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 2021 (section 5.1), as well as sections on recent disaster events (section 5.2), and an update on El Niño (section 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 43 major producers and exporters are estimated and predicted for 2021.

Production estimates

In 2021, total production of major cereal and oil crops globally is estimated to be at 2,882 million tonnes, a decrease by 0.4%, equivalent to 10.3 million tonnes. Maize production is estimated at 1,077 million tonnes, an increase of 0.6% or equivalent to 6.9 million tonnes; global rice production is at 764 million tonnes, an increase of 0.5% or an increase of 3.5 million tonnes; global wheat production is 720 million tonnes, a 2.4% decrease or 17.7 million tonnes drop from 2020, due to the consistent drought impact in North America and Western Asia. The global soybean production is estimated to be at 320.78 million tonnes, a decrease by 0.9%.

Table 5.1 2021 cereal and soybean production estimates in thousand tonnes. Δ% is the percentage of change of 2021 production when compared with corresponding 2020 values.

	Maize		Rice		Wheat		Soybean	
	2021	Δ%	2021	Δ%	2021	Δ%	2021	Δ%
Afghanistan					3905	-25		
Angola	2623	-11.4	45	-1.9				
Argentina	53440	-1.1	1901	-1.9	17674	12.3	51608	-1.9
Australia					29577	-2.1		
Bangladesh	3930	0.8	48100	4.5				
Belarus					3029	-2		
Brazil	83345	-4.8	11851	2.4	7337	17.7	96300	-4.7
Cambodia			9940	-1.8				
Canada	12149	1.8			28777	-15.2	7845	2.3
China	229703	1.6	202956	0.9	127981	0.7	14346	-1.6
Egypt	5864	-4.2	6487	-4.5	11466	-4.9		

	Maize		Rice		Wheat		Soybean	
	2021	**Δ%**	**2021**	**Δ%**	**2021**	**Δ%**	**2021**	**Δ%**
Ethiopia	6751	-2.6			3607	-2.3		
France	15573	7.9			35663	2.4		
Germany	4995	3.4			26223	-1.6		
Hungary	5683	-10.3			4942	-5.2		
India	18242	-1.9	181939	0.9	93439	-2.5	12996	11.5
Indonesia	16731	0.5	66353	2.2				
Iran			2453	-16.5	12678	-22.9		
Italy	6292	-2.4			7750	-0.9	1471	-9
Kazakhstan					11235	-12.7		
Kenya	2285	-20.9			292	-7.9		
Kyrgyzstan	617	-12.8			528	-15.6		
Mexico	24690	3.9			3436	-20.3	888	2.6
Mongolia					316	13.2		
Morocco					9024	43.2		
Mozambique	2102	4.1	399	4.5				
Myanmar	1897	1.1	24873	-2.8				
Nigeria	10374	2.9	4272	1.9				
Pakistan	5511	-1.8	11355	-1.1	26492	-3.7		
Philippines	7082	-0.9	20542	-1				
Poland					10792	0.4		
Romania	12945	1.1			8002	8		
Russia	13583	-1.7			53934	-3.1	3582	-4.7
South Africa	11459	-2.6			1820	6.2		
Sri Lanka			2525	0.5				
Thailand	4243	1	40344	-0.7				
Turkey	6366	-2.6			16809	-13.1		
Ukraine	35947	28.7			24122	9		
United Kingdom					12875	1.2		
United States	381103	1.8	11332	-3	51892	-2.7	104713	0.2
Uzbekistan					7508	-17.6		
Vietnam	5381	-0.4	46612	-0.5				
Zambia	3586	4			223	16.4		
Total	994491	1.4	694281	0.6	653348	-2.3	293748	-1.5
Global	**1077184**	**0.6**	**764019**	**0.5**	**720382**	**-2.4**	**320365**	**-0.9**

Affected by persistent hot and dry weather in Northwestern North America, Brazil, Central Asia, West Africa, and Southern Africa, global rice, wheat, and soybean production is expected to reduce. Global maize production in 2021 is expected to be 1.082 billion tonnes, an increase of 1.1%, 11.3 million tonnes. Global rice production is expected to be 751 million tonnes, a decrease of 1.3%. Global wheat production is expected to be 711 million tonnes, a 3.7% decrease of 26.99 million tonnes; global soybean production is expected to be 321 million tonnes, a 0.9% decrease.

Maize

In the United States, the world's largest maize producer, the major producing areas experienced abundant rainfall since late July, effectively alleviating early drought conditions in the northern corn belt. Maize production reached 381 million tonnes, an increase of 6.83 million tonnes (up by 1.8%). Maize production in the U.S. corn belt in Illinois, Iowa, Idaho and Indiana, as well as Nebraska and Kansas increased. The agro-meteorological conditions were favorable during the maize growing period in Ukraine. Regular rainfall befitted crop growth, prompting the recovery of maize yields from the reduced production in 2020. Coupled with the increase in maize planted area, Ukraine's maize production reached 35.95 million tonnes, an increase of 8 million tonnes or up by 28.7%. Maize production in France, Mozambique and Zambia also increased by more than 4%. Kenya (-20.9%), Kyrgyzstan (-12.8%), Angola (-11.4%), Hungary (-10.3%), Brazil (-4.8%) and Turkey (-2.6%) suffered from persistent drought during the maize reproductive period and maize production decreased. Ethiopia was affected by desert locusts, conflicts and other adverse factors. Its maize production shrank by 2.6%. The output of the remaining major maize producing and exporting countries is comparable to 2020. They have a small impact on the change in total global maize production.

Rice

Asian rice production dominates the world with most rice grown in areas with abundant rainfall or well-developed irrigation facilities. Inter-annual fluctuations in rice production are generally smaller than those of the other three major crops. China, India and Indonesia are the world's three largest rice producers, the overall rice production situation is favorable. Production increased by 1.78 million tonnes, 1.66 million tonnes and 1.44 million tonnes respectively. Agro-climatic conditions in Thailand and Vietnam are in general at average level, and rice production was slightly reduced. Affected by severe drought, Iran's rice production decreased significantly by 16.5%. Myanmar was also affected by drought and rice production was reduced by 2.8%. Rice production in Brazil, Nigeria, Mozambique have increased, while rice production in Argentina, the United States, Egypt, Angola and some other countries decreased slightly. Overall, the global rice production and supply situation is stable.

Wheat

In most spring wheat production countries wheat yields decreased due to below average rainfall, resulting in significantly reduced wheat production in Afghanistan (-25.0%), Iran (-22.9%), Uzbekistan (-17.6%), Kyrgyzstan (-15.6%), Canada (-15.2%) and Kazakhstan (-12.7%). Russia's wheat also experienced decreased rainfall and wheat production was reduced by 3.1%. In the southern hemisphere, the drought in the central region of Brazil continues. Severe drought

conditions resulted in a decline in wheat yields nationwide, but the impact of the drought on wheat production is limited in central Brazil as wheat is all irrigated in this region. On the other hand, a significant increase in planted area contributed to a 17.7% increase in wheat production. Despite the widespread drought in South Africa, the drought mainly occurred in the main producing areas of summer crops, while the wheat production areas located in the Mediterranean climate zone in the southwest of South Africa experienced overall normal conditions. Both wheat yield and planted area have increased, prompting the wheat production of South Africa to increase by 6.2%. Morocco, Argentina and Zambia wheat yield increased significantly from the severe drought in 2020, and wheat production increased by 43.2%, 12.3% and 16.4%, respectively. Overall, the global wheat supply situation is basically normal.

Soybean

The widespread hot and dry weather in South America led to a decline in soybean production in Brazil and Argentina to 96.3 million tonnes and 51.61 million tonnes, a decrease of 4.74 million tonnes and 0.98 million tonnes respectively. The U.S. soybean planted area increased by 0.4%, prompting its soybean production to increase by by 0.2% to 104.7 million tonnes. Canada's soybean production area received regular rainfall. Its soybean production increased by 2.3%. India's soybean planted area and yield increased simultaneously, prompting India's total soybean production to increase by about 11.5% or 1.34 million tonnes from the previous year. Russia was affected by drought conditions and soybean production decreased by 4.7%. Overall, total global soybean production decreased slightly by 0.9%, which is expected to have a limited impact on the international soybean supply situation and global soybean market remains stable.

5.2 Disaster events

Several disasters are impacting human health, the economy, and food production chains worldwide. This report discusses the main disasters and their negative impacts.

Floods

During August and September 2021, floods hit several regions globally, such as in Africa (DR Congo, Sudan, Benin, Niger, Ghana, South Sudan, Uganda, Guinea, Nigeria, Chad) and in Europe (Turkey, Germany, Austria, Italy, Sweden, Russia, France, and Spain), causing the death and displacement of many citizens, in addition to the massive destruction in infrastructure and resources. In Niger, the severe floods that occurred in late August had caused over 60 deaths and affected 100,000 people, when 413 villages were flooded and thousands of homes mostly in the Maradi Region were destroyed. While in Sudan, the intensive rains during the period from 24 to 31 August, caused the rise of Nile River levels and flooding in 12 States, where the River Nile State was the hardest hit. The floods have affected 60,000 People and destroyed 3,800 homes nationwide. South Sudan has also been suffering severe floods since May this year. The floods have affected more than 380,000 people in 6 states from late August to September, where Unity State was the hardest hit.

(a) (b)
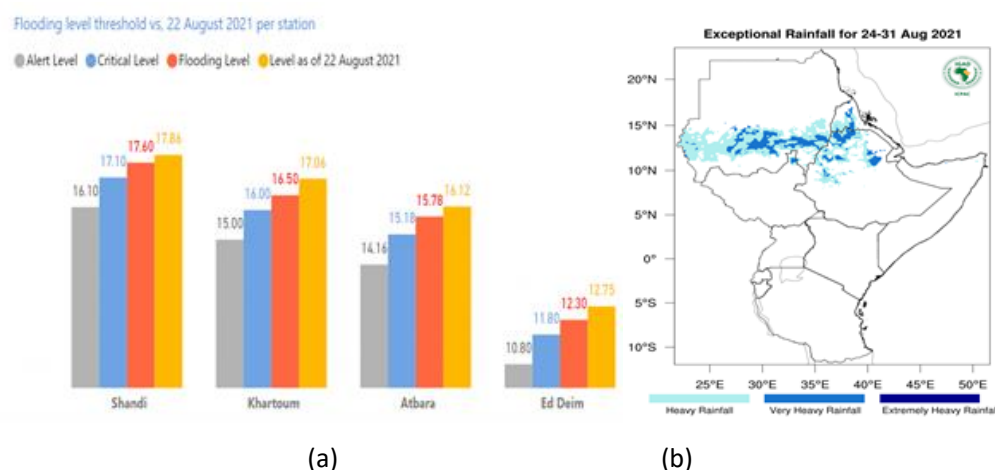
Figure 5.1 a) Nile River levels in Sudan on 22 August 2021 (Image via UN OCHA), and b) Rainfall forecast Sudan Ethiopia in August 2021 (Image: IGAD).

In Chad, driven by an uneven rainy season in 2021, floods affected 250,000 people across 400 villages during September. Fifteen people have lost their lives, 17 were reported missing, and a total of 329 people have been injured. Tandjilé Region was the worst affected, where 32,181 houses have been damaged and 160,000 people were left with no shelters. Thousands of livestock have been lost due to floods and almost 70,000 hectares of crops were damaged or destroyed, in particular sorghum, maize, peanuts, sesame, pearl millet, and cotton. In Nigeria, over 100,000 people have been directly affected by flash floods that occurred in August in Adamawa State of northeastern Nigeria, including the state capital Yola, as reported by the UN.

In Europe, and more particularly in Turkey, floods severely impacted people's life. In Turkey, 77 people were reported dead and 34 still missing due to the flooding that began after heavy rainfall on 10 August, including 26 people Bozkurt district in Kastamonu Province, which was the hardest hit by the floods.

(a) (b)

Figure 5.2 a) Flood damage Bozkurt, Kastamonu, Turkey, in August 2021 (Photo source: Ministry of Interior), and b) Flood rescues Black Sea Region, Turkey, August 2021 (Photo source: General Directorate of Security, Turkey).

In October 2021, floods continued to threaten Africa (Cote d'Ivoire, Algeria, Tunisia, and Italy), Europe (Slovenia and Italy), and severe floods hit Asia (India, Indonesia, China, Philippines, Vietnam, Oman, and Nepal) and Americas (Colombia, Mexico, Ecuador, Guatemala, and USA). In Shanxi Province, in north China, the unusually heavy rains from 02 to 07 October in this relatively dry region caused the rise of water levels of main rivers, including the Yellow River, China's second-longest river, leading to severe flooding in Yuncheng. As a result, a total of 1.76 million

people were affected by the intensive floods that hit the province in October 2021, and more than 120,000 people were forced to move from their homes. As reported by local media, 5 people lost their lives and 17,000 homes were severely damaged or destroyed. Besides, the heavy rain has also caused severe damage to crops (190,000 hectares) and infrastructure, since a section railway track was washed away by floodwaters in Qixian County on 07 October.

Figure 5.3 The flood-affected Yellow River beach near Lianbo village in Hejin city, North China's Shanxi province as captured by an Aerial photo on Oct 10, 2021.

Henan was another province in China that has also been severely affected by flooding since mid-July 2021. The rainfall amount observed in Zhengzhou, the provincial capital, in an hour reached a record-breaking amount of 201.9 millimeters. Local authorities reported that 302 people died, 50 more were missing, 815,000 people were evacuated, 1.1 million were relocated, and 9.3 million people were affected. Henan grows about 25% of China's wheat and 10% of China's corn. By the time of flooding, the crops remaining in the field (to be harvested in autumn) were approximately 50% corn and 15% peanut. As reported by provincial authorities on August 2, 2021, about 13% of the fall crop area (1,017,100 hectares) has been impacted and about 6% of the area (605, 500 hectares) had been impacted moderately (expected loss of yield greater than 30%).

CropWatch shows that heavy rainfall in July in Henan caused severe flooding and led to the crop failure of 540,000 acres of maize and 470,000 acres of other summer crops in Hebi and other regions. Several rounds of heavy rainfall weather, continued flooding and low sunshine led to a 2.6% year-on-year decline in yield per acre and 3.4% year-on-year decline in maize production in Henan province. Shanxi and Anhui was also affected by excessive rainfal, and the maize production fell 4.1% and 1.5% respectively.

Besides crop impacts, the flooding hit livestock operations. It has been reported that rains swamped 1,678 larger-scale farms and killed more than 1 million animals, mostly chickens, across the province.
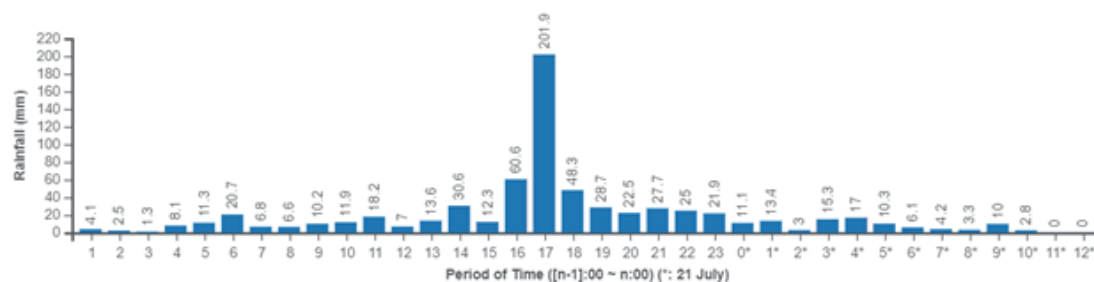
Figure 5.4 Hourly rainfall in Zhengzhou, from 0:00 on 20 July to 12:00 on 21 July 2021.
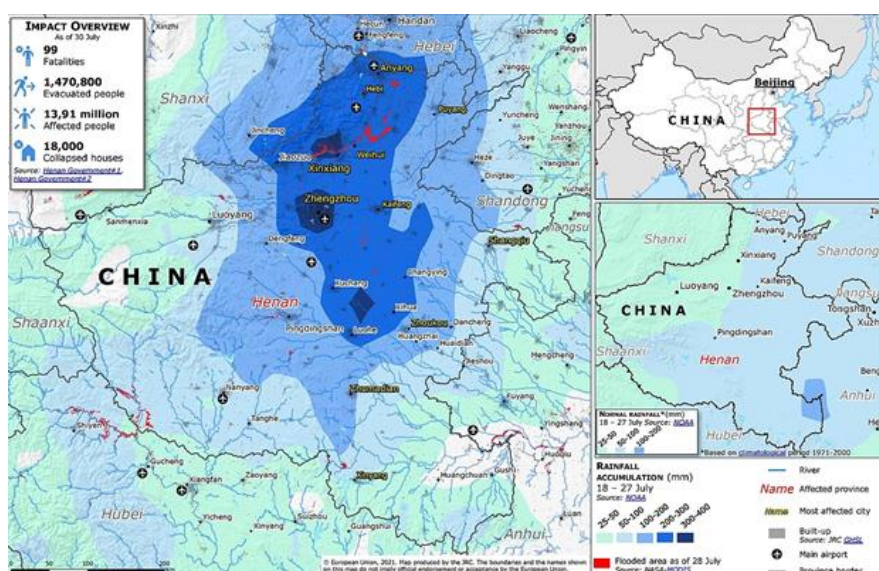

Figure 5.5 Heavy rainfall and floods occurred in Henan Province, China, in Mid-July 2021, (ECHO/European Commission - https://erccportal.jrc.ec.europa.eu/ECHO-Products/Maps#/maps/3780).

Drought

In California, USA, the drought this summer was the worst on record due to the warmer temperatures and the lack of precipitation that increase the plant's water demand. Based on the Palmer Drought Severity Index, July 2021 was the driest month on record in California since records began in 1895. June, July, and August were three out of the state's five driest months on record. Hence, the local authorities formally urged all Californians to reduce their water use by 15 percent. Because the drought conditions during the summer in California has become common, farmers have increasingly turned to those higher-value tree crops that turn every drop of water into a lot of money compared with other crops. Moreover, some farmers are forced to leave parts of their lands as fallow due to the limited water resources.

California Palmer Drought Severity Index (PDSI)
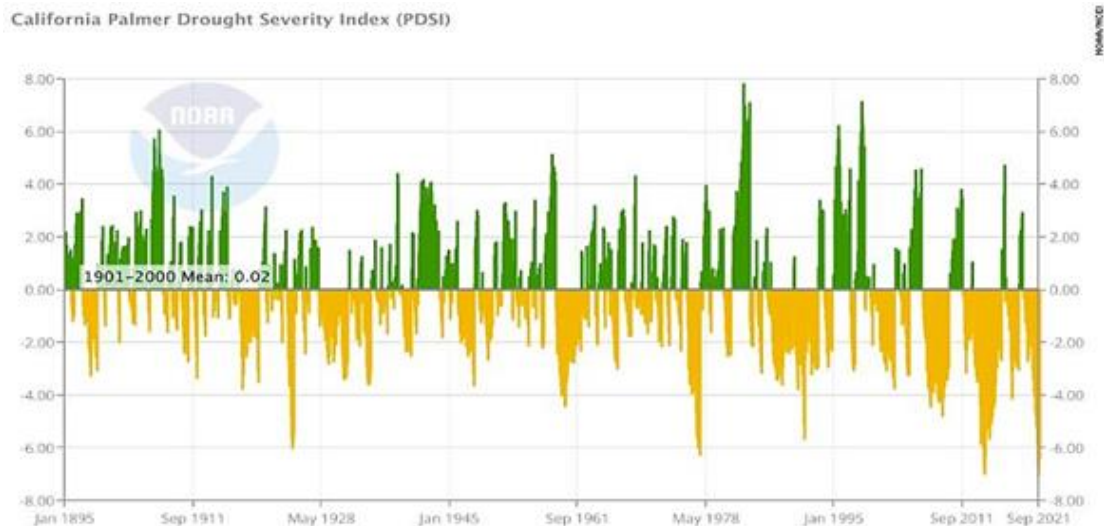
Figure 5.6 PDSI time series for every month from January 1895 to September 2021. A more negative value indicates a worse drought (Source: https://edition.cnn.com/2021/10/14/us/california-summer-drought-worst-on-record/index.html).

In Diyarbakir Province, Turkey, the cultivation of summer crops was delayed due to the lack of rainfall. Low production was estimated. In central Asia, drought was the main driver of rising food prices. In **Kazakhstan**, central Asia, severe drought conditions were observed during the summer in six of the country's 14 provinces: Aqmola, Aqtobe, East Kazakhstan, Mangistau, Kyzylorda, and Kustanay. Water levels in many small reservoirs and rivers were at less than half their normal amount in June. For saving more water, local officials In Kyzylorda reduced the number of rice fields under cultivation this year. Moreover, Kazakh officials reported more than 2,000 animals, most of them were horses, had died for lack of water and food in Kyzylorda and Mangistau provinces. Farmers in Chui Province, Kyrgyzstan, demanded that state action be taken to save their crops. The price of hay in Kyrgyzstan increased by 50% in the second week of June. Local authorities promised in Kyrgyzstan to bring in hay and water from other areas of the country and dig more wells in Mangistau. In Tajikistan, many farmers reported the lack of grass due to the rainfall shortage to feed animals in the Yavan district. While in Turkmenistan's eastern Mary and Lebap provinces, cotton fields were totally dried up due to high summer temperature with water and fertilizer shortage. Afghanistan is also facing the second drought in four years and consequent water scarcity impacting a third of the country. In September and October 2021 (the post-harvest season), nearly 19 million people in Afghanistan experienced high levels of acute food insecurity, with a 30% increase from the same season last year. The situation is exacerbated by the conflict and subsequent change of government. With another La Niña event on the horizon, threatening to extend this year's drought into 2022, immediate support has become crucial to meet the most basic humanitarian needs as Afghans confront a winter with no jobs, cash, or prospects.

Wildfires

Forest fire is the main driver of the high deforestation rate in Brazil's Amazon rainforest. Satellites registered 28,060 fires in the Brazilian Amazon in August, a decline of 4% compared to the same month in 2020 when fires likely hit the highest point in a decade, according to Brazil's national space research agency (INPE). Deforestation in Brazil's Amazon rainforest has reached a 15-year high this year. INPE estimated that 13,235 square kilometers of the forest were lost

between August 2020 and July 2021, with a 22% increase from the previous year. The states of Pará, Amazonas, Mato Grosso and Rondônia saw the most deforestation during the 2020-21 period. To fight against the high deforestation rate, some governments have signed an agreement at the COP26 climate summit pledging to end deforestation by 2030.

In the United States, local officials reported that the burnt area was over 6.5 million acres during the last summer season of 2021. The fires were particularly intensive in the American west, where the wildfires have started earlier this year, burned more intensely, and scorched swaths of land larger than ever before. California State experienced the largest fire on record, named the Dixie fire. Over the last four years, California experienced more than half of the 20 largest fires in the state's history. The two main drivers of the high wildfire frequency and intensity in California are drought and heatwaves. Although the two factors were always a natural part of the western landscape, they play crucial roles in driving bigger blazes lately.

In Canada's western provinces, multiple fires threatened populated centers in Alberta, Saskatchewan, and Manitoba during the wildfire summer season. As of Sept. 15, the Canadian Interagency Forest Fire Centre (CIFFC) reported 6,317 wildfires that had burned 10.34 million acres (4.18 million hectares).

In Algeria, wildfires have been affecting the Kabylia Region in northern Algeria since 9 August. More than 70 fires have occurred in 13 prefectures in the north of the country. More than 40 people have died as a result of the fires, according to media reports. Fires raged in north and north-east of Algeria overnight on Monday 9 August 2021. The Algerian Government has requested assistance from the international community in response to the fires, including through the EU Civil Protection Mechanism on 11 August. On 25 October, the Algerian Government launched a national tree-planting campaign for 19 million trees across the affected government by the fires, in addition, the Government launched an online platform for rehabilitation of forests affected by the recent fires in order to enable citizens and civil society organizations to participate and volunteer in this program.

Desert locusts

East Africa is dealing with the worst desert locust invasion in 25 years. The situation in the Horn of Africa and Yemen was relatively calm during the period (August - October) compared to last year. A few spring-bred swarms remaining in northeast Somalia matured and laid eggs that hatched and new hopper bands started forming. As observed by FAO, some of these swarms moved to northwest Somalia and eastern Ethiopia with at least one small swarm nearly reaching the Kenya border on unusually strong and persistent northerly winds at the end of October. The future movement of swarms is highly dependent on rainfall and the success of survey and control operations. Due to insecurity in both Ethiopia and Yemen, control operations against immature swarms were not possible or limited. Consequently, a few swarms are likely to migrate to the Red Sea coast for winter breeding and more hopper bands are expected to form in north Somalia and extend to eastern Ethiopia and perhaps central Somalia, and reach northern Kenya in the coming weeks. In central and western Africa, the situation remained calm, where only scattered adults were present in Niger and Chad from summer breeding. The below-average rainfall (RAIN -5%) is conducive to curb the reproduction of desert locusts
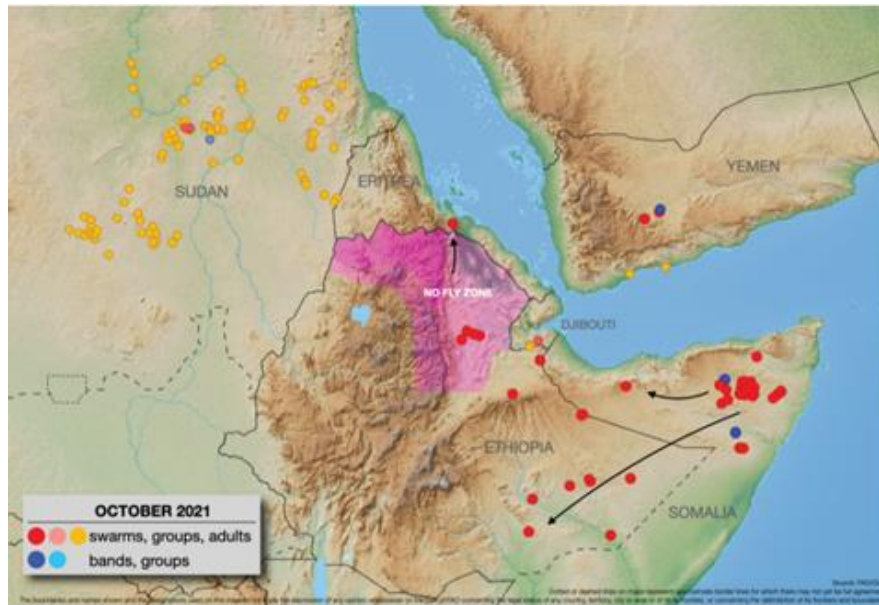
Figure 5.7 The distribution and movement of desert locusts in October 2021, as observed by FAO (https://www.fao.org/ag/locusts/common/ecg/1914/en/DL517e.pdf).

Covid-19

Since the spread of the new Covid-19 virus was announced as a global pandemic by WHO in March 2020, many countries closed their borders and imposed restrictions on human and goods movement. These restrictions hampered the transportation of food, materials, and labour, which impacted the economy and food production chain. In some countries, human movement restrictions due to the pandemic have resulted in farm-labour shortages, especially for high-value crops and sharecropping farmers. Also, the limited access to agricultural inputs (seed, fertilizer, veterinary inputs, fish fingerlings, and feed), which will likely drive a reduction in crop yields, was also reported. The agriculture and food systems in South Asia demonstrated unexpected resilience, most likely due to the investments in infrastructure and institutions for social transfers and safety nets, as well as the pandemic-related expansion of many of these programs. With the intensive vaccination campaigns in most countries, it is expected that the severity of the restrictions on the movement of people and goods will decrease, which helps in the recovery of the economy to normal levels.

5.3 Update on El Niño

The Australian Government Bureau of Meteorology's ENSO Outlook remains at La Niña ALERT, meaning around a 70% chance of La Niña forming in the coming months. Several climate drivers are combining to produce the current wet outlook for Australia.International climate models have strengthened their forecast likelihood of La Niña forming before the end of the year. However, atmospheric and oceanic observations have yet to consistently reach La Niña levels. The latest tropical Pacific Ocean temperatures, while cooler than average, are at similar levels to a fortnight ago and do not meet La Niña thresholds. Similarly, in the atmosphere, the Southern Oscillation Index (SOI) has eased back slightly from La Niña levels. Regardless of whether La Niña thresholds are met, a La Niña-like pattern in the Pacific may still increase the chances of above-average rainfall for northern and eastern Australia at times during spring and summer.

Figure 5.7 illustrates the behavior of the standard Southern Oscillation Index (SOI) published by the Australian Bureau of Meteorology (BOM) for the period from October 2020 to October 2021. Sustained positive values of the SOI above +7 typically indicate La Niña while sustained negative values below -7 typically indicate El Niño. Values between about +7 and -7 generally indicate neutral conditions. During this monitoring period, SOI decreased from 15.9 in July to 4.6 in August, then increased to 9.3 in September, then decreased to 6.7 in October.

Figure 5.8 shows several El Niño regions. Persistent NINO3 or NINO3.4 values cooler than −0.8℃ are typical of La Niña, while persistent values warmer than +0.8℃ typically indicate El Niño. Values of the three key NINO indices for October 2021 were: NINO3 −0.4℃, NINO3.4 −0.6℃, and NINO4 −0.3℃. There is no La Niña forming, but the risk remains

Sea surface temperature (SSTs) for October 2021 (Figure 5.9) show weak cool SST anomalies were present across much of the central to eastern equatorial Pacific, while generally weak warmer than average SSTs were present in waters around the north of Australia and the Maritime Continent.
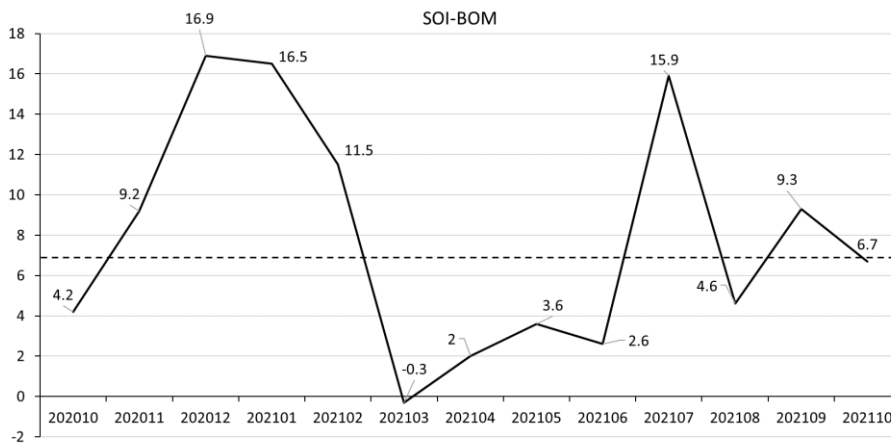

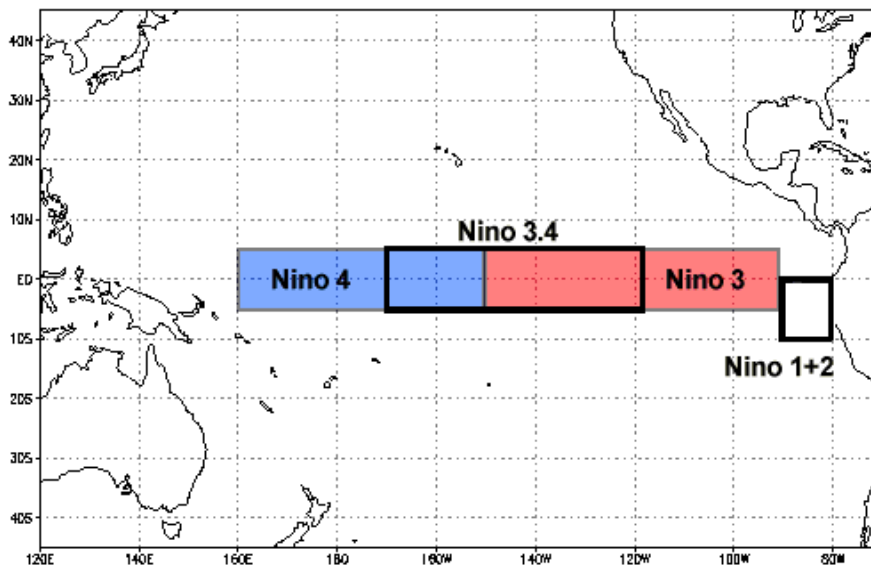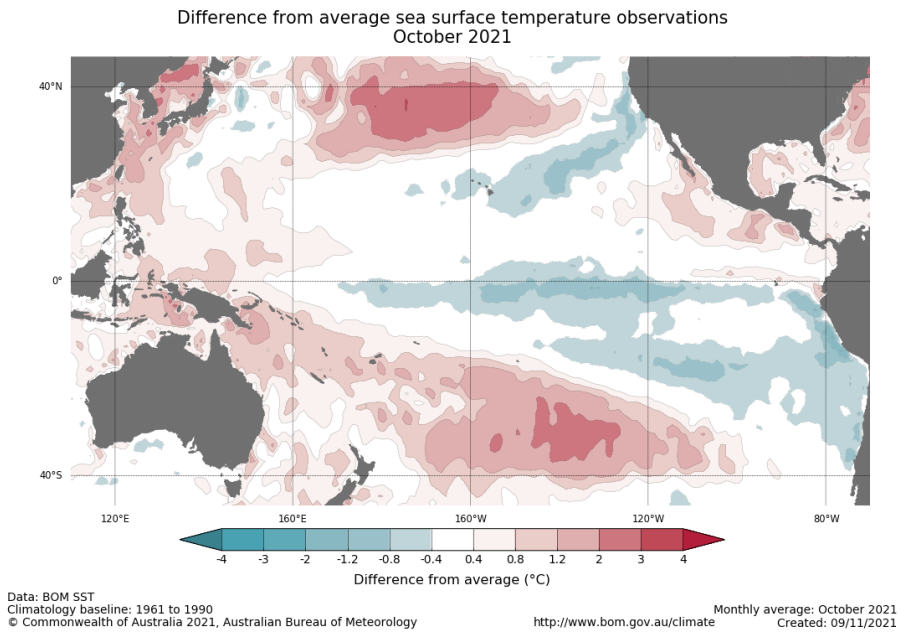**Figure 5.8 Monthly SOI-BOM time series from October 2020 to October 2021(Source: http://www.bom.gov.au/climate/enso/soi/)**

Figure 5.9 Map of NINO Region(Source: https://www.ncdc.noaa.gov/teleconnections/enso/sst)

Difference from average sea surface temperature observations
October 2021

Data: BOM SST
Climatology baseline: 1961 to 1990
© Commonwealth of Australia 2021, Australian Bureau of Meteorology

Monthly average: October 2021
http://www.bom.gov.au/climate
Created: 09/11/2021

Figure 5.10 October 2021 sea surface temperature degree difference from normal conditions (climatology).
(Source: http**://www.bom.gov.au/climate/enso/wrap-up/#tabs=Sea-surface**)**