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Harvesting Resilience:

The UAE's Path to a Sustainable Food System

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From Crisis to Resilience

Transitioning to a Sustainable Food System

In a groundbreaking move, COP27, the UN climate conference in 2022, allocated an entire day solely focused on agriculture and food—a timely response to the ongoing global food crisis. The crisis has been exacerbated by the Ukraine war, extreme weather events causing crop failures, and a 45-year peak in food inflation rates.

Despite their significant impact on climate change, food systems have historically been sidelined in climate discussions. The agriculture and food sector alone contributes a third of global greenhouse gas emissions. The current industrialized, specialized, and chemical-intensive agricultural practices have resulted in severe environmental degradation, jeopardizing the very ecosystems that sustain food production. Moreover, these food chains lack the resilience needed to withstand environmental, economic, and social pressures, often perpetuating human rights violations, such as forced and child labor, poor working conditions, low wages, and land rights violations.

Evidently, a transformative, comprehensive shift is urgently required to establish more sustainable food systems. This transition would foster resilient and diversified farming practices, safeguard the environment, support climate stabilization efforts, and enhance the economic and social resilience of farmers.

As for the UAE, although it is considered food secure due largely to its economic and political stability, the country must still address the formidable food security hurdles caused by its arid climate, limited arable land, and scarce water resources, and now more than ever as the population surges and consumption escalates dramatically. However, through strategic planning and innovation, the country has made remarkable progress in transforming its food system to ensure long-term sustainability.



The white paper "Harvesting Resilience: The UAE's Path to Sustainable Food System" will be discussing UAE's transition into a sustainable food system. It introduces the concept of sustainable food system as it is defined by the international community and sets the context of which will be used in assessing the transition of UAE food system into a more sustainable one. Furthermore, the paper will discuss in detail UAE's policies, initiatives, and overarching efforts to transition into a sustainable food system.

The Triad of Sustainable Food Systems

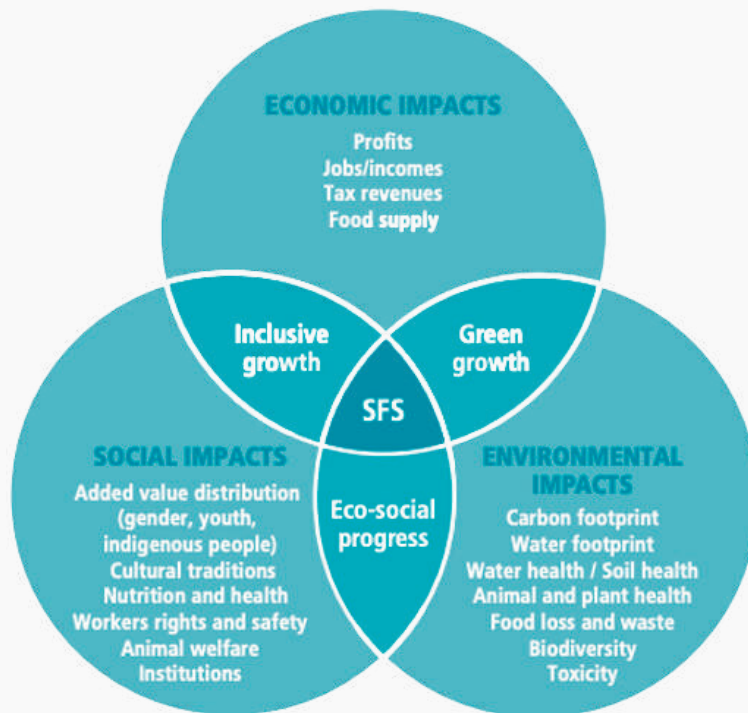
The Holistic Framework of Food Networks and Interactions

In the realm of food systems, a comprehensive network of actors and value-adding processes exists, spanning production, aggregation, processing, distribution, consumption, and disposal of food originating from agriculture, forestry, or fisheries. It intertwines with various aspects of the broader economic, societal, and natural environments. This intricate food system comprises sub-systems like farming, waste management, input supply, while also interacting with critical systems like energy, trade, and health. Notably, any structural shift within one system, such as a policy favoring increased biofuel in the energy system, can wield substantial influence over the entire food system.¹

In adherence to the FAO's established criteria, a sustainable food system (SFS) embodies unwavering fortitude, ensuring food security and nourishment for all without jeopardizing the essential foundations necessary to sustain future generations.² To qualify as truly sustainable, the system must prove itself on three pivotal fronts:

- 1) Ensuring unwavering profitability (economic sustainability).
- 2) Delivering widespread societal advantages (social sustainability).
- 3) Demonstrating a positive or neutral ecological impact (environmental sustainability).

In sustainable food system development, true sustainability is evaluated comprehensively, requiring the food system's actions to create positive outcomes across three key dimensions: economic, social, and environmental, as shown by the diagram below.³



Source: Adapted from FAQ, 2014.

- On the economic front, sustainability demands that all food system actors and support service providers engage in financially viable activities, yielding benefits for stakeholders such as workers' wages, government taxes, enterprise profits, and improved food supply for consumers.

- Socially, sustainability entails equitable distribution of economic value-added, addressing the needs of vulnerable groups based on gender, age, race, and more. Additionally, food system activities should contribute to vital socio-cultural outcomes, encompassing nutrition, health, traditions, labor conditions, and animal welfare.
- Environmentally, sustainability is ensured through neutral or positive impacts on the natural surroundings, including biodiversity, water, soil, animal and plant health, carbon and water footprints, food loss, waste, and toxicity.

In conclusion, the journey towards a sustainable food system is a collective imperative that transcends national boundaries, as evidenced by the pivotal inclusion of agriculture and food at COP27.

This transformative endeavor, as defined by the FAO's triad of sustainability, necessitates economic prosperity, social equity, and environmental stewardship to secure nourishment for current and future generations. The upcoming part will take a closer look at the UAE's ambitious efforts, exploring the progress made, the strategies employed, and the path forward as this remarkable nation navigates the transition towards a more sustainable, secure, and prosperous future for all its citizens.

Overcoming Challenges

UAE's Pioneering Path to Sustainable Food System

The United Arab Emirates (UAE) has begun on an unprecedented journey in the center of the desert vastness, one that extends beyond mere sustenance and into the area of pioneering sustainability in its food systems. Despite the limitations of limited arable land, restricted water resources, and a significant reliance on food imports, the UAE has carved out an impressive route toward ensuring a resilient future for its fast rising population.

This part two of the white paper "Harvesting Resilience" sheds light on the UAE's path for a sustainable food system, including its strategic goals, technical innovations, and revolutionary advances that are transforming the global food security environment. Furthermore, it will also discuss, in particular, the UAE's effort to enhance local production as part of the overarching goal to transform into a more sustainable food system. From growing lush vertical farms in the midst of an arid region to using aquaponics to reinvent agriculture, the UAE's growth story provides significant insights into addressing 21st-century challenges at the nexus of food security and environmental harmony.

The UAE's paramount policy priority lies in food security, compelled by the scarcity of arable land, water resources, and heavy dependence on imported food. The UAE's food systems are designed to guarantee the well-being of its population of approximately 9.8 million by providing ample, safe, and nutritious food at affordable prices, supporting active and healthy lifestyles consistently. However, the nation confronts formidable challenges in achieving domestic and competitive food production, as it currently relies on imports for over 90% of its food to sustain a growing and urbanized populace. As a result, fostering sustainable food production has become a pivotal priority, aiming to decrease dependence on fragile food sources and secure a resilient future.

By comprehending the essence of the UAE's transformative vision outlined in the document "Articulating national pathways for food systems transformation in support of the 2030 Agenda: UAE National Pathway for Food Systems Transformation," the nation's journey towards a sustainable food system centers on vital initiatives such as creating strategic reserves of essential food items, forging diverse food import sources to strengthen global supply chains, and fostering self-sufficiency through innovative, technology-driven, and sustainable food production methods.

The UAE stands out as a global pioneer in sustainable food systems, driven by cutting-edge technologies such as vertical farming, hydroponics, and aquaponics. By adopting precision farming techniques like drip irrigation and IoT-powered infrastructure, the country has curtailed food imports, increased self-reliance, and elevated crop yields while preserving precious resources. Additionally, the UAE takes proactive measures to combat food waste, employing government-led initiatives to redistribute surplus food and foster responsible consumption. Their unwavering commitment extends to community engagement and education, empowering citizens, particularly the youth, to embrace agrobiodiversity and AgTech practices. The UAE's journey towards sustainability offers invaluable insights for addressing 21st-century food security and environmental challenges. The subsequent sections delve into the UAE's strategic steps in achieving a more sustainable food system.

Enhancing Local Food Production

The National Farms Sustainability Initiative: A Path to Self-Sufficiency

The National Farms Sustainability Initiative was established by the UAE Minister of Climate Change and Environment (MOCCA) to ensure the objectives of the National Food Security Strategy 2051 are met.

By the end of 2023, the UAE aims to source 50 percent of its basic food requirements from local farms and producers, a number set to rise to 70 percent by 2025 and ultimately reach 100 percent by 2030.

This strategic initiative encompasses over 38,000 farms spanning 46,000,000 sqm of land and aquatic farms covering 1,000,000 sqm (without soil). The National Farms Sustainability Initiative is a powerful driver of the ambitious plan, enhancing domestic production through secure purchase agreements, elevating the nation's self-sufficiency in targeted food commodities, and bolstering UAE farmer incomes while preserving food trade dynamics.⁵

In its pursuit of reduced import reliance and heightened food self-sufficiency, the UAE has taken a decisive stance on elevating local food production. This commitment is underpinned by significant investments in state-of-the-art technologies like vertical farming, hydroponics, and aquaponics. By transcending the constraints of traditional agriculture, these pioneering methods enable year-round output, optimize land efficiency, and drastically curtail water consumption. A concrete illustration of this progress is as follows:

Badia Farms

A UAE-based vertical farming company, produces over 5,000 kilograms of pesticide-free leafy greens annually within a compact space of just 8,000 square feet.⁶

UNS Farms

An Al-Quoz-based indoor vertical farming company, which began production in January 2020 and is on a 3,000 sqm plot of land produces, on average, crops equivalent to over 5,000 sqm of land. With daily production ranging from 1,000 to 1,500kgs of premium vegetables, UNS Farms serves gourmet chefs, hotels, restaurants, supermarkets, and hypermarkets.⁷

Merlin Farms

Established in 2018 at the Sharjah Research Technology and Innovation Park (SRTIP), revolutionizes agriculture through aquaponics - a synergistic blend of aquaculture and hydroponics. This innovative technique harnesses fish waste to nourish plants, enabling soil-free cultivation with exceptional efficiency.⁸



Image Source: <https://unsfarms.com/>

Moreover, the UAE has demonstrated the viability of local food production, exemplified by the inaugural harvest of protein-enriched wheat at an expansive farm in Maliha, Sharjah, which yielded an impressive 15,200 tonnes of wheat in early 2023.⁹

Finally, in a world where food security and environmental sustainability are becoming increasingly difficult, the United Arab Emirates (UAE) emerges as a beacon of creativity and dedication in reforming its food systems. With a firm commitment to ensuring the well-being of its people through sustainable practices, the UAE has launched on a journey that blends innovative policy with ground-breaking technology.

From vertical farming and aquaponics to precision agriculture and IoT-powered solutions, the country has used innovation to reimagine how food is produced and resources are conserved. As we go deeper into the core of this white paper, we will look at the UAE's next frontier: Sustainable Innovative Agriculture Practices. The forthcoming chapter will shed light on the UAE's endeavors in harnessing cutting-edge methods to foster a thriving agricultural sector while safeguarding the planet's future.

Innovation

UAE's Sustainable Agriculture Journey

In this third chapter of the "Harvesting Resilience" white paper, we delve into the UAE's trajectory toward a sustainable food system, analyzing its strategic aims, creative technology achievements, and revolutionary discoveries that are transforming the global food security environment. The focus will be on the UAE's attempts to boost local production, which is a critical step toward building a more sustainable food system. The UAE's story offers important insights into handling 21st-century difficulties at the nexus of food security and environmental harmony, from developing thriving vertical farms in the midst of desert surroundings to revolutionizing agriculture using aquaponics.

Building on the underlying ideas covered in the last part, which emphasized the UAE's top policy objective of food security, we now shift our attention to the cutting-edge practices that are propelling the country to the forefront of sustainable agriculture. The UAE is demonstrating that innovation and determination can actually alter food systems and pave the path for a more resilient and sustainable future through strategic programs such as the National Farms Sustainability Initiative and investments in ground-breaking technologies.

Sustainable Innovative Agriculture Practices

Efficiency Through Precision

The United Arab Emirates (UAE) places significant importance on implementing sustainable agriculture techniques to combat environmental degradation effectively. As part of this effort, precision farming methods have been introduced to optimize the utilization of crucial resources like water and fertilizers.

Drip irrigation, a widely adopted technique in the UAE, has proven highly successful in water conservation. By precisely delivering water to plant roots, it minimizes waste and significantly improves water usage efficiency. Alkaabi et al.'s 2019 research reveals impressive outcomes from precision agriculture, showing water savings of up to 30% and crop yield increases of 18-30%. These findings highlight the significant environmental benefits of sustainable agricultural practices as the UAE government prioritizes food production and responsible resource management.

Moreover, the UAE fully acknowledges the immense potential of IoT (Internet of Things) solutions in precision agriculture. This recognition stems from the capability of IoT to monitor critical factors like soil conditions, crop health, and irrigation systems, leading to remarkable outcomes. By optimizing water consumption, minimizing the requirement for pesticides and fertilizers, and enhancing overall agricultural productivity, IoT-enabled agricultural infrastructures are generating a profound impact.

A compelling illustration of this progress can be seen in Silal Farms, a prime example that successfully implemented IoT sensors on 100 farms in Abu Dhabi throughout 2022. These sensors collected vital data on greenhouse and nursery conditions, empowering farmers to make well-informed decisions, optimize resource allocation, and significantly boost productivity.

Indeed, in the realm of sustainable agriculture and responsible farming practices, the UAE stands strong, propelled by government support. Notably, the Ministry of Climate Change and Environment's 2019 data reveals a remarkable accomplishment: the incorporation of modern agricultural technologies, particularly hydroponics, in more than 177 advanced farms.¹⁰ Moreover, the nation boasts the participation of over 100 entities actively dedicated to organic farming practices. This impressive data attests to the UAE's unwavering commitment to embracing cutting-edge methods for a flourishing agricultural sector.

The Food Tech Valley, a collaboration between the Food and Water Security Office and Wasl Properties, is a modern city hub for clean tech-based food and agricultural products. With four main clusters—agricultural technology, food innovation, R&D, and smart logistics—it advances self-sufficiency and reduces resource wastage through cutting-edge techniques.

A remarkable story is unfolding in the arid heart of the United Arab Emirates (UAE), one that intertwines innovation, dedication, and sustainability to alter the future of food systems. The nation's trajectory toward a resilient and sustainable food system is revealed through a strategic perspective, exposing a commitment to encouraging local agriculture as a cornerstone of progress. Vertical farms flourish in desert landscapes, and aquaponics is revolutionizing agriculture. The UAE's journey demonstrates how innovative techniques can pave the way to nourishment and environmental harmony. The UAE exemplifies the essence of modern agriculture, from precision farming's water-saving capabilities to the revolutionary promise of IoT-driven solutions.

Government programs, such as the National Farms Sustainability Initiative, highlight the country's commitment to cultivating a thriving agricultural industry. As this chapter concludes, it prepares the way for the next installment of this white paper, which will investigate the UAE's tireless efforts to eliminate food waste on a worldwide scale. In this land where ambition knows no bounds, the UAE sets a course toward a future in which food security and environmental sustainability coexist.

Initiatives

The UAE's Leading Role in Food Waste Management

As we have discussed in the previous chapter of this white paper, the UAE has shown inspiring progress in utilizing tech-empowered solutions to build innovative and resilient food production methods in order to develop a sustainable food system. This innovative and creative approach does not stop at the UAE's food production scheme but extends to UAE's commitment to combat food waste. At the forefront of this endeavor are visionary initiatives, propelled by both governmental bodies and innovative startups, united in a shared mission to create a more conscientious and responsible approach to food consumption.

In this part, the white paper delves into the remarkable efforts and impactful strategies that the UAE has employed to confront the global challenge of food waste, showcasing how these initiatives have not only saved millions of meals but have also laid the foundation for a more sustainable future. From the UAE Food Bank's tireless distribution of meals to the revolutionary Waste-to-Feed project and the community-driven practices of The Waste Lab, the UAE's unwavering dedication to food waste management stands as a beacon of hope and a model for the world. This paper explores the journey, the achievements, and the promising future that the UAE has charted in its quest to transform food waste into a powerful force for positive change.

Food Waste Management

Government-Led Sustainability Campaigns

The UAE is actively combating global food waste through a range of impactful initiatives. Government-led campaigns, including the "Year of Giving," effectively promote sustainability among individuals and businesses.

The UAE Food Bank

The UAE Food Bank, under the Mohammed bin Rashid Al Maktoum Global Initiatives, is a driving force in enhancing global sustainability and food security. Since 2017, it has distributed 55 million meals, saving 55,000 tonnes of food waste.¹¹ With 200+ strategic partnerships, the bank efficiently operates its initiatives, surpassing its Ramadan 2023 goal by providing 5.1 million meals to thousands of families and workers worldwide, aided by 720+ volunteers. Demonstrating commitment to sustainability, it diverts 908,000 kg of food from landfills, recycles 367,409 kg of food waste, produces 73 tonnes of fertilizers, and reduces 2,306,687 kg of carbon emissions, equal to planting 96,112 trees.¹²



Image Source: <https://www.mediaoffice.ae/en/news/2022/Jan/27-01/Contribution-of-UAE-Food-Bank-more-than-10m-meal-in-2021>

Ne'ma

Ne'ma — Arabic for blessing — is a campaign aimed at curbing food loss and waste by encouraging responsible consumption, a collaboration between the Ministry of Climate Change and Environment and Emirates Foundation.¹³

Over three days of the 2023 Abu Dhabi Sustainability Week (ADSW) alone, Ne'ma has diverted 3 tonnes of food waste from landfills, redistributed 400 kg of food surplus and donated 1000 meals.¹⁴

The United Arab Emirates (UAE) has become a staunch supporter of startups in their mission to address food waste management, offering an ecosystem comprising incentives, funding, and infrastructure to nurture innovative solutions. Some great examples of flourishing startups based in the UAE that support the national effort for food management includes but not limited to the following:

Winnow

Winnow spearheads food waste reduction in the hospitality sector through technology-driven surplus food sales and data-driven insights for optimized food management. Utilizing AI, Winnow's system effortlessly identifies and reports food waste to chefs.¹⁵

Circa Biotech

Circa Biotech offers a distinctive solution leveraging the Black Soldier Fly (BSF) via industrial insect farming to convert organic waste into premium protein for animal feed production—a commercially viable, highly sustainable local solution.¹⁶ With Circa Biotech, the UAE has essentially launched the first-ever Waste-to-Feed project in the region.¹⁷

The Waste Lab

The Waste Lab specializes in off-site and on-site composting for both B2C and B2B clients.¹⁸ Moreover, The Waste Lab fosters a dynamic community of individuals and businesses through an interactive platform, driving proper organic waste sorting and eco-friendly practices.¹⁹

In conclusion, the United Arab Emirates (UAE) stands at the forefront of global food waste management, demonstrating an unwavering commitment to sustainability and innovative solutions.



Through initiatives such as the UAE Food Bank and Ne'ma, the nation has already made significant strides in reducing food waste, redirecting surplus meals to those in need, and fostering responsible consumption. Moreover, by nurturing and supporting innovative startups like Winnow, Circa Biotech, and The Waste Lab, the UAE has created a vibrant ecosystem that not only tackles food waste but also paves the way for groundbreaking advancements in this critical field. As the UAE continues to lead by example, it sets the stage for a brighter, more sustainable future, inspiring others worldwide to join the noble cause of combating food waste and ensuring a more nourished planet for generations to come.

Transition

Education Initiatives Driving the UAE's Move to Sustainable Food Systems

In the pursuit of a sustainable food system, the pivotal roles of community engagement and education cannot be overstated. The United Arab Emirates (UAE), a nation known for its ambition and innovation, has been making remarkable strides in this crucial domain, as evidenced by a series of noteworthy initiatives. The initiatives range from training and workshops, to campaigns promoting healthier diets, and to empowering the younger generations to embrace their role in the sustainable food system transitions. This white paper explores in detail these initiatives and their impacts in driving a resilient food ecosystem in the UAE. Moreover, as the closing chapter of this white paper, the following part will recap the discussions throughout all the five chapters.

Community Engagement and Education

Empowering Sustainable Practices

Community engagement and education are pivotal in establishing a sustainable food system, and the UAE has, as shown by the highlighted initiatives below, evidently been making remarkable strides in this regard.

ADAFSA Farm Training Series

In 2022 only, the Abu Dhabi Agriculture and Food Safety Authority (ADAFSA) conducted 449 specialized training workshops, engaging over 9,390 participants. The workshops covered 21 farming-related topics tailored to the trainees' needs, enhancing their awareness of sustainable practices, farm productivity, and local production quality. The training reached farms across Abu Dhabi, Al Ain, and Al Dhafra. Conducted in Arabic, Urdu, and English by ADAFSA's extension engineers, working in 26 agricultural extension centers.²⁰

Food for Life Campaign

The "Food for Life" campaign, initiated by the Ministry of Climate Change and Environment (MOCCA) and the Ministry of Health and Prevention (MoHAP), in collaboration with Emirates Nature-WWF and FAO, is mobilizing the UAE community to rethink and reshape diets for personal health and the planet's well-being.²¹

Youth Circle

The UAE's potential as a global leader in commercial urban agriculture relies on cultivating a culture of AgTech among its youth and providing viable career pathways, exemplified by the "Youth Circle" event, where young leaders discuss agrobiodiversity and sustainable food systems' transformative potential.²²

BZAR Movement

Empowering children to tackle food challenges, the BZAR movement, initiated by MOCCAIE in 2021, promotes hands-on culinary exploration in schools, provides tool-kits for parents, instills a culinary cool-factor, and fosters curiosity and creativity around Emirati-inspired food.²³

Nourishing Tomorrow: The Path Ahead

Paving the Way for a Sustainable Future

In conclusion of this white paper “Harvesting Resilience: The UAE's Path to Sustainable Food System”, the journey from crisis to resilience in our global food system requires concerted efforts from all nations, exemplified by the pioneering steps taken by the United Arab Emirates. The transition towards sustainable food systems demands an unwavering commitment to economic viability, social equity, and environmental stewardship.

By prioritizing local food production, adopting innovative and sustainable agricultural practices, and actively managing food waste, the UAE has emerged as a beacon of hope in the pursuit of a more resilient and equitable food future.

However, the challenges we face are not exclusive to the UAE but resonate globally. The transformation of food systems is a collective responsibility that necessitates international cooperation, policy reforms, and technological advancements. The COP27's groundbreaking focus on agriculture and food is a testament to the urgent need for change. As we move forward, let us draw inspiration from the UAE's progressive endeavors and work hand in hand to build a sustainable food system that nourishes our planet, ensures food security for all, and safeguards the well-being of future generations. Only through collective action can we surmount the crises at hand and forge a path towards a resilient and sustainable future for our planet.

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