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Wheat Production Outlook in Morocco amid the Ukraine Crisis

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1. Introduction

Global grain supply chains have been disrupted by the Russia-Ukraine war, raising the threat of food insecurity in Africa. Countries that import agricultural inputs such as fertilizers have to prepare for possible supply chain disruptions, and food prices could rise if the war disrupts the production of staples such as wheat (IFRC 2022).

The African Agricultural Watch (AAGWa) platform uses bio-geophysical remote sensing data, historical production maps, and machine learning techniques to forecast seasonal yields and harvests for nine key crops across 47 African countries. The Africa Crop Production (AfCP) model used by AAGWa has been applied in this brief to predict 2022 wheat production levels for the first growing season in Morocco since the start of the Ukraine war.

Remote sensing enables the generation of detailed data about the environment, while machine learning can be used to extract hidden information from this data (Ly et al. 2021). Both techniques have been used in this brief to predict how much wheat would be produced in Morocco in 2022, amid the Ukraine-Russia crisis.

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2. The Significance of Wheat in Morocco

Wheat is an important cereal crop in Morocco, contributing significantly to the livelihoods of farming communities and the national economy. Wheat is also a crucial food staple in the Moroccan diet. The “Fédération Nationale de la Minoterie” (FNM) puts the average per capita wheat consumption in Morocco at 200 kg or three times the global average (Lyddon 2022). The government has a policy called the Green Morocco Plan (GMP) which aims to ensure the attainment of food security. The GMP considers the cereal seed system as a fundamental component of enhancing the agricultural sector and achieving wider economic development (Bishaw et al. 2019). Soft wheat is the most important cereal grown in Morocco, accounting for 45 percent of the total cereal growing area. When combined with durum wheat, wheat is by far the country’s most important crop, covering 2.9 million hectares (65 percent of the total cereal growing area).

Morocco is one of the top global wheat importers and Africa’s third-largest wheat importer. Between 2016 and 2022, the country imported an estimated average volume of 35,150,000 MT (Table 1) annually.

Table 1: Morocco’s wheat imports and exports from 2016 to 2022.

Market Year	Imports (MT)	Growth Rate	Exports (MT)	Growth Rate
2016	5,479,000	N/A	2,731,000	N/A
2017	3,677,000	-32.89%	7,091,000	5.17%
2018	3,724,000	1.28%	7,342,000	24.59%
2019	4,626,000	24.22%	4,025,000	-17.11%
2020	5,444,000	17.68%	2,560,000	7.94%
2021	5,200,000	-4.48%	7,540,000	10.29%
2022	7,000,000	34.62%	2,250,000	0.00%
Total	35,150,000		33,539,000	

Source: US Department of Agriculture

Morocco imports wheat from various countries worldwide, primarily from France, Canada, Ukraine, Russia, and Germany. During the 2016-2022 period, Morocco’s wheat exports were an estimated 33,539,000 MT annually, with France and Spain being the main destinations.

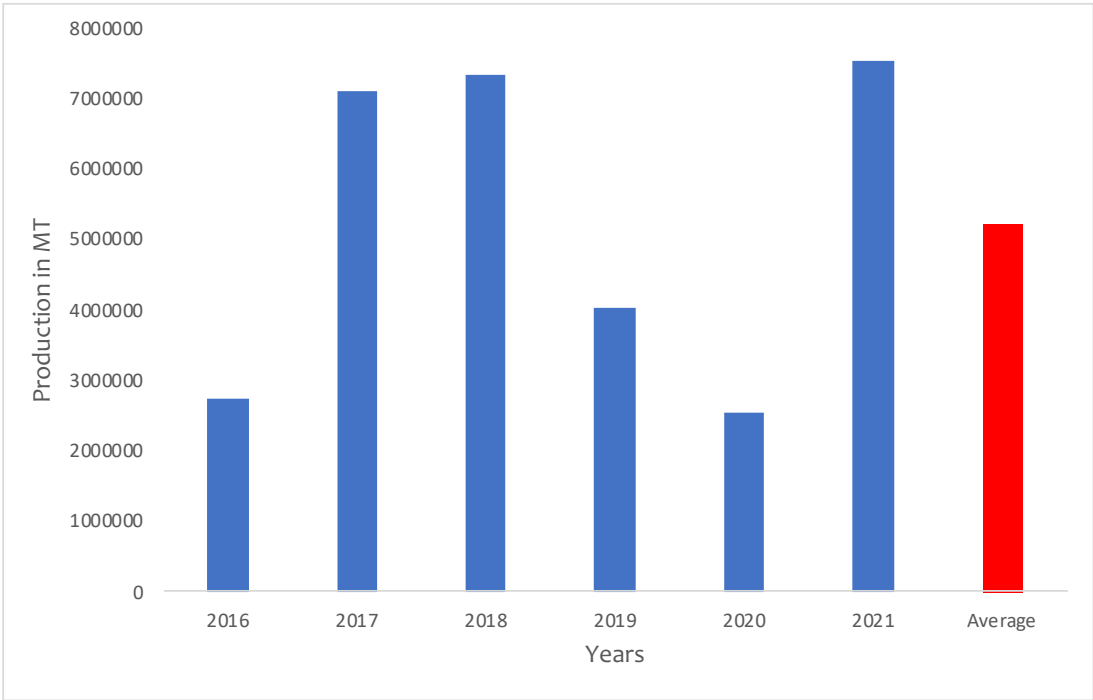
The Moroccan government has decided to subsidize bread wheat imports in response to rising prices due to the war in Ukraine and increased shipping costs.

3. Wheat Production and Demand Trends in Morocco

The agricultural sector is a key economic engine within the country and is highly dependent on often-limited rainfall. Drought and the prohibitive cost of food imports are adding to the challenges Moroccans face following more than two years of economic disruptions due to the COVID-19 pandemic.

Wheat production in Morocco between 2016 and 2020 was uneven. It increased in 2017, 2018, and 2021 when production was 7,091,000 MT, 7,342,000 MT, and 7,540,000 MT, respectively, while in 2016, 2019, and 2020, it decreased with 2,731,000 MT, 4,025,000 MT, and 2,560,000 MT produced in those respective years (Figure 1).

Figure 1: Wheat production in Morocco from 2016 to 2021.



Source: US Department of Agriculture

4. 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. The analysis allows for a detailed assessment of where wheat production would increase or decrease and provides critical information for planning interventions in response to possible supply disruptions. At the national level, Morocco would experience an increase in wheat production by 4.1 percent between the 2021 and 2022 seasons. In 2021, the country produced an estimated 5,107,075 MT, while our forecast estimates an overall production of 6,993,358 MT in 2022. Overall, wheat production would increase in all the cropping areas in 2022 compared to 2021. The country’s top wheat-producing sub-counties in 2022 are Chaouia - Ouardigha, Gharb - Charda - Béni Hssen, and Marrakech - Tensift - Al Haouz. Their projected production levels are 773,343 MT, 763,481 MT, and 709,791.125 MT, respectively.

A comparison of wheat production in Figure 2 and Figure 3 shows that higher production is expected in 2022 compared to 2021. The projected wheat production for 2022 across Morocco is used to generate 2022/2021 production level ratios shown in Figure 3, which indicates significantly increased wheat production in most cropping areas of western and northeastern Morocco between 2021 and 2022.

Figure 2: Estimated wheat production in Morocco, 2021.

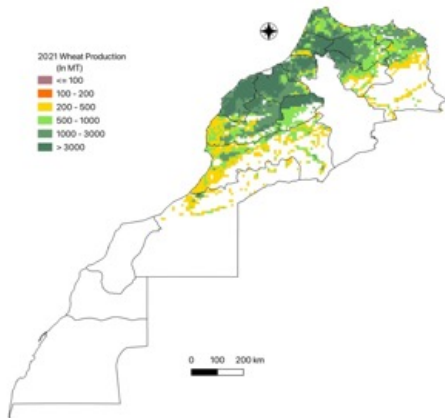


Figure 3: Predicted wheat production in Morocco, 2022.

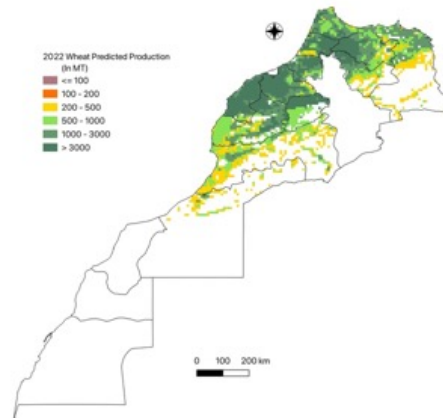
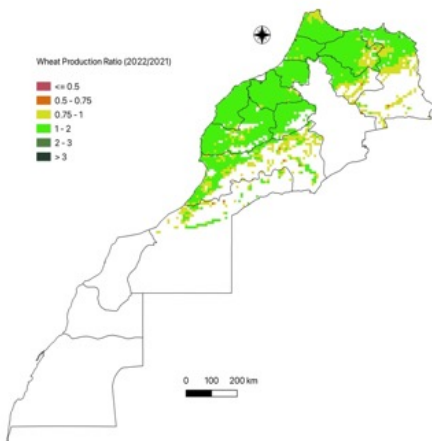


Figure 4: Ratio of predicted wheat production (2022) and estimated wheat production (2021) in Morocco.



A ratio of more than one means greater wheat production in 2022 than in 2021, while a ratio of less than one means the opposite.¹

5. Status of Crop Growing Conditions

Warmer climatic conditions have driven lower wheat production levels, especially in southern Morocco, as shown in Figures 2 and 3. According to the U.S. Department of Agriculture’s Foreign Agricultural Services, Morocco experienced a severe drought, which caused overall grain production to decline by 70 percent between 2015 and 2016 (USDA 2018).

However, Morocco’s wheat and barley production level for 2021-22 is expected to expand by 206 percent because of current favorable weather conditions, notably in the central and southern parts of the country.

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

The spatial correlations between land surface temperatures, rainfall, and vegetation index distribution are shown in Figure 5, Figure 6, and Figure 7. Rainfall difference and LST maps indicate dry and hot weather in 2022, with negative rainfall and positive LST anomalies (Figure 5) occurring in the western-central and northern regions. These regions are slightly warmer

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

than the 20-year average, while the central-southern region of Morocco is expected to receive more rainfall. The southern and eastern zones indicate positive rainfall anomalies, meaning higher precipitation in 2022 than in the previous 20 years. Additionally, in 2022 the country is mainly characterized by negative NDVI anomalies in the central, western, and southern regions, indicating low biomass levels or vegetation cover in those parts of the country. However, some areas in the extreme north, west, and central regions present positive NDVI anomalies, synonymous with higher vegetation cover (Figure 7).

Figure 5: Rainfall anomalies in 2022

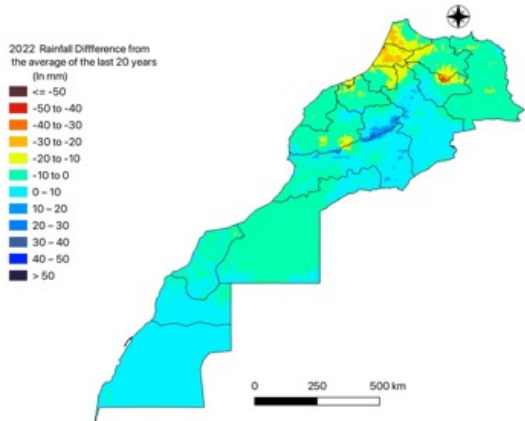


Figure 6: LST anomalies in 2022

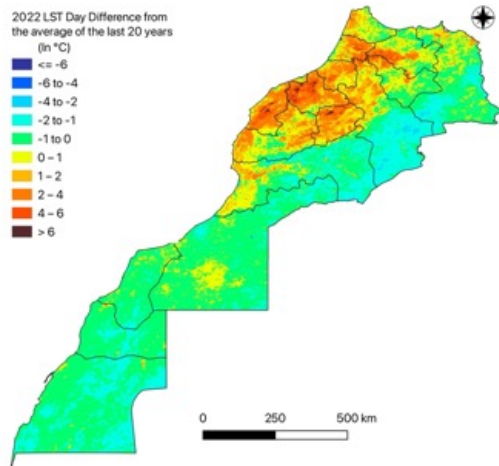
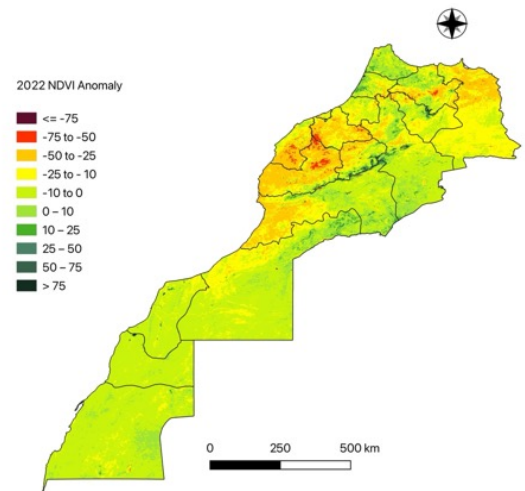


Figure 7: NDVI anomalies in 2022



7. Conclusion

The AfCP model was used to generate Morocco’s 2022 wheat production forecast at the pixel-level. The estimated wheat production, shown as 2022/2021 production level ratios, indicate significantly increased wheat production in most cropping areas of western, northeastern, and eastern Morocco between 2021 and 2022.

The ability to accurately forecast wheat production in those African countries where wheat is an essential commodity can facilitate the development of appropriate policies to overcome supply disruptions and support self-sufficiency in the event of a global crisis. In addition, formulated policies could target local farmers to help them improve their yields and ensure food security in vulnerable countries.

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Annex





Table 2: Morocco 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
Chaouia – Ouardigha	663,950.13	773,343.00	1.16
Doukkala – Abda	595,450.25	736,556.44	1.24
Fès – Boulemane	275,585.22	304,647.94	1.11
Gharb - Chrarda - Béni Hssen	646,488.25	763,481.88	1.18
Grand Casablanca	7,063.60	8,254.41	1.17
Guelmim - Es-Semara	56,144.91	59,811.01	1.07
Marrakech - Tensift - Al Haouz	539,255.50	709,791.13	1.32
Meknès - Tafilalet	38,163.84	46,673.69	1.22
Oriental	281,401.66	305,799.09	1.09
Rabat - Salé - Zemmour – Zaer	362,020.25	402,551.19	1.11
Souss - Massa - Draâ	252,048.94	269,014.41	1.07
Tadla – Azilal	470,012.63	601,879.00	1.28
Tanger - Tétouan	306,028.00	343,232.81	1.12
Taza - Al Hoceima – Taounate	613,462.13	699,355.75	1.14

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