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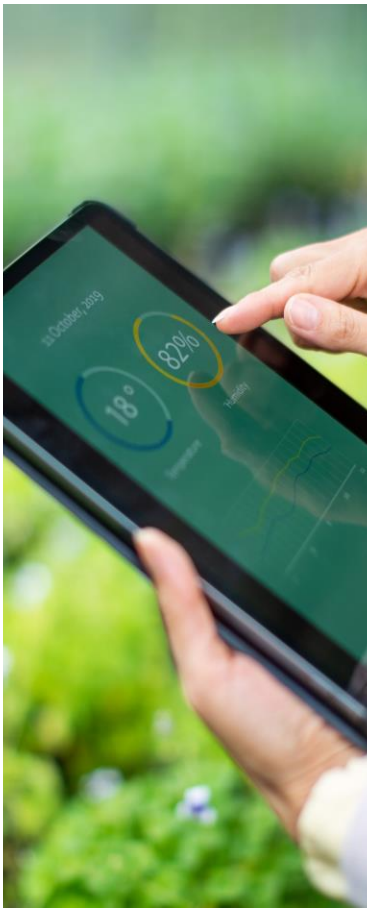
WORLD AGRICULTURE FORUM

Part of ABU DHABI SUSTAINABILITY WEEK | Hosted by MASDAR

The Next Crop: The Water-Energy-Food-Environment Nexus



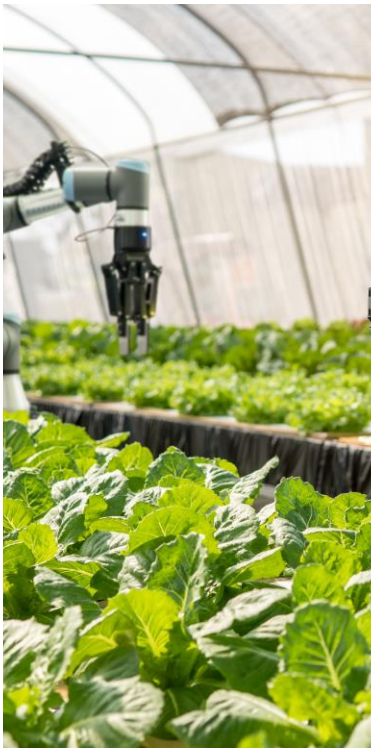
ADSW Dialogues

Introduction

Food, water, energy and environmental systems are under increasing pressure. Climate volatility, water scarcity, land degradation and biodiversity loss are exacerbating one another as food demand continues to rise. In many regions, these pressures are no longer marginal. They are systemic, exposing the limits of approaches that treat food, water, energy and ecosystems as separate policy and investment domains.

Food systems sit at the centre of this challenge. Agriculture is among the largest users of water and land, a significant consumer of energy and a major driver of environmental degradation, yet it remains essential to human wellbeing, economic stability and social resilience. Improving performance in one area without creating new risks elsewhere is becoming harder, with trade-offs increasingly visible across supply chains, markets and public health outcomes. In the Middle East, one of the world's most import-dependent food regions, reliance on global supply chains remains high – particularly in the GCC, where around 85% of food is imported, leaving countries exposed to supply chain shocks.[1]

1. https://www.weforum.org/stories/2025/02/gulf-food-security-innovation/



Against this backdrop, The Next Crop Dialogue – an Abu Dhabi Sustainability Week Dialogue held in partnership with the World Agriculture Forum UAE Country Council – brought together policymakers, investors, producers, researchers and technology providers. Under the Chatham House Rule, the discussion, moderated by PwC Middle East, examined how the Water-Energy-Food-Environment (WEFE) nexus can provide a more integrated pathway forward. Participants focused on pragmatic solutions where integration breaks down in delivery, rather than on the absence of intent or technology. Rather than optimising individual components in isolation, the nexus frames food systems as connected ecosystems, linking water stewardship, energy inputs, food production and environmental outcomes into coherent, investable models.

The five strategic insights that follow are distilled directly from the roundtable discussion. They focus on what enables scale: place-based design, measurable value, aligned incentives and a clearer connection between food systems, nutrition and long-term resilience, reflecting where participants consistently identified the gap between ambition and execution.

NEXT CROP STRATEGIC INSIGHTS

1 Local conditions set the performance ceiling, so solutions must be designed for place

Integrated WEFE outcomes are ultimately constrained by local conditions. Soil biology, water quality, salinity, heat and humidity determine what is viable and what fails at scale. In arid and water-scarce environments, solutions designed for temperate climates often introduce hidden inefficiencies. These include microbial inputs that underperform, crop varieties that struggle under heat stress and cooling systems that consume excessive water.

A place-based approach treats localisation as a core design principle rather than an adaptation step. This begins with diagnostics – soil microbiology, crop suitability and water characteristics – followed by engineering choices that respond to those conditions, including shading, passive cooling, irrigation scheduling and structural design rooted in arid-climate realities rather than imported greenhouse models.

Crop selection is equally critical. Saline-tolerant crops such as quinoa, sorghum and millets can perform well under brackish irrigation, while legumes can improve soil fertility through biological nitrogen fixation, reducing reliance on imported fertilisers. Long-term saline irrigation

trials show that, when crop choice and rotation are aligned to local conditions, soil structure and organic matter can improve rather than degrade, challenging the assumption that productivity and sustainability must trade off.

Scale is achieved not by replicating generic models, but by building a repeatable playbook for arid systems validated through field trials, commercial pilots and operational learning. Local validation is the foundation of regional scalability and future-preparedness as climate conditions shift globally.

2 What gets measured gets funded, so nexus value must be quantified in ways markets recognise

Integrated systems consistently underperform in capital allocation when their value is poorly measured. Water savings, emissions reductions, transport avoided, food waste prevented and health outcomes improved are all material, yet they are rarely captured in a single, comparable decision framework that supports investment, procurement and regulation.

Embedding measurement into operations changes this dynamic. Comparing locally produced food with imports using transparent metrics such as distance travelled, time in transit and emissions avoided. This creates a clear basis for procurement decisions and credible sustainability claims that resonate with buyers, investors and policymakers alike.

Fresher food supports better nutrition through improved maturity at harvest and shorter time to consumption. Controlled production can lower pesticide exposure. If even a portion of avoided healthcare costs, reduced absenteeism and productivity gains were systematically measured and attributed, the investment case for integrated WEFE systems would strengthen materially and become legible to finance ministries as well as investors.

Measurement is not administrative overhead. It is the bridge between operational performance and scalable finance, and between sustainability ambition and economically rational decision-making.

3 Policy alignment matters most where pricing masks true costs and blocks better options

Mis-priced inputs distort nexus outcomes. When water and energy prices fail to reflect carbon intensity, transport losses or environmental externalities, markets can penalise lower-impact solutions and entrench inefficient practices. Farms may access low-cost water produced through carbon-intensive desalination and long-distance transport, while decentralised, lower-impact alternatives struggle to compete on headline cost despite delivering superior system outcomes.

The consequence is structural inertia. Adoption slows, innovators face uneven competition and capital gravitates toward incremental improvements rather than system change. The solution lies not in blunt price corrections, but in smarter market design – transparent accounting of externalities, incentives linked to verified performance and procurement frameworks that reward outcomes rather than inputs.

Fragmentation across water, agriculture, energy and environmental mandates compounds the challenge. Without shared definitions, datasets and priorities, policies remain well intentioned but weakly implemented. Aligning standards, disclosure requirements and incentives across these domains creates the soft infrastructure needed to translate policy ambition into market behaviour.

When policy shifts from setting targets to shaping markets, sustainable practices become commercially rational rather than dependent on goodwill or pilot-stage support.

4 Food loss and waste is an immediate nexus lever, but adoption depends on fixing who pays and who benefits

Reducing food loss and waste is one of the highest-return WEFE interventions. Addressing this inefficiency reduces pressure across the entire system.

Technologies that extend shelf life without chemicals can deliver rapid gains that improve reliability for retailers, reduce disposal and preserve embedded resources.

The primary barrier is not technical performance, but incentive design. In many supply chains, farmers do not bear the cost of waste, while retailers and distributors do. This misalignment delays adoption, even

when the system-level benefits are clear. Prevention becomes economically rational only when responsibility and return are aligned across growers, distributors and retailers.

Commercial redesign provides the pathway forward. Performance-linked pricing, shared savings arrangements and offtake agreements that reward extended shelf life can realign incentives without mandating technology choices. When the actor able to reduce waste is also rewarded for doing so, adoption accelerates and nexus benefits compound quickly.

5 Resilience in food systems is shifting from calories to outcomes

Resilience in food systems can no longer be measured by calorie supply alone. Systems that deliver volume at the expense of health, diversity and trust are inherently fragile. Nutrition quality, dietary diversity, food safety and consumer confidence are emerging as core performance metrics. This highlights the need to redesign food systems for long-term health, sustainability, and resilience, not just output.

Production choices play a central role in this redesign. Crop choice shapes water demand, energy use and environmental impact. Long supply chains reduce freshness and nutritional value through early harvesting, extended cold storage and transport emissions.

Locally produced food, when grown under controlled standards, can reduce pesticide use, shorten time to market and strengthen confidence in safety and quality – provided standards are transparent and consistently applied.

Consumer behaviour ultimately reinforces these dynamics. Purchasing decisions are driven by convenience, freshness, taste, trust and price, with sustainability influencing choices only when it aligns with these factors. Perceptions often lag reality, particularly in arid environments, making transparency, labelling and consistent standards essential for shifting demand.

Adoption accelerates when integrated strategies focus first on improved nutrition, safety and reliability. Environmental and resource benefits then become commercially and socially durable.

Turning insight into action

The discussion highlighted that the technologies, knowledge and capital needed to strengthen the water–energy–food–environment nexus already exist. The priority now is translating integrated thinking into practical models that work across policy, investment and supply chains. Participants identified several pragmatic steps that could help accelerate progress.

1

Establish place-based diagnostics as the starting point

Develop shared assessments of soil biology, water quality, climate stress and crop suitability to guide crop selection, irrigation design and production systems suited to arid environments.

2

Embed measurable nexus value into investment and procurement

Introduce consistent metrics for water savings, emissions reductions, transport avoided and nutrition outcomes so that integrated food systems can compete for capital and procurement on a comparable basis.

3

Align policy frameworks across water, agriculture and energy

Strengthen coordination across these sectors so that pricing signals, standards and incentives reflect long-term environmental and resource outcomes rather than short-term input costs.

4

Redesign commercial models to reduce food loss and waste

Adopt shared savings mechanisms, performance-linked pricing and longer-term offtake agreements that reward practices which extend shelf life and reduce waste across supply chains.

5

Integrate nutrition and health outcomes into food strategies

Incorporate indicators for nutritional quality, freshness and safety into agricultural programmes and food procurement frameworks to strengthen long-term food system resilience.

6

Expand regional demonstration and learning platforms

Scale pilot projects into coordinated demonstration programmes that generate shared datasets, operational playbooks and practical lessons for arid food systems.

Thank you

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