Chapter 4. China

This chapter starts with a brief overview of the agro-climatic and agronomic conditions in China over the reporting period (section 4.1). Next it describes the situation by region, focusing on the seven most productive agro-ecological regions of the east and south: Northeast China, Inner Mongolia, Huanghuaihai, Loess region, Lower Yangtze, Southwest China, and Southern China (4.2). Additional information on the agroclimatic indicators for agriculturally important Chinese provinces are listed in table A.11 in Annex A.

4.1 Overview

Agro-climatic conditions were quite fair in China from October 2022 to January 2023. Winter wheat sowing was completed in late October. The crop reached the hibernation stage in December. Spring green-up is starting in February. Radiation and temperature had increased by 5% and 0.6°C over the 15YA, respectively. Rainfall was 14% below the 15YA. The lack of rainfall resulted in the below-average potential biomass (-6%). National average of maximum Vegetation Condition Index (VCIx) and Crop Production Index (CPI) is 0.82 and 0.97.

Temperatures in seven of the agroecological zones (AEZs) of China were above average, ranging from 0.1°C (Inner Mongolia) to +1.0°C (Lower Yangtze region). Four of the AEZs received above-average rainfall, the positive rainfall departure ranging from +15% (Inner Mongolia) to +47% (Huang Huaihai), while the remaining three AEZs had below-average precipitation. The potential biomass (BIOMSS) indicator takes rainfall, radiation, and temperature into consideration. In China, rainfall tends to be the most important factor controlling crop growth. Hence, the potential biomass estimates followed the rainfall patterns: Huanghuaihai (+14%), Inner Mongolia (+12%), Loess region (+13%) and Northeast China (+13%) had above-average potential biomass, while the rest of AEZs had below-average potential biomass.

The spatial distribution of the rainfall indicated that 68.3% of the agricultural area (marked in dark green) had near-average rainfall, which was widely distributed across China. Other regions in China went through some fluctuations in rainfall. Excessive rainfall (more than +90 mm/dekad) occurred mainly in early October in southern part of Huang Huaihai and northeastern part of South West China (light green marked regions). Areas marked in blue, located mainly in southeastern part of Lower Yangtze region and eastern part of Southern China, also received largely above-average rainfall (almost +90 mm/dekad) in late November, mainly in some parts of Zhejiang, Fujian, Jiangxi, Hunan, Guangdong, and Guangxi. The temperature profiles indicated that the region marked in dark green, located mainly in the Northeast, had the largest departures from the 15YA, with the biggest positive departure (more than +4.0℃) in middle of November and the biggest negative departure (almost -3.5℃) in early October. However, the summer crops had reached maturity by then and no winter crops are grown in that region.

At the provincial level, only 8 provinces had positive rainfall anomalies, ranging from +10% (Heilongjiang) to +62% (Shaanxi). The negative temperature anomalies were only recorded in Ningxia (-0.1°C). The wet conditions in early October might have caused a delay in winter wheat planting, especially in the Loess and Huang Huaihai regions. Subsequently, conditions were rather favorable and the crops got well established, as can be seen in the above average CALF for Huanghuaihai. Overall, conditions for winter wheat are normal.

Table 4.1 CropWatch agroclimatic and agronomic indicators for China, October 2022 - January 2023, departure from 5YA and 15YA

Region	Agroclimatic indicators				Agronomic indicators	
	Departure from 15YA				Departure from 5YA	Current period
	RAIN (%)	TEMP (°C)	RADPAR (%)	BIOMSS (%)	CALF (%)	Maximum VCI
Huanghuaihai	47	0.5	0	14	10	0.86
Inner Mongolia	15	0.1	-1	12	/	/
Loess region	31	0.5	-3	13	1	0.86
Lower Yangtze	-19	1.0	7	-10	-4	0.84
Northeast China	28	0.3	-3	13	/	/
Southern China	-24	0.6	9	-17	0	0.91
Southwest China	-26	0.7	10	-15	0	0.89

Figure 4.1 China crop calendar

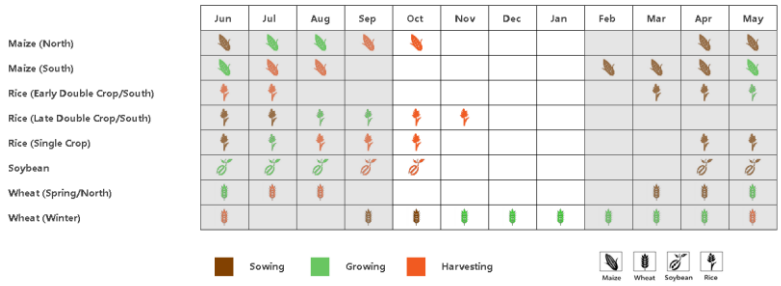


Figure 4.2 China spatial distribution of rainfall profiles, Oct 2022 to Jan 2023

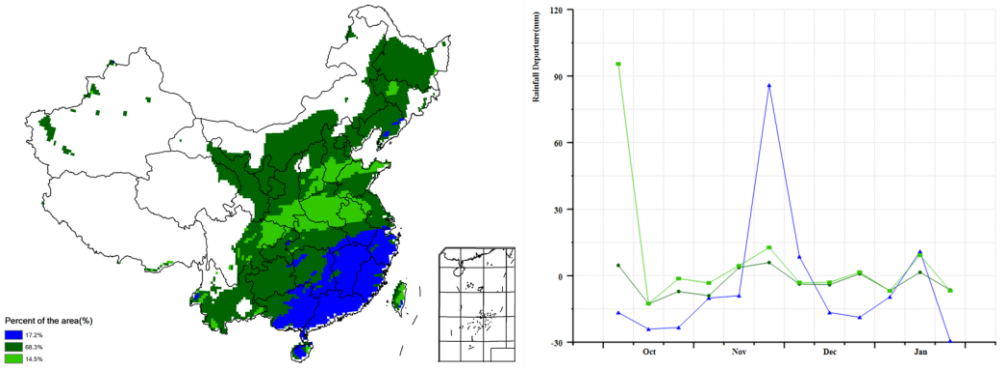


Figure 4.3 China spatial distribution of temperature profiles, Oct 2022 to Jan 2023

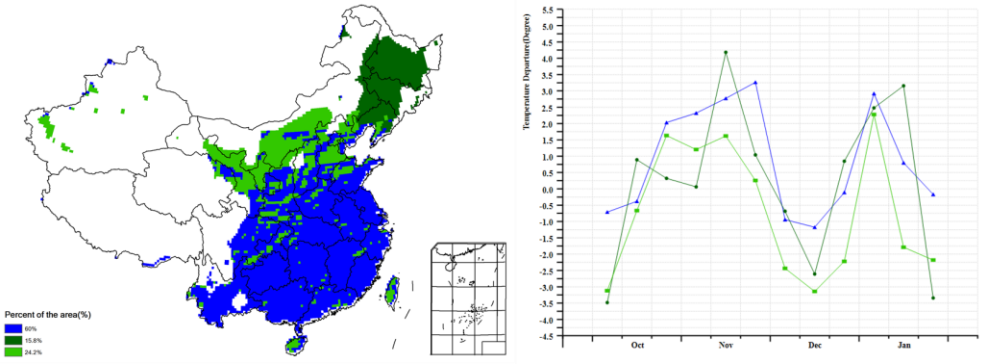


Figure 4.4 China cropped and uncropped arable land, by pixel, Oct 2022 to Jan 2023

Figure 4.5 China maximum Vegetation Condition Index (VCIx), by pixel, Oct 2022 to Jan 2023

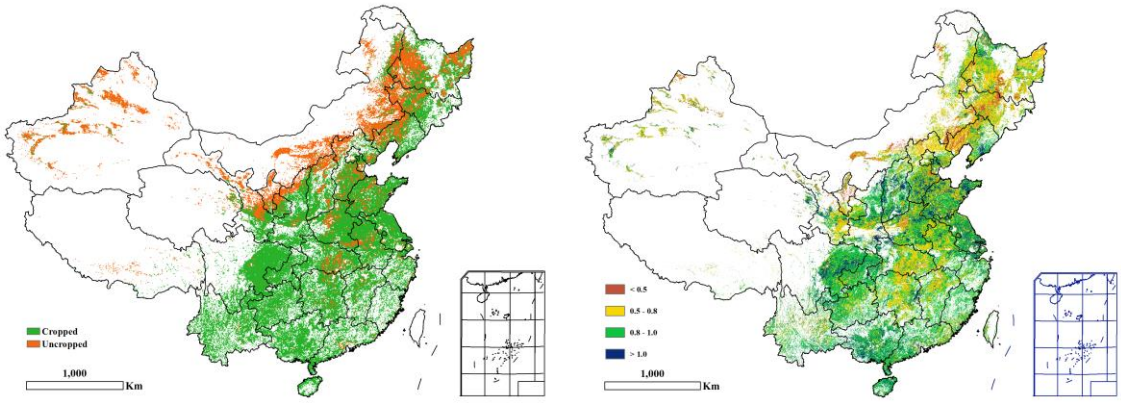
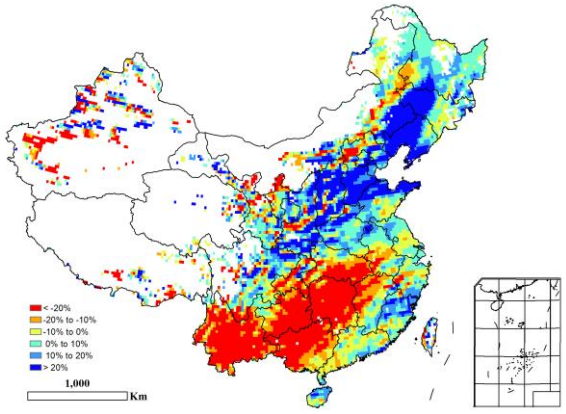


Figure 4.6 China biomass departure map from 15YA, by pixel, Oct 2022 to Jan 2023



4.2 Regional analysis

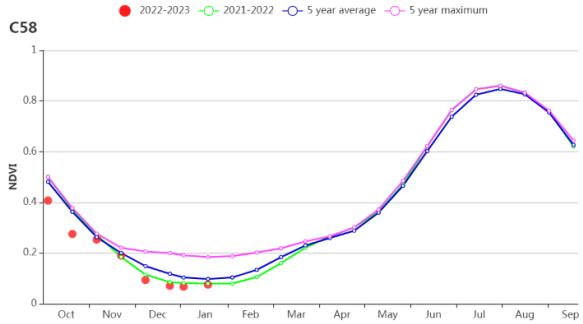
Figures 4.7 through 4.13 present crop condition information for each of China's seven agricultural regions. The provided information is as follows: (a) Phenology of major crops; (b) Crop condition development graph based on NDVI, comparing the current season from October 2022 to January 2023 to the previous season, to the five-year average (5YA), and to the five-year maximum; (c) Spatial NDVI patterns for October 2022 to January 2023 (compared to the (5YA)); (d) NDVI profiles associated with the spatial patterns under (c); (e) maximum VCI (over arable land mask); and (f) biomass for October 2022 to January 2023. Additional information about agro-climatic indicators and BIOMSS for China is provided in Annex A.

Northeast region

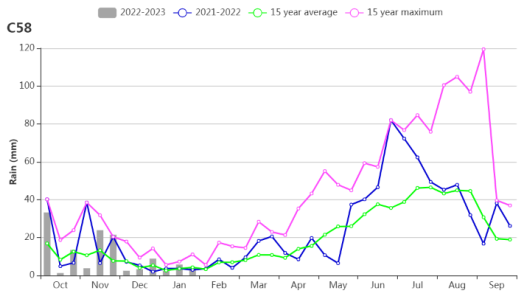
Due to the freezing conditions, no crops were growing in the northeast of China during this monitoring season. CropWatch Agroclimatic Indicators (CWAIs) showed that the overall precipitation increased by 28%, and it was significantly above the 15YA in mid-November, late-December and mid-January. The photosynthetically active radiation decreased by 3%, and the temperature increased by about 0.3°C.

In general, the above-average precipitation in the current monitoring season can be expected to have a positive impact on spring sowing. Adequate soil moisture, together with normal temperature and radiation will benefit the emergence and early growth of crops in the spring.

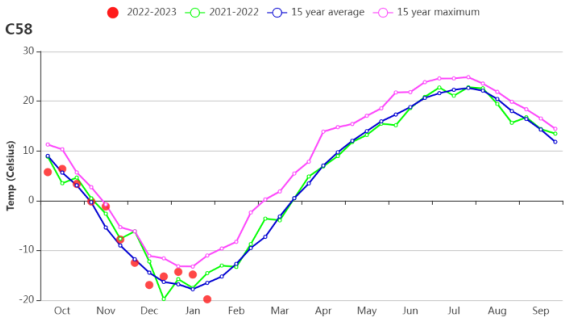
Figure 4. 7 Crop condition China Northeast region, October 2022 - January 2023



(a) Crop condition development graph based on NDVI



(b)Time series rainfall profile

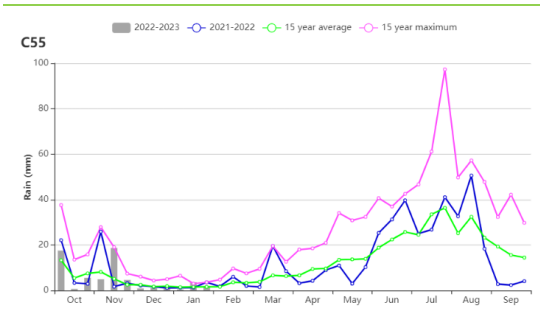


(c)Time series temperature profile

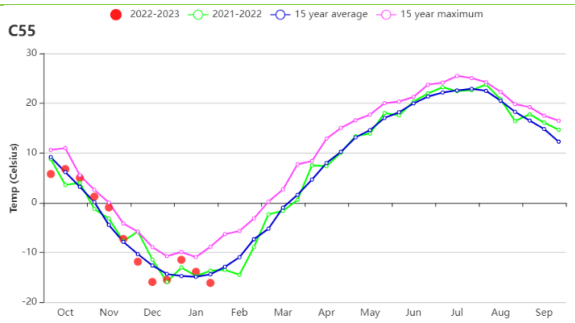
Inner Mongolia

Due to seasonal low temperatures, no winter were crops grown in Inner Mongolia during this monitoring period. The weather conditions in this period were favorable, rainfall (+15%) was above average. It will provide adequate soil moisture for the preparation and establishment of the spring crops. CropWatch Agroclimatic Indicators showed TEMP (+0.1°C) was slightly above average, while RADPAR (-1%) was below average. Potential biomass was above the average level (BIOMASS +12%). Conditions in the next reporting period will be more critical for the 2023 production.

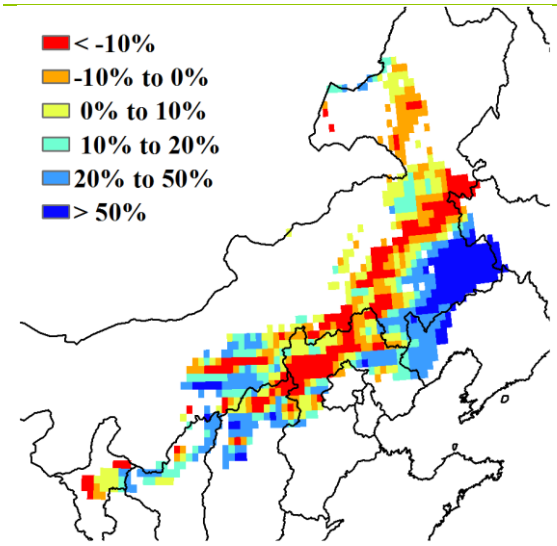
Figure 4.8 Crop condition Inner Mongolia, October 2022 - January 2023



(a)Time series rainfall profile



(b)Time series temperature profile



(c) Biomass departure

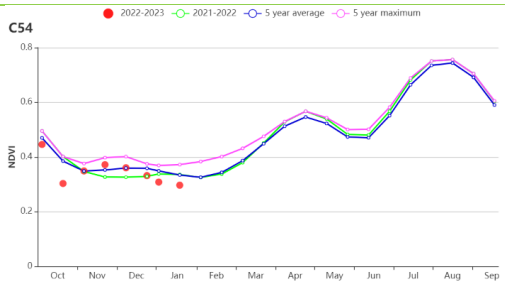
Huanghuaihai

The monitoring period (October 2022 to January 2023) covers the planting and early growth stages of winter wheat in Huanghuaihai. Agro-climatic indicators showed that precipitation (+47%) and temperature (+0.5°C) in this area were above the 15YA, but radiation was unchanged, which resulted in above-average biomass production potential (BIOMSS +14%). The CALF exceeded the 5YA by 10%, indicating an increase in summer grain planting area in the MPZ. Below-average BIOMSS was located in southern Anyang, Henan, northern Xinxiang, Henan and southeastern Shandong.

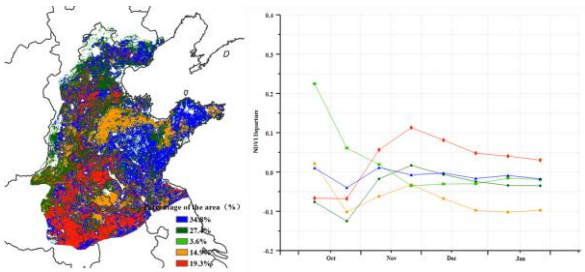
According to the NDVI development graph, rainfall profile, and temperature profile, crop growth conditions were favorable due to sufficient rainfall, supplementary irrigation and above-average temperatures. Cold temperatures caused a drop in NDVI starting in December. As the NDVI departure clustering map shows, 19.3% of the cropland was slightly above average after November, mainly located in eastern Henan, northern Anhui, southwestern Shandong, and middle-eastern Hebei. 14.9% of the cropped area in northern Suzhou, Anhui, southeastern Shangqiu, Henan, and northern Shandong (yellow colors in the NDVI departure clustering map) indicate slightly less favorable conditions.

The maximum VCI value was 0.86, and the Crop Production Index (CPI) is 1.17. In general, crop conditions in this region were average.

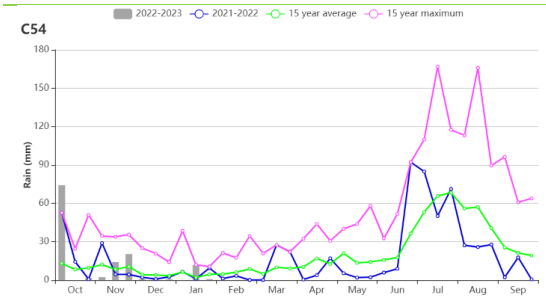
Figure 4. 9 Crop condition China Huanghuaihai, October 2022 - January 2023



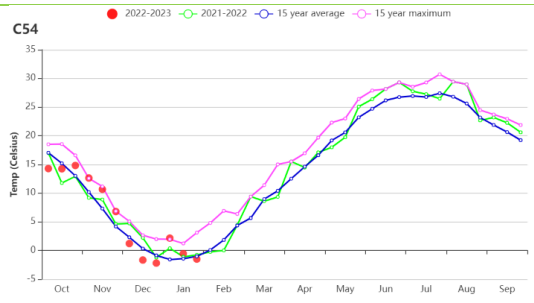
(a) Crop condition development graph based on NDVI



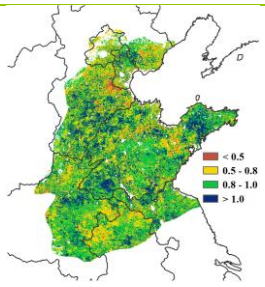
(b) Spatial NDVI patterns compared to 5YA (c) NDVI profiles



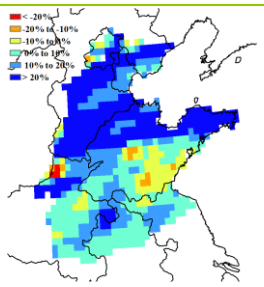
(d)Time series rainfall profile



(e)Time series temperature profile



(f) Maximum VCI



(g) Biomass departure

Loess region

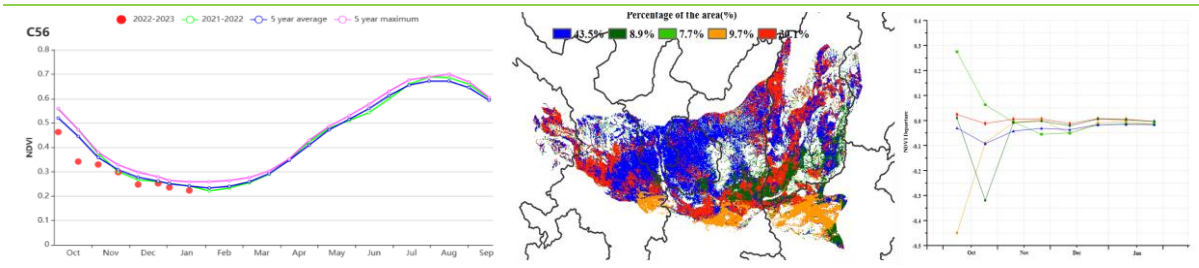
Winter wheat is the predominant crop that is grown during this monitoring period. Sowing started in September and was completed in October.

The CropWatch Agroclimatic Indicators (CWAIs) in the Loess Region show that although radiation was below average (RADPAR -3%), accumulated rainfall and temperature were above average (RAIN +31%, TEMP +0.5℃), which resulted in above-average biomass production potential compared to the 15YA (BIOMSS +13%). During the monitoring period, rainfall was significantly above average in early October, but then returned to close to the 15YA in the subsequent periods.

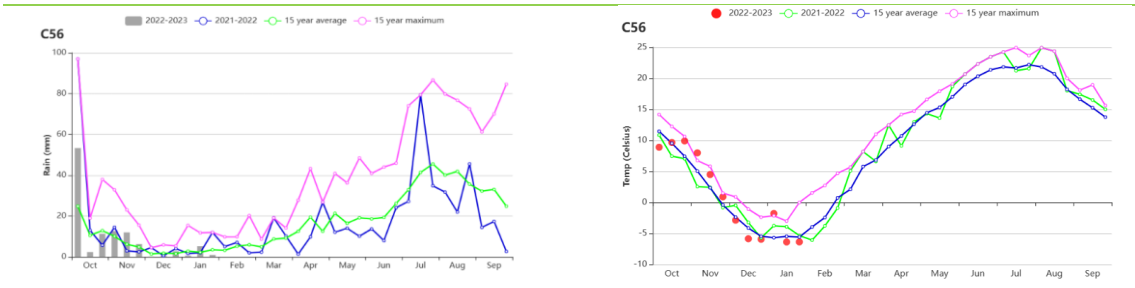
According to the regional NDVI development map, the overall crop condition in the Loess region was close to the 5YA, but below average in October. The NDVI departure cluster profiles indicate that about 53.2% of the areas were below average from October to mid-November, mainly distributed in most of the region. In addition, about 7.7% of the areas were above average by mid-November, mainly in central Henan, southwestern Shanxi, and southeastern Shaanxi Province. The majority of arable land had high VCIx values, with a regional average of 0.86, and the fraction of cropped arable land under cultivation is 78% , which is 1% above the 5YA. The CPIx in the region is greater than 1.

In conclusion, the CropWatch indicators point to normal conditions for this region.

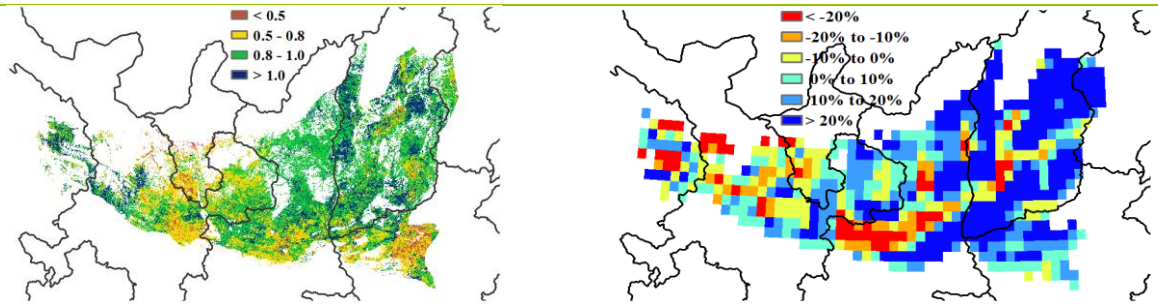
Figure 4. 10 Crop condition China Loess region, October 2022 - January 2023



(a) Crop condition development graph based on NDVI (b) Spatial NDVI patterns compared to 5YA(c) NDVI profiles



(d)Time series rainfall profile (e)Time series temperature profile



(f) Maximum VCI (g) Biomass departure

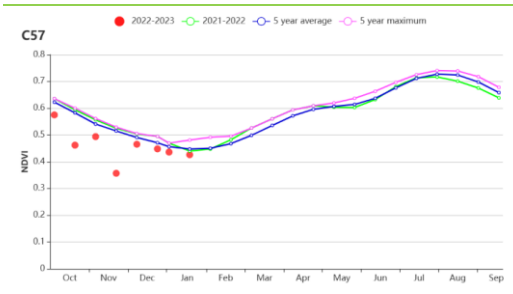
Lower Yangtze region

During this monitoring period, only winter crops like wheat and rapeseed were in the field, mostly in the north of the region, including parts of Hubei, Henan, Anhui and Jiangsu provinces. Limited winter crops were planted in Fujian, the southern Jiangxi and Hunan provinces.

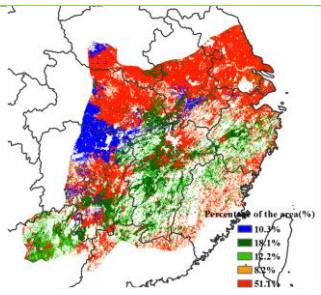
The accumulated precipitation was 19% below the average. Temperature and photosynthetically active radiation were 1.0℃ and 7% higher than the 15-year averages, respectively. The drought conditions caused a negative departure of the biomass production potential by 10%. The rainfall profile indicates that the precipitation in late November exceeded the maximum in 15 years, but the precipitation in other periods was mostly lower than the average. As shown in the NDVI development graph, crop conditions were below the 5-year average throughout this period. 51.1% of the region, mainly in the northern part, including Jiangsu, Anhui, Henan, northern Jiangxi and northern Hubei, had slightly below-average crop growth until late November, after which the crops improved to average. The potential biomass departure in this part had values between -20% and +20%. Crop growth in the rest of the region also started to improve in December and gradually approached the average level. The average VCIx of this region was 0.84. Most of Jiangsu had VCIx values ranging from 0.8 to 1, the other parts had VCIx values ranging from 0.5 to 1.

In general, the crop conditions in the Lower Yangtze region were close to average.

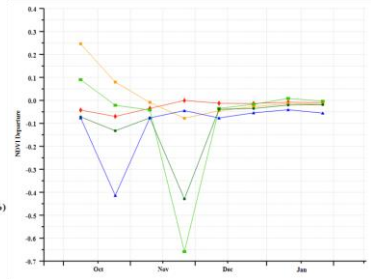
Figure 4. 11 Crop condition China Lower Yangtze region, October 2022 – January 2023



(a) Crop condition development graph based on NDVI

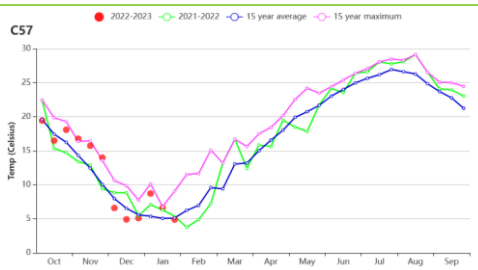


(b) Spatial NDVI patterns compared to 5YA

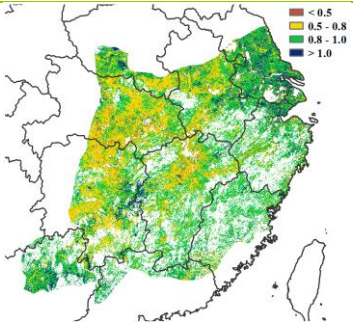


(c) NDVI profiles

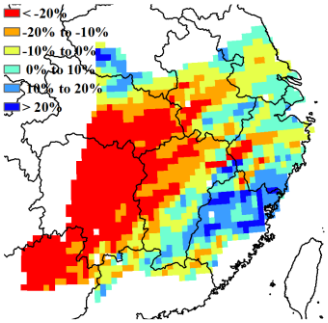
(d)Time series rainfall profile



(e)Time series temperature profile



(f) Maximum VCI



(g) Biomass departure

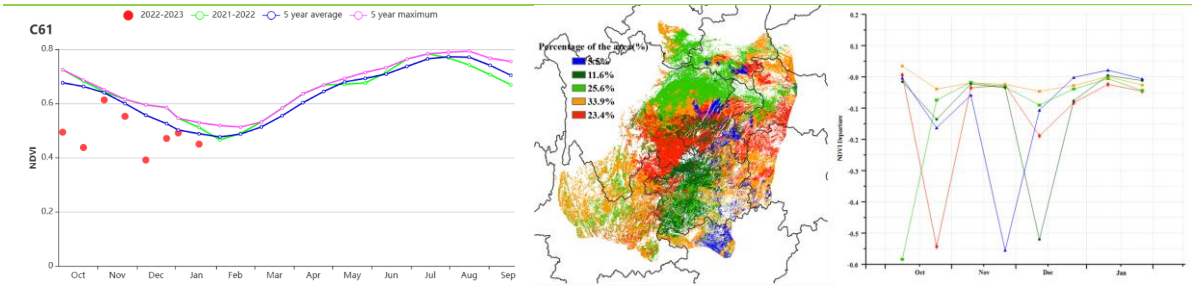
Southwest region

The reporting period covers the planting and establishment of winter wheat in southwest China. However, this region is only a minor producer of wheat in China.

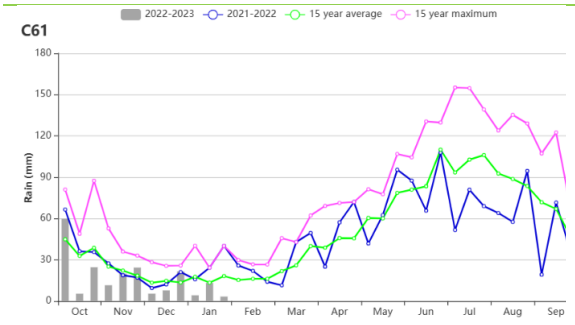
During this monitoring period, agroclimatic indicators showed that the RAIN in this region was 202 mm, 26% below the 15-year average, and the TEMP was 8.4℃, 0.7℃ above the 15-year average. The decrease in rainy weather also led to a small increase in RADPAR (+10%). Overall low precipitation resulted in a 15% lower BIOMSS than the 15YA. The VCIx in the area was 0.89 and the arable land was almost fully utilized, and CALF is the same as in previous years.

The potential biomass map shows a significantly drop in production in the southern part of this region. However, in this region, most of the winter wheat is grown in Sichuan, where conditions were more favorable. VCIx values in some areas are greater than 1.0, indicating that overwintering crop growth exceeds the best conditions of the last 5 years. Overall across the region,, the crop conditions were slightly below average, due to a rainfall deficit.

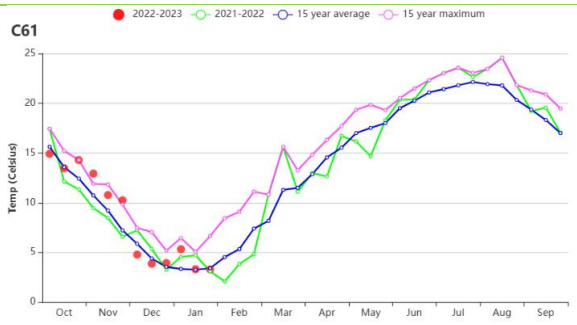
Figure 4. 12 Crop condition China Southwest region, October 2022 - January 2023



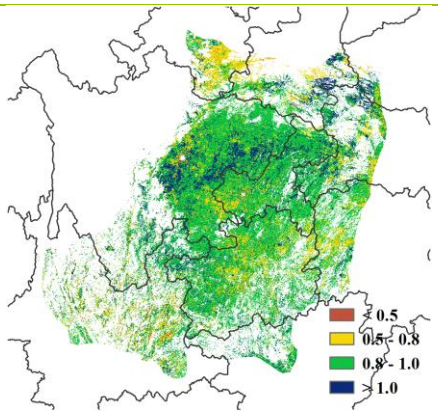
(a) Crop condition development graph based on NDVI (b) Spatial NDVI patterns compared to 5YA (c) NDVI profiles



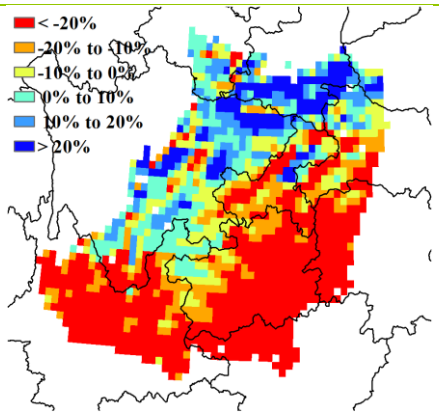
(d)Time series rainfall profile



(e)Time series temperature profile



(f) Maximum VCI



(g) Biomass departure

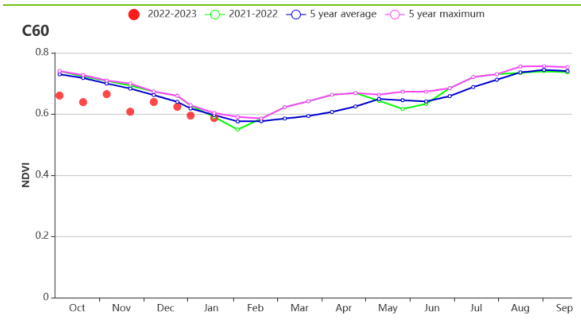
Southern China

The reporting period covers the harvest period of late rice in Southern China. As presented by the agro-climate indicators, the temperature (+0.6°C) and radiation (+9%) in this area were above the 15YA, but precipitation was below (-24%), which resulted in a below-average biomass production potential (BIOMSS -17%). Based on the potential biomass departure map, BIOMSS in most of Southern China was significantly below average.

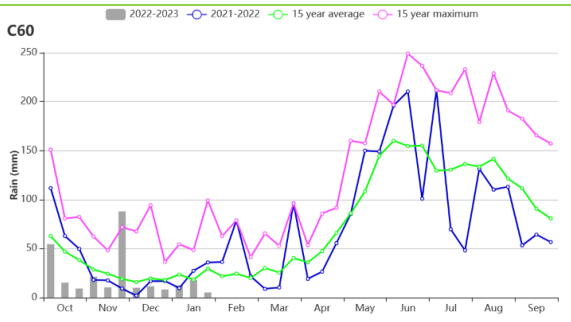
The NDVI development graph also showed below average conditions during the harvest period of late rice in October and early November. Rainfall was generally below average, apart from late November, when the crops had been harvested already.

All in all, crop conditions were close to normal.

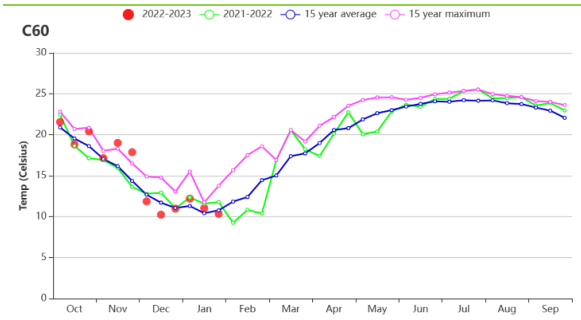
Figure 4. 13 Crop condition Southern China, October 2022 - January 2023



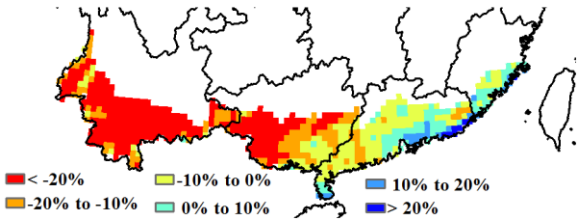
(a) Crop condition development graph based on NDVI



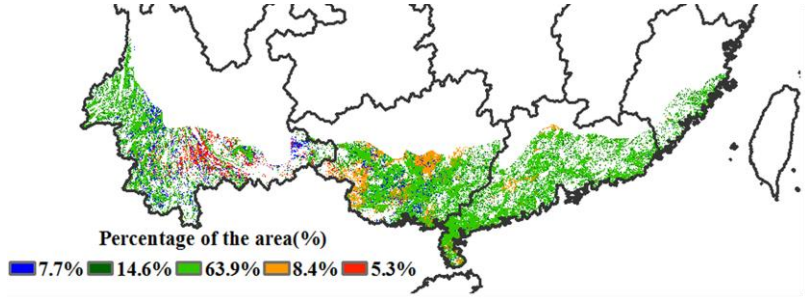
(b)Time series rainfall profile



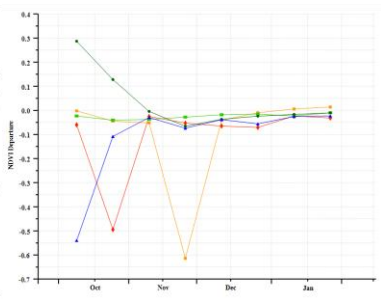
(c)Time series temperature profile



(d) Biomass departure



(b) Spatial NDVI patterns compared to 5YA



(c) NDVI profiles