

PRODUCTION, GOVERNANCE, AND FOOD
SECURITY: TOWARDS A QUANTITATIVE
UNDERSTANDING OF WHEAT SELF-SUFFICIENCY
IN NORTHEAST SYRIA

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Abstract: Northeast Syria is a semi-autonomous region under the control of the Kurdish self-administration resulting from the ongoing Syrian Civil War. While relations with the Assad administration have somewhat normalized, the Kurdish self-administration still faces possible involuntary economic self-sufficiency if they seek independence. Using a two-pillar approach, this study explores the possibility of wheat self-sufficiency in Northeast Syria through understanding the production capacity and governance institutions in place. As true self-sufficiency should result in food security, this paper also measures current household wheat security to better understand the current level of self-sufficiency.

Using secondary quantitative data, this paper first looks at the wheat production capacity in Northeast Syria. This research finds that wheat yield in Syria is slightly correlated with rainfall. Furthermore, the research determines the average number of hectares planted for wheat in Northeast Syria would theoretically be sufficient to feed the population based on low or medium yields.

For the second pillar, governance, the study looks at both production and end line consumer prices for flour as a critical success factor for understanding the current governance structures that regulate the wheat cycle. For consumer flour pricing, this paper specifically looks at the differences between public and private bakeries before and after the Syria Caesar Civilian Protection Act of 2020, the most recent sanctions from the United States. Results show that the public bakeries offer lower prices in the short run; however, research in agricultural development indicate that this may not be sustainable in the long run.

Ultimately, this paper measures current food security as a function of flour, looking at the total household expenditure on flour using Smith and Subandoro's method of expenditure thresholds. Households that spend more than 6% of total income on flour are considered insecure; for the average Syrian household, flour expenditures amount to 6.5%, indicating high food insecurity. Contextualized within the larger food security narrative, indeed the Syrian population in the Northeast still face considerable barriers to food security, indicating that self-sufficiency is still not quite within grasp for the self-administration.

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CHAPTER I

INTRODUCTION AND BACKGROUND

Economic self-sufficiency is often considered market inefficient, the natural opposite to international trade and comparative advantage. However, some states choose to be self-sufficient or are forced to become self-sufficient due to a variety of factors. The most common two ways in which states are forced to become self-sufficient are either sanctions or lack of recognition by the international community. In what is referred to as the double blockade, Northeast Syria (NES) is facing both (Anderson, 2021).

While affected by the international community's sanctions against Syria, the Northeast part of Syria is slowly building institutions and governance structures in a bid to become a semi-autonomous region within Syria under a federal system, with some scholars positing that they will eventually make a bid for independence. In the interim years, however, they are operating as a kind of pseudo – state, building institutions but not formally recognized by the international

community, which inhibits trade. As a non-state actor, the Northeast part of Syria may have to operate at a high level of self-sufficiency for many sectors if and when they choose to seek independence (Anderson, 2021).

Historically, economic food self-sufficiency was most often linked only to food production: can a state produce enough of each crop to reach the necessary number of kilocalories needed to feed their population. However, researchers and policy advocates have begun to argue that food self-sufficiency incorporates other facets as well, including “natural, financial and economic resources to grow food, good governance, developed infrastructure and distribution systems, technological advancement, and effective agricultural programmes and policies” (Wegren & Elvestad, 2018, p. 567). Each of these components more generally fall under governance and infrastructure, which has become the second pillar to understanding a country’s food self-sufficiency. It is now not just production numbers that are considered when determining self-sufficiency; the good in question must both be able to be produced in sufficient quantity and able to be accessed by the population after proper processing (Wegren & Elvestad, 2018).

Northeast Syria, which is currently controlled by the semi-autonomous Kurdish self-government, faces involuntary self-sufficiency if they attempt to establish a state separate from the Assad administration. Wheat, whose products make up approximately 40% of the Syrian diet, is one of the main staples that is grown in Northeast Syria (Ahmed, 2016). To determine if wheat self-sufficiency is an option for Northeast Syria under their current production and policies, this paper looks at wheat self-sufficiency through two main pillars: production capabilities and wheat governance, which includes the forces that guide the wheat value chain, infrastructure, and policies (Gareffi et al, 2005; Kaplinsky & Morris, 2001). Ultimately, however, the goal of wheat self-sufficiency is to ensure food security for the Northeast Syria population, which this paper also calculates as a function of wheat (Wegren & Elvestad, 2018).

First, to better understand the systems that organize the wheat value chain, this paper provides an introduction to the institutions created by the Syrian Arab Republic before detailing the various areas of control as of September 2021 resulting from the ongoing Civil War. The introduction then highlights the current wheat production cycle and household level food insecurity faced in Syria and finish with a summary of the challenges facing the wheat cycle.

As a part of the literature review, this paper looks at the concept of self-sufficiency before outlining the wheat and flour value chains. The literature review also looks at at nationalization and the effect of sanctions, both of which impact wheat governance in Northeast Syria, in addition to food security in Syria and the different ways in which food security are measured. This paper also looks at wheat production levels compared to the population to understand the sufficiency level from a purely production standpoint. For the governance pillar, this paper looks at end consumer prices for both wheat production inputs and flour as a proxy of the value chains operating in Northeast Syria. This paper then calculates food security as a function of wheat to understand how the current production and policies are operating compared to full self-sufficiency. Finally, this paper offers a policy analysis of the findings, including recommendations to invest further in irrigation and expand the service of public bakeries, offering explanations and recommendations for future research.

Section 1.1. A Brief History of Socialist Syria and the Civil War

The Syrian Arab Republic was founded in 1946 after becoming independent from French rule. In the years that followed, the setting up of the political system was marked by turbulence, with multiple cabinets installed and the drafting of four different constitutions in the first five years of the republic alone (Khan & Khan, 2017). During this time, the young state's international relations were also strained, particularly with the new neighbor to their south, the state of Israel. In 1948 in the Arab-Israeli war, Syria joined the Arab alliance against the Israelis, who ended up gaining the territory of the Golan Heights, a stretch of land spanning about 1800 square

kilometers along Syria's southwestern border (Pipes, 1992). While the zone was demilitarized as a part of the Israel-Syria Armistice Agreement, the war led to further political destabilization in Syria, with two coup d'états in 1949 alone (Pipes, 1992). A third coup in 1955 led to the rise of a nationalist leader, who was supported at the time by the Ba'ath Party of Syria, a pan-Arab promoting socialist-leaning party with strong anti-imperialist beliefs (Pipes, 1992). In 1958, Syria became a part of the United Arab Republic, a unified nation with socialist Egypt. During the nationalist rule, power was rapidly concentrated in the military as unrest grew in Syria due to the control that Egypt was exercising over the Syrian economy. Another coup ensued, with Syria taking back their national identity in 1961. Despite this overthrow of socialist Egypt, however, the new Ba'ath governments continued in the socialist agenda, nationalizing large corporations that dealt in everything from banking to cotton.

In the subsequent years, the Syrian government also began signing various treaties and pacts with the Soviet Union, which solidified communist and socialist influence in the country (Pipes, 1992). From 1955 to 1970, the Ba'ath party continued to gain military power and carry out agenda items with the support of the ruling party, leading on everything from supporting the Palestinian Liberation Organization to fighting in the Six Day War against Israel in 1967. In 1970, during a decline in popularity for the current ruling party, one of the Ba'ath party leaders and Minister of Defense Hafez al-Assad took control of Syria in a bloodless overthrow, which was later deemed the Corrective Movement (Zisser, 2017).

Hafez al-Assad's early years were marked by ample organizational and institutional growth, with him creating a new legislature, defense command, and eventually a new constitution (Dicker, 2017). This constitution outlines Syria as a socialist and secular state, with provision made for Islam to be the majority religion. As a part of this growth of government institutions, Hafez al-Assad establish the General Establishment for Cereal Processing and Trade (GECPT), a government enterprise that is responsible for the marketing of all grain, including wheat. Until

1991, two government-owned companies under the GEPCT were responsible for all wheat milling and baking, while wheat storage of grain was undertaken by a different government organization (Westlake, 2003). This approach was not unique for the burgeoning Hafez al-Assad administration; indeed, most agricultural outputs were in some way controlled and processed by the new Ba'ath government, with the government directly involved in the marketing of everything from dairy products to corn to meat (Westlake, 2003).

During the establishment of these institutions, Hafez al-Assad also legitimized his power through a referendum, which gave him the presidency for a seven-year term. However, over the course of his 30-year rule, many questions arose regarding the legitimacy and fairness of the elections as Hafez al-Assad began appointing family members and Ba'ath loyalists to positions of power (Dicker, 2017). This nepotism would lay the groundwork for the eventual appointing of his second son to power and the unrest that followed.

In 2000, Hafez al-Assad died, and his son Bashar al-Assad won election during a referendum with 97% of the vote according to government statistics (Zisser, 2017). In the early years of his rule, Bashar al-Assad was known for being lenient with his opposition parties and allowing for mild dissenting opinions of him to be said freely (Zisser, 2017). However, after the dissenting opinions started to grow, Bashar al-Assad began to crack down on his opposition with more force, particularly in the Northeastern regions of Syria where there was a Kurdish majority (Zisser, 2017). This led to much unrest in the Northeast and growing tensions between the Ba'ath party and the Kurdish people, even as Bashar al-Assad was continuing to censor internet usage throughout the country. These measures and ongoing tensions led to international outcry, with the United States and others starting to implement sanctions on the Assad administration, a pattern that would continue for years to come (Zisser, 2017).

The national tensions regarding Bashar al-Assad's presidency and overreaching control of the Syrian people came to a head in 2011 when the Syrian people began demonstrations against the Assad administration. These protests started in Damascus and Deraa in March of 2011; after the security forces killed a number of people in Deraa during the protests, tensions increased further with various anti-Assad groups meeting in Istanbul to solidify their joint agreement and cooperation, forming the Syrian National Council and Free Syrian Army (Britannica, 2020). This army began fighting in small skirmishes with the Assad forces, eventually starting to take large swaths of land during the first years of the Civil War. It is estimated that 6.2 million individuals have been internally displaced and over five million individuals began seeking refugee or asylum status in other countries (OCHA, 2019) over the course of the Civil War, which has yet to reach a clear ending as of September 2021.

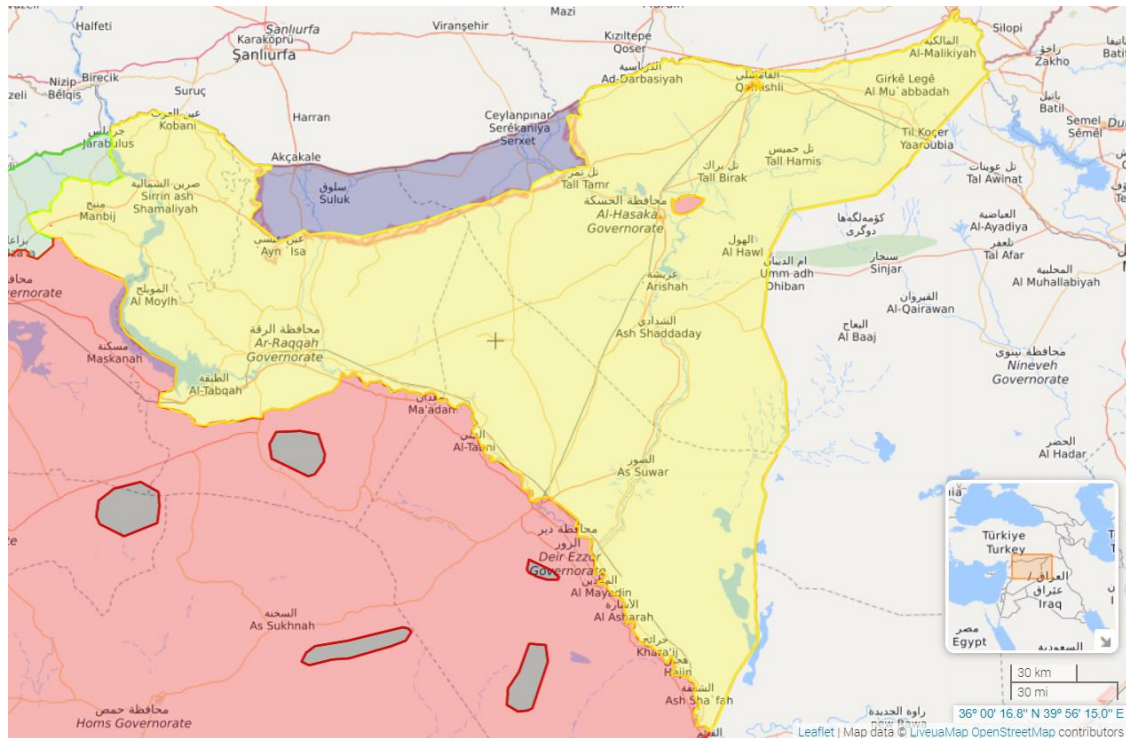
During the early years of the war, the Assad administration sought bilateral or multi-lateral agreements with the international community to engage them to further intervene. These talks, however, ultimately failed, and the National Coalition for Syrian Revolutionary and Opposition Forces, a rebrand of the initial Syrian National Council, began to gain recognition as the true voice of the Syrian people (Britannica, 2020). However, as the war raged on, this council slowly began to unravel as sectarian loyalties grew and the number of players in the Syrian Civil War continued to rise (Britannica, 2020).

One of the many driving forces behind the initial unrest that sparked the Syrian Civil War was the historic drought from 2008 – 2011, which decimated crops and led to massive food shortages (Ciro, 2017). This shortage also means that bread production, a staple of the Syrian diet as an estimated 40% of household kilocalories coming from bread, was also scarce (Goldman, 2013; Ahmed, 2016). This bread shortage, which is what some people have believed spurred the initial protests in 2011, happened despite the government control enacted by the Assad administration. Due to his administrations' intense intervention in the wheat value chain, the shortages were

viewed at least in part as being caused by government policy, which further spurred on the governmental protests (De Chatel, 2014; World Bank, 2008; Goldman, 2013).

Since the initial protests in March 2011, many different actors have participated in the Civil War, from rebels to coalition forces to Kurdish state fighters to jihadists. The most notable jihadist group to gain prominence in the region was the Islamic State of Iraq and Syria (ISIS), who rose to power in 2014. Kurdish state fighters in Northeast Syria, backed by the US-led coalition forces, eventually expelled the jihadists in 2019 (Dicker, 2017). These Kurdish forces have gained control of the area to the northeast of the Euphrates, the territory of Deir-ez-Zor, Hasakeh, and Raqqa governorates, an autonomous area governed by the Kurds as of September 2021, which they have named Rojava (Dicker, 2017). Figure 1 shows the current area occupied by the Kurdish forces in yellow, which have named themselves the Syrian Democratic Forces.

Figure 1 – Northeast Syria occupied by the Syrian Democratic Forces, September 2021 (LiveUAMap, n.d.)



Since 2011, Assad has also taken back much of the land that his administration lost during the Civil War to armed opposition groups, occupying most of the central and south areas of the country. Armed opposition groups still hold the far Northwest corner of the country, which has become essentially one large refugee camp as the Assad administration executes what is believed to be a final offensive on this front (HNAP, 2021). Please see figure 2 for the current area occupied by these opposition groups and figure 3 for a map of the Syrian Arab republic as whole (Kurdish- controlled Northeast in yellow, Assad-controlled areas in red, Opposition-controlled areas in green, areas disputed with another state in blue) (LiveUAMap, n.d.).

Figure 2 – Northwest Syria (NWS) occupied by Opposition groups (in green), September 2021 (LiveUAMap, n.d.)

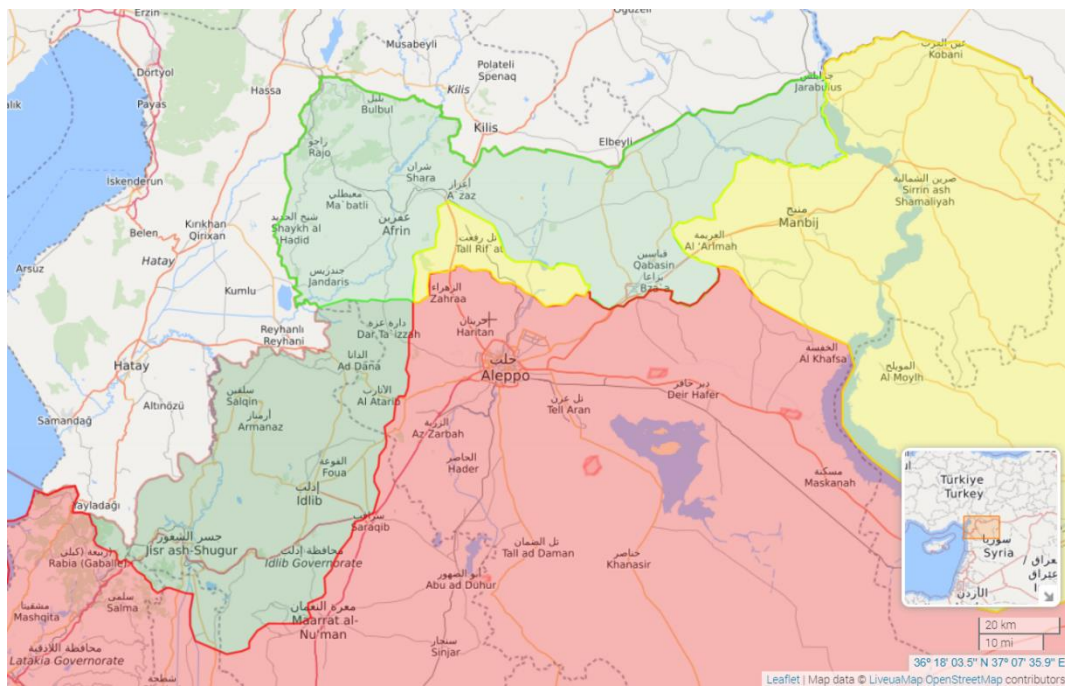
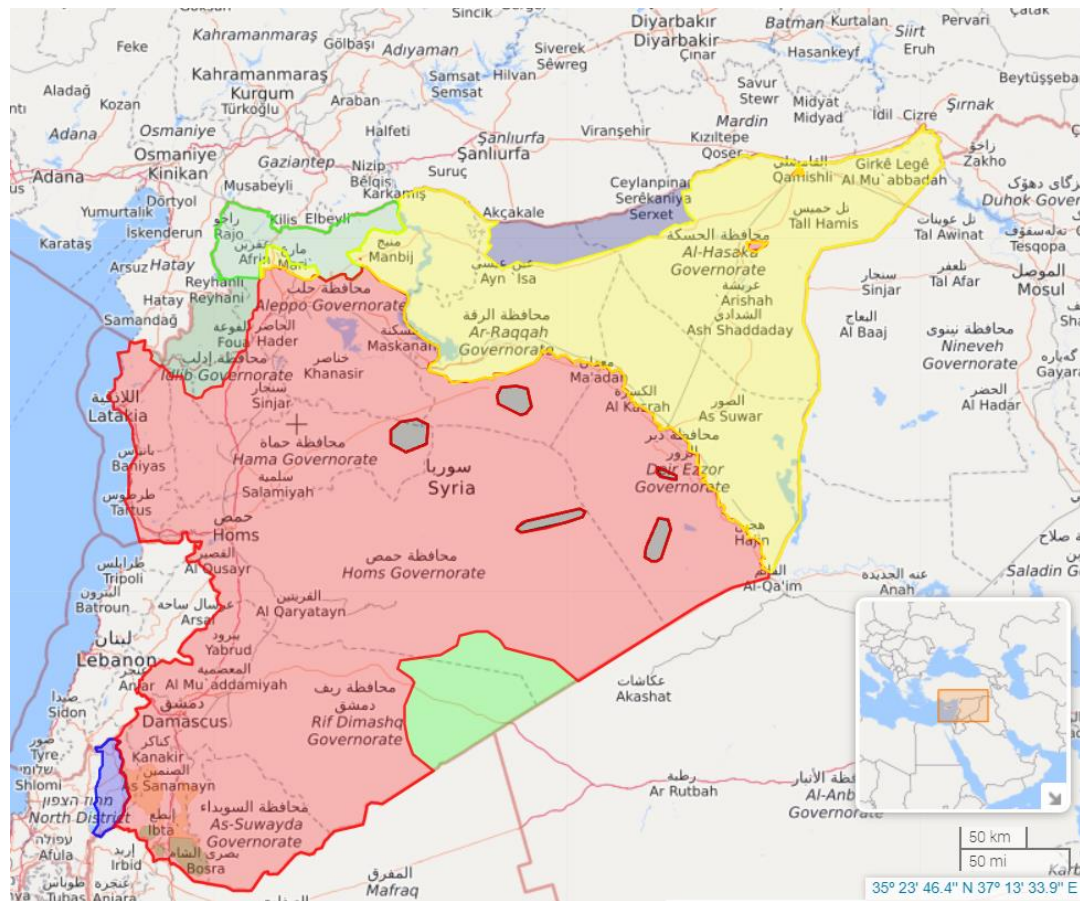


Figure 3 – Whole of Syria, territorial claims, September 2021 (LiveUAMap, n.d.)



However, during his administration, Bashar al-Assad also continued in his father’s legacy of increasing government involvement of key and strategic agricultural outputs. Indeed, when Bashar al-Assad first took power, Syria saw massive growth in their wheat production, with production peaking in 2003 at 4.91 million tons (FAO, 2021a). After years of growing wheat output and infrastructure, including the three respective organizations responsible for grain marketing in Syria, Bashar al-Assad passed a new law, merging the three main grain processing government entities, the General Grain Trading and Processing Corporation, the General Grain Silos Company, and the General Mills Company, into one in April 2019 (Kiwani, 2020). Bashar al-Assad named this new government department the General Establishment for Cereal Processing (GECP), which is colloquially called *Huuboob*, or grain, in Arabic (Kiwani, 2020). The

department led all storage, milling, processing, and trading of grains; the organization also sets the wheat purchasing price per kilo on a yearly basis and sets the consumer purchasing price of bread processed and baked by the GECP owned bakeries (Kiwan, 2020). While Bashar al-Assad has continued to allow for private bakeries and private wheat processing as determined by his father in 1991, the sector has slowly become smaller as competing with large government entities has become more difficult due to the war and the ongoing crisis.

Additionally, the United States of America under the former Trump administration signed into law the Caesar Syria Civilian Protection Act, which took effect in June 2020 (US Department of State, 2020). In reaction to the human rights violations committed by the Assad government, this piece of legislation prohibits foreign actors from conducting business with the Assad government in Syria, meaning that previously foreign-sourced material to support the government, including their subsidized wheat value chain, has now become more difficult to procure (U.S. Department of State, 2020). Despite these sanctions, however, some countries – notably Russia – have continued to trade or even donate grain to Syria (Donely, 2020). Despite this trade, however, there are still major bread shortages, especially in the Assad – controlled areas in South Central Syria (Cornish & al-Omar, 2020).

Section 1.2. Northeast Syria and Northwest Syria – an Overview

To better understand the different administrations acting in Syria currently, this paper outlines the three major regions of control in Syria. As of September 2021, the Assad administration controls most of central and south Syria, with headquarters in Damascus. The Assad administration's control abuts the Euphrates River on its easternmost side, with the area of control stretching to the southern and eastern borders. This region is relatively closed to foreign intervention, including to aid organizations excepting the few registered and allowed by the Assad administration. The Assad administration controls most of Aleppo, Idleb, and Latakia governorates while controlling

all of Homs, As-Sweida, Damascus, Dar'a, Hama, Quneitra, Rural Damascus, and Tartous governorates (HNAP, 2021).

As mentioned above, Northeast Syria, henceforth called Rojava, is roughly comprised of the governorates of Ar-Raqqa, Al-Hasakeh, and Deir-ez-Zor and is controlled by the Kurdish semi-autonomous government (Bery et al, 2019). Since the complete expulsion of ISIS from Kurdish territory in early 2019, the self-administration has been trying to rebuild public institutions in coordination with international non-governmental organizations (INGOs) working in the region. The self-administration has reopened to these organizations, setting an ambition plan of rebuilding costing billions of dollars. As a matter of example, the self-administration estimates that rebuilding the health sector alone would cost 1.9 billion USD, all of which would need to be from investment from foreign aid (Bery et al, 2019).

The Northeast region is also home to many refugee camps, both formal and informal (Saad, 2020). The residents of these camps are comprised partially of some of the 6.2 million internally displaced individuals; however, these camps also house ex-ISIS members who were captured during the fall of Bagouz, the last ISIS stronghold (Saad, 2020). A large part of international aid that could go toward rebuilding and development is instead tied up in these camps as a matter of international safety and security, with some aid organizations wary of investing in lasting infrastructure as the war has not fully come to an end (Rabinovich & Valensi, 2021).

While the self-administration has not been recognized by any foreign state, it has kept close ties to the United States until its quick withdrawal from Rojava in late 2019 and early 2020, with relations cooling after that (Rabinovich & Valensi, 2021). Turkey has been openly hostile toward the self-administration, conducting operation Peace Spring in October 2019, a cross-border operation into Syria during which they took and occupied land 30 kilometers south of the Turkish

border. As of September 2021, the land remains occupied by Turkish troops with support from Russia (Rabinovich & Valensi, 2021).

Similarly, the Kurdish self-administration has difficult diplomatic relations with the Syrian Assad administration. While the two administrations tacitly work together to combat the resurgence of jihadists in the Northeast, they generally have opposing constitutions and visions forward (Rabinovich & Valensi, 2021). The self-administration has been vocal about not wanting independence, but rather creating a federalist like system in which they continue to have autonomous ruling of the Northeast parts of Syria (Rabinovich & Valensi, 2021). Representatives of the Assad administration, however, have called the Kurdish administration and their armed forces “separatist terrorist militias,” saying that they have no interest in negotiating policies with them after the conclusion of the war (Szuba, 2019). Regardless, the two administrations have continued to work together to carry out civic works, including continuing of trade, particularly of agricultural goods, and use of some roads for commercial interests (Rabinovich & Valensi, 2021). The Assad administration has set up strong holds in key cities in Northeast Syria, including Hasakeh City and Qamishli. Using these areas, the Assad administration has continued to purchase wheat through designated centers for the set price of 400 SYP (\$0.12 USD) in 2021 (Hassan, 2020)

These normalized relations are needed for both the self-administration and the Assad government: the Northeast parts of the country have historically been the agricultural center of the country, producing the majority of the country’s wheat (REACH, 2021a). However, the Northeast currently does not have enough infrastructure to process this wheat; consequently, the Assad administration still buys wheat from the Northeast region (Syrian Observatory for Human Rights, 2020).

The Northwest (NWS) region, controlled by opposition armed groups, generally spans the northern most parts of Aleppo and Idlib governorates, with some fighting still ongoing in Latakia (REACH, 2021a). These opposition groups were formed during the creation of the Syrian National Council in 2011 and are still fighting along the Turkish border (Britannica, 2020). These armed groups are generally supported by Turkey and have set up a de facto government called the Syrian Interim Government, which claims to be the legitimate voice of the people of Syria (Agence France Presse, 2015). Indeed, the opposition group received funding from the United States Government in their early days for relief projects and other civil duties, legitimizing their desire to represent the Syrian people (Agence France Presse, 2015).

Relations between the Northwest and the Assad administration, however, have never normalized, with Assad still carrying out heavy offensive measures against the armed groups (Rabinovich & Valensi, 2021). Most recently, before the onset of the novel coronavirus pandemic in early 2020, the Assad administration launched its fourth offensive into the Northwest to take back the road that connects Aleppo and Damascus, only successfully retaking the full road in mid- 2021 (Besheer & Yeranian, 2021). Since the onset of the coronavirus pandemic, however, offensives in the Northwest have become less frequent and smaller in scale as both parties work toward curbing the rise of the virus in their respective territories.

The Northwest armed groups have come to rely on the United Nations (UN) cross-border relief work as determined under the UN Security Council Resolution (UNSCR) 2585 for 2021 (United Nations Security Council, 2021). Access is renegotiated on a yearly basis, with the security council voting on if cross-border operations can continue. In 2021, many feared that the resolution would be blocked by Russia, who had previously stated that they thought that the Assad administration should be able to determine how aid is delivered (Rabinovich & Valensi, 2021). Regardless, these operations will continue through July 2022.

Section 1.3. Food Insecurity and Wheat Supply

In Syria as a whole, it is estimated that 90% of all Syrians live below the poverty line (OCHA, 2020). Due to the ongoing drought, there are bread shortages throughout the country, with extreme bread shortages in both Northeast and Northwest. On average, the entire Syrian population need an estimated three to four million tons of wheat at a minimum to sustain the population's bread needs; however, in the years 2020 and 2021, despite the increased stability in the country, Syrian farmers harvested only 2.8 million and 2 million tons each year respectively (Cornish & al-Omar, 2020, USDA 2021). In addition, due to the Caesar Syria Civilian Protection Act, bridging this gap has been difficult. Russia, Syria's most closely allied country and major provider of wheat to Syria during the war, has instead begun to donate wheat as humanitarian aid, which is allowed under the Caesar Syria Civilian Protection Act (Donley, 2020). However, prices across Syria have also continue to rise in the last two years, in part due to the coronavirus pandemic, with households on average reporting to spend 44% of their household income on food (HNAP, 2021).

In Northeast Syria, 54% of all household report that their primary need is food to combat household level food insecurity. Agriculture is the main source of income for many families, with over one-fifth of all households reporting to receive at least part of their income from agricultural related activities (HNAP, 2021). Inflation has increased drastically over the last two years, due to the coronavirus pandemic and the ongoing sanctions imposed by Caesar Syria Civilian Protection Act of 2020. In March 2021, the Syrian Pound (SYP) has reached an all-time low in Northeast Syria, with the average exchange rate being 3800 SYP to 1 USD (REACH, 2019 - 2021). While it has rebounded some as of September 2021 with an average exchange rate of 3200 SYP to 1 USD, prices remain high, with 56% of Syrians living in Rojava reporting that they cannot meet their basic needs due to the increased prices (HNAP, 2021).

The Assad administration, however, has done little to curb the inflation or guarantee exchange rates. Indeed, in response to a journalist's question regarding the economic collapse, Assad infamously proposed that television networks should stop airing cooking shows to not tempt the Syrian population with food that is unavailable (Hubbard & Saad, 2021). Similarly, during the steep inflation in 2020 caused by the Caesar Syria Civilian Protection Act, one minister in the Assad administration seemingly dismissed the inflation crisis and said that Syrian households could live off of the average wage even with inflation if they managed their finances correctly (Citrinowicz et al, 2021). Consequently, a black market has arisen in Syria, particularly around bread (Human Rights Watch, 2021). However, it is estimated that bread bought on this market is 150% more expensive than the bread accessed through official channels (Human Rights Watch, 2021).

Exacerbating the economic crisis, due to the ongoing drought, wheat yields have suffered for the breadbasket of Syria in the years of 2020 and 2021, with an estimated yield of 2100 and 2200 of wheat harvested per hectare in each agricultural year (FAO, 2021a). Additionally, the drought has exacerbated food insecurity at a household level as locally grown food has become scarcer.

Twelve million people are estimated to be at risk for losing access to water for basic needs in the region, and the dams in Rojava, which are crucial to the power infrastructure of Northeast, have for the most part become inoperable (Al Jazeera, 2021). Other notable limitations to the agricultural sector in Northeast Syria include the damaged irrigation infrastructure, the high cost of agricultural inputs like seed and fertilizer, and the displacement of thousands of farmers after operation Peace Spring by the Turkish forces in October 2019 (OCHA, 2021). Regardless, 72% of all Syrian wheat is grown in these Kurdish controlled areas (Human Rights Watch, 2021).

In Northwest Syria, over one-quarter of household report having at least part of their household income come from agriculture related activities (HNAP, 2021). Additionally, in January 2021, due to the lack of livelihood opportunities, 91% of all residents in Northwest Syria report that they rely on informal daily labor as their household's primary source of income (HNAP, 2021).

Regarding food security, the majority of Northwest Syria relies on UN food delivery across the border to meet the minimum requirements for food access and nutrition, which is not a durable solution (OCHA, 2021). While bread is available in some of the sub-districts, the bread is sold on the black-market, with a high markup price to the already high prices set by the Assad administration (Cornish & al-Omar, 2020). The Northwest is also seeing a steep rise in coronavirus cases, which INGOs are struggling to respond to, and which further intensifies the already acute food needs (HNAP, 2021).

While this paper will not focus on the black-market prices, it is important to note that a black market for bread has arisen, particularly in the Northwest and South-Central parts of Syria where the free market is more stifled by the Assad government (Human Rights Watch, 2021). In these parts of the country, the black market for bread has arisen in response to the long wait lines, high prices, and general bread scarcity. Despite this, however, the black-market bread is generally of lower quality and higher prices than the subsidized bread. Communities who depend on these black markets, however, generally do so due to not being served by the subsidized bakeries, typically a rural population (Human Rights Watch, 2021).

Section 1.4. Organization of the Thesis

With this context in mind, this paper focuses on identifying the main barriers to wheat self-sufficiency for Rojava, the Northeast region of Syria, by focusing on two pillars: production and governance. To understand current wheat self-sufficiency, the paper then aims to understand household level food security under the current system as true self-sufficiency results in the populace being food secure.

The research first looks at the historical yield data and production data, taking into account that approximately three-quarters of all wheat is currently grown in the Northeast, to determine whether or not it is possible for the Northeast to grow this amount of wheat (Human Rights Watch, 2021). This historical analysis looks at secondary data along with looking at the long-term

impact and legacy of subsidy through an economic lens, which is explored through a comprehensive literature review.

After looking at the historical data associated with wheat yield and production, this paper focuses on wheat production prices and flour consumption prices, comparing between Northeast and Northwest for consumer prices. From a consumption standpoint, market prices for flour are used to incorporate the effect of the wheat processing value chain. To build a realistic production price for Northeast and for government-controlled areas, this paper uses secondary data collection by international institutions and non-governmental organizations on market prices for agricultural inputs, taking into account the difference in pricing and practices. To better understand the difference between and consumption prices, this data analysis is coupled with a literature review on the impact of subsidies, which government-controlled regions benefit from. Additionally, this paper showcases a review of the wheat value chain literature from both the production and processing side to better highlight the differences in prices. This paper also reviews frameworks associated with non-state actors participating in the global market.

Finally, this paper looks at the above-mentioned production and consumption prices and compare them to the household level income and purchasing power in Northeast Syria to better understand household level barriers to growing wheat. As the Northeast wants to have a level of autonomy, either within or outside of the current Syrian state, the barriers to becoming wheat self-sufficient must be determined and documented before the state can move forward.

CHAPTER II

REVIEW OF LITERATURE

To better understand the factors at play that could influence Northeast Syria in becoming wheat self-sufficient, this paper looks at two pillars of wheat self-sufficiency: production capacity and governance, trying to understand the status quo to better quantify potential barriers to wheat self-sufficiency in the event of independence. As a part of the literature review, this paper aims to better understand self-sufficiency as a concept and further define the two-pillar conceptual framework by looking at governance as elucidated in the value chain literature. It then offers an overview of the wheat value chain, starting with a history of its nationalization followed by a review of literature surrounding the current value chains. This paper then discusses the effects of sanctions on Syria, with a particular focus on the Caesar Syria Civilian Protection Act, which came into effect in June 2020 during the height of the coronavirus pandemic. Lastly, the literature review outlines the current household food security levels with a focus on household level food expenditures, discussing a framework for determining household food security through market pricing and household income.

Section 2.1. Self-sufficiency – a Two Pillar Approach

Food self-sufficiency, or the ability of the state to provide for the needs of its population without the need for external trade, is by most economists deemed to be inefficient as there is a deadweight loss for the international community (Wegren & Elvestad, 2018). While some states tended toward isolationism during the middle of the 20th century, international organizations and hegemon slowly advocated and brokered increasingly liberal trade as this allowed countries to produce on comparative advantage, increasing the overall wellbeing of the global population according to liberal trade theory (Wegren & Elvestad, 2018). Very few countries in practice have had to face total the prospect of food self-sufficiency, with only those facing sanctions from the international community or regions not recognized as states truly facing a full cessation of international trade.

Food self-sufficiency historically has been concerned primarily with production rates, revolving around the question of whether a country can produce enough food to feed its population (Wegren & Elvestad, 2018; Kaplinsky & Morris, 2001). The measures of this self-sufficiency have ranged from counting kilocalories produced to number of kilos produced per person to percentage of consumption needs met. While this question, of course, is still at the crux of the issue surrounding self-sufficiency, scholars have noted that it does not indeed encompass all that food self-sufficiency requires as the governance, policy, and infrastructure involved in the value chains of the food also play a significant role on whether a state can reach food self-sufficiency (Orazgaliyev, 2018; Mellor et al., 1998; Gereffi et al, 2005).

Governance structures in this paper are all forces that set the “parameters requiring product, process, [or] logistics” to meet certain standards and which ensure that all interactions of these “exhibit some reflection of organization” (Kaplinsky & Morris, 2001, p. 29). These governance institutions can take many forms and are not necessarily in place all from government

organizations (Gereffi et al, 2005; Kaplinsky & Morris, 2001). Indeed, scholars note that there are three general types of governance when discussing value chains that should be taken into account: legislative, judicial, and executive governance (Kaplinsky & Morris, 2001). According to Kaplinsky and Morris (2001), legislative governance focuses on setting standards, judicial governance on monitoring the implementation of these standards, and executive governance on supporting firms participating in the value chain to meet these standards. Kaplinsky and Morris (2001) note that at different points in the value chain for different types of governance, different actors such as large firms, governments, international multilateral organizations, or NGOs can act set these standards for other actors.

To understand if these governance structures are functioning, Kaplinsky and Morris (2001) identify three “critical success factors” or CSFs: quality, price, and delivery reliability (p. 55). While the authors suggest various ways in which to gather primary data on which CSFs are most important in each specific market, the authors note that price typically becomes the more important CSF in low-income markets (Kaplinsky & Morris, 2001). Consequently, this research will look at prices for both producers and consumers of wheat to understand if governance structures can reliably facilitate the delivery of goods at prices that are accessible for the general population.

In the event that Northeast Syria is denied autonomy under a federalist system and fully breaks from the Assad Administration, they would face a period of involuntary self-sufficiency for most products as their closes neighbors would not normalize trade with them and the international community would not yet recognize them as a state (Rabinovich & Valensi, 2021). Due to the current sanctions, however, the Northeast is already experiencing a significant amount of de facto isolation from liberal trade, which means that understanding current Northeast food security as a function of the current production capacity and governance institutions would allow for an understanding of whether the Northeast is able to be self-sufficient in the event of proper

isolation. These two pillars then, production capacity and governance institutions, need to be functional and adequate in order for a state to be able to meet their household's food needs and provide for their country's household food security, the ultimate indicator of food self-sufficiency.

Section 2.2. Nationalization, Subsidy, and Their Impacts

Nationalization is defined as the “assumption of control or ownership of private property by the state” (Spaeth, 2017, para. 1). Often, this nationalization occurs for entire sectors instead of just one private firm in more socialized countries (Spaeth, 2017). Governments may seek to “nationalize . . . private firms in the presence of social welfare considerations” when positive externalities exist for certain sectors (Crivelli & Staal, 2020, p. 521). In states that value free market enterprise over full government intervention, these governments often tend more toward bailouts or subsidies rather than full nationalization (Crivelli & Staal, 2020). Even for countries with preference toward free market, however, scholars studying development in the agricultural sector note that “there has to be substantial public-sector investment” in the agricultural sector since “agriculture is a small-scale sector” (Mellor et al, 1998, p. 149). Examples given of public sector investment include “transportation, power, communication, research, and input” (Mellor et al, 1998, p. 149). However, the scholars also note that the burden of investing in all of these may be too great for many governments to undertake, with preference given to the private sector despite the inequity for smaller scale farmers (Mellor et al, 1998).

Part of the reason for government intervention is the appeal of having economic control over developing economies. In Orazgaliyev's 2018 study regarding the oil and gas sector in post-Soviet Kazakhstan, Orazgaliyev notes that part of the reasoning behind government intervention was to control prices and try to control for inflation (Orazgaliyev, 2018). Scholars have also argued that using a state's negotiating power instead of individual firms, prices can be kept lower,

and services can be offered at a cheaper price compared to if small private firms each negotiated on their own (Crivelli & Staal, 2020). Other research conducted in developing African countries focusing on the agricultural sector notes that governments often intervene in sectors because of political incentives to keep prices low, particularly for the urban population (Bates, 2014).

However, researchers note the tension in government intervention in the agricultural sector as they want to keep prices low in order to feed people but need to keep prices high to incentivize farmers (Timmer et al, 1998). This constant tension often means that feeding the population is prioritized over keeping prices high for farmers, which can lead to conflict between rural farmers and the government as the low rate does not cover production costs (Timmer et al, 1998; Bates, 2014). Some research conducted in Egypt suggests, however, that when governments have enough revenue to also levy subsidy for production inputs for farmers, these subsidies can sometimes balance the negative effects of the artificially low prices with the high production costs (Von Braun & de Haen, 1983). When this study was conducted, however, the Egyptian government was spending around 15% of its total expenditure on supporting the agricultural sector which is not feasible for the majority of countries (Von Braun & de Haen, 1983).

However, researchers also argue that states can have more than economic reasons for nationalizing or other conducting other forms of government intervention, particularly in developing countries (Orazgaliyev, 2018; Bates, 2014). Both Orazgaliyev and Bates argue that this nationalization or other state intervention is sometimes done during the inception of a new state or a new sector within an existing state in order to increase industrialization and development (Orazgaliyev, 2018; Bates, 2014). This development could include both developing the skills of the workers in the sector and the sector as a whole as a part of the portfolio of the developing country (Orazgaliyev, 2018). However, Bates (2014) notes that this government intervention for the sake of development is often at the expense of the farmer as governments tend to artificially reduce prices and increase costs, disincentivizing farmers from certain crops.

Farmers respond by either planting less or changing the makeup of what they plant, which is not ideal for development (Bates, 2014). These small rebellions are often put down by the government through coercion in order to continue to appease urban populations and keep food prices low as mentioned above (Bates, 2014).

Another incentive for nationalization or government intervention is the protection of growing industry in developing countries. Orazgaliyev argues that particularly in the Middle East and Central Asia regions, nationalization of sectors can also be seen as a way to decrease the likelihood of multinational corporations from monopolizing developing nations' firms (Orazgaliyev, 2018). Bates (2014) also argues that part of the goal of state intervention is sheltering local industry; however, Bates (2014) also notes that this sheltering is at the expense of the farmers as they end up paying higher prices for inputs due to restrictions on imports. Consequently, from the farmers' perspective, this type of government intervention is mostly viewed as unfavorable unless, as mentioned above, production subsidies are also levied (Bates, 2014, Von Braun & de Haen, 1983).

From a private industry standpoint, then, government intervention is not particularly desirable. Some researchers note that the main perceived benefit of government intervention for firms is stability (Orazgaliyev, 2018; Sander, 2020). For example, when looking at the voluntary semi-nationalization of the Anglo-Persian Oil Company, researcher Michael Sander argues that the Anglo-Persian Oil Company in part voluntarily gave itself over to nationalization due to the fear that the firm would not survive financially without public funding (Sander, 2020). While Sander notes that this is a unique case thus far in private – public relationships as firms “usually avoid any entanglement with governments or other public actors,” Sander also underlines that public funding is often seen as a more stable option than private funding, particularly when governments present themselves as an ally to the private sector, able to withstand external shocks (Sander, 2020, p. 926). While firms do not normally volunteer nationalization or any level of government

control, there is a sense of safety when the alternative is private funding or bankruptcy (Sander, 2020).

In Syria, however, nationalization of the wheat sector was not a voluntary phenomenon, instead following more closely with the developing countries model put forth by Bates (2014) and Orazgaliyev (2018). Syria began its nationalization of most of the agricultural sector in the mid-1950s as they began their investment in developing national industry. During this time, the government began setting up the Agricultural Bank and multiple irrigation projects (Keilany, 1968). However, the distribution of agricultural land still highly favored the wealthy, with land being concentrated in large swaths rather than distributed for small scale farming (Keilany, 1968). In 1958 in an effort for redistribution and equity, however, the Syrian government, then a part of the United Arab Republic, a merged state between Egypt and Syria, signed into law that one individual could not own more than 80 hectares of land, with the excess being redistributed to smaller families (Keilany, 1968). These types of strict reforms continued under Egyptian leadership, with the nationalization of banks and most companies.

Once the socialist Ba'ath party took control of the country in 1961, agrarian reform projects continued to grow and flourish under the newly minted five-year development plan, which aimed to increase gross national income and savings along with creating jobs (Keilany, 1968). In the first several years of socialist Ba'ath Syria, over 100 companies were nationalized or partially nationalized, with nationalization focusing on banks, raw materials, and agricultural production (Keilany, 1968). Agricultural cooperatives that had been formed in the late 1950s and early 1960s, including tens of thousands of households to offset the inefficiencies of small-scale farmers, were expanded. Agriculture overall expanded during this time, with Syria becoming a net exporter of wheat by 1962 (USDA, 2021). While this extensive government intervention in the agricultural sector during the 20th century slightly oversteps the examples from sub-Saharan Africa put forth by Bates (2014), the general pattern can be seen in Syria during this time: the

government in a developing country wants to keep food prices low and shelter national industry through government intervention, putting down rebellions through coercion.

Since the fragmentation of Syria due to the onset of the Civil War, however, the operation of the nationalized sectors has become more complicated with the emergence of the self-administration in the Northeast. Prior to 2011, the government provided seed and on occasion agricultural inputs to farmers free of charge or at highly subsidized prices (Tothova et al, 2018). Now, however, the government does not provide inputs to farmers in the self-administration controlled land; additionally, their stock of inputs falls short of the demand. For example, wheat seed as subsidized by the General Organization for Seed Multiplication (GOSM), a government owned entity responsible for distributing seeds, provides wheat seed at 858 SYP / kg (FAO, 2021b). However, in self-administration controlled areas, wheat seeds were sold on the free market price of 1200 SYP / kg (FAO, 2021b). This slightly higher price in the self-administration controlled areas generally continues across all wheat inputs: subsidized N-P-K fertilizer sells at 5363 SYP / kg compared to 8000 SYP on the free market in the self-administration, subsidized urea sells for 1400 SYP /kg compared to 1500 SYP / kg on the local market in the self-administration region, and subsidized fuel for farmers sells at 180 SYP / liter compared to 1555.45 SYP / liter under the free markets in the self-administration, etc. (FAO, 2021b).

Buying and selling of wheat has become more complicated since the onset of the crisis; while the GECPT and later the GECP facilitated at least part of the milling, selling, and storage of wheat throughout Syria before the crisis, now the self-administration and the government of Syria work together to facilitate this through Assad-controlled pockets throughout Northeast Syria, with notable outposts in Hasakeh City and Qamishli. In the Northeast specifically, the infrastructure to facilitate this milling and processing is also significantly damaged, with less ability to respond to the needs of the population, which is why much of the wheat processing is outsourced to the central and south Assad – controlled regions before being returned for consumption (FAO,

2021b). In 2021, the GECP set the buying price of one kilogram of wheat at 400 SYP¹, or around 0.127 USD (SANA, 2021). However, while this price has quadrupled since 2017, the price has not necessarily kept up with inflation and increased cost of inputs, with some farmers instead choosing to abandon production since it is no longer deemed profitable (FAO, 2018).

The GECP, ACDC, and Northeast free market actors all have different supply chains through which they facilitate sorting, milling, and processing. While both of the government affiliated agencies (GECP and ACDC) have sieves, mills, and bakeries fully owned and operated by the agency, there are also these facilities that are owned by private companies in the Northeast and operate fully apart from either government (FAO, 2021b). These chains are further explained in the subsequent section about the various wheat value chains.

Overall, the nationalized institutions which govern the wheat cycle in Syria face difficulties operating and keeping prices within the affordable bounds for their population due to conflict and inflation. While these same institutions have seen great successes at their inception through high productivity increases, they have in more recent years faced pushback and protest as they struggle to provide adequate wheat for their constituency.

Section 2.3. Value Chains and the Syria Wheat Value Chain

To this point, the literature review has focused predominantly on explaining the construct of self-sufficiency and describing policy around wheat in Syria. However, to understand which governance structures are at play and to determine actors involved in turning wheat to flour, constructing a wheat-to-flour value chain is necessary. To conduct an in-depth wheat value chain review, however, according to best practices as determined by Kaplinsky and Morris (2001), primary qualitative data collection would need to be gathered, which is outside the scope of this

¹ The world price for one kilogram of wheat is 0.1860 USD, making Assad's buying price well below the world price (about two-thirds of the price). However, due to poor infrastructure and inability to access the international market, farmers are stuck selling at this price.

research. Consequently, this paper will present a simple value chain for Northeast based on review of existing literature and conceptual frameworks along with an overview of the Northwest counterpart for context.

Section 2.3.1. Conceptual Framework for Constructing the Wheat Value Chain

American academic Michael Porter first popularized the idea of the value chain in his 1985 book *Competitive Advantage* in which he argues that the value chain is the full indices of activities that are needed to create value for the customer from logistics to marketing to services. However, this foundational work focuses on value chains for individual firms and has since been expounded upon by scholars like Gereffi, Humphrey, and Sturgeon (2005) and operationalized by Kaplinsky and Morris (2001). As mentioned above, while the methodology suggested by Kaplinsky and Morris is not implemented for this particular paper, the overall principles of a value chain assessment that they present in their work will be used to explore the Northeast and Northwest wheat value chains, particularly their focus on governance.

Governance in these cases, as mentioned above, is defined as the forces that organize the interactions between different actors in the value chain for a specific commodity (Kaplinsky & Morris, 2001). Kaplinsky and Morris (2001) have presented a handbook meant to help researchers in conducting value chain assessments that also presents different governance constructs to better understand the concept. In this handbook, they identify three different types of macro-governance at play within value chains. The first, legislative governance, is meant to set standards for suppliers (Kaplinsky & Morris, 2001). Judicial governance is meant monitor the adherence to these standards and is sometimes undertaken by those external to the value chain such as NGOs in the case of child labor standards (Kaplinsky & Morris, 2001). Executive governance is the action taken to help suppliers to meet the standards set out by the legislative

governance and can range from support service providers to government policies meant to help suppliers in the value chain (Kaplinsky & Morris, 2001).

Kaplinsky and Morris (2001) note that any large firm can exercise certain levels of this governance power within a value chain, and that their power can derive from a number of sources such as their share of the chain profits or control over a particular technology needed in the chain. However, each of these firms exerting governance power must have some level of legitimacy and, in case of legislative governance, the power to punish those who break the chain standards (Kaplinsky & Morris, 2001).

Kaplinsky and Morris (2001) note throughout their handbook that value chains are complex and that conducting value chain analysis can focus on many different facets depending upon with whom the researcher interviews and on what questions the researcher focuses their interviews. Ultimately, however, value chain analysis is meant to identify “key policy issues that can be considered as a consequence of value chain analysis” (Kaplinsky & Morris, 2001, p. 101). While this paper constructs a simple value chain based on secondary literature review and does not attempt to conduct a full value chain analysis, the ultimate goal of this reduced analysis is also meant to inform the policy recommendations presented in the conclusions.

As explored above, Kaplinsky and Morris (2001) focus their governance analysis on macro-level governance of value chains, expounding on the different actors who can exercise legislative, judicial, and executive governance over the chain. While Gereffi et al (2005) also use the term governance, these authors instead determine a governance framework to apply to value chain assessments that focuses more on the interactions and transactions between different actors in the chain. Gereffi et al (2005) determine three variables that influence the transactional governance within global supply chains: the complexity of the transaction, the ability to codify transaction, and the capabilities in the supply base. Based on if each of these variables are high or low, five

separate types of governance in value chains could be at play. The first, market governance, is when governance structures ensure low complexity of transaction, high ability to codify transactions, and high capabilities in producers (Gareffi et al, 2005).

On the opposite end from market governance is hierarchy governance, in which there is high complexity in the product and transaction but low ability to codify these transaction as well as low capabilities in the supply-base (Gareffi et al, 2005). Hierarchy governance results in one integrated lead firm performing all necessary steps in the value chain since information sharing is stunted and other firms' capacity is low. Similar to hierarchy is captive governance, which occurs when the complexity of products and the ability to codify these complexities is high, but highly competent suppliers are scarce (Gareffi et al, 2005). This type of governance results in 'captive' suppliers who are dependent upon a lead capable firm to implement the complexity of the product, resulting in a high degree of power asymmetry (Gareffi et al, 2005).

While this paper does not attempt to determine which of these governance patterns the Northeast Syria wheat value chain falls into as this is outside the scope of the research, these categories are still useful for thinking about how governance structures dictate the interactions between firms and other actors in the value chain. In addition, due to the high levels of intervention from the self-administration in the Northeast wheat value chain, the categories codifying transactional governance structures at play do not necessarily relate to the situation in a one-to-one comparison as Gareffi et al (2005) focus on interactions between firms and suppliers, neither of which are government entities.

Section 2.3.2. Wheat Value Chains in Northeast Syria, Summer 2021

Before farmers can produce wheat, they first must access wheat inputs like seeds and fertilizers; in Northeast Syria, the majority of these inputs come from the private market, imported by private traders from Kurdish Iraq (FAO, 2021b). Due to the sanctions, other bordering countries typically

do not trade with the private traders (FAO, 2021b). Generally throughout Northeast Syria, local market inputs (not subsidized) available throughout the Northeast include fertilizer, phosphate fertilizer, liquid insecticides, liquid fungicides, diesel fuel, and wheat seeds. The GECP also provides these inputs at two different points in Northeast Syria at a subsidized price, but in quantities that are not sufficient for all farmers in Northeast, covering only about one-third of the demand from farmers (FAO, 2021b). The GECP supplies limited amounts of subsidized urea, ammonium nitrate, phosphate fertilizer, NPK fertilizer, insecticides, fungicides, herbicides, wheat seeds, and fuel for agriculture (FAO, 2021b). However, the two distribution points at which the GECP provides these subsidized inputs are in urban areas of Hasakeh City and Qamishli, which many farmers have difficulty accessing due to the high cost of transportation (FAO, 2021b, SANA 2021). When looking at this through the lens of agricultural policy in developing countries, this aligns with Bates' (2014) analysis that often the urban populations are pacified at the expense of the rural farmer. At this stage, however, the GECP is still the de facto legislative governance entity in the value chain: the GECP sets the standards for which seed quality dictate whether or not the wheat will be purchased by the GECP or ACDC, which is then followed by traders so that the yield will pass the quality tests during the wheat buying period (FAO, 2021b; SANA, 2021). Generally, however, private market prices for these inputs are significantly higher for the same quality of seeds deemed acceptable by the GECP (FAO, 2021b). Farmers also complain of generally low quality inputs being available in both the private market and the subsidized distribution points, which has caused some farmers to strike (Mauvis, 2021).

During cultivation in Northeast Syria, farmers generally rely on daily workers during planting and harvesting along with some mechanization (Ahmed, 2016). Daily wage rates are calculated at 4082 SYP / day, or about 1.3 USD (HNAP, 2021). Irrigation is another necessary operations-level input needed for growing wheat in Syria; however, of the original 1.5 million hectares of irrigated agricultural land, 550,000 of which were irrigated through government-led schemes, less than

500,000 of hectares remain irrigated (FAO, 2018). Even these lands, however, are not reliably irrigated as they rely either on the power grid, which is not reliable due to the fluctuating rainfall powering the hydroelectric dams, or on generators run by diesel fuel, which is expensive and often scarce (FAO, 2018). To cope with this shortage, wheat farmers in Northeast report irrigating their cereals only two to three times, short of the recommended five. Others report drilling private wells to reach groundwater, which has resulting in increasing salinity in the water table (FAO, 2018). Eight of the ten reservoirs that serve Northeast Syria remained operational throughout the first ten years of the Civil War; however, due to the ongoing drought, these reservoirs are mostly depleted, with the Euphrates running dry (REACH, 2021a).

When comparing this production to the models put forth by Gareffi et al (2005), the high control over pricing and the lack of selling options outside of the ACDC would suggest a captive or possible hierarchical structure of transactional governance. However, as mentioned above, neither of these models fully capture the ACDC's involvement in the value chain. Either of these frameworks, according to Gareffi et al (2005), lead to high power asymmetry, disfavoring the producers, or in this case farmers. This analysis further aligns with the research done by Bates (2014), who also notes that the governments of developing countries extract resources from the rural farmers, exercising their force.

After the farmers harvest their wheat, local wheat is procured mostly by government (GECF) or self-administration (ACDC) entities through either direct purchase or wholesale traders who buy the wheat at a reduced rate and sell to a government agency. These private traders also sell to private mills directly instead of to government agencies, with purchases typically happening through the summer months directly after the local harvest (IMMAP, 2018). Very little wheat is sold directly to local households, with some wheat being kept by the farmers for either replanting or livestock feed use. After collecting wheat at their buying points, the wheat is then transported by either GECF or ACDC to their seed processing plants or storage facilities. The primary seed

processing plant for GECP in Northeast is in Qamishli, a northern town on the border with Turkey. The GECP, however, mostly sends the wheat that they buy to Northwest or South-Central Syria, having no commercial selling outlets for flour in Northeast Syria. Storage is an issue both for public and private traders; most silos in the Northeast were destroyed because of the crisis, leaving private processors to rent warehouses to store their grain. The ACDC, however, has historically preferred to store grain in open-air fields to store their purchased wheat as this does not require to rehabilitate assets and draws less attention for terrorist attacks (IMMAP, 2018).

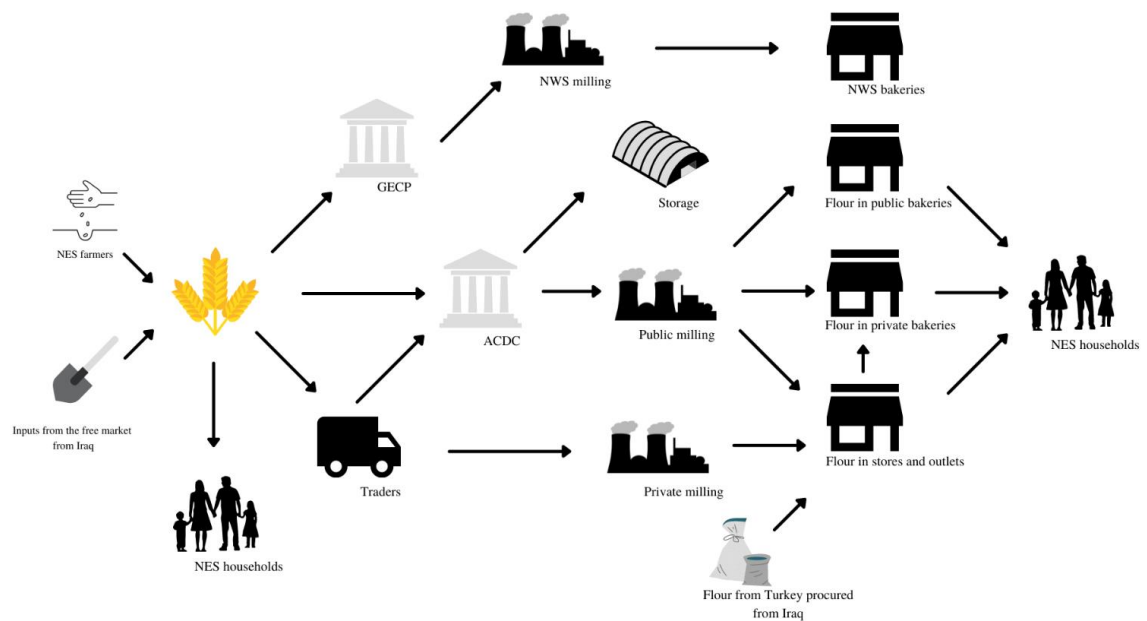
When looking at the buying of wheat through the transactional governance lens, both the ACDC and the GECP are price setters at this stage of the wheat value chain, which according to Kaplinsky and Morris (2001) is one way in which entities derive their power over market transactions. However, private wholesale traders also exercise some power over market transactions as they are one of the main facilitators of farmer selling and government buying, setting lower prices for the farmers (IMMAP, 2018, Kaplinsky and Morris, 2001). From a macro-governance perspective, all three buyers in some ways exert judicial governance as they only buy wheat that matches with the quality standards set by the GECP. Additionally, the traders in particular act as a kind of executive government entity as they also offer a specialized service to support in the coordination of the value chain.

After the fall of ISIS, it was estimated that the ACDC covers about 80% of the Northeast's wheat milling needs, with the remaining 20% covered by the private sector (IMMAP, 2018). However, this is expected to have increased in the interim years due to the increase in private business. Regardless, this high level of value chain shares that are operated by the ACDC indicate that they are one of the main governance entities in this value chain when considering the framework by Kaplinsky and Morris (2001). Additionally, it is estimated that 12% to 30% of all wheat is lost during this milling process (IMMAP, 2018). To compensate for the gap in supply, then, many

private milling firms also supplement their supply by importing flour from Iraq (IMMAP, 2018). While this supply chain is expected to have slowed some due to sanctions, there is still much trade between the Iraqi Kurdish region and the Syrian Kurdish region.

Figure 4 below displays a reduced summary of the wheat to flour value chain in Northeast Syria.

Figure 4 – Northeast Syria wheat to flour value chain



Once the wheat is processed into flour, this flour goes to either shops or bakeries for purchase by the Northeast population. All shops selling flour or bread are private and therefore procure their flour from the private mills, not benefiting from the subsidized flour prices set by the ACDC. Bakeries, however, can be either public or private, with public bakeries owned and operated by the ACDC. Aid agencies often also support private shops and bakeries through either rehabilitation or the distribution of high-quality inputs to stimulate the local market.

The public bakeries mentioned above, then, offer flour at prices that incorporate the governance exercised primarily by the ACDC, who is involved in buying, processing, and distributing the

wheat. This high level of involvement would indicate that they have a high level of chain value added, which according to Kaplinsky and Morris (2001) indicates that they are one of the key governors of the wheat value chain. Kaplinsky and Morris (2001) also argue that price is one of the critical success factors that can be used in final markets to understand the functioning of the value chain. Comparing the prices between these public and private bakeries, then, would allow for some understanding of the governance mechanisms in place in these slightly different value chains.

Section 2.3.3. Flour Value Chains in Northwest Syria

In Northwest (both opposition controlled and Assad – controlled), the majority of wheat was procured from Turkey before the imposition of the latest round of U.S. sanctions. Now, however, the majority of mills and bakeries rely on wheat given as foreign aid or, for public entities, procured from the Northeast (IMMAP, 2019; Grabenhorst 2020). Procuring wheat from the Northeast is not an option for private owned milling as the main trade highway, the M4, is unsafe for private transport since the Turkish Operation Spring Peace and other transport methods are unsafe as they cross through Assad-controlled South - Central Syria.

All milling for flour distributed in Northwest is done within Northwest at public and private mills. The public mills in the opposition controlled Northwest are operated by the Syrian Public Establishment of Grain (SPEG), while those within the control of the Assad administration are run by GECP (IMMAP, 2019). The main stressors for mills in Northwest are the lack of consistent electricity, the lack of inputs, and the lack of functioning marketplaces due to the ongoing war. Additionally, cases of coronavirus have begun to increase drastically in the fall of 2021, which has closed-down many companies and stunted supply chains (Al-Monitor, 2021).

In Northwest, there are both public and private bakeries that distribute flour and bread. The public bakeries are run by SPEG, who mostly set the end consumer prices in USD or Turkish Lira due to

the fluctuation of the Syrian Pound. There are also shops which distribute flour along with bread, which are all also privately run. These shops exclusively procure their flour from privatized mills or from humanitarian organizations working cross-border like AFAD, the Turkish Disaster Fund, or SRTF (IMMAP, 2019). These prices are also typically set in Turkish Lira to follow both the SPEG and GECP prices.

As seen through this brief analysis, the wheat to flour value chain in Northwest, then, has a few more governance entities than Northeast as multiple entities and the private market conduct price setting, buying, milling, and distribution. Additionally, international organizations play a larger governance role in Northwest than in Northeast, involved in every level from wheat seed distribution to flour distribution to in-kind food rations distribution. Similarly, the private market in Northeast is generally functions better according to aid organizations operating in both regions (IMMAP, 2019). This means that eventual governance through private firms and not government organizations is more feasible in Northeast than in Northwest (IMMAP, 2019).

Section 2.4. Sanctions and Their Impacts

One other main challenge of these nationalized institutions is the increase in sanctions throughout the last ten years. Sanctions, or trade embargoes, are “discriminatory restrictions or bans on economic exchange” (Pugel, 2016). Sanctions are considered a type of economic warfare and were used nearly exclusively during wartime until the last half of the twentieth century. The United States is one of the most prevalent users of sanctions, with an estimated 20 billion USD in exports blocked by sanctions during the 1990s alone, costing an estimated 1 billion USD per year in loss globally (Pugel, 2016). However, the sanctions have moved away from blanket sanctions into the more targeted sanctions of the 2010s; regardless, the United States had placed overarching sanctions on many countries, including Iran, Cuba, North Korea, Sudan, and Syria (Hufbauer & Jung, 2020). Multilateral sanctions have also become more prevalent during the

1990s, with the United Nations also imposing sweeping sanctions on many nations; however, due to their limited success and high cost, the UN now opts for smaller more targeted sanctions (Pugel, 2016).

Sanctions generally have the most impact on the targeted country when they have low elasticity of demand for the targeted goods. For example, when large countries that impose sanctions on smaller ones, the sanctions normally have the desired impact as the imposing country's elasticity is relatively high compared to the smaller country's elasticity (Pugel, 2016). Researchers also note that sanctions that are imposed suddenly and all at once that have not given the targeted country time to plan for and adjust to the sanctions are also more effective in the real world according to economists: the sudden shock to the economy has a sweeping negative effect instead of allowing for slow adjustment (Pugel, 2016). Economists have also found that sanctions work best when the political system is participatory; when the population has direct influence over government, they often pressure the government to comply with the terms needed to lift the sanctions (Pugel, 2016).

However, as sanctions have become more popular, more thought has been given to the impact on the country being sanctioned. Regarding impact on the country which has sanctions imposed upon them, economists generally see "import-competing producers benefiting from the removal of foreign competition, while other groups are damaged to a greater extent" (Pugel, 2016, p. 269). These 'other groups' include the consumers of the country, with much of the burden borne by average citizens. To try to offset these costs, most sanctions today have a humanitarian exception, meaning that lifesaving food and medicine can be traded with the country in question; even the US's North Korea and Cuba sanctions have a humanitarian provision. Economists, however, argue that this is more to pacify Western journalists and the international system than enacting actual exceptions as most companies still will not trade with governments (Hufbauer & Jung, 2020).

While the United States has levied many sanctions against the Syrian government over the course of the Civil War, the previous Trump administration enacted a restrictive set of trade embargoes known as the Caesar Syria Civilian Protection Act, which came into effect starting 17 June 2020. This set of sanctions is named after the codename of the photographer who documented torture and atrocities within the Assad government prisons for the United States, which gave them proof of previously supposed mistreatment. Title I of the Act mandates that any individual who facilitates the buying or selling of goods, services, or technologies to the Assad government that could support their military actions or oil and gas company are penalized by the United States from conducting business in the United States (U.S. Department of State, 2020). These included any “article, natural or man-made substance, material, supply or manufactured product, including inspection and test equipment, and excluding technical data” (United States Congress, 2019). Additionally, monetary support including the “provision of loans, credits, or export credits” is also subject to sanctions by the United States government (United States Congress, 2019). This Act enforces the same penalty on individuals who profit from conducting any reconstruction activities in Syria including providing engineering goods or services for the purpose of reconstruction (United States Congress, 2019). For any foreign individual who is known to participate in these activities, the United State Government will block property, revoke existing visas, and block future visas, including business visas (United States Congress, 2019).

Title II of the Act, however, outlines that these sanctions will not apply to any individual or organization who is a certified humanitarian organization (United States Congress, 2019). The Act specifies that registered humanitarian organization will be able to operate exactly as before the enactment of the sanctions to try to provide for the basic needs of the Syrian population (United States Congress, 2019; U.S. Department of State, 2020). This provision is extended to humanitarian actors already operating in Syria along with new humanitarian actors who can prove that they do not profit from reconstruction efforts.

Indeed, the United States Government noted throughout the rolling out of the Act that the intent was not to harm the Syrian people, but rather to hold the Assad administration accountable for their war crimes committed during the Civil War (U.S. Department of State, 2020). Journalists and economists alike have documented that the Assad administration, however, has not changed their approach due to the sanction, noting the severe impact on the Syrian population. In part, this unchanging approach by Assad could be because the United States did not impose the sanctions quickly after announcing them; Congress announced the sanctions on 3 June 2019, noting at the time that the Act would not come into effect until 17 June 2020, which gives the Assad administration time to adjust to the provisions of the Act. While the sanction only targets materials that ‘support’ the Syrian military, the sanction’s sweeping language also effectively stopped most trade in and out of Syria, particularly because of the partial or full nationalization of many sectors.

However, the United States envoy to Northeast Syria noted in May of 2020, before the Act took effect, that the provisions would exclude the autonomous region of Northeast Syria (Hawar News Agency, 2020). This has allowed for stilted trade to continue between Kurdish Iraq and the Northeast self-administration, which some scholars think has helped lessen the impacts on the Northeast. However, the self-administration is also viewed by many countries to be a kind of rebel group, which means that many nations do not trade with them, resulting in an ongoing pseudo-sanction from much of the international world.

Regardless of the unchanging approach from Assad, there are some observable changes to wheat importing and exporting due to the Act; While they cannot directly trade wheat to Syria anymore, Russia, Syria’s most closely allied country and major provider of wheat to Syria during the war, has begun to donate wheat as humanitarian aid (Donley, 2020). However, Russia has exported or donated less during the year of 2020 than the previous years, according to one analyst, due to the ongoing coronavirus pandemic (Cornish & al-Omar, 2020). Analysts note that countries generally

engaged in less trade during the height of the coronavirus pandemic, not only due to supply chain issues but also because countries tend to store goods during uncertainty (Cornish & al-Omar, 2020). The pandemic coupled with the sanctions led to a drastic shortage of wheat in 2020 and 2021, which directly impacted the Syrian people.

Due to the ongoing shortage, bread prices have doubled even as the Syrian pound has depreciated to less than half of its pre-war value due to the Lebanese economic crash of 2020 and the ongoing war (Cornish & al-Omar, 2020). This depreciation and shortages have meant that many households have had to reduce bread consumption, causing further household food security deterioration. Due to these drastic impacts and the ongoing pandemic, there has been some push back in general on enacting sanctions during the coronavirus pandemic, with one analyst reporting that making those affected by war “targets of unilateral sanctions... will lead to a humanitarian catastrophe – in particular for women, the elderly, young people and children” (Grabenhorst, 2020). While journalists have outlined these humanitarian risks and ongoing needs, there has not been much scholarly work done into the changing wheat prices and the Act’s effect on consumer prices and access compared to before the Act.

Section 2.5. Household Food Security and Expenditure

Household level food security exists when all people “have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life” (FAO, 2012). There are many ways in which food security is measured, including standard indicators collected and compiled by the Food and Agriculture Organization of the United Nations (FAO). Some of these include the average energy supply in kilocalories per person in each country, average value of food production per country, and prevalence of malnourishment (FAO, 2021a). Syria currently has poor household food security across most

indicators, with 12.4 million people in Syria being food insecure in compared to 7.9 million in 2020 (UNICEF, 2021).

There are also indicators relating to the type and also the frequency with which households eat certain types of food. With regards to wheat specifically, wheat and wheat products comprise about 40% of all caloric intake for Syrian individuals, mostly consumed in the form of bread, making it a staple of the Syrian diet (Ahmed, 2016). However, when discussing the economic access part of food security, there are not many globally indicators at a household level.

To try to bridge this gap, the International Food Policy Research Institute (IFPRI) has published work relating to the total household expenditure on food and how this can be used to approximate household food security. IFPRI researchers Smith and Subandoro posit that households spending 75% of their household income on food are considered very vulnerable and food insecure. This framework then cascades, with households who spend 65% - 75% of their income having high food insecurity, 50% - 65% having medium food security, and less than 50% of their income to have lower food insecurity (Smith & Subandoro, 2007). While this framework is used for overall household expenditures, it can be adjusted if the overall food expenditure basket for a certain country is known. In this way, wheat security can be isolated from overall household level food security.

CHAPTER III

METHODOLOGY

Section 3.1. Determining self-sufficiency production scope

The first step to understanding the barriers associated with Northeast Syria becoming wheat self-sufficient is understanding whether or not the production levels need to sustain typical consumer behavior or is achievable based on the land size and resources available. To do this, this paper first considers the total number of kilograms of wheat needed per person based on historical production data, export data, import data, and population data. All production, export, and import data comes from data collected and stored by the United States Department of Agriculture (USDA) (2021) and is available for download online. However, when using population data specific to Northeast Syria, the estimates used are from reports conducted by Information Management and Mine Action Programs (IMMAP) (2021). Yield is calculated using the total production in metric tons compared to the area of land planted in hectares, also stored by the USDA (2021). Please see below for the formula used to calculate yield.

Equation 1 – Equation used to calculate yield throughout

$$y = \frac{q}{a}$$

Where y is yield

Where q is total wheat production in kilograms

Where a is number of hectares planted (area)

Additionally, this paper outline the average low yield, medium yield, and high yield for wheat in kilograms per hectare to understand the breadth of yield possible in Syria based on historical data using the quartile function. Once an average has been established for the total number of kilograms of wheat produced or imported per person, a construct is created to determine the total number of hectares Northeast Syria would need to plant depending on the low yield average, medium yield average, and high yield average. These constructs are then be compared against the total planted area for wheat in the autonomous regions of Northeast Syria in the previous few years to understand the feasibility from a production standpoint. Please see below for the formula used to calculate the total number of hectares needed to sustain the Syrian population.

Equation 2 – Equation used to calculate the average number of kilograms of wheat needed to sustain the population

$$k = \frac{1}{n} \sum_{i=1}^n ((q_i - x_i) + m_i) * POP_i$$

Equation 3 – Equation used to calculate the number of hectares needed to sustain the population

$$A = \frac{\frac{1}{n} \sum_{i=1}^n ((q_i - x_i) + m_i) * POP_i}{\bar{y}}$$

Where k is the average number of kilograms of wheat needed to sustain the population

Where A is the number of hectares needed to sustain the population

Where q is the total production of wheat for a specific year in kilograms

Where x is the total exports of wheat from a specific year in kilograms

Where m is the total imports of wheat from a specific year in kilograms

Where POP is the population for a specific year

Where n the total number of observations

Where \bar{y} is the average wheat yield in kilograms per hectare

Given that yield per hectare is not constant and that population estimates fluctuate greatly, this paper uses three separate yield estimates from the first quartile, second quartile, and third quartile of yield range since 2000 to construct a range of \bar{y} values that are tested against the total number of hectares planted with wheat in Northeast Syria. These quartile ranges are used instead of average yield during this same time to try to account for the lowest yields and highest yields under modern agriculture while excluding outliers. Since this research is attempting to understand the levels of wheat self-sufficiency, understanding production capacity through these quartile range yield levels is necessary. Additionally, as all population estimates also differ, this paper uses three population estimates to construct the range of values for wheat self-sufficiency.

Equation 4 – Equation used to calculate the number of hectares needed to be wheat self-sufficient at a certain population estimate and yield estimate

$$A = \frac{(POP_i * k)}{y_i}$$

Where POP_i is the population for each estimate

Where y_i is the yield estimate for each quartile range

Where k is the average number of kilograms of wheat needed to sustain the population

Where A is the number of hectares needed to be wheat self-sufficient at a certain population estimate and yield estimate

Sufficiency, then would mean that the total number of hectares planted for wheat in the Northeast would need to be larger than level of wheat self-sufficiency needed at the population level.

Equation 5 – Equation used to calculate self-sufficiency levels for production

$$\text{Self sufficiency (production): } A_{normal} \geq A_{SelfSuff}$$

Where A_{normal} is the normal number of hectares planted with wheat in Northeast Syria

Where $A_{SelfSuff}$ is the number of hectares needed to be wheat self-sufficient at a certain population estimate and yield estimate

To understand the availability of inputs on the market, a review of literature are used to assemble a table detailing the prices of goods in local markets in the Northeast. This, when paired with the wheat value chain literature reviewed in the previous section, should give an overview to the feasibility of procuring wheat production inputs at a local level. At this stage, no further price comparisons or price tracking are conducted.

Additionally, to understand the dependence of Northeast Syria on rain for their wheat crops, a simple regression to test for correlation was run using yield data and rainfall data. The population data is stored and available for download online by the Central Intelligence Agency for global population tracking purposes. The data regarding yearly rainfall is collected and stored by the United Nations and accessible online. Using Statistical Analysis Software (SAS), two separate regressions are conducted, with the first incorporating yield and rainfall data from 1960 to the present, and a second incorporating data only from the Bashar al-Assad years to better understand modern agriculture's reliance on rainfall versus irrigation for wheat yield. The R-Squared result is used to understand the correlation between wheat yield and yearly rainfall. All rainfall data comes from the United Nations (2020).

Section 3.2. Understanding Flour Pricing Before and After the Enactment of the Caesar Syria Civilian Protection Act, with a focus on Public Institutions in Northeast Syria

In order to better understand the governance and policy including the wheat value chain, this paper looks at both the producer cost and consumer pricing of wheat. This paper then

contextualizes these costs and prices to the prices offered through the GECP for both buying of raw material wheat along with the selling of flour once it has been processed. This paper disaggregates between both Northeast and Northwest for comparing consumer prices, along with comparing between public (GECP – subsidized) sellers and private sellers. In particular, this paper focuses on the impact of the Caesar Syria Civilian Protection Act by focusing in on the month before and after its enactment. For all pricing, this paper looks both at the Syrian Pound (SYP) to understand the practical pricing of the good, but also convert all prices into U.S. dollar (USD) to try to control for the drastic inflation of the SYP.

Section 3.2.1. Production Cost

The Food and Agriculture Organization of the United Nations (FAO) has kept a log of the overall cost of producing one ton of wheat in Syria in the local currency from 1990 to 2017. When discussing how they calculate this production cost, the FAO notes that production costs incorporate both cash costs, like purchased seeds, fertilizers, non-cash costs, like unpaid family labor and owned machinery, capital costs, and land costs (FAO, 2021a). The production costs are then determined based on the needed allocation of each type of input based on the local soil and agricultural practices.

However, as mentioned above, the FAO has only recorded these costs up until 2017. To estimate the 2021 production cost, a simple predictive regression is conducted. Using only the data since the start of the Civil War through 2017 to try to capture the year over year inflation rate that has been seen during this time. Before the Civil War, the Syrian Pound was relatively more stable, which means that predictions including this data predict well below the reality starting in 2011.

This production cost prediction is further contextualized by assembling a table of common wheat inputs pricing from the free-market pricing seen throughout Northeast Syria in 2021. These prices are used to estimate a partial production cost for farmers only accessing inputs from the free

market. These production costs come from market monitoring conducted and published by the FAO (2021b) in collaboration with the food security cluster operational in Northeast and Northwest Syria. To calculate the production cost, a formula constructed by IMMAP (2018) are used, as detailed below where the coefficients are the amount needed to plant one hectare of rainfed wheat in Northeast Syria.

Equation 6 – Equation used to calculate the cost of production for one kilogram of wheat

$$c = \frac{100f + 1.5h + 10d + 2t + 220s}{y}$$

Where c is the cost to produce on kilogram of wheat

Where f is the cost of one kilogram of urea fertilizer

Where h is the cost of one kilogram of herbicide

Where d is the cost of one liter of diesel

Where t is the cost of renting a tractor

Where s is the cost of one kilogram of seeds

Where y is the yield in number of kilograms of wheat produced per hectare

The costs later used associated with each type of fertilizer are based on the free-market prices and are not the subsidized costs given by the Assad administration as the majority of farmers do not have access to these inputs as noted in FAO's report (2021a).

Section 3.2.2. Consumer Prices

To understand the cost of wheat at the end consumer price, this paper looks at the price of flour in the local marketplaces. By using the price of flour and not raw wheat prices, this paper hopes to encompass the markup that happens as a result of the processing conducted throughout the wheat processing value chain described in section 2.2 of this paper. This paper uses data collected by REACH, a “humanitarian initiative providing granular data, timely information and in-depth

analysis from contexts of crisis, disaster and displacement” (REACH, 2021b). In line with this objective, REACH’s Syria mission and REACH partners have conducted monthly market monitoring in various parts of Syria; this monthly monitoring includes collecting prices for basic non-food welfare items, fuel prices, water prices, and staple food items in local markets in both Kurdish Rojava and Northwest Syria. REACH then cleans this pricing data and publishes it online for humanitarian and scholarly uses (REACH, 2021b).

This section uses 24 months of data collected by REACH throughout this monthly market monitoring, beginning in October 2019 and finishing in September 2021. This paper starts by conducting simple averages per month per region, split between the Northeast and Northwest. The analysis then focuses in on the change in prices of flour seen from May 2020 to June 2020 when the Caesar Syria Civilian Protection Act came into effect, disaggregated by the variables outlined below:

region : This variable is used to disaggregate data between Northeast self-administration controlled Syria and the Northwest, both the territories that are controlled by opposition groups and by Assad where he allows for humanitarian operations.

shop_type : flour is sold both at food items shops and also at bakeries. This variable is used to disaggregate between these two types of shops.

public_private : Some bakeries in both Northeast and Northwest are the final step in the nationalized wheat sector. These public bakeries sell flour and bread that has been bought, mill, and processed as a part of the fully subsidized value chain by the GECP.

rural_urban : This variable describes the setting of the shop or bakery, whether rural or urban and are used to disaggregate accordingly. This variable is particularly interesting when comparing with the narrative put forward by Bates, who argues that in developing countries, governments tend to appease urban populations at the expense of rural populations to keep peace (Bates, 2014).

The research also tests to see if the price of flour sold at public versus private bakeries was different either before or after the Caesar Syrian Civilian Protection Act to understand if public or private bakeries are more resilient to sanctions in the short run. Additionally, this section then also conducts a similar test to see which are more resilient in the long run.

The paper then pivots to focus on Northeast Syria, focusing on understanding differences in overall average pricing between bakeries and shops, public versus private bakeries, and rural versus urban outlets to better understand the different demographics facing higher and lower prices for flour.

Section 3.3. Contextualizing Pricing at a Household Level and Calculating Household Food Security

Using the calculation above, the paper contextualizes these consumer flour costs based on household level income data collected by the Humanitarian Needs Assessment Programme run by the United Nations (HNAP). As the most recent household level income data was collected in June 2021, data from only this month is used.

To understand general household food security as a function of flour, however, thresholds should be determined for what constitutes food insecurity. As determined by Smith and Subandoro, households spending 75% of their household income on food are considered very vulnerable and food insecure. Their framework then cascades, with households who spend 65% - 75% of their income having high food insecurity, 50% - 65% having medium food security, and less than 50% of their income to have lower food insecurity (Smith & Subandoro, 2007). This framework helps determine food security by economic access at a household level but is not yet flour spending specific.

To determine these thresholds specific to flour, this paper uses Survival Minimum Expenditure Basket (SMEB) calculated on a monthly basis by REACH. The SMEB is comprised of 18 items

“which represents the minimum, culturally adjusted items required to support a 6-person household for a month” (REACH, 2019-2021). Eleven of these items are food items, comprising the food SMEB, whose price, according to Smith and Subandoro (2007), should be less than 50% of household income in order for households to have low food insecurity. However, to make this threshold flour specific, this paper averages the total percentage of the food SMEB that is allocated toward flour over all months, which was 6% (REACH, 2019-2021).²

Equation 7 – Equation used to calculate the total percentage of household income that should be spent on wheat for a culturally and nutritiously appropriate meal in Northeast Syria based on food SMEB calculations

$$v = \frac{1}{n} \sum_{i=1}^n \frac{c_i}{b_i}$$

Where v is the percentage of income that should be spent on wheat for a culturally and nutritiously appropriate meal in Northeast Syria based on food SMEB calculations

Where n is the total number of observations

Where c is the cost of all flour products within the food SMEB for a specific observation

Where b is the cost of the food SMEB for a specific observation

This paper then recalculates the thresholds proposed by Smith and Subandoro based on the assumption that $v = 6\%$ of food expenditures for the average Syrian household are spent on flour, amounting to less than 3% of all income being spent on flour in order for households to have low food insecurity.

To calculate the actual spending per household, this paper also uses the SMEB calculations to understand the quantity of flour being on average consumed per household. For a household of 6, the average household size for Syria, 13 kilograms of flour are consumed on a monthly basis (REACH, 2019-2021). This paper then uses this average household flour needs to understand

² When REACH first began calculating the SMEB for Syria, REACH used flour / bread interchangeably as a part of the SMEB due to the lack of operational bakeries. Now, while they predominately use bread, they still will substitute for flour on a basis of 1 kilogram flour to 2.85 kilos of bread. This calculation has been used throughout when conversions between kilos bread and kilos flour have been needed.

household food security based on wheat prices from different sources and the average income for Northeast Syria.

This paper chooses to employ the framework put forth by Smith and Subandoro (2007) in an attempt to isolate wheat security from overall food security in Northeast. However, it should be recognized that in the event that wheat product prices have risen past what households can afford, households may substitute for cheaper goods such as barley products or other grain products. Consequently, while the findings presented using the Smith and Subandoro (2007) model can be useful for understanding if these substitutions may be happening or if the prices fall in line with acceptable household level expenditure. With this in mind, this paper will supplement findings with additional contextual food security data to better understand the overall situation, not just relating to wheat.

Section 3.4. Limitations

All data used in this research are secondary data, collected, cleaned and stored by the data's respective organizations. Consequently, while each dataset was crosschecked against other sources and also checked for internal validity, there was no primary data collection conducted by the researcher. Additionally, this paper does not conduct any analysis on qualitative data as qualitative data collection was outside the scope of this research, a limitation to understanding the depth and breadth of production and governance barriers to wheat self-sufficiency.

The data collected and stored by the FAO regarding production data does not have estimates for the years in which the majority of South Central and Northeast Syria were under the rule of ISIS, which detracts from the data usable in the predictive regression line.

The data provided by REACH is dependent upon their and their partner's access to local markets. Consequently, the same markets are not monitored each month, which means that comparing one to one markets between Northwest Syria and Rojava is not possible. Instead, the average of all

markets meeting the specified criteria (Rojava urban markets, Rojava rural markets, Northwest urban markets, and Northwest rural markets) are compared month to month. However, for October 2019, during which Turkey was conducting Operation Peace Spring, there is no market data for Rojava as the region was in upheaval due to Turkey taking large swaths of land along the northern border by force. There is also no rural market data for Rojava in November due to the ongoing conflicts caused by Operation Peace Spring in the countryside.

Similarly, in April 2021, there seems to be an artificial spike in the data for Northeast Syria; however, no data was collected from Deir-ez-Zor during this month due to high ISIS activity in the area. Due to its mostly rural nature, the cost in Deir-ez-Zor is often lower than in other governorates, which means that the reading for this month may be artificially high.

This market monitoring data also does not cover the full swath of Assad controlled territories. The Assad administration only allows aid and humanitarian organizations to operate where the needs are the most acute in the far Northwest area of the country. South and central territories are strictly off-limits for international aid agencies, which means that no REACH partners are able to conduct market monitoring in these regions, a major limitation of this paper.

Bread prices and consumption data may have given a better picture of the whole of the subsidized wheat value chain as subsidized bakeries are the last step in the wheat consumption cycle.

However, consistent data on bread prices are not available for each month as some bakeries do not have the diesel fuel necessary to operate their machinery in some months. Consequently, for consistency of data, flour prices have been used as a proxy instead in order to offset this lack of data.

Actual flour consumption data for households was not available, so this paper uses the minimum recommendations for a household of 6 per month as calculated by REACH. However, actual consumption may differ. Additionally, while calculations done using REACH data suggest that

6% of household food expenditures are on flour in order for households to have culturally and nutritiously acceptable levels of food consumption, this number too may differ depending on individual household practices.

One of the main limitations to measuring food security in this way is that it does not account for households' ability to supplement their diet with other food that provides for similar or equal utility. For example, households unable to afford wheat flour could substitute with lower quality flour made from barley, or substitute with different grains altogether. While this limitation is somewhat caveated due to the cultural dependence on wheat flour and bread, making the demand for wheat flour less elastic than most goods, the 6% benchmark is not an absolute. Consequently, all discussions about food security calculations made in this paper should be viewed along with other contextual food security data.

CHAPTER IV

FINDINGS

Section 4.1. Self-sufficiency: Production Capacity

Before the onset of the Civil War, approximately 1.5 million hectares were irrigated compared to just 500,000 hectares after the crisis (FAO, 2018). This is due in part to infrastructure disrepair due to the crisis, but also the high cost of fuel to run the irrigation generators. Due to this decrease in irrigated lands, understanding the correlation between rain and yield in Syria is the first step in understanding if the Northeast can be wheat self-sufficient from a production standpoint despite the lack of irrigation. Table 1 and figure 5 display a regression analysis of the relationship between wheat yield and rainfall from 1960 to 2020. Table 2 and figure 6 show the same regression but only conducted for the years of Bashar al-Assad's administration (2000 – 2020) to try to control for difference in policy.

Table 1 – Rainfall and wheat yield regression from 1960 – 2020

Analysis of Variance						
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F	
Model	1	0.05778	0.05778	0.1	0.7567	
Error	59	35.1944	0.59652			
Corrected total	60	35.25218				
Root MSE	0.77234	R-Square	0.0016			
Dependent Mean	1.65614	Adj R-Sq	-0.0153			
Coeff Var	46.63512					
Parameter Estimates						
Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	Intercept	1	1.50831	0.48516	3.11	0.0029
rainfall	rainfall	1	0.00053445	0.00172	0.31	0.7567

Figure 5 – Rainfall and wheat yield regression from 1960 - 2020

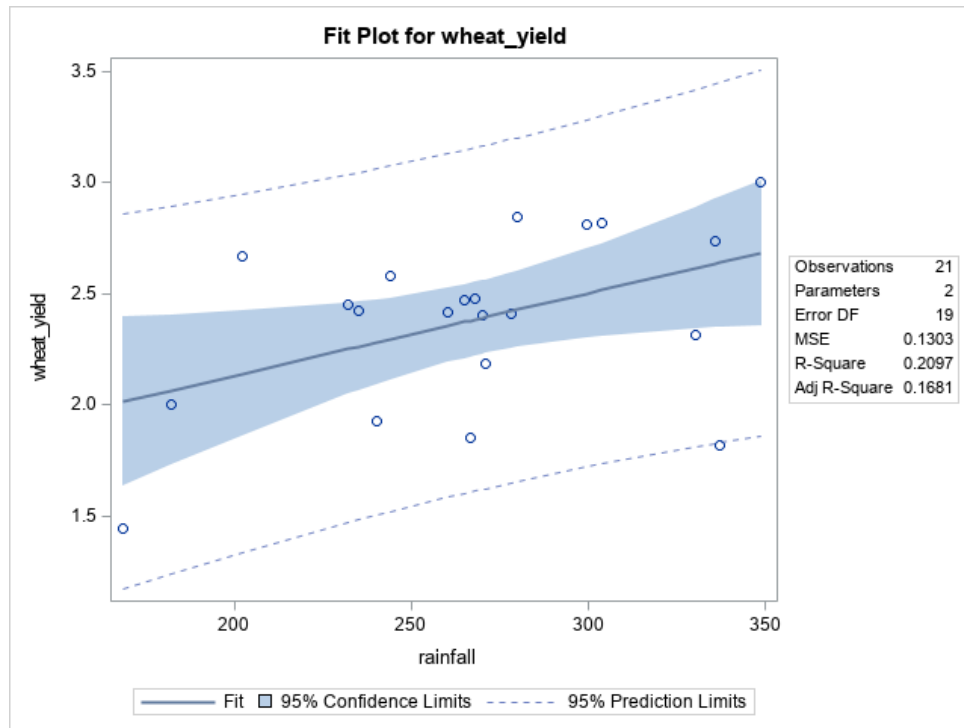


When looking at yield rates as a function of rainfall from 1960 to the present, there is little correlation (Table 1 and Figure 6). Indeed, the R-squared for the regression is 0.0016, which effectively indicates zero correlation between rainfall and yield. However, as mentioned in the background section, the 1960s and 1970s were fraught with government instability while the 1980s and 1990s brought the recent agricultural technical advancements to Syria. To control for this instability and to focus on modern farming techniques, this paper also looks at the correlation from 2000 – to the present, which results in a slight positive correlation between yield rates and rainfall (R-squared = 0.2097) (Table 2 and Figure 7). This suggests that while increased rainfall does have a slight correlation to increased yield, it is not the only determinant to increasing yield rates.

Table 2 – Rainfall and wheat yield regression from 2000 - 2020

Analysis of Variance						
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F	
Model	1	0.657	0.657	5.04	0.0368	
Error	19	2.47602	0.13032			
Corrected Total	20	3.13302				
Root MSE	0.36099	R-Square	0.2097			
Dependent Mean	2.38213	Adj R-Sq	0.1681			
Coeff Var	15.15428					
Parameter Estimates						
Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	Intercept	1	1.38947	0.44906	3.09	0.006
rainfall	Rainfall	1	0.00371	0.00165	2.25	0.0368

Figure 6 – Rainfall and wheat yield regression from 2000 - 2020



Considering that the correlation is slight, it is possible for Northeast to have medium yields even in years with relatively low rainfall. This finding should be taken into consideration when looking at the needed hectares needed for self-sufficiency based on different wheat yields: while self-sufficiency may be possible at high or medium yields, these yield level may be dependent upon rainfall, particularly since much of the irrigation infrastructure is in disrepair due to the conflict.

To calculate these ranges of needed number of hectares needed for self-sufficiency, this paper uses three different estimates for yield and three different estimates for population. As seen in Table 3, the average kilograms of wheat needed per person to meet the needs of the population is on average 472 kilograms. The average yields per year range from 1800 kilograms / hectare to 2200 kilograms / hectare, and the population estimates for the self-administration controlled area range from roughly 2 million to 2.5 million.

Table 3 – Average kilograms of wheat needed per person, yield rates using first, second, and third quartiles, and population estimates from IMMAP reports

Average kg wheat needed per person per year	472
Low yield (KG / HA)	1,804
Medium yield (KG / HA)	2,289
High yield (KG / HA)	2,741
Low population est.	2,078,755
Medium est.	2,309,728
High population est.	2,540,701

Based on the above calculation, with high yield and low population estimates, the Northeast would need to plant 357,961 hectares of wheat. At the opposite end, the Northeast would need to plant 664,751 hectares of wheat in order for production to be self-sufficient. Please see table 4 for the range of hectares needed.

Table 4 – Number of hectares needed to feed the Northeast population based on high and low yield and population data

	Low population	Medium population	High population
Low yield	543,887	604,319	664,751
Medium yield	428,647	476,274	523,902
High yield	357,961	397,735	437,508

The Food and Agriculture Organization estimates that 600,000 – 800,000 hectares are planted with wheat yearly in Northeast Syria (FAO, 2018). This estimate means that it is possible for Northeast to sustain their population if nearly all wheat fields are both planted and harvested, which is improbable. Similarly, until more of the irrigation infrastructure is repaired throughout Northeast, higher yield estimates would be improbable as well given that the majority of wheat is currently rainfed.

Section 4.2. Self-sufficiency: Governance, Institutions, and Policy Understood through Pricing

In the scope of this paper, the second pillar of self-sufficiency, governance, is explored through the concept of price and price change. As mentioned by Mellor (1998), in developing countries an increase in consumer prices for agricultural goods is one of the indicators that can be used to understand whether agricultural production or development is the root cause. In developing countries, when development and technological advancement has been “inadequate”, “rising prices...indicate a problem,” which governments can try to identify the source of and offset with policy (Mellor et al, 1998, p. 150). Mellor (1998) also notes that due to differences in agricultural technology and development between different regions, price differences can also help signal this inequality for governments. Similarly, as explained above, Kaplinsky and Morris (2001) argue that price is one of the key indicators for whether or not the firm, or in this case mix of firm and institutions, will be successful in the market, based on trends in prices (particularly for exports) or the ability to capture rents given a firm’s production cost structure for example. This paper uses wheat production costs to compare with the different prices paid by both the ACDC and the GECP to understand how these costs compare and if the policies in place can adequately respond to the needs of the farmers. Similarly, this paper will consider the end consumer price for flour at various outlets in different regions as it helps indicate the success of each outlet and the governance structures at play in providing the endline flour product.

Section 4.2.1. Production Costs

To understand the governance mechanisms in place in the wheat value chain and their functionality, this paper calculates production costs and compares it to the prices offered by both ACDC and the Assad administration. Using past wheat production prices calculated by the FAO, table 5 details the predicted cost of producing one kilogram of wheat.

Table 5 – Predicted cost of producing one kilogram of wheat using previous production cost data in SYP

Year	Cost of producing one kg of wheat	Predicted Value	Std Error Mean Predict	95% CL Mean		95% CL Predict		Residual
2010	20.3	5.75	11.0205	-24.8478	36.3478	-48.6867	60.1867	14.5
2011	21	21.5	9.1341	-3.8603	46.8603	-30.1748	73.1748	-0.5
2012	25	37.25	7.6214	16.0897	58.4103	-12.4983	86.9983	-12.25
2015	63	84.5	7.6214	63.3397	105.6603	34.7517	134.2483	-21.5
2016	106	100.25	9.1341	74.8897	125.6103	48.5752	151.9248	5.75
2017	130	116	11.0205	85.4022	146.5978	61.5633	170.4367	14
2018	.	131.75	13.1204	95.322	168.178	73.8351	189.6649	.
2019	.	147.5	15.3463	104.8917	190.1083	85.5113	209.4887	.
2020	.	163.25	17.6508	114.2436	212.2564	96.7011	229.7989	.
2021	.	179	20.0065	123.4529	234.5471	107.4975	250.5025	.

Where R-square = 0.9073

As seen above, the predicted production costs in SYP range between 123.5 and 234.5 SYP for 2021. However, as the SYP has had an unprecedented depreciation, this value would be expected to be higher. The value calculated in table 6 below takes into account current market pricing for the needed inputs to grow wheat in Syria based on IMMAP research. Low yield estimations are used as the formula is considering fields are receiving rainfed only irrigation.

Table 6 – Northeast production cost estimation based on free market pricing and farming practices, June 2021

	SYP	Rainfed amount needed / HA	Total cost per hectare (SYP)	Production cost 1 KG wheat (SYP)
Urea	1500	100	150,000	
Herbicides	62735	1.5	94,102.5	
Diesel fuel	1555.45	10	15,554.5	
Tractor rental	134207.8	2	268,415.7	
Wheat seed	1200	220	264,000	
Total			792,072.7	

As noted above in the methodology section, all prices used to calculate the total production cost based on IMMAP methods are free market prices as recorded by FAO in Northeast Syria in June

2021. While prices were collected also for the subsidized inputs, FAO notes that these inputs are only available in a few urban outlets and cannot cover demand, with most demand met by the free-market inputs imported from Kurdish Iraq. Additionally, in the framework created by IMMAP to calculate production cost, fertilizers are needed that are not offered at subsidized prices by GECP. Consequently, calculating a fully subsidized production cost would not be feasible or practical as most farmers would not have a yield from strictly subsidized product.

As seen in tables 5 and 6, both the high end of the confidence interval created using FAO data (250.50 SYP) and the market price determined by the IMMAP matrix (439.06 SYP), do not leave much margin of profit considering Assad administration's purchasing price of 400 SYP for the 2020 – 2021 wheat planting year. A significantly larger profit margin can be seen from the ACDC purchasing price of 1150 SYP per kilogram, which would incentivize the farmers to sell to the local self-administration rather than the Assad administration. The production prices above also do not include transportation or packaging costs, both of which are costs assumed by the farmer when selling to either the self-administration or the Assad administration. Consequently, most farmers choose to sell to a trader who takes care of packaging and transportation to either private mills, self-administration, or Assad, but who also pays a lower price to be compensated for his services (IMMAP, 2021). The estimation for these prices, however, range drastically from 300 SYP to 800 SYP, which would mean possibly selling at a loss for some farmers in Northeast (IMMAP, 2021).

Section 4.2.2. Consumer Prices for Flour in the Local Market

While comparing production costs to the prices set by the different governance structure offers an insight into production governance in the wheat value chain and their self-sufficiency, it does not capture consumer impact. However, looking at the month-over-month change in flour prices

from different endline outlets, particularly around months of high shocks, will allow for insight into the governance mechanism's functionality for different pathways in the value chains.

Table 7 below outlines the different averages of flour prices disaggregated by location and month.

Table 7 – Average flour prices from October 2019 – September 2021 in SYP

region	date	N Obs	N	Mean	Std Dev	Minimum	Maximum
Northeast	2019-11	1	1	350	.	350	350
	2019-12	2	2	275	106.066	200	350
	2020-01	55	55	378.727	98.5319	250	650
	2020-02	95	95	443.421	159.094	200	750
	2020-03	83	83	383.795	180.724	150	1000
	2020-04	121	121	496.388	183.473	200	900
	2020-05	153	153	504.248	228.213	150	1200
	2020-06	145	145	866.103	1723.41	325	21000
	2020-07	151	151	696.093	304.088	300	1500
	2020-08	108	108	678.241	300.721	400	1500
	2020-09	149	149	687.94	243.658	200	1375
	2020-10	146	146	808.904	2274.4	350	28000
	2020-11	149	149	974.832	2135.98	450	26500
	2020-12	149	148	796.622	340.413	350	2000
	2021-01	123	123	831.789	307.691	400	2700
	2021-02	133	133	1127.32	1166.54	450	12000
	2021-03	133	133	1348.12	489.875	450	3200
	2021-04	128	128	1978.83	6072.74	650	70000
	2021-05	126	126	1413.37	502.684	550	4625
	Northwest	2019-10	338	338	226.746	39.2784	150
2019-11		352	352	238.625	31.3564	150	325
2019-12		363	363	287.237	36.1234	220	400
2020-01		331	331	347.698	43.7891	200	500
2020-02		221	221	389.072	44.2968	250	690
2020-03		135	135	394.741	49.6943	300	600
2020-04		246	246	417.663	45.075	300	550
2020-05		267	267	520.569	57.6184	350	665
2020-06		266	266	918.459	123.211	600	1300
2020-07		288	288	818.09	79.5249	550	1200

2020-08	288	288	814.545	122.608	600	1300
2020-09	292	292	773.812	89.893	80	1100
2020-10	265	265	810.74	73.2661	600	1100
2020-11	260	260	841.346	81.1531	700	1100
2020-12	228	228	1040.77	921.547	525	12225
2021-01	276	276	1125.76	261.202	300	3500
2021-02	244	244	1206.28	147.514	800	1600
2021-03	244	244	1452.65	181.413	950	2100
2021-04	245	245	1445.26	814.476	1100	13850
2021-05	274	274	1222.62	120.965	900	1750
2021-06	279	279	1305.51	175.77	900	1850
2021-07	267	267	1266.67	156.124	900	1875
2021-08	264	264	1310.77	133.044	900	1925
2021-09	308	308	1468.67	198.502	950	2250

The Caesar Syria Civilian Protection Act in June of 2020 created a shock to the market and operations in both Northeast and Northwest. Table 8 below showcases the average for all months before the CSCPA and after.

Table 8 – Average flour prices before and after the Caesar Syria Civilian Protection Act

	Before		After	
	SYP	USD	SYP	USD
Overall average	359.7	0.3509	1092.8****	0.3785****
NES average	456.7	0.3672	1069.4****	0.3667
NWS average	337.8	0.3472	1104.8****	0.3845****

*Denotes a statistically significant change at $\alpha = 0.1$

**Denotes a statistically significant change at $\alpha = 0.07$

***Denotes a statistically significant change at $\alpha = 0.05$

****Denotes a statistically significant change at $\alpha = 0.01$

All testing is done using the Satterthwaite test for non-equal variances.

As seen in tables 7 and 8, while the price in SYP more than doubled in both Northeast and Northwest in the month before and after the CSCPA, the USD amount did not increase as much, which suggests a macroeconomic effect in the exchange rate. Indeed, in Northeast Syria, the USD average actually decreased slightly, with no statistically significant change recorded. Future research should focus on this macroeconomic impact of the CSCPA.

However, this research does seek to understand how the CSCPA impacted different types of flour sellers as the governance structures coordinating the different parts of the value chain could react differently to the shock. Table 9 disaggregates each variable comparing May 2020 prices to June 2020 prices.

Table 9 – Average flour price between May and June 2020 after the Caesar Syria Civilian Protection Act, both Northeast and Northwest

	May 2020		June 2020	
	SYP	USD	SYP	USD
Overall average	514.6	0.3198	854****	0.3357***
Shops average	523.3	0.3245	847.2****	0.3339
Bakeries (all) average	473.4	0.2971	888.8****	0.3454****
<i>Public bakeries average</i>	425	0.2635	787.5****	0.3048
<i>Private bakeries average</i>	484.8	0.3051	945.3****	0.3681***
Urban average	541.2	0.3340	841.8****	0.3217
Rural average	474.4	0.2983	871.2****	0.3377****
NES average	504.4	0.301	735.8****	0.3098**
NES shops average	526.6	0.3144	744.2****	0.3134
NES bakeries (all) average	346.8	0.2071	672.1**	0.2830
<i>NES public bakeries average</i>	332.1	0.1983	410.7	0.1729
<i>NES private bakeries average</i>	355.4	0.2122	855*	0.3600
NES urban average	532.9	0.3181	712.9****	0.3002
NES rural average	396.1	0.2365	620.5****	0.3467****
NWS average	520.6	0.3305	918.5****	0.3499****
NWS shops average	521.3	0.3310	908.3****	0.3460****
NWS bakeries (all) average	517.9	0.3288	962.5****	0.3667****
<i>NWS public bakeries average</i>	517.9	0.3288	942.6****	0.3591

<i>NWS private bakeries average</i>	517.9	0.3288	972.7****	0.3706****
NWS urban average	548.8	0.3485	960.3****	0.3658****
NWS rural average	492.9	0.3130	881.4****	0.3358****

*Denotes a statistically significant change at $\alpha = 0.1$

**Denotes a statistically significant change at $\alpha = 0.07$

***Denotes a statistically significant change at $\alpha = 0.05$

****Denotes a statistically significant change at $\alpha = 0.01$

All testing is done using the Satterthwaite test for non-equal variances.

In particular, public bakeries in Northeast Syria, which benefit from the full nationalized wheat supply chain, did not experience a statistically significant increase in prices from May to June, even at $\alpha=0.10$, with prices at these public bakeries during this month increasing from 332.1 SYP to 410.7 SYP. Indeed, of all the disaggregated pricing, public bakeries had the lowest on average cost in June. These numbers suggest that the Northeast public institutions were able to be more resilient in the face of shocks than the private institutions were. Additionally, table 9 shows that when adjusted for SYP inflation through conversion to USD, only the average for rural outlets experienced a significant increase in price. This further suggests the resilience of the public institutions and the private market in Northeast Syria, but that their being tied to the unstable SYP is part of the reason for the institutions' instability.

However, it is unclear whether or not this resilience will translate in the long run in the Northeast, particularly given the difficulties associated with raising enough government revenue to offset the extensive subsidy. The Assad administration has notoriously struggled with this, resorting to extortion or market manipulation. For example, to offset their spending and raise government revenue, the Assad administration has begun to take \$0.51 USD of every dollar of UN contracts through manipulation of the Syrian pound (Fox, 2021). The central bank is keeping the exchange rate of Syrian Pound exchange rate artificially low according to journalists, which means that the money pledged through UN projects in foreign currencies is lost when procuring goods through this official exchange rate (Fox, 2021). While no such investigation has yet been conducted into

the self-administration regarding artificially manipulating the Syrian pound for their own gain, raising government revenue would be mandatory for continuing to subsidize the wheat value chain to this extent.

Similarly, the findings displayed in Table 9 highlight that while the prices changed drastically in SYP, the prices in USD remained fairly stagnant, which suggests that the exchange rate has been more impacted than the actual value of flour. More research into the macroeconomics effects of the CSCPA should be undertaken to better parse out these differences.

To further understand the differences for the public versus private subsidies, tables 10 and 11 outline the differences between the bakeries' flour prices in May and June 2020 while table 12 highlights the differences between the sellers in the long run, one year after the CSCPA.

Table 10 – Public and private bakeries, Northeast versus Northwest difference in May 2020

	Northeast average	Northwest average	t Value	Pr > t
ALL OUTLETS				
SYP	504.2	520.6	-0.87	0.3862
USD	0.3010	0.3305	-2.62	0.0095
N	153	267	-	-
Public bakeries				
SYP	332.1	517.9	-2.12	0.0738
USD	0.1983	0.3288	-2.49	0.0431
N	7	7	-	-
Private bakeries				
SYP	355.4	517.9	-10.21	<0.0001
USD	0.2122	0.3288	-12.04	<0.0001
N	12	47	-	-

All testing is done using the Satterthwaite test for non-equal variances.

Table 11 – Public and private bakeries, Northeast versus Northwest difference in June

	Northeast average	Northwest average	t Value	Pr > t
ALL OUTLETS				
SYP	735.8	918.5	-5.56	<0.0001
USD	0.3098	0.3499	-2.91	0.0041
N	145	266	-	-
Public bakeries				
SYP	410.7	942.6	-11.8	<0.0001
USD	0.1729	0.3951	-10.47	<0.0001
N	7	17	-	-
Private bakeries				

SYP	855	972.7	-0.47	0.6528
USD	0.36	0.3706	58.01	<0.0001
N	10	33	-	-

All testing is done using the Satterthwaite test for non-equal variances.

Table 12 – Public and private bakeries, Northeast versus Northwest difference last three months (July, August, September 2021)

	Northeast average	Northwest average	t Value	Pr > t
ALL OUTLETS				
SYP	1556.8	1354.7	9.71	<0.0001
USD	0.4724	0.4108	10.05	<0.0001
N	419	839	-	-
Public bakeries				
SYP	1100	1147.1	-0.29	0.7755
USD	0.3331	0.3468	-0.28	0.7831
N	11	7		
Private bakeries				
SYP	1539.3	1315.1	2.93	0.0057
USD	0.4651	0.3988	2.97	0.005
N	34	102		

All testing is done using the Satterthwaite test for non-equal variances.

When comparing these Northeast institutions with those of Northwest, the NES public bakeries endured the shock with less inflation compared to the Northwest. As seen in Table 10, public bakeries in Northeast and Northwest before the Act had statistically similar average flour prices in May of 2020 ($\alpha = 0.05$). By June, however, the prices for one kilogram of flour at a public bakery changed between the Northeast and Northwest institutions, with the averages statistically dissimilar at $\alpha = 0.01$. In Northeast, the public bakeries continued selling bread at 410.7 SYP per kilogram on average compared to 942.6 SYP in Northwest, which was also statistically dissimilar when converted into USD (see table 11).

Considering the long run resilience to the stress of the sanctions, however, the Northeast and Northwest have leveled again, selling flour at 1100 and 1315 SYP respectively. These averages are not statistically different at $\alpha = 0.10$. These findings imply that while the Northeast institutions were initially more resilient to the shock of the Caesar Syria Civilian Protection Act, in the long-term their prices have risen on level with the rest of Syria. Indeed, the private bakeries in Northeast compared to Northwest have a slightly higher average selling price for flour,

significant at $\alpha = 0.01$. These findings further raise questions about the self-administration's ability to maintain their current level of involvement and subsidy in the wheat value chain as their prices have risen past the Assad administration's subsidized pricing.

To understand public versus private outlets' resilience to shock, tables 13 and 14 outline the differences between public and private bakeries' flour prices in May and June 2020, while table 15 looks at long run effects.

Table 13 – Public versus Private Bakeries flour prices, May 2020

	Public average	Private average	t Value	Pr > t
ALL BAKERIES				
SYP	425	484.8	1.18	0.2562
USD	0.2635	0.3051	1.3	0.2138
N	14	59	-	-
NES BAKERIES				
SYP	332.1	355.4	0.27	0.7962
USD	0.1983	0.2122	0.27	0.7962
N	7	12	-	-
NWS BAKERIES				
SYP	517.9	517.9	0	0.9995
USD	0.3288	0.3288	0	0.9995
N	7	47	-	-

All testing is done using the Satterthwaite test for non-equal variances.

Table 14 – Public versus Private Bakeries flour prices, June 2020

	Public average	Private average	t Value	Pr > t
ALL BAKERIES				
SYP	787.5	945.3	1.92	0.0593
USD	0.3048	0.3681	1.99	0.0514
N	24	43	-	-
NES BAKERIES				
SYP	410.7	855.0	1.75	0.1131
USD	0.1729	0.3600	1.75	0.1131
N	7	10	-	-
NWS BAKERIES				
SYP	942.6	972.7	0.71	0.4833
USD	0.3591	0.3706	0.71	0.4833
N	17	33	-	-

All testing is done using the Satterthwaite test for non-equal variances.

Table 15 – Public versus Private Bakeries flour prices, last three months (July, August, September 2021)

	Public average	Private average	t Value	Pr > t
ALL BAKERIES				

SYP	1118.3	137.1	2.6	0.0174
USD	0.3384	0.4154	2.62	0.001
N	18	136	-	-
NES BAKERIES				
SYP	1100	1539.3	2.59	0.0207
USD	0.3331	0.4651	2.58	0.0211
N	11	34	-	-
NWS BAKERIES				
SYP	1147.1	1315.1	2.97	0.0175
USD	0.3468	0.3988	3.27	0.0109
N	7	102	-	-

All testing is done using the Satterthwaite test for non-equal variances.

When looking only at Northeast bakeries, the public and private institutions sold flour for similar prices before the Act. In the long run, when looking at resilience to the stress caused by the Act, the public bakeries have maintained a lower selling price for flour than the private bakeries, significant at $\alpha = 0.05$ for both SYP prices and prices converted into USD. While this is a positive indication of the self-administration's ability to maintain subsidized pricing in the long run despite sanctions and inflation, further research into macroeconomic functions at play, particularly possible manipulation of foreign exchange rates, along with foreign exchange reserves held by the self-administration should be undertaken to try to understand their long-term resilience.

Section 4.3. Self – Sufficiency as Signaled by Household-level Food Security

For the average Syrian household, 42% of calories come from wheat products, including flour and bread (Ahmed, 2016). On average, households tend to buy the equivalent of 37 kilograms of bread per month, which amounts to 13 kilograms of flour (REACH, 2020). As a part of a culturally and nutritiously acceptable diet, 6% of all household food expenditure typically goes toward bread or flour (REACH, 2019-2021). The most recent reliable income data is from June 2021, where the average household earned 91 USD per month. Table 16 shows the thresholds set by Smith and Subandoro calculated based on only flour expenditures.

Table 16 – Thresholds for household flour expenditures set for household food security based on Smith and Subandoro model

	Percentages of total household income to be spent of flour	Income thresholds based on June income data (USD)
Severe food insecurity	>4.6%	>4.186
High food insecurity	4% - 4.5%	3.627 – 4.185
Medium food insecurity	3% - 3.9%	2.79 – 3.627
Low food insecurity	<3%	<2.79

Table 17 below shows the average price of bread for each type of flour outlet in June 2021 along with calculations for the total expenditure by the average household if they purchased their wheat exclusively from that outlet. All averages are for Northeast only.

Table 17 – Average household expenditure on flour in June 2021 disaggregated by shops, Northeast only

	SYP	USD	Number of kilos / household / month	Total flour expenditure / month
All	1418.09	0.4552	13	5.9176
Shops	1400.00	0.4494	13	5.8422
Bakeries	1631.82	0.5239	13	6.8107
<i>Public bakeries</i>	1000.00	0.3210	13	4.173
<i>Private bakeries</i>	1695.00	0.5441	13	7.0733
Rural	1335.00	0.4286	13	5.5718
Urban	1463.74	0.4700	13	6.11

According to HNAP data collected in June 2021, female headed households earn 20 USD on average per month while male headed households earn 93 USD per month, for a combined average of 91 USD per month. Table 18 below displays the percentage of household income spent on flour if the household bought their flour exclusively at each shop. All prices used are from June 2021.

Table 18 – Percentage of household expenditure spent on flour monthly disaggregated by household type and flour outlet

	All	Female headed households	Male headed households
All	6.50% (Severe)	29.59% (Severe)	6.36% (Severe)

Shops	6.42% (Severe)	29.21% (Severe)	6.28% (Severe)
Bakeries	7.48% (Severe)	34.05% (Severe)	7.32% (Severe)
<i>Public bakeries</i>	4.59% (High)	20.87% (Severe)	4.49% (High)
<i>Private bakeries</i>	7.77% (Severe)	35.37% (Severe)	7.61% (Severe)
Rural	6.12% (Severe)	27.86% (Severe)	5.99% (Severe)
Urban	6.71% (Severe)	30.55% (Severe)	6.57% (Severe)

As seen in table 18, no households reach the acceptable threshold determined by Smith and Subandoro contextualized for wheat in Syria. Indeed, most households, both male and female headed, spend more than 6% of all household expenditures on flour alone if they have a culturally and nutritiously appropriate diet. This level of expenditure places the average household into the severe food insecurity category. The findings are particularly abysmal for female headed households, who would need to spend on average more than 20% of their household's income on flour if they were to have a culturally and nutritiously appropriate diet. However, when adjusting the flour prices per type of outlet, there is one notable exception who does not fall into the severe coping strategies. Households who theoretically procure all flour from public bakeries are in the high food insecurity category and not the severe category. As this is the public bakery, however, the same macroeconomic and political economy questions raised earlier in the findings section remain as the self-administration would need to be able to maintain these levels of subsidy without depleting their revenues, a feat not easily accomplished.

As stated above, these thresholds presented are purely to try to understand wheat security and not overall household food security. The prices presented in table 18 should be understood through the lens of overall food security as households can adjust their household food needs based on substitution for high-cost goods. Similarly, the likelihood that a household can procure all flour needs from a particular shop type.

However, when looking to contextualize these results within the overall food security situation in Northeast Syria, the data does back up these wheat security results that insinuate food insecurity remains high: 12.4 million people are estimated to be food insecure at the start of 2020, with female headed households faring worse than their male counterparts (OCHA, 2021). As food prices have continued to increase, due partially to inflation and partially to supply chain breakdown caused by COVID-19, households have increased their spending on food, with estimates ranging from 44% - 51% of all income spent on food (OCHA, 2021). For wheat security specifically, additional quantitative research focusing on wheat products would help to further contextualize the findings above.

CHAPTER V

DISCUSSION AND CONCLUSIONS

Research on self-sufficiency posits that self-sufficiency hinges on not only production capacity, but also governance institutions that guide the value chains for a certain good. This more holistic approach to self-sufficiency, then, can be measured not just by production of a certain good, but also by understanding prices' resilience to shocks and stresses as an indicator for the infrastructure, policy, and external pressures. Ultimately, then, the goal of self-sufficiency is service of the population and allowing for a good to be available and accessible by the majority of the population.

In Northeast Syria, where the Kurds have set up an autonomous self-administration, wheat and wheat processing are a staple part of the diet and policy. While the self-administration in Northeast Syria is not yet aiming for self-sufficiency and is still in partnership with both the Syrian administration and the Iraqi Kurds, waves of sanctions, specifically the Caesar Syria Civilian Protection Act, along with the fact that they are not a recognized state has caused the Northeast to become further and further isolated regarding trade. The Northeast has expressed

intentions of becoming an autonomous region of Syria, much like Iraqi Kurdistan, to which the Assad administration has answered harshly. Consequently, months or even years of involuntary self-sufficiency may be within their future should they choose to try to actualize this goal.

With this in mind, this paper attempts to quantify the needed levels of wheat production so that it can be determined whether or not wheat self-sufficiency is within the grasp of the Kurdish Northeast. Kaplinsky and Morris (2001) argue that in a “low-income final market, price [is] a relatively important” critical success factor that will ultimately contribute to which firms, or in this case combination of firms and government institutions, will continue to function in the market (p. 55). By looking at the flour prices offered by different outlets and in different geographic areas, this paper attempts to look at which of the various endline outlets continue to offer lower prices even during shocks and stresses to better understand the value chain functionality for endline consumers.

Finally, as the ultimate indicator of wheat self-sufficiency, this paper looked at household level food security as determined by economic access. Using an expenditure threshold model piloted by Smith and Suborondo and contextualized for flour in Northeast Syria, this paper classified households based on their average income as having either severe food insecurity, high food insecurity, medium food insecurity, or low food insecurity.

The following discussion sections outline the key findings and discussion points from each pillar of wheat self-sufficiency in Northeast Syria, explore the conclusions from the household level food security thresholds, and present areas of further research needed.

Section 5.1. Wheat Production and Self-Sufficiency

The first step in determining the Northeast’s ability to become wheat self-sufficient is through determining production capacity and asking whether or not they can produce enough wheat on their land using their current infrastructure. Before determining the size of land needed, it is

important to understand the Northeast's dependence on rainfall for adequate crop yield. As seen in table 2 above, there is only a slight correlation between rainfall and yield for wheat in Northeast Syria (R-squared: 0.2097). However, during the Civil War and crisis, much of the irrigation infrastructure was damaged or fell into disrepair, leaving the majority of farmers to depend on rain as their main method of watering their crops. What irrigation infrastructure is left often cannot be operated to its full capacity due to the high cost of diesel fuel and / or the unreliable power grid. Rainfall is viewed as one of the sole determinants of yield in Northeast Syria for wheat, with irrigation from the streams depending on this rainfall.

Similarly, in the event that the Northeast does try to become independent, they would face further isolation and possible aggression from neighboring states. The Turkish administration is and has been against the idea of a Turkish autonomous state; they also control the water supply into Syria through the Euphrates River, which is where the majority of irrigation water comes from (al-Khateb, 2021). Given this control and probable political fall out in the event of independence and given the slight positive correlation even when irrigation channels were functioning, rainfall may become a much bigger determinant of yield. Consequently, to ensure yield rates are sufficient to feed the population, investing in irrigation and water reserve resources may be in the self-administrations best interest to guarantee yield rates that can sustain a population.

Irrigation is only part of the picture, however. According to the data above, it is theoretically possible for Northeast to sustain their population if nearly all wheat fields are planted, harvested, and kept internal to Northeast. At low yield and medium / high population estimates, the tolerance for shocks affecting yield would be slim. The self-administration should consider policies that help offset these shocks and/or put policies in place to try to achieve medium yield level, which may include investing in irrigation as the reliance on rainfall would be expected to rise in the event of independence, formalizing relations with greater Kurdistan to keep supply chains open, or investing in their own seed storage and development. While no determinations

can be made regarding how Turkey would begin treating regional trade partners should the Northeast declare federal or national independence, it is possible that these high yield seeds would also become more difficult to find.

Regardless, even with low yield from water scarcity and lower quality seeds (1.8 MT / HA), the Northeast would have enough hectares of wheat fields to provide for their population at low or medium population estimates, which means that self-sufficiency from a production standpoint is attainable should the status quo be maintained.

Additional research into the question of future production levels in Northeast Syria should focus on the potential political fallout caused by independence and the ability of the self-administration to keep normalized relations with local trade partners. Future research could also focus on how the area of wheat fields fluctuated during the Civil War; while this level of destruction may or may not occur as a result of declaring autonomy, understanding how IEDs, bombings, instability, changes in territorial control, etc. changed the wheat planting landscape would be useful in the event that a regional state decides to move forward with aggression if the self-administration does declare autonomy.

Section 5.2. Productions Costs and the Implications on Governance

Once determining that the Northeast indeed has enough wheat land to feed their population in the event of isolation, this paper then seeks to understand governance structures through pricing. As mentioned above, the supply chain for production inputs, where wheat is a function of land, water, seeds, fertilizer, and labor, has inputs available both from the private market and from the Assad administration. However, as the Assad administration only has two outposts in Northeast Syria, namely in Hasakeh City and Qamishli, these outputs are often difficult to obtain for the rural-majority farmers. Consequently, most farmers must purchase these inputs on the private market, where the cost is much higher. These inputs, however, are normally much more

expensive than the subsidized inputs from the Assad administration, which means that production costs also are higher.

As seen in table 5, which uses production cost data collected from FAO, the price of production for one kilogram of wheat has risen exponentially since the onset of the war in 2011, increasing by over 500% from 2011 to 2017. Production pricing, however, has not been collected by the FAO since 2017. Based on the data from the onset of the war to the last collected data point, this data predicts that the current production price is between 107.50 and 250.50 SYP. However, due to the inflation of the SYP seen as a result of the Caesar Syria Civilian Protection Act, the prediction would likely be toward the upper end of that confidence interval.

To cross-check this prediction, as seen in table 6, this paper then also used market data collected by the FAO in a matrix commonly employed by IMMAP to construct production pricing for wheat in Northeast Syria. IMMAP has found that using 100 kilograms of urea, 1.5 kilograms of herbicides, 1 tractor rented twice per season and powered by 10 liters of diesel fuel, and 220 kilograms of wheat seed are the needed inputs to produce one hectare of rainfed wheat (IMMAP, 2018). Using market prices collected in June 2021 and assuming low yield per hectare due to the lack of irrigation for such estimates, the average cost to produce one kilogram of wheat would average at 439.06 SYP in a year with normal rainfall.

When only looking at production cost and purchasing cost by the self-administration, the governance and policies in the Northeast could be viewed as supporting self-sufficiency as the purchasing price is higher than the production price for one kilogram of wheat. While this paper does not consider any shocks or stresses in its analysis, it is worth noting that the production cost calculated above assumes adequate rainwater for production without incorporating irrigation costs and does not include transportation costs.

However, the agricultural year of 2020 to 2021 introduced many stresses into the agricultural year, including one of the worst droughts and water crisis seen in Northeast Syria in modern history. The low levels of the reserves for the irrigated lands and the lack of rainfall for the rainfed lands meant that farmers incurred costs far beyond the typical production costs to produce one kilogram of wheat. Indeed, many farmers in the 2020 – 2021 season face issues with selling their wheat, and many report that the input costs were too high to offset the drought and lack of irrigation, so they reverted their lands for grazing (al-Omar, 2021). This means not only lower wheat production to feed into the systems, but also low return for the farming inputs cost. Other farmers rioted, saying that they would rather burn their wheat than sell at a loss, indicating that the price set by the self-administration, despite being much higher than estimates, would still come at a loss to farmers (Mauvais, 2021).

In a year without shocks or stresses, then, the policies in place would be able to sustain the wheat cycle according to production estimates. However, these policies seemingly do not address the various shocks and stresses faced by farmers, particularly lack of irrigated lands, which does call into question the self-administrations' ability to respond to the real and actual needs of the Northeast. More research into these shocks, particularly drought, are needed to better understand specific pricing and policies that could mitigate these impacts. In the event that the Northeast does decide to vie for independence, they would be expected to face similar shocks and stresses, with possibly more ramifications from Turkey. The current policies surrounding wheat production, then, may need to be addressed in order to better provide for production needs before the Northeast attempts self-sufficiency.

This narrative of farmers' dissatisfaction with the prices paid to them for their wheat aligns with Bates' research on agriculture in developing countries. Bates (2014) notes that to keep prices low for endline urban consumers, developing countries' governments have historically underpaid farmers. In a few instances, like Egypt, artificially low inputs for farmers have offset the low

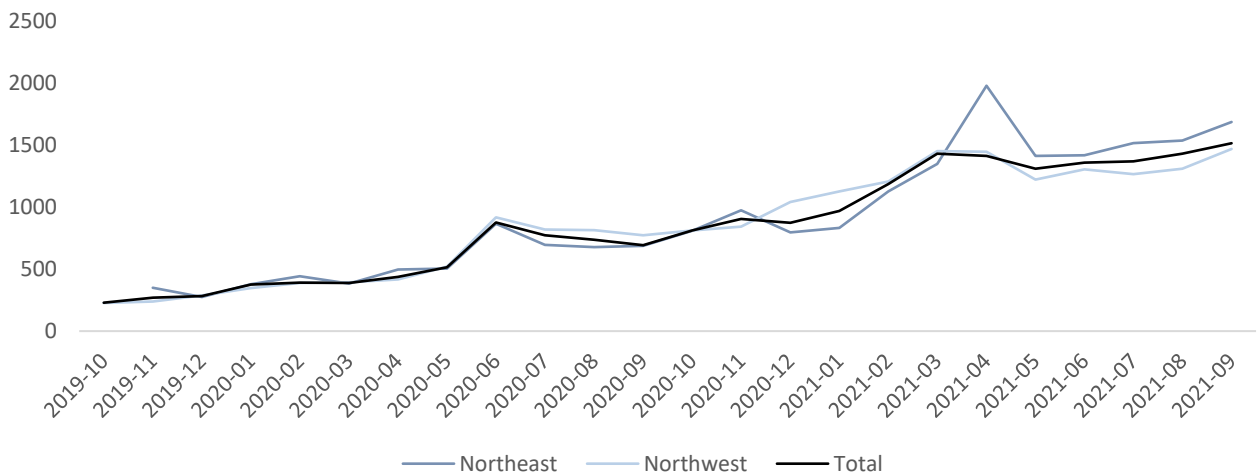
buying costs, but this does not seem to be the case in Syria (Von Braun and de Haen, 1983).

Indeed, questions are already being raised regarding both the self-administration's and the Assad administration's ability to maintain the level of subsidy in the long run, with recent reports indicating that the Assad administration is manipulating the SYP to offset their lack of revenue (Fox, 2021). While it's unclear if the self-administration is partaking in any similar scheme, it is worth noting that the exchange rate in Northeast Syria has suffered similar to the rate in Northwest Syria, which indicates larger macroeconomic issues at play (REACH, 2021).

Section 5.3. Consumption Costs and the Implications for Governance

As seen in table 7 and below in figure 7, there was a steep one-month increase in the price of one kilogram of flour between May 2020 and June 2020, during which time the Caesar Syria Civilian Protection Act came into effect. This shock to market prices resulted in a 46% month-over-month increase for Northeast in the price of one kilogram of flour on average, with an increase from 504.4 SYP in May to 735.8 SYP in June. As seen in table 9, this increase was statistically significant at $\alpha = 0.01$. However, when disaggregating per type of outlet, not all outlets experience the same type of increase.

Figure 7 – Average market prices for flour in Northeast and Northwest Syria



The figures overall do suggest that in the short-run, the public bakeries in Northeast are more resistant to shocks and stresses than the other flour outlets in Northeast and demonstrates similar resilience to Northwest in the long run. In June, the public bakeries in Northeast were one of the only flour-selling outlets to not incur statistically significant increase in prices. Additionally, they have maintained a slightly lower price than their private counterparts through the stress of the Act as seen in the long run comparison. However, some of this resilience is counteracted by the inflation of the SYP, to which the institutions are tied. Access to the flour in these public institutions is also sometimes low, as the outlets are often concentrated in more urban areas and generally are less responsive to rural needs due to transport costs.

If the self-administration moves forward with their plans for an independent Northeast, however, they should consider the sustainability of their current system. When looking historically at agricultural development and government subsidy as explained by Bates (2014), the subsidies provided are often at the expense of a large rural population and exceeds the administration's actual monetary capacity, which is ultimately not sustainable and typically ends in unrest. Consequently, while the current system indicates that the subsidy indeed provides lower prices of bread, the larger political implications should be viewed through precedent and corrective action should be considered.

Section 5.4. Governance: Pillar Two Conclusions

Looking at the status quo, from a production side, the governance structures surrounding wheat in Northeast seem as though they would meet the needs of their population when only considering status quo, including the production costs and the buying price for wheat in a year without shocks or stresses. In general, the basic production cost for farmers for one kilo of wheat during a standard agricultural year is less than the price offered by the self-administration, in theory allowing for profit. However, these institutions do not hold in the face of stresses and shocks; the

ongoing water crisis in the Northeast due to the drought has increased the cost of wheat production, in some cases over the buying price from the self-administration. Similarly, the high cost of fuel also means that farmers face difficulties transporting the wheat to the buying points themselves, resulting in them selling to traders for much reduced costs. In the event that the Northeast faces involuntary wheat self-sufficiency due to vying for independence, these types of shocks and stresses would be expected to continue and possibly multiply. Consequently, the Northeast would need to bolster their infrastructure and governance surrounding wheat production, in particular mitigating costs related to irrigation for farmers and / or mitigating transportation costs, enabling farmers to sell more of their wheat to the self-administration institutions.

From a consumption standpoint, the public institutions involved in governance involved of the wheat value chain as indicated by flour prices seem to have fared slightly better than their private counterparts. In general, the public bakeries, which are the final selling point of the subsidized flour supply chain, had a statistically insignificant increase ($\alpha = 0.01$) in price after the enactment of the Caesar Syria Civilian Protection Act compared to the other outlets, which all had a statistically significant increase. Similarly, while public and private bakeries offered flour at similar prices before the Act, public bakeries compared to private bakeries offer cheaper prices in the long run effects of the act, which shows overall resilience of the institutions in the face of shocks and stresses.

However, these findings look at these governance structures at status quo. If the Northeast were to actually pull away, these institutions would be extremely vulnerable: the Syrian Pound is notoriously volatile and not resilient in the face of shocks, and multiple regional actors have insinuated that they would take military action should the Northeast secede (Rabinovich & Valensi, 2021). Future research into the governance structures, then, should try to quantify the effects of instability on the Syrian Pound, the effects of regional conflict on supply chains, and

the capacity of the self-administration to respond to these challenges with their current governance structures.

Section 5.5. Household-level Food Security: an Indicator of Self-sufficiency

Food self-sufficiency, or in this case, wheat self-sufficiency, ultimately should culminate in food security for the target population. In this framework, then, food security is the ultimate indicator of food self-sufficiency for a state or pseudo-state. While there are many different indicators meant to measure food security devised by international development groups, such as the Food Consumption Score, the Coping Strategy Index, the Household Hunger Score, or simply measuring the number of kcals per household member, the indicators predominantly focus on nutrition value of food, wholistic food variety and consumption, and / or coping strategies used by households. In the scope of this paper, using any of these indicators to measure wheat self-sufficiency would indeed not give a realistic picture of the necessary levels of food security as a household cannot meet the whole of their diet and nutrition needs through flour.

This paper, then, uses an economic measure of household food security as developed by researchers Smith and Subandoro at the International Food Policy Research Institute, who posit that households spending less than 50% of their household income on food makes means that households have relatively low food insecurity. To adapt this to the Syria context and make it applicable for only wheat, this paper uses the Survival Minimum Expenditures Basket (SMEB) calculations for overall income to be spent on flour in order for a household to meet their household food needs. In Syria, households spending less than 3% of all household expenses are considered to have low food security.

While this high food insecurity is still not considered to be sufficient, it does show that the public institutions are still supporting the population more than other private market solutions in the short term. However, the overall levels of household food security under the current production

and policies indicate that there is still much work to be done regarding wheat self-sufficiency when considering wheat food security, particularly for female headed households who earn significantly less than their male counterparts.

Section 5.6. Conclusions and Future Research

Overall, this paper outlines the areas in which wheat self-sufficiency has and has not been reached in Northeast Syria, focusing on a wholistic approach of both production capacity and governance structures in place. To then understand the current state of wheat self-sufficiency, this paper calculates household level wheat food security as an indicator of self-sufficiency.

From a production standpoint, wheat self-sufficiency can be reached based on yield rates and hectares available for planting as long as the population remains at status-quo. However, should the population continue to increase due to fighting in the Northwest and returnees, the wheat yield per hectare would need to be increased, which, according to literature, would be a function of increasing irrigation to allow for higher yield with the same seed and fertilizer inputs. Future research on wheat self-sufficiency for Northeast should focus on understanding how to increase yield within the confines of inputs available regionally and also the overall cost benefit analysis of repairing existing irrigation infrastructure that has fallen into disrepair.

The second pillar of self-sufficiency, governance, were proxied by both the production costs of wheat and the consumption costs of flour since the value chain for both are heavily or fully subsidized by the self-administration. From a production standpoint when only looking at wheat production costs compared to the buying price used by the self-administration, the farmers seem to be able to turn a profit, a good indication. However, when looking at the literature around the 2020 – 2021 wheat agricultural season, the sufficiency of these policies is called in to questions as farmers on average report much higher costs needed to offset the stress of drought and water scarcity that are not then offset by higher buying prices from the self-administration. This

indicates that while the policies may work in seasons of relative stability, this stability does not necessarily translate into high shock or high stress environments. More research should be done from a qualitative perspective on the shocks and stresses most often impacting wheat production to better understand flexible policies that could answer to them. Further research should also be conducted on possible transportation related policies to facilitate wheat selling, as the production costs constructed in this also do not incorporate transportation of wheat to the self-administration buying points, another cost to the farmers.

From a consumption standpoint, the government institutions involved in milling and selling wheat as flour have generally fared better than their private market counterparts, with public bakeries offering lowering prices for wheat than their public counterparts despite significant stresses. Similarly, after the shock of the of the Caesar Syria Civilian Protection Act, the public bakeries were one of the only institutions without a significant rise in price of one kilogram of flour in either SYP or USD, which shows that the public bakeries and the public milling services in place from the self-administration are generally functioning.

However, two major caveats to the findings presented should be considered: the economic and political sustainability of the current policies. As noted by other agricultural development researchers Von Braun & de Haen (1983) and Bates (2014), developing governments investing in their agricultural industries often cannot provide for the subsidies and interventions leveled in the long-term. While this paper only seeks to understand the status quo, further research into the self-administration's foreign reserves and central banking on the macroeconomics level should be undertaken to quantify the long-term sustainability the current policies. From a political standpoint, the current policies and even urbanized distribution of the bakeries falls in line with the agricultural development and government intervention model posited by Bates (2014), who argues that developing governments have political pressure to appease the urban masses at the expense of their rural counterparts. The narrative put forward by Bates (2014) displays that this

ultimately is politically unsustainable in the long-term, leading to unrest. Indeed, riots are already becoming commonplace among farmers in Northeast Syria due to these policies (Mauvais, 2021). Additional qualitative research should be undertaken to understand the wider political atmosphere and to what extent the Northeast self-administration can avoid repeating the same mistakes explored in Bates (2014) and made by the Assad administration that helped catalyze the Civil War.

Despite the seeming successes of both production capacity and public institutions at status quo, household food security as a function of percentage of household income spent on wheat remains poor, with the majority of households facing severe wheat insecurity, spending more than 6% of total income on flour if they have overall sufficient levels of culturally and nutritiously appropriate food consumption. These findings line up with overall calculations of food security in Northeast, with 12.4 million people in Syria being food insecure in compared to 7.9 million in 2020 (UNICEF, 2021). However, while the self-administration may be tempted into artificially decreasing food prices, this is not sustainable in the long-term as history has shown time and time again (Bates, 2014). Further research into policies that the Northeast can use to bolster household level food security while not falling into the trap of artificially decreasing prices at the expense of the farmers should be considered.

Overall, while there are some indications that wheat self-sufficiency is not out of reach for the self-administration, particularly as a function of production capacity, there are many places in which the governance relating to wheat production and consumption are not resilient in the face of shocks and stresses, which would only be expected to increase if the Northeast tries to become independent. This paper has tried to present self-sufficiency as relating to the current status quo; however, in the event that the self-administration does break from the rest of Syria, they would be vulnerable not only to existing constraints, but also those that arise as a response, making them even more vulnerable than current data indicates.

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