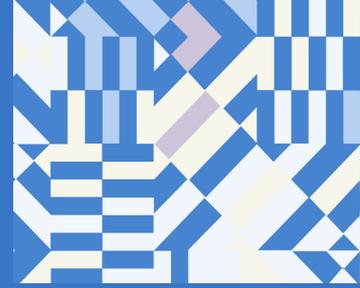




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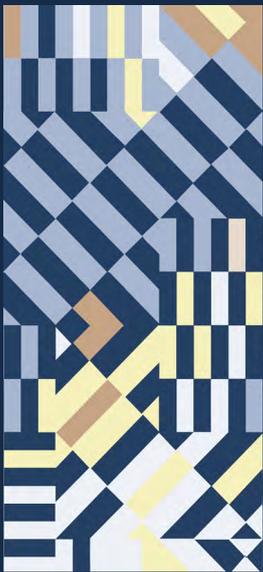
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Wheat Production Forecasts for Algeria amid the Ukraine Crisis

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1. Introduction

The Ukraine-Russia conflict is likely to negatively impact food security in Africa as food crops such as wheat, become more expensive and difficult to obtain. This is in addition to socio-economic factors such as dampened growth and recovery due to rising uncertainties in global financial markets. The ongoing Ukraine crisis will likely lead to continued food price increases in Algeria, a major importer of food products (IFRC, 2022). Given its dependence on food imports, Algeria may have to turn to other major suppliers to fill the gap created by the disruption of supplies from Ukraine and Russia.

Access to timely, disaggregated, and accurate wheat production data is critical to limit the adverse effects of the Ukraine crisis on people's livelihoods and the economy as a whole (Ly et al., 2021). The Africa Crop Production (AfCP) model, developed by AKADEMIYA2063, facilitates the prediction of wheat production.

The model combines remotely sensed data and machine learning techniques to predict crop production and yield levels in African countries months before harvesting. The AfCP model is embedded in the open-access [Africa Agriculture Watch \(AAgWa\)](#) platform.

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Remote sensing is used to produce extensive datasets that can be used to understand complex systems. Machine learning, in turn, is used to extract information that is not immediately visible in the datasets. This information is then used to predict wheat production in Algeria, in 2022, amid the ongoing Ukraine-Russia crisis.

2. The Significance of Wheat in Algeria

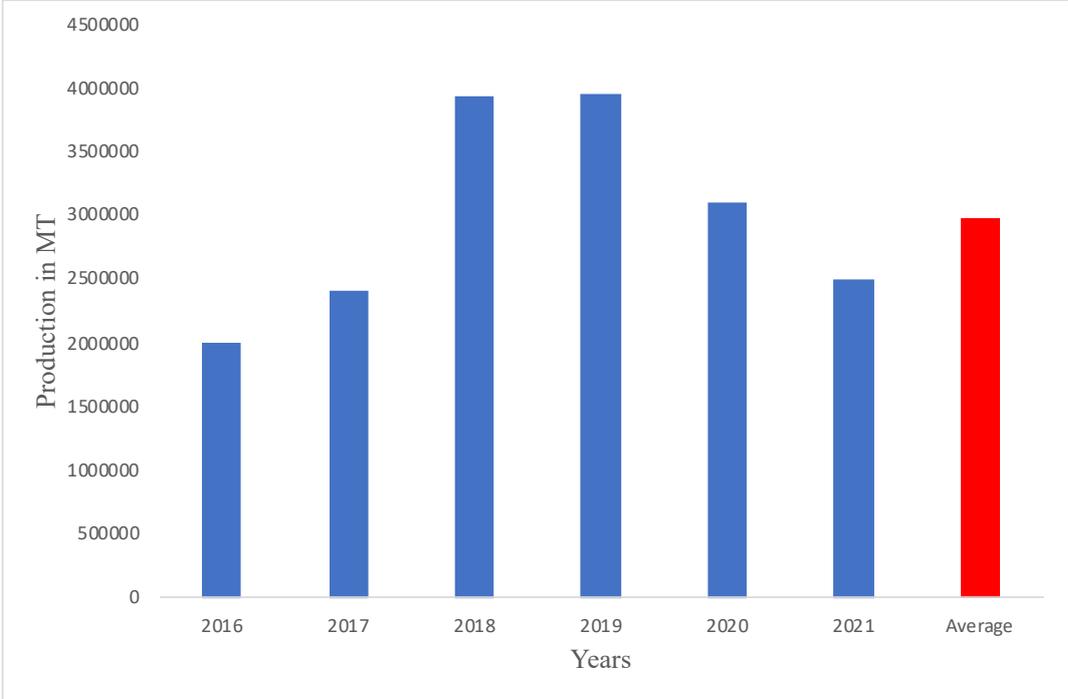
Algeria is a major consumer of cereals, and wheat is the country’s main staple, representing 60 percent of the food consumed in the country. The Algerian government has declared increasing agricultural production a national priority and, in 2021, planned to expand Algeria’s wheat acreage to 3.5 million hectares. In 2020 and 2021, Algeria consumed 11 million metric tons (MT) of wheat. This quantity was the largest recorded over the past several years, likely due to an increase in wheat consumption in recent years (Statista Research Department, 2022). Algerian wheat consumption has increased in recent years because of rising urbanization, population growth, and expanded milling capacity. Domestic production of wheat has improved, but it remains dependent on the weather and does not meet domestic demand. Algeria, therefore, continues to import wheat.

3. Wheat Production and Demand Trends in Algeria

Algeria’s population, currently estimated at 44 million, continues to expand. This has been accompanied by increased urbanization as nearly 73 percent of people live in urban areas and cities, increasing their consumption of soft wheat (bread) and durum wheat. At 11 million metric tons, demand for wheat far exceeds the North African country’s domestic wheat production of about 3.9 million metric tons.

Algeria’s wheat market has long been dependent on imports. Therefore, the government has taken measures that aim to lower the value of wheat imports as well as encourage domestic and foreign investors to fund the country’s industrial agriculture sector. Average wheat production over the past six years (2016-2021) is estimated at 2,982,833 MT, as shown in Figure 1.

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



Source: United States Department of Agriculture

Current wheat production is insufficient to meet the growing demand in Algeria, especially from millers and other consumers who required an estimated 11 million MT in 2020-21, an amount that could decline to 10.7 million MT, according to the US Department of Agriculture.

From 2016 to 2022, the wheat market was dominated by imports averaging 7,803,714.3 MT while exports averaged 8,285.7 MT. In 2020, Algeria imported US\$ 1.64 billion of wheat, making it the seventh-largest wheat importer worldwide and the second-largest wheat importer in Africa after Egypt. Wheat was Algeria’s most imported product in that year.

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

Market Year	Imports (MT)	Growth Rate	Exports (MT)	Growth Rate
2016	8,414,000	3.20%	8,000	-42.86%
2017	8,172,000	-2.88%	6,000	-25.00%
2018	7,515,000	-8.04%	15,000	150.00%
2019	7,145,000	-4.92%	6,000	-60.00%
2020	7,680,000	7.49%	3,000	-50.00%
2021	7,800,000	1.56%	10,000	233.33%
2022	7,900,000	1.28%	10,000	0.00%
Total	7,803,714.29		8,285.71	

Source: United States Department of Agriculture

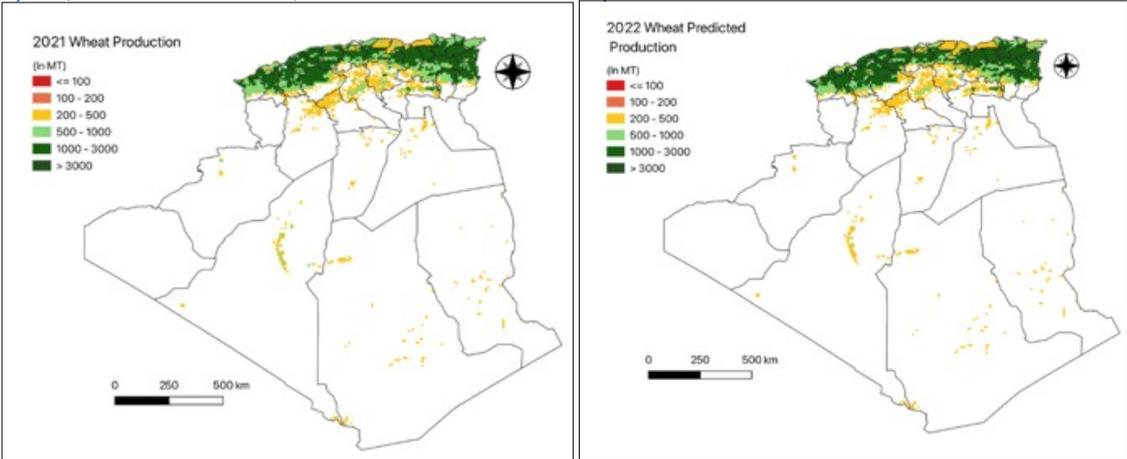
Algeria primarily imports wheat from France (US\$ 889 million), Germany (US\$ 202 million), Canada (US\$ 120 million), Poland (US\$ 92.2 million), and Lithuania (US\$ 92.1 million). The principal purchasers of Algeria’s wheat exports are Austria (US\$ 4,000) and Canada (US\$ 1.62000) (OEC 2020).

4. Projected Wheat Production for the Upcoming Harvest Season (2021-2022)

The wheat production forecasts for Algeria were generated using the AfCP model. The 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 built to learn the relationships between the same bio-geophysical data and historical staple food crop production data available at the pixel-level.

The modeling predicted that local wheat production in Algeria would increase by 4.3 percent (120,000 MT) between 2021 and 2022 (Figure 2). Total wheat production was estimated at 2,754,014 MT in 2021, while the model predicted a total production of 2,872,113 MT in 2022. Most of Algeria’s agricultural activities are in the north because of the large, uninhabitable desert areas that stretch southward (Abdelkader, 2014). Production was predicted to increase in the country’s northern parts between 2021 and 2022, while it was expected to decrease in the southern parts of the country.

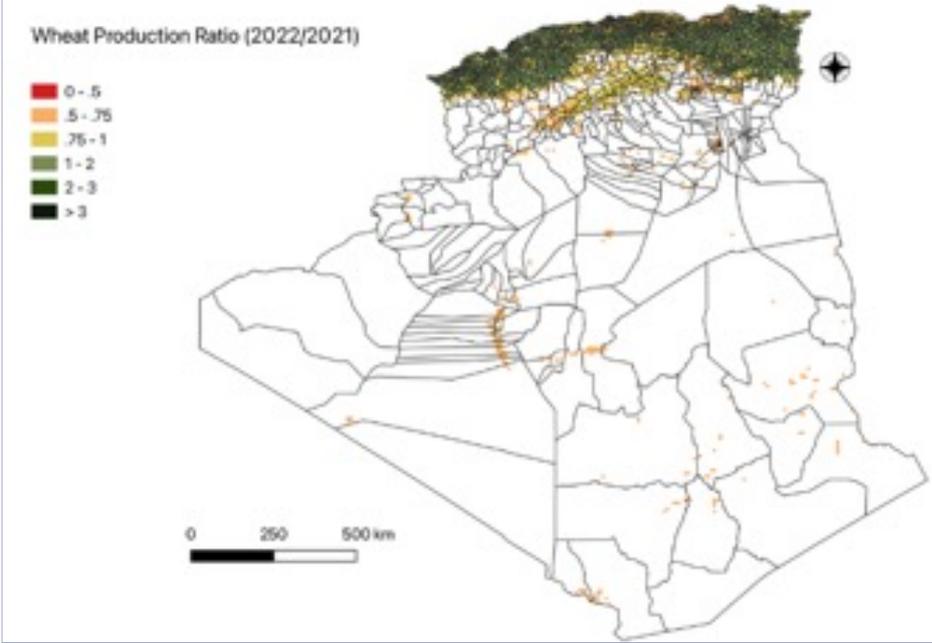
Figure 2: Estimated Wheat production in Algeria:
 a) 2.75 million MT in 2021; b) 2.87 million MT in 2022.



Source: www.aagwa.org

Figure 3 shows the projected production ratio between 2022 and 2021 across Algeria, indicating a marginal increase in wheat production in almost all cultivated areas within the country. Production is expected to decrease in the southern parts of the county, with wheat growing in small, scattered croplands.

Figure 3: Ratio of predicted wheat production (2022) and estimated (2021) wheat production in Algeria.



Data source and analysis: Authors

5. Status of Crop Growing Conditions

The northern region of Algeria has great agricultural potential due to the fertile coastal plains that extend to the Atlas Mountains. In contrast, the south has a semi-arid zone made up of the High Plains (Geography of Algeria, 2020).

For most of Algeria’s wheat production areas, the rainfall increased by between 10 and 20 mm in 2022. However, in the northeastern parts of the country, rainfall decreased by between 20 and 40 mm (Figure 4). Small areas in the western and eastern sides experienced increased land surface temperatures falling between 2 and 4 degrees Celsius. The rest of the wheat croplands remained approximately within normal temperature ranges.

6. Comparison of Estimated Wheat Production Levels in 2021 and 2022

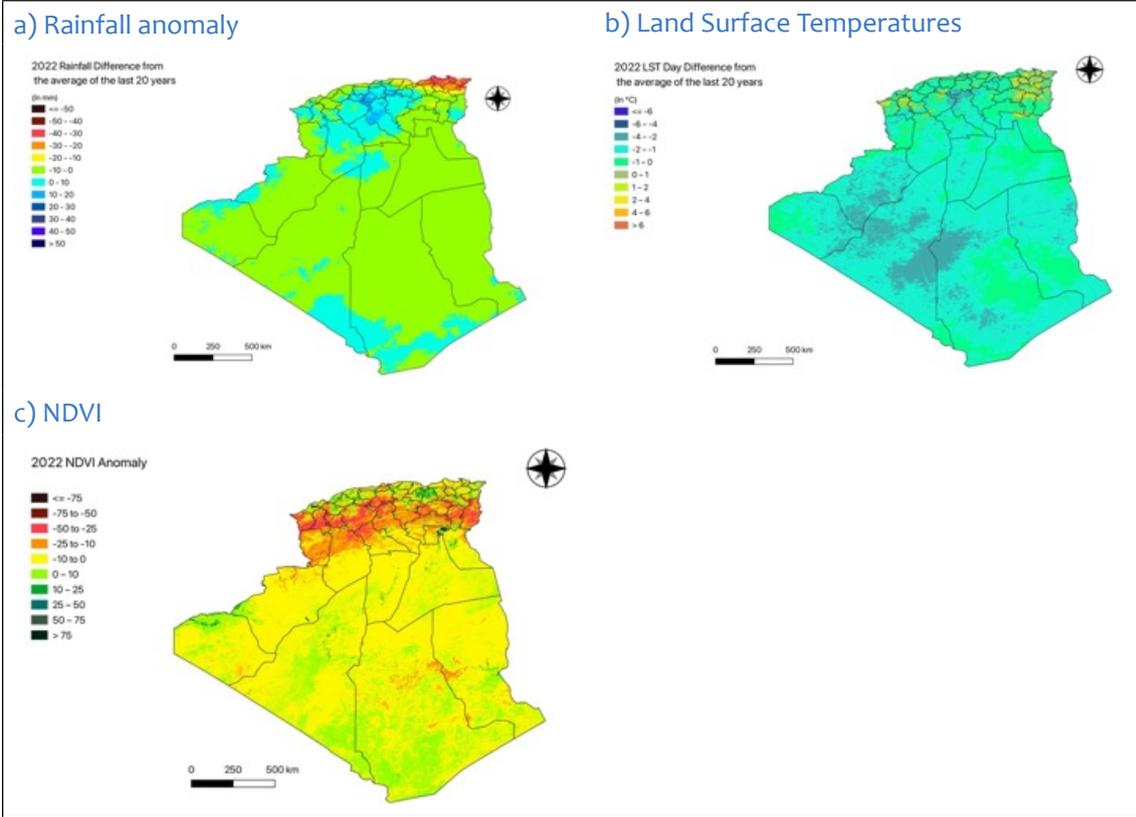
We compared wheat production levels for the 2021 and 2022 seasons by computing and mapping their ratios at the pixel-level. This analysis enables a detailed assessment of where wheat production is expected to increase or decrease and provides critical information for planning interventions to respond to possible supply disruptions. At the national level, Algeria would experience an increase in wheat production of 4.1 percent between the 2021 and 2022 seasons. In 2021, the country produced 2,754,014.41 MT, while our forecast estimates an overall production of 2,872,112.31 MT for 2022. However, national-level data mask geographical variations across wheat-producing areas. The pixel-level data, shown in Figure 3 above, 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 was expected to decrease in Adrar (41 percent), Reggane (38 percent), and Sali (40 percent) compared to 2021.

In 2022, the top wheat-producing counties in Algeria were projected to be Tebessa, Sétif, and Tiaret. Their respective production levels were estimated to be 147,026.31 MT, 160,768.01 MT, and 223,217.26 MT. The county of Tiaret was projected to produce the highest amounts of wheat in a cold, semi-arid climate with an average temperature of 14.7 °C and average annual rainfall of about 400 mm.

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

The spatial biophysical analysis of Algeria over the last twenty years revealed negative rainfall anomalies in most parts of the country (0-10 mm), mostly in the eastern, western, and southern regions. This indicates declining amounts of rainfall with high variability, while positive anomalies in LST are synonymous with warmer temperatures. A positive trend in precipitation anomalies is expected in the country’s northern, central, and southern regions, which may favor increased wheat yields in the country. Positive NDVI anomalies in Algeria’s southern, eastern, and western regions indicate areas with higher biomass or vegetation vigor than the average value. In contrast, the negative NDVI anomalies in the north are correlated with those areas with a biomass or vegetation vigor that is lower than the average value.

Figure 5: Anomalies in a) Rainfall, b) Land Surface Temperatures, and c) NDVI, observed in Algeria, 2022.



8. Conclusion

This brief focuses on Algeria, which resumed wheat importations from Russia in 2021 after a five-year hiatus. The country consumes over 11 million tons of wheat annually, most of which (7.5 to 8 million tons) is imported. Due to the ongoing crisis, the uncertainty around wheat importation has increased.

Algeria needs to increase its wheat production as having a variety of sources for this vital food staple can help reduce the impacts of the Ukraine crisis. Diversifying the country’s wheat sources can help increase resilience in the event of an importation shortfall.

The AfCP model was used to predict Algeria's wheat production in 2022 at the pixel-level. The model found that production increased in the northern region, while production in the south was expected to decrease. The study also offers details on expected anomalies in biogeophysical conditions during the next growing season across wheat-producing areas to raise awareness about the anticipated impacts of climate variability on the country's wheat production.

References

1. Abdelkader, B. 2014. "The History of Wheat breeding in Algeria". In *Proceedings of the International Symposium on Genetics and Breeding of Durum Wheat*, edited by A.B. Damania, and C.O. Qualset, 363-370. Bari: CIHEAM (Options Méditerranéennes: Série A. Séminaires Méditerranéens; No. 110).
2. Ly, R., K. Dia, and M. Diallo. 2021. "Remote Sensing and Machine Learning for Food Crop Production Data in Africa Post COVID-19". In *2021 Annual Trends and Outlook Report: Building Resilient African Food Systems After COVID-19*, edited by J. M. Ulimwengu, M.A. Constan, and E. Ubalijoro, 129–154. Kigali and Washington, DC: AKADEMIYA2063 and International Food Policy Research Institute (IFPRI).
3. OEC - The Observatory of Economic Complexity. 2020. Wheat in Algeria | OEC. Accessed February 7, 2023. <https://oec.world/en/profile/bilateral-product/wheat/reporter/dza>
4. Reynolds, M. P., and H.J., Braun, eds. 2022. *Wheat Improvement: Food Security in a Changing Climate*. Cham: Springer.
5. Statista Research Department. 2022. Algeria: Wheat Consumption 2016-2021. Accessed November 17, 2022. <https://www.statista.com/statistics/1194004/consumption-of-wheat-in-algeria/>
6. IFRC (International Federation of Red Cross and Red Crescent Societies). 2022. *The Impact of the Conflict in Ukraine as a crisis multiplier in the Middle East and North Africa*. https://www.ifrc.org/sites/default/files/2022-06/impact-ukraine-conflict-mena-EN_1.pdf
7. USDA (US Department of Agriculture), Foreign Agricultural Service. 2022. *Algeria: Grain and Feed Update*. Accessed December 08, 2022. <https://www.usda.gov/>
8. Fanack.com. 2020. *Geography of Algeria*. Accessed February 16, 2022. <https://fanack.com/algeria/geography-of-algeria/>

Annex

Table 2: Algeria 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
Adrar	39,274.32	24,781.08	0.63
Aïn Defla	83,633.84	92,288.64	1.10
Aïn Témouchent	45,399.73	49,194.66	1.08
Alger	25,63.51	2,414.97	0.94
Annaba	16,577.96	17,327.02	1.05
Batna	105,941.46	109,847.39	1.04
Béchar	4,000.96	2,661.40	0.67
Béjaïa	24,984.67	22,191.08	0.89
Biskra	53,801.64	45,651.13	0.85
Blida	14,693.84	14,017.59	0.95
Bordj Bou Arréridj	76,246.85	87,197.86	1.14
Bouira	65,649.60	70,559.30	1.07
Boumerdès	11,903.36	10,781.57	0.91
Chlef	83,201.59	90,893.66	1.09
Constantine	64,067.46	70,129.01	1.09
Djelfa	62,591.73	53,843.57	0.86
El Bayadh	25,225.76	17,945.01	0.71
El Oued	1,333.33	944.11	0.71
El Tarf	29,701.02	29,080.72	0.98
Ghardaïa	9,152.47	6,330.43	0.69
Guelma	89,491.89	96,154.78	1.07
Illizi	15,744.85	9,002.28	0.57
Jijel	14,428.10	10,920.65	0.76
Khenchela	68,073.38	72,980.83	1.07
Laghouat	33,768.79	26,113.91	0.77
M'Sila	78,965.23	70,798.15	0.90
Mascara	93,382.83	102,565.60	1.10
Médéa	107,350.58	116,252.17	1.08
Mila	94,782.74	105,532.11	1.11
Mostaganem	34,504.96	37,906.09	1.10
Oran	19,969.48	20,203.95	1.01
Ouargla	11,775.32	7,599.22	0.65
Oum el Bouaghi	115,103.06	129,751.86	1.13
Relizane	104,729.46	117,537.37	1.12
Saïda	71,256.78	72,257.68	1.01
Sétif	141,822.46	160,768.01	1.13
Sidi Bel Abbès	106,296.00	116,472.89	1.10
Skikda	55,052.29	56,747.98	1.03
Souk Ahras	108,499.81	122,238.88	1.13
Tamanghasset	27,299.53	15,326.11	0.56

County	2021 wheat production (MT)	2022 wheat production (MT)	2022/2021 wheat production ratio
Tébessa	130,445.60	147,026.31	1.13
Tiaret	204,682.10	223,217.26	1.09
Tipaza	22,087.30	22,271.94	1.01
Tissemsilt	66,923.35	75,948.76	1.13
Tizi Ouzou	29,081.51	26,163.68	0.90
Tlemcen	88,551.89	92,274.02	1.04

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