemes

- Develop and implement an irrigation information management system (to support collaborative learning)
- Establish basin-wide tools for measurement, monitoring and evaluation mechanism by utilizing the advances achieved in digital technologies and Earth Observation
- Provide dedicated capacity development opportunities for women and other marginalized groups

### Conclusion

Most of the Nile Basin riparian states are among the world's most food-insecure countries. Most of their populations depend on rainfed agriculture which is increasingly unreliable, often with catastrophic consequences. The downstream regions of the basin, due to the arid/semi-desert climate, are also facing the challenges of declining per capita water availability with severe consequences on their food production systems. The twin challenges of the projected population growth (indicated to double approximately every 25 years) and climate change pose an existential threat to the riparian states.

Improved agricultural water management, including irrigation, is considered vital in achieving food security and improved adaptation to climate change. Given the transboundary nature of the river, the Nile Basin riparian states have potentially huge opportunities for addressing their food and water security challenges in a climate crisis. 'Water saved anywhere in a basin is water saved everywhere' — to harness the opportunity provided by the Nile and minimize mutual risks, collective action by the riparian states is necessary.

The Nile Basin Initiative, through its Strategic Water Resources Assessment, has identified several options that can be used to address the growing water demands in

the Nile Basin more sustainably with mutual gains among the countries. This policy brief builds on those findings and provides key recommendations to the Member States in the collective endeavor towards their shared vision objective, i.e., sustainable socio-economic development through equitable utilization and benefit from the common Nile Basin water resources.

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