

Agricultural Water Demand Signaling (AgWaterDS) for smarter irrigation decisions

Matching irrigation water to what crops really need

Irrigation water is too often allocated on rough estimates rather than on what crops actually need. AgWaterDS (Agricultural Water Demand Signaling) is a water-accounting and crop-water-demand modeling framework that turns hydrologic and agricultural data into clear, tailored signals. It helps farmers, irrigation districts and policymakers match water allocation to current crop and climate needs. The framework is led by the International Water Management Institute (IWMI) as part of the CGIAR Digital Transformation Accelerator.

Project at a glance

Approach	Pairs supply-side hydrologic modeling with demand-side crop-water modeling, then signals the resulting gaps to end users
Primary users	Farmers, irrigation districts, and policymakers and basin authorities
Core outputs	Water-availability maps, crop water demand maps, allocation plans and an interactive decision-support dashboard
Priority countries	Ethiopia, Kenya, Nigeria and Zambia, with a design intended for replication across Sub-Saharan Africa and other water-stressed regions

A note on terminology: water demand, not market demand

AgWaterDS applies agricultural water demand signaling: it signals how much water crops need, where and when, so that irrigation allocation matches real crop and climate needs. This is distinct from agricultural market-demand signaling, which concerns demand for crops and produce further along the supply chain. Market information is referenced only as background context; it is not the signal AgWaterDS produces.

The need: why AgWaterDS, why now

- Water allocation decisions often rely on rough estimates rather than the actual, current water needs of crops.
- Water is not always directed to where it creates the greatest economic or ecological value; identifying those zones requires better spatial information.
- Basin authorities and irrigation managers frequently lack advance insight into peak irrigation demand, limiting proactive planning.
- A warming climate is intensifying variability in water availability, making the coordination of supply and demand increasingly critical.

GOAL

A digitally enabled approach to agricultural water management that matches irrigation allocation to real crop and climate needs, raising water productivity, reducing waste, supporting more equitable access and strengthening resilience to increasing rainfall variability and drought.



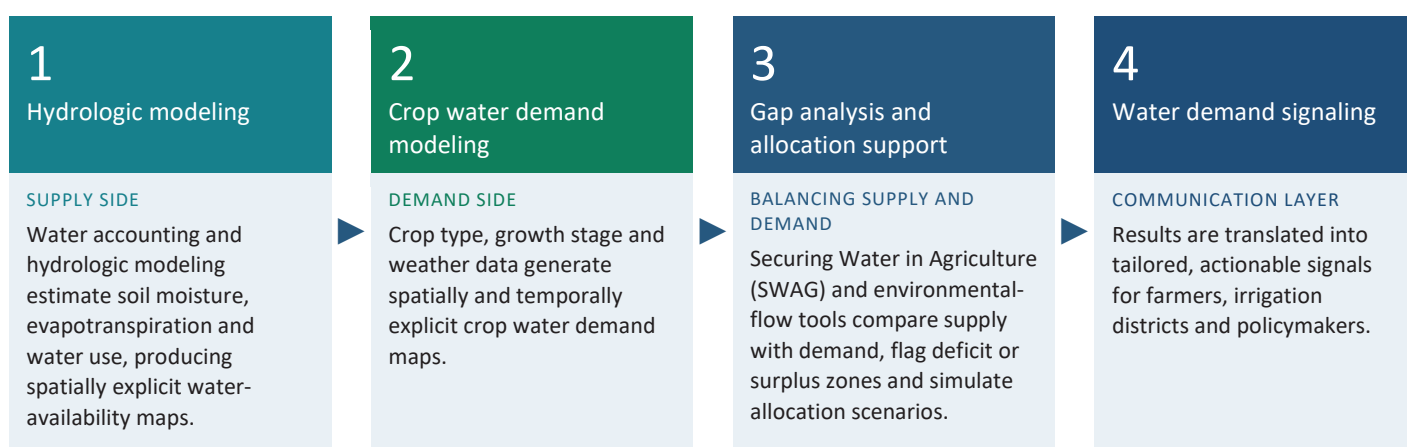
Why governments, water managers and development partners should support AgWaterDS

AgWaterDS gives decision-makers a shared, evidence-based picture of water supply and demand, replacing fragmented or outdated information.

- **Plan with evidence:** spatially explicit maps of water availability and crop water demand support national and basin-level planning.
- **Decide with confidence:** supply–demand gap analysis and scenario simulation show where deficits or surpluses exist before decisions are made.
- **Act ahead of demand:** advance insight into peak irrigation needs supports proactive rather than reactive management.
- **Support equitable outcomes:** allocation plans are designed to balance productivity with environmental flow requirements.
- **Build climate resilience:** a climate-adaptive framework helps stakeholders prepare for increasing rainfall variability and drought.

How AgWaterDS works: a four-stage framework

Four linked stages turn water-supply and crop-demand data into actionable signals for each user group.



Primary users and decisions supported

Farmers	Irrigation districts	Policymakers and basin authorities
▪ Receive irrigation guidance based on evapotranspiration (ET) deficits ▪ Know how much to irrigate and when ▪ Reduce over-watering and improve yield efficiency	▪ Identify demand hotspots across the service area ▪ Plan crop diversification based on water availability ▪ Coordinate water releases with actual field requirements	▪ Prioritize allocations under water scarcity ▪ Simulate policy scenarios before implementation ▪ Support equitable distribution across regions and crops

Expected benefits (anticipated outcomes)

The benefits below are expected outcomes of the AgWaterDS approach. They are not yet measured or demonstrated impacts.

Higher water productivity More yield per unit of water through more precise allocation	Less wasted water Reduced over-irrigation through timely demand signals	More equitable access Distribution guided by evidence rather than precedent	Greater climate resilience Adaptive management for variable rainfall and drought
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Geographic focus: priority countries

AgWaterDS is being profiled in four priority countries. The framework is designed for replication across Sub-Saharan Africa and other water-stressed agricultural landscapes.

Country	Basin and context	AgWaterDS focus	Priority crops
Ethiopia	Awash and Rift Valley Lakes basins: expanding irrigated agriculture, increasing competition for limited water, and high seasonal and climate variability	Irrigation scheduling and crop water-demand signaling for irrigation schemes	Onion, cabbage, pepper, tomato, wheat
Kenya	Tana and Athi basins: competing demands from agriculture, urban use and ecosystems	Multi-stakeholder allocation support and drought preparedness for horticulture exporters	Potato, tomato, cabbage, maize
Nigeria	Lake Chad and Niger River Basins: smallholder irrigation and seasonal variability	Irrigation scheduling and basin-level water accounting	Tomato, pepper, onion, rice, okra
Zambia	Zambezi Basin: major irrigation expansion under national growth plans	Water demand signaling for large-scale irrigation schemes and transboundary water coordination	Wheat

Core data inputs and digital components

Data inputs	Digital components
▪ Hydrologic: precipitation, evapotranspiration, routed river discharge, inflows, land cover ▪ Agricultural: crop type maps, growth-stage calendars, weather and climate data ▪ Remote sensing: satellite-derived land use, NDVI and actual evapotranspiration (MODIS, Landsat) ▪ Socioeconomic (contextual): market-demand information, crop price data, farmer survey data	▪ VegET hydrologic model for water accounting and supply-side estimation ▪ SWAG and environmental-flow (e-flow) tools for supply–demand gap analysis and scenario simulation ▪ Interactive decision-support dashboard with visualization and scenario-simulation features

Illustrative prototype: an early dashboard demonstration summarizes crop water balance at the sub-administrative level, showing the type of output the platform is designed to provide.

Key outputs and deliverables

Deliverable
Spatially explicit surface-water availability maps
Spatially and temporally explicit crop water demand maps
Optimized allocation plans and equitable water-distribution frameworks
Water demand intelligence reports
Interactive decision-support dashboard with visualization and scenario simulation

Authors

Mansoor Leh, Senior Researcher, International Water Management Institute (IWMI), Colombo, Sri Lanka

Naga Velpuri, Research Group Leader – Water Data Science for Action (WDSA), IWMI, Colombo, Sri Lanka

Darshana Wickramasinghe, Research Analyst – Remote Sensing and GIS, IWMI, Colombo, Sri Lanka

Dedunu Dissanayake, Intern, IWMI, Colombo, Sri Lanka

Sandamini Siriwardhane, Intern, IWMI, Colombo, Sri Lanka

Kavinda Gunasekara, Senior Project Manager – Artificial Intelligence and Data Innovations, IWMI, Colombo, Sri Lanka

Mariangel Garcia Andarcia, Research Group Leader – Water Futures Data and Analytics (WFDA), IWMI, Colombo, Sri Lanka

Author contributions

Conceptualization: Mansoor Leh, Naga Velpuri ; Methodology: Naga Velpuri, Mansoor Leh; Software: Darshana Wickramasinghe, Dedunu Dissanayake, Sandamini Siriwardhane; Validation: Darshana Wickramasinghe; Formal analysis: Darshana Wickramasinghe; Investigation: Naga Velpuri, Mansoor Leh, Darshana Wickramasinghe; Data curation: Darshana Wickramasinghe, Dedunu Dissanayake, Sandamini Siriwardhane; Writing – original draft: Naga Velpuri, Mansoor Leh; Writing – review & editing: Naga Velpuri, Mansoor Leh; Visualization: Darshana Wickramasinghe; Supervision: Mansoor Leh; Project administration: Kavinda Gunasekara; Funding acquisition: Naga Velpuri, Mariangel Garcia Andarcia.

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CGIAR Accelerator for Digital Transformation

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Contact

Naga Velpuri, Research Group Leader – Water Data Science for Action (WDSA), IWMI, Colombo, Sri Lanka

Mariangel Garcia Andarcia, Research Group Leader – Water Futures Data and Analytics (WFDA), IWMI, Colombo, Sri Lanka

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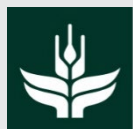
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**International Water
Management Institute (IWMI)**

Headquarters

127 Sunil Mawatha,
Pelawatte, Battaramulla, Sri
Lanka

Mailing address:

P. O. Box 2075, Colombo, Sri Lanka

Tel: +94 11 2880000

Fax: +94 11 2786854

Email: iwmi@cgiar.org

www.iwmi.org