

COP28 white paper

Driving Private Sector Commitments to Build a Sustainable Global Food System

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COP28 White Papers

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Executive Summary

The world's food systems are coming under increasing strain. Climate change, biodiversity loss, and resource scarcity are all threatening the foundations upon which the agriculture industry is built – and, on top of that, demand for food is rising because of an increasing global population that is expected to hit **10** billion by 2050.

How can we feed an ever-rising number of people with a shrinking supply of land and resources, all while weather patterns are disrupting traditional farming seasons? There is not a single answer to this incredibly complex question. Instead, there are several that all need to work in harmony if they are to work at all.

Advances in technology will be key. Aeroponics, hydroponics, vertical farming and a range of modern monitoring technologies can transform the farming industry, allowing year-round growing in a way that uses less land and has less of an environmental impact.

But getting these expensive and research-intensive innovations off the drawing board and into the field will not be straightforward. This is where governments need to step in to help the start-ups and other companies behind the pioneering products and practices that can re-invent agriculture for the **21st** century.

Overarching policies and incentive schemes are imperative for encouraging private companies to invest in sustainable food production techniques. Financial support, tax breaks, R&D initiatives, and guaranteed prices for farmers growing organic and sustainable crops all need to be part of the policy mix.

Educating farmers will be crucial too. The global agriculture system is highly fragmented, with many small-scale farmers located in remote areas where it is hard to spread new ideas and best practices.

Consumers also need to be educated on the wider benefits of paying a premium for sustainable food products. Building out the demand side will make it easier to scale up sustainable operations on the supply side.

Singapore, Mexico and the Netherlands are providing examples of how to build innovative clusters focused on incubating cost-effective, sustainable agriculture. Elsewhere, through its Food Tech Valley in Dubai, the UAE is also demonstrating how sharing both resources and ideas are easier in hubs such as these.

The UAE will also be speaking up for more sustainable forms of agriculture when it hosts COP28 this year. The multi-stakeholder collaboration showcased by global events such as this are what is needed to change agriculture for the better. Working together to support small-scale farmers, encourage fair trade, and embrace more environmentally farming techniques will benefit people and the planet. It's also the only way that it will be possible to create a resilient and inclusive food system that is fit for the future.

A – Introduction – Our fragmented food industry needs innovation

Ensuring that food is available and affordable for all is becoming a bigger challenge than ever.

Food systems are facing significant pressure not only from climate change, but also from an ever-rising global population, which is expected to climb to **10** billion by 2050.

This demographic growth will require increases in agricultural productivity and investigations into potential alternative sources of nutrients. Boosting crop yields and enhancing livestock production are options, but ensuring efficient farming practices with minimal environmental impacts will also be crucial.

Agriculture is vulnerable to the impacts of climate change, including extreme weather events, changing rainfall patterns, and rising temperatures. All of this affects crop yields, livestock productivity, and the availability of water resources. On top of this, the natural resources on which agriculture relies – such as land and biodiversity – have been depleted in recent decades.

A balance has to be struck between the need to feed the world and the critical requirement to minimize the environmental and climate impacts of agriculture. This has led to a global push for innovative solutions that can reduce the environmental effects of agriculture, but investment relative to high margin industries has been limited because of the low expected financial returns.

The fragmented nature of the agriculture industry also creates a major obstacle to instituting widespread change. The majority of farmlands are family-owned and in remote areas, and as a result it is hard to spread new technologies and best practices.

The food industry is responsible for **20-30%** of global greenhouse gases due to unsustainable practices and slow advances with technology that could limit these impacts. But there are several emerging trends that show potential to help drive the food system toward more sustainable operations:

Technological and digital developments

- Advances in biological science for agriculture contributed to a **29%** rise in sales of plant-based foods that directly replace animal products between 2018 to 2020.
- Robotics and automation are changing the food production cost curve, and robots are expected to become **50-70%** cheaper than current drivers and **1.5-3.0** times more productive.

Sustainability and supply chain efficiency

- An increased focus on traceability, powered by blockchain and other technology, can boost safety and enable companies to tell powerful stories about the origins of the foods they produce.

Evolving consumer preferences

- Organic food sales rose to **\$133** billion in 2021 from **\$18** billion in 2000, in line with an increase in the availability of healthy, convenient, and alternative sources of nutrition.
- Snacking is a **\$60** billion industry growing at nearly **6%** a year, with smaller brands growing at around **13%** per year.

Building resilient food supply chains with technology and sustainability at their heart will require time, effort, and extensive collaboration between policymakers, private companies, technology firms, and consumers.

Despite the challenging industry conditions, the UAE is playing an active role in combating many food security problems. COP28 is also providing a platform for the UAE to drive wider sustainability changes, and to foster dialogue among decision-makers and private companies on key targets for food systems.

B – The main challenges of the UAE's food systems

The UAE relies on imports to meet **80-90%** of its food needs, with difficult agricultural conditions meaning its own food and agriculture sectors make up only **0.1%** of GDP (Ammar et al. 17).

As a result, it is critical to ensure minimal disruptions along the food supply chain, as well as strong levels of strategic food reserves. The UAE has also joined other countries in promoting improved food security, with the government investing in systems to optimize the situation.

Value chain analysis

Food value chains require favourable agricultural conditions, reliable sourcing of agricultural inputs, regular food production, storage facilities, and distribution networks. The UAE's food value chain has many interconnected stakeholder networks, but its agriculture sector is fragmented, like in many other major agricultural countries. This means there is a significant consolidation opportunity to drive efficiency and sustainability.

The UAE's food value chain is summarized in the diagram below:

	Input	Production	Primary Processing	Secondary Processing	Distribution
Key Categories	Seed, fertilizers, crop protection, machinery, animal health, crop insurance	Staple crops, fruit & vegetables, dairy, livestock	Cold storage, commodity trading, agriculture wholesale, packaging	Biofuels, meat & dairy products, fruit products, cereals, flours, etc	Agents, refrigerated transport, FMCGs transport, wholesale transport
Concentration	High and mostly multinational	Low-Medium	Medium	Medium	Low
Key Players	Large (Revenue >\$200m)				
	Small (Revenue <\$200m)				

Consumer trends

Consumer consciousness about dietary choices has grown significantly across all regions in recent years. UAE consumers are increasingly demanding more organic, natural, gluten-free, vegan, and vegetarian options, as well as seeking higher-quality food while being conscious of price and affordability. This follows various government campaigns to drive awareness of the benefits of healthy and active lifestyles. The UAE's National Food Security Strategy 2051 also places a significant emphasis on nutrition and healthy diets. In addition, recent shifts towards e-commerce have led to changes in food buying patterns, with consumers enjoying the convenience of online grocery delivery platforms.

they are made locally or abroad. The National Rapid Alert System for Food also protects consumers by requiring timely responses following any detection of food risks (Amicarelli et al. 2908). These laws also guide producers in adopting practices that ensure sustainability in food markets.

The UAE's National Food Security Strategy 2051 aims to increase people's access to safe, adequate, and nutritious food at affordable prices. A key part of this will be developing a comprehensive, country-wide sustainable food production system that uses modern technologies to enhance local production. Establishing resilient agricultural practices is the government's main strategy for bolstering productivity and sustainability. It will also be a key tool in maximizing output quality and quantities.

Regulatory environment

The UAE has various forms of regulation to serve the needs of producers and consumers. The Federal Law on Food Security seeks to safeguard the wellbeing of consumers by ruling that any food imported into the country for the first time must be approved by the Ministry of Climate Change and Environment (Salem et al. 228). The National Food Registration and Accreditation System policy requires accurate labeling of food ingredients, regardless of whether

Policymakers collaborate closely with government agencies, including the Ministry of Climate Change and Environment and various international agencies, to develop key strategies to improve food security. The recently launched National Dialogue for Food Security is an example of this (Ammar et al. 19). Put together with private-sector involvement, its objective is to facilitate constructive discussions on ways to enhance safety, supplies, and nutrition across the food system, and it acknowledges that collaboration between the public sector and agricultural companies will be key to this.

Existing challenges

Environmental constraints and import dependency create various challenges for the UAE's food system. Here is a list of some of the key challenges across the value chain:

Input providers	<p>Lack of resources: Given the UAE's arid climate and water scarcity, the traditional agricultural sector struggles to ensure sufficient water supplies and adequately fertile soil. The country uses an estimated 378m³ of water per person per day, which is about 82% above the global average.</p> <p>Technological adaptation: While the UAE is investing in innovative farming methods like vertical farming and hydroponics, there is a challenge in making these methods widely accessible and cost-effective for all farmers.</p>
Producers	<p>Limited arable land: The UAE has limited arable land (only about 0.77% of the total land area is arable), making large-scale agriculture difficult.</p> <p>Dependency on imported inputs: Around 80-90% of food is imported, leading to high dependence on international markets and making the country vulnerable to global price fluctuations.</p>
Processors	<p>Energy consumption: Food processing consumes high volumes of energy, so the UAE's commitment to reducing carbon emissions means there is a need to deploy more energy-efficient processing methods.</p>
Distributors, retailers & consumers	<p>Logistics and storage: Given the high temperatures in the UAE, there is a significant challenge associated with storing perishable food items and preventing food wastage.</p> <p>Increasing competition: The UAE food retail market is highly competitive, and this competition is expected to intensify with the increasing popularity of e-commerce.</p> <p>Food waste: Annual food waste in the UAE is estimated at 197kg per person, compared to 95-115kg per person in Europe and North America. Food waste costs the UAE around \$3.5 billion per year, according to the Ministry of Climate Change and Environment.</p>

C – The UAE's path forward

To address these challenges, the UAE government has implemented a number of policies and initiatives to promote the development of more sustainable food systems. One key recent development is the UAE Food Tech Valley, a new economic zone in Dubai focused on fostering and commercializing innovative food technologies, with the goal of making the UAE a global leader in the food tech sector. The Food Tech Valley is intended to become the home for start-ups and companies working on a variety of food tech projects, including vertical farming, aquaponics, and food waste reduction. It also has several research and development facilities, as well as a business incubation program.



The UAE's Food Tech Valley marks a significant investment in the future of food production. It has the potential to help the country become more food secure, reduce its environmental impact, and create new jobs. The Food Tech Valley is also a sign of the UAE's commitment to innovation and its ambition to be a global leader in the food tech sector.

In addition to the government's efforts, there are several local companies and organizations that are working to make the UAE's food system more sustainable. One example is Pure Harvest, which specializes in sustainable greenhouse farming using advanced technologies to enhance productivity while conserving resources:

- **Sustainable greenhouse farming:** Pure Harvest uses aeroponics – a method of growing plants in a mist of water and nutrients – to produce fruits and vegetables. This method uses less water and land than traditional farming methods, and it also produces higher yields.
- **Reduced environmental impact:** Pure Harvest's greenhouses are climate-controlled, allowing it to grow produce year-round, regardless of the weather. This reduces the need for transportation, which has a positive impact on the environment.

Bustanica, the world's largest vertical farm, is another example of sustainable farms that has commenced its operation in Dubai in 2022 to produce +1 million kilograms of products that are free of pesticides, herbicides and chemicals. The facility is projected to annually save in excess of 250 million litres of water. There are also a number of smaller players who are making sustainability efforts such as Badia Farms that uses vertical farming techniques to produce leafy greens sustainably.

These are just a few of the pioneers working to make the UAE's food system more sustainable. They are making significant progress with new technologies and new business models, despite the complex challenges they face.

One of the biggest challenges is the need for an overarching policy or incentive scheme encouraging private companies to invest in sustainable food production. Another challenge is the need for greater consumer awareness about the importance of sustainable food choices. Making consumers aware of the wider benefits of paying a premium for sustainable food products will make it easier for companies in this area to scale up operations. Additional government support will also help innovative companies make larger and faster steps forward.

D – Learnings from global benchmarks

Stable supplies of food and agricultural commodities depend on several large companies across the value chain, from traders to processors. Their actions are pivotal in ensuring the efficiency and sustainability of the supply chain, and many have already started setting sustainability targets to reduce their Scope 1 and Scope 2 emissions. To achieve these aims, they will need to undertake a thorough and rigorous review of all aspects of their business. Some companies have established verticals to address sustainability measures.

These include ADM, one of the world's largest human and animal nutrition companies, which has the following goals for cutting its climate impact:

- **Greenhouse gas (GHG) reductions:** Reduce absolute GHG emissions intensity by 25% by 2035.
- **Energy efficiency:** Improve energy efficiency in its operations by 15% by 2035.
- **Water stewardship:** Reduce water intensity by 10% by 2035 by improving water use efficiency across its operations.
- **Sustainable sourcing:** Increase sustainable sourcing of key agricultural commodities. The company focused on areas such as responsible soy, sustainable palm oil, and sustainable cocoa.
- **Zero waste to landfill:** Achieve zero waste to landfill at 90% of its global facilities by 2035.
- **Biodiversity and ecosystems:** Protect and enhance biodiversity and ecosystems in its supply chains, particularly in high-risk sourcing areas.

Nestle is a leading global food company with more than 2,000 brands in seven key categories. It is championing more sustainable practices, with its own targets including:

- **GHG emissions:** Reduce absolute emissions by 50% by 2030.
- **Packaging and waste:** Make 100% of its packaging recyclable or reusable by 2025. It also committed to reducing packaging materials and increasing the use of recycled content in its packaging.
- **Rural development and livelihoods:** Improve the livelihoods and well-being of farmers and rural communities in its supply chains. This includes initiatives to enhance agricultural practices, provide training, and support local economic development.
- **Health and nutrition:** Enhance the nutritional profile of its products and provide healthier choices to consumers. The company is focusing on reducing sugar, sodium, and saturated fats in its products and promoting balanced diets.

Companies can continue to enhance their processes and systems to become more sustainable. However, governments also have a pivotal role to play in driving integration across the food and agriculture supply chain, and can significantly influence and impact market participants. Here are some examples from around the world of what governments are doing to promote sustainable activities.



Singapore

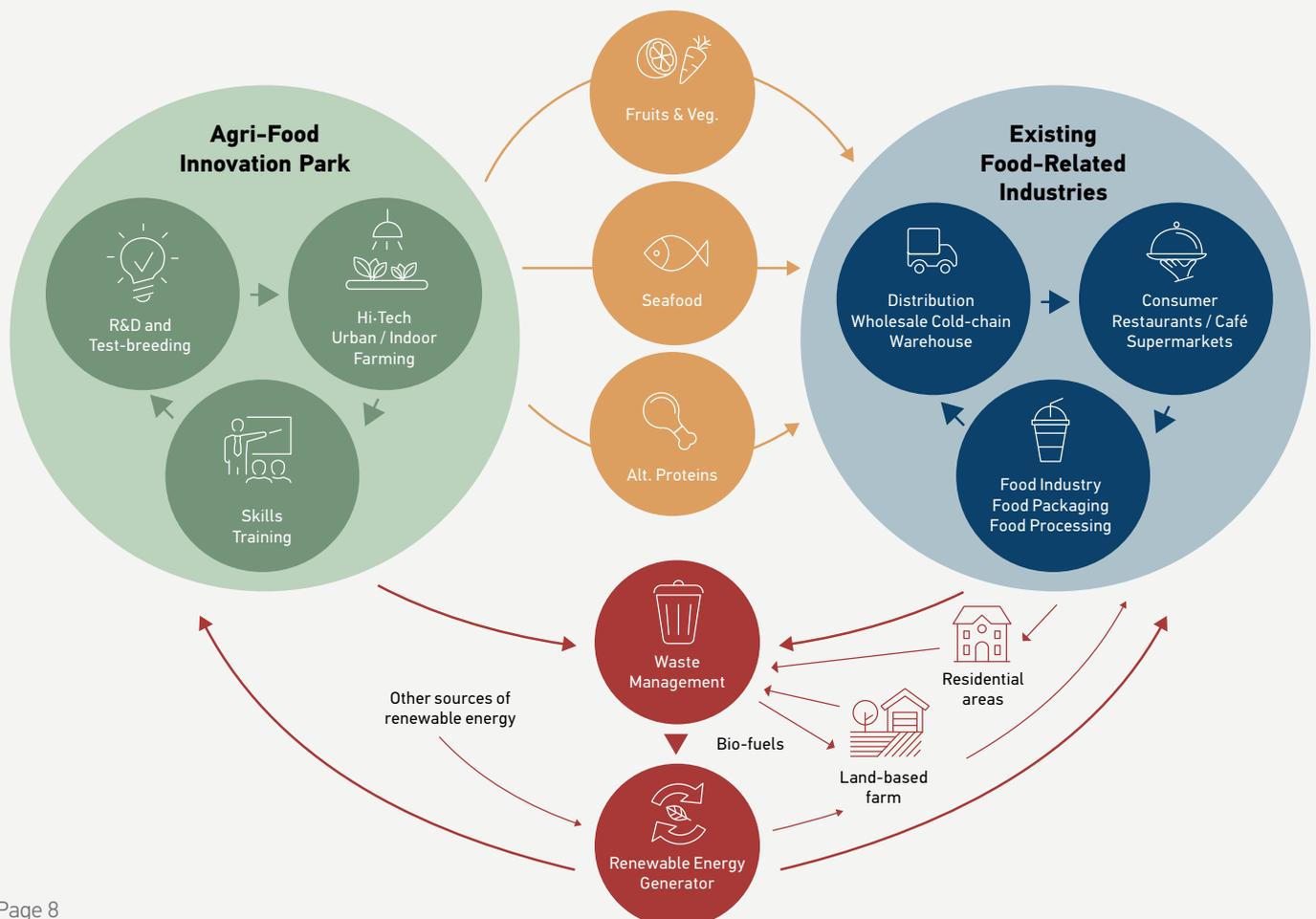
The government has announced the development of the Agri-Food Innovation Park. This is intended to become a leading urban agriculture and aquaculture technology hub that will help improve the productivity of local farms. It is part of the country's objective of having local food production cover **30%** of nutritional intake by 2030. Some of the advanced technologies it will make use of are:

- **Water management (irrigation and recirculatory usage):** Incorporate advanced precision irrigation technology as well as recirculatory water systems into farms.
- **High-tech farming process:** Develop the world's first low-carbon, water-driven, rotating vertical farm, in addition to other multi-tiered hydroponics.
- **IoT and advanced analytics:** Develop the world's first low-carbon, water-driven, rotating vertical farm, in addition to other multi-tiered hydroponics.
- **Modern genomics:** Develop climate-proof vegetables with higher nutritional content.

The park is expected to enable the establishment of an integrated model that could track and manage emissions and minimize waste.

Singapore is also fostering innovations and supporting start-ups through incentives around developing sustainable practices. These include:

- R&D financing options.
- Around **\$30** million allocated to companies that are able to increase productivity in the production of leafy greens, eggs, and fish.
- An agriculture productivity fund to enable equipment upgrades and productivity enhancements.





Mexico

Mexico's government-sponsored, high-tech cluster Agropark Colon is an Integrated Greenhouse Center that aims to grow export-quality vegetables. It uses agriculture technologies such as semi-hydroponics to produce around **213,000** tons of crops annually.

Agropark Colon is similar to the sustainability developments in the other countries listed above in that it aims to create an integrated system to attract technologies and foster know-how. The Mexican government's initiatives and incentives to support the park include:

- **Agriculture income tax concessions:** Agriculture is treated differently for income tax and property tax purposes (small-scale producers are exempt from income tax).
- **Government financial support:** A federal government trust can finance up to **35%** of the total investment as a loan.

- **Energy tax exemptions:** Farmers are reimbursed the excise tax they pay on diesel and gasoline used in agricultural machinery.
- **Guaranteed prices scheme:** This program establishes guaranteed prices to small farmers (<5-hectare farms) for corn, wheat, rice, beans and milk.

These examples show the efforts being undertaken by private companies and governments to advance sustainable agriculture and food chain security.

However, they represent only a fraction of the industry. More companies and countries need to adopt such practices to drive the required improvements along the food and agriculture value chain.



E – Relevance of food systems to COP28 objectives

Identifying sustainable practices and solutions for food systems and related activities will be one of the areas of focus at COP28. This should help to encourage wider development of the resilient and environmentally conscious practices that are needed to feed a growing global population.

These practices can also contribute to the broader COP28 goals of mitigating greenhouse gas emissions, conserving biodiversity, improving public health, and promoting socio-economic development:

- **Emission reduction initiatives:** Measures such as regenerative agriculture and low-carbon transportation can help make agriculture more sustainable. Encouraging the adoption of practices that minimize waste along the food supply chain will also help cut emissions.
- **Climate resilience planning:** COP28 will address the vulnerabilities of global food security to climate change and look at strategies for putting in place sustainable food systems. Priorities will include more diverse farming practices, agroforestry, and water conservation.
- **Socio-economic development:** Supporting small-scale farmers, encouraging fair trade, and embracing sustainable agriculture technologies will boost socio-economic development. Food systems play a major role in generating economic growth and job opportunities, particularly in rural and marginalized communities.
- **Equitable access to food:** Equitable access to safe and nutritious food needs to be guaranteed, given the disproportionate impacts climate change is likely to have on disadvantaged populations.

F – Conclusion

The pressure on food systems is intense and is rising. To serve the needs of a potential global population of **10** billion by 2050, agricultural productivity needs to increase and alternative nutrient sources need to be developed.

Climate change is already posing threats to agriculture, with extreme weather, shifting rainfall patterns, and reduced water resources all having an impact. Agriculture's reliance on dwindling natural resources is being compounded by the fragmentation within the industry, which is limiting the spread of technologies and best practices.

It will be difficult to balance growing food production needs with intensifying climate concerns, especially given the limited

investment in innovative solutions because of the perceived low financial returns. The food industry's substantial contribution to greenhouse gas emissions is well known, yet advances in technology and the implementation of these new methods is proving slow, and this is hindering progress in addressing climate impacts.

Tackling agriculture's challenges will require multi-stakeholder collaboration, involving governments, farmers, agribusinesses, researchers, civil society organizations, and consumers. The most critical element will be mobilizing private players across what is a complex, widespread, and highly varied industry. Working together to implement sustainable practices is the only way that it will be possible to create a resilient and inclusive food system that is fit for the future, and where the benefits are shared among all communities and market participants involved.

Some key recommendations for the main stakeholders to consider are:

Governments

- Finance R&D initiatives to address climate challenges in agriculture.
- Support international collaboration and agreements, such as COP28, to prioritize sustainable food systems.
- Implement incentives such as a green tax scheme to reduce the overall operational costs for market players.
- Monitor and hold stakeholders accountable for their sustainability commitments.
- Educate farmers on best practices to achieve sustainable operations.
- Foster partnerships and dialogue among governments, farmers, businesses, researchers, etc.

Private players

- Embrace technological advances and implement sustainable and traceable farming methods.
- Collaborate with local farmers and support fair trade practices to enhance food security and sustainability.
- Share know-how and experience with key industry players to aid learning.
- Set achievable Scope **1**, **2** and **3** emissions targets and a clear roadmap for implementation.

By adopting these action-driven recommendations and involving all key stakeholders, we can collectively address the challenges facing agriculture, promote sustainability, and ensure food security for a growing global population, with the benefits shared equitably.

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