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Inventory of existing planning tools

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The project consortium is comprised of:

EGYPT	Heliopolis University (HU)
ETHIOPIA	Water and Land Resources Institute (WLRI)
FINLAND	Finish Environment Institute (SYKE)
ITALY	Centro Internazionale di Alti Studi Agronomici Mediterranei di Bari (CIHEAM-Bari)
ITALY	Italian Research Council (CNR)
KENYA	Kenya Agricultural & Livestock Research Organization (KALRO)
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THE NETHERLANDS	International Soil Reference and Information Centre (ISRIC)
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Abstract (for dissemination)	The Climate Smart WATer Management and Sustainable DEVelopment for Food and Agriculture in East Africa (WATDEV) project aims to enhance sustainability of agricultural water management and strengthen resilience of agro-ecosystems to climate change in East Africa and Egypt. The project is implemented by AICS (Agenzia Italiana per la Cooperazione e lo Sviluppo) as the executive agency, with CIHEAM-BARI serving as the lead scientific institution. Key partners include ASARECA (Strengthening Agricultural Research in Eastern and Central Africa), KALRO (Kenya Agricultural and Livestock Research Organization), WLRC (Water, Land Resources Centre - Ethiopia), WRC (Water Research Centre, Sudan) and HU (Heliopolis University, Egypt). ISRIC (International Soil Reference and Information Centre, The Netherlands) and SYKE (Finnish Environment Institute, Finland) are the modelling partners. The overarching objective of WATDEV is to improve sustainability of agricultural water management and increase resilience of agro-ecosystems to climate change in East Africa and Egypt. The specific objectives include: (1) improving national ministries and research institutions' knowledge and management of water in agriculture; and (2) enabling farmers and local actors, cooperatives and Water User Associations to adopt innovative and sustainable water management and skills. A key component of the WATDEV project is the development of a modelling toolbox that enables users to assess the impacts of different Best Management Practices (BMPs) on crop water use, yield, fertilizer application, and other performance indicators including economic outcomes. The toolbox is implemented as an online decision-support platform, and local and regional stakeholders are trained in its application to support evidence-based decision-making. To support the develop this tool, it is essential to understand which irrigation and water-management decision-support tools are already available, and currently in use within the project's study areas. This report presents the results of Activity A4.1: Inventory of Existing Planning Tools. A literature review was conducted to identify existing and historical decision-making support tools to each study site. The review was presented to the local WATDEV partners for confirmation.
Keywords	Decision Support Tool; Irrigation planning

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Acronyms and Abbreviations

AHP	Analytic Hierarchy Process
AICS	Italian Agency for Development Cooperation
ANP	Analytic Network Process
ASARECA	Association for Strengthening Agricultural Research in Eastern and Central Africa, Uganda
CIHEAM	Centre International de Hautes Etudes Agronomiques Méditerranéennes, Italy
DEWS	Drought Early Warning System
DSS	Decision-support System
DSTs	Decision-support Tools
EU	European Union
ET	Evapotranspiration
FAO	Food and Agricultural Organization of the United Nations
FF-EWS	Flash Flood Early Warning System
HU	Heliopolis University, Egypt
IHE Delft	Institute for Water Education Delft
IMISET	Irrigation Management Information System of Ethiopia
IQMS	Irrigation Infrastructure Quality Management System
ISRIC	International Soil Reference and Information Center, The Netherland
IWMI	International Water Management Institute
KALRO	Kenya Agricultural & Livestock Research Organization, Kenya
KU	Khartoum University, Sudan
LSC	Land, Soil, Crop
LSC-IS	Land, Soil, Crop Information Services
NBI	Nile Basin Initiative
NBIS	Nile Basin Information Systems
NB DSS	Nile Basin Decision Support System
NIA	National irrigation Authority, Kenya
NRC	National Research Council, Sudan
NSIS	National Soil Information System
SYKE	Finnish Environment Institute, Finland
UNDP	United nations Development Programme
WAD	The Water Availability and Demand
WATDEV	Climate Smart WATer Management and Sustainable DEVelopment for Food and Agriculture in North and East Africa
WB	World Bank
WEAP	Water Evaluation and Planning
WLRC	Water and Land Resources Center, Ethiopia
WRC	Water Research Centre, Sudan
WUA	Water User Association
WUE	Water-Use Efficiency

Executive Summary

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The overarching objective of WATDEV is to improve sustainability of agricultural water management and increase resilience of agro-ecosystems to climate change in East Africa and Egypt. The specific objectives include: (1) improving national ministries and research institutions' knowledge and management of water in agriculture; and (2) enabling farmers and local actors, cooperatives and Water User Associations to adopt innovative and sustainable water management and skills.

A key component of the WATDEV project is the development of a modelling toolbox that enables users to assess the impacts of different Best Management Practices (BMPs) on crop water use, yield, fertilizer application, and other performance indicators including economic outcomes. The toolbox is implemented as an online decision-support platform, and local and regional stakeholders are trained in its application to support evidence-based decision-making.

To support the develop this tool, it is essential to understand which irrigation and water-management decision-support tools are already available, and currently in use within the project's study areas.

This report presents the results of Activity A4.1: Inventory of Existing Planning Tools. A literature review was conducted to identify existing and historical decision-making support tools to each study site. The review was presented to the local WATDEV partners for confirmation.

1. Introduction

A key component of the WATDEV project is the development of a modelling toolbox that enables users to assess the impacts of different Best Management Practices (BMPs) on crop water use, yield, fertilizer application, and other performance indicators including economic outcomes. The toolbox is implemented as an online decision-support platform, and local and regional stakeholders are trained in its application to support evidence-based decision-making.

To support the develop this tool, it is essential to understand which irrigation and water-management decision-support tools are already available, and currently in use within the project's study areas.

This report presents the results of Activity A4.1: Inventory of Existing Planning Tools. A literature review was conducted to identify existing and historical decision-making support tools to each study site. The review was presented to the local WATDEV partners for confirmation.

An initial review was focused on Decision Support Tools (DST) for irrigated agricultural systems that are available for water managers in the WATDEV study areas, broadly covering the Nile Delta and Nile River Basin (with a focus on Egypt, Ethiopia and Sudan) and the Tana River Basin in Kenya. The review revealed that most tools are designed to assess water use and performance in established systems, while relatively few support the planning and evaluation of interventions aimed at improving water-use efficiency and sustainability.

Given the limited availability of operational planning tools, the review was expended to include prototype tools developed in academic research but not implemented with end users, as well as guidance documents manuals that can support planning processes.

Table 1 provides an overview of the decision support tools identified through this review. Overall, the findings indicate a significant gap in tools that support long-term strategic planning and decision-making for agricultural water management in East Africa. In this context, the WATDEV Toolbox addresses an important need by providing agricultural water managers with practical support for evaluating and planning interventions that enhance the sustainability and resilience of irrigated agricultural systems.

Table 1 – Overview of existing Decision Support Tools

Type	Region	Decision Support Tool	Availability
Active	All countries	Water Productivity through Open access of Remotely sensed derived data (WaPOR)	https://data.apps.fao.org/wapor/
	Nile Basin countries	Nile Basin Information Systems	https://nilebasin.org/nile-basin-information-systems
	Ethiopia, Kenya (also Rwanda)	Land, Soil and Crop Information Hub	https://lsc-hubs.org/ https://ethiopia.lsc-hubs.org/ https://kenya.lsc-hubs.org/
	Ethiopia	Irrigation management information system of Ethiopia (IMISET)	https://imiset.gov.et/home/
	Ethiopia	Ethiopian National Soil Information System	http://196.188.183.112/
	Kenya	Water Availability and Demand (WAD) Tool	https://www.irrigationauthority.go.ke/sustainable-irrigation-management/water-availability-and-demand/
Prototype	All countries	CROPWAT-based DSTs	Offline
	Egypt	DSS for economic value of irrigation water	Offline

Type	Region	Decision Support Tool	Availability
		DSS for Proper Utilization and Management of Water Resources in Egypt	Offline
		DSS to Prioritize Irrigation Structures in Rehabilitation Programs	Offline
		WEAP analysis for enhancing water resource sustainability in Egypt	Offline
	Sudan	DSS for Irrigation Management at Gezira Scheme	Offline
		Water-energy-food planning and operations framework for the Blue Nile	Offline
Manual	Ethiopia, Kenya	Irrigation Infrastructure Quality Management System (IQMS) Toolkit	https://qmskit.iwmi.org/
	Ethiopia	National Surface Irrigation Planning & Design Guidelines	https://www.moa.gov.et/wp-content/uploads/2024/11/201811_SSIGL-15-Surface-Irrigation-System-Planning-and-Design-compressed-1.pdf
	Kenya	Guidelines for Promotion, Development and Management of Irrigation in Kenya	https://www.policyvault.africa/wp-content/uploads/policy/KEN607.pdf

2. Active Decision Support Tools

2.1. WaPOR: Water Productivity through Open Access of Remotely Sensed Data

- Region of application: Global, with a primary focus on Africa, the Near East, and partner countries.
- Year developed: 2015 (project initiation); major upgrae with the release of WaPOR 2.0 in 2019.
- Developer: Food and Agriculture Organization of the United Nations (FAO), in collaboration with partners including Institute for Water Education (IHE) Delft and International Water Management Institute (IWMI).
- Access: https://data.apps.fao.org/wapor/

WaPOR is a state-of-the-art decision support system developed by the FAO to monitor agricultural water productivity using satellite-based remote sensing data. Initiated in 2015, the platform was designed to address the growing need for reliable, spatially explicit information on water use and agricultural production, particularly regions where ground-based data are limited. WaPOR provides open access, near real-time database covering large parts of Africa and the Near East, supporting decision-making at scales ranging from individual irrigation schemes to river basins and national agricultural systems.

The primary objective of WaPOR is to enable water managers, policymakers, and agricultural stakeholders to assess and improve water-use efficiency in both irrigated and rainfed agriculture. The platform provides key indicators, including actual evapotranspiration (ET), biomass production, and water productivity (agricultural output per unit water consumed). Derived from satellite observations and integrated into a geospatial database, these indicators allow users to analyse temporal trends, compare performance across regions, and identify inefficiencies and opportunities for improvement in agricultural systems.

WaPOR is founded on remote sensing-based water balance and crop productivity modelling approaches, in which evapotranspiration serves as a proxy for water consumption. The system distinguishes between “green water” (rainfall) and “blue water” (irrigation water), enabling detailed water accounting and resource-use assessment. Land productivity is estimated through biomass and yield models, while water productivity is calculated as biomass production or crop yield per unit of water consumed.

WaPOR’s multi-resolution data architecture, ranging from continental to field scale, supports a wide variety of applications, including irrigation performance assessment, crop water requirement estimation, drought monitoring, and the planning and evaluation of improvements interventions. By providing freely accessible, high-quality data and analytical tools, WaPOR strengthens evidence-based water management and contributes to improving agricultural productivity and resilience under increasing water scarcity and climate change pressures.

References

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GEO Knowledge Hub (2024) WaPOR dataset overview. Available at: https://gkhub.earthobservations.org/packages/4dkpz-75t98

IWMI (2024) WaPOR: Remote sensing for water productivity. Available at: https://www.iwmi.org/projects/wapor/

UN-Water (2022) Global monitoring of evapotranspiration, biomass production and water productivity through remote sensing (WaPOR). Available at: https://www.unwater.org/our-work/un-system-wide-strategy-water-and-sanitation/contributing-actions/global-monitoring-actual

2.2. Nile Basin Information Systems

- Region of application: Nile Basin countries, including Egypt, Ethiopia, Kenya, Sudan, and other member states of the Nile Basin.
- Year developed: Progressive development since early 2000s with major information platforms and data services introduced and expended between 2023 and 2025./
- Developer: The Nile Basin Initiative (NBI), with support from development partners including the World Bank, UNDP, FAO, and various regional programs.
- Access: https://nilebasin.org/nile-basin-information-systems

The Nile Basin Information Systems (NBIS) comprise a comprehensive, multi-component decision-support environment developed by the Nile Basin Initiative (NBI) to support data-driven water resources management across the Nile Basin. Rather than a single tool, NBIS consists of an integrated suite of platforms, databases, and analytical services designed to enhance data sharing, monitoring, and cooperative planning among the basin's member states.

The system has evolved progressively since the early 2000s in response to the growing need for integrated information systems capable of addressing challenges such as water scarcity, climate variability, and competing sectoral demands. One of its foundational components was the Nile Basin Decision Support System (NB DSS), which provided a framework for basin-wide analysis and planning. More recent developments have significantly expanded NBIS through the integration of advanced tools and services including the Drought Early Warning System (DEWS), the Flash Flood Early Warning System (FF-EWS), and centralized databases covering water quality, dams, groundwater resources, and climate scenarios. Together, these components provide near real-time monitoring and forecasting, and analytical capabilities, strengthening early warning, risk assessment, and mitigation efforts across the Nile Basin and its sub-basins.

A key strength of NBIS lies in its integration with modeling and analytical tools. By linking data infrastructure with simulation and decision-support capabilities, the system enables hydrological modeling, river and reservoir simulations, and scenario-based planning and analysis. This integration allows water managers and planners to assess alternative water allocation strategies, evaluate irrigation development options, and examine the potential impacts of infrastructure investments under different future conditions. As a result, NBIS supports more informed, evidence-based decision-making for sustainable water resources management across the basin.

From a technical perspective, NBIS integrates remote sensing data, hydrometeorological observations, and numerical models into a unified information platform. It supports river flow forecasting, drought monitoring, and climate scenario analysis using datasets, including CORDEX climate projections. In addition, the Water Smart Irrigation Dashboard provides irrigation-specific information for selected irrigation schemes, enabling users to assess water availability, evaluate irrigation performance, and better understand crop-water interactions. Overall, NBIS offers a comprehensive decision-support framework that promotes transparency, strengthens regional cooperation, and facilitates evidence-based decision-making for irrigation planning and water resources management across the Nile Basin.

References

Georgia Water Resources Institute (2015) Sharing the Nile: Information and Decision Support Systems. Available at: https://gwri.gatech.edu/2015/05/17/sharing-the-nile-information-and-decisions-support-systems/

Nile Basin Initiative (NBI) (2012) Nile Basin Decision Support System (NB DSS) portal. Available at: https://nbdss.nilebasin.org/

Nile Basin Initiative (NBI) (2026) Nile Basin Information Systems. Available at: https://nilebasin.org/nile-basin-information-systems

2.3. Land, Soil and Crop Information Hubs

- Region of application: Ethiopia, Kenya (also Rwanda)
- Year developed: 2021–2025
- Developer: EU-funded LSC IS project (ISRIC, WUR, partners)
- Access:
  - https://ethiopia.lsc-hubs.org/
  - https://kenya.lsc-hubs.org/
- More info: https://lsc-hubs.org/

The Land, Soil and Crop (LSC) Information Hub is a data-driven decision support platform designed to advance climate-smart agriculture and sustainable land and water management in East Africa. It forms part of the broader LSC IS initiative, which seeks to enhance the availability and usability of agricultural data to support decision-making at multiple levels.

The hub aggregates a wide range of datasets, including soil properties, crop yields, weather observations, land use information, and socio-economic indicators. These datasets are harmonized and delivered through interactive maps, dashboards, and analytical tools.

The platform is guided by the FAIR principles (Findable, Accessible, Interoperable, Reusable), ensuring that data can be readily easily discovered, shared, and integrated into decision-making processes.

The analytical capabilities of the LSC hub include predictive modeling based on statistical and machine learning techniques. These models generate outputs such as soil fertility maps, crop suitability assessments, and soil and water conservation recommendations. These outputs support farmers, extension officers, and policymakers in making informed decisions related to irrigation scheduling, crop selection, and land management practices.

Although broader in scope than irrigation-focused decision-support tools (DSTs), the LSC hub makes an important contribution to irrigation water management by linking soil and crop conditions with water demands. By improving data accessibility and integration, it supports more efficient and sustainable use of water resources within agricultural systems.

References

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LSC Hub (2024) Land, Soil and Crop Information Hub. Available at: https://lsc-hubs.org/

LSC Hub Ethiopia (2024) Land, Soil and Crop Information Hub Ethiopia. Available at: https://lschub-geoportal.vercel.app/

LSC Hub Kenya (2024) Land, Soil and Crop Information Hub Kenya. Available at: https://kenya.lsc-hubs.org/

2.4. EthioSIS: Ethiopia National Soil Information System

- Region of application: Ethiopia
- Year developed: 2025–2026
- Developer: ISRIC and Ethiopia partners
- Access: http://196.188.183.112/

The National Soil Information System (NSIS) of Ethiopia was established in 2017, building on earlier soil survey and mapping initiatives such as EthioSIS, AfSIS, CASCAPE, and REALISE. As soil health and fertility management have become national priorities, aligned with Ethiopia's digital transformation and digital agriculture strategies, the system has evolved into a key platform for soil data management and decision support.

Following the transition of EthioSIS to the Ministry of Agriculture (MoA), support was sought from ISRIC – World Soil Information to further strengthen the NSIS. The enhancement focuses on improving sustainability, accessibility, usability, and long-term management of soil information across the entire data workflow. The system currently contains approximately 70,000 records of soil properties collected and analyzed throughout Ethiopia, providing a valuable resource for agricultural planning, soil fertility management, research, and policy development.

References

EthioSIS (2026) Ethiopia National Soil Information System. Available at: http://196.188.183.112/

2.5. IMISET: Irrigation Management Information System of Ethiopia

- Region of application: Ethiopia
- Year developed: ~2020s (enhanced with WaPOR integration)
- Developer: Ethiopian Ministry of Agriculture, FAO, IWMI
- Access: https://imiset.gov.et/home/

The Irrigation Management Information System of Ethiopia (IMISET) is a web-based decision support platform designed to monitor irrigation performance and support evidence-based water management decisions. Developed collaboratively by the Ethiopian Ministry of Agriculture, FAO, and the International Water Management Institute (IWMI), IMISET integrates remote sensing data and ground-based observations into a unified system to track irrigated agriculture across the country.

A key advancement in IMISET has been the integration of FAO's WaPOR (Water Productivity through Open-access Remotely sensed data) datasets, which provide spatially distributed information on evapotranspiration, biomass production, and water consumption. Using these datasets, the system derives seasonal crop water use, crop water requirements, and irrigation performance indicators such as adequacy, relative water supply, and water productivity. These indicators enable managers to assess whether irrigation schemes are meeting crop demands and using water efficiently.

IMISET functions as both a monitoring and analytical tool, providing insights at multiple scales—from individual irrigation schemes to national planning. It supports policymakers with up-to-date information on irrigated areas, water use patterns, and agricultural productivity. This enables the identification of underperforming systems and informs investment decisions and policy interventions. The system relies on a combination of remote sensing-based models and performance metrics rather than purely simulation-based approaches. By enhancing transparency and data availability, IMISET strengthens irrigation governance and contributes to improved water productivity and food security in Ethiopia.

References

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FAO (2023) IMISET tool for Ethiopia. Available at: https://www.fao.org/in-action/remote-sensing-for-water-productivity/applications-and-uses/applications-catalogue/product-detail/wapor-imiset-tool-for-ethiopiaef168d5f-2ab2-4b97-8828-21ae65affc05/en

2.6. Water Availability and Demand Tool

- Region of application: Kenya
- Year developed: ~2023–2026
- Developer: IWMI, FAO, National Irrigation Authority (NIA)
- Access: https://www.irrigationauthority.go.ke/sustainable-irrigation-management/water-availability-and-demand

The Water Availability and Demand (WAD) Tool is a modern digital decision support platform developed to enhance irrigation planning and water resource allocation in Kenya. It leverages satellite-based data (WaPOR) and national datasets to provide a comprehensive view of water availability, water use, and irrigation demand at multiple spatial scales.

The tool's architecture is organised into four main analytical components: water availability, water demand, storage assessment, and sufficiency analysis. It integrates data on rainfall, evapotranspiration, groundwater resources, and crop distribution to estimate water supply and irrigation requirements. Based on this information, it identifies areas of water deficits or surpluses and evaluates the potential for water storage interventions such as ponds and small reservoirs.

A key strength of the WAD tool lies in its use of remote sensing-based water accounting models, which enable consistent and spatially explicit analysis across regions. It allows planners to visualise water demand across different cropping systems (rainfed, fully irrigated, supplementary irrigation) and compare these demands with available water resources.

The tool was officially handed over to Kenya's National Irrigation Authority in January 2026, marking its transition into an operational planning platform. By providing real-time, data-driven insights, it supports investment planning, irrigation expansion, and climate-resilient agriculture. It represents a new generation of decision-support system (DSS) that integrate Earth observation data with national planning frameworks to strengthen water governance.

References

IWMI (2023) Water Availability and Demand Tool. Available at: https://www.fao.org/in-action/remote-sensing-for-water-productivity/applications-and-uses/applications-catalogue/product-detail/water-availability-and-demand-%28wad%29-toolb770b12f-385b-47eb-bd91-a41b33971c18/

National Irrigation Authority (2026) Official handover of the WAD tool. Available at: https://www.irrigationauthority.go.ke/2026/01/22/official-hand-over-of-the-wad-tool-to-nia/

3. Prototype Decision Support Tools (DST)

3.1. CROPWAT-based DSTs

- Region of application: Global
- Access: https://www.fao.org/land-water/databases-and-software/cropwat/en/

CROPWAT is a widely used decision support tool developed by the FAO for irrigation planning and estimation of crop water requirements. It is based on the FAO methodology for calculating reference evapotranspiration (Eto), using the Penman–Monteith equation, which is subsequently converted into crop evapotranspiration through crop coefficients. The model integrates climate, soil, and crop data to estimate irrigation requirements and generate irrigation schedules. It also includes a soil water balance module to simulate moisture dynamics in the root zone, enabling evaluation of irrigation strategies under different agro-climatic conditions. CROPWAT is applied globally for irrigation design, water allocation planning, and drought impact assessment, supporting decision-making at both farm- and regional scales. Recent examples of applications include studies in Egypt (Abd El Baki 2021) and Kenya (Akoko 2020).

References

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Akoko, G. et al. (2020) Evaluation of irrigation water resources availability and climate change impacts—A case study of Mwea irrigation scheme, Kenya. Available at: https://doi.org/10.3390/w12092330

Abd El Baki, H. et al. (2021) Management of irrigation requirements using FAO-CROPWAT 8.0 model: A case study of Egypt. Available at: https://doi.org/10.1007/s40808-021-01268-4

3.2. DSS for Economic Value of Irrigation Water

- Region of application: Egypt

This DSS evaluates the economic performance of irrigation water by estimating returns per unit of water used. It integrates crop production data, water consumption, costs, and revenues to generate spatially explicit maps of economic water productivity. The system enables comparisons across crops and regions, helping to identify optimal cropping patterns under water constraints. By combing economic analysis with estimate of water demand, it supports resource allocation decisions and informs policy development in water-scarce contexts.

The tool is particularly valuable in Egypt, where agriculture relies heavily on efficient and highly optimized use of irrigation water.

References

El-Gafy, I. et al. (2012) Decision support system for economic value of irrigation water. Available at: https://doi.org/10.1007/s13201-012-0029-2

3.3. DSS for Proper Utilization and Management of Water Resources in Egypt

- Region of application: Egypt

This DSS uses multi-criteria decision-making, specifically Analytic Hierarchy Process (AHP), to prioritise water resource options across regions in Egypt. It evaluates alternative water sources — such as Nile water, groundwater, desalination, and drainage reuse — based on sustainability and economic criteria. By ranking water supply options at the regional level, the tool supports strategic planning under conditions of increasing water scarcity. The approach integrates decision theory with hydrological and socio-economic considerations, enabling policymakers to allocate water resources more effectively across diverse environmental and demand contexts.

References

Zaki, Y.A. et al. (2025) Decision support system for proper utilization and management of water resources in Egypt. Available at: https://doi.org/10.31272/jeasd.2795

3.4. DSS to Prioritize Irrigation Structures in Rehabilitation Programs

- Region of application: Egypt

This DSS supports prioritisation of irrigation infrastructure rehabilitation using the Analytic Network Process (ANP). It evaluates engineering, environmental, and socio-economic criteria to rank structures according to urgency and impact within Egypt. Applied to large-scale irrigation systems, the tool processes extensive datasets to optimise budget allocation and intervention planning. By integrating multi-criteria decision-making approaches, it helps ensure more efficient maintenance strategies, reducing water losses and improving overall system performance.

References

Abdelazim, N. et al. (2019) Decision support system to prioritize irrigation structures in rehabilitation programs. Available at: https://www.iosrjournals.org/iosr-jmce/papers/vol16-issue2/Series-1/J1602015867.pdf

3.5. WEAP analysis for enhancing water resource sustainability in Egypt

- Region of application: Egypt

Water Evaluation and Planning (WEAP) is an integrated water resources planning tool widely applied in Egypt to assess water allocation scenarios. It combines hydrological modeling with demand forecasting enabling simulation of future water availability under varying socio-economic and climate conditions. The model uses water balance calculations and scenario-based analysis to evaluate irrigation efficiency, cropping patterns, and policy interventions. It supports decision-makers in comparing alternative management strategies and identifying more sustainable pathways for water resource allocation and use.

References

Elsadek, E. et al. (2023) WEAP analysis for enhancing water resource sustainability in Egypt: A dynamic modeling approach for long-term planning and management. Available at: https://doi.org/10.1080/16874048.2023.2260602

3.6. DSS for Irrigation Management at Gezira Scheme

- Region of application: Sudan

This DSS supports irrigation scheduling in the Gezira Scheme by estimating crop water requirements based on evapotranspiration. It applies soil-water balance concepts and crop coefficients to determine appropriate irrigation timing and volumes. The system generates scheduling recommendations for scheme managers, improving the efficiency and reliability of water distribution. Although relatively simple in structure, it demonstrates practical DSS tool at the irrigation scheme scale and contributes to improved water management in large-scale irrigation systems in Sudan.

References

Abdallah, A. et al. (2013) Decision support system for irrigation management at Gezira scheme. Available at: https://research.ijcaonline.org/volume65/number4/pxc3885845.pdf

3.7. Water-energy-food planning and operations framework for the Blue Nile

- Region of application: Sudan

This advanced DSS integrates water, energy, and food systems through combined simulation and optimisation. It employs a high-resolution hydrological model linked with AI-based optimisation algorithms to evaluate dam operations, irrigation expansion, and cropping strategies within the Blue Nile system. The framework enables assessment of cross-sectoral trade-offs, supporting more coherent basin-scale planning. It is particularly relevant for transboundary river basins, where it helps policymakers in Sudan and neighbouring countries balance competing water, energy, and agricultural demands under conditions of uncertainty.

References

Basheer, M. et al. (2024) Water-energy-food planning and operations framework for river basins with a case study on the Blue Nile. Available at: https://doi.org/10.1016/j.jhydrol.2024.130801

4. Decision Support Manuals

4.1. Irrigation Infrastructure Quality Management System (IQMS) Toolkit

- Region of application: Ethiopia and Kenya (and rest of Sub-Saharan Africa)
- Access: https://qmskit.iwmi.org/

The IQMS toolkit provides structured decision support for the planning, development, and management of irrigation infrastructure. Developed to improve the quality and sustainability of irrigation investment, The IQMS Toolkit offers comprehensive guidelines, checklists, and workflow procedures covering the entire project cycle, including planning, design, construction, and operation and maintenance.

Unlike model-based decision support systems, the IQMS Toolkit focuses on quality assurance and management processes rather than quantitative analysis. By standardising procedures and promoting adherence to best practices, the toolkit helps improve project performance, reduce implementation risks, and strengthen accountability among stakeholders. The toolkit is particularly valuable in supporting the development of sustainable and resilient irrigation systems across Ethiopia, Kenya, and other countries in Sub-Saharan Africa. .

References

Amare, M. et al. (2024a) Irrigation infrastructure quality management system toolkit for Sub-Saharan Africa using Ethiopia, Kenya and Uganda as a case study: Volume I – Guidelines. Available at: https://doi.org/10.5337/2024.222

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4.2. National Surface Irrigation Planning & Design Guidelines

- Region of application: Ethiopia
- Access: https://www.moa.gov.et/wp-content/uploads/2024/11/201811_SSIGL-15-Surface-Irrigation-System-Planning-and-Design-compressed-1.pdf

These guidelines provide standardized procedures for planning and design of surface irrigation systems in Ethiopia. They integrate hydrological analysis, soil assessment, agronomic considerations and hydraulic design principles to support development of efficient and sustainable irrigation infrastructure. Although not a software-based decision support system, the guidance functions as a procedural DSS by providing engineers and planners with structured methodologies, design criteria, and decision-making workflows. By promoting consistent design practices and adherence to technical standards, they help improve the reliability, efficiency, and performance of irrigation projects while supporting informed decision-making throughout the planning and design processes.

References

Ministry of Agriculture (2018) National guidelines for small-scale irrigation development in Ethiopia: Surface irrigation system planning and design (SSIGL-15). Available at: https://www.moa.gov.et/wp-content/uploads/2024/11/201811_SSIGL-15-Surface-Irrigation-System-Planning-and-Design-compressed-1.pdf

4.3. Guidelines for Promotion, Development and Management of Irrigation in Kenya

- Region of application: Kenya
- Access: https://www.policyvault.africa/wp-content/uploads/policy/KEN607.pdf

These national guidelines provide a comprehensive framework for the promotion, development, and management of irrigation in Kenya. They support decision-making through standardised approaches to irrigation planning, infrastructure development, and water allocation, and system management. Although not a software-based decision support tool, the guidelines function as a procedural decision support framework by providing policymakers, planners, and engineers with structured principles and recommended practices for irrigation development.

The guidelines emphasize sustainability, stakeholder participation, and efficient water use, and environmental stewardship, while aligning irrigation investments with national development priorities and climate resilience objectives. By promoting consistent planning and management approaches, they contribute to more effective and sustainable irrigation development across the country.

References

Ministry of Water, Sanitation and Irrigation (2020) Guidelines for promotion, development and management of irrigation in Kenya. Available at: https://www.policyvault.africa/wp-content/uploads/policy/KEN607.pdf