FOOD (IN)SECURITY IN GOVERNMENT-HELD SYRIA

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MERCY CORPS
Humanitarian Access Team

CONTENTS

FIGURES

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KEY POINTS

- Food insecurity has reached critical levels in Syria, with 59% of the population now food insecure and another 7% severely food insecure.
- Macroeconomic shocks caused by the collapse of the Lebanese financial system, COVID-19, and economic sanctions have prompted significant economic deterioration, leading to a partial survival minimum expenditure basket becoming 97% less affordable between October 2019 and October 2021.
- The government's dwindling support for the agricultural sector has greatly affected agricultural production, particularly when it comes to strategic crops such as wheat.
- Drought and water mismanagement of the country's water resources have also significantly negatively impacted the agricultural sector.
- A bread shortage has emerged because of difficulties importing soft wheat due to low foreign currency reserves and reduced domestic wheat production.
- A total of 5,784 km^2, or 69%, of the cultivated land in areas controlled by the Syrian government experienced a large or very large increase in plant water stress from May 2020 to May 2021.
- Syrian governorate-controlled Aleppo governorate contained the largest cultivated area under a higher level of plant water stress, with 1,107 km^2 (86%) of its cultivated land experiencing higher plant water stress.
- Cultivated land in Syrian government-controlled Deir-ez-Zor and Ar-Raqqa (to a lesser extent), located along the Euphrates River, experienced relatively lower levels of additional plant water content.

INTRODUCTION

Food insecurity has reached critical levels in Syria. The World Food Programme (WFP) estimates that there are currently 12.4 million food insecure Syrians (equivalent to 59% of the population), an increase of 4.5 million people compared to 2020, and the highest number ever recorded in the country.[1] Even more critical is that 1.3 million people are now severely food insecure, meaning they cannot survive without food assistance, double the number in previous years, with another 1.8 million at risk of falling into severe food insecurity.[2]

In March 2021, the WFP reported a 200% increase in food prices compared to the previous year,[3] pushing more families to adopt coping strategies by limiting portion sizes, restricting adult food consumption to leave more for children, purchasing food on credit, and skipping meals.[4] Increased prices and a reduction in households incomes (as a result of the deteriorating economy, discussed below), have meant that overall living standards and livelihoods have suffered – families have had to sell their livestock and other valuables, have reduced education and health-related spending and child and early marriages are reportedly on the increase in some governorates, all further coping mechanisms to deal with increasing levels of poverty.[5]

Syria's intensifying food crisis is the result of multiple interrelated factors spanning the financial, economic, agricultural, and climatic spheres, resulting in the steep depreciation of the Syrian pound, a reduction in the average Syrian citizens' purchasing power, a reduced ability to support the agricultural sector, a reduction in agricultural production and an overall reduction in affordability. This paper provides a general overview of the main factors contributing to Syria's increased food insecurity.

[1] WFP, Countries: Syrian Arab Republic, [updated regularly] 7 October, 2021.

[2] WFP [via Relief Web], Syria Situation Report #4, April 2021.

[3] *Ibid.*

[4] WFP [via Relief Web], "Syria - Review on the Impact of Rising Food Prices, Food Security Update, March 2020.

[5] *Ibid.*

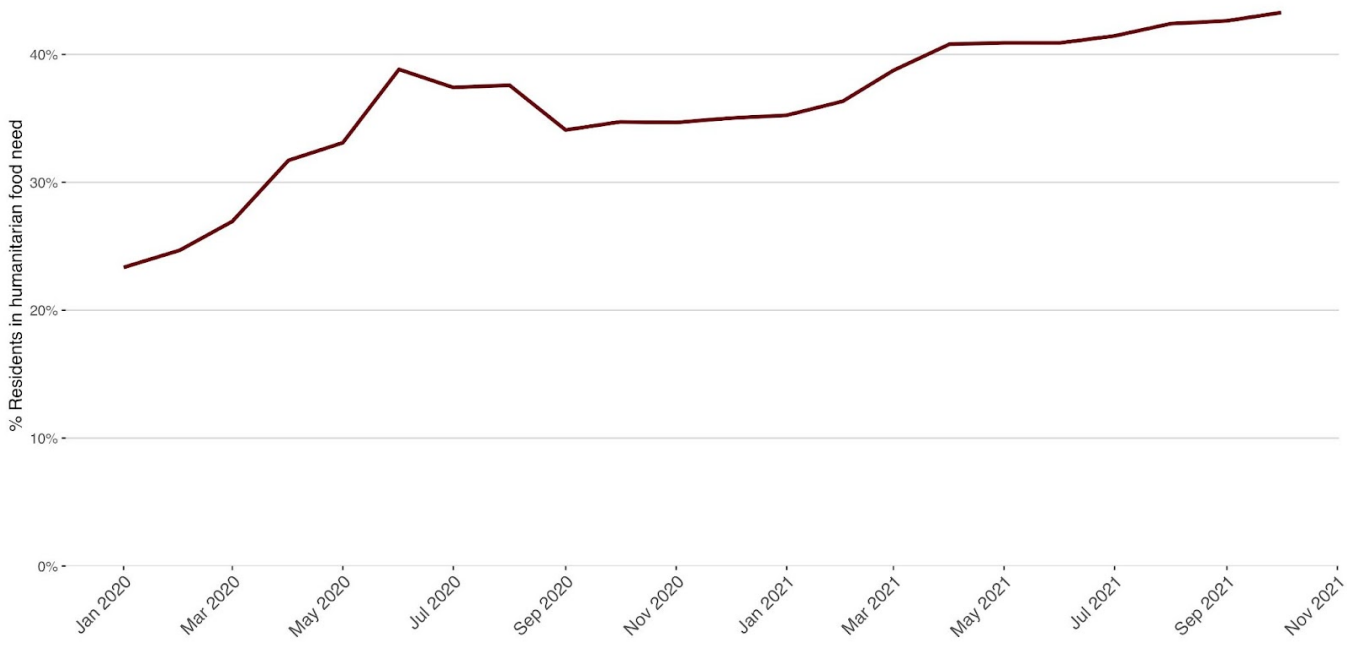

Figure 1: Residents in food need in government-held areas of Syria, Jan 2020–Nov 2021 (Source: HNAP)

DRIVERS OF FOOD INSECURITY

I. FINANCIAL COLLAPSE AND ECONOMIC DETERIORATION

Food security is unavoidably linked to household purchasing power and the wider economy. The Syrian conflict, combined with a number of external shocks have contributed to a significantly deteriorated national economy, and a depreciation of the Syrian pound, ultimately leaving Syrian families poorer and less able to satisfy their basic needs, most significantly for food, fuel and water.

Gross domestic product (GDP) in 2021 sits at just 45% of its pre-conflict level in 2010, while both internal and external economic shocks have further undermined domestic trade, financial markets and the export market. Oil production and tourism, the government's two largest foreign currency sources in 2010,[6] dropped from 385,000 to 35,000 barrels per day between 2010 and 2021, and from $8.21 billion to $14 million between 2010 and 2017 respectively.[7,8] Additionally, the absence of solid infrastructure and sufficient service provision has rendered many of the country's economic sectors largely unproductive. Externally, the collapse of the Lebanese banking system, COVID-19 restrictions, and economic sanctions imposed by many western countries (the last major sanctions came under the US-legislated Caesar Civilian Protection Act), all furthered Syria's economic and financial problems.

Collapse of the Lebanese banking system

At a national level, the financial crisis in Lebanon played a key role in accelerating the depreciation of the Syrian pound.[9] Lebanese financial institutions placed limits on US dollar withdrawal to prevent a rush at banks and the depletion of financial reserves following civil unrest and protest at political corruption and economic mismanagement.[10] Following implementation of the Lebanese government's COVID-19 precautionary measures, banks ceased providing US dollars completely. As a result, Syrian citizens,

[6] The Syria Report, Prospects for Tourism Industry Slightly Improve as Profits Increase September 2021.

[7] Knoema. Syrian Arab Republic Production of Crude Oil, 2019-2021, updated July 2021. .

[8] HAT Syria, Government of Syria responses to the financial crisis, May 2020.

[9] Syria Direct. How Is the Lebanese Crisis Affecting Syria? December 2019.

[10] Bloomberg, Lebanon's Banks Set Limits They Won't Call Capital Controls November 2019.

including businessmen and traders, have reportedly lost access to an estimated $45 billion in the Lebanese banking system, starving the Syrian economy of much needed foreign currency.[11]

Compounding the difficulties faced by Syrian households was the inability of Syrian citizens living and working in Lebanon to send remittances back to Syria through their financial systems. An estimated 1.5 million Syrians living in Lebanon sent financial remittances back to their families making up a major income source within Syria, with some estimates suggesting they accounted for up to 19% of national revenues, or $274.4 million per year.[12]

The Syrian government implemented initial market and currency control measures in January 2020 which did not succeed in containing the Syrian pound's depreciation. The measures consisted of additional capital control measures restricting the amount of money that can enter and leave the country, a ban on the use of foreign currencies in financial transactions, and limiting currency exchange through its Central Bank branches at first. All these measures aimed to control existing foreign currency in the country after the government lost its only remaining steady source from Lebanon. The government would later impose a series of policies to help flatten the pound's depreciation, in addition to restrictive central bank policies. However, these measures have shown to provide only short-term gains, and have not significantly alleviated households deteriorating living standards.

COVID-19

In March 2020, the Syrian government began implementing COVID-19 precautionary measures, which included the prohibition of inter-governorate travel, restriction of international travel, suspension of conscription, the closure of shops and businesses except for those producing or selling food items, cleaning supplies, and medical supplies, and a partial curfew. The precautionary measures lasted until May, a period which disrupted trade networks and supply chains, restricted movement, and resulted in wide-scale business closures, all of which compound the slide in value of the Syrian pound which depreciated from 1,100 to 1,800 SYP per USD from March 1 to end of May 2020. Moreover, the precautionary measures were implemented without tackling their secondary side-effects. The government was unable to provide financial compensation for the prolonged period of closure required by these measures which affected citizens' work. Indeed, WFP reported in March 2020 that nine out of ten households surveyed applied at

[11] Asharq AL-awsat. Damascus Estimates Syrian Deposits in Lebanese Banks Worth $45 Billion. January 2020

[12] *Ibid*

least one food coping mechanism, 73% of households surveyed were buying food on credit, and 84% had their savings depleted.[13] The economic impact of COVID-19 later forced the government to discontinue the measures in May 2020.

In a meeting with the ministerial committee for combating COVID-19 on 4 May, Syrian president Bashar al-Assad said: "Hunger, due to poverty and need, is a condition that is certain and not a possibility. On the other hand, a citizen getting this disease when he goes out is a possibility. The effects of hunger on a person are known and certain both in advance and afterwards...we can ask a human being to wear a mask and abide by precautionary measures, but there are no precautionary measures against hunger except for work."[14]

COVID-19 mitigation measures have since been scaled back as a result, while the secondary impacts have been reduced, however regional restrictions have also applied, reducing supplies.

Sanctions

Recent years have seen a number of sanctions imposed on Syria, most recently by the US in the form of the Caesar Civilian Protection Act (more commonly known as the Caesar sanctions), in effect from June 2020, which have targeted trade and financial institutions. These sanctions have targeted specific businesses and individuals and made it difficult to import agricultural, industrial, and energy-related material and equipment necessary for production and infrastructural maintenance, severely impacting the manufacturing and agricultural sectors and aiding the collapse of local production capacity, essential to food production and economic exports. As these sectors also sustained significant damage throughout the conflict, sanctions have prevented many national efforts for reconstruction, meaning increased dependence on import substitution in order to fill the gap in domestic markets caused by the dip in output.

IMPACT

The ongoing economic crisis in Syria has had multiple causes: HAT has measured specific levels of inflation since 2019, specifically following the Lebanese financial crisis, the onset of COVID-19 and the implementation of the Caesar Act (and increased sanctions) to assess how this may affect affordability at the household level and how this may specifically affect food prices.

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[13] WFP [via Relief Web], Syria MVAM Bulletin #53: March 2021. March 2021.

[14] SANA (blog via Kamel), "الرئيس الأسد يجتمع مع المجموعة الحكومية المعنية بمواجهة جائحة كورونا لبحث مستجدات التصدي للجائحة وآثارها على الحياة اليومية للمواطنين." May 2020.

The events since October 2019 have had a profound effect on the Syrian economy. The Syrian pound has depreciated 455% in the past two years (shown in Figure 2) with the government's successive attempts failing to stabilize the currency thus far. The large depreciation has both simultaneously increased prices and decreased wage values, significantly reducing the average citizen's purchasing power and widening the wage-price gap. Indeed, the deteriorating economic situation has made basic food items less affordable.

Using HAT's measurement of household affordability, with prices of basic food items increasing 19% on average (shown in Figure 3), the average working hours required to purchase one partial SMEB basket in Syrian government areas increased 97% from 6.94 working hours in October 2019 to 13.65 working hours in October 2021 (shown in Figure 4). Moreover, increased unaffordability becomes a bigger problem when unemployment is considered; the unemployment rate in Syria was estimated at 42.6% in 2019 and could be much higher.

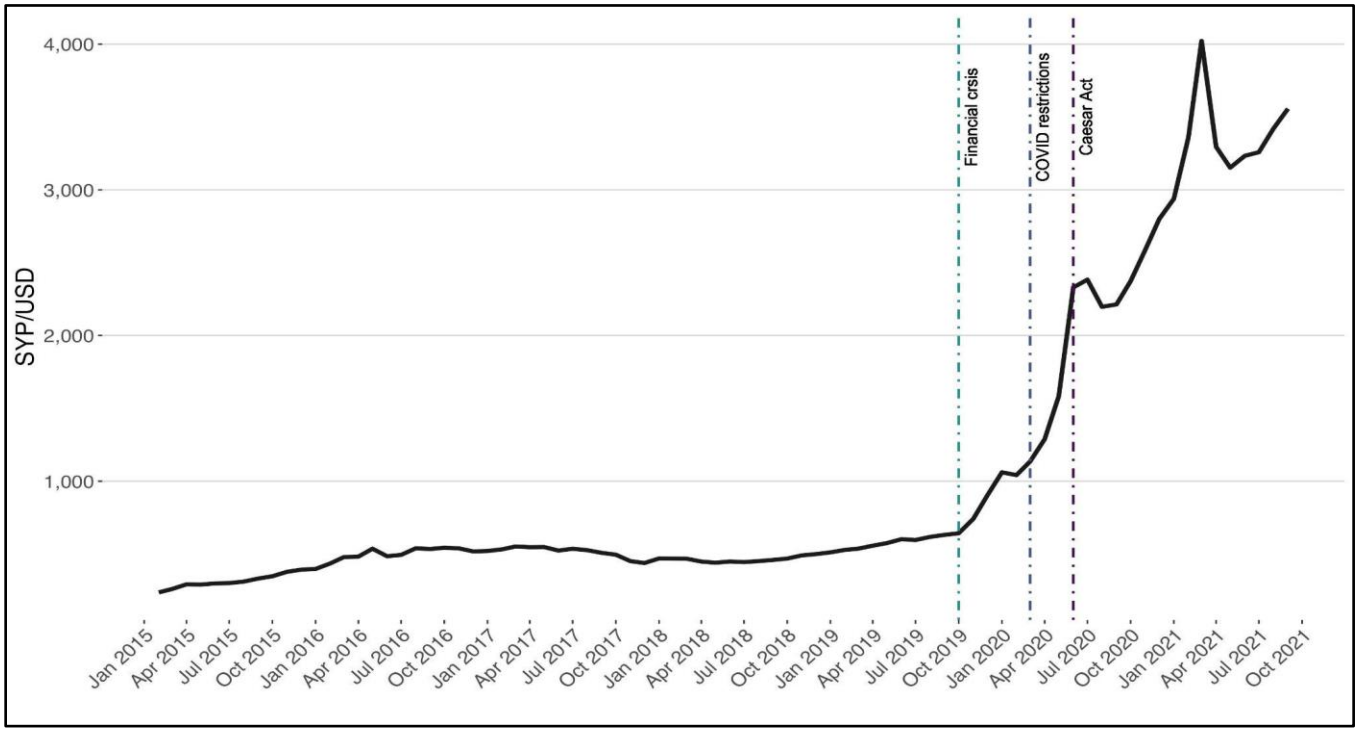

Figure 2: SYP per USD unofficial exchange rates (Source: HAT Syria)

Figure 3: Affordability of a partial SMEB in Syrian government-held areas. Data from WFP and SMEB parameters based on a WFP definition[15]

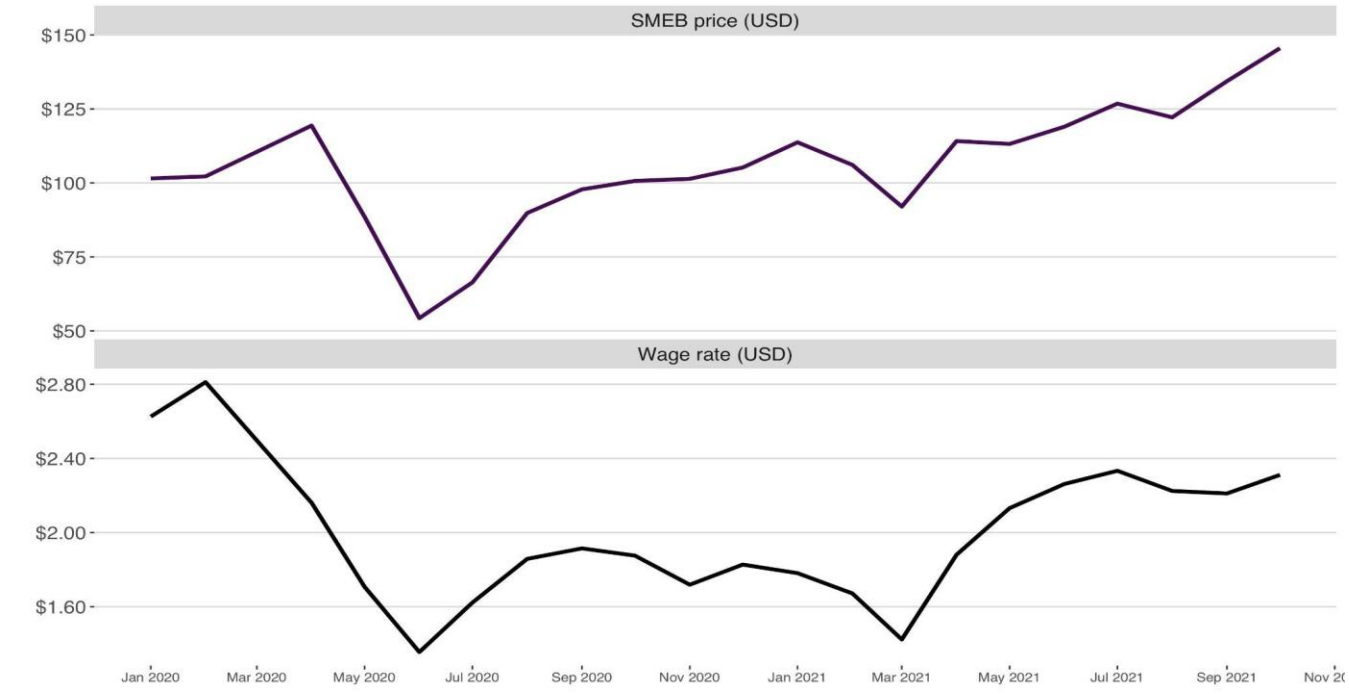

Figure 4: Price and wage increases in Syrian government-held areas, USD value (Source: WFP)

[15] The following items are included in the partial SMEB: Eggplants, diesel, whole chicken (plucked), cooking oil, salt (iodised), sugar, and tomatoes.

EFFECT OF FUEL ON FOOD PRICES

There have been severe shortages of fuel in government-held areas of Syria since September 2020. Issues with supply lines, interrupted domestic trade and sanctions on international trade have meant a decrease in quantity and increase in price of state-supplied fuel. High levels of demand coupled with rampant corruption has also meant that some of the subsidized fuel earmarked for citizens instead found its way onto the black market, exacerbating supply issues, while the price of black market petrol and diesel increased 567% and 627% respectively between September 2020 and July 2021 in Damascus city. Local sources reported that businesses, citizens, and even humanitarian organizations resorted to purchasing black market petrol and diesel to cover their needs.

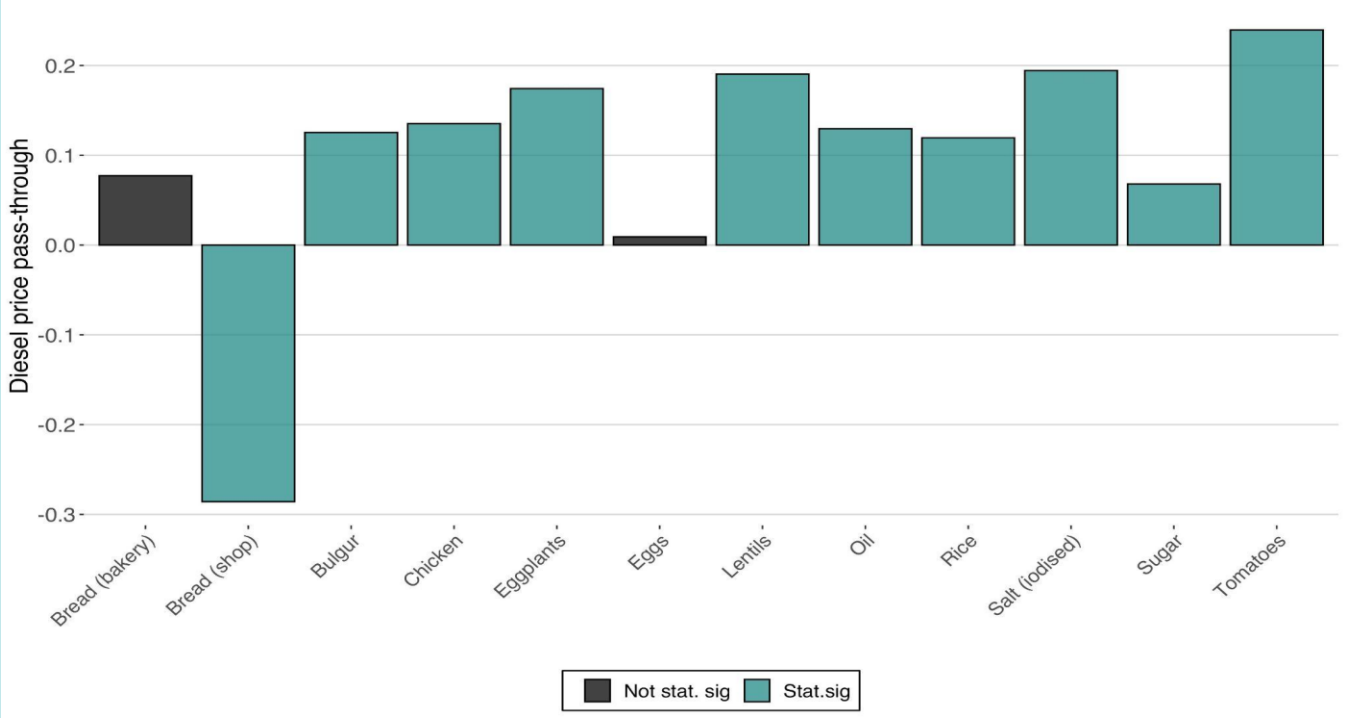

Figure 5: Diesel price pass-through for basic food basket items, calculated using monthly WFP food price data from September 2020 to October 2021. (Source: HAT Syria)

Considering that diesel is the most common fuel product used to power commercial trucks and irrigation water pumps, HAT Syria measured how much price changes in non-subsidized (black market) transportation diesel passed through to the price of SMEB food items using WFP food price data from

September 2020 to September 2021.[16] Unsubsidized diesel prices only increased during this time period, meaning the entire analysis measures the impact of a positive price shock and a static analysis is sufficient; however, a dynamic impulse response approach is recommended for future research because non-subsidized diesel prices will inevitably fluctuate over time.[17]

The pass-through effect of diesel prices on SMEB food items were relatively similar, as shown in Figure 5. Lentils, eggplants, and tomatoes produced the most noticeable largest pass-through effect, likely because these produce are grown in irrigated plots that require more intensive water pumping. The effect of the price of diesel on the price of eggs and chicken is weaker because the diesel is less directly involved in its additional inputs, particularly fodder. Diesel prices are also transferred to the price of food items that are largely imported (for example, salt; sugar; oil) due to higher transportation costs. The price of diesel did not have a statistically significant pass-through effect on bakery bread, which is expected because it is subsidized by the Syrian government. However, bread sold in shops, which originates from private bakeries, was negatively related to the price of diesel, meaning shop bread prices increase when diesel prices decrease. This result is admittedly spurious and likely indicates that the bread price pass-through from diesel prices is the result of variable production costs unrelated to diesel prices, such as electricity costs for bakery ovens.

[16] WFP recorded non-subsidized (black market) transportation diesel beginning in February 2020, and our panel begins in September 2020 because it falls after the sanctions began and allows a full-year calculation, which avoids any bias from the seasonality of certain food items. There are too few time periods available to conduct this analysis before and after the Caesar Act.

[17] Similar to the following: Kpodar, K.R. and Abdallah, C. 2016. Dynamic Fuel Price Pass-Through : Evidence from a New Global Retail Fuel Price Database. IMF Working Paper1 6/254.

II. DECLINE OF THE AGRICULTURAL SECTOR

In addition to the increased unaffordability of basic food items, the reduction in the agricultural sector's food production capacity has also contributed to food insecurity. The agricultural sector was a dominant sector in Syria, contributing 30% to the country's GDP and employing 25% of the country's total labor force and an additional 50% in agro-dependent manufacturing sectors.[18] Syria used to boast being the only country in the region which has self-sufficient food production, especially in staple foods such as barley and wheat.[19] However, the sector took a hit over the years, particularly since the start of the Syrian conflict, sustaining significant infrastructural damage, reduction in government support, worsening climate, and water scarcity.

Sector-wide destruction of infrastructure

The ten years of war ongoing in Syria since 2011 has severely impacted the country's agricultural sector. The UN Food and Agriculture Organization (FAO) has reported that the agricultural sector lost $16 billion in material damages (just under one-third of the national GDP) as a result of the conflict, with the largest loss incurred in Rural Damascus, Deir-ez-Zor, Ar-Raqqa, Al-Hasakeh, and Idleb, each registering more than $1 billion in damages. Moreover, it would almost cost an equal amount ($11–$17 billion) to rebuild the sector over a three-year period.[20] Fighting has damaged agricultural machinery, storage and processing facilities, and irrigation infrastructure such as wells and canals among other vital agricultural infrastructure reducing the sector's capacity and efficiency in production.[21]

Reduction in government support as a policy

In addition to sector-wide infrastructural damage, the Syrian government's support for the agricultural sector was significantly altered from an agro-centric economic policy under former president Hafez al-Assad, aimed at developing self-sufficiency and ensuring political support domestically, to a neoliberal policy under his son and current president Bashar al-Assad, which gave the agricultural sector secondary

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[18] Bayram, M., and Gök, Y., The Effects of the War on the Syrian Agricultural Food Industry Potential. *Turkish Journal of Agriculture - Food Science and Technology*, vol. 8, (7), July 2020.

[19] Carnegie Endowment for International Peace, Food Insecurity in War-Torn Syria: From Decades of Self-Sufficiency to Food Dependence. June 2015.

[20] FAO, Counting the Cost: Agriculture in Syria after six years of crisis, April 2017.

[21] Action on Armed Violence [via Relief Web], The Reverberating Effects of Explosive Violence on Agriculture in Syria , July 2020.

importance. This new neoliberal outlook saw the gradual decrease of agricultural subsidies and public investment in the agricultural sector.

Agro-centric economic policies under Hafez al-Assad

During Hafez al-Assad's presidency, the Syrian government's policies revolved around agrarian reform, supporting farmers, and securing their representation in the state, thereby ensuring the loyalty of rural communities to the government. The government's agricultural plans centered on three sub-policies: [22, 23]

I. **Ensuring self-sufficiency** through the production of "strategic crops" which had political and economic importance, such as wheat. The government also took on a loan from the Kuwaiti Development Fund in the 1970s to construct additional silos to ensure Syria had a strategic wheat reserve which could last two years – exports were prohibited until the reserves were full.

II. **Supporting profitable agricultural exports** such as cotton and tobacco by designating agricultural land to produce these crops, in addition to subsidizing agricultural production materials for farmers engaging in their production.

III. **Supporting agricultural production** through dedicating a significant amount of public funding to support the agricultural sector, thereby providing many seasonal low-income unskilled agricultural job opportunities in the poorest corners of the country. These funds subsidized seeds, fertilizer, and fuel making them more affordable for farmers. Moreover, these subsidies were provided through governmental agricultural cooperatives and institutions, ensuring that farmers abide by the government's central agricultural production policies.

Neo-liberal economic policies under Bashar al-Assad

Following Hafez's death in 2000, and the onset of Bashar al-Assad's presidency, the Syrian government undertook neo-liberal economic reforms based on a social market economy model before officially adopting it in 2005 under the *Tenth Five-year plan* extending from 2006 until 2010. The plan constituted investing in profitable sectors such as telecommunications, real estate, tourism, commerce, and industry. Pro-social market officials considered the agricultural sector to be a financial burden and began siphoning funds from the sector, moving the investment of public funds to urban areas. According to the Syrian Center for Policy Research, the huge shift in economic focus was motivated by the steady reduction in oil

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[22] Middle East Directions, "التمهيد للأزمة: التدهور السياسي للزراعة في سوريا." January 2020.

[23] Al-Akhbar, "قرار لحافظ الأسد قبل أربعة عقود: «مُونة» الدولة التي حالت دون الانهيار". الأخبار! September 2016.

production since the late 1990s (shown in Figure 6) and its consequent profits which continued well into Bashar al-Assad's presidency. This created the need for finding alternatives to make up for the oil sector's production shortfall.[24]

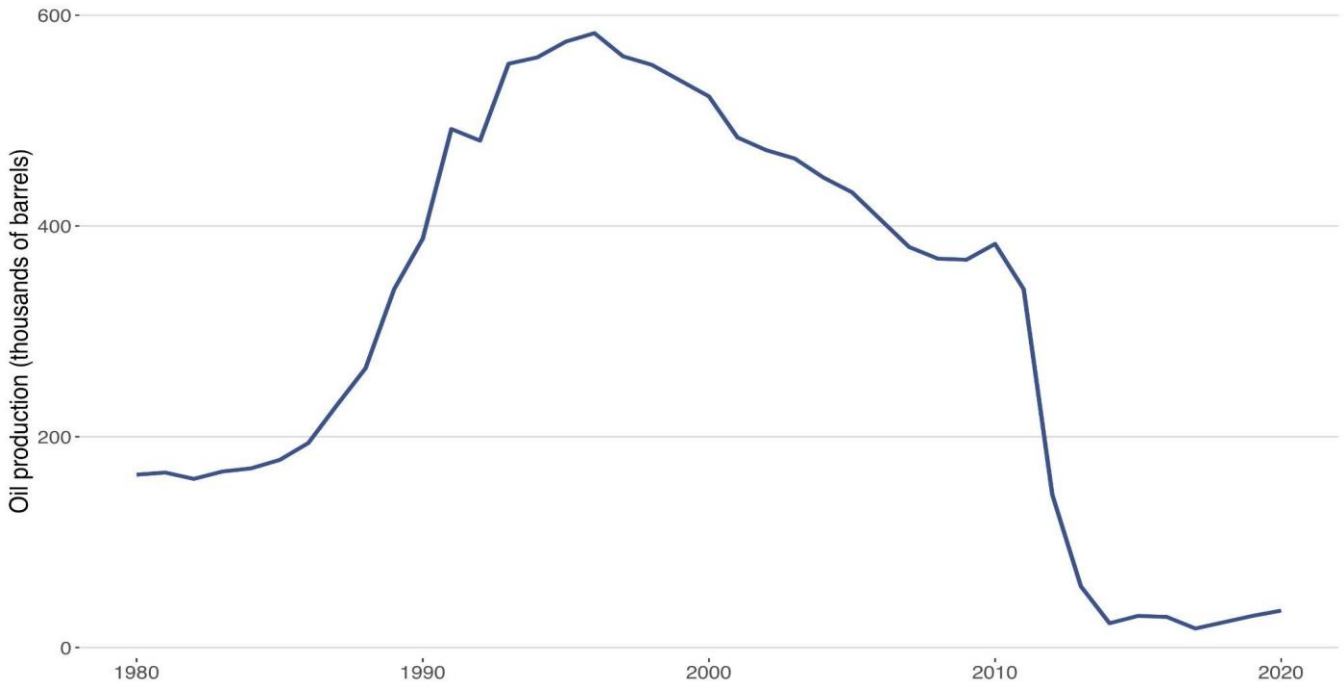

Figure 6: Syrian Arab Republic's crude oil production (Source: CEIC)

The agricultural sector post-neoliberal reform

The government's institutional neglect of agriculture under the *Tenth Five-Year Plan* had a profoundly negative effect on the agricultural sector:

- **Subsidy removal:** The Syrian government removed diesel subsidies in May 2008 leading to a 342% increase in diesel prices. Fertilizer subsidies were also removed leading to a 200–460% increase in fertilizer prices (293% superphosphate, 202% nitrate, 458% potassium).[25] Moreover, the amount of fertilizer distributed by the government decreased by 56%. Pesticide subsidies were reduced in 2005 before being completely removed in 2010.

[24] Syrian Center for Policy Research [blog], الأمن الغذائي و النزاع في سوريا May 2019.

[25] UN Official Reports, Olivier De Schutter, Special Rapporteur on the Right to Food. Accessed July 25, 2021.

- **Drop in wheat production:** Wheat production dropped by 47.5% between the 2006/2007 and the 2007/2008 harvests due to a country-wide drought which lasted three years, between 2007–2010.[26] The high price of diesel following subsidy removal in 2008 made it expensive for farmers to pump water to irrigate their lands. Additionally, fungal infections such as yellow rust disease reportedly spread in the absence of significant amounts of pesticides and fertilizer; both being essential in combating crop diseases.
- **Reduction of public investment:** Public investment in agriculture decreased by approximately 37% between 2004 and 2010.[27]
- **Decrease in the agricultural labor force:** The percentage of the Syrian labor force which works in the agricultural sector notably decreased from 30% toward the end of the 1990s to 25% in 2008 before dropping to 14% in 2010.

The reduction in the government's investment and interest in the agricultural sector is holistically reflected in the decrease of the sector's percentage output in the country's GDP (shown in Figure 7).

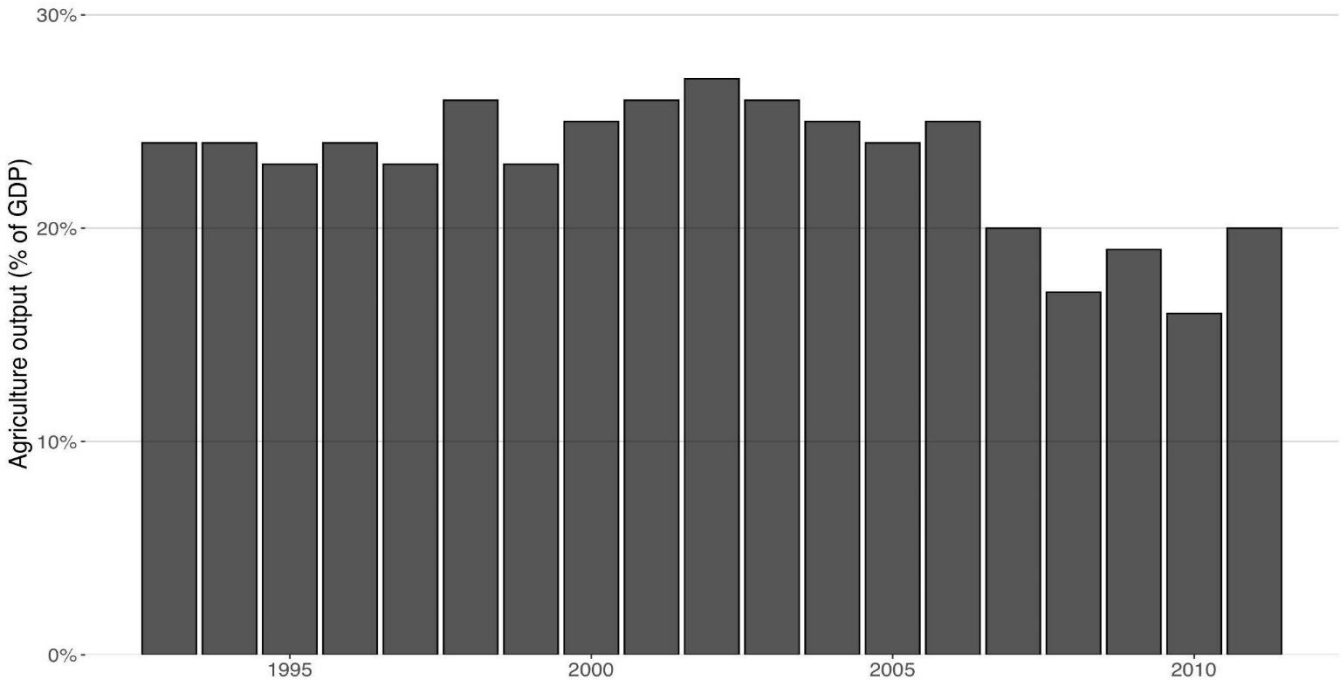

Figure 7: Percentage of agricultural output in Syria's GDP. (Source: Central Bureau of Statistics)

[26] Selby, J., *et al*, Climate Change and the Syrian Civil War Revisited. *Political Geography* 60, September 2017.

[27] Middle East Directions, Prelude to crisis: The political decline of agriculture in Syria. January 2020.

Since the start of the Syrian conflict, official documents relating to agricultural policy or planning, or any official statistics on agricultural production, have been extremely limited. In the absence of official information, HAT Syria tracked the effects of a reduction in agricultural production using limited data published by the Syrian Ministry of Agriculture and humanitarian agencies, in addition to monitoring the removal of subsidies on specific foodstuffs (indicative of its supply), and the cost of production inputs.

Increasing costs of production

Syria's various economic and financial crises throughout the conflict, in addition to the government's low level of support for the agricultural sector, took their toll on the price of agricultural raw materials, leading to a steady increase in the overall cost of production for various strategic crops, including wheat (shown in Figure 8).

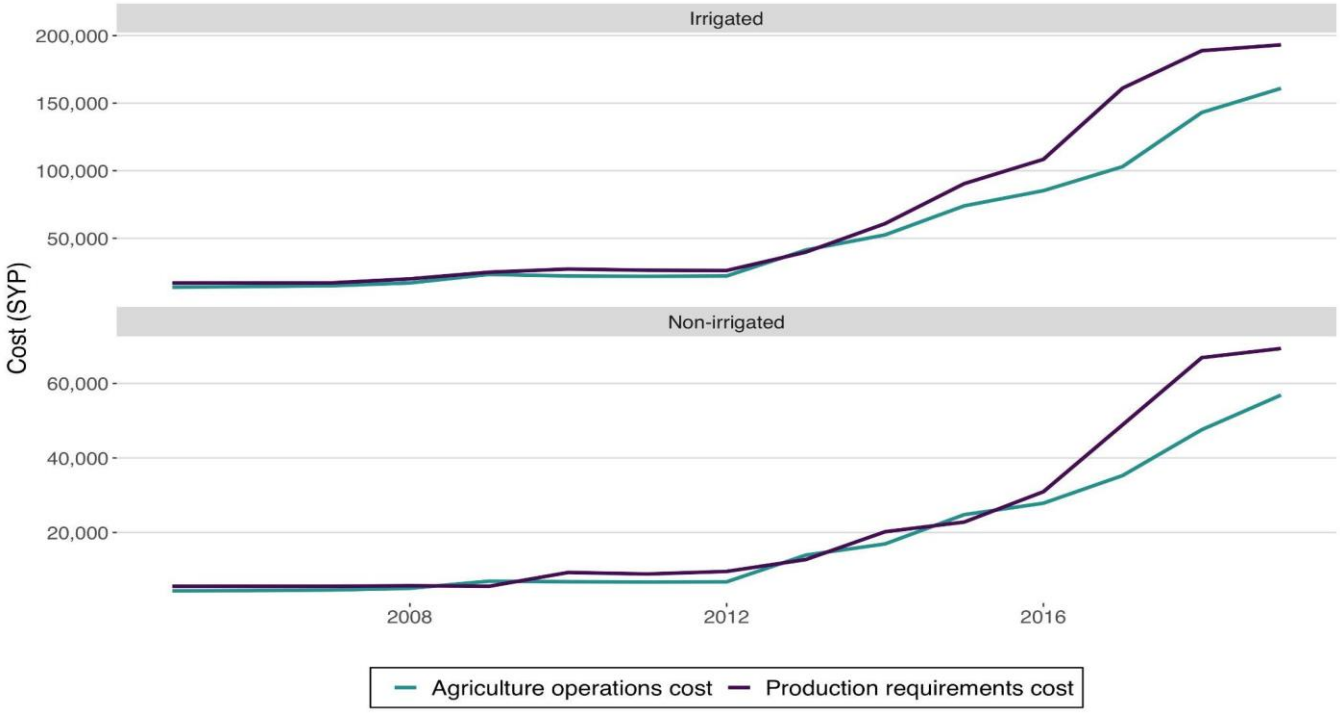

Figure 8: Average wheat production cost per hectare (Source Syrian Ministry of Agriculture)

1. Diesel

While water scarcity and decreased groundwater has been an issue for farmers, their ability to extract the water has also been compromised due to the increase in diesel prices. Diesel is the primary fuel type used by Syrian farmers to power their water pumps either to extract water from their boreholes or rivers adjacent to their lands. The government provides 25 liters of agricultural diesel (subsidized diesel that is

priced and sold specifically to the agricultural sector) per dunam at 400 SYP per liter, if the crop being grown falls under its agricultural plan. However, local sources have reported that the amount of agricultural diesel provided to them is insufficient, forcing them to buy more for exorbitant prices on the black market. The fuel crisis of late 2020 has also plagued government areas with chronic fuel shortages making all fuel-related products, including diesel, hard to find. Diesel's black-market price increased further following the government's decision to lift subsidies for transportation and heating, increasing by 178% from 180 SYP to 500 SYP on 11 July. This effectively led to a 42% increase in black-market prices, (shown using Rural Damascus as an example in Figure 9), reaching 3,800 SYP per liter.

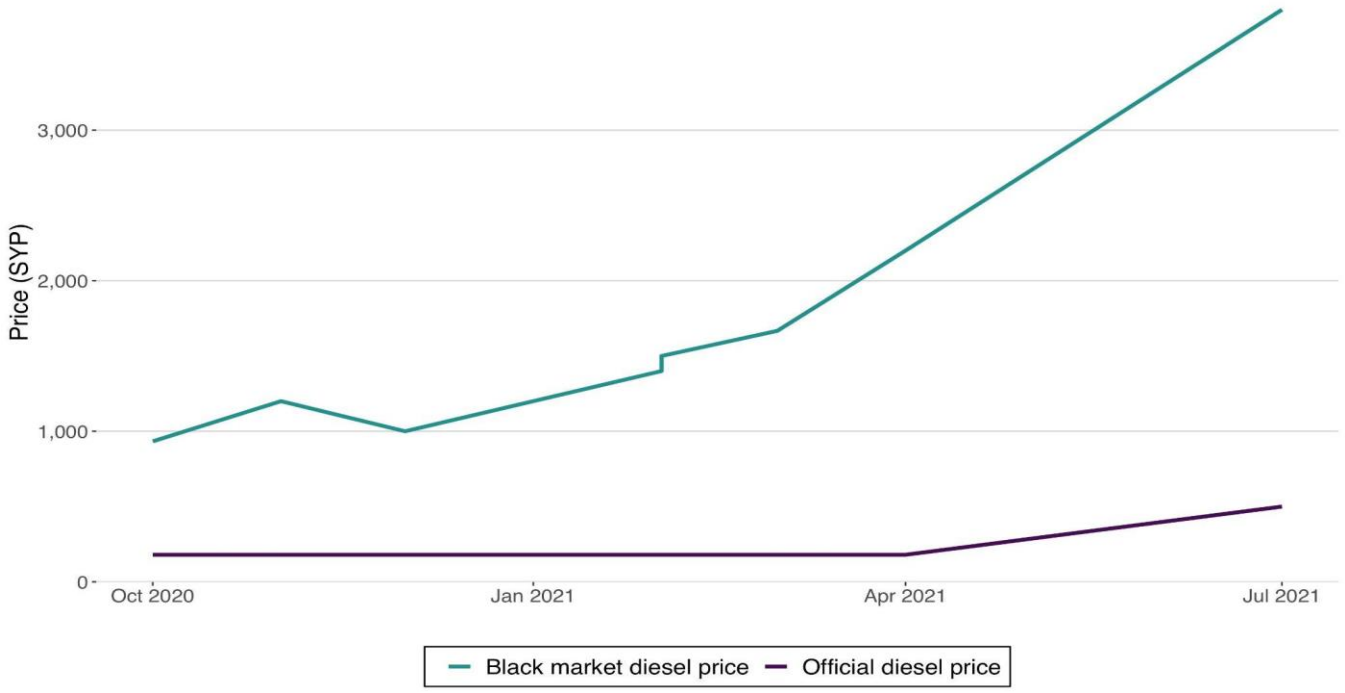

Figure 9: Official and black market price of diesel in Rural Damascus (Source: HAT)

2. *Agricultural machinery*

The increase in the price of diesel has also led to the increase in the cost of renting agricultural machinery. Tractors used for ploughing and seeding and harvesters used to harvest the crop, operate using diesel. The cost of renting the machines has increased by 33% across them all, further increasing agricultural operation costs. The Syrian pound's depreciation has also affected the cost of repairs and spare parts to increase, making maintenance costs more expensive. The use of agricultural machinery is a time-saving endeavor

which also has a positive impact on the quality of the crop. However, the increased costs have been prohibitive to farmers, with some having to give up on their harvests altogether.

Table 1: Changes in rental costs of agricultural machinery in Dar'a, 2020–2021 (Source: HAT Syria).

Item	2020 price (SYP)	2021 price (SYP)	% change
Ploughing tractor (rent per dunam)	9,000	12,000	33%
Seeding tractor (rent per dunam)	9,000	12,000	33%
Harvester (rent per dunam)	40,000	60,000	33%

3. Fertilizer

The Syrian government has reduced its fertilizer subsidies, making the purchase of fertilizer more expensive. On 1 June, the government's Agricultural Council increased the price of subsidized fertilizer between 30%–290% (shown in Table 2). The general manager of the Agricultural Bank, Ibrahim Zeidan, later clarified that the new price is based on the base price of the fertilizer which the bank is buying in addition to shipping and labor costs. He then said that the decision was made upon the recommendation of the economic council; that the price does not include a profit margin, and that it is still 10%–15% less than the market price.[28]

The decision was unpopular with farmers already frustrated with the government's policies which have led to the deterioration of agriculture in the country. Farmers in Dar'a, for example, complained that the decision to further lift subsidies and increase prices will negatively affect farmers; their profits are already insufficient to cover essential raw materials such as fertilizer and seeds.[29]

[28] Horan Free league, تجمع أحرار حوران. "وسط استياء الفلاحين.. النظام يرفع الدعم عن أسعار الأسمدة في سوريا. June 2021.

[29] *Ibid.*

Table 2: Change in cost of fertilizer, March 2020 - June 2021

Items	March 2020 price (SYP)	June 2021 price (SYP)	% change
Super phosphate	308,000	1,112,000	261%
Urea	248,000	336,000	35%
Ammonium nitrate	206,000	789,600	283%

4. Storage

Fruit and vegetable farmers have been largely affected by the severe electricity rationing. Following their harvest, they rent space in cold storage facilities to store their produce before selling them on the market. In Dar'a, for example, renting 60 m^3 of refrigerated storage space costs 1,000,000 SYP per month, 20% higher than last year. However, severe electricity rationing and cuts have made farmers hesitant to pay such a high cost to store their produce knowing that there is a chance it might be ruined. Indeed, local sources reported on 8 February that 120 tonnes of agricultural produce was ruined after electricity was cut off from a cold storage facility in Sarghaya township (Sarghaya subdistrict) in Rural Damascus. Moreover, farmers who own refrigerators operated by private generators have found it increasingly expensive to store their produce due to the high price of diesel.

Water scarcity

Water scarcity has also been an important issue impacting agricultural production. Water resources in Syria are scarce and limited, with the country categorized as water-poor back in 2000. Syria's water wealth was estimated to be between 16.375–18.209 m^3 per year, adequately supplying the country. However, decades of water mismanagement and pollution, climate change, and the start of the Syrian conflict in 2011, has led to a deterioration in the country's water resources.

1. Water mismanagement

Surface water and groundwater, two major water resources have seen a dip in production due to the government mismanagement. The government's push for self-sufficiency in food production caused it to

begin expanding irrigated land in 1990, leading to an annual negative water balance, causing water scarcity in surface water resources to increase 42% between 1992 and 2009.[30] This eventually led the government to further tap into the groundwater to make up for the shortfall, later greatly affecting its depleting reserves.[31] The endeavor, coupled with the government's failure to adopt efficient irrigation techniques (ie, drip irrigation, sprinkler systems) led to the agricultural sector consuming up to 90% of the country's overall water resources.[32]

In addition to government irrigation policies, a discrepant supply and demand furthered the depletion of the country's water sources, forcing the government to implement rationing measures. Reportedly, there is a gap of 2 m^3 of water per second between water consumption in Damascus and Rural Damascus to that pumped through the Ein al-Fijeh spring, the region's main source of water. Manager of the government's public institution for drinking water and sewage, Mahmoud Zalzleh has said that water coming from Ein al-Fijeh, Damascus city's main water source, currently covers only 90% of the residents' needs, and has implemented rationing of up to 12 hours per day as a result of the "excessive and wasteful use of water."

2. Drought

Syria is currently experiencing the worst drought in decades resulting in a severe water shortages. The Syrian minister of agriculture, Mohammad Hassan Qatana stated that this is the "most dangerous year in terms of low levels of torrential rainfall, drought, and climate change since 1953". The drought has hit all governorates simultaneously, unlike the droughts in 1999, 2008, and 2018 which were limited to a select few.[33]

Qatana stated that the reduction in water supply has forced the government to prioritize securing drinking water for the population, pushing it to revise its summer crop production plan and reduce the area of water-heavy agricultural crops such as cotton by 20,000 hectares (30%). The redirection of water resources may prove problematic for farmers as almost 90% of total water use goes to the agricultural sector compared to the 9% directly used by the population.[34] Moreover, Qatana stated that the reduction in rainfall had led to a reduction in stored water in dam reservoirs by 52% in addition to a severe reduction in groundwater

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[30] The Omran Center, Water security in Syria: an analytical study of the reality of the available water resources. January 2015.

[31] *Ibid.*

[32] Action on Armed Violence [via Relief Web], The Reverberating Effects of Explosive Violence on Agriculture in Syria. July 2020.

[33] Al Araby, عام العطش في سورية: الجفاف الأسوأ منذ 70 سنة. July 2021.

[34] AQUASTAT Database, Database Query Results. [Updated regularly] accessed July 26, 2021.

levels. The drought coupled with the consequent high levels of water scarcity later reportedly forced the ministry to exclude 700,000 out of the 800,000 hectares of rain-fed land from its production plan at a time when it intended on growing 1,550,000 hectares of crops.

Moreover, it is unlikely that this will be Syria's last drought. A study by UN Water states that rainfall amounts are expected to be reduced by 20–25%, a 15% decrease in available water, and with droughts becoming ten times more frequent in the Middle East.[35]

3. Irrigation infrastructure

In addition to the drought and its consequent water scarcity, damage to vital water infrastructure such as pipes and irrigation canals exacerbate the problem.[36] FAO estimated the cost of damage to agricultural infrastructure and assets including irrigation systems at $3.2 million. Moreover, 20% of households surveyed by FAO have stated that they have lost complete access to irrigation while another 40% have stated that they face higher costs in doing so (ie, increased price of diesel). Indeed, the damage to electricity infrastructure, which has reportedly reduced power output by 62.5% between 2010 and 2015, has made it difficult to power the irrigation systems which remain intact. Additionally, 35% of all water treatment plants had been damaged as early as 2014, due to violent conflict.[37]

IMPACT

The agricultural sector has been severely impacted by the accumulation and longevity of the abovementioned factors, resulting in a reduction of cultivated land and production. Reduction in government support for the sector and the steadily rising cost of production due to both the deterioration of the economic situation and lifting of agricultural subsidies has made it increasingly costly for farmers to grow their crops. Additionally, the steady depletion of Syria's water resources due to gross mismanagement and inefficient irrigation has reduced water availability for irrigation. Also, the damage sustained by the country's irrigation infrastructure, significant reduction in power output, and high diesel prices, have made it exceedingly difficult to engage in irrigated farming. Displacement has also played a

[35] Trondalen, J. Climate Changes, Water Security and Possible Remedies for the Middle East. Scientific paper for UNESCO-PCCP. March 2009.

[36] CSIS, Addressing the Growing Hunger Crisis in Syria. February 2021.

[37] The Omran Center, Water security in Syria: an analytical study of the reality of the available water resources. January 2015.

part leading to a reduction in demand for irrigation due to the local population's inability to cultivate their own land.[38]

Cultivation

A study conducted by the University of Stanford in 2016 found that the amount of irrigated land in Syria had been reduced by 47% between 2013 and 2015 alone, coinciding with a 49% reduction in water reservoirs.[39] According to a study published by Humboldt University of Berlin, the amount of cultivated land decreased by 21% between 2010 and 2018 with 943,000 hectares being lost per year.[40]

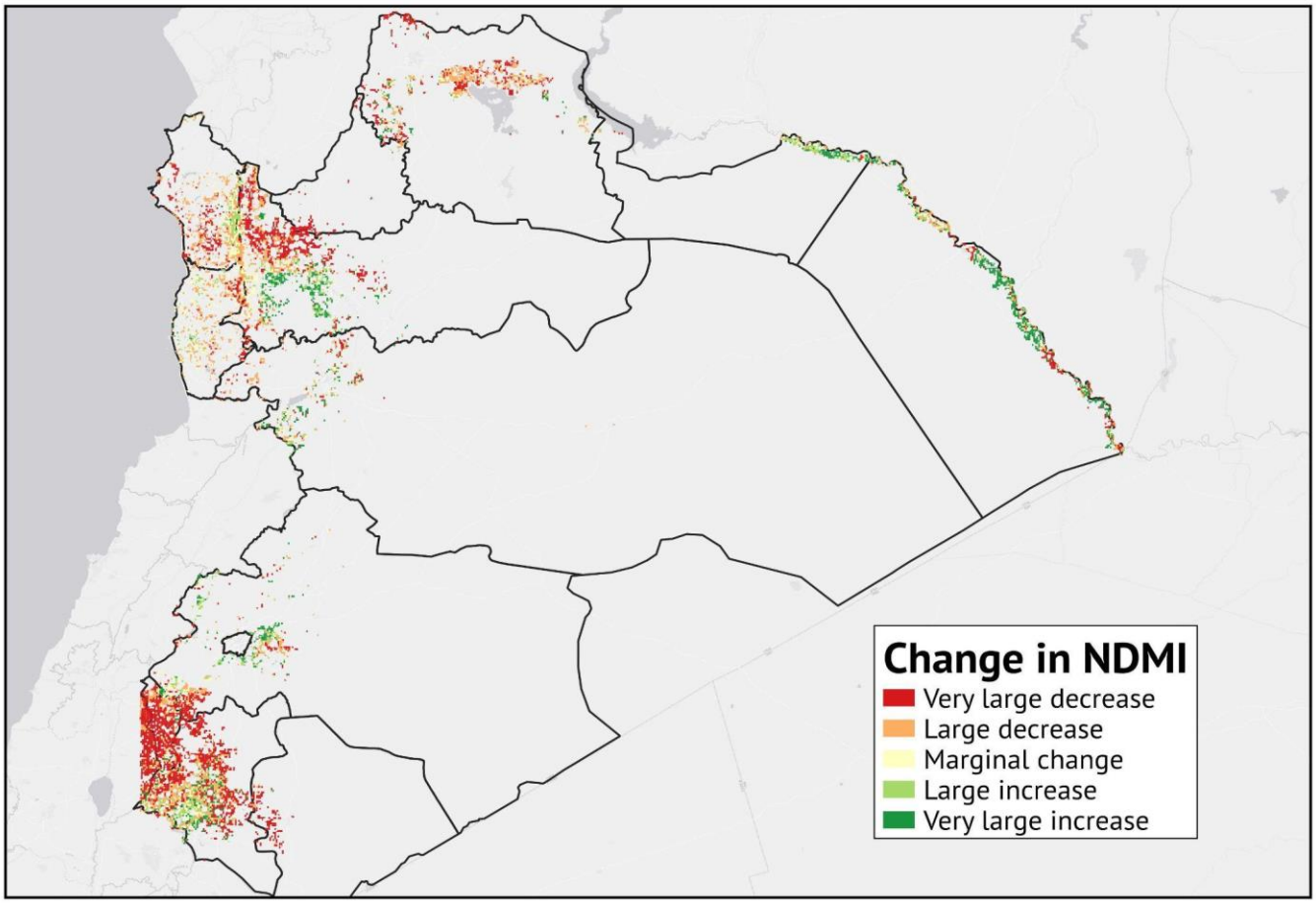

Figure 10: Changes in NDMI in cultivated areas within Syrian government control (Source: HAT Syria)

[38] Müller, M.F., *et al*, Impact of the Syrian Refugee Crisis on Land Use and Transboundary Freshwater Resources. Proceedings of the National Academy of Sciences, vol. 113, (52), December 2016.

[39] Stanford School of Earth, Energy and Environmental Sciences, Syrian Crisis Altered Region's Land and Water Resources, Stanford Study Finds. December 2016.

[40] Mohamed, A.M., Anders, J. and Schneider, C., Monitoring of Changes in Land Use/Land Cover in Syria from 2010 to 2018 Using Multitemporal Landsat Imagery and GIS, *Land*, vol. 9, (7), July 2020.

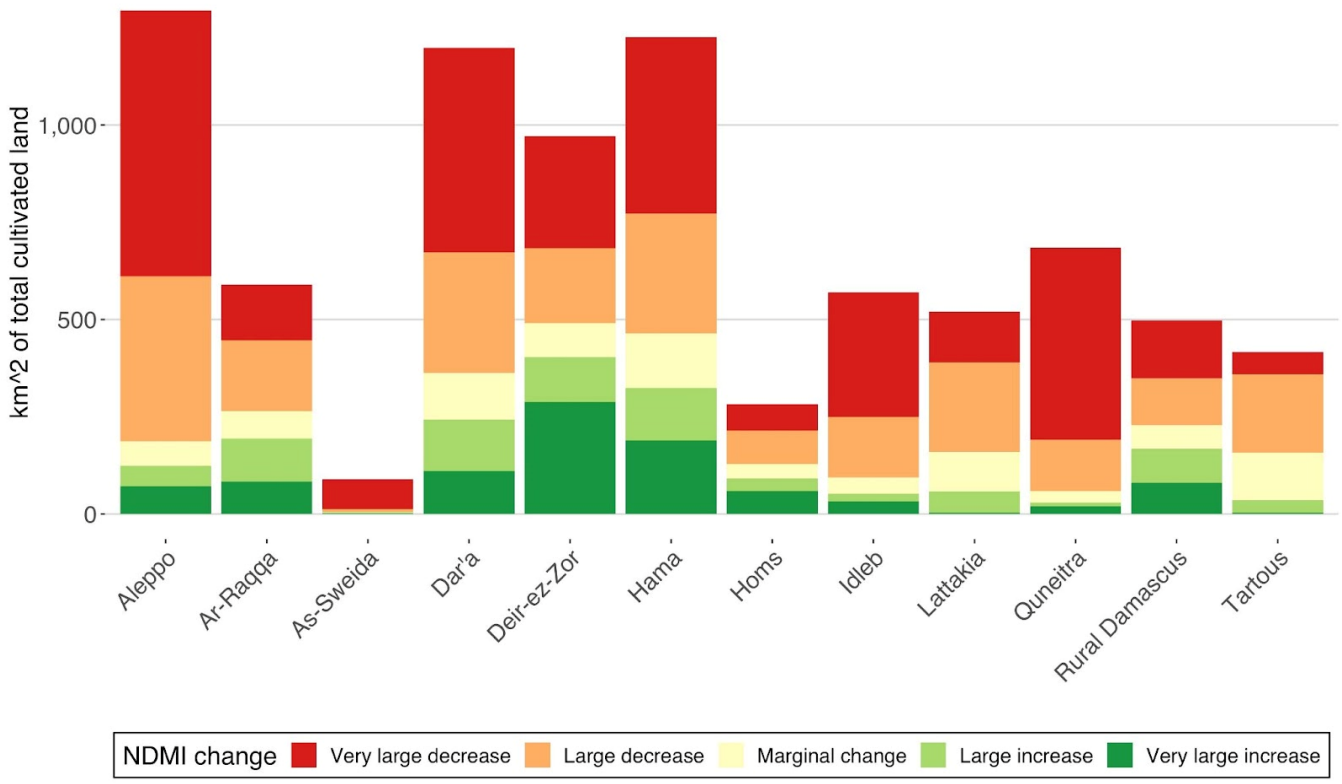

Figure 11: Changes in NDMI in cultivated areas within governorates under Syrian government control. Excluded governorates lacked significant aggregate levels of observed NDMI in one or both time periods.

The HAT conducted an analysis of vegetation water content using satellite imagery to measure the vitality and extent of crop production in Syrian government-held areas. The analysis uses the Normalized Difference Moisture Index (NDMI),[41] an indicator of vegetation water content, to measure changes in the extent and vitality of cultivated land from May 2020 to May 2021. NDMI is calculated using near-infrared (NIR) and short wave-infrared (SWIR) bands from multispectral satellite images to measure plant water content.[42] SWIR reflectance is indicative of moisture-related internal structure and NIR reflectance is solely indicative of the dry matter internal structure. The ratio of the difference between NIR and SWIR reflectance and the total NIR and SWIR reflectance, the formula for NDMI, accurately measures the relative abundance of dry structure in a plant, and is an accurate measure of vegetation water content.

41 Cessato, P., *et al*, Detecting vegetation leaf water content using reflectance in the optical domain. *Remote Sensing of Environment* 7, 2001.

[42] Sentinel 2 satellite images.

The analysis measures NDMI growth-cultivated land areas, shown by the map in Figure 10 and associated graph in Figure 11. A total of 5,784 km^2, or 69% of the cultivated land in Syrian government areas, experienced a large or very large increase in plant water stress from May 2020 to May 2021. Syrian governorate-controlled Aleppo governorate contained the largest cultivated area under a higher level of plant water stress, with 1,107 km^2 (86%) of its cultivated land experiencing higher plant water stress. By proportion, As-Sweida governorate contained the highest proportion (95%) of cultivated land with higher levels of plant water stress; however, the total cultivated area in the governorate is relatively small at 89 km^2. Cultivated land in Syrian government-controlled Deir-ez-Zor and Ar-Raqqa (to a lesser extent), located along the Euphrates River, experienced a relatively lower level of additional plant water content, likely the result of additional water abstraction in response to a greater market incentive created by lower agriculture production throughout the drought-stricken northeast.

Reduction in wheat production

Wheat is central to food security given bread's importance as a staple food, essential to the Syrian diet. Bread (particularly subsidized bread) is considered to be an affordable food item for all of Syrian society. However, the abovementioned drivers of food insecurity have driven wheat production down, effectively resulting in a shortage of subsidized bread to the Syrian population in general.

The Syrian government had declared in October 2020 that the following year would be considered the "year of wheat" with the objective of producing 2.2 million tonnes of wheat. Syrian Minister of Agriculture, Hassan Qatana had encouraged farmers to "grow wheat in whatever area is available" in order to "make up for the shortfall in the amount of wheat in the strategic reserve."[43] The government allocated its meager agricultural subsidies primarily to wheat production to meet this goal. Qatana stated the Ministry was working on providing all the necessary materials, including seeds and fertilizer. The government was motivated to pursue this goal to save on spending its scant foreign currency on wheat imports which can amount to $400,000 per month if the wheat shortage is severe.[44] Moreover, the government was encouraged to do so after wheat production nationwide reached 2.8 million tonnes the previous harvest due to favorable weather conditions and an improved security situation.[45]

[43] Snack Syrian, سناك سوري. "وزير الزراعة: العام القادم سيكون عام القمح. October 2020.

[44] Emirates Policy Center, Growing Threats to Food Security in Syria: Reasons and Response Capacity. July 202.

[45] The Syria Report, Wheat Harvest Improves but Imports Needed to Meet Demand. January 2021. .

However, on 21 May, Qatana reported that the harvest had not only not risen, but had dropped to 450,000 tonnes due to low precipitation and drought.[46] The steep reduction in wheat production later prompted the Syrian government to compete with the Autonomous Administration over wheat purchases with the latter eventually outbidding the former and preventing wheat transportation outside of its areas. This was particularly problematic for the government as approximately 63% of wheat production is in Syria's northeast. On 28 May, Russia's Ambassador to Syria, Alexander Efimov, stated that his country would supply the Syrian government with 1 million tonnes of wheat, however, government officials complained about delays in Russian wheat deliveries ordered last year. Regardless, even if the promised wheat shipment this year was delivered, it would be difficult to cover the country's annual need for 2.5 million tonnes of wheat when combined with the low level of local wheat production.[47]

The government's desperation for wheat has pushed it to procure the crop through unconventional means. For example, local sources stated that government checkpoints in Deir-ez-Zor began thoroughly searching vehicles in mid-June for smuggled wheat. Military Intelligence arrested the head of the farmers union in Shmeitiyeh township (Tabni subdistrict) on 18 June for refusing to force farmers to sell their wheat to the government and for attempting to sell the crop on the black market. Moreover, government forces conducted arrests on 26 June, 100 farmers in Ashara township (Ashara subdistrict) and 70 farmers in Muhasan township (Muhasan subdistrict) for refusing to sell their wheat to government collection centers on 26 June and 1 July respectively.

The low wheat production led to the re-intensification of the bread crisis in Syrian government areas as more Syrian citizens rely on subsidized bread following a decrease in their purchasing power. Local sources reported on long queues continuing to form in front of state bakeries with citizens having to wait hours for the possibility of securing their allocated bread packet. Moreover, the Syrian Ministry of Domestic Trade and Consumer Protection introduced new bread rationing measures and distribution system through the smart card system in Lattakia, Tartous, and Hama on 1 August. The ministry later introduced rationing measures and bread into the smart card system in As-Sweida for the first time.

[46] Enab Baladi, عنب بلدي. "الزراعة السورية" تبرر انخفاض محاصيل القمح والشعير. May 22, 2021. .

[47] The Syria Report, Russia Vows to Supply One Million Tons of Wheat to Syria. June 2021

CONCLUSION

Food insecurity in Syria has increased as a result of both a significant reduction in affordability and availability. In terms of reduction in affordability, the collapse of the Lebanese banking system, COVID-19, sanctions, and the Syrian pound's steep depreciation have led to an increase in the cost of production, price inflation, reduction in wage values, and an overall increase in unaffordability of basic food items for Syrian citizens. The successive economic shocks have also furthered the depletion of the government's foreign-currency reserves denying it the ability to import soft wheat, essential for bread production. This resulted in a bread crisis making bread in general and subsidized bread in particular, both a staple food and essential part of the Syrian diet, scarce and more expensive.

In terms of reduction in availability, the war and ensuing large scale damage to the country's infrastructure, the government's significant subsidy reduction for agricultural raw materials, the increase in the cost of production, and the consequent departure of many farmers from the profession reduced the sector's overall vitality and food production capacity. The weather and water availability have also been contributing factors; Syria has experienced its worst drought in decades affecting rain-fed crop production, particularly wheat. This in turn exacerbated the bread crisis due to low local wheat production and forced the government to drop voracious crop production and implement water rationing measures.

Noting the grim reality which Syrian citizens are facing, it is unlikely that matters are going to improve anytime soon; 60% of the Syrian population is already food insecure with the WFP estimating that an additional 1.8 million Syrians are at risk of becoming food insecure themselves. The Syrian economy is still suffering from economic shocks and the Central Bank is finding it difficult to maintain the exchange rate's stability for long periods of time as the currency's value continues to depreciate. The government's coffers are still dry, continuing to deny them the ability to import fuel and soft wheat, making shortages in both fuel and bread a chronic issue. Moreover, low foreign-currency reserves means less subsidies for the country's productive sectors, particularly agriculture which is also suffering from water scarcity and climate change. Things also look bleak on the water resource front; the government unable to get its affairs in order and set up a nationwide water management plan and it is estimated that water resources in the Middle East will be reduced 33% by 2050, meaning more droughts. The continuously deteriorating economic situation and the country's inability to increase food production due to a combination of capacity and climate issues, it is possible that the number of food insecure people in Syria will continue to increase.

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The Humanitarian Access Team (HAT) was established in Beirut in March 2015 in response to the collective challenges facing the remote humanitarian response in Syria. Successful humanitarian and development interventions require a nuanced and objective understanding of the human ecosystems in which these interventions occur. To this end, the HAT's most important function is to collect, triangulate, synthesize, analyze and operationalize disparate data and information. Since 2015, HAT analysis has provided a forward-looking template for international interventions in Syria, and facilitated an increasingly nimble, adaptive, integrated, and ultimately impactful international response to the Syrian conflict.

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