

AMERICAN UNIVERSITY OF BEIRUT

FOOD SYSTEM RESILIENCE IN RESOURCE-POOR  
COUNTRIES IN CONFLICT AND CRISIS: A DIAGNOSIS OF  
THE LEBANESE FOOD SYSTEM

by  
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A thesis  
submitted in partial fulfillment of the requirements  
for the degree of Master of Science  
to the Department of Food Security  
of the Faculty of Agriculture and Food Sciences  
at the American University of Beirut

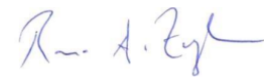
Beirut, Lebanon  
November 2021

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## ACKNOWLEDGEMENTS

I would first like to thank Dr. Rami Zurayk for his continuous support, guidance, and dedication throughout the process of completing this thesis. His expertise helped me to dive deeper and his feedback allowed me to move forwards with renewed confidence every time I hit a roadblock. Throughout all stages of this research, Dr. Zurayk provided prompt, direct, and concise feedback that recentered the scope and focus of this project, without which I could not have completed this research. Dr. Zurayk consistently made himself available to me throughout this project, despite having a high number of other obligations and responsibilities, and for your time and guidance both academically and personally, I am truly grateful.

Further, I'd like to thank all of my committee members, Dr. Ali Chalak, Dr. Samer Kharroubi, and Ms. Rachel Anne Bahn. Your willingness to take on this project, and your guidance along the way have been crucial and I am lucky and proud to have been your student. A special thanks to Ms. Rachel Anne Bahn for consistent motivation, support, and honest advice throughout the entirety of my time at AUB and with the Food Security Department, both academically and personally.

An additional thanks to Dr. Martin Keulertz for his support and input throughout my courses at AUB, and his continuous efforts to make the Food Security Program feel like a community through enriching and hands-on events inside and outside of the classroom. Further, thank you Dr. Giuliano Martiniello for instilling passion in the classroom through the medium of your own passion, and challenging me to think in new ways. Additionally, thank you to Abed Al Kareem Yehya for continuous help in all aspects of navigating this program, devoting himself to helping myself and my fellow classmates, and for consistent support and motivation.

Last but certainly not least, a huge thank you to my parents – you are my anchors in this world and I owe everything to you both and your undying support.

# ABSTRACT OF THE THESIS OF

John William Russell

for

Master of Science

Major: Food Security

Title: Food System Resilience in Resource-Poor Countries in Conflict and Crisis: A Diagnosis of the Lebanese Food System

Food systems thinking has overwhelmingly become recognized as the most effective form of holistically and comprehensively addressing issues within food systems and the systems connected to them. These systems produce social, economic, political, environmental, and food security and nutrition outcomes. As such, resilience has become a metric of measuring the strength or fragility of these intricate systems and their multiple interdependent pieces. Lebanon is a small, resource-poor and import-dependent Mediterranean country currently experiencing overlapping and reinforcing triple-crises in the form of an economic crisis, political crisis, and health crisis (including safety and security). The occurrence of these crises severely impacts the vast majority of the population of Lebanon and its food systems. This paper uses an established metric, the Tracking Food Security in the Arab Region food systems outline, adapted from the Food Systems Dashboard, to outline the Lebanese food system (LFS) and its individual pieces and components in detail. Next, 18 verified resilience and sustainability indicators with available data for Lebanon were gathered through a deep literature review, and compiled according to their relation to the Six Pillars of food security, as well as UN Food Systems Summit goals and UN Sustainable Development Goals (Table 1). With the knowledge of the cultural and contextual background of the LFS established, an analysis of the 18 indicators was conducted to assess points of resilience and fragility in the LFS, better understand how disruptions and fragility from the ongoing Triple Crisis permeate throughout the LFS, and identify potential pathways towards resilience and opportunities to bolster the LFS. Significant fragility was seen throughout components of the LFS through the use of the validated resilience and sustainability indicators, with frequent and common overlap between drivers of fragility: political corruption and mismanagement, currency devaluation, and social inequalities being amongst the severe inhibiting factors driving fragility in the LFS.

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## ABBREVIATIONS

CFS: Committee on Food Security  
FAO: Food and Agricultural Organization  
FAOSTAT: Food and Agricultural Organization Statistical Database  
FS: Food Systems  
FSD: Food Systems Dashboard  
FSMS: Food Safety Management Systems  
FSOs: Food System Outcomes  
FST: Food Systems Thinking  
GCC: Gulf Cooperation Council  
GDP: Gross Domestic Product  
GHG: Greenhouse Gas  
GII: Gender Inequality Index  
HLPE: Committee on World Food Security High Level Panel of Experts  
LMIC: Low-to-Middle-Income Countries  
MENA: Middle East and North Africa  
MOET: Lebanese Ministry of Economy and Trade  
NCDs: Non-Communicable Diseases  
NGOs: Non-Governmental Organizations  
PRPs: Pre-Requisite Programs  
TFSAR: Tracking Food Security in the Arab Region Executive Summary  
UNDP: United Nations Development Program  
UNESCWA: United Nations Economic and Social Commission for Western Asia  
UNFSS: United Nations Food Systems Summit  
UNSDG: United Nations Sustainable Development Goals  
WHO/EMR: World Health Organization in the Eastern Mediterranean Region

# CHAPTER 1

## INTRODUCTION

### **1.1. Background**

The widely accepted understanding of food security is defined by the 1996 World Food Summit's conceptualization of four pillars – availability, access, utilization and stability - as the foundation of food security. This definition, despite being used conventionally across most food security projects globally, is incomplete, and doesn't fully allow for full understanding of the nature and fallibilities of the world's current food security efforts. Too often, social and environmental outcomes are glossed over or not fully recognized as factors that have agency in determining food security. The conventional definition of food security was useful in describing the components of food security (the four pillars) but fell short in trying to understand the multiplicity of actions and reactions that define the nature of these components and is comparatively static in its analytical capabilities.

Recently, there have been calls for substantial shifts in the way food security is analyzed and addressed, as recognition of the flaws of current practices increased. As Lang and Barling (2012) highlighted, "...for the last two decades a view has emerged from social science that even if one's focus is on farming, a supply chain or systems approach becomes essential" (pg. 317). Specifically, a recognition of the narrow scope of analysis of contemporary food security thinking after the 2007-2008 financial crisis led to global attempts to fill these gaps (ibid.). Despite global summits calling for extensive funding and initiatives to increase production and use of technology in agriculture, increasing production and reducing waste remained the central focuses of food security thinking (ibid.). Still entirely missing from the discussion was any efforts

to respond to the “effects of deeper structural environmental and natural resource depletion factors on demand and the complexities of the evolving global demands for food” (ibid., pg. 315).

## **1.2. Food Systems Thinking**

Food systems thinking (FST) has recently emerged as a systematic approach aiming to fill the previously mentioned gaps by addressing all aspects of food production more comprehensively, including analysis of all the processes involved in the production, packaging, distribution, sales, consumption, and disposal of food (Ericksen et al. 2010). Essentially, FST approaches consider every step on the path down the value chain from food to fork (ibid.). Tendall et al. (2015) further elaborate that FST recognizes that FS operations and outcomes are related, connected, and play out across different scales, impacting “multiple stakeholders in diverse and sometimes conflicting ways” (pg. 17). Devereux et al. (2020) highlight that another important benefit of emerging FST is the recognition of the “dynamic and interdependent nature of relations between the different components and actors in the system, including tradeoffs and feedbacks” (pg. 2)

This allows for a more holistic, inclusive view of aspects of food security overlooked under previous frameworks and analyses, and emphasizes that FS are not merely “mechanistic clock works, but are embedded in values and cultures that need to be considered when system transformations are proposed.” (von Braun et al., pg. 2, 2021). Overall, FST considers environmental and socio-economic factors and outcomes where they were previously overlooked, and broadens the scope of analysis without compromising its depth (Devereux et al., 2020, Nature Food, 2020). Food security is

thus a result of the processes of FS interacting at different scales and across the value chain, which produce food system outcomes (FSOs) - which need to be more broadly understood not only in terms of food production quantity and hunger, but also include the levels of food security, environmental security, and social and economic welfare stemming from the operation of food systems and their interacting components. (Ericksen, 2008; Ericksen et al., 2010).

Recognizing the comprehensiveness of FST approaches in policy and practice, a 2020 report by the High Level Panel of Experts (HLPE) on Food Security and Nutrition of the Committee on World Food Security expanded the working definition of food security in a report aiming to build a holistic global narrative on the topic (HLPE, 2020). The report specifically endorses the FS approach, citing the shift in food security approaches from a focus on sectoral issues to a recognition that food system drivers, actors, and outcomes are “connected in complex ways to other sectors (health, agriculture, environment, culture) and systems (such as ecosystems, economic systems, social-cultural systems, energy systems and health systems)” (ibid., pg. 14). Further, tools like the Food Systems Dashboard (FSD) have been developed to specifically outline FS components in depth (Figure 1).

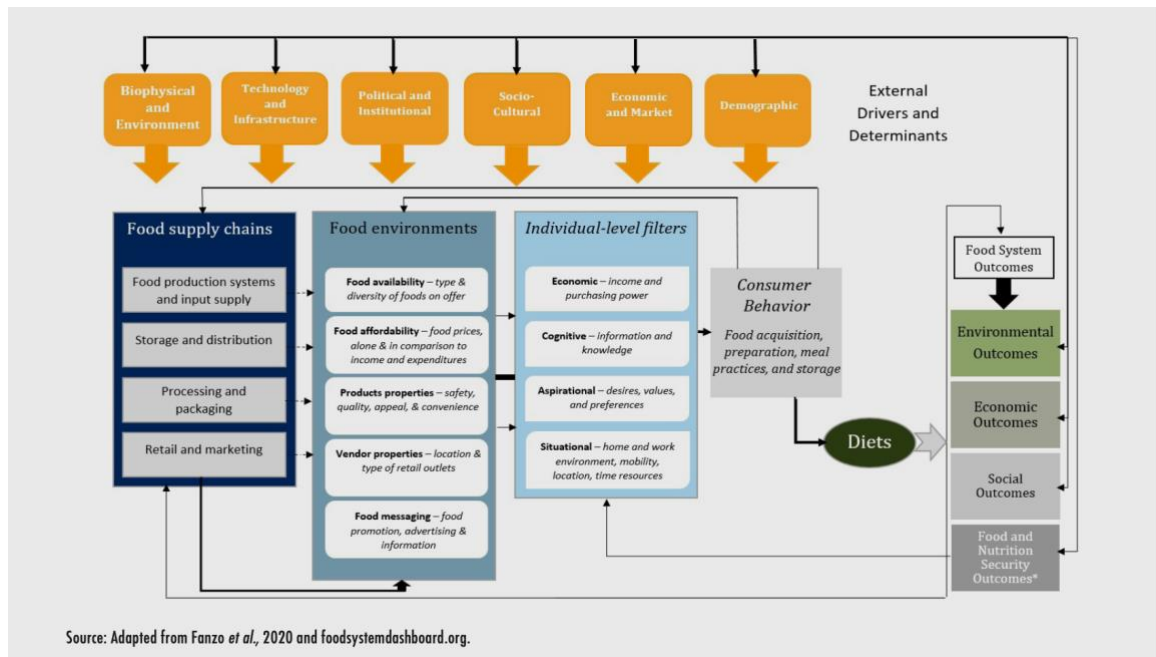


Figure 1 Food system components

These shifts in the understanding of food security and its drivers, and the transition towards FST have also led to shifts in the discourse on food system outcomes. Resilience has been widely discussed in recent literature as an essential goal for food systems. The concept of resilience currently used in the discussion of social-ecological systems like food systems derives from a more specific environmental context (Leslie and McCabe, 2013). In this context, resilience is “the capacity of a system to absorb disturbance and reorganize while undergoing change in a manner that allows for the persistence of system structure, function, and feedback” (ibid., pg. 115). In the context of food systems specifically, resilience is defined as the extent to which a food system, across multiple scales, can provide enough appropriate, accessible food to societies, even when facing interruptions and disturbances to the system (Tendall *et al.*, 2015).

### **1.3. Resilience + Sustainability**

This perspective emphasizes the importance of understanding that resilience in food systems acts as a safe-fail, and not a fail-safe, aiming at continuously developing mechanisms across the system that can mitigate food insecurity within a food system in an environment that can face multiple unforeseen disturbances or crises (ibid.) Given the unpredictability and complexity of crises capable of impacting food systems, and their capacity to propagate disturbances across value chains, complete crisis prediction and avoidance is nearly impossible. Unforeseen crises will likely always manifest within food systems due to the diversity of drivers and actors within the system, and thus building resilience in food systems serves as a pathway towards dampening potential negative outcomes, increasing the speed of recovery, and system learning and adaptation to mitigate future iterations of similar crises.

Food security definitions have also evolved to center the concepts of agency and sustainability as pillars of food security, in addition to the original four pillars. In FS, agency refers to the ability of an individual, group, or community to decide “what foods they eat, what foods they produce, how that food is produced, processed and distributed within FS, and their ability to engage in processes that shape food system policies and governance” (HLPE, 2020 pg. 8). Commonly, disadvantaged members of FS like women, small-scale producers, marginalized communities, urban-poor communities, etc. lack agency regarding food security and FS. On the other hand, donors, large corporations, and individuals or groups with significant societal influence and power have disproportionately high agency in determining both food system discourse and operation (ibid.).



Sustainability refers to the “long-term ability of FS to provide food security and nutrition today in such a way that does not compromise the environmental, economic, and social bases that generate food security and nutrition for future generations” (HLPE, 2020, pg. 9). Essentially, sustainability calls for FS to operate in a way that respects and protects ecosystems, natural environments, and natural resources in all of their interactions with economic and social systems – as these natural environments are the foundation of FS themselves (ibid.).

Recent works, serving as a framework for centralizing terminology across FS discourse for the 2021 United Nations Food Systems Summit (UNFSS), further highlight the need to incorporate a sustainability focus when addressing FS resilience. von Braun et al. (2021) cite that a central focus of all FS resilience works must be the way FS impact sustainability in its “economic, social, and environmental dimensions” (pg. 2).

von Braun et al. (2021) accentuate the link between sustainability and FS resilience - whereas unsustainable systems are naturally non-resilient. Action Track 5 of the UNFSS (Build Resilience to Vulnerabilities, Shocks, and Stresses) highlights that FS should aim to be regenerative and circular, and prepared to withstand, recover, and improve in the face of shocks and disturbances in a way that ensures sustainability for the future operation of the system. Bene et al. (2019) further highlight that improving the sustainability of food systems is one of the most crucial actions to be taken as the world continues to face higher global populations, climatic pressures, and poorer nutritional quality. Overall, practices that prevent FS from operating in the future as efficiently and effectively as the FS currently operates take away from its sustainability - its ability to function effectively over time and into the future. In short, unsustainable

FS are fragile FS, and sustainable FS are resilient FS, and as such, resilience and sustainability should be addressed and assessed in conjunction.

Across ecology, psychology and food security, resilience is described as a dynamic process - a characteristic of complex and diverse systems that is not directly measurable, rather assumed through the presence or absence of certain indicators that have been linked to higher levels of resilience in the system being studied (Norris et al., 2007; Hermann et al., 2011; Nuwayhid et al., 2011; Leslie and McCabe, 2013; Aldrich and Meyer, 2014, Bullock et al., 2017; Seekell et al., 2017; Béné 2020). Thus, resilience and sustainability are most accurately inferred as a result of the presence or absence of the indicators that represent system resilience. These indicators can be used to assess system resilience and determine points of fragility in food systems of different scales. This paper will apply this technique, using validated sustainability and resilience indicators with available data to assess resilience of the LFS with specific respect to the cultural, environmental, and socio-political contexts of Lebanon and its FS.

## CHAPTER 2

### RESEARCH QUESTIONS

**2.1. What are the characteristics of the Lebanese Food System (LFS)?**

**2.2. What can be said about the resilience of the LFS?**

**2.3. How can the LFS be buttressed against future conflicts or crises?**

# CHAPTER 3

## METHODOLOGY

### **3.1 Outlining the characteristics of the Lebanese Food System.**

The characteristics of the LFS will be outlined using the FSD and the TSFAR Executive Summary. As a framework to describe the Lebanese food system, the Food Systems Dashboard (FSD) and the Tracking Food Security in the Arab Region (TFSAR) will be used (Figure 1). The FSD is a platform that compiles public and private data to “describe global, regional and national food systems; to assess the challenges for improving diets, nutrition and health; and to guide its users to set priorities and decide on actions” (Fanzo et al., 2020, pg. 244). The FSD aggregates data on more than 140 food system indicators from over 30 sources and frames the food system based on its different components: “food supply chains, food environments, individual factors, consumer behavior, diets and nutrition, and environmental, social, political and economic drivers” (ibid.). The FSD allows for system-wide analyses that can contribute to improving food system outcomes in regard to diet, nutrition, natural resources and the environment (ibid.).

The TSFAR is an Executive Summary developed “through extensive consultations over four years that involved up to 200 experts”, which ultimately expressed food security and nutrition at different regional scales as an outcome of the aggregate of numerous determinants and causal factors (Zurayk et al., 2019, pg. 8). The report visually applies the UNESCWA Arab Food Security Monitoring Framework indicators at the regional and subregional scales – with the capacity for translation to the national scale. Drawing data from verified international sources, this framework

justifies each of the 24 food system indicators used and their linkages to achieving the 2030 UNSDGs.

### **3.2 Assessing the resilience of the Lebanese Food System:**

This paper will use verified proxies of resilience and of sustainability to make inferences on resilience of the LFS, points of fragility, and pathways towards bolstering system functionality, and improving social, environmental, and food security and nutrition outcomes in respect to the FS Drivers outlined by the FSD. Indicators will be used with knowledge and attention to the UNFSS Action Track 5 statement that initiatives in achieving resilience and sustainability need to “begin with an in-depth understanding of the cultural, environmental, and socio-political context of each locality” in mind (pg. 3). Lebanon has experienced numerous crises and shocks within its recent history, and a recognition and understanding of the development of its macroeconomic, political, and social landscape will be applied during the assessment of indicators, as it is crucial in contextualizing any analysis or discussion of the nation’s food systems and their resilience.

With this in mind, and to compensate for the difficulty of data limitations for Lebanon, a LMIC experiencing conflict and crisis, and to most accurately gauge the resilience and sustainability of the LFS in line with the UNFSS and UNSDGs, a combination of resilience indicators and sustainability indicators will be used. These indicators will be taken from a number of validated sources, and focus on different axes of food security - social, economic, nutritional outcomes, environmental sustainability, etc.

While acknowledging the effectiveness of already established frameworks for measuring resilience and sustainability in FS using indicators and proxies (i.e Bene et al. 2019, Bene 2020), data limitations in resource poor countries experiencing conflict and crisis, the MENA region, and in Lebanon specifically are well documented, and can prove significantly limiting in the comprehensiveness of those frameworks.

(Abdurrahman et al., 2012; Alvaredo and Piketty, 2014; Amirtha, 2014; and Merhej, 2021) These frameworks, in the context of resource poor countries experiencing conflict and crisis are not practical, given that they are not comprehensive enough to be of use in the case of countries like Lebanon, due to a significant number of missing data points across indicators which compromises the integrity and validity of these calculated quantitative analyses.

In light of this reality, this paper aims to prove that an equally valid, and in some cases deeper contextual analysis of FS resilience and sustainability can be achieved through a combination of quantitative and qualitative analyses of the validated indicators with available data, in combination with a deeper contextual dive into the narrative and reality of a system in conflict and crisis. This analysis and the indicators used to assess resilience and sustainability are in line with the UNSDGs, and the 2021 UNFSS mission “to alter food systems to be healthier, safer, more sustainable, more efficient, and more equitable” through three main objectives - “end hunger and achieve healthy diets for all... enable the sustainable use of biodiversity and natural resources, the protection of ecosystems and the safeguarding of land, oceans, forests, freshwater, and climate... and eliminate poverty and increase income and wealth” (von Braun et al., 2021).

While in some ways data limitations are discouraging, and bar the use of established metrics like those previously mentioned above, von Braun (2021) writes in preparation for the UNFSS 2021 that analyses that attempt to be overly complex map out every interaction and function of food systems “tend to collapse under the density and complexity of the interactions” that are trying to be interpreted and understood (pg. 3). Simultaneously, a hyper-focused analysis overlooks important components of the social, environmental, economic resilience and sustainability of the system under question.

### **3.3 Strengthening the Lebanese Food System against future conflict and crises:**

Based on the assessment of resilience and sustainability indicators and their performance within the LFS, recommendations will be made to add capacities and strengthen existing capacities regarding the specific components of the LFS that are proven to be weak, and the components that have potential to bolster the system in a comprehensive manner, and improve FS + Nutrition Outcomes.

## CHAPTER 4

### RESULTS

#### **4.1. Food Supply Chains**

Food supply chains “include all the stages and actors, including private sector businesses, from production to trade and processing to retail and consumption, including waste disposal” (FAO, 2021, pg. 89).

##### ***4.1.1. Food Production Systems and Input Supply***

Lebanon is composed of around 332,000 hectares of land, for a population of roughly 5.4 million Lebanese citizens, with a total population estimate approaching 7 million, due to the presence of Syrian and Palestinian refugees displaced by conflict living in Lebanon (FAO, 2020). About 232,000 hectares of total land are cultivated, and less than half of cultivated land, roughly 113,000 hectares, are irrigated. Production focus has shifted from cereals to specialized, export-oriented high value fruits and vegetables. A combined 25% of the effective labor force in Lebanon (12% full-time and 13% part-time/seasonal) work in agriculture. Most of the employees working in menial labor, or low-wage manual labor in the agricultural sector are women - and many farmers “use labor provided by poor-families, especially women, working 12 to 14 hours per day” (FAO, 2020, pg. 11). Typically, women have very low participation in the workforce, and are largely underrepresented in formal agricultural employment (ibid.). Specifically, only 9% of farm operators are female, and they cultivate a cumulative 9% of cultivated area. Most women involved in agriculture, specifically in the production of dairy products, food preserves, and subsistence farming “are marked by an increased incidence of poverty” (FAO, 2020, pg. 10).



In Lebanon, local food production proves to be self-sufficient for fruits and vegetables, up to 200% sufficiency for bananas, citrus fruits, and apples, all of which are heavily exported (Riachi, 2013). On the other hand, Lebanon is significantly deficient in local production of cereals, livestock, and dairy products. For cereal production specifically, the nation has a deficit of 800 thousand tons per year (before the Syrian crisis) rising to 1,280 thousand tons during the Syrian crisis (Hamade, 2019). In terms of animal fodder, only 2% of temporary cropland, or roughly 4,500 hectares, are used for fodder crops, leaving Lebanese highly dependent on inputs for feed production (FAO, 2020). Figure 2 shows the top 10 agricultural products in Lebanon by production (IDAL, 2020)

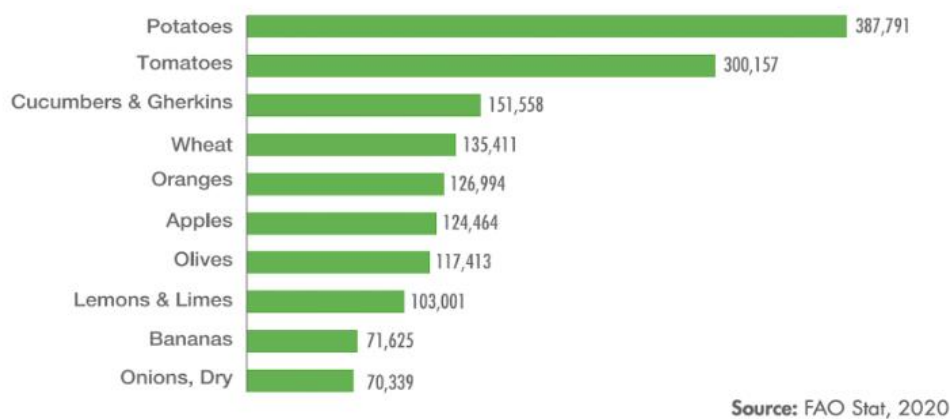


Figure 2 Top Agricultural Products in Lebanon by Weight in Tons, 2018 (IDAL, 2020).

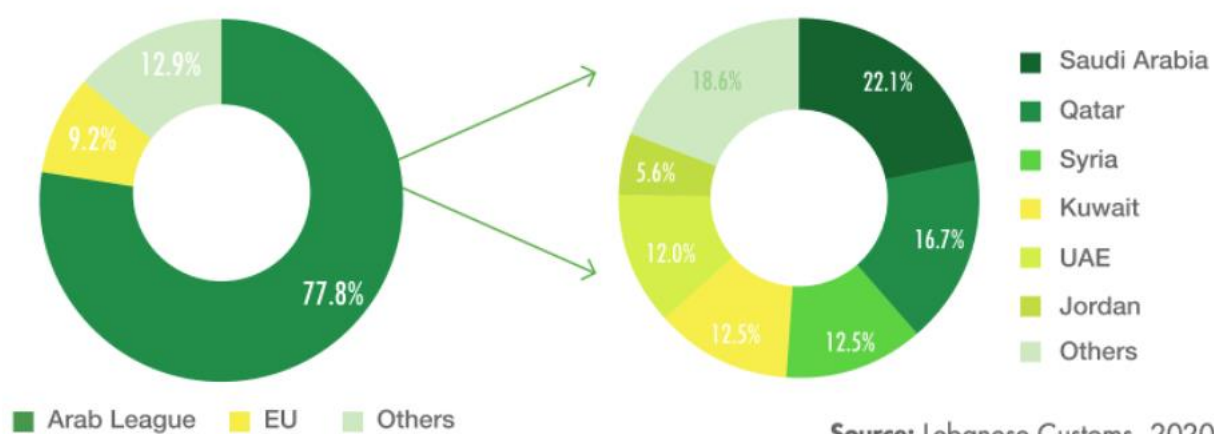
Lebanese agriculture is characterized by high input costs and low output prices. Most inputs, “including seeds, fertilizers, plant protection materials and feed ingredients are imported by private agri-business companies” as there are extremely limited state agricultural support programs (FAO, 2020, pg. 1). Further, no formal credit is available for agricultural workers, and private agri-business companies have taken the place of

the state in providing seasonal credit and extension services to farmers (ibid.). Since the end of the Civil War in 1990, there has been no financial or policy support for the agricultural sector by the government, and there are no agricultural credit or development banks in the country (ibid.). Distribution of inputs and extension is cited to target “key farmers”, usually industrialized, large scale farms, rather than attempting to reach farmers in need. 70% of farmers operate on less than one hectare, with only 4% of farms operating on more than 6 hectares. Despite this, 40% of total agricultural land is attributed to large farms (ibid.).

High dependency on imports of inputs proves to be prohibitive for smallholders willing to enter agro-industrial production. The entry costs of imported livestock for dairy production, for example, in addition to the “absence of a well-defined agricultural strategy” or support in Lebanese agriculture results in a split along the lines of production. On one hand, agro-industrial, capital heavy and export oriented farms, and on the other hand small-scale, locally focused and under-capitalized producers (Hamade, 2019, pg. 261).

Total food import value has been increasing at an average annual rate of 8%, annually, with 80% of total wheat supply coming as imports (Bankmed, 2016; USDA Foreign Agricultural Service, 2016). As of 2014, 17.85% of all merchandise shipments to Lebanon were food product imports, with the highest volume of imports coming in the form of prepared foods and animal and vegetable products (USDA Foreign Agricultural Service, 2016). Further, total cereal import dependency ratio rose from 88% to 99.5% between 2000 and 2017, indicating high risk for Lebanon given its resource-poor, highly import dependent nature (FAO, 2021).

Saudi Arabia, Qatar, and Syria, have been the largest buyers of Lebanese food exports, combining to account for more than 50% of all Lebanese food exports in 2019, despite war in neighboring Syria significantly disrupting land routes for trade from Lebanon to all three of its main buyers and other Gulf Cooperation Council (GCC) nations (Figure 3) (IDAL, 2020; USDA Foreign Agriculture Service).



Source: Lebanese Customs, 2020

Figure 3 Exports of Lebanese Agricultural Products (IDAL, 2020).

Further, Lebanese agricultural communities were dependent upon highly subsidized Syrian agricultural inputs. Costs of agricultural production for Lebanese farmers increased significantly as these subsidized inputs became unavailable during the conflict in Syria (FAO, 2014). Exports typically consist of fruits and vegetables, raw tobacco, spices, and live sheep (FAO, 2020). Food exports are the most valuable national export, bringing in roughly \$1.7 billion annually, and are an essential component in bringing in revenue and foreign currency (Kharroubi et al., 2020).

Overall, extreme import dependency and a lack of trade partner diversity pose threats to the LFS. Import dependency leaves the LFS extremely vulnerable to market price changes and internal currency devaluation. Limited trade partners and limited access to those trade partners due to conflict puts the Lebanese export system, which

brings in valuable supplies of foreign currency, at risk. Further, gender inequality, social inequality, and land ownership inequality amongst the LFS production system pose threats to its integrity and resilience.

#### ***4.1.2. Storage and Distribution***

The Lebanese government does not maintain a public grain stockpile. All grain storage facilities within the country are privately owned and operated, and there are no public resources available for staple grain storage (Food Security Brief 1). The Port of Beirut was the largest private grain storage facility in the nation, with 120,000 tonnes of temporary storage capacity for imported grains until transportation to mills (El Dahan and Francis, 2020).

Storage facilities and distributors in Lebanon are impacted by the electricity cuts within the nation, having to operate expensive generators to ensure proper storage and distribution of food products. Within Lebanon, many Non-Governmental Organizations (NGOs) and international foundations operate to distribute food or cash-assistance to at-risk populations, in place of absent social services or state initiatives.

One study found that food handlers' and distributors' knowledge on safe food storage, amongst both trained and untrained respondents, were markedly low (Faour-Klingbeil et al., 2015). Despite roughly half of the respondents having received formal food storage training, "57.5% of respondents did not know what the Danger Zone implies nor the range of temperature that is considered optimum for bacterial multiplication" (ibid., pg. 168). Overall, food handlers' knowledge related to proper storage and temperature control in Lebanon have been deemed to be insufficient (ibid.).

Food storage poses a significant threat to the resilience of the LFS, as centralization of resources, without any redundancy or diffusion of storage facilities across different locations. Further, lack of knowledge on proper storage and distribution practice poses threats of food contamination, food waste, and foodborne illness.

#### ***4.1.3. Processing and Packaging***

A 2020 study identified public-based international food safety management systems (FSMS) as the dominant food processing governance system in Lebanon (Abebe et al., 2020). Massoud et al. (2010) found that most food processing establishments in Lebanon are small-medium in size, and 23% operate in the production and processing of baked goods, 16% in dairy products, 7% in grain processing, 4% in fruits and vegetables, oils, and meat and fish. A survey from Abebe et al. (2020) found that, of food processing companies from all governorates in Lebanon, 51% were small, and 49% were medium to large in size. 68% were family owned, and 71% had been in business for more than two decades.

Much like other components of the Lebanese food system, “food processing factories mostly rely on imported ingredients because of their uniform quality and steady supply” (FAO, 2020, pg. 36). Only one factory produces glass bottles through recycled glass, and other agro-processing inputs such as jars, lids, and corks are entirely imported (ibid.).

Implementation of pre-requisite programs (PRPs) that assess proper practice of processing operations varied greatly by the size of the processors. Amongst small processors, only 27% and 21% had implemented different PRPs, where large processors had implemented the same PRPs at a rate of 69% and 54%, respectively. By type of

food processing, processors engaged in meat, dairy, and fruit and vegetable processing were more likely to follow proper food processing regulations than enterprises working in the processing of dry foods. (Abebe et al., 2020).

Further, frequency of FSMS implementation was divided along retailing lines. As outlined below, Lebanese food retail is dominated by a high frequency of small scale, domestic retailers. In terms of processing, “of the food processors that had implemented public-based international FSMS, the majority of them were export-oriented” (ibid., pg. 1090). Whereas export-oriented production must follow strict requirements, small retailers may not exert pressure on food processors to follow these regulations, and that implementation of FSMSs is driven by international trade (ibid.).

Bou-Mitri et al. (2020) found that Lebanese consumers “are attracted to specific packaging designs” based on a “positive perception regarding food quality, safety and healthiness” where transparent glass packaging and vacuum sealed products were regarded as significantly safer/of higher quality, and were purchased more frequently. Consumer perception was found to be “significantly influenced not only by the packaging material but also by the food package, the package color” as well as nutritional information and health claims (ibid., pg. 82).

Lebanese processing and packaging systems are subject to currency volatility and economic destabilization due to their reliance on imported materials. Further, local processing facilities that provide to local markets, not export markets, are less regulated and were found to be less in compliance with FSMS – indicating an increased risk of foodborne illness or lack of proper sanitation throughout processing and packaging.

#### ***4.1.4. Retail and Marketing***

While literature on Lebanese retailing patterns and consumption is scarce, Seyfert et al. (2014) found that a large majority of Lebanese consumers rely on traditional food retailers over modern, large scale retailers and supermarkets. Bahn and Abebe (2017) highlight that “despite its impressive growth, Lebanon’s modern food retail segment only slightly gained market share from the traditional food retail segment over the period of 2010-2015”, where modern retailers’ share of total food sales only increased by 2% (pg. 33). Annual growth for modern and traditional retail outlets was about 11.2% and 5.4%, respectively, between 2001 and 2015, and in 2015, traditional retailers still accounted for 58% of total food retail sales, significantly higher than the Asia average of 48%.

Within Lebanon, density of food retailers varies geographically and by population density. While geographic density of retailers is highest within Beirut (3.2 retailers/square kilometer), Nabatiyeh and South Lebanon have less than 0.02 retailers/square kilometer). Beqaa has the highest number of retailers per person, at roughly 1.5 retailers per 1000 residents, while Nabatiyeh and South Lebanon are again the most underserved, with 0.04 retailers per 1000 residents. Traditional food retailers still account for 96% of all registered food retailers in Lebanon, and medium and small size traditional grocers dominate food retail. Modern retailers are highly concentrated in the urban areas of Beirut and Mount Lebanon, with only 23% of all modern retailers existing outside of these two regions (Bahn and Abebe, 2017).

This dynamic is reflected in the FSD measurement of retail services in Lebanon. As of 2018, Lebanon has significantly less supermarkets – 0.6 per 100,000 population – compared to the Western Asia and Global averages of 8.2 and 5.4, respectively.

Similarly, Lebanon has 3.3 modern retailers per 100,000 population, compared to the Western Asia and Global averages of 25 and 18, respectively. This shows the continued dominance of traditional retail outlets in the country (ibid.).

Overall, the structure of Lebanese retail and marketing systems provides an opportunity for strengthening resilience in the system. The UNFSS 2021 calls for enhanced civic engagement and initiatives supporting micro, medium, and small enterprises, given their “inclusive and equitable” position in FS (von Braun et al., 2021). Small scale enterprises like those that dominate food retailing in Lebanon have power in their connections with local communities and individuals, and are capable of serving as access points within communities. If supported with resources, both through physical food supply and financial means, these retailing centers have the capacity to serve as strong buffer points within communities in the face of a shock or crisis.

#### **4.2. Food Environments**

Food environments represent the “physical, economic, socio-cultural and policy conditions that shape access to, affordability of, safety of, and preferences over, food”, mainly influenced by “physical and economic access to food (proximity and affordability); food promotion, advertising and information; and food quality and safety” (FAO, 2021, pg. 89).



#### ***4.2.1. Food Availability***

Food availability is discussed as the ability to have “a quantity and quality of food sufficient to satisfy the dietary needs of individuals, free from adverse substances and acceptable within a given culture, supplied through domestic production or imports” (HLPE, 2020, pg. 10). As previously mentioned, Lebanon is highly import dependent, reaching a cereal import dependency ratio of 99.5% by 2017, signifying that the nation is effectively entirely dependent on imports for its cereal needs (FAO, 2021). Lebanon is only self-sufficient/export oriented for the production of fruits and vegetables, and otherwise extremely import dependent (ibid.).

As of 2021, By 2016, the Lebanese diet consists of less dietary energy from cereals, roots and tubers, at 44% compared to the global average of 50%. Overall, food availability has decreased over the past two decades in Lebanon. Specifically, vegetable, fruit, egg and milk supply (g/person/day) have all decreased by more than 50% between 2000 and 2018, with supply of pulses and meat decreasing by almost 50%. Supply of fish was the only positive change between 2000 and 2018, increasing from 20g/person/day to 24g/person/day (Food Systems Dashboard).

While undernourishment increased between 2007 and 2013 as a result of an influx of war-displaced Syrian citizens entering Lebanon, undernourishment reached a decade-low 5.7% in 2017-2019 (FAO, 2021). While undernourishment is decreasing, Lebanon is exhibiting statistics significant of a nation experiencing a nutritional transition and the double burden of malnutrition, likely to put populations at higher risk of Non-Communicable Diseases (NCDs) and poor health outcomes. Despite decreasing undernourishment, a 2004 study showed that prevalence of wasting, overweight, and stunting sit at 6.6%, 16.7%, and 16.5% respectively, with prevalence of overweight

specifically representing a very high threat to public health (FAO, 2021). Data between 2010 and 2014 shows slightly increasing prevalence of diabetes in adults, both male and female, which is also significant of increased availability and consumption of high-energy, high-fat foods (Food Systems Dashboard). Most recently, the 2021 State of Food Security and Nutrition in the World (FAO et al., 2021) highlight increasing adult obesity and prevalence of anemia in women of reproductive age amongst the Lebanese population, with obesity rising from 29.7% to 32% between 2012 and 2016, and anemia rising from 25.4% to 28.3% between 2012 and 2019 – both indicative of inadequate nutritional intake and overconsumption of unhealthy foods throughout the population.

#### ***4.2.2. Food Affordability***

Consumption expenditure can be used to approximate national income and spending power, which plays heavily into food choice and affordability in food systems. Whereas regional and global consumption expenditure per capita (International dollars, 2011 PPP) rose steadily between 2015 and 2019, Lebanese consumption expenditure per capita decreased steadily, with the steepest decrease between 2018 and 2019 (Food Systems Dashboard).

Further, a 2014 report highlighted that poorer communities in Lebanon, specifically in city suburbs and rural areas, “spend over a third of their monthly income on food”, making their situation particularly precarious in case of fluctuation in food prices or food shortages (Issam Fares Institute, 2014, pg. 19)

### ***4.2.3. Products Properties***

Food safety is an issue in Lebanon met with rising concern. A recent study, compiling and analyzing multiple years of government-collected data that sampled multiple types of food categories across all Lebanese governorates found 28.7% of all samples were of unacceptable quality (Kharroubi et al., 2020). Results were stratified geographically, with the nation's capital of Beirut containing the least contamination at 23.8% of all samples, and the North governorate the highest at 31.7%. Lebanon's North governorate is known as one of the poorest, with high levels of income distribution inequality, and lack of infrastructure (ibid.). Red meat, poultry, and dairy were of the most contaminated food types that were tested.

Exclusion of common pathogens and contaminants in government data collection indicates that there is a “possibility that the rejection rate might increase if other microbial pathogens/indicators/chemicals were to be tested” (ibid., pg. 8). Food toxins present serious threats to the populations well-being, as well as health and economic systems, and food safety should be a primary goal in ensuring

Even amongst export products, which have significantly stricter food safety and quality regulations, Lebanese exports have been shown to be contaminated “Lebanese sesame-seed paste (tahini) was implicated in outbreaks of foodborne disease in Victoria (Australia) and Auckland (New Zealand)” (ibid., pg. 2). Further, disease outbreaks from Lebanese products in the USA and Canada have led to product recalls, and caused concern amongst consumers about the safety of products imported from Lebanon (ibid.).

#### **4.2.4. Food Messaging**

In Lebanon, 31% of television advertisements are for food or drink, with food advertisements rising to 43% of the total during children's programs (Nasreddine et al., 2019). Lack of regulation on food advertisements leads to a high percentage of ads being deemed unsuitable for marketing to children, and further leads to advertisements during children's programs highlighting alcoholic beverages, coffee, and other food items considered unacceptable for young adolescents. Only 3.6% of all food advertisements contained any sort of health disclaimer, and 80% of all food advertisements did not meet the nutrition standards set by the World Health Organization in the Eastern Mediterranean Region (WHO/EMR) nutrient profile model (ibid.).

High advertisement of unhealthy foods is indicative of a shift to unhealthy diets and poor eating habits. This reflects the nutrition shift that Lebanon is experiencing away from its traditionally diverse and healthy diet to one characterized by "a high consumption of red meat, fast foods, sweets, and sugar-sweetened beverages" (ibid.). This shift, driven in part by food messaging and advertisements, threatens the LFS and Lebanese health system, adding pressure to deal with an increasing number of obese and overweight in the population.

### **4.3. Individual-Level Filters**

Individual decision-making and consumer behaviors operate as a response to local and national food environments, and are composed of decisions on what foods to buy from which retailers, and how to prepare and consume them. Essentially, "these individual decisions ultimately shape diets in terms of quantity, quality, diversity, safety

and adequacy of food”, based on an individual’s economic, cognitive, aspirational, and situational circumstances (FAO, 2021, pg. 12).

#### **4.3.1. Economic**

The FSD uses the Gini index as a measure of inequality and wealth distribution as an outcome of food systems, as well as a driver. In 2011, Lebanon had a score of 32 on the Gini scale, out of 100, with numbers closer to 0 representing more equality. This ranking indicates that, as of 2011, Lebanon was more equal than both Western Asian (39) and World (39) averages. More recently, calculations by the United Nations Development Programme (UNDP) and the Lebanese Ministry of Finance estimates with data from 2014 put Lebanon at 51 on the Gini scale. Overall, continuous and rising inequality in Lebanon is of significant concern for all aspects of society, with negative implications for food system resilience.

The World Bank annual Gross Domestic Product (GDP) growth dataset for Lebanon shows a tremendous decline in GDP growth, falling from 10.2% annual growth in 2009 to -6.7% as of 2019. Within the same decade, Lebanese national debt-to-GDP rose from 136.83% in 2010 to 174.32% in 2019, making it the third most indebted nation globally (Youssef, 2020; Statista Databank).

Individual purchasing power in Lebanon has taken a severe hit as a direct resultant of the current tripartite crisis, which will be discussed in depth later in the paper. Briefly, individual consumers are facing a massive devaluation of their local currency, and increasing food prices to match import rates on a volatile currency black market, severely threatening the integrity of the individual actors in the LFS and their economic capacity to support themselves.

#### ***4.3.2. Cognitive***

Traditional food knowledge in Lebanon is considerably high, and historically wild plants are used frequently in traditional dishes in Lebanese cuisine. In direct relation to Lebanon's nutritional transition, traditional food knowledge and wild plant use are phasing out of Lebanese food systems, where they were previously harvested and prepared as alternatives and crucial sources of micronutrients during times of war and crop failures (Marouf et al., 2015). In conjunction with the continued popularity of high-fat Westernized diets, continuously expanding urbanization, a heavy reliance on chemical pesticides and inputs for agriculture, decreasing interest in agricultural and traditional knowledge, and environmental pollution, traditional knowledge and wild plant use in the Lebanese food system is becoming increasingly rare (ibid.).

Further, consumer knowledge and awareness about salt in Lebanon is considered to be low. Lebanon exceeds the rates of cardiovascular diseases and hypertension compared to other nations worldwide, likely in part to low knowledge and a very small proportion of consumers adopting behaviors to reduce salt intake (Nasreddine et al., 2014). Only 25% of the study population were aware that processed foods are the main contributors to salt intake, a worrying statistic given that 67% of average daily salt intake came from processed foods in Lebanon, indicating risk of poor nutritional outcomes and increased stress on overloaded health systems (ibid.)

#### **4.4. Consumer Behavior**

Consumer acquisition, preparation, consumption, and storage or waste of food products identify the steps that individuals take in the food system, and inform diets. Lebanon has a higher incidence of food waste when compared to global rates, similar to other countries in the region, indicative of a need for improved practices in consumer behavior (Mattar et al., 2018). In Lebanon, rural households were identified as less wasteful than urban households, and households with university graduates were twice as likely not to waste food compared to households with secondary education at the highest educational level.

Further, employment and a higher number of individuals living in the same household were linked to higher food waste. (ibid.). Concerning shopping practices, buyers in Lebanon were found to be drawn towards buying food outside of their planned shopping patterns when items were discounted as a special offer. Shopping based on discounts is especially common in the context of countries with weak economies like Lebanon, and is directly linked to increased food waste (ibid).

#### **4.5. Diets**

Diet diversity and quality are essential components of a healthy society and a properly functioning food system. Healthy diets are crucial in reducing and preventing NCDs, ensuring a healthy population, and reducing strains on food, environmental and health systems (Hwalla et al., 2016). In practice, healthy and sustainable diets “promote all dimensions of individuals’ health and wellbeing, have low environmental pressure and impact, are accessible, affordable, safe and equitable, and are culturally acceptable” (FAO, 2021, pg. 89). Further, dietary patterns are a significant driver in terms of

environmental (un)sustainability and Greenhouse Gas (GHG) emissions; current dietary patterns are expected to cause an 80% increase in global GHG emissions by the year 2050 (Skaf et al., 2021).

A 2016 report highlights that food security strategies in the Arab region tend to prioritize food production and availability more than the nutritional quality of diets, and as a result “diets have become less diverse and nutritious, with perversely negative impacts on human health” (ibid., pg. 168). Traditionally, the Lebanese diet “is a collection of minimally processed vegetarian recipes, in addition to an abundance of fruits, vegetables, cereals, legumes and nuts” where olive oil is the main source of fats, and wild edible plants are often incorporated into dishes (Hwalla and El Khoury, 2008, pg. 493). While the Lebanese traditional diet still holds a strong cultural and social presence within the nation, Lebanon is also experiencing “a shift in food consumption toward increased intake of fat, milk, and animal protein and a decrease in the intake of non-refined carbohydrates” (ibid., pg. 495).

A 2006 survey analyzing food availability and consumption patterns in Beirut found that the average daily consumption by adults was ~2523 kcal per day (Nasreddine et al., 2006). Of this consumption, 13.4% of calories came from proteins, 38.9% from fats, and 47.2% from carbohydrates (ibid.). Of all foods consumed, breads and toast were the most highly consumed items, providing 16.1% of total daily energy intake.

Batal et al. (2012) highlight that traditional Lebanese diets, characterized by their high level of consumption diversity and healthy foods, are being replaced by diets of limited diversity, overly dependent on hyper-caloric and processed imported foods. Further, Iraqi, Palestinian, and Syrian refugees living in Lebanon all experience higher levels of food insecurity and significantly lower levels of dietary diversity, reflecting



nutrient poor diets (Ghattas et al., 2014; VASyR, 2020). Syrian refugees have been consuming less daily meals, on average, in the last two years, indicating decreased food availability for an already marginalized group within Lebanon (VASyR, 2020).

The nutrition transition in Lebanon, paired with large inequities in diet quantity and quality between refugee and migrant worker communities in Lebanon pose serious threats to FS and to public health. Contrarily, the healthiness of the Lebanese traditional diet, and its cornerstone in the country's culture and cuisine serves as a huge opportunity to improve public health and nutritional outcomes.

#### **4.6. Politics and Leadership - Buildup to Current Triple Crises**

Understanding the drivers of food systems is a necessary first step in understanding and analyzing the previously described food system components and their current and future outcomes. The FSD identifies Population Growth and Migration, Climate Change and Environment, Politics and Leadership, Income Growth and Distribution, Globalization and Trade, Urbanization, and Socio-Cultural context as the main food system drivers. Further, FS drivers are inherently linked with the resilience or fragility of the food system – as drivers are key determining factors in FS operations and outcomes. As such, resilience and FS drivers are closely related, and the following section will outline each specific resilience indicator based on what driver has the most impact. This analysis adds the crucial contextual scope of Lebanon and its food systems operations that is necessary in addressing food system resilience, using data from the FSD in conjunction with supplementary academic literature (von Braun et al., 2021).

Indicators with available data for use in an analysis of the LFS were compiled and outlined in Table 1, sorted by the FS driver with the most direct impact. In this section, FS resilience of the LFS will be assessed through the analysis of validated resilience indicators with available data, in conjunction with the FS drivers that inform the performance of each indicator.

<b>Pillar</b>	<b>Indicator</b>	<b>Axis</b>	<b>Validation</b>	<b>Food System Driver</b>	<b>Target Goal</b>
Access	Food Consumption as share of total income	Economic	Bene et al. (2019)	Income Growth and Distribution	UNSDG 2 UNFSS Action Track 1
Access	Household Food Insecurity	FS + Nutrition Outcomes	Bene (2020)	NA**	UNSDG 2 UNFSS Action Track 1
Access	Individual Purchasing Power	Economic	Bene (2020)	Income Growth and Distribution	UNSDG 10 UNFSS Action Track 4
Access/Stability	Food Price Volatility	Economic	Bene et al. (2019)	Globalization and Trade	UNSDG 2 UNFSS Action Track 1
Agency	Income Inequality	Economic	Von Braun et al. (2021)	Income Growth and Distribution	UNSDG 10 UNFSS Action Track 4
Agency	Land Ownership Equality	Social/Political	Von Braun et al. (2021); Hamade (2019)	Politics and Leadership	UNSDG 2 + 10 UNFSS Action Track 4
Agency	Politics, Leadership and governance	Political	Von Braun et al. (2021)	Politics and Leadership	UNSDG 16 UNFSS Action Track 5*
Agency	Equitable FS for Marginalized Communities	FS + Nutrition Outcomes, Social	Von Braun et al. (2021)	Population Growth and Migration	UNSDG 2 + 10 UNFSS Action Track 1 + 4
Agency	Gender Equity	Social	Von Braun et al. (2021)	Socio-Cultural Context	UNSDG 2 + 5 UNFSS Action Track 1 + 4
Agency	Psychosocial Factors and Subjective Well-Being	Social	Bene, 2020	Socio-Cultural Context	UNSDG 3 UNFSS Action Track 5
Agency/Stability	Equitable Livelihoods to All Actors Across Food Value Chains	Social	Von Braun et al. (2021)	Socio-Cultural Context	UNSDG 8 + 10 UNFSS Action Track 4
Availability	Diversity of trade partners	Economic	Kummu et al. (2020)	Globalization and Trade	UNSDG 2 UNFSS Action Track 1
Availability	Dependence on Imports	Economic	Kummu et al. (2020)	Globalization and Trade	UNSDG 2 UNFSS Action Track 5*
Sustainability	Biophysical Redundancy	Environmental	Fader et al. (2016)	Climate Change and Environment	UNSDG 2 + 12 UNFSS Action Track 3
Sustainability	Food Waste	Environmental	Bene et al. (2019)	Climate Change and Environment	UNSDG 2 + 12 UNFSS Action Track 2 + 3
Sustainability	Agricultural Employment Base	Social	Hamade (2019)	Urbanization	UNSDG 8 UNFSS Action Track 4
Utilization	Stunting/Overweight	FS + Nutrition Outcomes	Bene et al. (2019)	NA**	UNSDG 2 UNFSS Action Track 1
Utilization	Burden of Foodborne Illness	FS + Nutrition Outcomes	Bene et al. (2019)	NA**	UNSDG 2 UNFSS Action Track 1

Table 1 Resilience and sustainability indicators and their focus based on their FS Pillar of focus, Axis of impact, validation study, and UNSDG and UNFSS 2021 target goals. \*UNFSS Action Track 5 is titled “Build resilience to vulnerabilities, shocks and stress”. Given that the indicators used in this assessment are being used to address resilience, all

indicators listed in Table 1 are in fact inherently targeting UNFSS Action Track 5. \*\* FS + Nutrition Outcomes axis are outcomes of the interlinked composition and action of food system drivers, FS + Nutrition Outcomes are not dominantly linked to only one driver.

Politics and political leadership are drivers of food systems through the implementation (or lack of) policies and systems regarding agriculture, nutrition, and trade. Long-term political malpractice, negligence and mismanagement have been frequent critiques of the Lebanese state (Nagle and Clancy, 2019; Mazzucotelli, 2020; Shehabi et al., 2020). The FAO Statistical Database (FAOSTAT) political stability and absence of violence index measures perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically-motivated violence and terrorism. In Lebanon, this index decreased significantly, from a -0.44 in 2000 to -1.64 in 2018, indicating decreased political stability. This significant increase comes even before the 2019 Lebanese Revolution, persisting economic crisis, Covid-19, port explosion, and absence of government, and is likely significantly more severe presently.

Before the Civil War, a political focus on banking and finance led Lebanon to experience a rural crisis paired with mass urban migration, as the nation attracted capital from Europe and the Americas, as well as the neighboring Arab world with its “laissez-faire economy with minimal state interference and public services” (Baumann, 2019, pg. 62) A colonially implanted consociational power-sharing democracy with little to no public services, average citizens relied on their confessional political representatives for access to education, health services, and employment (ibid.).

The start of the Civil War in 1975 saw the exit of most foreign banks from the country, as well as a “new diaspora bourgeoisie of Lebanese who became contractors in

the Gulf during the oil boom” (ibid., pg. 63). After the Civil War, Lebanon had effectively lost its role as a banking and economic intermediary between its Western and Eastern neighbors. In an effort to avoid another currency crisis and emulate a stable economy, the nation effectively shifted its economy towards dependency on Gulf nations, through foreign direct investment hyper-focused on real estate (post-war reconstruction by Solidere), and through remittances from the large portion of the diaspora working and living in Gulf countries (ibid.).

A spike in national debt came as a direct resultant of post-Taif Agreement sectarianism and its impact on the reconstruction of the Central Beirut District, which sparked an “irreversible” debt crisis, and led to the dollarization of the economy (Mazzucotelli, 2020). Clientelism and real estate investments made Lebanon a capital sink for Arab, and specifically Gulf capital, and the dollar peg made importing goods a cheaper option than local production. By 2014, remittances accounted for 26.5% of total GDP (ibid.). Throughout all of this, massive debt servicing and interest payments eradicated any capacity for public spending on social services or infrastructure, and the Lebanese economy devolved into a system “completely oblivious to the social and environmental consequences of the pathology of obsessive wealth accumulation” by the ruling class, who had “one foot in the state and another in the economy” (Shehabi, 2020, pg. 35). Despite showing “growth”, Lebanon’s massive debt to GDP ratio, third highest in the world behind Japan and Greece, as well as double digit current account deficits in 19 of the last 25 years were indicators of massive structural problems in the Lebanese economy (ibid.).

#### 4.6.1. The Devaluation of the Lebanese Lira

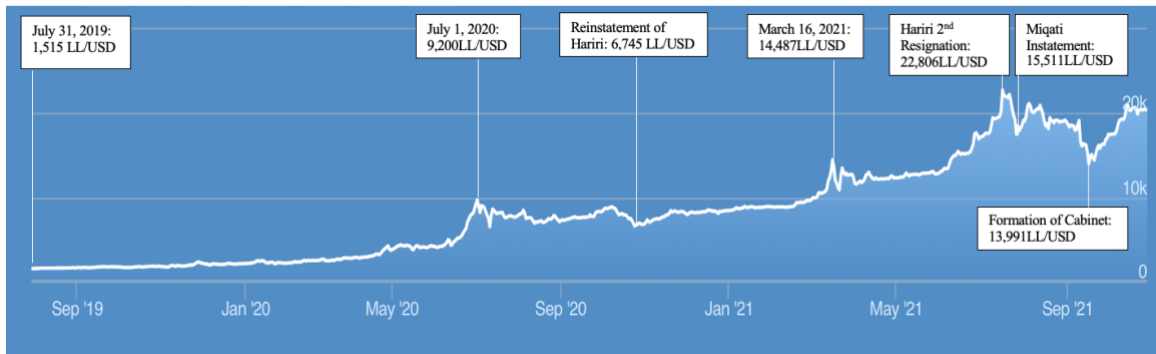


Figure 4 LL Devaluation Pinned to Political Speculation (Data from [lirarate.com](http://lirarate.com))

As the crisis in neighboring Syria heightened and the inflow of foreign currency, dependent on Gulf real estate investments and expatriate remissions, Lebanese banks started offering extremely high interest rates (up to 14%) to encourage and drive in investments, but simultaneously requiring consistent new investment to pay off previously prescribed interest (Koffman, 2020). Signs began to show - foreign money transfers were paid out in Lebanese Lira even when sent and denominated in US Dollars, as the floor began to fall out from what was essentially a national-scale Ponzi scheme. While in retrospect there were clear signals of a disparaging currency crisis to come just a few years down the line, financial puppetry through high interest rates and the unwavering dollar exchange rate feigned the stability of the Lebanese economy, until late 2019 (ibid.).

The Lebanese Lira (LL) began losing value against its 24-year post civil war peg of 1507.5 LL to \$1 US in August of 2019, with devaluation and short term stabilization closely tied to political and social events occurring in Lebanon over the following two years – highlighting the influence of exchange speculation and financial puppeteering in the collapse of the lira. The following section will outline the fall of the Lebanese Lira, and identify significant events that led to devaluation or stabilization. Political protests

against corruption and mismanagement erupted on October 17th, 2019, in part catalyzed by announcements that taxes would be added to free services like WhatsApp, as well as subsidized goods like tobacco and gasoline (Mordecai, 2019). In response to the protests, Prime Minister at the time Saad Hariri stepped down on October 29th, and the Lebanese Lira slipped steadily over the following months, from the dollar peg of 1507.55 LL to \$1 US, to 4,300 LL by June 13, 2020, accelerated by and in alignment with a lack of political stability, the outbreak of Covid-19 in Lebanon, and the nation's Eurobond default, the first default in its history, on March 9, 2020 (Mordecai, 2019; [lirarate.com](http://lirarate.com)).

By July 1, 2020, the LL had jumped to 9,200 LL to the dollar, re-sparking protests previously paused due to Covid-19, and destruction of banks throughout the country as citizens watched the value of their savings freefall (Bahn et al., Food Security Briefs). Fluctuations continued, highly linked with political happenings and speculation. In September of 2020, a continuous inability to form a government after Hassan Diab's resignation after the Beirut Port Explosion, speculation of political instability led to further economic instability: the September 26 resignation of Prime Minister designate Mustapha Adib led to devaluation. Shortly after, the reinstatement of Saad Hariri as PM in October of 2020 saw slight stabilization, dropping to 6,745 LL to the dollar, a low not seen since mid-June. Further, an international donor conference to bring foreign currency to Lebanon saw the stabilization of the LL at just over 8,000 LL to the dollar (Bahn et al., Food Security Briefs, [lirarate.com](http://lirarate.com)).

Despite this, increased withdrawals of foreign currency, drying up of remittances, and lack of private sector deposits continued to push the LL in the general trend of depreciation, despite these small stints of stabilization based on political

speculation. In December of 2020, continued failure to agree on and form a new cabinet, and announcements by French President Macron that visits to Lebanon would not happen increased speculation that foreign investment would not enter Lebanon, and LL value against the dollar steadily decreased (Bahn et al., Food Security Briefs).

The lira hit a new all-time low at the end of February, 2021, reaching nearly 10,000 LL to the dollar as a new cabinet formation continued to stall and fail, import needs continued, and central bank demands to increase local bank capital decreased availability of USD. Record spikes continued, reaching nearly 15000 LL to the dollar by mid-March, 2021, and recovering slightly and seemingly arbitrarily to under 12,000 by the beginning of April – a sign of severe speculation over political and bank action, subsequently driving exchange changes (ibid.).

The LL broke 20,000 LL to \$1 US for the first time in accordance with the second resignation of Prime Minister Saad Hariri on July 15, 2021. Spikes to 23,000 by mid July 2021 led to protests and violent clashes with military personnel across the country, and continuous uncertainty of the formation of a new government made the LL extremely volatile throughout the summer of 2021, with frequent variation and a high of 22,806 LL to the dollar on July 16, the day after Hariri's resignation (Qiblawi and Salem; [lirarate.com](http://lirarate.com)). Just 10 days later came a summer low of 15,511 LL to the dollar on July 26, the same day as billionaire Najib Miqati was designated the new PM, citing optimism on political stability with hope for a forthcoming formation of government under Miqati (ibid).

After an agreement between PM Miqati and President Aoun on a new governmental cabinet on September 10th, 2021, the first since the Beirut Port Explosion more than a year prior, saw appreciation of the LL against the dollar, with a low on Sept

16, 13,991 LL to the dollar. Despite this brief appreciation, the LL has devalued and experienced brief restabilization at just above 20,000 throughout most of October (Qiblawi and Salem, 2021).

#### ***4.6.2. Political Leadership and Governance***

In general, the Northern governorate, and other areas that rely most heavily on agriculture see little to no trickle-down from the wealth amassed by Beirut's finance and real estate elite. The lack of public services, paired with the confessional nature of Lebanese politics, especially in poorer areas, allows political parties and figures to abuse their position and plunge the general Lebanese population into a deeper reliance on them for access to education, healthcare, employment, and other services that would otherwise be out of reach. As such, "the quality of education... depends on the ability to pay" entrenching a cyclical reproduction of societal advantage and disadvantage determined by wealth and/or confessional relations (Baumann, 2019, pg. 69). Health care systems operate similar to education - wealthy and connected individuals can pay or maneuver their way through prohibitive prices of private services and low quality of public services in a system where 90% of hospital beds exist in private institutions, and ambulatory care is primarily available through private clinics and pharmacies (ibid.).

A final inequality found in access to services, again dependent on personal wealth, comes in the form of access to electricity. A 2020 study shows that diesel generators account for roughly 37% of all electricity generated in Lebanon, to make up for the lack of consistently available public electricity, and that 75% of residential and commercial customers rely on diesel generated electricity (ESMAP, 2020).



In October of 2019, nationwide protests against the corruption and fiscal mismanagement of politicians and governmental leaders that led to the start of the Lebanese Lira's devaluation saw millions take to the streets demanding change. Despite this, change was not delivered, and conditions only worsened. Instability, speculation, and hard currency shortages led importers to demand payment in foreign currency, causing large price spikes for food and other basic commodities, and capital flight in the order of \$2.3 billion in only three weeks led to a \$63 billion currency mismatch between US Dollars and the Lebanese Pound, with the latter's devaluation now approaching 90% (ibid.).

The ongoing Covid-19 crisis led to a four month closure of land borders and airports, "severely disrupting the import of raw materials and basic goods, and the inflow of foreign currency" that the country is heavily dependent on (UNESCWA, 2020, pg. 3). Covid-19 also led to huge losses in income and employment, paired with a significant increase in prices and massive devaluation of the Lebanese pound (ibid.). Simultaneously, a 71% decrease in international tourist arrivals between January to May 2020 is estimated to reduce national GDP by at least 13% (international tourism accounted for 19.47% of total GDP in 2019) (FAO 2021).

On August 4<sup>th</sup>, 2020, political mismanagement led to the massive explosion that rocked Beirut, killing hundreds and leaving hundreds of thousands with destroyed homes, and also damaging grain silos and food supplies (Abouzeid, 2020). It is well known and widely cited that the Port of Beirut violated regulations and safety standards in the storage of the ammonium nitrate that led to the Explosion (Cheaito and Al-Hajj, 2020; Al-Hajj, 2020). Political failure and corruption are widely cited as the cause of the blast, with members of government said to have known of the amount of explosive

ammonium nitrate in the port well before the explosion (Gavlak, 2020). At the time, Prime Minister Hassan Diab stepped down over the Port explosion, and blamed chronic corruption and his political opponents for the blast (Hubbard, 2020).

In terms of agricultural governance and policy, despite many food safety, agriculture, and nutrition policies or action plans being identified and accepted, many are never implemented or developed, and there is a significant lack of funding, national strategies, cooperation (between academia, government, research, and industry), and infrastructure and technological support (FAO 2010; McKelvey, 2020).

Recently, in an effort to mitigate the effects of the tripartite crisis on the most vulnerable in Lebanon are continuously put off: “A 246 million USD loan from the World Bank intended to provide a social safety net to the most vulnerable households has reportedly been delayed as a result of administrative blunders” while other programs aimed at providing rations to the nation’s poorest have been approved, yet not effective, due to an inability to properly execute implementation of the plan (FSB 17). Inability to govern properly reduces sustainability of the FS and produces highly negative FSO, time and again disproportionately disadvantaging those most at need in the LFS.

#### ***4.6.3. Land Ownership Equality***

Calo (2020) highlights the critical role that land tenure and land ownership play in the development of resilient food systems and adaptive capacity. Where decision making on the scale of individual farmers and producers is often discussed in the context of adaptive capacity within food systems, the impact of land ownership and rights are overlooked and undervalued. The question ‘who has the power to adapt’

arises when considering land tenure in food systems – farmland tenure is a crucial tool in observing “the social relations that mediate any benefits of agricultural diversification” (ibid., pg. 2). Failing to address, analyze, and understand which actors have the power and ability to benefit from adaptive capacity in the food system effectively mislocates “the power of decision making in land tenure regimes where the ‘farmers’ are overly constrained by the social relations that condition their land access” (ibid., pg. 4).

In Lebanon, the dynamics of political and social power are reflected in land tenure and ownership of productive resources. Nationwide, and running parallel to the dynamic of wealth conglomeration and inequality in Lebanon, the top 10% of landlords own 60.6% of the country’s total agricultural land, with the top 1% with ownership of 26.5% of total land (Hamade, 2019). Regional disparities in plot sizes, land tenure, and production activities highlight the nature of Lebanese land ownership. In the West and Central Beqaa, large plots, covered by crops intended for export and under intensive production dominate the landscape (Table 2 and Table 3). Subsequently, these regions are also most heavily tied to politically affiliated private owners and absentee landlords who rent out land on short term contracts (Table 2 and Table 3) (ibid.).

		0.1ha ≤ area ≤ 0.2ha	0.2ha < Area ≤ 0.5ha	0.5ha < Area ≤ 1ha	1ha < Area ≤ 2ha	2ha < Area ≤ 5ha	Area > 5ha	Total
West Beqaa	Share of land	%2.7	%5.1	%6.7	%7.8	%13.8	%63.9	%100
	Share of plots	%34.8	%13.5	%15.4	%9.1	%7.4	%7.8	%100
Central Beqaa	Share of land	%1.1	%4.7	%9.1	%11.0	%21.8	%52.3	%100
	Share of plots	%15.2	%25.3	%23.5	%15.0	%13.6	%7.5	%100
Baalbek Hermel	Share of land	%4.0	%11.5	%16.4	%18.6	%26.7	%22.9	%100
	Share of plots	%28.0	%30.3	%20.5	%12.1	%6.8	%2.4	%100
Akkar	Share of land	%9.1	%18.3	%21.7	%19.3	%17.2	%14.5	%100
	Share of plots	%40.8	%30.4	%16.8	%7.9	%3.4	%0.8	%100

Source: Author elaboration from Ministry of Agriculture and FAO (2010) census raw data

Table 2 Plot size by region (Hamade, 2019)

		West Beqaa	Central Beqaa	Baalbek AL-Hermel	Akkar
Farmed by land owner	Share of land	%33.0	%57.5	%64.8	%73.1
	Share of farms	%67.2	%79.1	%74	%83.7
Leased out	Share of land	%50.3	%36.6	%14.7	%21.5
	Share of farms	%11.1	%16.5	%6.4	%8.5
Share cropping	Share of land	%11.0	%5.4	%3.3	%0.9
	Share of farms	%3.5	%3.1	%1.5	%0.6
Other	Share of land	%5.7	%0.4	%17.1	%4.5
	Share of farms	%18.2	%1.4	%18.1	%7.3

Source: Author elaboration from Ministry of Agriculture and FAO (2010) census raw data.

Table 3 Land tenure by region (Hamade, 2019)

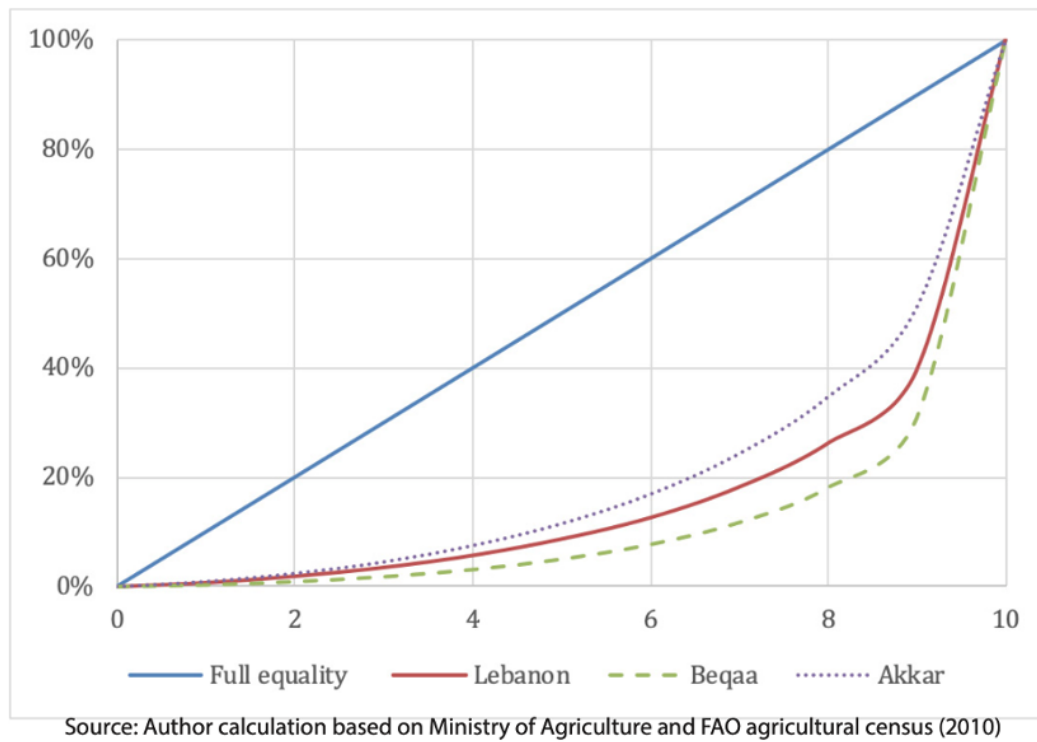


Figure 5 Lorenz curve of agricultural holdings (Hamade, 2019)

Further, 75% of plots require seasonal labor. While Syrian citizens have historically worked seasonally in Lebanese agriculture, the Syrian crisis that led to the displacement of more than a million Syrian nationals within Lebanon amplified the availability of cheap labor. A disproportionate amount of these displaced citizens are concentrated in Northern Lebanon and the Beqaa region – where agriculture accounts for roughly 80% of local GDP (FAO, 2014). In these rural, agricultural areas, limited land, employment, and input resources has also led to competition between Lebanese host communities and displaced Syrians (Sumpf et al., 2016).

Land tenure in this fashion, paired with widely available low-wage labor disincentivizes positive action in building the resilience and longevity of agricultural lands. Heavy reliance on the availability of low-wage labor disincentivizes land owners from investment, upkeep, and eliminates a focus on long term sustainability of land and

reusability, proving a critical point of fragility in the LFS, which already faces resource scarcity and over-competition for productive and viable agricultural land (Hamade, 2020). In the long term, this pattern of land use and ownership threatens the long term production of crops in Lebanon, and simultaneously threatens access to sustainable livelihoods for Lebanese communities, as well as refugees that rely on agriculture for employment. Further, this style of land ownership reinforces the use of underpaid refugee labor - specifically dangerous for refugee women and children who work in agriculture.

#### **4.7. Income Growth and Distribution**

Contemporarily, inequality and instability have driven the nation to a breaking point - today's economic crisis. The burst of the previously described rentier economy, along with a decline in tourism and GCC remittances and investment, led to a real-estate sector collapse and a huge spike in unemployment (Mazzucotelli, 2020). As the nation's economic crisis continues to worsen, national debt financing resembles direct payment to the nation's elite, where national debt payments lead to more interest being paid to commercial banks and their shareholders, the nation's political elite (Shehabi, 2020).

As Lebanon's economy continued to become overly reliant on rent-creation mechanism "such as government debt management and urban 'reconstruction'" (Baumann, 2019, pg. 66) the vast majority of the population was excluded, and these economic endeavours only benefitted GCC contractors and wealthy individuals in the Lebanese diaspora, allowing "businessmen and warlords" to earn most of the rent, as "Lebanon's economic elite is closely networked to, or congruent with, the political

elite”, leading to increasing inequality in income financial security between the average citizen and the ruling political class (ibid., pg. 66).

#### **4.7.1. Income Inequality**

Laithy et. al highlight significant and regionally disproportionate poverty across the nation, with the poorest members of society predominantly concentrated in agricultural work (Laithy et al., 2008). Further, even in 2008, wealth distribution was highly uneven. The top twenty percent of the country account for 43% of total consumption, with the bottom twenty percent accounting for only 7%. 8% of the country lived in extreme poverty, with 28.5% living under the upper poverty line. Regionally, the Northern Governorate holds only 20.6% of the population, yet 46% of the extremely poor and 38% of the total poor. (ibid.).

Although the cost of cutting extreme poverty by 50% or more was, at the time, considered quite low, the report warned that if future was unequal, anti-poor, or highly consolidated amongst the already rich and powerful, the economic and social consequences, as well as the cost of reducing poverty, would “rise dramatically” (ibid.). As predicted, the consequences rose dramatically. The country profile report outlined that Lebanon’s macroeconomic and fiscal policies “will have to be redesigned” if the nation wants to increase public expenditure, social services and safety nets, decrease poverty (ibid., pg. 14).

Chaaban (2016) highlights that by 2014, 18 out of the 20 major banks in Lebanon had major shareholders directly linked to the political ruling class, and that roughly 43% of all banking sector assets are directly linked to political control. Further, most of the debt created was resultant not of rebuilding physical infrastructure itself, but rather overpayments on the high interest rates of government debt in attempts to

maintain currency stability at the post-war US dollar peg (Gaspard, 2003). There was a massive consolidation of wealth, with the wealthiest 10% of the population owning 70.6% of all personal wealth in the country (UNESCWA, 2020). By 2017, the top 2% of private sector income was equivalent to the bottom 60% - leaving Lebanon ranked 129 out of 141 globally in terms of income inequality (Saliba et. al, 2017).

The Lebanese system is well documented as ruled by a handful of political elites and rife with inequality, corruption and mismanagement. Eight families control 29% of all banking assets within Lebanon (more than \$7.3 billion) (Shehabi, 2020). Wealth is highly concentrated, with three banks holding 45% of the entire sector's assets, and the top ten banks approaching 90% of total assets (Chaaban, 2016). In terms of depositors, the largest 1% of accounts hold half of all deposits, with the largest 0.1% holding 20% of all deposited wealth, signifying massive wealth inequality and high levels of consolidation amongst Lebanon's wealthiest individuals (IMF, 2017).

The wealth of Lebanon's billionaires is worth about 30% of total national income, and, tied to the previous sections description of GCC dependency and wealth as a necessity for Lebanon's economy, "the source of wealth of Lebanon's seven biggest tycoons lies in the Gulf" (Baumann, 2019, pg. 68). Both families that represent nearly all of these tycoons - the Hariri family and the Miqati family - "both... originally amassed their wealth through Gulf contracting and both had a family member assume the post of prime minister" (ibid.) further highlighting the continuous overlaps in Lebanese political and economic spheres.

The disparity between the elite who benefit from the nation's debt crisis and the average citizen is astounding: with one of the highest concentrations of billionaires per



capita, and billionaire wealth equivalent to the wealth of the bottom 62.4% of the personal wealth of all adults in the country (UNESCWA, 2020).

Overall, postwar capitalism based on inflows of foreign currencies, heavily through rentierism and remittances from the GCC countries, mixed with political confessionalism and clientelism have driven Lebanon straight into the ground, at the expense of its people, and to the benefit of its political and economic elite.

#### ***4.7.2. Individual Purchasing Power***

Seekell et al. (2017) identify socioeconomic access to food as one of the main national-scale resilience indicators for food systems. They cite that resilience can be considered higher in “countries where the poor have higher income relative to food prices, compared to countries where the poor have low incomes relative to food prices” (ibid., pg. 3). Essentially, strength or weakness of individual purchasing power for actors in a food system is indicative of system resilience or fragility, respectively.

Currency devaluation due to the economic crisis, described above, and visualized through Figure 6 have led to a massive contraction of the Lebanese middle class, and an extreme increase of poverty and extreme poverty since the outbreak of the tripartite crisis. Lebanon’s national annual inflation is now the highest in the world, surpassing Zimbabwe and Venezuela (FSB 19)

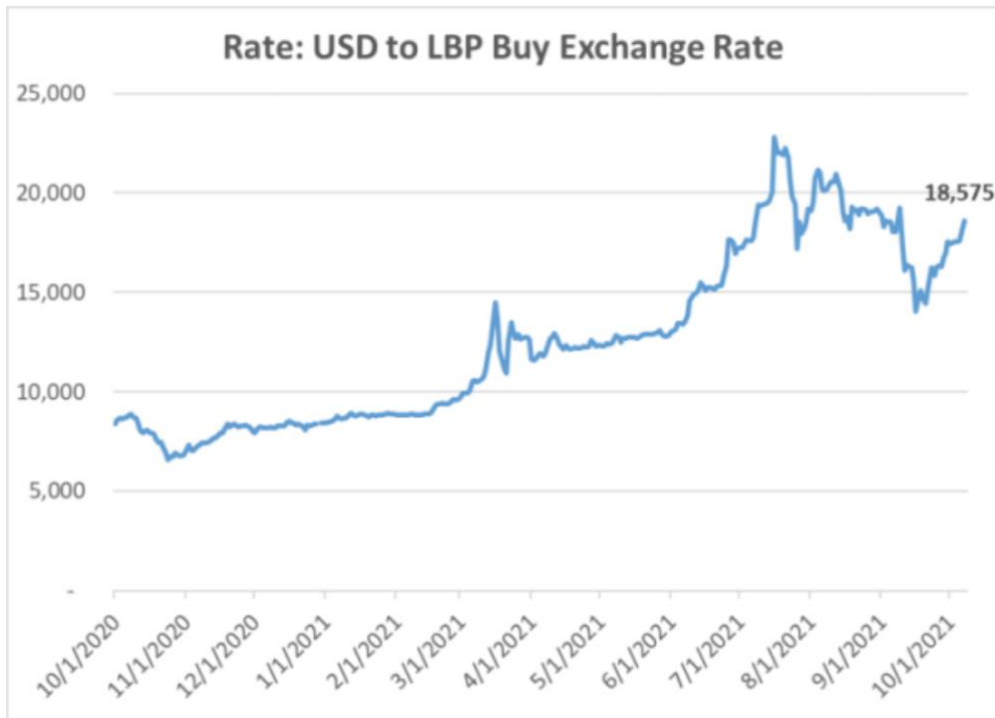


Figure 6 Lebanese Lira Devaluation

Recent literature highlights the continuously rising poverty in the nation, and diminishing individual purchasing power and economic agency. By 2020 the total number of poor people in Lebanon increased by 1.4 million, with extreme poverty increasing by 800,000, and the middle class contracting from 57% of the population to less than 40% in just one year (UNESCWA, 2020).

#### ***4.7.3. Food Consumption as Share of Total Income***

As mentioned earlier, before the tripartite crisis, households in some rural areas of Lebanon already spent more than a third of total income on food consumption (Issam Fares Institute, 2014). While a more recent statistic is unavailable, this statistic can be expected to have risen significantly in the past two years. As of mid-2020, 40% of Lebanese households had difficulty satisfying their food security needs due to lack of

purchasing power and increased prices (WFP & WB, 2020). At the same time, a total of 19% of all Lebanese households reported that they were currently consuming insufficient diets (ibid.). Comparatively, a more recent study shows a significant increase in food insecurity. By the end of 2020, 40% of households had difficulty accessing markets to buy food, and 56% of households started eating less than two meals a day to save money and food (Hoteit et al., 2021). More than 70% skip at least one meal, and 53% of the nation has a poor food consumption score (ibid.).

Moreover, 50% of households had begun resorting to severe coping strategies in an attempt to maintain food security: 27.7% directly spent savings, 38.1% sold productive household assets, and 54.1% took on debt, of which the majority cited the main reason being to afford food (Figure 7) (ibid.).

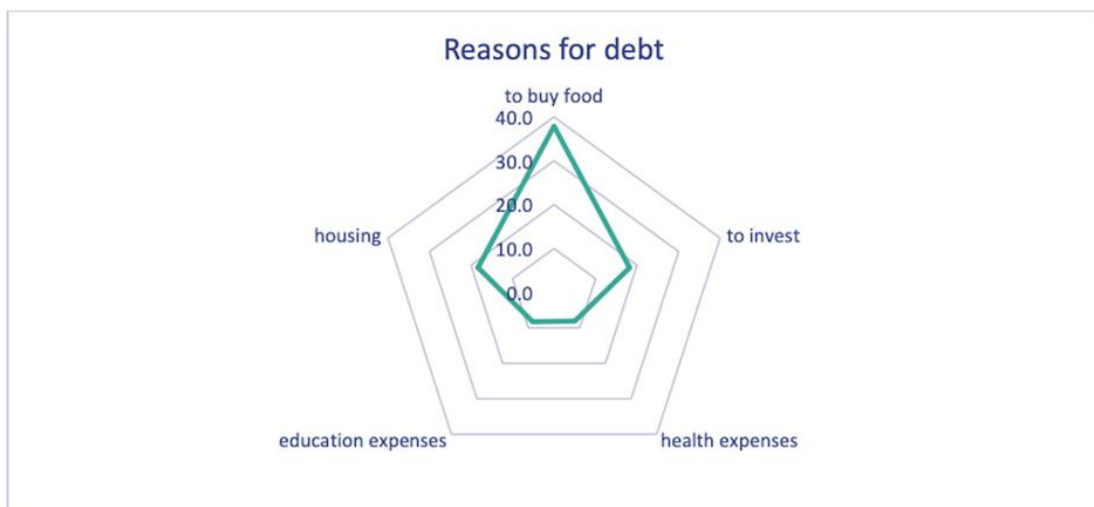


Figure 7 Reasons for Incurring Debt (Hoteit et al., 2021)

In attempts to lessen the total share of income spent on food consumption, nutritional outcomes were also severely reduced. An alarming 85% of Lebanese are buying cheaper foods, of worse nutritional value, to be able to consume enough food. This is reflected in purchasing shifts and market records - showing 105% increases in sales of cheaper basic foods like cereals, pasta, sugar, and rice, and a 50% decrease in the volume of sales of functional foods (Hoteit et al., 2021). Almost all respondents reported eating less diverse foods, and more foods with high fat, oil, and sugar contents due to the lower prices (ibid.).

This reality is alarming in a nation where 84% of mortality is already attributed to chronic NCDs. As diets shift towards unhealthier, energy-rich foods with poorer nutritional quality, chronic disease will become an even larger threat, for a people with decreasing access to proper health services. The current crisis puts proper healthcare off the table for most Lebanese. With healthcare, medical services, and basic medicines unavailable due to prohibitive pricing of private services and inability to import medicine due to currency devaluation, few outside of the elite are able to afford the cost of living. A recent study found that 45.2% of respondents in a recent study had no health insurance at all, and 19.8% were already suffering from NCDs, now unable to afford proper medicine or treatment due to lack of purchasing power from currency devaluation (Hoteit et al., 2021).

#### **4.8. Population Growth and Migration**

Population growth is a significant driver of FS, indicative of speed at which a nation's population increases or decreases, and informs nationwide age profiles, and thus dependency ratios: household crowding and a higher number of dependents per household is directly related to increased food insecurity (Jomaa et al., 2019). Further, faster growing populations put food systems under more stress to continually meet the needs of a growing population. Lebanese population growth has fluctuated dramatically since the beginning of the 21<sup>st</sup> century, from a -0.055%/year in 2008, to 6.568% in 2013, back to 0.099% in 2019. This dramatic fluctuation is likely due to a large influx of displaced citizens and refugees fleeing conflict zones in neighboring Syria and entering Lebanon. In Lebanon's unique case, rapid population growth through migration not only directly impacts the food system, but also serves as an influencing factor on other food system drivers, as discussed below.

##### ***4.8.1. Equitable FS for Marginalized Communities***

Marginalized and refugee communities often face significant disadvantages in daily living. In Lebanon, While inadequate infrastructure to serve its own population was already a challenge inhibiting functions of the Lebanese food system, an influx of more than one million conflict-displaced Syrian nationals added further strain across food system value chains (Sumpf et al., 2016). A disproportionate amount of these displaced citizens are concentrated in Northern Lebanon and the Beqaa region – where agriculture accounts for roughly 80% of local GDP (FAO, 2014). In rural, agricultural areas, limited land and input resources has also led to competition between Lebanese host communities and displaced Syrians (Sumpf et al., 2016).

Syrian refugees are effectively universally worse off in terms of food security and livelihoods than Lebanese citizens, and despite significantly lower average food consumption compared to Lebanese citizens, the environmental and socio-economic impacts of the diets of a large number of refugees in Lebanon are significant (Skaf et al., 2021). Specifically, producers within the food system are disproportionately poor, and disproportionately composed of Syrian refugees: 67% of households for which agriculture is the main source of income fall below the poverty line, and 21% of Syrian refugees are employed in the agricultural sector compared to 5% of Lebanese, leaving more refugees employed in the informal sector without guaranteed pay, access to healthcare or other benefits (Table 4) (Hamade, 2019; Skaf et al., 2021).

	<b>Employees in informal jobs</b>
<b>Lebanese</b>	27.8%
<b>Non-Lebanese</b>	91.1%

Table 4 Employment Style by Nationality (Central Administration of Statistics)

Overall, refugee communities face extreme inequity in their host FS, as exemplified by FS and Nutrition outcomes of Syrian refugee populations over time, showing levels of FI much higher than those of Lebanese host communities, and increasing moderate and severe food insecurity (Figure 8) (VaSyr 2020).

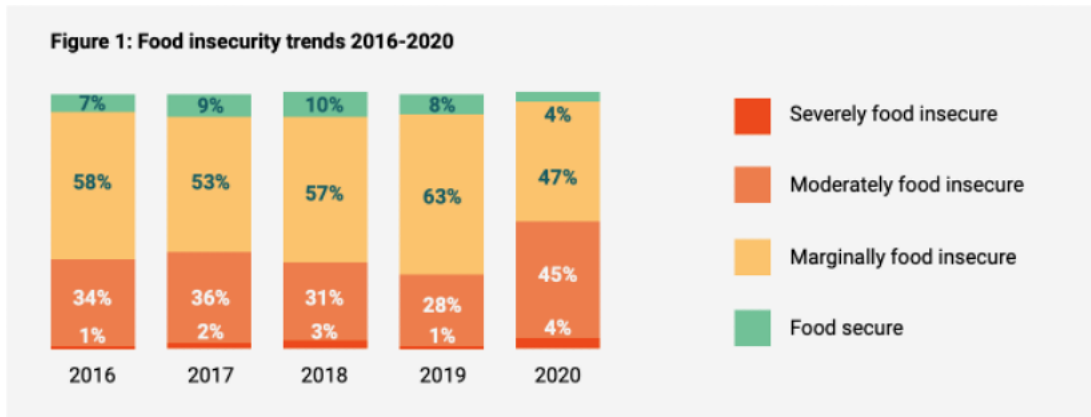


Figure 8 FS and Nutrition outcomes for Syrian Refugees in Lebanon

Equitable FS for marginalized refugee communities in Lebanon are a clear and significant point of fragility in the LFS. Food systems for Syrian refugee communities in Lebanon are indisputably unequal, with Syrian refugees performing significantly worse across the board in virtually all aspects of food security - while simultaneously being overrepresented in exploitative agricultural labor, as previously described (Figure 9).

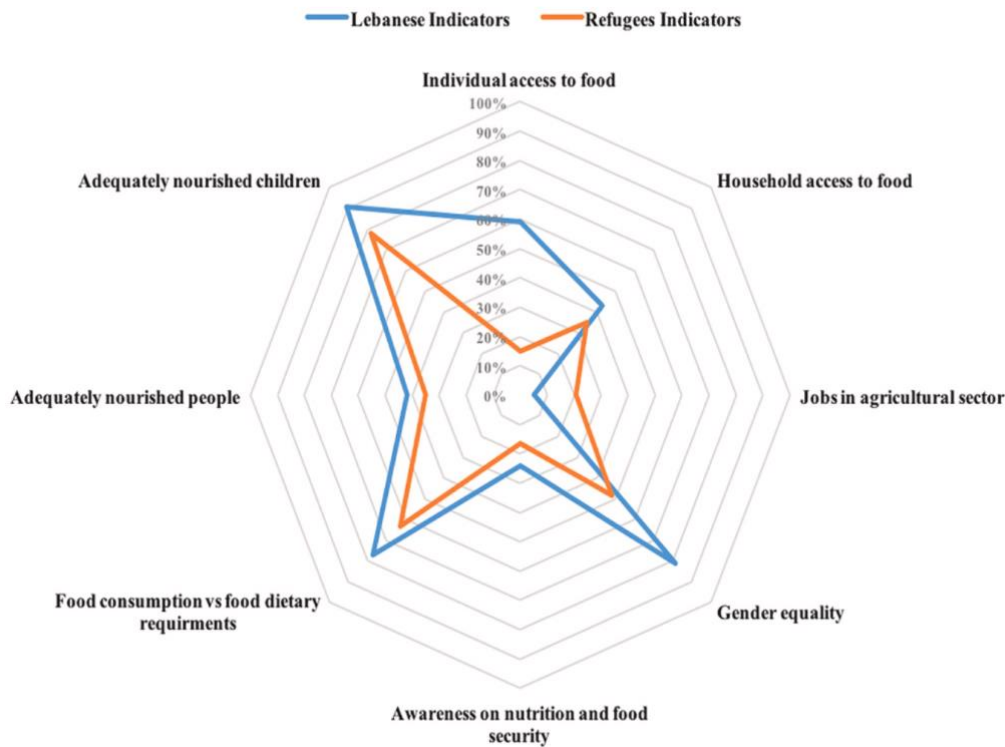


Figure 9 Inequitable FS for Marginalized refugee communities (Hoteit et al., 2021)

#### 4.9. Climate Change and Environment

As an accelerator of climate change, GHG emissions are not only indicative of food system impact on climate change, but additionally representative of large scale land transformations like clearing or burning. The FSD measures drivers of Climate Change and Environment through the quantification of total GHG emissions, including Land Use and Forest Change. Lebanon emitted 34.28Mt in 2018. In terms of other environmental factors, resource pollution and water scarcity are drivers of the Lebanese food system with negative outcomes. High population influxes and lack of infrastructure have led to an estimated 8-12% increase in national water demand, and a decrease of groundwater levels between 1 and 20 meters in different regions of



Lebanon, indicating groundwater stress and increased demand (Republic of Lebanon Ministry of Environment, UNDP, 2015). Massoud et al., (2021) determined that in the Beqaa valley, one of the most productive agricultural regions in the region, there is an “overall long-term trend of groundwater depletion” in most wells in the Beqaa due to unsustainable groundwater pumping (pg. 12).

Even before population increases due to migration and displacement, Lebanon only treated 8% of national wastewater, with 92% of wastewater being released into open land or waterways (ibid.). Massive pollution of natural resources in Lebanon leads to increased risk of surface and groundwater contamination, increased flood risk due to clogged waterways, and the degradation of viable agricultural land due to development of informal settlements on agricultural land (ibid.). Overall, water pollution and depletion, limitations of arable land, and competition for natural resources are environmental drivers of the Lebanese food system.

In terms of climatic changes, the average temperature in Lebanon has increased at a rate of 1.97 degrees Celsius per century since 1960, with the hottest years on average since 1750 being 2010, 2018, and 2016, respectively (FAO, 2021). Despite this, Lebanon is listed as a medium to low climate risk nation under the VERISK climate vulnerability index. Recent media reports, however, contradict this notion, citing that Lebanon’s wine production - a growing industry that holds serious potential for wealth generation through exports of locally produced wine, is suffering from climatic changes. Lebanese viticulture, which produces roughly 8.5 million bottles annually (half of which are exported) has seen significant growth in export values, from \$13.8 million in 2015 to \$20.3 million just three years later (Dadouch, 2021). Changes in temperature and disruptions to traditional rainfall patterns have posed serious challenges for this

emerging industry. Trends towards less rainfall coming at different times during the season, in conjunction with earlier heat waves and higher temperatures have significantly reduced production (ibid.).

#### ***4.9.1. Biophysical Redundancy***

Biophysical redundancy specifically pertains to the biotic and abiotic environmental conditions for potential future crop development. Fader et al. (2016) point out that “diverse trends in population growth, climate change, industrialization, urbanization, and economic development” impact food production and distribution across multiple scales. Local production, national agricultural practice and policy, as well as international trade flows will be affected by these shifts, specifically “implying risks for resource-constrained, food importing countries” (ibid., pg. 2). Reliability and consistency are two priority outcomes of complex systems like food systems. Within such systems, “redundancy of components or resources is considered a key element of resistance” (ibid.). Further, Seekell et al. (2017) support this definition and state that biophysical capacity contributes to resilience as a form of system redundancy, allowing for more diverse operational pathways in the face of crisis.

In Lebanon, cereal import dependency ratio rose from 88% to 99.5% between 2000 and 2017, indicating high risk for Lebanon given its resource-poor, highly import dependent nature (FAO, 2021). Lebanon also falls in the category of “very low biophysical redundancy”, which includes values between 0-0.25, throughout the entire 20 year time-range of the study (Figure 10). Falling from a value of 0.052 in 1992 to 0.015 in 2012, Lebanon is on the very bottom of the range of countries for biophysical redundancy, indicating a lack of land and water resources available for future

extensification and/or intensification of agriculture, and signifying low resilience and a likely increase in import dependency in coming years.

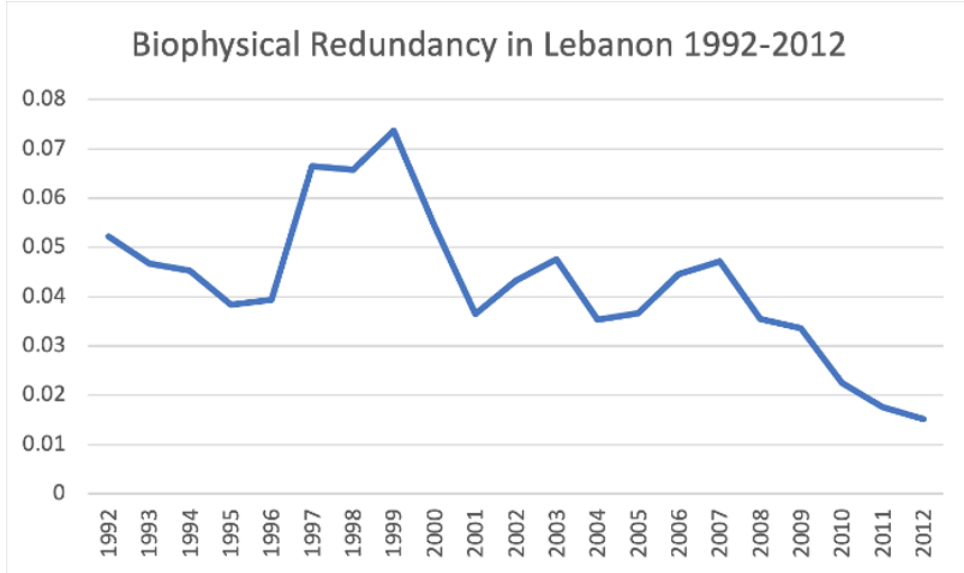


Figure 10 Biophysical Redundancy in Lebanon

Further, the food system in Lebanon heavily pollutes natural waterways and other water resources. Waste from agri-food producers and processors are cited as a major factor in the pollution of the Litani River, and excessive use of pesticides, fertilizers, and veterinary medicines have increased nitrogen and heavy metal levels in surface and groundwater resources in Lebanon (FSP 2021). Massive price increases due to currency devaluation and the necessity to import inputs in dollars has led many farmers to turn to cheaper input alternatives that are more damaging to both the environment and human health, likely to add stress to ecosystems and public health systems (ibid.). In a nation already facing extremely low biophysical redundancy, the pollution of scarcely available and rapidly depleting and degrading natural resources is cause for significant concern.

In addition to the already limited capacities of Lebanon's natural resource endowment, an influx of refugees further strain the system. Refugee diet patterns significantly impact the environment, and "despite the lower food intake of refugees, their population has a significant contribution in terms of direct and indirect natural resources consumption and environmental impacts" (Skaf et al., 2021, pg. 5). Overall, the refugee diet in Lebanon contributed to roughly 25% of Lebanon's environmental impact due to food consumption (ibid.).

This reality is a clear point of fragility in the LFS, where crisis leads to increased pollution and use of more dangerous chemicals in a reality of existing and significant limitations to natural resources. Pollution and contamination at a high level will render even more of Lebanon's limited resources unusable, and decrease further the nation's biophysical redundancy, putting domestic and export-based food systems at high risk for future failure.

#### ***4.9.2. Food Waste***

In Lebanon, up to 30% of all food products end up in the trash - with a staggering rise to 65% of all fruits and vegetables (Foodblessed Lebanon, 2020).

Chalak et al., 2019 found that household food waste in Lebanon leads to a caloric loss of 451kcal/day, with dairy products, oils, and bread being the main sources of wasted food. Further, significant amounts of dietary fiber, and micronutrients like iron, calcium, and vitamin D were lost due to food waste in Lebanon. Food waste is a point of fragility in the LFS, as valuable nutrients like dietary fiber are lost, where roughly two out of three adults do not meet adequate daily dietary fiber intake, and almost 84% of deaths in the country are attributed to NCDs, whose risk is increased through inadequate consumption of fiber and other micronutrients (ibid.).

In terms of the environmental impacts of diets, Lebanese diets were found to be significantly more environmentally damaging than dietary patterns of Syrian refugees living in Lebanon (Skaf et al., 2021). Further, the average Lebanese individual diet pattern wastes nearly four times more food annually than that of Syrian refugees (9.20 kg/yr versus 2.43 kg/yr). Despite this difference, both groups are well beneath the average annual food waste rates in European countries, ranging between 55 and 190kg/year (ibid.).

#### **4.10. Globalization + Trade**

The interconnectedness of the global food system shapes national food systems in multiple ways. While trade has the capacity to increase food availability and dietary diversity, it can also disproportionately increase the availability of cheap, processed, unhealthy foods that lead to negative health and food security outcomes. Globally, the nutrition transition leads consumption patterns from traditional diets to globalized, highly-processed diets with an overabundance of salt, saturated fats, and added sugars. In conjunction with reduced physical activity, these functions of globalization contribute to prevalence of overweight/obesity and non-communicable diseases. In Lebanon, total food import value has been increasing at an average annual rate of 8%, annually, with 80% of total wheat supply coming as imports (Bankmed, 2016; USDA Foreign Agricultural Service, 2016). As of 2014, 17.85% of all merchandise shipments to Lebanon were food product imports, with the highest volume of imports coming in the form of prepared foods and animal and vegetable products (USDA Foreign Agricultural Service, 2016).

The inverse relationship between increasing globalization and trade flows and the vitality of local food production and agricultural livelihoods are well documented (Mary, 2019; Zimmerman and Rapsomanikis, 2021). In a study of 52 low income, net importing countries, food trade openness had an overwhelmingly adverse effect on FS (Mary, 2019). Increasing import competition for local producers reduces the viability and feasibility of local agricultural livelihoods, and significantly damages those that rely on agriculture to survive, namely, in the case of Lebanon, marginalized refugee communities, women, and Lebanese citizens in poorer rural regions in Akkar and the Beqaa.

#### ***4.10.1. Diversity of Trade Partners***

In Lebanon, crop diversity and patterns changed from a more traditional form of seasonal crop production to permanent, export-oriented production as demand for fresh fruits and vegetables grew from GCC countries in the mid-20th century. Agricultural systems previously “focused on the production of pulses and cereals in the summer, legumes in winter, and sustainable traditional forms of animal grazing” quickly transitioned to permanent production of “apples, apricots and almonds, and cherries” to take advantage of growing export markets due to GCC demand (Hamade, 2019, pg. 261). In addition to shifting focus to exports and away from more diverse seasonal cropping patterns, this transition “put an end to the previously predominant sharecropping system, leaving many farmless farmers with no other option but to seek job opportunities in the cities” (ibid.).

Diversity is not only important in terms of production - but additionally in terms of trade partners at the national scale. Kummu et al. (2020) highlight that food system

resilience is enhanced with the increase in diversity, number, and connectivity of trade partners. Recently, Lebanon's lack of food safety regulations and proper export governance has severely inhibited its diversity and connectivity of trade. In April of 2021, Saudi Arabia announced a ban on the import of all Lebanese produce following the confiscation of over 5 million pills of amphetamine drugs found being shipped inside of pomegranates. This ban, if upheld over a long period of time, would be a major blow to the Lebanese agricultural sector and the Lebanese economy – already experiencing the worst economic and financial crisis of its modern history (Associated Press, 2021). Without access to the largest importer of Lebanese products, Saudi Arabia, and with essential land routes to other GCC trade partners blocked off due to the Saudi ban, Lebanon's economy will take a further hit, again due to lack of proper regulations, food safety measures, and governmental management of the extremely crucial export industry.

#### ***4.10.2. Dependence on Imports***

Producers in the Lebanese food system have been struggling with the introduction of informal capital controls in Lebanon that reduce access to hard currency, reducing their ability to import raw materials, packaging materials, and fertilizers and pesticides (FSP 2021). Given that agricultural production relies heavily on imported inputs, most farmers and producers have taken a huge hit, lacking access to despite the introduction of measures by the Central Bank to provide importers with hard currency. Without access to capital for these inputs, farmers are relying on cheaper alternatives that are worse for the environment and for human health, and are expecting significantly reduced yields, which will in turn further reduce their profits (Table 5).

<b>Agricultural Commodity</b>	<b>Estimated decline in value (2020 vs. 2018)</b>
<b>Plant Production:</b>	<b>47%</b>
- Field Crops	70%
- Fruit Trees	63%
- Industrial Crops	51%
- Vegetables and Flower Crops	44%
- Forest Products	39%
<b>Animal Production:</b>	<b>26%</b>
- Meat Products	22%
- Dairy Products	35%
- Poultry	23%
- Fisheries	23%
- Apiculture	40%
<b>Total Lebanese Agriculture Production</b>	<b>38%</b>

Table 5 Decline in (USD) Value of Agricultural Commodities (CREAL 2020)

Lebanese viticulture, a burgeoning export industry with the capacity to bring in significant and crucial supplies of foreign currency, has been severely affected by the tripartite crisis. Combined with capital controls due to the economic crisis preventing or reducing the import of production materials, closures due to Covid-19, and the port explosion disrupting import and export activity, some vineyard owners cite that their total bottle sales decreased by 70% in 2020 (Dadouch, 2021).

Similarly, the restaurant industry took a massive hit from the tripartite crisis, with Covid-19 shuttering businesses during lockdowns, the economic crisis increasing operational costs due to import dependency and decreasing customer count due to decreased individual purchasing power, and the Beirut Blast destroying physical infrastructure. Even before the Blast, in February of 2020, the head of Lebanon's syndicate of restaurant owners, Tony Ramy, cited that between September 2019 and February 2020, more than 785 restaurants and cafes closed due to increased operational costs due to the devaluation of the Lebanese Lira and increased input costs, in



combination with a 75% sales drop due to both Covid-19 and the economic crisis (Asharq Al-Aswat, 2020). This has resulted in more than 25,000 employees losing their positions, and many who remain employed earning half-pay to keep restaurants operational (ibid.).

#### ***4.10.3. Food Price Volatility***

Food price volatility has been linked to increases in international agricultural trade, and unexpected price changes on international and local markets threaten food security outcomes of entire nations. Specifically, countries overly dependent on imported foods, like Lebanon, are especially susceptible to this volatility, as price changes of imported food goods can limit food availability, accessibility, and utilization. Simultaneously, increased costs lead to limitations on inputs for agriculture that can be prohibitive to small-scale agricultural workers without access to capital, limiting their agency in food systems, and often leading to the use of more dangerous or unregulated chemicals and inputs, threatening environmental sustainability and increasing the risk of foodborne illness.

Throughout the ongoing triple crisis food price volatility, paired with an immense import dependence has proven to be an extreme point of fragility in the LFS. As local currency lost its value, importation of necessary food commodities, agricultural inputs, and fuel to power household electricity, generators, vehicles, and refrigeration for food products was severely limited. Food prices have jumped exorbitantly in conjunction with Lebanon's tripartite crisis, between the end of 2019 and present day – with the prices of food and non-alcoholic beverages increasing a staggering 221.8% between June 2020 and June 2021 alone (Figure 11) (Food Security Briefs #18).

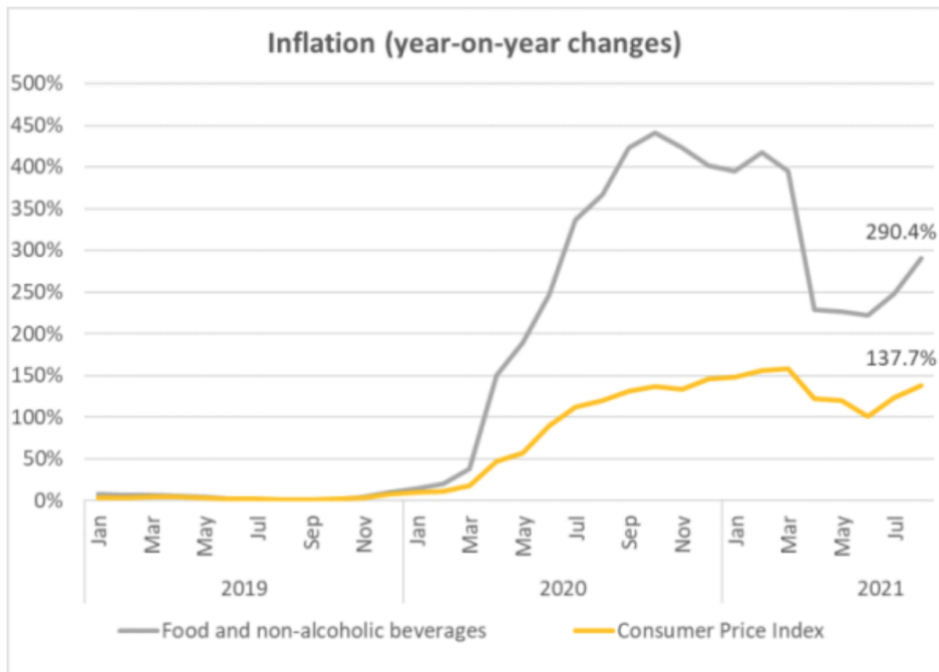


Figure 11 Food Price Inflation and Consumer Price Index Changes (Bahn et al., 2021).

Food affordability and price changes are a direct result of the ongoing tripartite crisis that is riddling Lebanon as a whole, including its food systems, and food import dependency makes food affordability subject to international currencies and black market exchange rates, which mark severe threats to the LFS, and have proven to be points of extreme fragility.

Bread, a stable food that is commonplace in the every-day diet of most Lebanese citizens, faced multiple price changes, impacting the poorest the most. The Ministry of Economy and Trade (MOET) imposed bread price increases three times in the first three months of 2021, claiming they are acting in accordance with sharp increases in global wheat prices (FSP 2021). With these increases, one package of bread a day, which is a common staple of many Lebanese households, would cost 11% of the national monthly minimum wage (ibid.). Shortly following the third change, however, MOET reduced the

price back to the level of the second price change (ibid.). Removing subsidies on common staples like bread surely impacts the nation's poorest the most heavily, but is viewed as a measure to reduce public expenditure on subsidies that are depleting the nation's minimal foreign currency reserves. Yet again in July of 2021, bread prices rose, citing rising import prices of sugar and yeast on international markets (ibid.).

The Covid-19 Pandemic, one layer of the triple crisis impacting Lebanon, led to more than 22 nations implementing export restrictions to maintain national reserves as international trade shut down (Hepburn et al., 2020). These restrictions are especially damning for low-income, resource poor, import dependent countries, and in the face of ongoing and future international climatic, political, and economic crises, the LFS is fragile and at risk due to the potential for export restrictions and food price volatility.

#### **4.11. Urbanization**

Urbanization acts as a driver of food systems in multiple ways. As populations increasingly move to cities, there are risks of food production declining in small and medium sized farms, as well as disparities in distribution and retailing availability in urban areas. For people with low incomes, urbanization can lead to increased prevalence of food deserts and swamps – areas with limited access to fresh and healthy foods, where residents consume higher proportions of fast foods and highly processed and packaged foods. Further, higher levels of urbanization are linked with higher prevalence of diet-related disease, and urban food environments change consumption patterns based on availability, affordability, desirability, and convenience (Hawkes et al., 2017).

Lebanon has a higher-than-average urban population, with 89% of all citizens living in urban areas as of 2019, compared with a 72% average for Western Asia and a 56% average globally. The overwhelming majority of the nation lives in urban settings, which are experiencing nutritional transitions towards highly processed, unhealthy foods, leading to increased obesity, especially for women (UNESCWA Country Profile). This transition, especially given the urban nature of Lebanese society, poses a threat to nutritional security and has the potential to increase diet-related health costs linked to NCDs (FAO 2021). Despite these implications, proper census data is entirely missing in Lebanon. Due to political concerns over instability along sectarian lines if accurate census data highlighted wide shifts in population demographics, all demographic summaries have been based on surveys and extrapolation (Faour, 2015). This poses a problem for Lebanon, where continuous, unregulated, urbanization and sprawl pose a threat to Lebanon's "social, economic, environmental, health and safety factors" (ibid., pg. 30).

#### ***4.11.1. Agricultural Employment Base***

Chalak et al. (2017) cite a highly diminishing interest in agricultural work in Lebanon, specifically in agriculture-dominated regions of the country like the Beqaa. The authors mainly attribute this to the sector's extremely low, unsustainable returns - as two-thirds of all farmers interviewed who disclosed their income had income levels considered insufficient for supporting a family. Of all farmers interviewed, 47% had more than 25 years of agricultural working experience, indicating that nearly half of the interviewed population fell into the category of older farmers (ibid.). Urban migration in search of improved opportunity due to the lacking capacity of rural agriculture to

provide agency and sustainable livelihoods is a significant factor in Lebanon's declining agricultural employment base.

This is consistent with other literature - Hamade (2019) found that the average farmer age in Lebanon was very high - 52.2 years old in 2010, and expected to increase substantially (Hamade, 2019). This statistic, however, was compiled before the Syrian crisis and the influx of displaced Syrians into Lebanon, and subsequently into the Lebanese agricultural production system. As previously mentioned, it is well documented that women and young children are frequently hired as part-time, low-wage laborers in the agricultural sector, which likely would drastically reduce the average age of farmers if recalculated with current and accurate data. However, the potential of a "forthcoming shortage of Syrian labor that may be associated with post-war Syrian reconstruction" puts food system resilience at further risk in Lebanon (Hamade, 2019s, pg. 259), both in terms of production force and the average age of the agricultural employment base.

Further, as most agricultural employment is informal, without benefits, guaranteed pay, or access to coverage for health care, the informal agriculture sector is altogether unappealing, and unlikely to attract a strong base of employment or younger generations. Figure 12 shows that the agricultural employment base is the most informal sector in the country (Lebanon Central Administration of Statistics).

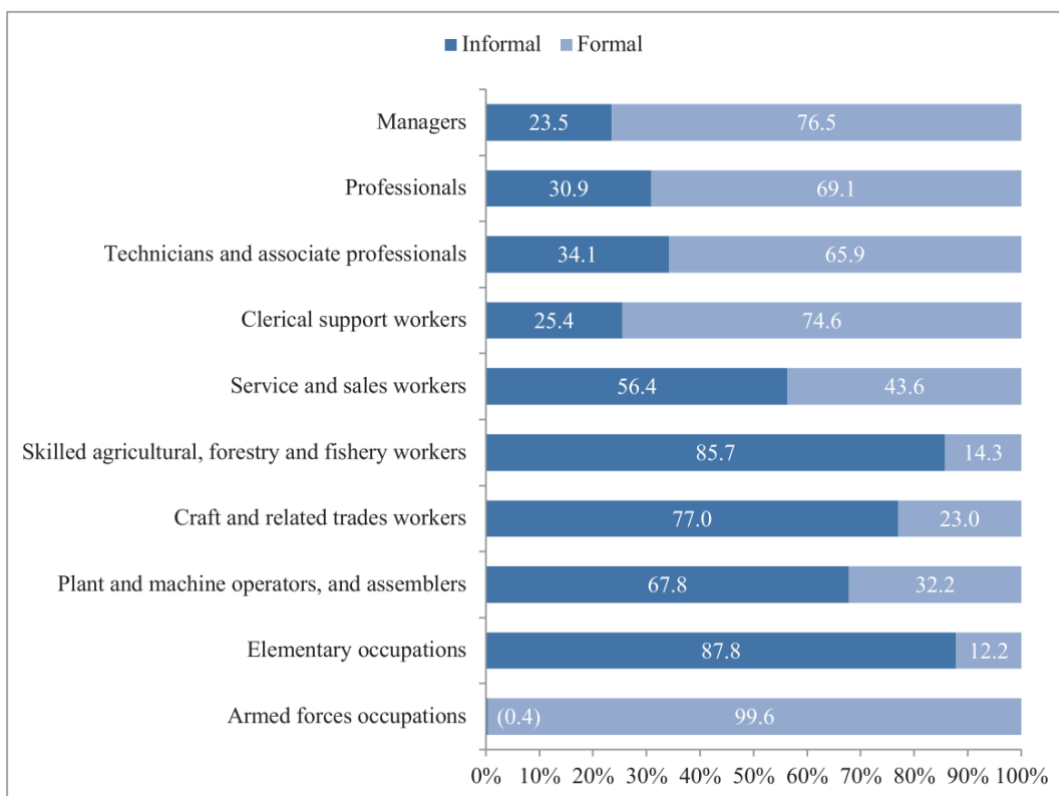


Figure 12 Employment type by sector (Central Administration of Statistics)

Overall, urbanization and a lack of interest and incentive to participate in agriculture are points of fragility in the LFS, and reflections of the inequity in land ownership and income that exists.

## 4.12. Socio-Cultural Context

### 4.12.1 Gender Equity

The Gender Inequality Index (GII) is used as a perspective into the Socio-Cultural Context drivers of the food system. Gender inequality can lead to unequal food distribution within the household, and determines the roles of women and men in different components of the food system. The GII ranks nations on a scale of 0 to 1.0, with 0 being the most equal and 1.0 being the least equal. The FSD lists Lebanon at

0.411 on the UNDP GII, and between 2010 and 2019, Lebanon decreased from 0.424 to 0.411, signifying a very small increase in gender equality, but still leaving Lebanon at 92<sup>nd</sup> worldwide.

Further, gender inequalities exist in consumption levels within the food system, as “mean consumption values of bread and toast, cereal and cereal products, eggs, meat and poultry, potatoes, pulses, nuts and seeds, sugar and sugar derivatives, added fats and oils, alcoholic beverages and soft drinks were significantly higher in men than women”, where women consumed more of only milk and dairy products, vegetables, and coffee (Nasreddine et al., pg. 198, 2006). Despite similar dietary and macronutrient composition, average daily intake was higher in men (3273.6 grams per day) than women (2832.8 grams per day), and mean energy intake followed a similar trend for men and women, at 2938.2 kcal day and 2151.4 kcal day respectively (ibid.).

Women are disproportionately inactive in the agricultural sector in Lebanon, as the economically active percentage of women in all sectors rose from 19.8% to 26% between 1980 and 2010, where the percent of economically active women in the agricultural sector decreased from 20% to 2.2% between the same years (Chaaban et al., 2018). Gender inequities compound with other points of fragility in the LFS: gender inequality is tied to social inequality for refugee communities in Lebanon, and clearly visible in Lebanese food systems. More than 55% of informally employed Syrian refugee women are employed in agriculture, and paid 23% less than men for nearly the same number of working days (International Labour Organization, 2019). Fragility in gender equity in the LFS was clearly visible in the face of triple crises, as female-headed households face a poverty increase 6x higher than that of male headed

households, with the tripartite crisis exacerbating existing gender inequalities and disproportionately putting women at higher risk (Hoteit et al., 2021).

#### ***4.12.2. Equitable Livelihoods to All Actors Across Food Value Chains***

Inequality in land ownership, as well as agency, income, and participation in agricultural employment have already been highlighted in detail above. A distinct lack of equity in agency and livelihood opportunities across the food value chains in the LFS are apparent, and have been shown to be particularly damaging to already-disadvantaged members of society, namely refugees, women, and rural agricultural-based communities.

These disparities carry over into inequitable FS + Nutrition Outcomes. As mentioned previously, 40% of Lebanese households struggled to satisfy food security needs due to a lack of purchasing power brought on and exacerbated by the tripartite crisis. In Akkar and Baalbek-Hermel, predominantly agricultural communities; these numbers rose to 55% and 48% respectively, again highlighting regional disparities in food security and livelihoods in Lebanon (WFP & WB, 2020). Further, nationally 53% of all citizens have a poor food consumption score, whereas Akkar and the Beqaa have 73% and 83% of citizens with a poor food consumption score, respectively (Hoteit et al., 2021).

Further, actors in the LFS, specifically producers working in agriculture, do not have access to equitable livelihoods in multiple other aspects of their lives - like health care. Figure 13 shows that of all lines of employment in Lebanon, skilled workers in agricultural production in the LFS are statistically the least protected with health care coverage (Lebanon Central Administration of Statistics)



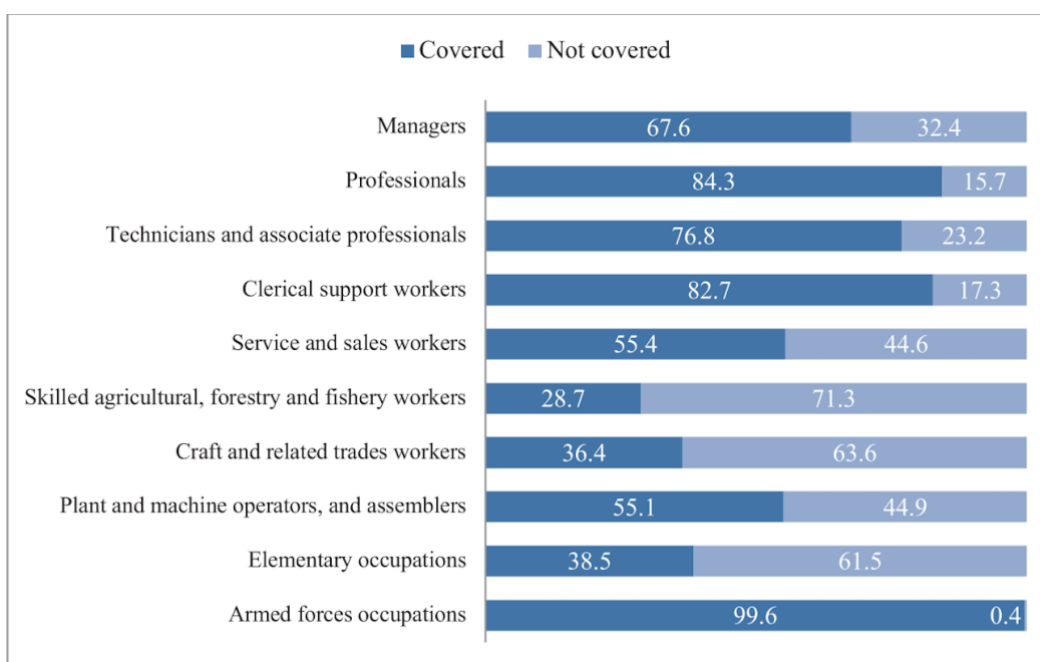


Figure 13 Healthcare Coverage by Profession (Central Administration of Statistics)

Inequitable agency and access to livelihoods to actors across food value chains is a point of fragility in the LFS, as FS + Nutrition Outcomes are directly jeopardized for large portions of the population, with significant disadvantages for those who are already the most vulnerable. This fragility is especially concerning in its potential to derive future conflict, crisis, and political instability. In resource poor countries, conflict and food insecurity are linked by a set of drivers.

Poverty, high levels of underemployment amongst young men, population pressures, poor or fragile governance, and high levels of inequality in income and access to land and natural resources give rise to both food insecurity and conflict (Breisinger et al., 2014). In such scenarios, food insecurity and conflict can give rise to each other, forming a negative feedback loop in which food insecurity leads to conflict (or vice versa) which heightens food insecurity, which in turn exacerbates conflict, and

so on. As described above, the triple crisis in Lebanon has massively increased all of these factors which give rise to conflict and food insecurity, signaling a point of fragility in the LFS that needs to be addressed to attempt to reinstate stability within political, social, economic, and food systems at all scales within the nation.

#### ***4.12.3. Psychosocial Factors and Subjective Resilience and Well-Being***

Bene (2020) emphasizes that factors like self-perceived risk, self-efficacy, goals and aspirations, and ability to persevere are “recognized to contribute to people’s construct of subjective resilience and influence their choice of responses in the face of adverse events” Effectively, an individual’s perspective on their ability to deal with the hardships they are facing and overcome negative situations is a bottom-up indicator of food system resilience.

Lebanese are rightfully concerned about their financial, personal, and food security well-being as they continue to face tripartite crises. One survey found that all respondents from all governorates were feeling overly stressed and pressured concerning their personal financial situation due to the economic crisis (Hoteit et al., 2021). Around 60% of Lebanese were afraid that Covid-19 restrictions, lockdowns, and closures would drag them into poverty. (ibid.). More than 77% are worried that they will not be able to meet their monthly expenses due to currency devaluation and lack of purchasing power, and 62% are no longer financially able to eat out at a restaurant or partake in any leisure activities. Of all respondents, 88% declared their lives severely affected by the Beirut Port explosion (ibid.) The mental weight of the triple crisis not only heavily impacts food security and nutrition, but also mental well-being and individual’s ability to cope, as a rising number of incidences of self-harm and suicides

are being witnessed - with 2020 being significantly higher than any of the four previous years (FSP 2021).

Mental health and subjective well-being have been severely impacted by the ongoing tripartite crisis, with Lebanese citizens, refugee communities, and migrant workers facing extreme personal, social, financial, health, and mental challenges on a day to day basis. Clearly, self-efficacy has been effectively destroyed through ongoing and overlapping crises that are out of the hands of the average citizen - a huge point of fragility in the LFS and cause for serious concern about the mental health and well-being of the population, both now and going forwards.

#### **4.13. Food Security + Nutrition Outcomes**

By 2021, more than half of the Lebanese population has become trapped in poverty as a result of the overlapping and ongoing economic crisis, Covid-19 crisis, and political crisis, which includes the August 4th Beirut Port Explosion. This poverty rate is nearly double the rate just two years prior, 28%, at the outbreak of the triple crisis, with the extreme poverty rate nearly tripling, from 8% to 23% (Hoteit et al., 2021). These circumstances have led to a rapid and accelerating decline of food security and nutritional well-being, that can be seen exacerbating as the crisis persists over time through the assessment of FS + Nutrition Outcomes.

##### ***4.13.1. Household Food Insecurity***

Household food insecurity is widely used as a metric to better understand food security and nutrition outcomes at the household scale in different geographical, social, economic, or gendered household contexts, and give insight into the resilience or

fragility of food systems in delivering an acceptable quantity and quality of food to its constituents. In Lebanon, multiple household food insecurity assessments have been carried out in varying localities, showing differences in food security and nutrition outcomes along rural-urban, gender, and household structure lines (Naja et al., 2014; Jomaa et al., 2017; Jomaa et al., 2018).

While multiple tools can be used to measure household food insecurity, the Household Food Insecurity Access Scale (HFIAS) is a powerful tool validated within multiple countries (United States, Tanzania, Iran) including Lebanon (Naja et al., 2014). First used and validated in the rural Beqaa region of Lebanon in 2014, the HFIAS found more than 50% of the study population falling under some category of food insecurity, with the largest portion of food insecure households being severely food insecure (Figure 14) (data from Naja et al., 2014).

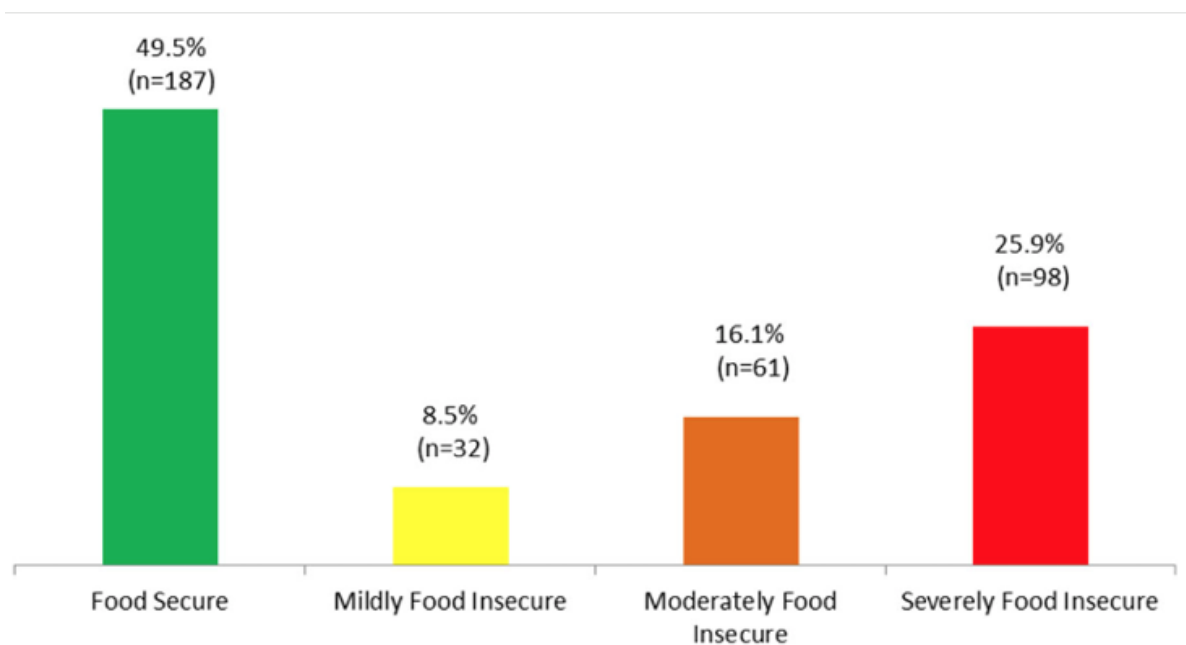


Figure 14 HFIAS in Rural Beqaa

Further studies using different metrics, and assessing household food insecurity in different communities and regions of Lebanon have been conducted (Figure 15) (Naja et al., 2014; Sahyoun et al., 2014; Jomaa et al., 2017; Jomaa et al., 2018; Hoteit et al., 2021).

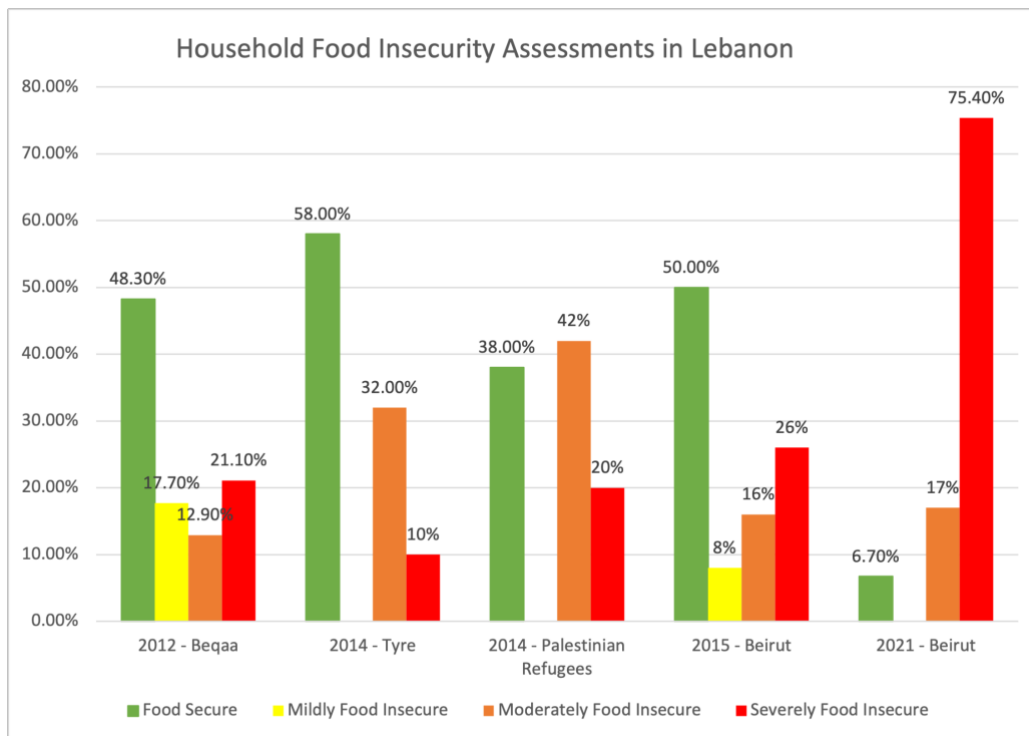


Figure 15 Household Food Insecurity Assessments in Lebanon Over Time

A severe reduction in food security, and increase in severe food insecurity is visible in the most recent data, taken in Beirut in 2021 (Hoteit et al., 2021) indicating that FS + Nutrition outcomes and household food security were a point of extreme fragility in the LFS, exposed by the ongoing tripartite crisis.

#### **4.13.2. Burden of Foodborne Illness**

In Lebanese food production systems, certain inputs are often used without regulation, leading to environmental contamination and food safety concerns. A notable example is the unregulated abuse of colistin, a “last-resort antibiotic against... bacterial pathogens” that is commonly used in animal husbandry, but in recent years has been banned in more than seven countries due to the development of colistin resistant bacterial genes. (Kassem et al., pg. 162, 2019; Olaitan et al., 2021). In Lebanon, more than 12 different over-the-counter, colistin containing drugs are available to farmers for purchase at agricultural stores, lacking specific information on usage or safety (ibid.). This reality has led to an unregulated, uncontrolled abuse of the drug, leading to the dissemination of colistin-resistant genes in poultry in Lebanon. Recently, the Lebanese poultry industry was found to exhibit “a high prevalence and a massive spread” of colistin resistant *E. coli* – with a damning 84% of farms in the sample study containing colistin resistant *E. coli* (Al- Mir et al., 2021).

Lack of food safety knowledge and regulations, paired with colistin abuse leading to colistin-resistant bacteria like *E. coli* spreading rapidly throughout poultry producers in the LFS poses serious health risks for Lebanese consumers. This reality reflects a lack of implementation of proper management, regulation, and guidelines in the agri-business system of Lebanon, with public health and environment repercussions (Al-Mir et al., 2021).

Simultaneously, previously mentioned instances of Lebanese exports causing foodborne illness in Australia, New Zealand, USA and Canada Improper processing, storage, and management of food products for both domestic consumption and for export are points of fragility within LFS, as cases of foodborne illness from products of

Lebanese origin are damaging the much needed export industry that brings foreign currency into the country, and internal colistin resistance and foodborne illness puts strain on individual well-being and health systems in both the immediate and long term.

Lack of foreign currency and the continuous depreciation of the Lebanese Lira has led to an inability to import sufficient amounts of diesel, used to operate the generators that, as previously described, a large majority of households and businesses rely on to access electricity. This raises concerns for food safety and a heightened risk of food-borne illness given that wholesalers, distributors, and retailers will be facing added expenses to ensure proper refrigeration, storage and handling of products (FSP 2021). One study on the quality and safety of meat from major supermarkets and local butchers found that 89 out of 200 test specimens were not of acceptable quality for consumption (MTV 2020). Further, “given the status of the economy and the current increase in the cost of medical care in Lebanon, these food contaminants might inflict higher mortalities and morbidities in susceptible populations” (Kharroubi et al., 2020, pg. 8).

#### ***4.13.3. Overweight and Stunting***

66.9% of all adults in Lebanon are categorized as overweight. Further, obesity increased in Lebanon from 12.39% in 1990 to 19.66% in 2017, a 59% jump, with the share of adults in the population who are obese increasing from 19.90% to 32% within the same time period (Richie and Roser, 2017; WHO Data). Childhood obesity also increased slightly within this time frame, from 23.16% to 25.33%.

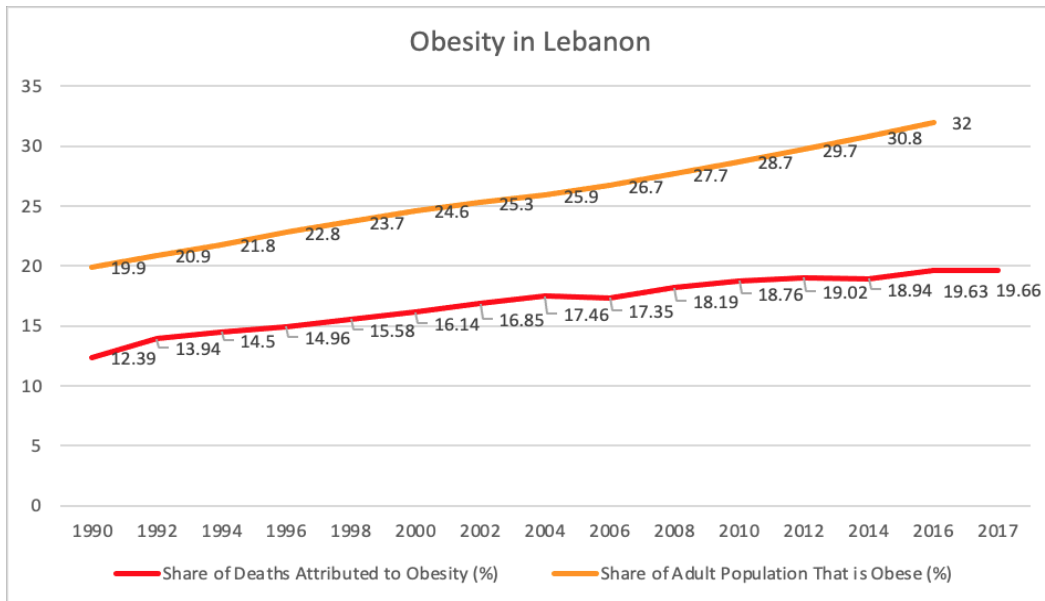


Figure 16 Obesity in Lebanon

While data on stunting is extremely limited for Lebanon, with two data points (17.2% of children under 5 were stunted in 1996, dropping slightly to 16.5% in 2004), associations between overweight/obesity and stunting are clearly established in the literature, specifically for lower-income countries experiencing stages of the nutrition transition, as Lebanon is (Popkin et al., 1996).



## CHAPTER 5

### DISCUSSION + RECOMMENDATIONS

In *Being Mortal*, Atul Gawande writes that complex systems “have to survive and function despite having thousands of critical, potentially fragile components” which could be impacted by defects, crises, or failures at any given time. Parts often fail, and failures accumulate, “the time comes when just one more defect is enough to impair the whole system”. Lebanon has been overrun by systemic ‘defects’ leading the LFS into a headfirst dive into fragility, and threatening the food security and nutrition of the nation and its inhabitants.

Resilience and sustainability are difficult to keep track of in real-time. While indicators are useful tools in understanding where a FS stands on the spectrum of Fragility-Resilience, the unpredictable nature of crises often blind-sides systems, highlighting fragility in components of the system that previously passed unnoticed or, if noticed, unaddressed. Fragility in the LFS was exposed throughout the ongoing tripartite along all dimensions - social, economic, health, environmental, and through FS + Nutrition Outcomes. The LFS shows significant points of fragility across all drivers, and most resilience and sustainability indicators assessed highlighted weaknesses in the structure and functioning of the LFS over time, that were more directly exposed in the face of the ongoing tripartite crisis.

In many cases, drivers of fragility are overlapping and reinforcing in different parts of the food system. Massive currency devaluation exacerbated the LFS across multiple indicators - exposing the fragility of extreme import dependence, income inequality, and lack of individual purchasing power among a growing majority of food

system actors, with no safety nets to fall back on. Weak political representation and corruption have not only precipitated crises in Lebanon, but simultaneously allowed the development of long-growing and deep-rooted social and economic inequalities, which have proven to make the LFS fragile in terms of gender equity, land ownership, equity within FS for marginalized communities, and have been detrimental to FS + Nutrition Outcomes across the board, albeit more severely for women, refugees, and migrant workers. Clearly, drivers of fragility in the LFS are overlapping and carry a ripple effect throughout the system, negatively impacting actors systemwide in a domino-effect fashion.

Further, von Braun (2021) emphasizes that “the role of women and gender are very important determinants for productive, healthy, and sustainable food systems - Womens’ empowerment positively affects all five Action Tracks” for the UNFSS (pg. 9). Women in the LFS experience disproportionately higher levels of food insecurity, poverty, and employment inequality in agriculture and across the LFS. Improving opportunity and equity for women in Lebanon and the LFS is of utmost importance in bolstering the resilience of the system, and needs to be a focus point of all resilience-based work going forwards.

Outside of gender-specific inequalities, “overall inequalities across classes, regions, rural-urban contexts, and social groups also influence whether food systems will transform to be healthier, more sustainable, and more equitable” (ibid., pg. 10). This paper’s analysis has shown that class-based, regional, rural-urban, and social inequalities are rampant within Lebanon, and carry serious repercussions in terms of the resilience, sustainability, and equality of the LFS, and the FS + Nutrition Outcomes for its actors. As we have seen, communities that rely on agriculture for a living, women,

Syrian refugees, and certain regions like much of the Beqaa and Akkar face drastic inequality in access to equitable livelihoods, income, and proper FS and nutrition. In many cases, these inequalities overlap and compound - for example, a refugee woman working in agriculture in the Beqaa faces the brunt of multiple fronts of inequity combined, highlighting certain groups of actors within the LFS that need specific action taken to safeguard.

In short, the LFS, in conjunction with engrained systems of political, economic, and social inequality need a complete overhaul. Yet, despite overwhelming ongoing fragility in the LFS, further compounded and exposed by the ongoing triple crisis, there are points of resilience and potential growth to look towards as stepping stones towards building a more equitable food system with improved FS + Nutrition Outcomes. Micro, medium and small enterprises are recognized as opportunities to build sustainability and resilience, given their inclusive and equitable position in food systems. In many food systems, the implementation of these small-scale enterprises and retailers are goals yet to be achieved. In Lebanon, however, and especially in terms of retailing and food markets, these markets are the norm. As we saw earlier, traditional small scale food retailers account for 96% of all registered markets in the country - and show no signs of falling out of use. As most individuals rely on these small scale retailers and markets that have been embedded in communities for multiple decades. Strengthening the capacities of these retailers through improved infrastructure, access to information, and increased connection with producers, distributors, and other retailers has the capacity to strengthen the whole food system, and increase resilience, sustainability, and agency in the LFS, while respecting the ethics and norms that exist within current FS operations.

Politics and governance continues to be one of, if not the most inhibiting factors in achieving sustainable and resilient food systems operations in Lebanon. Malpractice in general government and politics has triggered crises in Lebanese society that significantly detracts the operations and outcomes of the LFS, and jeopardizes the health, safety, and lives of Lebanese citizens and foreign residents alike. A general lack of attention to environmental capacities and sustainability, and an effective stream of nepotism in the functioning of most factions of national governance has allowed the progressive devolution of the Lebanese economy and currency, and prevented sustainable transformation of the LFS in many ways. While the “inclusive transformation of smallholders” is imperative in developing sustainable and resilient FS, and providing equitable livelihoods across FS value chains, we have seen that land ownership inequality is rife in the LFS, and smallholders are in most cases effectively prevented from livelihood security and engaging as valuable members of the FS.

Further, lessons from indigenous food systems and traditional knowledge mark an opportunity for improved resilience (von Braun et al., 2021). Where we have previously described the phasing out of traditional knowledge and wild plant gathering from the LFS, action should be taken to promote this form of indigenous knowledge as a pathway towards increasing resilience and sustainability of the food system. Lebanon specifically, as a resource poor country with extremely poor biophysical redundancy and high competition for land, water, and other agricultural resources, can find significant benefit and opportunity in re-harnessing traditional knowledge and supporting its place in food systems at local, regional, and the national scale. In the same vein, acknowledging and applying the healthiness of the traditional Lebanese diet, which has been proven to be healthy and affordable even during the ongoing tripartite

crisis, and has the capacity to reverse negative FS + Nutrition Outcomes that come with the nutrition transition and poor quality diets (Hwalla et al., 2021).

Overall, dramatic structural and systemic changes are necessary to create sustainable livelihoods and bolster resilience in the LFS. Investment to expand science, research, and data collection in Lebanon is crucial, as data limitations are significant constrictions in research focused on the nation.

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