

# Food Supply Chain in Pandemic, Geopolitical, and Climate Change Era–Efforts of United Arab Emirates (UAE)

Samara Bin Salem, Premanandh Jagadeesan\*

Department of Technical Affairs, Abu Dhabi Quality and Conformity Council, Abu Dhabi, United Arab Emirates

## ABSTRACT

The world is currently undergoing a series of changes, the consequences of which are affecting many areas including the supply chain. In a globalized market, a considerable level of interdependence exists where food produced from one country is consumed in another country. This article discusses United Arab Emirates (UAE) strategic efforts in the food supply chain during the pandemic, geopolitical, and climate change era. The initiatives taken by the UAE government to mitigate climate change and measures to augment sustainable food security across the value chain are presented. The devastating impact of COVID-19 pandemics and measures adopted by the UAE to manage the supply chain are discussed. The current geopolitical situation and its aftermath on food security are presented in detail. In conclusion, commendable efforts have been made by UAE to tackle food insecurity in a sustainable manner establishing the roadmap for the Middle East region.

Keywords: Food security; Pandemics; Geopolitics; Supply chain

# INTRODUCTION

Food is an integral part of life as it provides nourishment for human existence. Unlike ancient times when our ancestors relied on hunting and scavenging in the wild, modern food production has radically transformed human societies to the extent of producing animal-free meat and milk [1,2]. On the other hand, the world is currently undergoing a series of changes, the consequences of which are affecting many areas including the supply chain. As far as the food supply chain is concerned, it involves production, processing, and distribution, a process commonly called the "farm to fork approach". In this, a considerable level of interdependence exists where food produced from one country is consumed in another country balancing food security and accessibility.

United Arab Emirates (UAE), a federation of seven emirates along the eastern coast of the Arabian Peninsula is an arid land characterized by sand dunes, oases, marshes, mangroves, and salt pans [3]. Thus, the natural conditions are not very conducive to agricultural production. With less than 1% of cultivable lands, the country depends on imports to meet food demands. Increasing temperature coupled with high humidity forces higher energy, water, and carbon footprints. Hence, agriculture has always been challenging in the region.

Nevertheless, strategic initiatives taken by the UAE government to augment and sustain food security across the value chain yielded considerable benefits. For instance, the national food security strategy was introduced in 2018 to make UAE the world's best in the Global Food Security Index by 2051. The pathway covers key elements such as domestic consumption volume, nutritional requirements, production capacity, source diversification of imports, and alternative supply schemes for each major food category amongst others. It also promotes sustainable food production by utilizing modern technology [4].

However, the catastrophic effect of COVID-19 pandemics coupled with the current geopolitical situation has been an eyeopener for both food-importing and exporting countries due to its unprecedented economic and accessibility impacts. It is fueled by problems associated with climate change. Though food is a fundamental human right, more than 155 million people faced severe food security in 2020 [5].

Correspondence to: Premanandh Jagadeesan, Department of Technical Affairs, Abu Dhabi Quality and Conformity Council, Abu Dhabi, United Arab Emirates, E-mail: jpanandh@yahoo.com

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With this background, this article discusses and highlights UAE's strategic efforts in the food supply chain during the pandemic, geopolitical, and climate change era. The article is structured into 3 sections in which section 1 provides the impacts of climate change on to supply chain and mitigation efforts of the UAE followed by pandemic impacts and geopolitical situation in sections 2 and 3 respectively with concluding remarks.

#### Climate change

The driving force of the food supply chain lies in the prosperity of agriculture and animal production which is in turn associated with climate change amongst other factors. UAE is the 5th largest hydrocarbon energy producer in the Organization of the Petroleum Exporting Countries (OPEC) having listed among countries producing at least 55% of the world's GHGs [6]. In addition, it has the record for highest population growth rate in the region. Thus, the demand for electricity and water increases proportionally adding challenges to mitigative efforts on climate change. In this, a considerable level of interdependence exists where food produced from one country is consumed in another country balancing food security and accessibility as shown in Figure 1.



To address these key climate issues, the National change action plan was established to identify strategic priorities covering both mitigation and adaptation measures [7]. The key objectives of the plan included the management of greenhouse gas emissions with sustainable economic growth, increasing climate resilience by minimizing risks and improving adaptive capacity, and advancing the UAE's economic diversification agenda through innovative solutions. For sustainable development, a green economy has been implemented covering all key aspects of a green economy transition from technology, human capital, regulatory environment, green finance, and international trade to name a few [8].

The pivotal action taken during the last few years has set mitigation efforts as a long-term pathway for the country. UAE's commitment reflects in the action to achieve significant reductions in carbon emissions by 22% in 2019, two years ahead of the target. As a result, resources and non-renewable energy utilization is reduced thereby contributing to the mitigation of climate change. Nevertheless, the entangled relationship between infrastructure development and climate change is often left unnoticed. Though power, transport, and digitalization are essential for development, the sector accounts for 79% of all greenhouse gas emissions [9].

To reduce the dependence on natural gas for power generation, environmentally friendly alternatives such as clean energy infrastructure assets and services are implemented in the country. Targets to achieve 44% of clean energy, 6% nuclear, 38% of natural gas, and 12% clean coal have been set [10]. On the other side, emission intensity reduction of up to 25% by 2030 is expected to be achieved through resource efficiency, zero-flaring policy, and carbon capture, utilization, and storage.

Transportation is yet another contributor to GHG emissions in the UAE accounting for 40.7 million tons of carbon dioxide in 2017. To curb this activity, green mobility alternatives such as electric and hybrid transport vehicle has been introduced. Simultaneously, public transport systems with conventional gasoline and diesel are being converted to compressed natural gas. Mobility options are enhanced through the Etihad railway network across the country, a key strategic step to remove around 300 trucks from the road to reduce CO2 emissions to a significant level of 70%-80%. The network will link all major UAE industrial ports and trading centers [11].

The digital technology revolution for its share contributes considerably to the carbon footprint. Though it is difficult to quantify, published estimates suggest a 2%-4% emission from this sector [12]. Being a technology-driven region in the Middle East, UAE is at the forefront of digital transformation. Emissions resulting from the production, use, and data transfer of digital devices and infrastructure should be dealt with caution especially when the impact is unclear. The thumb rule is to reduce the carbon footprint generated by digital information and technology.

It is worthwhile to mention the climate-proofing initiative adopted by European Union which stipulates that infrastructure having a lifespan beyond 2050 should be carried out in a climate-neutral way [13]. UAE has also launched strategic initiatives to target climate neutrality by 2050 to achieve a balance between emitting carbon and absorbing carbon from the atmosphere. Though it is going to be a challenging road for a Petro-state like UAE, visionary leadership and commitment can drive the country towards a level that ultimately benefits the world. Efforts on the circular economy have also been initiated prioritizing infrastructure, sustainable transportation, sustainable manufacturing, and sustainable food production and consumption.

These proactive measures were based on the country's Intended Nationally Determined Contribution (INDC) submitted to the UNFCCC in October 2015. The INDC subsequently became the UAE's NDC following the ratification of the Paris Agreement in September 2016.

#### Pandemic impact

The devastating effect of the COVID-19 pandemic has intensified the disruptions to achieving sustainable developmental

goals set for 2030. The unusual experience of long lockdowns to refrain from virus spread has created havoc on the food supply chain.

In the UAE, domestic food production accounts for approximately 10% of total demand while the remaining portion is achieved through imports. There is a general notion that the country achieves food security due to its buying power at higher costs [14]. On the contrary, it is noteworthy to mention the sequential strategic initiatives taken over the last decade to reach the current level of food security even during the pandemics. For instance, the road map for food security was initiated when global food prices were surging in 2007, and importing basic commodities was very challenging [15]. Ever since then, substantial investments across the supply chain right the enhancement of domestic production, from the introduction of technology-oriented agricultural policies, foreign investments in agricultural production, research, and development of innovative technologies in food production, storage, and transport have been made. Contract farming approach to producing 350,000 tons of wheat a year in Egypt, investments in Morocco and Ethiopia on farming and fisheries, and initiatives to secure million tons of grain a year from Asia to name a few [16]. With regards to storage infrastructure, UAE can store a Million Metric Tons (MT) of grains sufficient to feed for 6 months as part of stockpiling strategy to meet emergency needs [17]. In this context, the country has introduced Federal Law to regulate stock of food commodities with an aim to manage food supplies during crises, emergencies, and disasters [18].

Furthermore, UAE's strategic location with well-developed ports infrastructure, trade-friendly regulations, and free zones has created opportunities to become the top re-export hub in the region. Currently, more than 60 percent of cargo destined for GCC states arrives *via* the UAE's seaports.

As far as pandemic impact is concerned, complete and partial lockdowns were implemented from April 2020 which included prohibited movement unless it is justified for essential services. The complete lockdown was gradually removed in a relatively short period of 3 months. The food supply chain was considered an essential service and exempted from lockdown.

Like any other country, food production especially, perishable products such as fruits and vegetables had an intense effect due to delays and disruptions in harvest and post-harvest processes [19]. Since the nation is highly dependent on imports, mechanisms to monitor and source global agricultural production systems were performed by the food security council. It was reported that the major challenge was attributed to logistics management resulting in red meat import disruption from India, cooking oil from Ukraine, and lentils from Australia among others [20].

With regards to domestic production, an uptrend was reported in 2020. For instance, the production of dates accounted for 328,669 metric tons, followed by tomatoes (43,121 metric tons while cucumber and gherkins added 57,052 metric tons showing steady growth. Achieving self-sufficiency soon is a great challenge. In addition, the country is vulnerable to price fluctuations and supply threats as it heavily relies on imports to meet the demand. To tackle this, logistics infrastructures were enhanced to utilize UAE as a global trade transit hub for the region. Furthermore, staple agricultural products such as wheat, barley, and rice, are exempted from import duties, to provide a favorable importing environment for traders [21]. Source diversification and symbiotic trade relations are increasingly being applied to reap benefits. A typical example is the Indo-UAE strategic partnership on oil for food, especially rice and wheat.

It is worthwhile to mention the proactive initiatives of the leaders, to explore ways to increase domestic production as a long-term strategy. In this regard, a food tech challenge contest with prize money of US\$1 million was launched in 2019 [18]. The winners were adjudged based on techno-commercial viability to meet UAE's food security demand. Hydroponicsbased vertical farming having product, service, and process innovation aligned with the 17 sustainable development goals, a salt water-based agricultural system that suits UAE conditions were amongst the winners. Likewise, water retaining liquid nano clay mixture which increases the fertility of nutrient-poor sandy soils is being experimented with International Center for Biosaline Agriculture (ICBA) and a Norwegian company with promising results. Scientific evidence-based technical attempts are continuously being applied to enhance the share of local production. As a result, the UAE grows quinoa, amaranthus, and Salicornia for the first time, among other crops that wouldn't have otherwise survived in the country's arid climate.

## Geopolitical influences

The world appears to move towards a multi or at least bipolar superpower system. Geopolitics is the contemporary world's synonym for international politics framed by the Swedish political scientist Rudolf Kjellén [22,23]. Politics and problems started since the beginning of trans boundary trading activities and, globalization has created further room for trade related issues which includes food among others.

Geopolitical turmoil has always resulted in supply chain disruptions. For instance, sanctions imposed on Russia by the European Union (EU) for the annexation of Crimea in 2014 with retaliation on EU food imports is a classic example.

Current disputes between Russia and Ukraine severely harm the global food supply. For instance, Russia's wheat exports account for 6 billion dollars annually in addition to fertilizer products for agriculture. Likewise, more than 20% of global cereal exports are from Russia and Ukraine according to United Nations Comtrade database. A sizable percentage of sunflower oil is obtained from Ukraine. It is not clear whether Ukraine will be able to harvest existing crops, plant new ones or sustain livestock production in its present condition [24]. Overall, the current crisis is escalating the demand leading to price volatility unless a fair intervention happens to curb further damage. It appears that food system management is not all about demand and supply but politics and political choices. Historically, UAE has always been and continues to be a peaceloving nation ever since its formation. Normalization of ties with Israel, initiative to facilitate Israel-Palestinian peace efforts reflects its position of adopting a pragmatic approach of dialogue and diplomacy with positive economic impacts in the region. Furthermore, through its humanitarian aid, the country has gained recognition and legitimacy in the international arena which is very important and essential to strengthen relations with the international community as food is a factor in international diplomacy [25,26]. The diplomatic credibility with major key stakeholders has been paving the way to ascertain continued food security for UAE. Furthermore, food and energy go hand in hand and there exists a natural mutualism between food and oil-importing nations with a direct impact on the development of the economy and the economic bloc for that matter.

Nevertheless, the food business is expected to face the challenges of protectionism in the future and current developments are clear indications since China, Vietnam, Argentina, and Indonesia are experimenting with protective food policies. The country must focus more on research and development of innovative solutions for food self-sufficiency as a long-term goal. As reported by Koch and Perreault, food, water, and energy are notionally related to sovereignty and security and the material connections that underpin them, which necessarily shift over time and space [27].

According to Organization for Economic Co-operation and Development and the UN's Food and Agriculture Organization Outlook report for 2019-2028, marginal agricultural productivity over demand has been projected at a global scale. But deeper stress on the food supply chain exists due to the unprecedented impact of COVID-19 pandemics. Though epidemics and pandemics are usually accompanied by food scarcity, the current situation is fueled by two warring nations with a considerable market share in wheat production, especially to low-income countries [28]. Food insecurity levels are expected to rise by 22% in low-income countries as compared to 2021 [29]. Though these estimates are based on a statistical analysis of global historical data and are prone to variations, it is generally accepted that population growth, geopolitics, and production decline have direct implications on food security.

Thus, to meet the growing demand, efforts to increase food production and minimize food loss are gaining considerable attention in recent times. Globally, about one-third of the food produced is lost due to infrastructure-related issues-particularly in developing countries. In India, it is even higher close to 40 percent as per the estimates of Nigam and Sharma [30]. To tackle this issue, bilateral agreements were made between UAE and India to establish food corridors in different parts with an investment of around 7 billion US dollars to establish food processing which would eventually minimize production-related loss. The other area to focus on is food waste attributed to throwing edible portions into the trash. Interestingly, the amount of loss generated from both sides is almost the same. Since food waste is predominantly generated by consumers, levying taxes on waste generators may be considered [31]. For domestic food waste reduction, "Pay-As-You-Throw" (PAYT) adopted by some countries like the USA, Japan, China, and Korea may be implemented in other nations due to its success in implemented countries [32]. It is worth mentioning about the UAE food bank, an initiative by the ruler to efficiently store, package and distribute excess fresh food from hotels, restaurants, and supermarkets.

To compensate for the yield-related deficit, alternative protein sources such as entomophagy and microalgae are gaining momentum in recent times as it produces less greenhouse gas emission [33]. Similarly, cultured meat is yet another prospective source to be explored. Though its environmental sustainability is contested, further research may augment the prospective utilization of these technologies [34].

#### CONCLUSION

Food that has been developed by new manufacturing methods, innovative mixtures, or formulations, and from new edible sources are covered under a new regulation in the UAE. It includes an expanded definition for novel food to account for innovation and technology advances in the food sector to secure food security, especially under any emergency or emerging circumstances. Despite climate-related limitations, significant progress was achieved by UAE expanding arable lands from 2237 to 74986 ha and at the same time having a proactive approach to adopting modern technologies to promote food insecurity sustainably.

In conclusion, commendable efforts have been made by the UAE to tackle food insecurity establishing the roadmap for Middle East nations.

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