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## Wheat Production Outlook in Tunisia amid the Ukraine Crisis

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### 1. Introduction

The war between Ukraine and Russia is likely to have significant consequences for Tunisia as the country is heavily dependent on imports to meet its grain needs. Both Ukraine and Russia have reduced the export of their commodities, including wheat. Rising food prices due to supply disruptions induced by the war are causing grain prices to soar in international markets and simultaneously threatening global food security (IFRC 2022). The war is also likely to have repercussions on the cost of agricultural inputs as supply chains are disrupted, leading to their reduced use and declines in yield and income. This would be highly detrimental to the livelihoods of Tunisian farmers, many of whom produce wheat. If substitutes for imports are not obtained, Tunisia may have to develop alternative solutions to ensure its food security.

The Africa Crop Production (AfCP) model developed by AKADEMIYA2063 can help forecast crop production levels before the harvest period in African countries (Ly et al. 2021). This information is available on the Africa Agriculture Watch (AAgWa) website. In this brief, this model has been used to forecast the quantity and spatial distribution of wheat production in Tunisia, in 2022, in the context of the ongoing Ukraine-Russia crisis.

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THE UKRAINE CRISIS  
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## 2. The Significance of Wheat in Tunisia

Tunisia is a major consumer and importer of foods, including wheat, and is representative of growing cereal markets in North Africa and the Middle East. The country has a high per capita wheat consumption rate, estimated at 258 kg per year. Total wheat consumption in Tunisia is approximately 2.8 million tons annually.

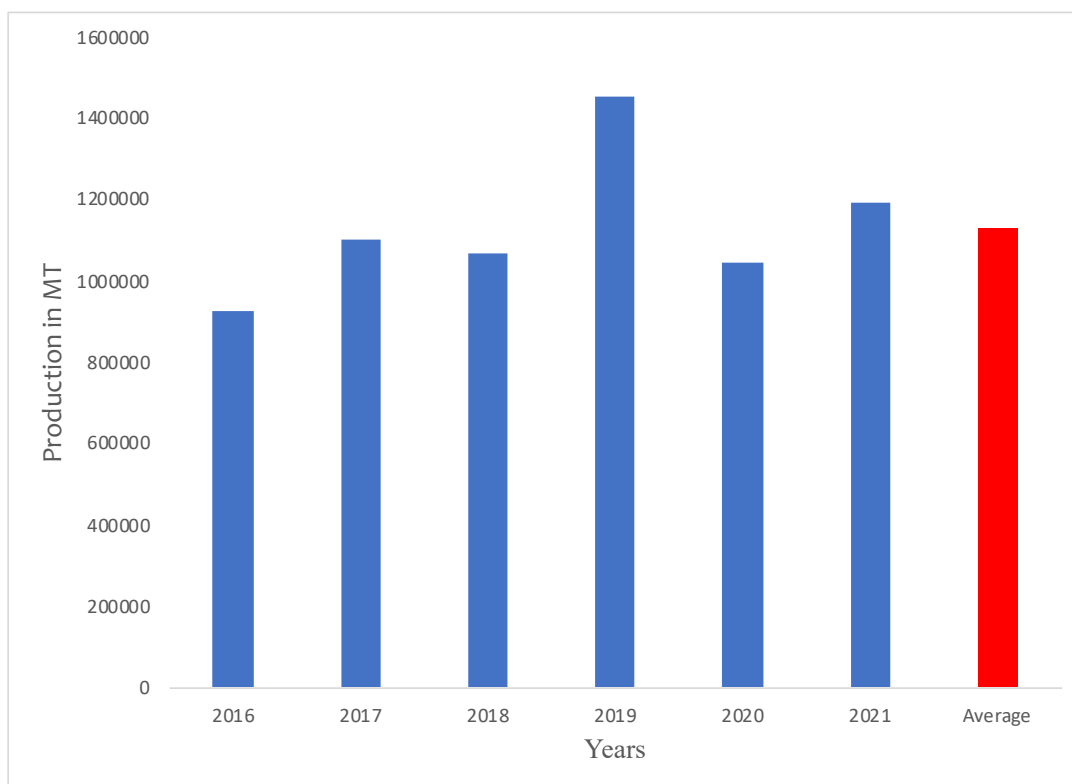
Cereals are the dominant crops grown in Tunisia. They occupy 61 percent of the arable agricultural land, most of which is used in the production of durum wheat (47 percent), followed by bread wheat (6 percent) and barley (8 percent). The crop rotation of wheat (durum or bread), barley or forage, and legumes is mostly practiced under rainfed conditions, while the rotation of wheat (durum or bread), barley or forage, and vegetables or legumes is prevalent under irrigated conditions.

## 3. Wheat Production and Demand Trends in Tunisia

Tunisia is highly dependent on grain imports, mainly wheat from Ukraine, which accounts for 40 percent of its wheat imports. The Russian invasion of Ukraine has disrupted the country's access to its primary wheat supplier, exacerbating an already difficult situation. In 2020, wheat was the third-most imported commodity in Tunisia. As the Ukraine crisis continues, the country may be exposed to the risk of significant price increases for wheat-related products, such as bread which is the most widely consumed food commodity. All the wheat grown in Tunisia can be consumed domestically and still not be enough to meet demand.

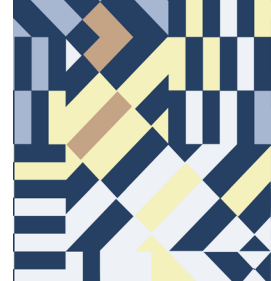
The average quantity of wheat grown domestically between 2016 and 2021 is estimated at 1,131,500 metric tons (MT), with peak production of 1,454,000 MT occurring in 2019 (Figure 1).

**Figure 1:** Wheat production in Tunisia from 2016 to 2021.



**Source:** US Department of Agriculture

During the 2016-2022 period, Tunisia imported a total of 13,174,000 MT of wheat, principally from Ukraine, Canada, Spain, Russia, and Bulgaria. Total wheat exports were an estimated 118,000 MT during the same period – export destinations were not specified (Table 1).



**Table 1:** Wheat imports and exports in Tunisia from 2016 to 2022.

Market Year	Imports (MT)	Exports (MT)
2016	2,016,000	9,000
2017	1,923,000	10,000
2018	1,814,000	11,000
2019	1,950,000	20,000
2020	1,771,000	28,000
2021	1,800,000	20,000
2022	1,900,000	20,000
Total	13,174,000	118,000

**Source:** United States Department of Agriculture

#### 4. Projected Wheat Production for the Upcoming Season

Tunisia’s wheat production forecasts were computed using the AfCP model. This model uses satellite-based, bio-geophysical time-series data, such as the normalized difference vegetation index (NDVI), land surface temperatures (LST), rainfall quantities, and evapotranspiration rates, as explanatory variables. An artificial neural network was created to learn correlations between various bio-geophysical data and food crop production data at the individual pixel-level. A forecast for Tunisia’s wheat production was made using a random forest predictor before the start of the growing season. The predictor was then used to input data from bio-geophysical readings into a model to predict production levels several months in advance. The results of this prediction are shown in Figure 3, which shows the projected production levels for 2022. The pixels considered for this map are from areas where wheat is usually grown and have a size of ten-by-ten kilometers.

Total wheat production in 2021 was an estimated 1,295,239 MT, while the predictions estimated a total production of 1,325,624 MT in 2022, indicating an increase of more than 3,000 MT (Figure 2 and Figure 3). The highest production increases are expected to happen in the country’s northern parts (Figure 4), including Beja Nord, Gaafour, Testour, and Joumine, with an estimated growth rate of 2-3 percent between 2021 and 2022. Tunisia’s northern regions are generally temperate, with mild, rainy winters and hot, dry summers. However, wheat production in the eastern regions was projected to decrease from 1,000-3,000 MT to 500-1,000 MT. In the south (characterized by hot and dry weather), projections indicated a decrease in the range of 500MT to 200MT.

#### 5. Comparison of Estimated Wheat Production Levels in 2021 and 2022

We compared wheat production levels for the 2021 and 2022 seasons by computing and mapping their ratios at the pixel level. This analysis allows for a detailed assessment of where wheat production is expected to increase or decrease and provides critical information for planning interventions in response to possible supply disruptions. At the national level, Tunisia would experience an increase in wheat production of 2.3 percent between the 2021 and 2022 seasons. In 2021, the country produced 1,295,239.17 MT, while our forecast estimates an overall production of 1,325,623.87 MT for 2022. However, national-level data mask geographical variations across wheat-producing areas. The pixel-level data, shown in Figures 2, 3 and 4 below, reveal substantial differences across sub-counties. Some localities would experience a decrease in wheat production in 2022 relative to 2021. For instance, in 2022, wheat production would decrease in Nebeur (0.98 percent), Ghazala (4.94 percent), and Sejnane (10.66 percent).

In 2022, the top wheat-producing counties in Tunisia are expected to be Beja Nord, Gaafour, Testour, and Joumine, with a respective total production of 29,636MT, 28,985 MT, 28,730 MT, and 26,165 MT. All these localities lie between the 400 mm and 500 mm isohyets.



Figure 2: Estimated Wheat Production in Tunisia, 2021

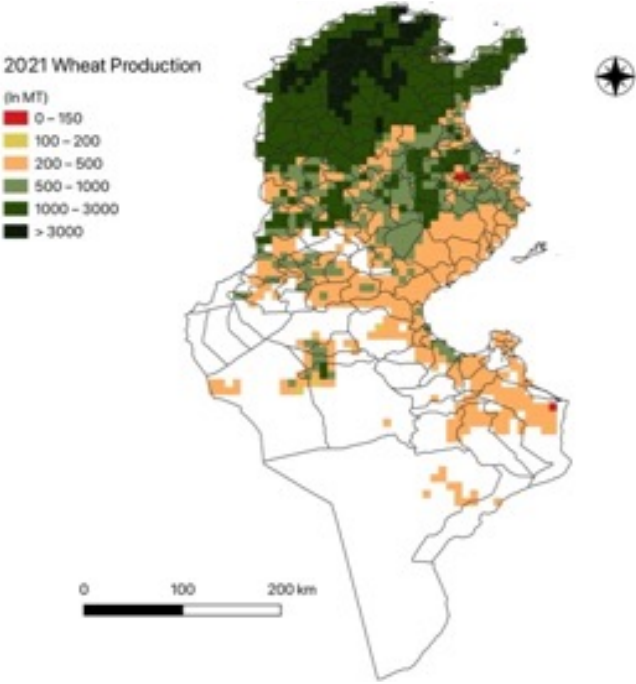
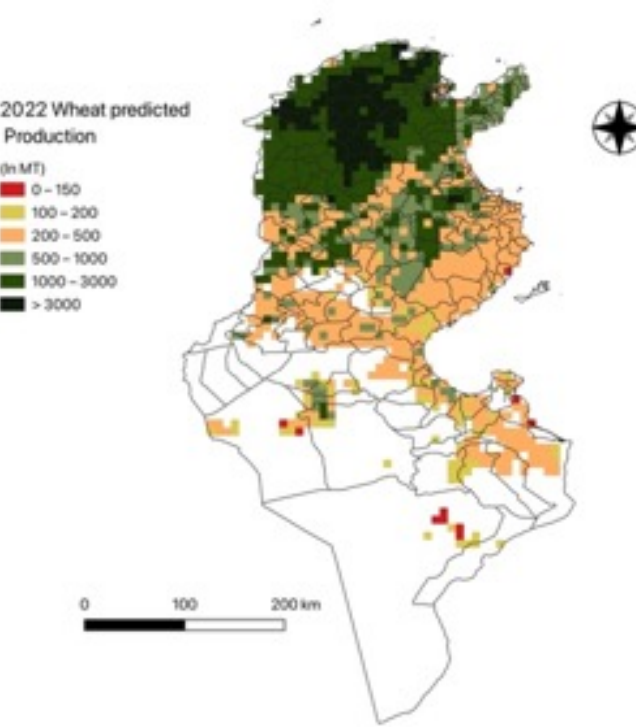
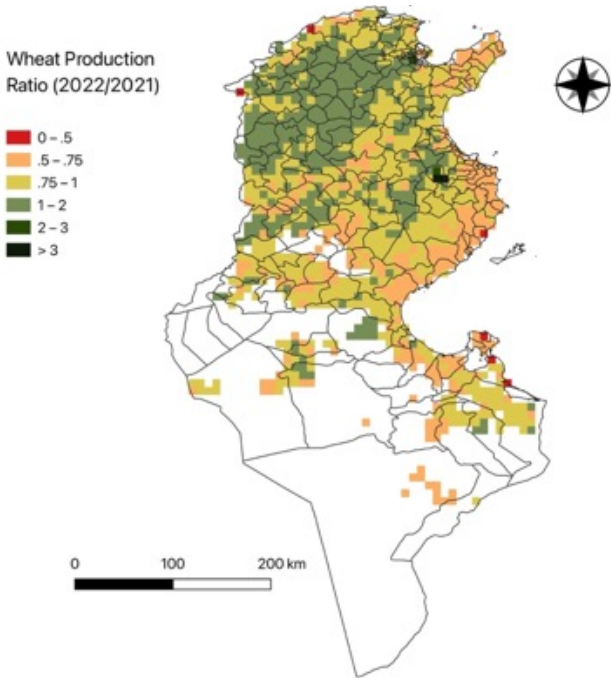


Figure 3: Predicted Wheat Production in Tunisia, 2022



**Figure 4:** Comparison between 2022 and 2021 Wheat Production Levels in Tunisia



For Figure 4, a ratio greater than one means greater wheat production in 2022 than in 2021, while a ratio below one means the opposite.<sup>1</sup>

**6. Status of Crop Growing Conditions**

Rainfall is a major climatic variable affecting agricultural production in Tunisia. Wheat production appears to increase in the northern regions, with lower land surface temperatures and slightly better rainfall conditions than the rest of the country. In parts of Tunisia’s western regions, a higher NDVI can be observed along with lower land surface temperatures and positive rainfall anomalies, resulting in slightly increased wheat production (Figure 5).

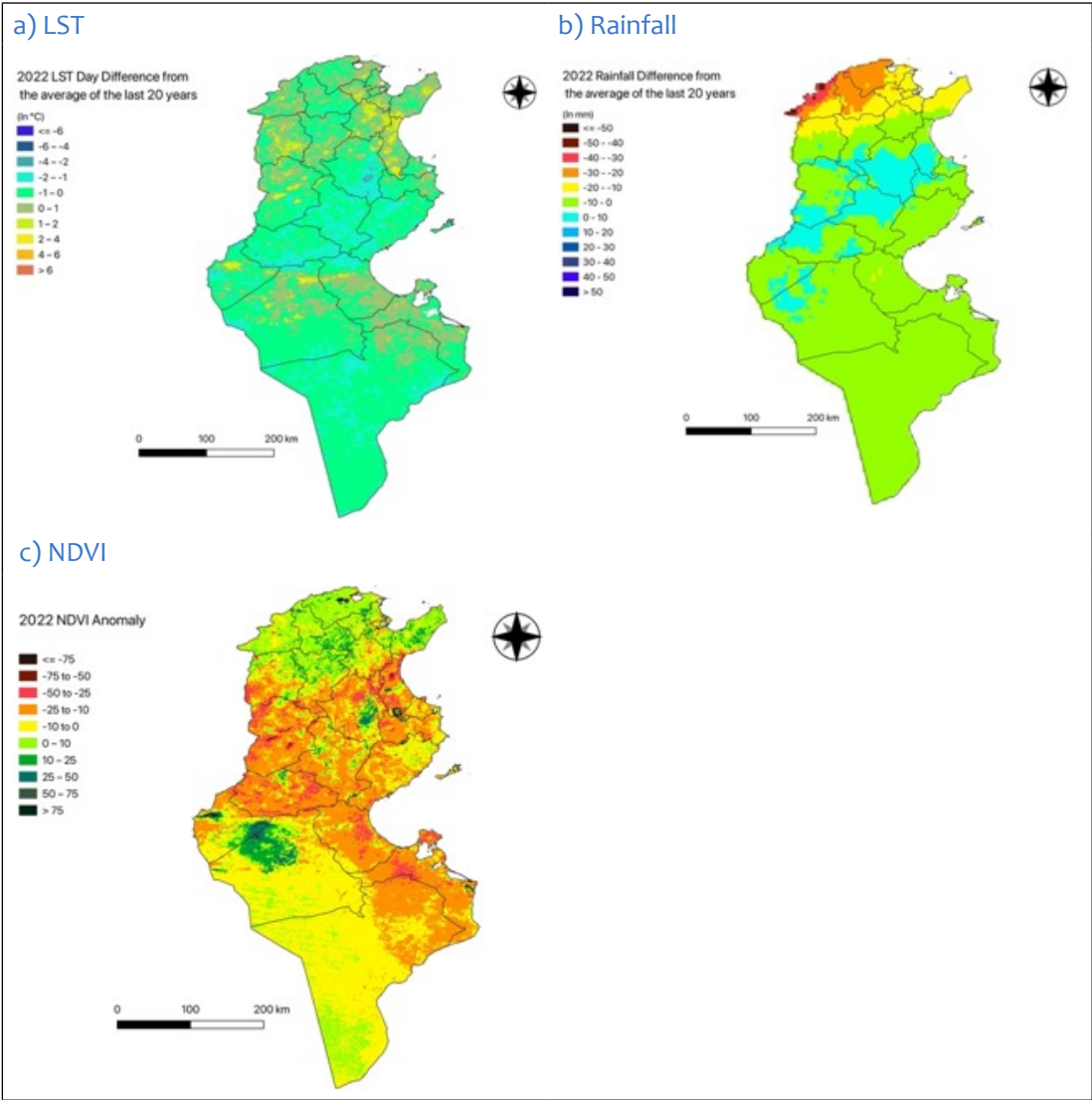
**7. Anomalies in Land Surface Temperatures (LST), Rainfall Levels, and Normalized Difference Vegetation Index (NDVI)**

Anomalies in the bio-geophysical parameters used to build the AfCP model were also calculated to study crop growing conditions. The difference between the average of the last 20 years and the aggregated 2022 data for these bio-geophysical parameters (NDVI, LST, and rainfall) was computed as shown in Figure 5. Significant anomalies are detected in the central regions of Tunisia, where positive LST and negative rainfall anomalies are observed, indicating lower precipitation and warmer temperatures. Negative NDVI anomalies in the central and eastern regions indicate reduced vegetation cover. In contrast, positive NDVI anomalies in the northern and extreme southern regions indicate higher vegetation cover and increased greenness in Tunisia.

<sup>1</sup> The boundaries and names shown, as well as the designations used in maps, do not imply official endorsement or acceptance by AKADEMIYA2063.



Figure 5: Anomalies observed for bio-geophysical parameters: a) LST; b) Rainfall; and c) NDVI



6. Conclusion

The AfCP model estimated that wheat production in Tunisia would increase by more than 3,000 MT between 2021 and 2022. However, production in the eastern regions would decrease, while in the south, production was expected to decrease at a smaller scale.

The ability to predict wheat production with the AfCP model developed by AKADEMIYA2063 is significant, especially in the context of the ongoing Ukraine crisis, as it enables researchers and planners to understand the potential impacts of the crisis on African crop production.

This brief shows that Tunisia is expected to increase its wheat production by 2.3 percent between the 2021 and 2022 seasons. The results from this brief can serve as a starting point for finding alternatives and formulating appropriate agricultural policies to ensure food security in Africa, especially for those vulnerable countries that mostly rely on imports from Ukraine and Russia. These alternatives include boosting local production of the most consumed staples, such as wheat. A similar analysis will be conducted in other African countries to examine projected wheat production and to investigate how to mitigate potential risks arising from the Ukraine crisis, particularly in northern Africa.

## 7. References

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## Annex

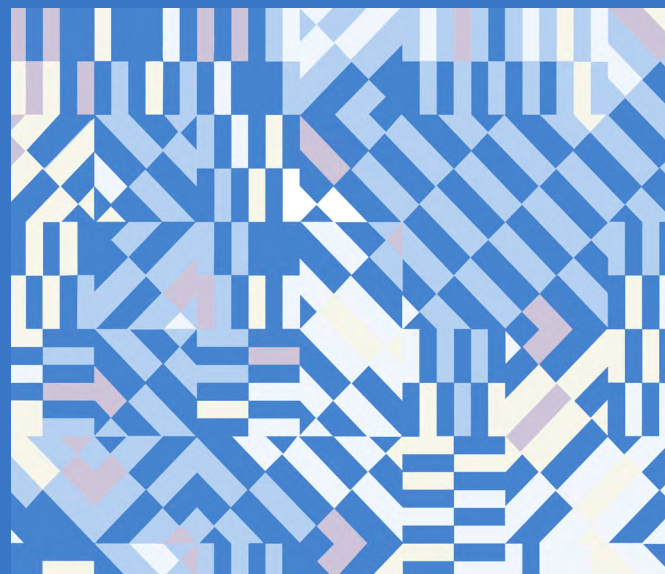
**Table 2:** Tunisia Level 1 (County) Wheat Production in 2021, 2022, and 2022/2021 ratio.





County	2021 wheat production (MT)	2022 wheat production (MT)	2022/2021 wheat production ratio
Ariana	19532.74	16835.73	0.86
Béja	174222.32	195007.54	1.12
Ben Arous (Tunis Sud)	13948.37	12615.37	0.90
Bizerte	121988.02	116724.20	0.96
Gabès	15570.29	13832.64	0.89
Gafsa	34491.84	29088.36	0.84
Jendouba	103889.53	107952.48	1.04
Kairouan	87770.93	90418.60	1.03
Kassérine	87757.83	95091.22	1.08
Kebili	19567.59	17606.03	0.90
Le Kef	113353.26	127222.31	1.12
Mahdia	20961.10	16808.36	0.80
Manubah	40191.79	40971.46	1.02
Médenine	19771.37	15433.70	0.78
Monastir	7851.73	6562.95	0.84
Nabeul	43845.28	32456.66	0.74
Sfax	38888.78	31374.99	0.81
Sidi Bou Zid	45130.16	39061.62	0.87
Siliana	164251.83	196503.71	1.20
Sousse	30637.47	34760.41	1.13
Tataouine	10754.82	8201.00	0.76
Tozeur	1038.67	1097.89	1.06
Tunis	5659.37	5599.94	0.99
Zaghouan	72309.35	72911.46	1.01



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