Chapter 5. Focus and perspectives

Building on the CropWatch analyses presented in chapters 1 through 4, this chapter presents first early outlook of crop production for 2023 (section 5.1), as well as sections on recent disaster events (section 5.2), and an update on El Niño (5.3).

5.1 CropWatch food production estimates

Methodological introduction

CropWatch production estimates are based on a combination of remote-sensing models combined with CropWatch global agro-climatic and agronomic indicators as well as meteorological data from over 20,000 meteorological weather stations around the world. The major grain crops (maize, rice, wheat) and soybean production of 47 major producers and exporters are estimated and predicted from January to mid-August 2023. This assessment included remote sensing monitoring, predictions, and verification of yield for major staple crops (corn, rice, wheat, and soybean) that were either in their growing period or close to harvest. The results are as follows.

Production estimates

From April to July 2023, the world transitioned steadily from La Niña to El Niño, despite temperature records being broken continuously. The occurrence of extreme events during this period was generally weaker compared to 2022, resulting in a less adverse impact on the production of crops. Remote sensing monitoring indicated that the global production of crops in 2023 reached 2.877 billion tonnes, an increase of approximately 17.1 million tonnes or about 0.60%. Specifically, maize production is projected to reach 1.072 billion tonnes, marking an increase of 26.94 million tonnes or 2.6% compared to the decreased production (1.045 billion tonnes) in 2022, yet remaining below the peak in 2021. Global rice production is estimated at 750 million tonnes, with a decrease of 4.4 million tonnes or 0.6%. Global wheat production is forecasted to be 736 million tonnes, down by 4.45 million tonnes or 0.6%. Global soybean production is anticipated to reach 319 million tonnes, reflecting a decrease of 0.99 million tonnes or 0.3% (Table 5.1).

Table 5.1 2023 cereal and soybean production estimates in thousand tonnes. Δ is the percentage of change of 2023 production when compared with corresponding 2022 values.

	Maize		Rice		Wheat		Soybean	
	2021	Δ%	2021	Δ%	2021	Δ%	2021	Δ%
Afghanistan					3,090	-14.6		
Angola	2,730	-0.2	47	-4.2				
Argentina	49,690	-9.6	1,791	-3.0	10,943	-14.1	42,005	-18.9
Australia					28,662	-11.0		
Bangladesh	3,517	-5.3	47,796	-0.4				
Belarus					2,856	-4.5		
Brazil	100,679	10.3	11,137	-1.9	7,510	-3.1	106,615	12.1

	Maize		Rice		Wheat		Soybean	
	2021	Δ%	2021	Δ%	2021	Δ%	2021	Δ%
Cambodia			9,871	0.8				
Canada	11,349	-2.2			27,951	-6.6	7,823	3.1
China	232,240	2.2	193,346	-1.0	134,723	0.4	17,156	-5.7
Egypt	6,214	2.6	6,953	5.6	11,331	0.8		
Ethiopia	7,869	37.6			4,713	38.1		
France	13,239	1.9			33,422	0.2		
Germany	4,239	-3.1			23,906	-4.7		
Hungary	5,110	5.2			4,514	1.4		
India	17,113	-9.1	174,607	-0.9	97,584	4.7	13,674	1.0
Indonesia	18,714	-2.3	64,508	-1.2				
Iran			2,521	-2.6	12,040	9.7		
Italy	5,673	11.6			7,836	6.4		
Kazakhstan					11,726	-9.5		
Kenya	2,329	20.4			301	11.5		
Kyrgyzstan	673	-12.9			614	-17.4		
Mexico	24,221	4.6			3,494	-13.0		
Mongolia					309	3.6		
Morocco					6,942	14.8		
Mozambique	2,254	2.2	398	-0.4				
Myanmar	1,864	-3.7	22,886	-7.0				
Nigeria	10,031	5.0	4,528	10.7				
Pakistan	5,864	2.0	10,968	6.8	25,093	-1.9		
Philippines	7,884	6.1	20,809	-2.3				
Poland					10,031	-2.5		
Romania	11,240	-0.3			7,333	5.6		
Russia	13,981	2.3			82,942	-3.8	3,799	-0.4
South Africa	12,211	3.0			1,730	8.4		
Sri Lanka			2,428	-2.4				
Thailand	3,928	-8.6	37,765	-2.8				
Turkey	6,621	1.9			18,770	11.3		
Ukraine	25,854	1.9			22,625	5.6		
United Kingdom					12,440	-1.6		
USA	377,377	3.8	11,246	5.2	55,640	7.9	100,478	-1.2
Uzbekistan					6,558	-21.3		
Vietnam	4,984	-4.5	46,754	0.1				
Zambia	3,656	2.8			246	0.1		
Syria					3,147	53.1		
Algeria					1,684	-35.3		
Laos			3,780	0.5				
Lebanon					151	51.0		
Sub-total	993,348	2.8	674,138	-0.9	682,858	-0.1	291,551	-0.1

	Maize		Rice		Wheat		Soybean	
	2021	Δ%	2021	Δ%	2021	Δ%	2021	Δ%
Others	78,765	0.3	76,040	2.1	52,754	-6.9	27,505	-2.8
Global	1,072,113	2.6	750,178	-0.6	735,613	-0.6	319,056	-0.3

Maize

The three leading maize-producing countries experienced production increases, providing a foundation for global growth, yet maize production in 2023 remained below the peak of 2021. As the world's largest maize producer, the United States encountered delayed spring temperatures during planting, coupled with lower rainfall in late May affecting germination and early growth. However, the overall normal rainfall since late June in the main producing regions provided suitable moisture conditions for maize production, projecting a production increase to 377.38 million tonnes, a significant increase of 13.78 million tonnes or 3.8%. China witnessed increased maize cultivation area, with overall higher rainfall favoring maize production in the Huang-Huai-Hai region and Northeast, even though localized flooding occurred. Consequently, China's maize production increased to 232.24 million tonnes, an increase of 5.05 million tonnes of 2.2%. Brazil experienced both a decrease in the first-season maize and an expansion of planting areas for the second-season maize. Due to improved irrigation and increased yields for the second season, Brazil's total maize production is anticipated to reach 100.68 million tonnes, reflecting a 10.3% increase. Compared to the extremely hot and dry conditions in 2022, Europe's most maize-producing countries generally enjoyed favorable weather conditions in 2023. Benefitting from overall abundant rainfall, countries like France, Hungary, Italy, Ukraine, and Russia experienced increased maize yields of 1.9%, 5.2%, 11.6%, 1.9%, and 2.3%, respectively. Ethiopia and Kenya in the Horn of Africa rebounded from drought, experiencing a significant recovery in maize production with increases of 37.6% and 20.4%, respectively. Several countries in Africa, including Mexico, Nigeria, Pakistan, Mozambique, Zambia, and South Africa, witnessed varying degrees of increased maize production. Argentina, however, was affected by continuous drought, resulting in a substantial reduction in maize production by 9.6%. India's maize production was negatively affected by flooding, leading to decreased cultivation areas and yields, projecting a reduction of 9.1% to 17.11 million tonnes.

Rice

Most rice-producing countries experienced a slight decrease in rice production, resulting in a global decline of 4.4 million tonnes or 0.6%. As the world's largest rice producer, China is expected to be 193.346 million tonnes of total rice production, down by 1.0% due to reduced cultivation areas. Adverse weather conditions, including excessive rainfall during heading and flowering, affected both early-season and single-season rice in major producing regions and northern China. Southeast Asian countries, including Bangladesh, Indonesia, the Philippines, Thailand, Myanmar, and Sri Lanka, experienced normal to slightly below-average rainfall during the rainy season, leading to decreased rice yields and resulting in lower rice production. However, excessive rainfall occurred in Pakistan and India in July, leading to localized flooding. Pakistan's rice production was expected to increase by 6.8%, while India's rice production decreased slightly by 0.9%. Vietnam, Cambodia, Nigeria, and the United States saw varying degrees of increased rice production. Overall, the global rice production and supply remained stable.

Wheat

The production for major wheat-producing countries varied significantly. Agro-climatic conditions improved notably in East Africa and the Middle East, leading to increased wheat production. Conversely, South America and Australia witnessed decreased wheat production. As the world's largest wheat producer, China experienced favorable weather conditions earlier in the season, but "flooding during grain-filling" impacted wheat yield during the maturity period, resulting in a yield to 134.72 million tonnes, an increase of 0.4%, However, decreased by 1.6 million tonnes compared with prediction in May. India and Pakistan experienced normal agro-climatic conditions during the wheat growth period. Due to irrigation, yields were higher compared to the extreme heat in 2022, with India's wheat planting area increasing and yielding a production increase of 4.7%. Pakistan, however, faced a yield reduction of 1.9% due to decreased cultivation areas of 4.3%. In Russia, wheat production decreased to 82.94 million tonnes, a decrease of 3.8%, primarily due to drought during May and June. The wheat production of the United States, despite experiencing unfavorable weather conditions during early growth, saw an increase of 7.9% to 55.64 million tonnes. Syria, Ethiopia, Morocco, Turkey, Iran, and Lebanon, the 6 largest increases among the major wheat-producing countries, experienced recovery increases in wheat production compared to the extreme drought year of 2022, with an increase of more than 9%. European countries, such as Hungary, Romania, Italy, and Ukraine saw increased wheat cultivation areas and yields, with an increase in production of 1.4%, 5.6%, 6.4%, and 5.6%, respectively. Afghanistan and Central Asian countries, including Kazakhstan, Uzbekistan, and Kyrgyzstan, experienced a reduction in both cultivation areas and yields. In the Southern Hemisphere, Australia, Argentina, and Brazil witnessed decreased wheat production by 11.0%, 14.1%, and 3.1% respectively, while wheat production in South Africa increased by 8.4%. Overall, while wheat production in major producing countries remained relatively stable, global wheat production decreased by 0.6% due to significant reductions in other countries, even resulting in the lowest production in 5 years. This decline, combined with Russia's cessation of exporting agricultural products from Black Sea ports, has led to a tense global wheat supply situation.

Soybean

Soybean production increased in the Southern Hemisphere, but the situations in Brazil and Argentina varied significantly. Northern Hemisphere soybean cultivation areas decreased, resulting in an overall production reduction. Global soybean production decreased slightly by 0.3%. Argentina's soybean production was severely impacted by continuous drought and low rainfall throughout the growing period, leading to a substantial reduction in both cultivation areas and yields. The soybean production decreased to 42.01 million tonnes, a reduction of up to 9.77 million tonnes, reaching the largest reduction for the 5 years. In contrast, Brazil experienced normal rainfall, and adequate water supply during the crucial pod-filling period resulted in increased yields. As a result, Brazil's soybean production recovered to 106.61 million tonnes, an increase of 12.1%, offsetting the impact of reduced production in Argentina and resulting in an increased soybean production by a cumulative 1.71 million tonnes in Argentina and Brazil. The United States and China witnessed favorable agro-climatic conditions during the soybean growth period, with suitable moisture and temperature contributing to favorable yields. However, both countries experienced a reduction in cultivation areas, leading to production decreases of 1.2% and 5.7%, respectively. Canada and India saw increased soybean production by 3.1% and 1.0% respectively, while Russia's soybean production slightly decreased by 0.4%. The cumulative decrease by 1.9 million tonnes in soybean production in the Northern Hemisphere, exceeded the increase in the Southern Hemisphere, resulting in a global soybean production decrease to 319.06 million tonnes, a decrease of 0.3%. Overall, the global soybean supply situation remained relatively stable.

5.2 Disaster events

Introduction

This section covers the April-July 2023 disaster events worldwide. Among others, this section highlights the current situation of global flood events, desert locusts as well as the current food production and international food prices situation in the context of Russia-Ukraine conflict.

Global Food insecurity situation: As the global population continues to grow and environmental pressures mount, achieving and maintaining food security becomes a complex and multifaceted issue. This encompasses not only the production and distribution of food but also the stability of food systems in the face of a deadly combination of factors such as political conflicts, economic shocks, climate extremes, and soaring fertilizer prices, which are at the root of the rising numbers. Since 2022, the economic fallout of the COVID-19 pandemic, combined with the Russia and Ukraine conflict, has pushed prices up and put food out of reach for millions of people across the world. As a result, according to the World Food Program (WFP), up to 783 million people (about one in ten of the world's population) still go to bed hungry each night. Estimates from 73 countries also indicate that more than 345 million people (representing an increase of almost 200 million since early 2020, pre-COVID-19 levels) are facing high levels of food insecurity, and over 40 million people across 51 countries are experiencing emergency or worse levels of acute food insecurity in 2023.

Extreme conditions by type

Conflicts

Russia-Ukraine conflict: The Russia and Ukraine conflict from February 2022 resulted in trade disruptions. While global prices for food have since retreated from their peaks, they remain considerably higher compared to pre-COVID levels. This has contributed to notable domestic inflation in food prices across many countries. Amidst the ongoing conflict, pessimistic export prospects for Ukraine continues in 2023. Producers in the region continue to grapple with high fuel and input costs, and low product prices. Russia halted the Black Sea Grain Initiative as of July 17. Hence, grains cannot be shipped out of Ukraine's Black Sea ports anymore.

CropWatch's assessment of crop conditions based on NDVI profiles in this region during the April-July 2023 reporting period reveals that the conditions for wheat were relatively favorable. Although these conditions initially declined, they rebounded by the end of the reporting period, surpassing those observed during the same period in 2022, shortly after the war began. The pace at which the region recovers, along with the eventual stabilization of global market dynamics and food security implications, hinges largely on the resolution of the conflict.

Ongoing conflicts in Sudan and South Sudan: Despite the signing of a peace agreement in 2018, the situation in South Sudan has taken a concerning turn, as the number of armed groups operating within the country has increased. This escalation in conflict is compounded by the impact of climate change, which has manifested in the form of remarkably intense rainfall, further exacerbating the challenges faced by the nation. The resulting floods have uprooted communities from their homes, leaving them not only displaced but also grappling with the severe lack of essential resources, such as food and clean water. The intersection of conflict and climate-induced disasters has culminated in a deeply distressing scenario for the people of South Sudan. More than 7.8 million individuals within the country are anticipated to confront a critical deficit in meeting their basic food requirements throughout the year 2023. This figure marks a distressing escalation from the already troubling statistic of 6.3 million people who experienced food insecurity in the preceding year, 2022. The consequences of these circumstances are disheartening and shocking. These figures underscore the urgent need for comprehensive and immediate interventions, both domestically and through international aid efforts, to address the complex interplay between conflict, climate change, and the impending food crisis that South Sudan is grappling with.

The situation is also quite dire in the Sudan. In April, an armed conflict between the military and a rebel leader started. So far, it has resulted in 1.1 million refugees and 3 million internally displaced people. Rainfed crop production is limited to the period from July to October. The lack of inputs, such as seeds and fuel, disrupted the timely sowing of the crops in some regions.

Desert locust

During the month of April to May, the Desert Locust situation remained calm. However, the small outbreak that developed from the spring breeding in March increased in Saudi Arabia in April. By the end of April, some late hopper groups, bands, and new immature adult groups were observed. Furthermore, in Northwest Africa, there were small hopper groups and bands present in the south of the Atlas Mountains in Morocco, as well as further south in Western Sahara, and control measures were carried out.

By the end of the April-July report period, the situation remained calm (**Figure 1**). However, Due to the conclusion of spring breeding and management efforts in Saudi Arabia, small clusters and swarms migrated to northern Yemen and traversed the country's interior where control measures were implemented. Hopper and adult groups were addressed in the Nile Valley of Sudan, as well as along the Red Sea coastline of Eritrea, where some ventured into the highlands. Adult locusts were observed in north-eastern Ethiopia, northwestern Somalia, and the southern regions of Oman and Egypt.

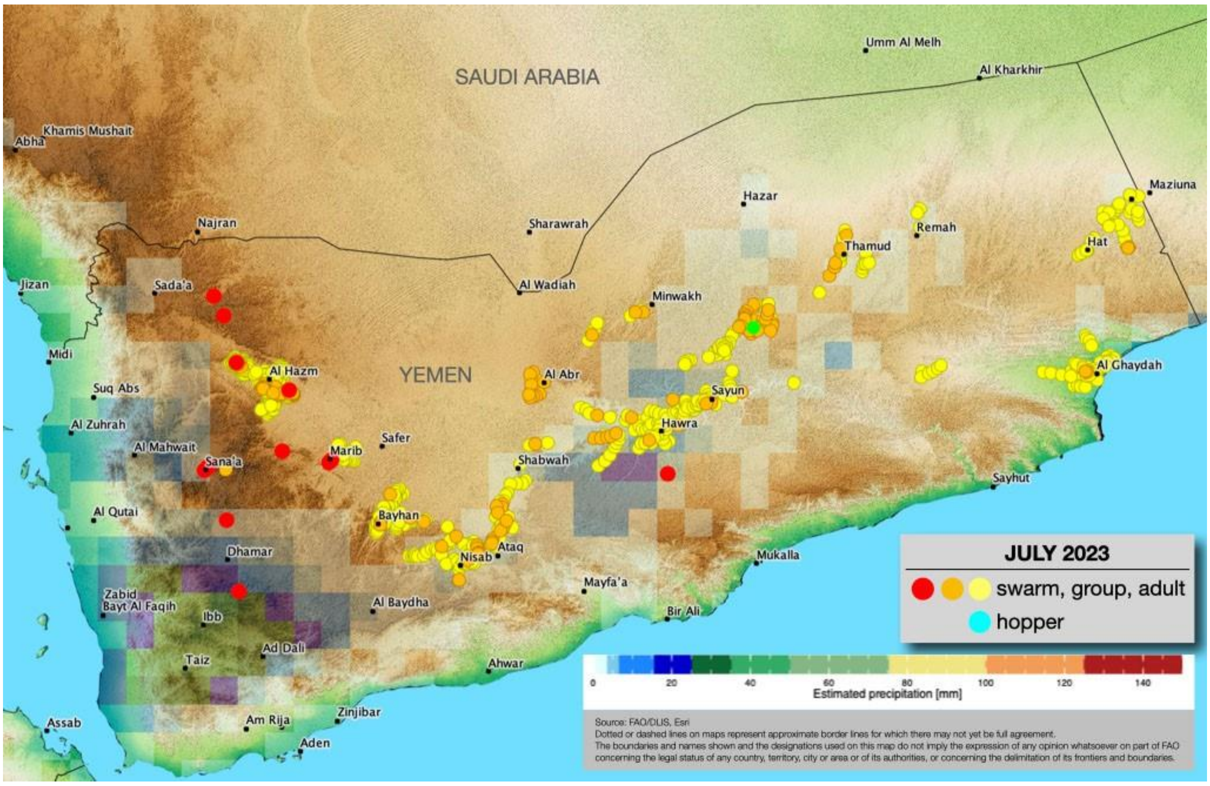

Figure 5.1. Desert Locust situation in July 2023

In the western sector, adult locusts were sighted in the northern Sahel of Mauritania, where the initial summer generation of hoppers emerged in the latter part of the month. A limited number of adult locusts were also noted in Niger. Spring control operations concluded in Morocco, resulting in only a small presence of adult locusts in Algeria. The onset of the southwest monsoon was experienced in the Indo-Pakistan region, where a small number of adult locusts were present.

As for the forecast, favorable rainfall is expected in the northern Sahel region from Mauritania to western Eritrea. This will lead to minor breeding activities accompanied by scattered hoppers during the months of August and September, followed by fledging after mid-September. In early August, there might be a few small clusters or swarms in northern Ethiopia. According to model predictions, limited rainfall is anticipated in the summer breeding areas of Yemen and Indo-Pakistan.

Floods events

China: Typhoon Doksuri and Khanun have made a powerful impact on China's north-eastern provinces: Heilongjiang, Jilin, and Liaoning. These provinces play a crucial role in China's agricultural output as they are known as the nation's main sources of grain. The increasing frequency of extreme weather events is causing serious concerns in China's agriculture sector. This trend is pushing Beijing to prioritize self-sufficiency, which has become even more important due to disruptions in the global market stemming from the Russia-Ukraine conflict.

Heilongjiang's Wuchang City, renowned for producing the highest quality rice in the nation, has not been spared from the recent impact of the typhoon. China's Ministry of Emergency Management reported that flooding has affected more than 2,720 hectares (6,721 acres) of its farmland, including 2,436 hectares of rice, as of Friday. **Figure 2** shows some of the impacted cropland in Shulan City, Jilin province. This continuous downpour has led to more than 15,000 hectares of productive agricultural land being submerged. Meanwhile, in the mountainous western outskirts of Beijing, an extended period of heavy rainfall has caused significant damage.

Figure 5.2 Impacted cropland in Shulan City, Jilin province
(Source: https://www.theguardian.com/world/2023/aug/07/china-floods-rain-weather-deaths-jilin-province-shulan-city)

India: With data from CropWatch's agronomic indicators revealing an increase in national rainfall compared to the average of the past fifteen years by 4%, North Lakhimpur experienced a notable downpour of 164 mm within a 24-hour span by June 15th. This led to the Singra River overflowing its banks, causing flooding in Nowboicha Town within the Lakhimpur District. Substantial impacts on the lives of Indian citizens have been documented.

Given that the heavy rainfall has caused damage to recently planted crops intended for winter harvesting, India has taken the step of halting the export of non-basmati varieties of rice. The retail prices of rice have risen by 3% in June alone and by 11.5% over the past year. Considering these developments, the government aims to curb food inflation by reserving a larger portion of the grain supply for the domestic market.

Drought

Situation in the Maghreb Region: The Maghreb region has been grappling with an continuing drought in recent years, and its profound repercussions are notably affecting crop yields. In contrast to historical trends, the forthcoming crop harvest in the region is anticipated to fall significantly below the established average. The intensity of the drought had escalated particularly in late March and early April, hampering the photosynthesis process of winter cereals since the flowering stage.

Afghanistan: Afghanistan has been experiencing below-normal rainfall since October 2020. These conditions have affected the accumulation of snow during the winter season, which is critical for water access during the spring and summer agricultural seasons. This persistent drought across Afghanistan is taking its toll on farmers, and its economy - a third of which is generated by agriculture, and food security. The drought situation in the country is exacerbated by climate change which leads to intensifying pressure on water resources. This situation has left nearly 20 million people in a state of food insecurity during the least productive season of 2023. However, recent reports from the WFP indicate that by October 2023, this number may decrease to 15.3 million (including 2.8 million people in Integrated Food Security Phase Classification (IPC) Phase 4 aimed at sustained humanitarian assistance.

Argentina: During the summer of 2022-20023 an unprecedented drought intensified causing extensive crop failures and a macro-economic crisis. This period of abnormally low precipitation was the outcome of a 3 consecutive La Niña events worsened by frequent and strong heatwaves. While its impact upon crop production has not been accurately estimated yet, the idea that crops were decimated by the drought is widespread. We contend that the description of the spatial variation in the drought magnitude and of its impacts upon crops contributes to identify differences in management practices and environmental factors that may improve Argentinean agriculture resilience to climate change. Therefore, here we sought to map drought severity and its impacts on extensive grain crops performance using standard satellite remote sensing products.

Our study area encompassed ca. 33 Mhas as mapped by the National Crop Type Map produced yearly by INTA. Climatological drought was characterized by means of the standard Palmer Drought Severity Index generated by the University of Idaho [1] and accessed through the Google Earth Engine platform. Agricultural drought was quantified through the ratio of evapotranspiration to potential evapotranspiration (ET:PET) taken from the MOD16A2 product at 500m and 16 days spatiotemporal resolution. Finally, the temporal dynamic of the NDVI from the MOD13A1 product was used as a proxy for crop performance. Both, ET:PET and NDVI, were standardized on a 16 day basis (i.e. 2022 observations were subtracted to the mean of 2001-2021 for that 16 days interval and divided by the standard deviation).

Preliminary results showed that the difference between 2022 and the mean of 2001-2021 PDSI averaged over all cropland area amounted to -5,48 (standard deviation: 0,25) almost doubling the -3 threshold usually assumed to represent severe to extreme drought (Figure. 3). The temporal dynamics over the year 2022 of the standardized ET:PET ratio and NDVI differed among regions. Both, agricultural drought conditions and the crop radiation interception were the lowest –except for a short summer period- in the cold southern Pampa as evidenced by the ET-PET and NDVI aggregated over the Tres Arroyos county (Figure 3).

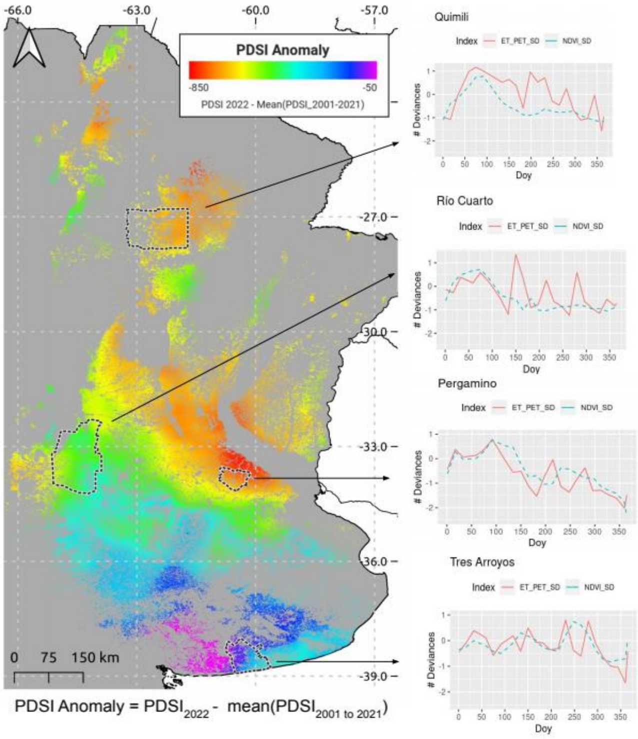

Figure 5.3 Climatological drought assessed by the PDSI anomaly over overall croplands of Argentina. Insets: Standardized ET:PET and NDVI time series for 4 distinct agricultural counties.

Contrarily, Pergamino, a county located in the main agricultural area of Argentina, experienced severe reduction in crop ET and radiation interception with only a short fallow period, centered around day of year 100, of above normal conditions. The rest of the year the drought and its impacts intensified reaching -2 standard deviation from the 2001-2021 means. In turn, Rio Cuarto, one of the most important maize producing counties, displayed mild drought conditions –and its concomitant crop impacts, neither exceeded the -1 standard deviation - albeit being located to the west were precipitation are lower than Pergamino. Finally, Quimilí (Moreno) county in the warmer Santiago del Estero province, drought conditions developed over the second half of the 2022 where croplands were fallowing.

These results agree with our observations through periodic crop surveys and with recent studies. Particularly, there is evidence that the shallow water table significantly contributes to crop ET to the mid-west of the Argentinean croplands (as observed in Rio Cuarto) and thus may have alleviated the effects of low precipitation. On the other hand, in Pergamino and the surrounding counties of the Rolling Pampas cover crops as well as double cropping are frequent and may underlie the acute drought effects therein.

5.3 Update on El Niño

According to the Australian Bureau of Meteorology, predictions for the El Niño – Southern Oscillation (ENSO) are at El Niño ALERT status. Sea surface temperatures (SSTs) in the tropical Pacific have exceeded the threshold for an El Niño event and climate models suggest this is likely to persist at least until the end of this year.

Figure 5.3 shows the progression of the standard Southern Oscillation Index (SOI) over the past 12 months from July 2022 to July 2023. The SOI has remained in negative territory and at low values over the past four months, dropping to -18.5 in May. The average SOI for the past two months has been -7 or lower. While the SOI is an important indicator for tracking tropical pressure changes, a broader range of atmospheric and oceanic conditions need to be considered when assessing ENSO status. This includes winds, cloud, ocean currents, surface and sub-surface ocean temperatures, and the outlook over the next few months.

Figure 5.4 Monthly time series of the SOI-BOM from July 2022 to July 2023(Source: http://www.bom.gov.au/climate/enso/soi/)

Another commonly used measure of El Niño is called the Oceanic Niño Index (ONI). Figure 5.4 shows the progression of several ONI values and their locations. In June 2023, the values for the three key NINO indices were: NINO3 1.33° C, NINO3.4 0.89° C, NINO4 0.67° C. The May and June data indicate the gradual warming of the tropical Pacific with sea surface temperatures approaching or exceeding historical averages.

In June 2023, sea surface temperatures (SSTs) across almost all the tropical Pacific equatorial region were above average. The anomalous warmth in the eastern tropical Pacific was more than 4° C above average, with positive anomalies extending to the far eastern areas near the South American coast.

Closer to Australia, the Coral Sea continued to experience anomalously warm SSTs, more than 1.2° C above average for much of the region. Warm SST anomalies also persisted in the southern Tasman Sea, extending from southeast of Australia to around the south of New Zealand's South Island. Cool anomalies less than 1.2° C below average remained around the western Australian coastline.

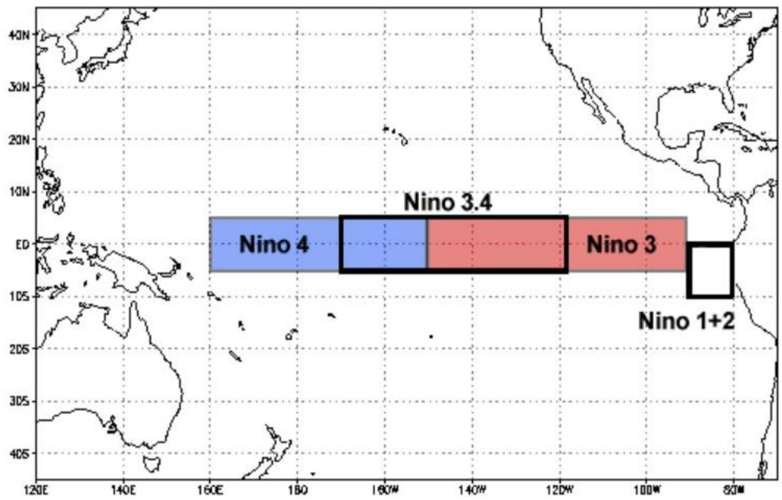

Figure 5.5 **NINO Region Distribution Map（Source: https://www.ncdc.noaa.gov/teleconnections/enso/sst）**

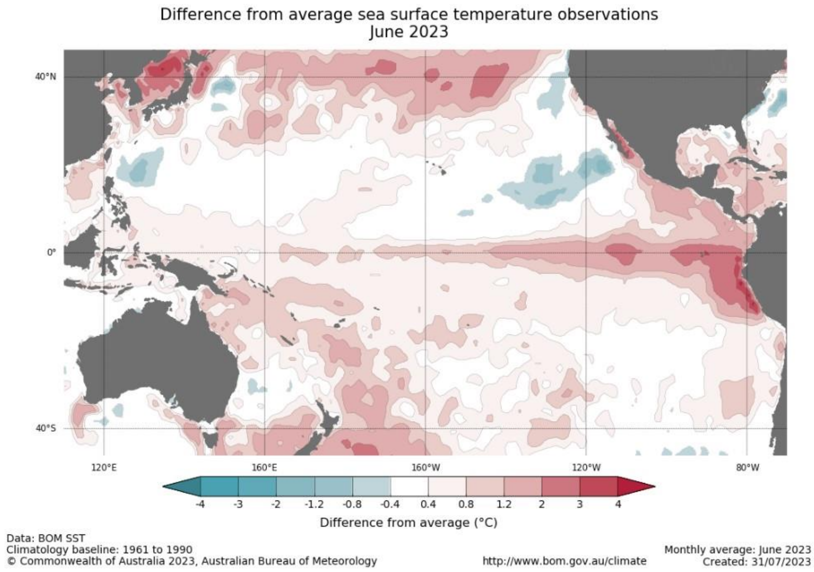

Figure 5.6 Monthly temperature anomalies for January 2023 (Source: http://www.bom.gov.au/climate/enso/wrap-up/#tabs=Sea-surface)

In summary, the tropical Pacific is currently undergoing a warming phase during the southern hemisphere winter. Central and eastern Pacific SSTs are currently above El Niño thresholds. Climate models indicate the central and eastern tropical Pacific may warm further. All surveyed models indicate temperatures will remain above El Niño thresholds at least until the end of this year. If the atmosphere responds to this warming, El Niño is likely to occur.

If the emerging El Niño intensifies as predicted, its effects are likely to be felt across many global regions. An El Niño typically brings drier conditions to parts of Australia, Southeast Asia and southern Africa, increasing risks for agricultural production and wildfires. Wetter than usual weather is expected in South America, the southern U.S. and East Africa, which could lead to flooding concerns. The position of the jet stream over the Pacific and cyclone activity may also be impacted.

Table 5.2 ONI (° C) Anomaly Values from May 2023 to June 2023(Source: https://www.cpc.ncep.noaa.gov/data/indices/sstoi.indices)

Year	Month	NINO3	NINO3.4	NINO4
2023	5	+1.02 °C	+0.53 °C	+0.39 °C
2023	6	+1.33 °C	+0.89 °C	+0.67 °C

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