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Commodity Intelligence Report

Extreme Heat and Below-Average Precipitation Challenge This Season's Russia Corn

USDA's estimate of Russia's corn production for marketing year (MY) 2024/25 is 13.0 million metric tons (mmt), down 21 percent from last year and 14 percent relative to the 5-year average. Yield is estimated at 5.20 tons per hectare, down 25 percent from last year and 10 percent from the 5-year average. Harvested area is estimated at 2.5 million hectares (mha), up 4 percent from last year, but down 5 percent from the 5-year average.

Russia ranks number 11 in terms of global corn production accounting for roughly 1 percent of the total corn produced in the world. Corn is the 4th major crop produced in the country after wheat, barley, and sunflower. Following the collapse of the Soviet Union, overall economic instability and disruption of the agricultural system initially led to a decline in corn production in Russia but since then it has increased significantly to now turning Russia into the fifth largest corn exporter in the world. Technological advancements, expanded market opportunities, increase in planted area, and the use of hybrid seed varieties are among the major forces that drove Russia's 10-year average corn production to increase from the post-Soviet 1.7 mmt (1990-1999) to its current 14.2 mmt (2015-2024), see Figure 1.

Corn is grown predominantly in the European part of Russia, where the bulk of the crop is produced in the Central (40 percent) district, followed by the Southern (26 percent) and the North Caucuses (21 percent) districts (Figure 2). The latter two districts encompass the so called 'black earth' or chernozem belt in Russia well-known for its high soil fertility. Corn is a spring crop; thus, it is typically planted between April and May (Figure 2). Harvest usually begins in early September and may continue until late-October through November. The large harvest window is determined by crop geography, corn variety, seasonal weather variability and its impact on crop development. Corn in Russia is highly susceptible to precipitation and temperature as it is predominantly a rain-fed crop. Long exposure to extreme heat can be detrimental for corn development and yield formation.

The 2024 season brought generally unfavorable weather, including several adverse weather events that proved challenging for the spring crops grown in the European part of Russia since planting. The key weather abnormalities this year include:

- *Overall, below average seasonal precipitation* (Figure 3). Soil moisture reserves were relatively limited at the start of the season. Precipitation remained short in terms of amounts and sporadic in terms of spatial coverage throughout the whole growing season. This further exacerbated the soil moisture deficit as the season progressed.

- *Frost spell in early-to-mid May*, which impacted the Central district, the Volga district, and the more northern growing regions of the Southern district (Figure 4). The low late spring temperatures had a negative impact on the development of the winter crops, but more importantly delayed the spring planting campaign. Russia's Ministry of Agriculture (MinAg) operational planting data indicated a drop in planting progress for all spring crops including corn in early May. Delayed planting and a narrower growing window can hamper crop development and lead to sub-optimal yields.
- *Excessive July heat* (Figure 5). Overall day time temperatures between 25 and 30 degrees Celsius are considered optimal for corn growth. Given the right soil moisture, humidity, and wind conditions, corn can tolerate a limited number of days with temperatures above this ideal range. However, prolonged exposure to heat can hinder corn development and result in reduced yield potential. Several factors play a role when trying to determine the implications of the heat-induced stress on yield, including duration of the heat wave, stage of crop development, status of soil moisture, humidity, and wind conditions. This season across the key corn producing regions in Russia temperature exceeded 35 degrees Celsius anywhere between 26 and 28 days depending on geographic location.

The new crop was planted under insufficient soil moisture availability due to persistent below-average precipitation across the European part of Russia since early spring. In some of the more northern crop growing regions, corn was planted later than normal due to the untimely May frost spell. July's scorching heat further threatened the already stressed crop. At the time corn was in early developmental stages and was expected to reach the key yield formation stages between late-July and early- to mid-August, depending on geographic location (Figure 6). The sub-optimal soil moisture reserves and excessive heat pushed the crop to develop ahead of last year and normal across all corn growing districts (Figure 7). The satellite-derived Evaporative Stress Index (ESI) and the Normalized Difference Vegetation Index (NDVI) indicate considerable crop stress and consistently below-average vegetation vigor, especially across the more southern growing regions that persisted during the whole growing season (Figure 8 and Figure 9). The NDVI curves captured in Figure 9 suggest between average to slightly below average yield potential for this season's corn crop.

As a result of this season's hot and dry weather and the faster crop development, the harvest campaign started earlier than usual in mid-August. Operational harvest results from the Ministry of Agriculture of Russia reveal substantially lower yield potential this season (Figure 10), which is expected given the challenging weather conditions corn faced this season. The final crop statistics for all crops harvested in 2024 are expected to be released by Russia's statistical agency, Rosstat in early 2025.

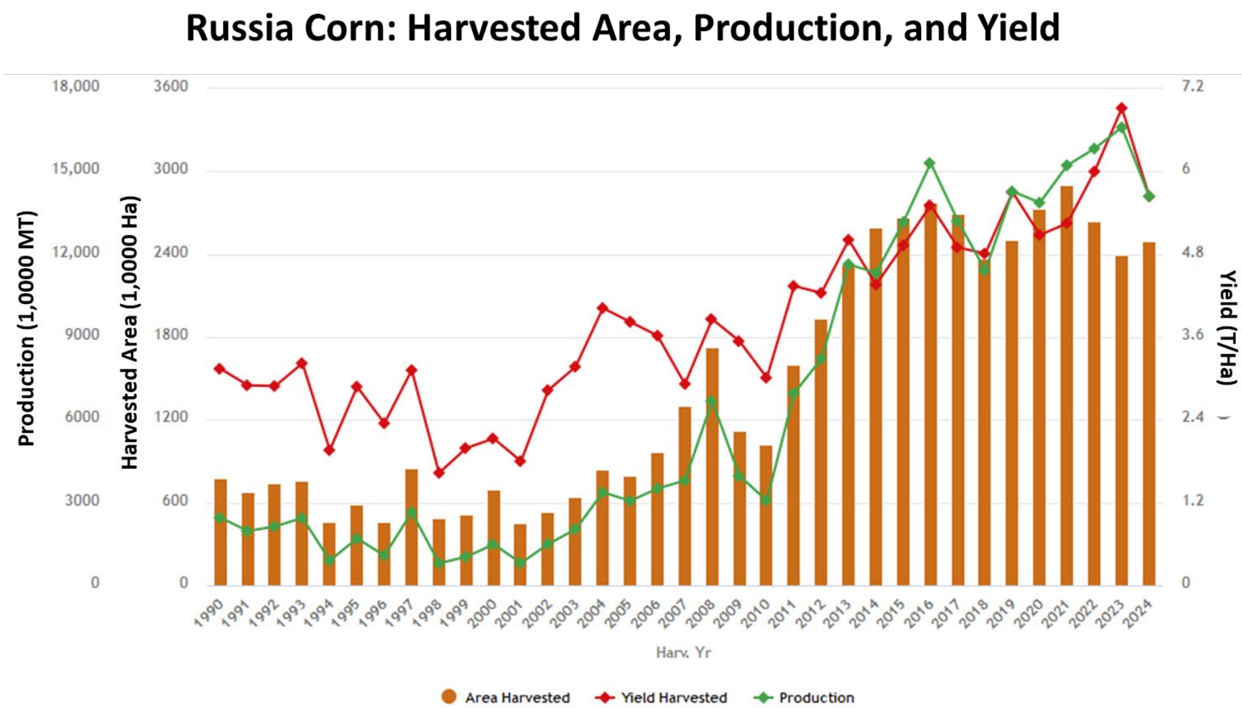


Figure 1. Time series of Russia Corn harvested area, production, and yield since 1990. Following the fall of the Soviet Union, corn production has increased from 1.7 mmt (10-year average between 1990 and 1999) to 14.2 mmt (10-year average between 2015 and 2024). Source: USDA PSD.

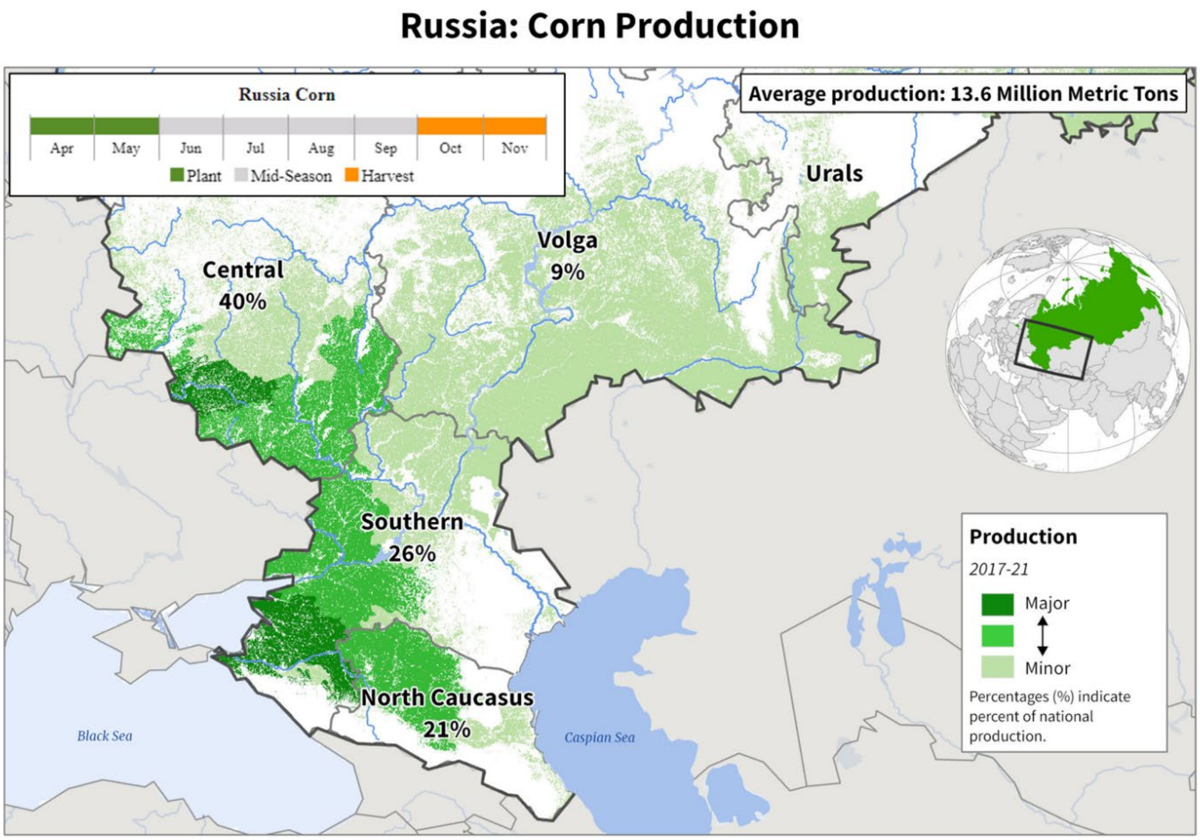


Figure 2. General overview of Russia's corn production by district. Sources: Rosstat; Crop Explorer.

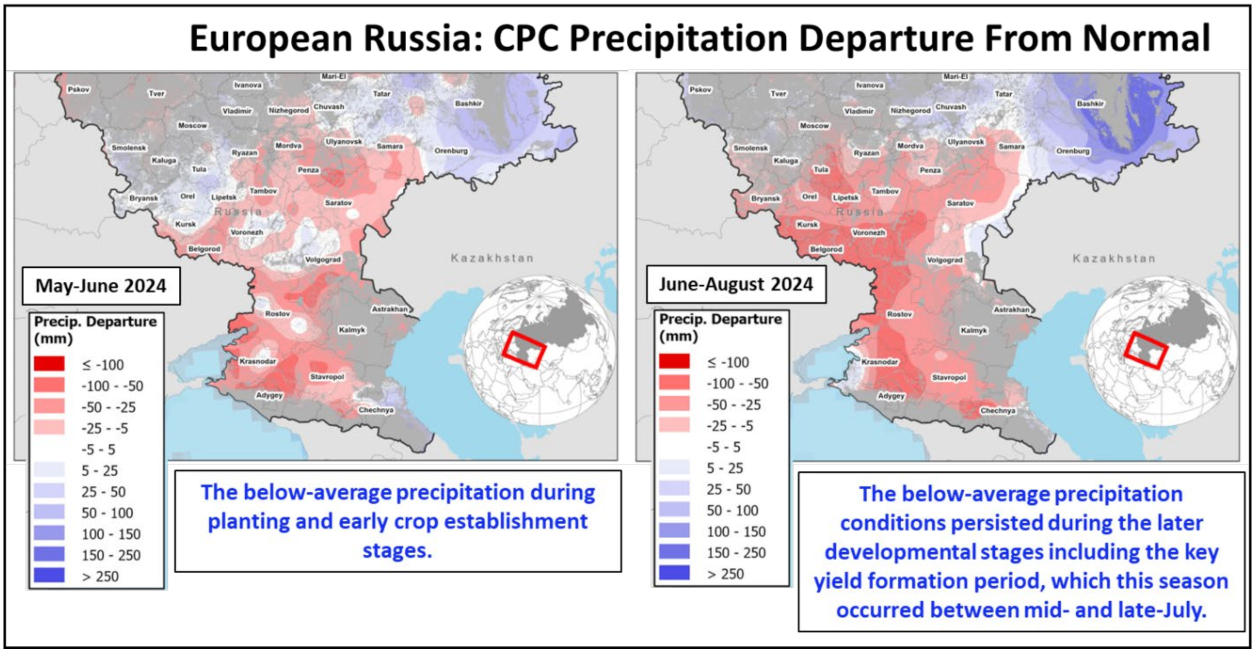


Figure 3. Precipitation departure from normal across European Russia. Sources: Climate Prediction Center (CPC); GFSAD 30 m crop cover (2015).

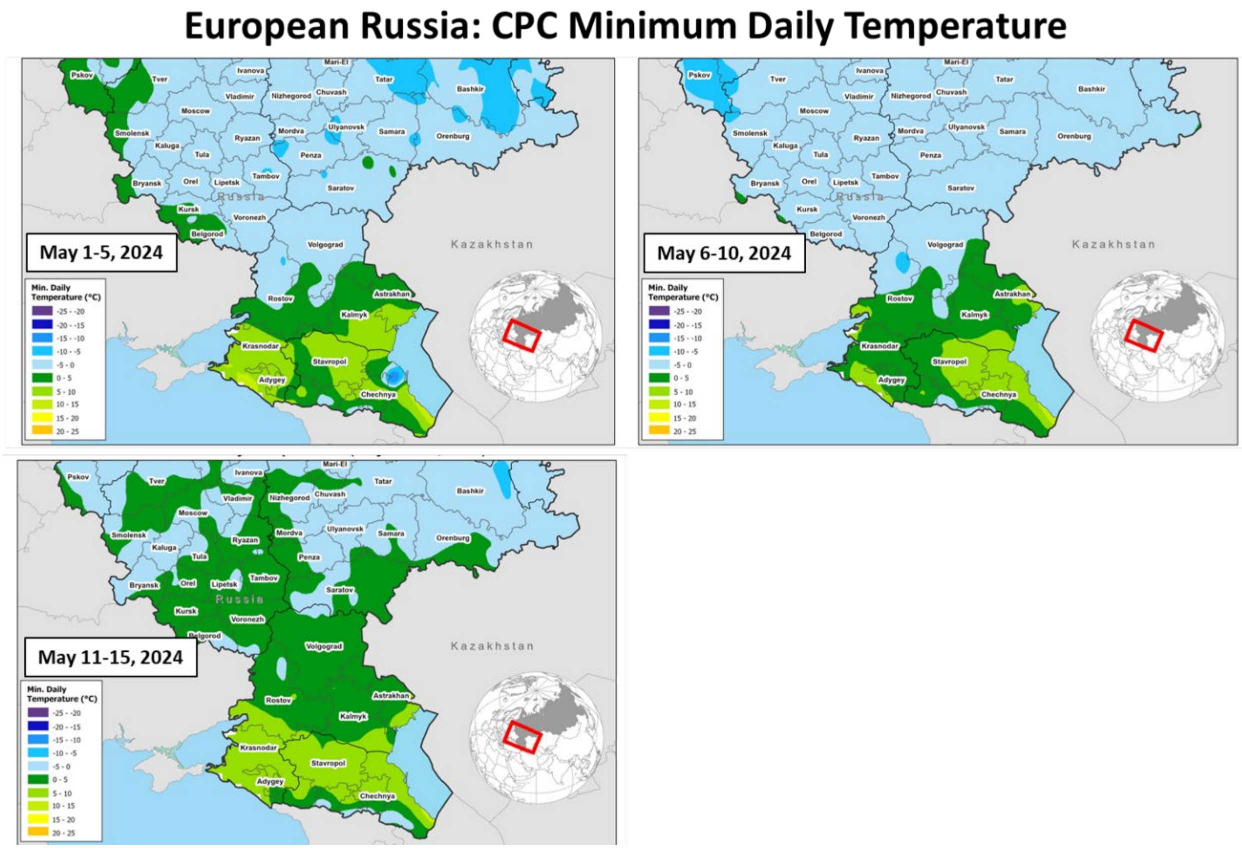


Figure 4. Frost spell across European Russia during the month of May 2024. The unseasonable negative temperatures caused spring crops planting delays. Source: NOAA Climate Prediction Center (CPC).

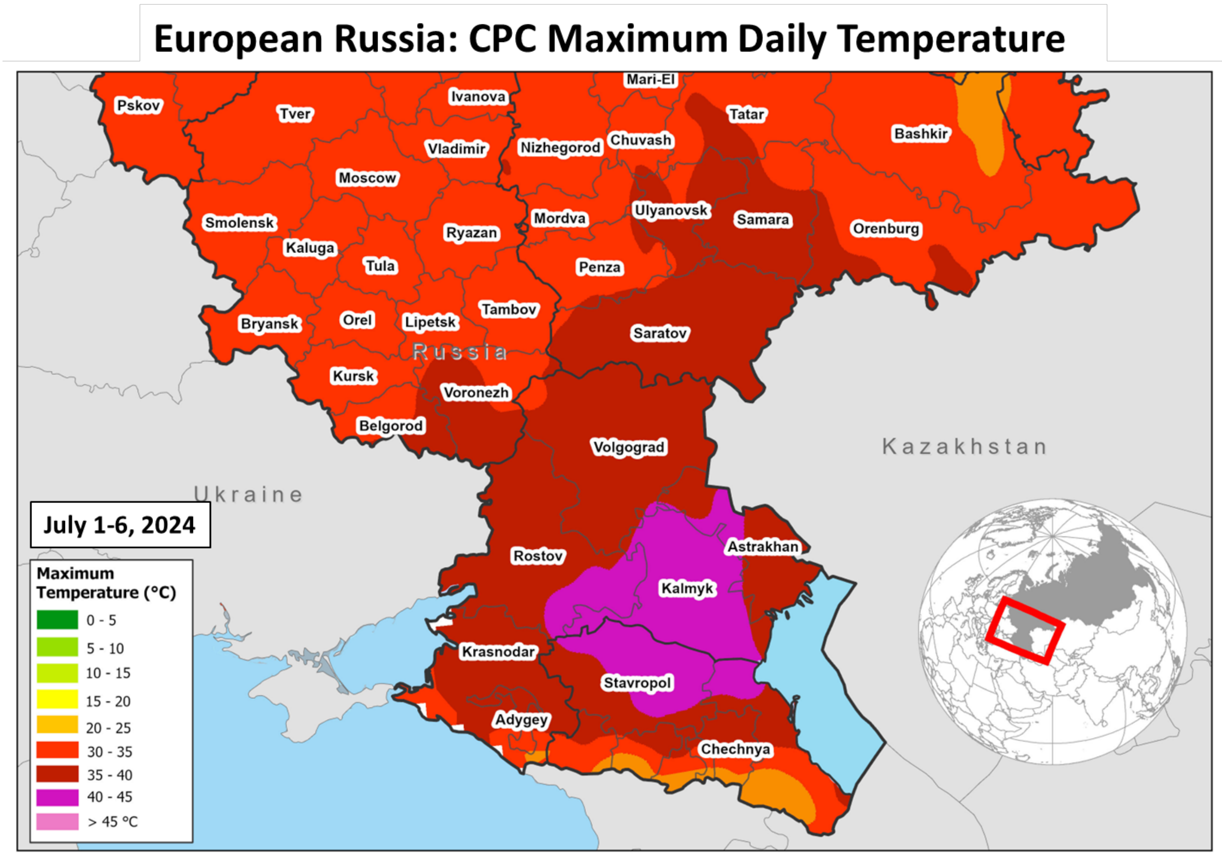
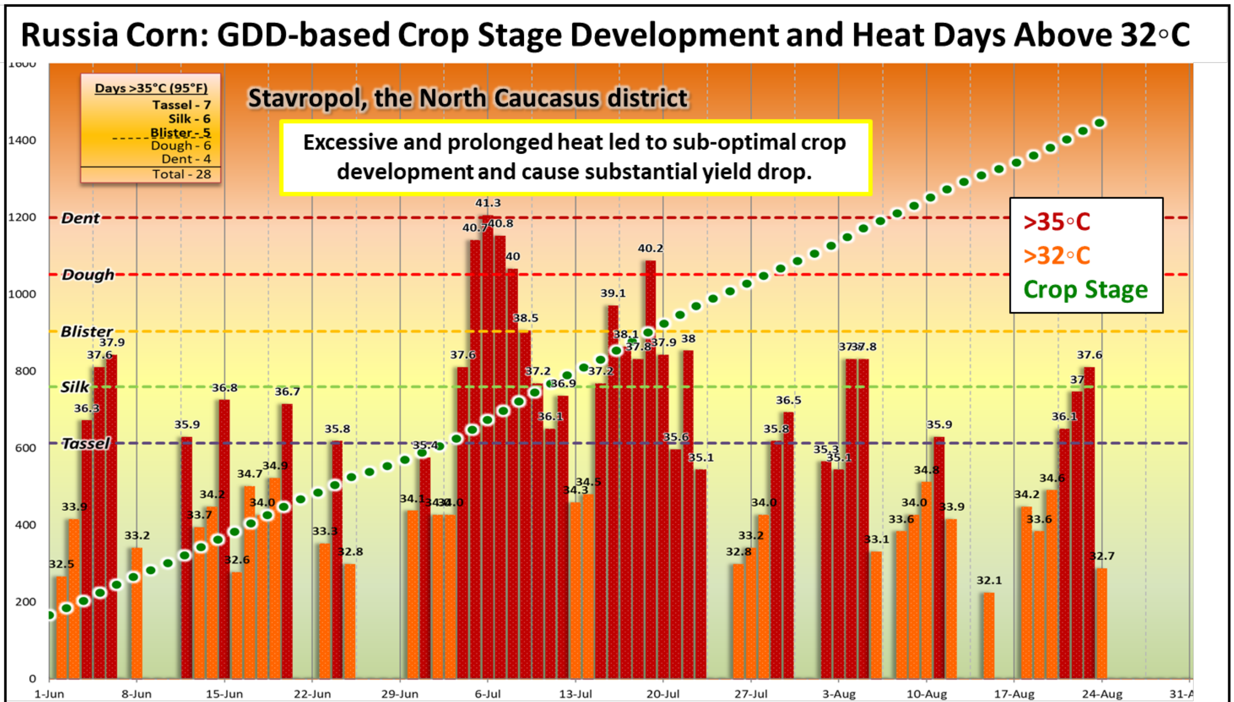


Figure 5. Excessive heat across European Russia during the month of July 2024 hampered corn development. Source: NOAA Climate Prediction Center (CPC).



Crop stage determined based on Growing Degree Days (GDD); GDD is developed by accounting for the amount of heat accumulated during the growing season.

This season corn across Stavropol, the North Caucasus district (example include here), Krasnodar and Rostov, both located in the Southern district experienced over 26 days of heat above 35◦C.

Figure 6. Substantial part of the corn producing regions across the North Caucasus and the Southern districts were subjected to prolonged and excessive heat during the key yield formation stages. Source: USDA World Agricultural Outlook Board; World Meterological Organization.

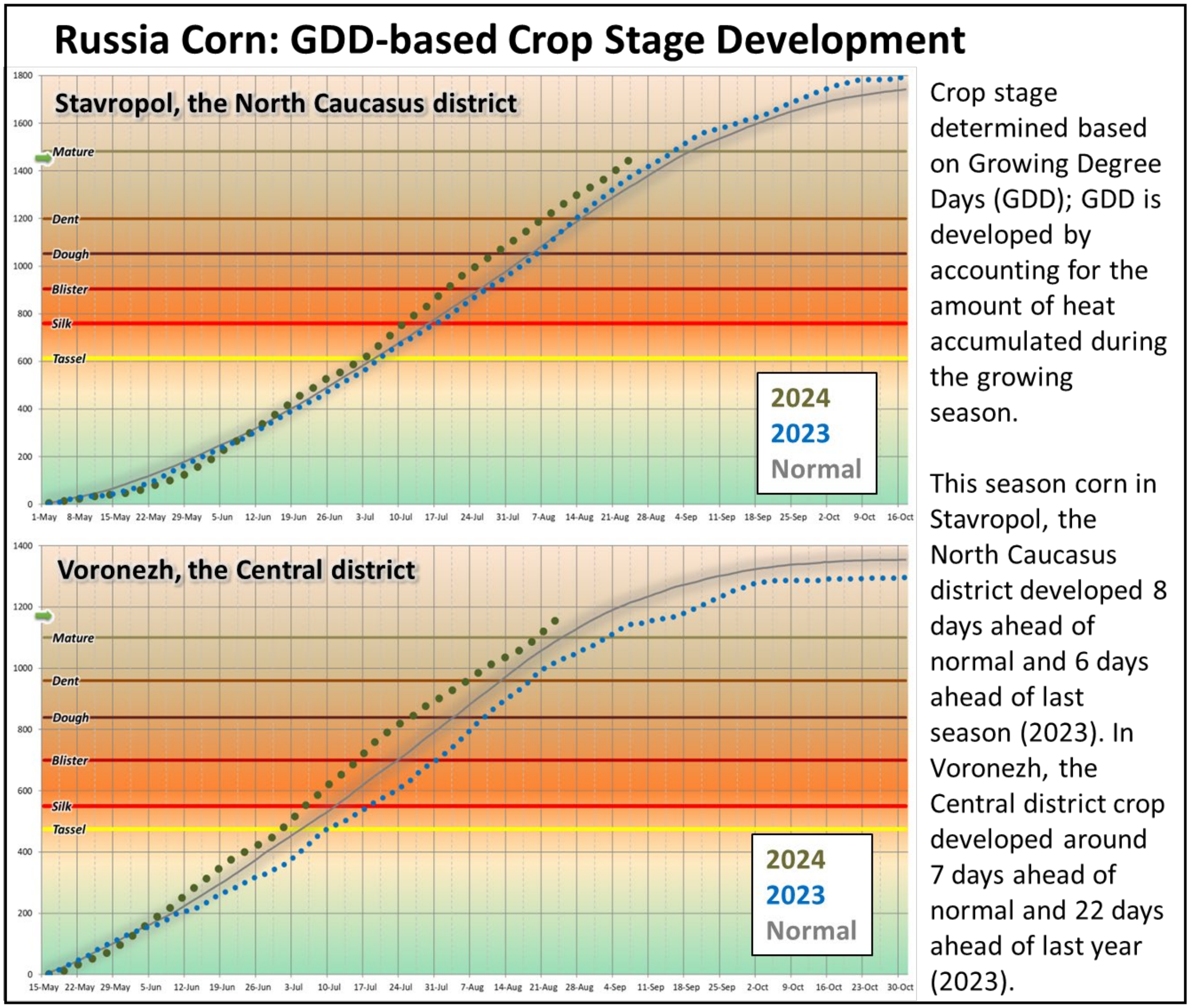


Figure 7. Russia corn crop stage development based on Growing Degree Days, i.e. heat accumulation. As a result of the prolonged soil moisture deficit, overall above-average seasonal temperatures, and excessive July heat, this season corn developed was ahead of normal and last season. Source: USDA World Agricultural Outlook Board; World Meteorological Organization.

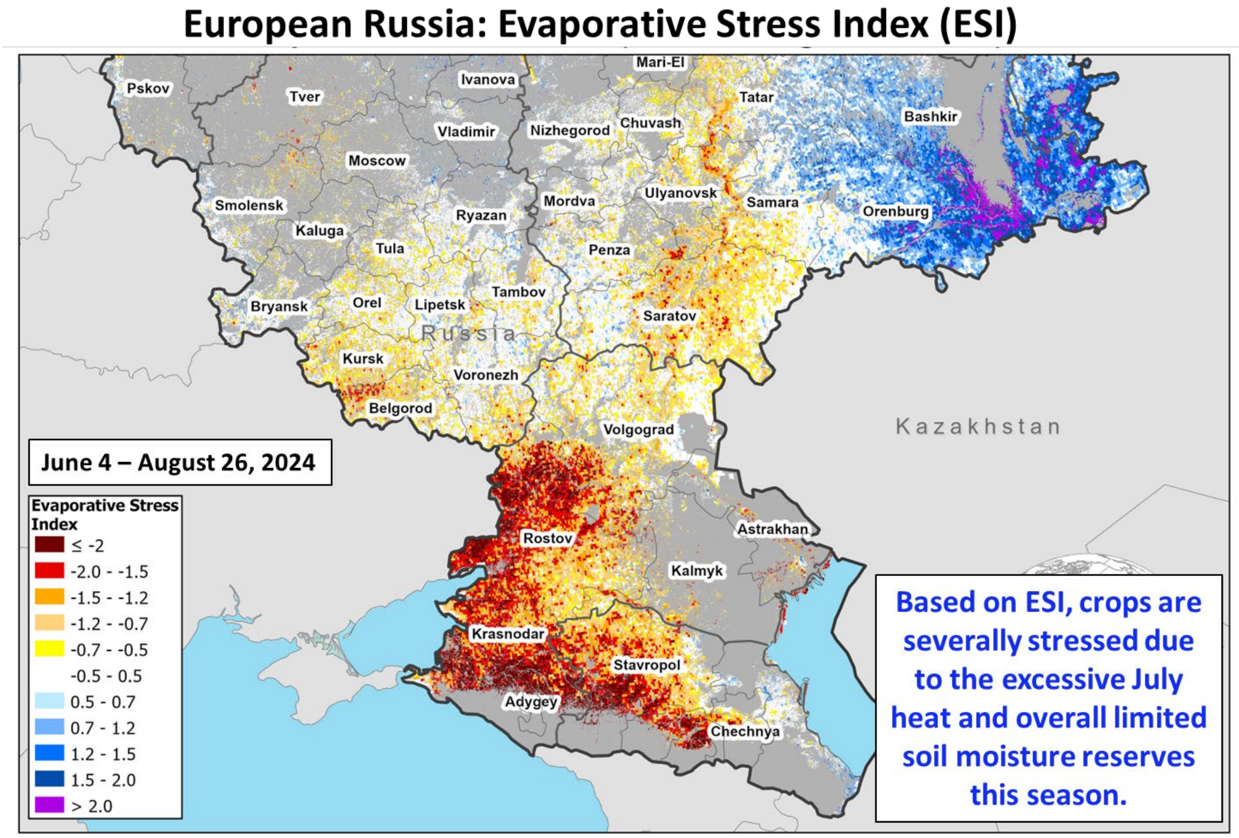


Figure 8. The 12-weeks Evaporative Stress Index reveals significant crop stress due to the excessive July heat and overall below-average precipitation this season, which generated substantial persistent soil moisture deficit. Sources: NASA, GFSAD 30 m crop cover (2015).

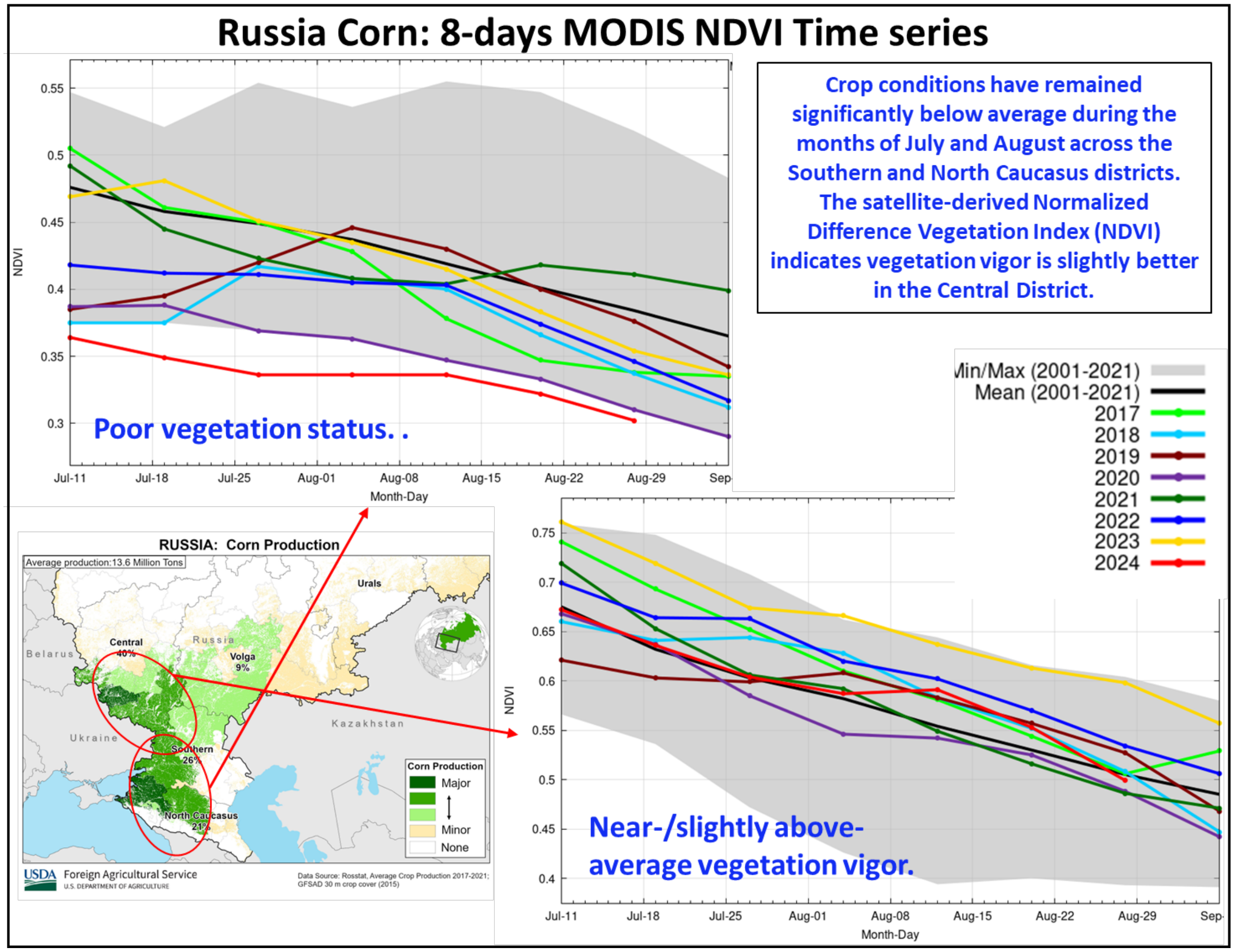


Figure 9. 8-days MODIS NDVI Time series across the major corn producing regions in Russia. Sources: MODIS, GFSAD 30 m crop cover (2015).

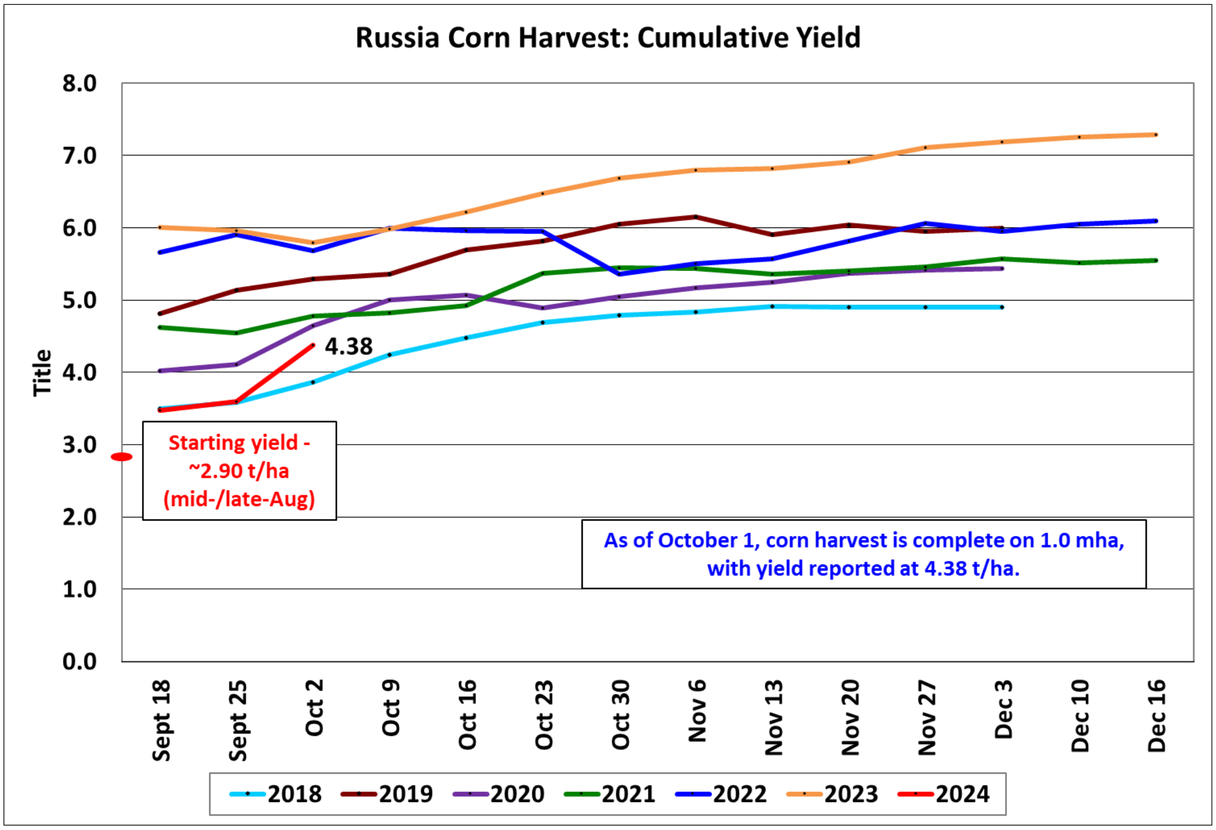


Figure 10. Russia corn cummilative yield based on harvest data. Source: Russian Ministry of Agriculture.

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