Research Report

Durra.ai – AI-Powered National Digital Twin of Water for Saudi Vision 2030

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Problem Statement

Severe water scarcity in Saudi Arabia driven by high agricultural use, fossil aquifer dependence, and inefficient irrigation.

Saudi Arabia’s Water Crisis

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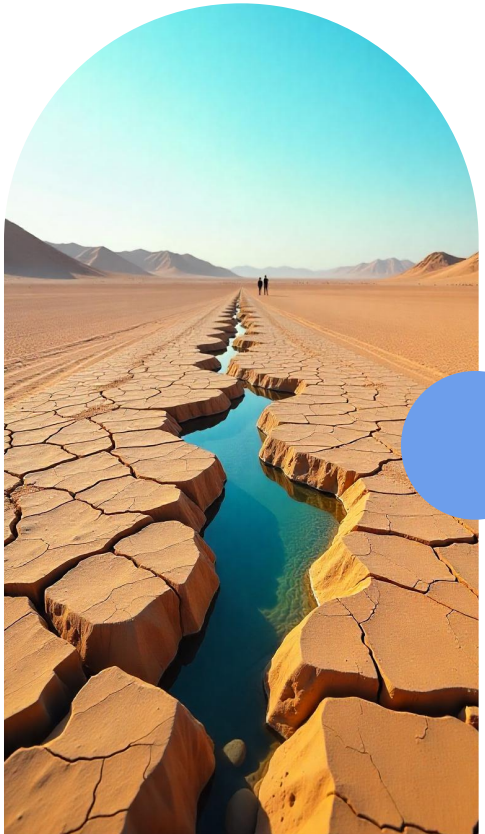
Saudi Arabia faces one of the most severe water challenges in the world, where natural limits and rising demand collide.

- Among the world’s most water-stressed nations
- No renewable rivers; **heavy reliance on fossil aquifers**
- Desalination provides critical supply but consumes **>10% of national electricity**
- Growing population and development make this cycle unsustainable



Agriculture’s Water Burden

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Agriculture consumes over **80% of the Kingdom’s freshwater,** and **up to 40% is lost** through inefficient irrigation.

The Global Benchmark Gap

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Saudi irrigation losses are:

3x higher

than international best practice.

Bridging this gap could **save billions of cubic meters of water** annually.

- Global agriculture share: **~70% of water use**
- Advanced irrigation systems globally keep losses at **10–15%**

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Current State of the Art

Existing solutions are fragmented, hardware-dependent, and unable to provide a national-scale view of water use.

Existing Water Management Solutions

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Today, water management tools exist at farm or city levels, but none provide an integrated, end-to-end view across agriculture, aquifers, desalination, and urban systems. This gap limits efficiency, scalability, and national-level planning.

1

Precision Irrigation Tools

Farm-level solutions such as Netafim, CropX, HydroPoint, and MENA soil-monitoring startups improve irrigation efficiency on individual farms. They rely on installed sensors and dashboards, making them hardware-dependent, fragmented, and limited to field-specific recommendations.

2

Plant- and City-Scale Digital Twins

These systems monitor urban or industrial water networks, tracking leaks, optimising distribution, and supporting operational decisions. While effective for cities, they exclude agriculture, the largest water consumer in Saudi Arabia.

The Gap for a National-Scale Solution

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No existing solution connects farms, aquifers, desalination, reuse, and cities into a single, integrated system. A solution is needed that can:

- **Focus on agriculture first**, targeting the largest water consumer and source of inefficiency.
- **Gradually build a national intelligence layer**, linking farms, aquifers, desalination, reuse systems, and cities.
- **Provide value to both farmers and policymakers**, providing immediate advice & support long-term scenario planning.
- **Be software-led and data-driven**, minimizing dependence on costly hardware.

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Innovation

Introducing smart irrigation for immediate impact, followed by a National Digital Water Twin to integrate, predict, and simulate the entire water cycle.

The Durra.ai Approach

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Durra.ai is one of the first **National Digital Twins of Water**. It is designed in two phases:

1. Addressing the largest water challenges first

2. And then scaling to cover the full national water cycle.

Phase 1 – Smart Irrigation

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Durra.ai starts with **Smart Irrigation** to deliver the fastest, most visible ROI. By combining satellite images, soil and salinity sensors, and weather forecasts with AI, the platform provides farmers simple advice on when and how much to irrigate.

Measurable impact within one growing season:

- Saving 20–40% of irrigation water
- Increasing crop yields by 20–30%
- Reducing energy and fertilizer costs

Phase 2 – National Water Twin

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Once adoption and data collection are established in Phase 1, Durra.ai expands to a full **National Digital Twin of Water** through integration, prediction, and simulation.

- **Integration:** Link aquifers, desalination, reuse, and urban demand
- **Prediction:** AI forecasts water demand, stress, and risk across the cycle
- **Simulation:** Policy makers can test “what-if” scenarios for sustainable planning

Why This Two-Phase Model Ensures Adoption and Scaling

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Biggest Impact First

Agriculture uses 80% of water, wastes 40%. Durra.ai targets the largest problem upfront.

Fast ROI and Farmer Trust

Benefits are visible in one season — lower costs, higher yields, stronger adoption.

Scalable Intelligence Layer

Every irrigation cycle generates a Saudi-specific dataset, building a national “data moat”.

National and global leadership

Saudi Arabia becomes the first mover with a nation-scale water twin, setting a benchmark globally.

Beyond Today's Siloed Solutions

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Current Solutions	Durra.ai
❌ **City/Plant twins**: Urban only, ignore agriculture.	✅ **Starts with farms,** then scales nationally.
❌ **Precision irrigation tools:** Hardware-heavy, fragmented, costly.	✅ **Software-led**, SaaS-based, partner-friendly.
❌ **Research models:** Theoretical, not operational.	✅ Delivers **real-time farmer advice** and policy simulations.

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Our Technical Approach

Integrates data fusion, water-need forecasting, and irrigation optimization to deliver actionable insights for farmers and planners.

Multi-layered intelligence

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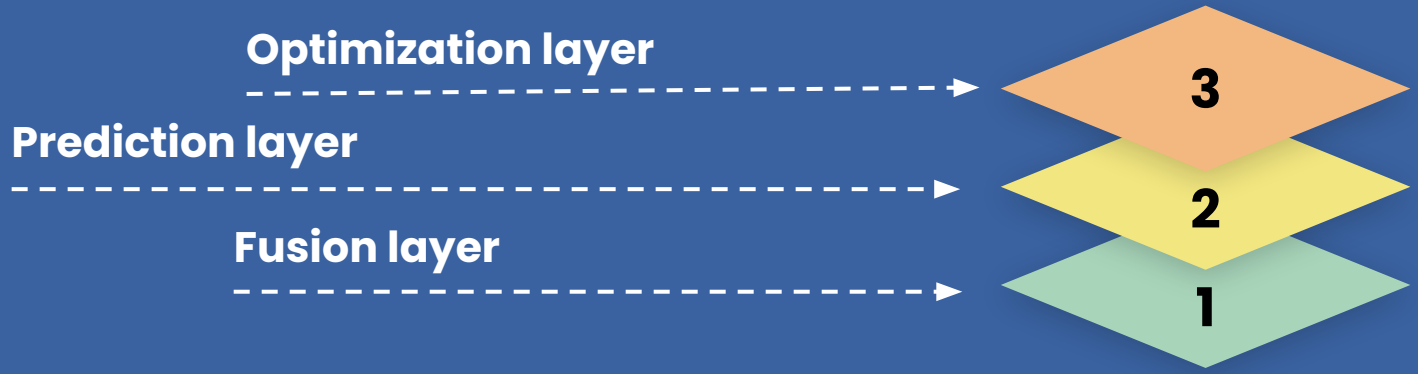
Durra.ai is designed as a **layered intelligence system** that collects, analyses, and optimises water and crop data. It provides farmers with clear irrigation advice today while building a growing dataset that enables policy makers to plan for tomorrow. Unlike siloed or hardware-heavy solutions, Durra.ai integrates multiple inputs into one coherent, scalable platform.



The System Layers

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3

Optimization Layer

Smart Irrigation Scheduling

Converts forecasts into **actionable irrigation plans**. Optimises when and how much water to apply to save energy, reduce salinity, and prevent over-irrigation. **Example:** “Irrigate in two shorter cycles at night instead of one long cycle in the afternoon” — lowering evaporation and electricity costs.

2

Prediction Layer

Forecasting Water Needs

Uses advanced models to predict how much water crops will lose in the coming days. Factors in rainfall, temperature, humidity, soil moisture, and crop conditions. Practical output: “Your field will need 15 mm of water in the next 48 hours.”

1

Fusion Layer

Data Collection & Cleaning

Integrates satellite images, soil and salinity sensors, weather forecasts, and farmer input (crop type, planting date, growth stage). **Detects errors** (e.g., faulty sensors) to ensure reliability. Produces a clear, **accurate farm profile** as the foundation for analysis.

Data Sources

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Durra.ai combines multiple data streams into one platform:

- **Satellite imagery:** tracks crop growth, soil moisture, and stress across large areas.
- **IoT sensors:** capture soil moisture, salinity, and temperature on the ground.
- **Weather forecasts:** anticipate rainfall, heat, and humidity shifts.
- **Farmer input:** adds local knowledge on crops, planting dates, and practices.

Continuous Learning

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A system that grows smarter every season

Durra.ai evolves through real-world use:

- Records every recommendation, farmer action, and outcome.
- Builds a **unique Saudi dataset** linking crops, soils, climates, and results.
- Retrains each season to improve forecasts and advice.
- Agronomists review anomalies, ensuring **human oversight**.

Why It Matters

Durra.ai is not static. It adapts **to climate change, local crops, and farmer practices**, creating a **Saudi-specific intelligence layer** that global competitors cannot easily copy.

Scientific Validation

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Proven results through gold-standard trials

Durra.ai's impact is measured using **Paired-Plot Trials**, a method trusted in agricultural research:

- **Control plots:** farmer's normal irrigation.
- **Treatment plots:** Durra.ai recommendations.

Measurements Include

- Water use (calibrated meters).
- Soil conditions (moisture, salinity).
- Crop yields (harvest weight).
- Energy use (electricity/fuel).

Reported results **(20–40% less water, 20–30% higher yields)** are scientifically credible and transparent, not just claims.

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Our Proven Track Record

The team behind Durra.ai has proven expertise in agriculture and hydroponics

Project 1

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Hydroponics Mega Farm

Client: Almarai

Scale

560 hectares (5.6 million m²), production capacity of 300,000 tons/year.

Products

Tomatoes, cucumbers, lettuces, bell peppers, strawberries.

Our Role

Investment assessment, market research, seasonal analysis, distribution, marketing and pricing strategies, scenario analysis.

Project 2

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HydroFresh Premium Vegetables

Client: Hydro Fresh

Scale

180,000 m²

Products

Cherry tomatoes, iceberg & looseleaf lettuce, butterhead, packaged salads.

Our Role

Concept assessment, business model development, competitor & target segment analysis, distribution, pricing, marketing strategy.

Project 3

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Soil-less Agriculture

Client: BANA United Trading Co.

Scale

11,611 m², 840 tons/year capacity.

Products

Tomatoes, lettuce, kale, baby spinach.

Our Role

Location & market analysis, product selection, technical requirements, operational & manpower planning, financial feasibility (hydroponic, aeroponic, aquaponic).

Project 4

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Leafy Greens Vertical Farming

Client: Scene Investments

Scale

1,000 aeroponic towers.

Products

Premium leafy greens

Our Role

Market assessment, concept & business model development, competitor and target segment analysis, marketing, distribution, and pricing strategies.

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Impact

Durra.ai delivers measurable farm-level benefits while building a strategic national intelligence layer. Its impact spans water, food, energy, environment, and policy.

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Water Savings

Saudi farms lose much of their irrigation water to over-application, evaporation, and poor distribution. By combining satellite imagery, soil sensors, and weather forecasts, Durra.ai gives farmers tailored irrigation advice that matches real crop needs. Early modelling and global literature suggest 20–40% reductions in irrigation volumes. Actual savings will vary by farm practices, soil, and crop type, but even at the low end, the impact is significant given agriculture consumes over 80% of the Kingdom's freshwater.

Yield Gains

Better irrigation is not just about saving water; it boosts crop performance. Applying water at the right time and in the right amount reduces stress and increases productivity. Based on trials abroad and initial Saudi testing, yield improvements of 20–30% are realistic. This means more food from the same land while using less water — a double benefit for food security and resource efficiency.

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Cost Reduction and Farmer ROI

Farmers gain financially both from lower costs and higher yields. Reduced pumping cuts energy bills, while efficient irrigation decreases fertiliser leaching and waste. Delivered as a software service with no heavy hardware costs, Durra.ai remains inexpensive compared with the value it generates. Importantly, farmers can see results within a single season, building trust and supporting large-scale adoption.

Energy Use and Greenhouse Gases

Water, energy, and climate are tightly linked. Every litre pumped requires energy, and every unit of fertiliser adds emissions. By cutting irrigation volumes and optimising fertiliser use, Durra.ai reduces both electricity/diesel consumption and fertiliser-related emissions. At scale, efficient water use also lowers the need for energy-intensive desalination plants, a major source of Saudi Arabia's water-related carbon footprint.

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Environmental Benefits

Impacts go beyond water and energy. Over-irrigation drives fertiliser runoff, chemical pollution, and soil salinity, degrading farmland and ecosystems. By advising only the water truly needed, Durra.ai reduces chemical runoff, preserves soil fertility, and protects long-term land productivity. These benefits compound over years of sustained use, even if not visible in a single season.

National Data Asset

Each irrigation cycle contributes to a growing record of how Saudi crops, soils, and climates interact. Over time, this builds a proprietary national database that improves recommendations and supports food and water security planning. Unlike global tools that rely on generic models, this Saudi-specific dataset becomes a long-term national asset.

Alignment With National and Global Goals

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Durra.ai supports Saudi Vision 2030 goals on sustainable water use, food security, and environmental stewardship. It also advances global Sustainable Development Goals (SDG 2: Zero Hunger, SDG 6: Clean Water and Sanitation, SDG 13: Climate Action). By aligning with both national and global priorities, Durra.ai strengthens Saudi Arabia’s leadership in sustainable innovation.

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Market & Scaling

Starting with Saudi Arabia and expanding across **MENA & GCC.**

Saudi Market Opportunity (Phase 1)

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Saudi Arabia is the ideal launch market for Durra.ai. Agriculture is the Kingdom’s largest water consumer, and its diverse crops and commercial farms face growing pressure to use resources more efficiently. By targeting high-value crops and larger farms first, Durra.ai can deliver measurable savings and build momentum for wider adoption.

1.5M

Hectares cultivated

500k

Hectares Phase 1 target

>$200M

Near-term Market

Expansion to MENA and GCC

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Water scarcity challenges extend across MENA and the GCC, where agriculture consumes most freshwater and efficiency pressures are rising. Building on results in Saudi Arabia, Durra.ai can scale into regional markets that are already investing heavily in sustainable farming.

5M+

Hectares farmland in MENA/GCC

>$1B

Potential addressable market

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Our Team & Partners

A multidisciplinary leadership and partner network combining strategy, AI, agronomy, and research expertise to drive scalable impact in Saudi agriculture.

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Dr. Abrar Zafar

Digital Transformation & Strategy

Over 30 years of international experience in large-scale digital projects. Leads strategy and national partnerships, aligning Durra.ai with Saudi Vision 2030.

Denis O'Grady

Large-Scale Agronomy & Irrigation

Experienced farm manager in GCC and Europe. Bridges high-tech solutions with real-world farming, ensuring Durra.ai's adoption on commercial farms.

Dr. Saad bin Qaisar

AI & IoT Systems

Designs the platform's predictive analytics for irrigation. Ensures data-driven recommendations are practical, reliable, and continuously improving.

Dr. Walter Luyten

Biotech & Sustainability

Biotech and soil health expert. Expands Durra.ai into sustainability modules, optimising fertilisers, nutrients, and soil carbon for long-term impact.

Strategic Partners

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جامعة الملك عبدالله للعلوم والتقنية
King Abdullah University of Science and Technology

KAUST

Collaboration with a leading science and technology university in Saudi Arabia, reinforcing innovation and credibility.

Farmonaut®
Satellite Based Crop Health Monitoring

Farmonaut

Strengthens Durra.ai's precision agriculture capabilities with practical, farmer-friendly digital tools.

PROVEYE

Farmonaut

Strengthens Durra.ai's precision agriculture capabilities with practical, farmer-friendly digital tools.

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Milestones & Roadmap

Durra.ai’s journey from pilot farms to a national AI-driven water management platform, highlighting key milestones and growth phases.

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Year 1 (2025)

Saudi Pilots

Controlled paired-plot trials on selected farms

Validate water savings (20–40%) & yield gains (20–30%)

Build farmer trust & generate Saudi-specific dataset

Years 2–3 (2026–2027)

Early Adoption

Expand to 20+ commercial farms

Enhance features & integrate more IoT sensors

Prove commercial viability & establish recurring revenue

Years 3–4 (2027–2028)

Saturn

Enter MENA markets (Egypt, Morocco, Sudan, GCC)

Integrate with Saudi agencies (MEWA, Water Authority)

Position Durra.ai as regional smart irrigation leader

Year 5 (2029)

National Digital Twin of Water

Launch full national platform connecting agriculture, aquifers, and desalination

Real-time monitoring & policy simulations

Establish Saudi Arabia as global leader in AI-driven water governance

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