Chapter 4. China

After a brief overview of the agro-climatic and agronomic conditions in China over the reporting period (section 4.1), Chapter 4 then presents China's crop prospects (section 4.2), 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 (section 4.3). Section 4.4 provides a closer look at the flooding impacts in the Lower Yangtze River Basin and section 4.5 describes trade prospects of major cereals and soybean. Additional information on the agro-climatic indicators for agriculturally important Chinese provinces is listed in table A.11 in Annex A.

4.1 Overview

Most of the summer crops, such as semi-late rice, spring maize and soybean, were in the field during the reporting period. The period also covered the harvest of early rice and winter crops, like winter wheat, and the sowing of late rice was gradually finished. The agro-climatic conditions were quite favorable, with rainfall slightly above average (+4%), temperature down 0.1°C and RADPAR down 2%. This was beneficial for crop growth and VCIx reached a high value of 0.91 at the national scale.

According to the time series rainfall profile, above-average rainfall was observed nationwide from mid May to early July. Nearly all the main agricultural regions of China recorded above-average rainfall, with the largest positive departure occurring in South-west China (+16%). The only exception was Southern China (-16%). Excessive rainfall (positive departures by more than 20%) occured in the provinces through which the Yangtze River flows (Anhui, Chongqing, Hubei and Yunnan). The largest positive departure was observed in Anhui province (+57%), which increased the pressure on the upstream provinces to constrain the release of water as much as possible.

Rainfall anomalies fluctuated largely over time and space. As can be seen from spatial distribution of rainfall profiles, 76.3% of cropped areas recorded relatively steady rainfall, with the rainfall departure within ±30mm. 13.2% of the cropped areas, mainly located in Southern China (Fujian, Guangdong, Hainan and some parts in Guangxi, Guizhou, Hunan, and Jiangxi), received significantly below-average rainfall (more than -50mm/dekad) during early May, middle to late June, and middle July. 10.5% of crops experienced the largest departure of rainfall (more than +200mm/dekad) during early July, essentially in some parts of Zhejiang, Jiangxi, Anhui, Hubei, Hunan, and Guizhou provinces.

Only two main agricultural regions in China recorded above-average temperature (Lower Yangtze region, +0.1°C; Southern China, +0.2°C), while the other regions all recorded below-average temperatures with negative departures ranging from -0.6°C to -0.2°C. Temperatures fluctuated during the monitoring period as follows: 72.5% of cultivated regions in southern parts and northern parts of China had positive temperature anomalies by more than 2.0°C, occurring in middle April and early May, while 27.5% of the cropped areas in central and eastern China experienced both positive temperature anomalies by more than 2.0°C in early June and negative anomalies by more than 3.0°C in middle July. RADPAR had the largest negative anomalies in Southwest China (-8%), and the biggest positive anomalies in Southern China (+5%), as a result of different rainfall situations during this monitoring period in these two regions.

As for BIOMSS, the situation was quite different among all the main producing regions, with the departures between -9% (Huanghuaihai, Loess region, and South-west China) and +6% (Southern China). CALF increased in the Loess region (+3%) and Inner Mongolia (+1%) as compared to the 5YA, indicating that the outlooks of crop production in these two regions are promising. The remaining regions all showed average

CALF. The VCIx values were higher than 0.9 in almost all the main producing regions of China, with values between 0.91 and 0.94, except for Inner Mongolia (0.87).

In terms of the proportion of NDVI anomaly categories compared with the 5-year average, the former seven 16-day phases, covering from April to early July, shared almost the same proportion pattern, while the last phase had below-average anomalies in more than 40% of the cropped areas, the reason of which might be the heavy rainfall and the impact of floods on the crops.

Table 4.1 CropWatch agro-climatic and agronomic indicators for China, April to July 2020, departure from 5YA and 15YA

Region	Agroclimatic indicators				Agronomic indicators	
	Departure from 15YA (2005-2019)				Departure from 5YA (2015-2019)	Current period
	RAIN (%)	TEMP (°C)	RADPAR (%)	BIOMSS (%)	CALF (%)	Maximum VCI
Huanghuaihai	10	-0.5	-5	-9	0	0.92
Inner Mongolia	5	-0.2	-3	-4	1	0.87
Loess region	2	-0.6	-2	-9	3	0.94
Lower Yangtze	8	0.1	0	0	0	0.92
Northeast China	1	-0.3	-1	-2	0	0.91
Southern China	-16	0.2	5	6	0	0.92
Southwest China	16	-0.2	-8	-9	0	0.92

Figure 4.1 China crop calendar

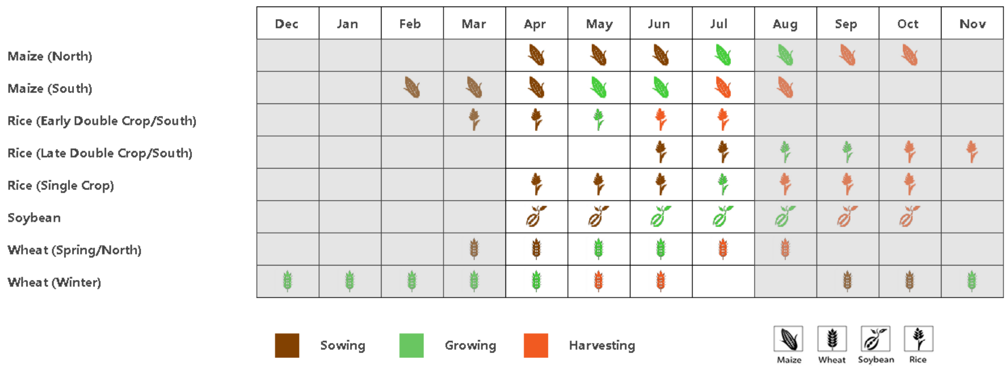


Figure 4.2 China spatial distribution of NDVI profiles, April - July 2020

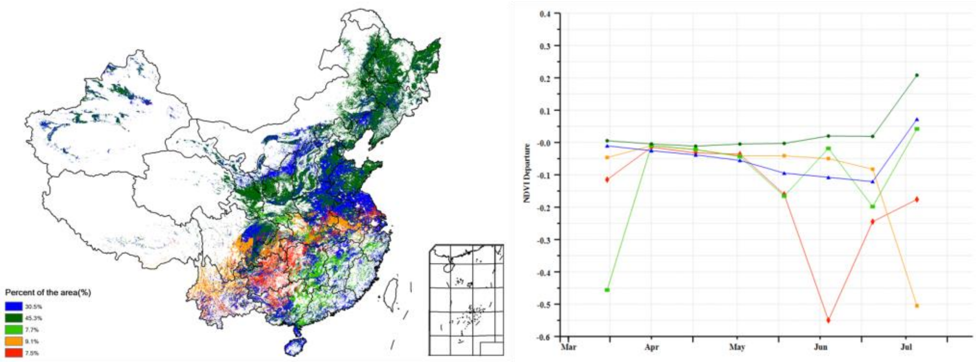


Figure 4.3 China spatial distribution of rainfall profiles, April - July 2020

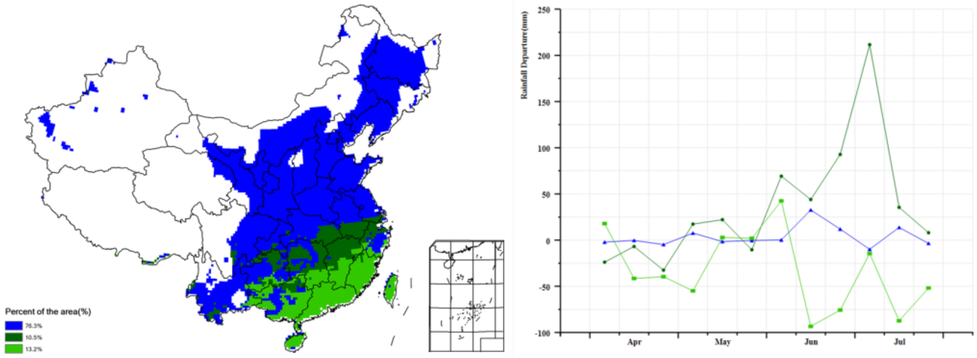


Figure 4.4 China spatial distribution of temperature profiles, April - July 2020

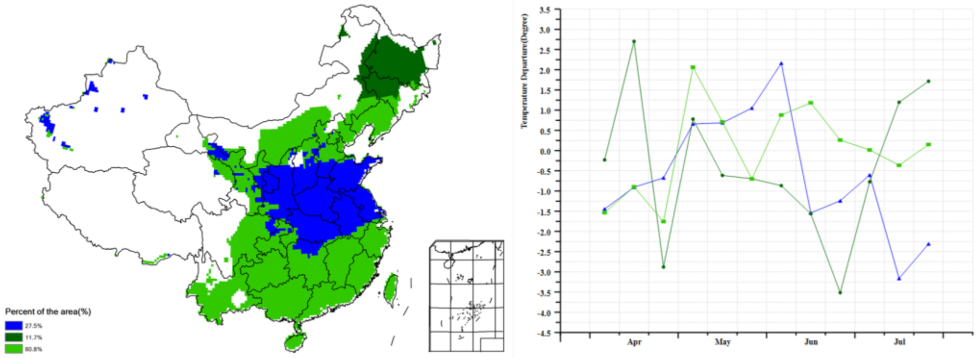


Figure 4.5 China cropped and uncropped arable land, by pixel, April - July 2020

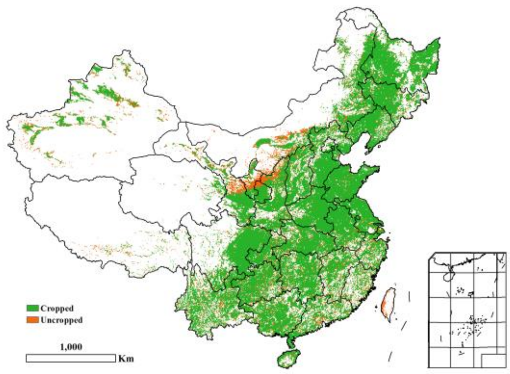


Figure 4.7 China maximum Vegetation Condition Index (VCIx), by pixel, April - July 2020

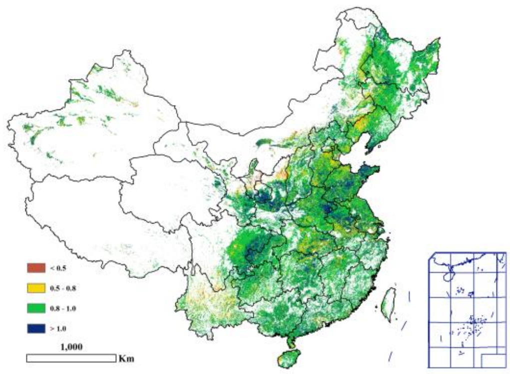


Figure 4.6 China biomass departure map from 15YA, by pixel, April - July 2020

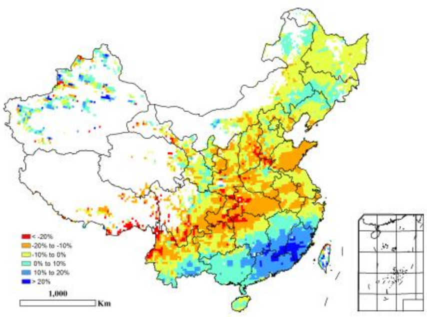


Figure 4.8 Time series rainfall profile for China

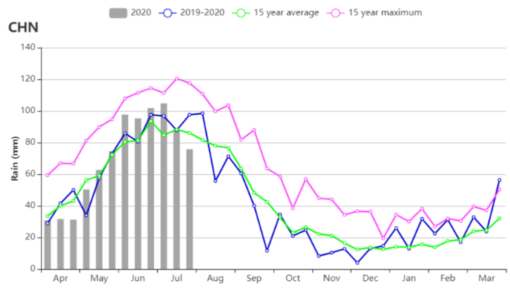
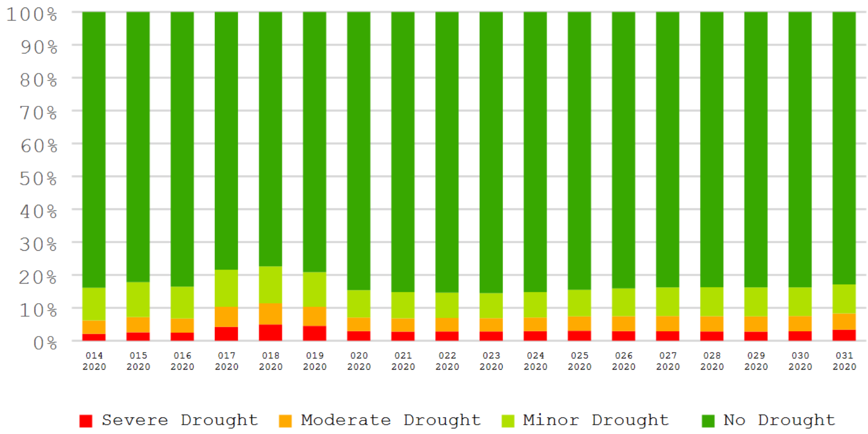


Figure 4.9 Proportion of different drought categories from April to July 2020



4.2 China crops prospects

Using multi-source remote sensing data, namely Sentinel-1 and Sentinel-2 from European Space Agency (ESA), Landsat 8 from the United States Geological Survey (USGS), and Chinese satellite data of Gaofen-1 and Gaofen-2, together with the latest agro-meteorological data, the yield of China's staple grain and oil crops (mainly including maize, rice, wheat and soybean) in 2020 was quantitatively predicted by integration of remote sensing index model, agro-meteorological yield estimation model. Based on GVG APP, 320,501 crops samples covering 586 counties in 10 provinces and autonomous regions of Northeast China, North China and the Lower Yangtze River were collected (see figure 4.10). Combined with the latest national 10 m resolution cropland data, crop area was estimated using Big Data analysis method. The results are as follows:

In 2020, the total crop output is expected to be 618,405 thousand tons, with a year-on-year increase of 1,267 thousand tons or 0.2%. The total output of summer crops (including maize, single rice, late rice, spring wheat, soybean, coarse grain, tuber crops and other minor crops) is expected to be 453,457 thousand tons, a decrease of 0.5% (2.4 million tons) compared with that in 2019; the total output of winter crops in 2019-2020 is 131,502 thousand tons, which is 346 thousand tons higher than that in 2018-2019, with an increase of 2.7%.

The total production of rice in China is predicted at 199,394 thousand tons, a year-on-year decrease of 1.8% (about 369 thousand tons). The main reason is that the continuous heavy rainfall in the South China has been unfavourable to rice production since June 2020, and the average rice yield in China has decreased by 2.0% year-on-year (Table 4.2 and Table 4.3). The production of early rice was 33,446 thousand tons, an increase of 0.6% over the same period of last year. There were several flooding disasters in the early rice-growing season in Jiangxi, Hunan and other major early rice-producing provinces, the continuous occurrence of heavy rainfall and the accompanying storm weather caused the early rice lodging to be seriously affected than in previous years, which led to a year-on-year decrease in the yield of most major early rice-producing provinces. Even though, China's early rice production still increased by 209 thousand tons from 2019 thanks to the the increased planted area by 2.2% from 2019, indicating limited effect from the COVID-19. The flooding disasters also negatively impacted on the single and late rice production in Jiangxi, Hunan, Hubei and Anhui provinces in the lower reaches of the Yangtze River, with a total of 397 thousand hectares of rice were damaged. At the same time, continuous overcast Rain and fair weather led to a year-on-year decrease in the average yield of single rice and late rice, resulting in decreases in the national single rice production by 242 thousand tons, and the late rice decreased by 1,479 thousand tons. It is also noteworthy that the agro-meteorological conditions of Heilongjiang, Jilin and Liaoning provinces in Northeast China were generally favourable, and the total production of rice in the three provinces increased by 424 thousand tons from 2019.

In 2020, the total output of maize in China is expected to be 225,737 thousand tons, an increase of 1,392 thousand tons (about 0.6%) compared with that in 2019. The national maize planted area is 39,300 thousand hectares, which is almost the same as that in 2019, with a slight increase of 0.1%. Meanwhile, the average yield of maize in China is expected to recover from the lower level in 2019, with a year-on-year increase of 0.5% (Table 4.2). Thanks to the favourable rainfall and heat conditions, the yield of maize in the Loess Plateau, including Shanxi, Shaanxi, Ningxia and Gansu provinces, has increased by more than 3.0%, and the maize planted area has also expanded, resulting in an increase of 8.4%, 6.6%, 5.1% and 3.6% respectively. The agrio-meteorological conditions of the maize growth period in Shandong and Hebei are beneficial, and the maize yield will recover from the 2019 drought conditions. In these provinces, the yield of maize increased by 3.4% and 3.6% respectively. Affected by the continuous rainy weather in July in Northeast China, the maize yield decreased by 1.4%, 4.0% and 1.8% in Heilongjiang, Inner Mongolia and Jilin Provinces, respectively.

The national soybean production continued to increase for the fifth consecutive year, with a total output of 14,797 thousand tons, a year-on-year increase of 356 thousand tons, or 2.5% (Table 4.2). The soybean planted area reached 79,787 thousand hectares, a marginal increase of 1.0% from 2019. Shanxi, Inner Mongolia, Shandong, Liaoning and Hebei had the largest percentage increases in the soybean planted area, with an increase of 2.5%, 2.4%, 1.4%, 1.1% and 1.1% respectively. While in Heilongjiang Province, the largest soybean-producing province, the soybean area decreased by 0.3% compared with 2019. The soybean yield in Hebei, Henan, Shanxi and Shandong provinces increased by 4.1%, 3.7%, 3.8% and 1.8% respectively. The soybean yield in Northeast China dropped from 2019 and the main reason is that the precipitation in July was less than normal, which led to the mild drought in flowering and pod setting period of soybean. The precipitation recovered to the normal level in the first ten days of August, the drought was relieved, and the reduction rate of soybean yield was less than 1%.

It must be pointed out that the heavy rainfall in Sichuan in mid-August led to serious flooding disasters in Sichuan, Chongqing and some other places, which was unfavourable to the summer crops production in Sichuan and Chongqing. The main affected crops were maize and rice. The crop yield of summer crops might be lower than the predicted yield as reported in this bulletin.

Based on the latest remote sensing data and ground observation data throughout the growing season of winter crops, the national wheat production in 2020 is estimated at 127,052 thousand tons, which reveals an increase by 3,537 thousand tons compared with that in 2019 (Table 4.2). The wheat production in the four major winter wheat-producing provinces of Henan, Shandong, Anhui and Hebei increased by 1,117 thousand tons, 708 thousand tons, 177 thousand tons and 37 thousand tons, respectively. The main reason for the increase of wheat production in Henan, Shandong and Anhui was the expansion of planting area, while the wheat yield in Hebei increased by 2.0% from 2019. The total wheat production of other wheat-producing provinces was almost at the same level as 2019.

Figure 4.10 GVG samples collected during July to August 2020 in supporting to crop area estimation

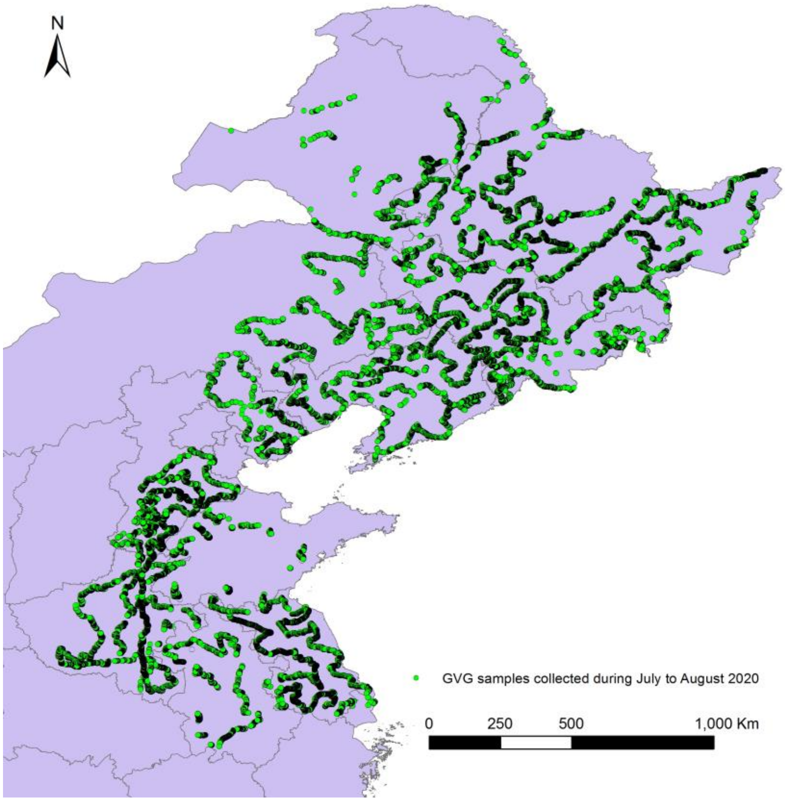


Table 4.2 China 2020 production of maize, rice, wheat, and soybean, and percentage change from 2019, by province

Provinces	Maize		Rice		Wheat		Soybean	
	2020 (ktons)	delta (%)	2020 (ktons)	delta (%)	2020 (ktons)	delta (%)	2020 (ktons)	delta (%)
Anhui	3582	0.8	17480	0.3	11527	1.6	1053	0.1
Chongqing	2085	-0.1	4698	0.0	1143	2.5		
Fujian			2727	-2.1				
Gansu	5740	3.6			3131	2.2		
Guangdong			11149	0.2				
Guangxi			10306	-1.3				
Guizhou	5171	0.4	5540	-1.8				
Hebei	18630	2.9			12032	0.3	189	5.3
Heilongjiang	41332	-1.4	21846	1.6	437	-0.5	5151	-0.4
Henan	14758	-1.9	3965	6.7	27963	4.2	779	0.2
Hubei			15825	1.2	3945	2.0		
Hunan			25166	-0.7				
Inner Mongolia	22561	-4.0			1898	-4.8	1209	1.9
Jiangsu	2077	-4.0	16081	-2.3	9990	-0.6	739	-1.0
Jiangxi			16919	0.5				
Jilin	30376	-1.8	5769	-0.6			796	-0.2
Liaoning	17980	2.9	4489	2.9			402	-1.6
Ningxia	1675	5.1	427	3.7	758	-4.4		
Shaanxi	4024	6.6	1043	-0.6	4138	5.6		
Shandong	18938	3.4			25409	2.9	679	3.2
Shanxi	9245	8.4			2277	1.7	158	6.3

Sichuan	7159	0.4	14778	0.3	4941	-1.5		
Xinjiang	6630	4.3			5132	-2.3		
Yunnan	6337	-0.5	5714	-2.7				
Zhejiang			6579	1.3				
Subtotal	218301	0.3	190500	0.1	114721	1.8	11155	0.3
China*	225737	0.6	199394	-1.8	127052	2.9	14797	2.5

* Production of Taiwan province is not included.

Table 4.3 China 2020 early rice, single rice, and late rice production and percentage difference from 2019, by province

Provinces	Early rice		Single rice		Late rice	
	2020(ktons)	Delta (%)	2020(ktons)	Delta (%)	2020(ktons)	Delta (%)
Anhui	1911	3.2	13798	-0.2	1770	1.8
Chongqing			4715	0.0		
Fujian	1564	3.4			1164	-8.6
Guangdong	5060	4.1			6088	-2.8
Guangxi	5137	5			5169	-6.9
Guizhou			5271	-1.8		
Heilongjiang			21776	1.6		
Henan			4186	6.7		
Hubei	2077	-11.5	10576	1.2	3172	10.3
Hunan	8399	1.0	8702	-0.7	8065	-5.7
Jiangsu			16325	-2.3		
Jiangxi	7206	-1.9	3023	0.5	6690	3.2
Jilin			5891	-0.6		
Liaoning			4439	2.9		
Ningxia			491	3.7		
Shaanxi			1031	-0.6		
Sichuan			14842	0.3		
Yunnan			5623	-2.7		
Zhejiang	801	0.9	4882	1.3	896	1.6
Subtotal	32154	0.8	125572	0.2	33013	-1.8
China*	33446	0.6	130770	-1.8	35178	-4.0

* Production of Taiwan province is not included.

4.3 Regional analysis

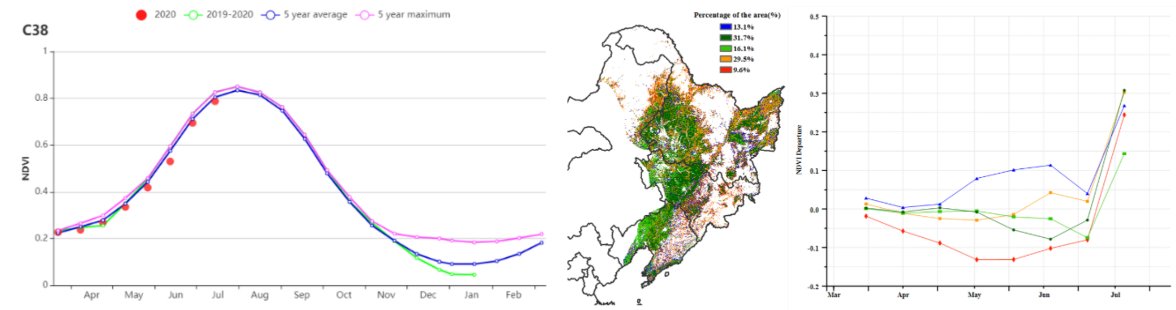
Figures 4.11 through 4.17 present crop condition information for each of China's seven agricultural regions. The provided information is as follows: (a) Phenology of major crops; (b) Crop condition development graph based on NDVI, comparing the current season up to October 2019 to the previous season, to the five-year average (5YA), and to the five-year maximum; (c) Spatial NDVI patterns for April - July 2020 (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 April - July 2020. Additional information about agro-climatic indicators and BIOMSS for China is provided in Annex A.

Northeast region

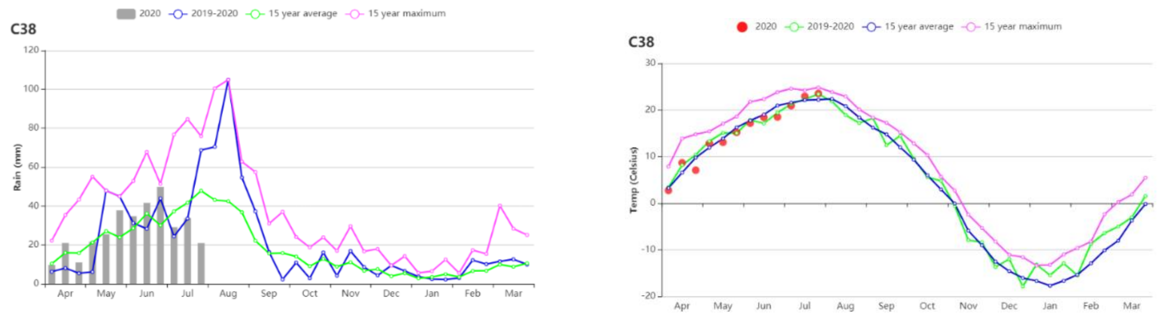
This current monitoring period covers the sowing and the first half of the growing season of the main crops in the northeast of China (April to July 2020). CropWatch Agroclimatic Indicators (CWAIs) revealed that all agroclimatic indicators were slightly below the average level. Precipitation was above the average level before July, but it was generally lower in July, resulting in a slight decrease of 1% in the accumulative precipitation from April to July. The photosynthetically active radiation was lower by 4% and the temperatures were also lower (-0.3°C). Especially in late April, temperatures were significantly lower than usual. From early May to mid-June, the temperatures were close to the average level and significantly lower than average in late June. Biomass in most areas in northeast China was below average level. Only a few areas in southern Jilin and northern Liaoning were slightly above average level, and the overall potential biomass was 2% below average.

In general, the crop conditions during the monitoring period were close to average level. The maximum VCI in the northeast of China showed that the low value areas were mainly distributed in western Liaoning province, northwestern Jilin province, eastern part of Inner Mongolia and the southwest part of Heilongjiang province and a small part of eastern Heilongjiang province. By mid-July, positive departures were observed for all provinces of the Northeast of China.

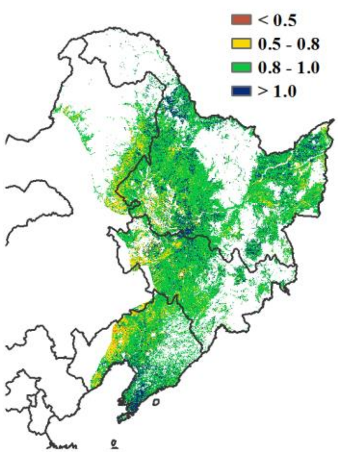
Figure 4.11 Crop condition China Northeast region, April - July 2020



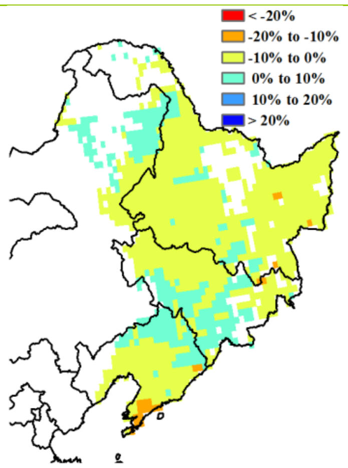
(a) Crop condition development graph based on NDVI (b) Spatial NDVI patterns compared to 5YA (c) NDVI profiles



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



(f) Maximum VCI



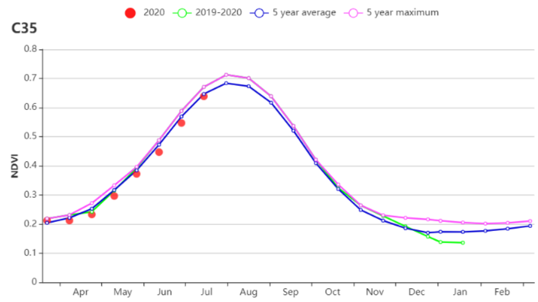
(g) Biomass departure

Inner Mongolia

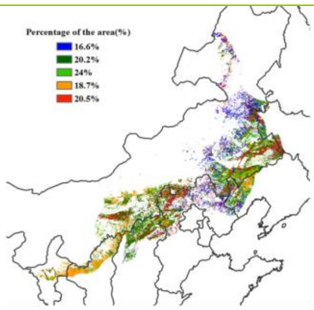
Inner Mongolia produces summer crops, such as maize, wheat and rice. Overall the crop conditions were slightly unfavorable. RAIN was above average (+5%), TEMP and RADPAR were below average (-0.2°C and -3% respectively), resulting in a below-average estimate for BIOMSS (-4%). The spatial and temporal distribution for these indicators was very uneven. Precipitation was insufficient in some region in West Liaoning, North Shaanxi, Central Ningxia and Central Inner Mongolia, which may have a negative impact on the rain-fed crops. Conditions were mainly unfavorable in the early part of the growing season, as illustrated in the crop development graph from May to June. 59% of the cropped areas displayed consistently below-average NDVI especially in the precipitation deficit areas mentioned above from April to June. This is confirmed by VCIx values being lower than 0.5 in the above listed areas, where the biomass accumulation potential (BIOMSS) was also well below average. These areas suffered from drought in May, as indicated by the temporal development of the VHIm categories when compared with 5YA. About 40% of the areas experienced varying degrees of drought, but conditions improved in June. Subsequently, crop conditions improved to close to average in July.

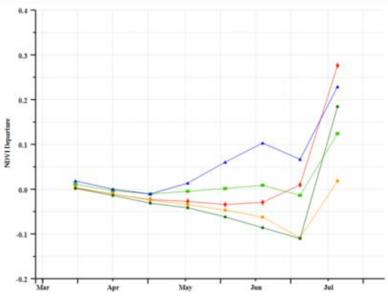
Overall, Inner Mongolia saw the fraction of cropped arable land (CALF) increased by 1% to reach 95%; VCIx was on average (0.87). Crop conditions were slightly unfavorable before June but recovered to average in July. The final outcome of the season will depend on weather conditions in August and September.

Figure 4.12 Crop condition China Inner Mongolia region, April-July 2020

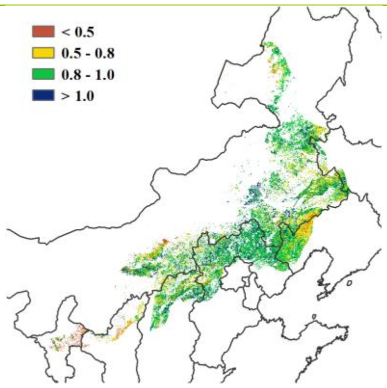


(a) Crop condition development graph based on NDVI

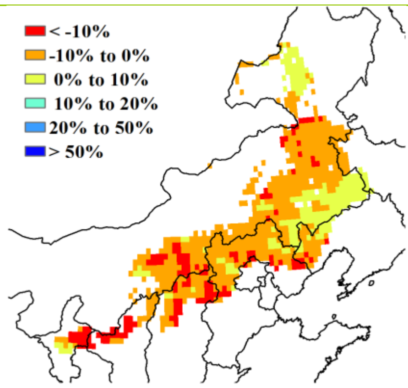




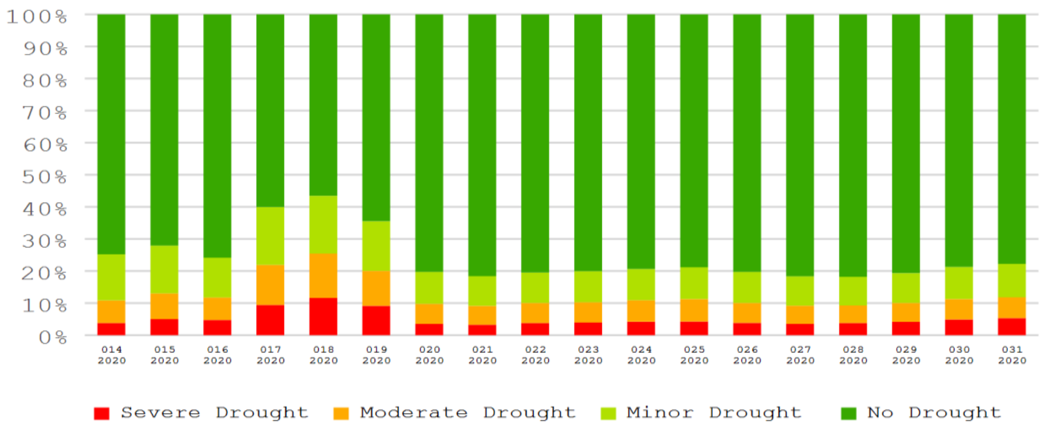
(b) Spatial NDVI patterns compared to 5YA (c) NDVI profiles



(d) Maximum VCI



(e) Biomass departure



(f) Proportion of VHIm categories compared with 5YA

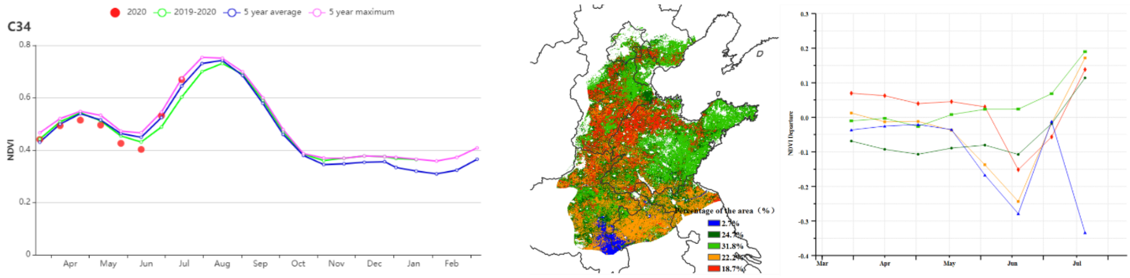
Huanghuaihai

Crop condition in Huanghuaihai was not favorable over the current monitoring period.The main crop in the region during the period is winter wheat and summer maize.Winter wheat was sowed in early October last year, in full development since April and with harvests starting in early June.And summer maize is planted after the harvesting of winter wheat.

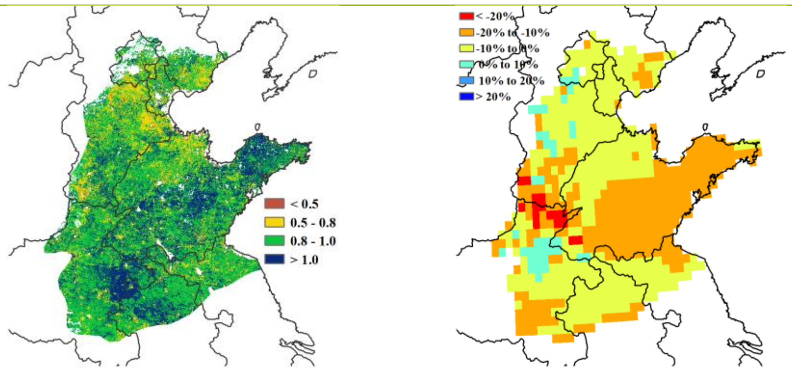
According to the crop condition development graph based on NDVI, crop condition was almost below the 5YA during the early stage of the monitoring period, especially in June, and recovered to average in July.This condition may related to less radiation which dropped 5% compared to 15YA.The temperature dropped 0.5°C compared to 15YA,while precipitation were 10% above compared to 15YA.In addition, the decrease of potential biomass was 9% compared to 5YA which may related to less radiation and temperature.

31.8% of cropland displays average NDVI condition almost throughout the monitoring period. The spatial distribution of crop condition follows patterns that are similar to those of NDVI profiles. Several regions in southern Hebei and western Shandong had above average condition before mid-May while very low values occurred in southern of the region after June.NDVI condition over the whole region improved late in July and the regional average VCIx was 0.92 at the end of July.The map of potential biomass shown the decline in the northern Henan and southern Hebei.

Figure 4.13 Crop condition China Huanghuaihai region, April - July 2020



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

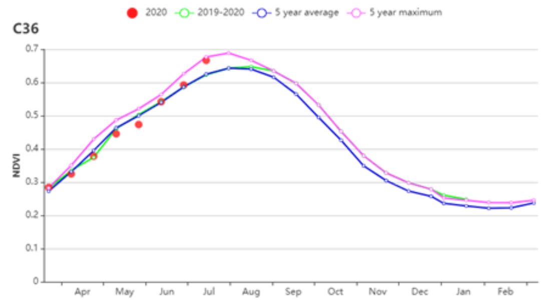


(d) Maximum VCI (e) Potential biomass departure from 5YA

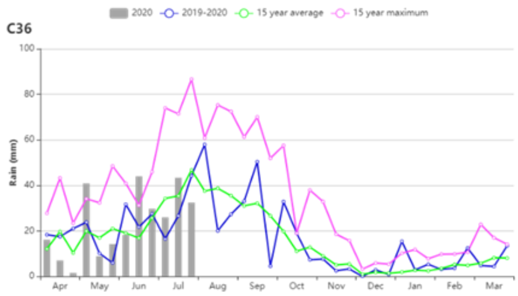
Loess region

During the reporting period, winter wheat was harvested from early to mid-June, while summer maize was planted from late May to late June. The CropWatch Agroclimatic Indicators (CWAIs) show that the weather conditions in this region were close to the 15YA: Rainfall (RAIN) exceeded the average by 2%, radiation (RADPAR) dropped by 2%, and TEMP was down by 0.6°C. The potential biomass (BIOMSS) was 9% below average as a result of reduced radiation and lower temperature. The low rainfall in April might also be another reason for the low biomass. According to the regional NDVI development graph, the overall crop conditions were favorable in the Loess region over the reporting period. Although the crop conditions were slightly below the 5-year average from late April to early June, they recovered and reached the five-year maximum in July because of the plentiful rainfall. NDVI clusters and profiles show that about 54.5% of cropped area was close to or slightly below the five-year average from April to June, mostly scattered in the north of Shannxi, west of Gansu and southeast of the Loess region. But the crop conditions of most cropped areas were above the average in June and July, because of the favorable agronomic conditions during these months. The Maximum VCI map shows high values of VCIx (0.95) in most cropped areas of the region except for scattered pockets in the north of Shannxi, Gansu and Ningxia. Almost 100% of the farmland was cultivated according to CALF (+3%) as compared to the 5YA. Overall, the current agroclimatic and agronomic conditions (especially rainfall) show favorable crop prospects in this region, especially for the summer season crops.

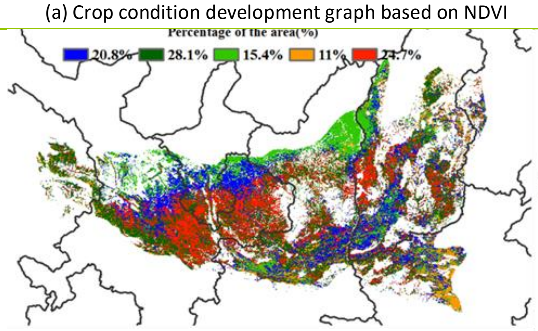
Figure 4.14 Crop condition China Loess region, April - July 2020



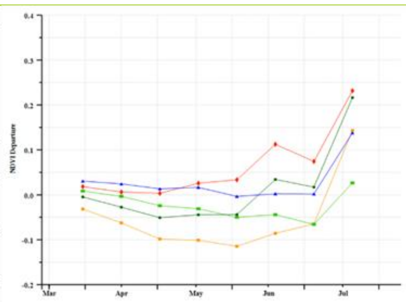
(a) Crop condition development graph based on NDVI



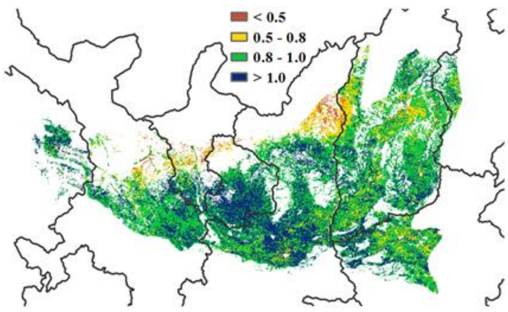
(b) Rainfall profiles



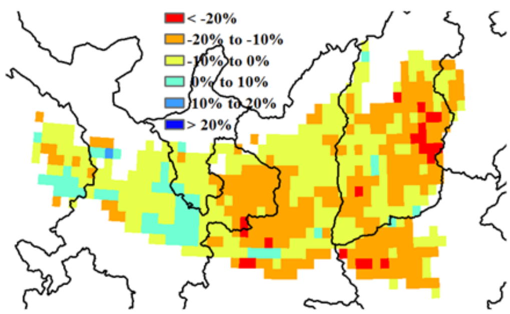
(b) Spatial NDVI patterns compared to 5YA



(c) NDVI profiles



(d) Maximum VCI



(e) Biomass departure

Lower Yangtze region

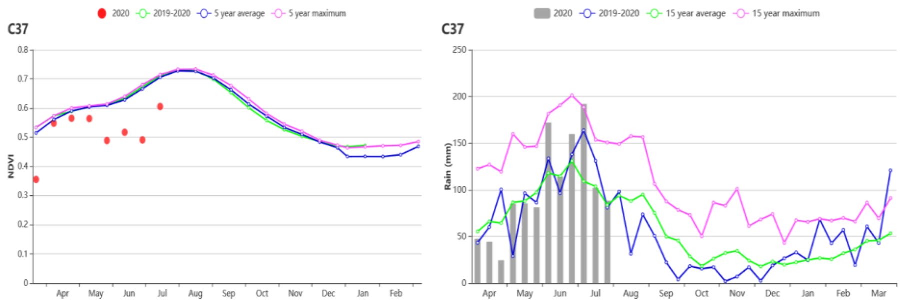
During this monitoring period, winter wheat and rapeseed reached maturity by June in Hubei, Henan, Anhui and Jiangsu provinces. The semi-late and late rice crops are still growing in the south and the center of the region including Jiangsu, Fujian, Jiangxi, Hunan, and Hubei provinces, while early rice has been harvested.

According to the CropWatch agro-climatic indicators, the Lower Yangtze region experienced a wetter and warmer season compared to the 15YA. The accumulated precipitation from late May to early July was significantly above average and was 8% more than the long-term average in this region. The temperature and photosynthetically active radiation were both slightly above average (TEMP +0.1 ℃, RADPAR +0.5%). Above average agro-climatic conditions resulted in a slightly positive departure of biomass production potential. However, the continuous rainfall in the upper stream of the Yangtze River and heavy rainfall in June to early July had led to flooding which destroyed some fields along the Huaihe River. For details, please refer to the impact analysis of flood disaster in the lower Yangtze region in Chapter 5.2.

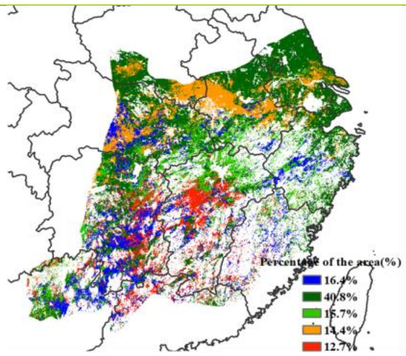
As shown in the NDVI development graph, crop conditions were quite below the 5-year average from late May to July, which coincided with the period of continuous rainfall. As a result of flooding, the vegetation index nearby Poyang Lake and also in the south of Poyang Lake was significantly lower in early June and early July. The areas bordering the Huaihe River were affected by floods in the middle and late July, and crop growth was significantly lower than the 5-year average. According to the Biomass departure, in the Yangtze River basin and its northern regions, continuous precipitation and low photosynthetically active radiation led to lower potential biomass compared to 15YA. The low VCIx area was consistent with the flood impact area. The VCIx in Chuzhou of Anhui, Jingzhou of Hubei and Changde of Hunan was higher than 1, which indicated that sufficent precipitation was favorable for the growth of crops in the above mentioned areas, and the growth conditions exceeded the best of the past 5 years.

The crop condition in the lower Yangtze region is currently assessed as below average level. The continuously rainy and cloudy weather and localized flooding were detrimental to agricultural production.

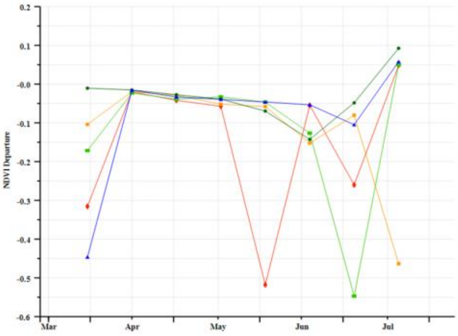
Figure 4.15 Crop condition China Lower Yangtze region, April - July 2020



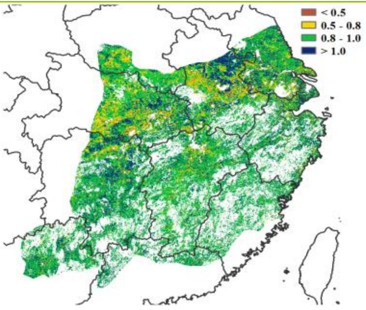
(a) Crop condition development graph based on NDVI (b) Rainfall profiles



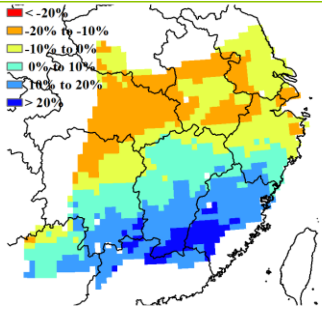
(b) Spatial NDVI patterns compared to 5YA



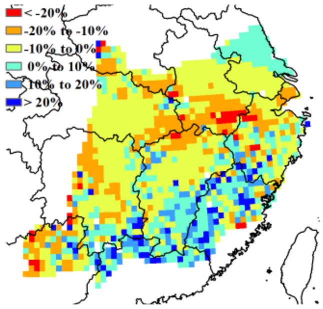
(c) NDVI profiles



(d) Maximum VCI



(e) Biomass departure



(e) Biomass departure from 15YA

Southwest China

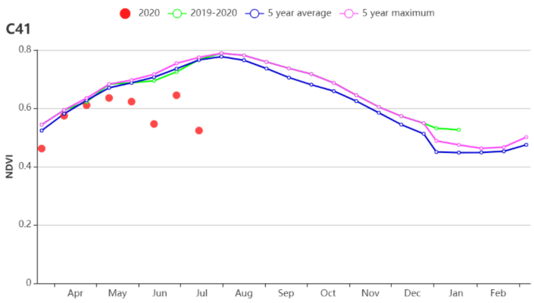
The reporting period covers the flowering and harvest of winter wheat in southwestern China. Summer crops (including semi-late rice, late rice and maize) are still growing. According to the regional NDVI profile, crop conditions remained close to average level before mid-May but dropped below the 5-year average after May.

On average, rainfall was above the fifteen-year average (RAIN +16%), whereas radiation was below (RADPAR -8%). Temperature was close to average as well (TEMP -0.2°C). The resulting BIOMSS was 9% below average mainly due to less radiation and local floods. The cropped arable land fraction remained at the same level as in the previous five years, which indicated there was no change in crop planting for this period.

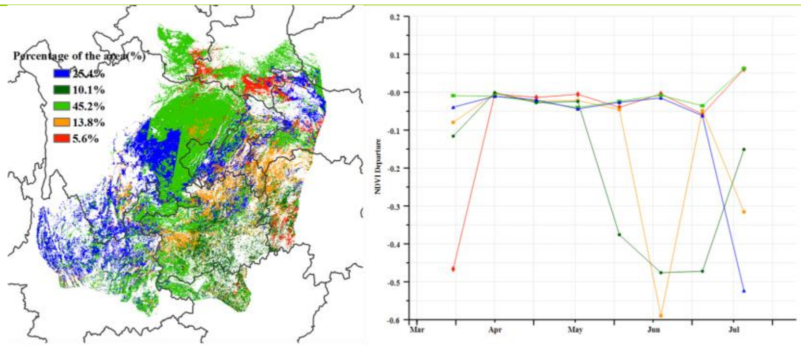
According to the NDVI departure clustering map and the profiles, conditions were close to average from mid-April to June, except in Guizhou and neighboring areas in eastern Chongqing, which recorded low NDVI values. RADPAR was also below average for Guizhou (-8%) and eastern Chongqing (-14%). Average NDVI throughout the monitoring period was observed in eastern Sichuan and Yunnan, where radiation was below average and precipitation above average (See Annex A.11). The maximum VCI reached 0.92, indicating that peak conditions were comparable to the previous five years. At the level of major production zones, the negative impact of above average rainfall and increased cloud cover is expected to be limited.

Some local flooding due to heavy precipitation and the mixture of positive, but predominantly negative departures from the long-term average indicate slightly below-average crop conditions.

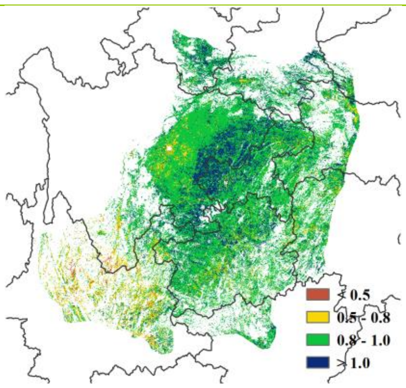
Figure 4.16 Crop condition China SouthWest region, April - July 2020



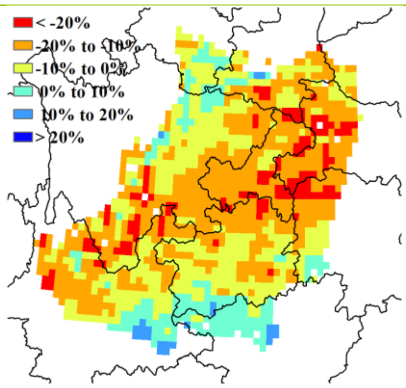
(a) Crop condition development graph based on NDVI



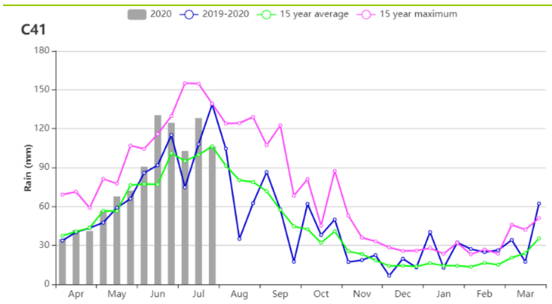
(b) Spatial NDVI patterns compared to 5YA (c) NDVI profiles



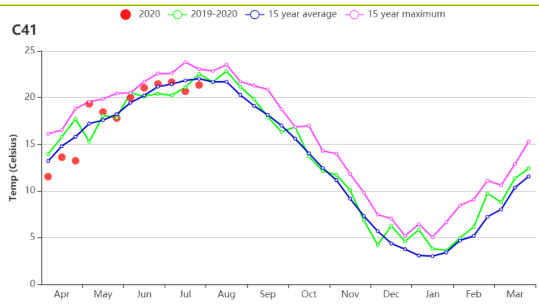
(d) Maximum VCI



(e) Biomass departure



(f) Time series rainfall profile



(g) Time series temperature profile

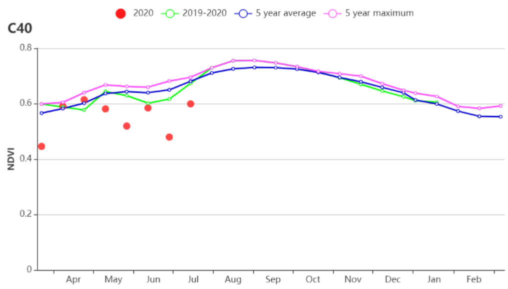
Southern region

During the monitoring period, the harvest of wheat and early rice was almost concluded, whereas spring maize reached maturity. The rainfall was 16% lower than the average level for the entire region, with -33% in Guangdong, -12% in Guangxi, -34% in Fujian and +20% in Yunnan. The precipitation of Guangdong, Guangxi and Yunnan exceeded 1000 mm while Fujian recorded just 900 mm. According to the rainfall profiles, the rainfall was above the fifteen-year average in the second half of May to early June, but below average in mid-to-late July. The average temperature in Southern China was close to average.

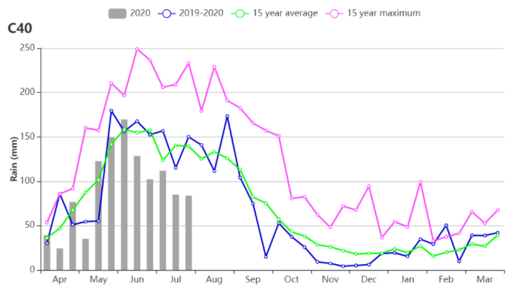
BIOMSS was up (+6%), and so was RADPAR (+5%). In Fujian, Guangdong and Guangxi, the potential biomass increased (+15%, +13% and +6%, respectively) while it decreased in Yunnan (-4%). At the provincial level, the change of the potential biomass was consistent with RADPAR. Meanwhile, less rain in June and July is more conducive to the filling and harvest of summer crops, which also promotes the increase of BIOMSS. The average VCIx of the Southern China region during the monitoring period was 0.92, and most regions presented VCIx above 0.80, except for scattered areas in Yunnan province. The above-mentioned patterns are confirmed by the NDVI departure cluster map. It shows that the crop growth in Yunnan was below the average level for most of the monitoring period.

In conclusion, the weather conditions were favorable for summer crops yields. CropWatch will keep tracking the agroclimatic and agronomic conditions in the future months.

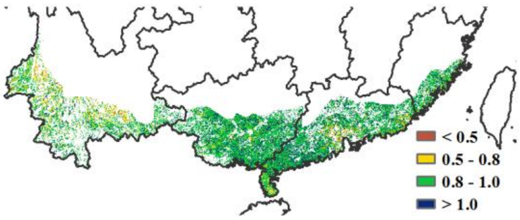
Figure 4.17 Crop condition China Southern region, April - July 2020



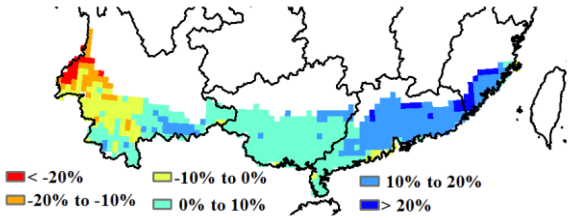
(a) Crop condition development graph based on NDVI



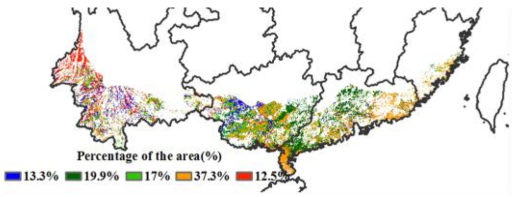
(b) Rainfall profiles



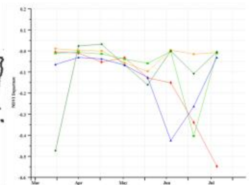
(c) Maximum VCI



(d) Biomass departure



(e) Spatial NDVI patterns compared to 5YA



(f) NDVI profiles

4.4 Remote monitoring of flooding in the middle and lower Yangtze River

The 2020 floods in Hunan, Hubei, Jiangxi, and Anhui provinces in the middle and lower stretches of the Yangtze River affected 731,000 hectares of cropland. Anhui is the province that lost the largest area of cropland (275,000 ha) to the floods.

In order to monitor the impact of continuous heavy rainfall on agricultural production, CropWatch used the multi-source satellite remote sensing data of ESA Sentinel-1 and Sentinel-2 from May 1 to August 10, 2020 to map the flood. The monitoring focused on Hunan, Hubei, Jiangxi and Anhui provinces in the middle and lower reaches of the Yangtze River. The monitoring results show that the areas affected by flooding reached the largest extent between mid- and late July. The cropland area affected by the flood disaster in Hunan, Hubei, Jiangxi and Anhui provinces was estimated at 731,000 ha, accounting for about 3.0% of the cropland area in the four provinces. The following are the detailed results from the monitoring:

From mid-July to August 10, 2020, the surface water area in Hunan, Hubei, Jiangxi, and Anhui provinces expanded by about 1.444 million ha in total. The flooded areas, including cropland and non-cropland were as follows: Hubei 376,000 ha, Hunan 350,000 ha, Jiangxi 357,000 ha and Anhui 360,000 ha (Table 4.4).

Since the start of the flood disaster in early July, a total of about 731,000 hectares of cropland have been inundated in Hunan, Hubei, Jiangxi and Anhui provinces. Among them, Anhui Province has the largest affected cropland area of about 275,000 ha, followed by Hubei (217,000 ha), Jiangxi (138,000 ha) and Hunan (101,000 ha). The flooded areas, as percentage of cropland, account for 4% of Jianxi, 3.7% of Anhui, 3% of Hubei and 1.7% of Hunan.

The flooded croplands are mainly located in the surrounding areas of Dongting Lake, Poyang Lake and Huaihe River, as shown in Figure 1. About 54.2% of the farmland inundated by the flood was planted with rice, with a total area of about 397,000 ha.

Figure 4.18 Flood and affected cropland areas from July 10 to August 10, 2020

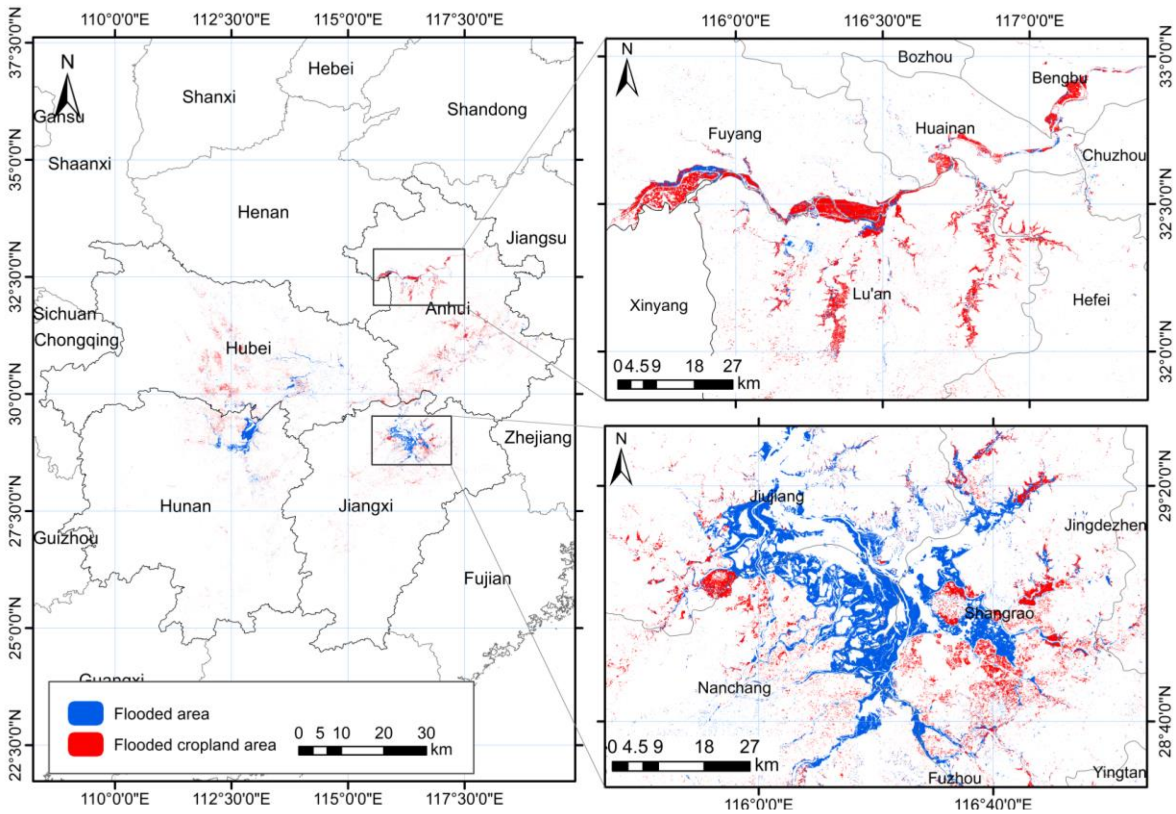


Table 4.4 Flood area and affected cropland area in Hunan, Hubei, Jiangxi and Anhui provinces in 2020 (July 10 to August 10, 2020)

Province	Flooded area (1000ha)	Proportion of the whole province area (%)	Affected cropland area (1000 ha)	Proportion of cropland area in the province (%)
Hunan	350	1.6	101	1.7
Anhui	360	2.5	275	3.7
Hubei	376	2.0	217	3.0
Jiangxi	357	2.1	138	4.0
Subtotal	1444		731	

4.5 Major crops trade prospects

This section analyzes the import and export situation of maize, rice, wheat, and soybean in the first quarters of 2020 in China.

In the first half of the year, China imported 1.2342 million tons rice, down by 2.7% compared to the same period last year. The main sources of rice imports were Vietnam, Myanmar, Pakistan, Thailand and Cambodia, accounting for 36.8%, 22.1%, 12.8%, 11.7% and 10.7% respectively, with an import value of US$684 million. Rice exports totaled 1.3613 million tons, a decrease of 7.4% over the previous year, mainly exported to Egypt, Sierra Leone and South Korea, accounting for 16.6%, 8.8% and 8.1% of the total exports respectively, with a value of US$527 million.

In the first half of the year, China imported 3.3519 million tons of wheat, an increase of 90.3% over same period in the previous year. The main sources of wheat imports were France, Australia and Canada, accounting for 31.1%, 30.4% and 20.7% of the total imports respectively, with an import value of US$960 million. The export volume of wheat and its products was 138.4 ktons, a decrease of 10.5% over the previous year, mainly to North Korea and Hong Kong, accounting for 75.7% and 22.4% of the total exports respectively, with a value of US $52 million.

In the first half of the year, China imported 3.6561 million tons of maize, an increase of 17.6% over the previous year. The main sources of import were Ukraine and Bulgaria, accounting for 93.5% and 3.1% of the total imports respectively, with an import value of US$781 million. Maize export was 1.7 ktons, a decrease of 80.2% over the previous year, and the export value was US$391.3 thousand, a decrease of 82.5% over the previous year.

In the first half of the year, China imported 45.0439 million tons of soybeans, an increase of 17.7% over the previous year. The main sources of imports were Brazil, the United States and Argentina, accounting for 72.3%, 20.5% and 5.6% of the total imports respectively, with an import value of US$17.631 billion. Soybean export was 50.6 ktons, a decrease of 24.9% over the previous year.

Trade prospects for major cereals and oil crop in China for 2020

Based on remote sensing-based production prediction in major agricultural producing countries in 2020 and the Major Agricultural Shocks and Policy Simulation Model, which is derived from the standard GTAP (Global Trade Analysis Project), it is predicted that the import of major grain crop varieties will increase slightly in 2020. The details are as follows:

Rice import will decrease by 4.3% and export will decrease by 8.2% in 2020. Novel coronavirus pneumonia is a major problem in the global rice market. The supply and demand of the rice market is basically balanced. The price gap persists at home and abroad. Chinese rice supply and demand are loose. The import of rice is stable due to the new crown pneumonia epidemic. It is expected to decrease slightly in 2020.

Chinese wheat import will increase by 35.6% and export will decrease by 8.5% in 2020. The global wheat output is basically the same as that of the previous year, and the price difference between China and foreign countries continues to exist. Affected by factors such as feed substitution, the import of wheat is expected to increase significantly in 2020.

Chinese maize import will increase by 19.5% and export will decrease by 20.8% in 2020. The global supply and demand of maize increased slightly, but the inventory level was further reduced, the domestic maize price was running at a high level, the international maize price was fluctuating at a low level, and the price difference between China and foreign countries was expanded. It is expected that Chinese maize import will grow steadily in 2020.

Chinese soybean import will increase by 15.4% and export will decrease by 9.6% in 2020. According to the results of the model, the global soybean supply is abundant, and the price difference between China and foreign countries remains high, and Chinese soybean import continues to increase. In addition, the first phase of Sino US economic and Trade Agreement continues to advance, and Chinese soybean import is expected to continue to increase in 2020.

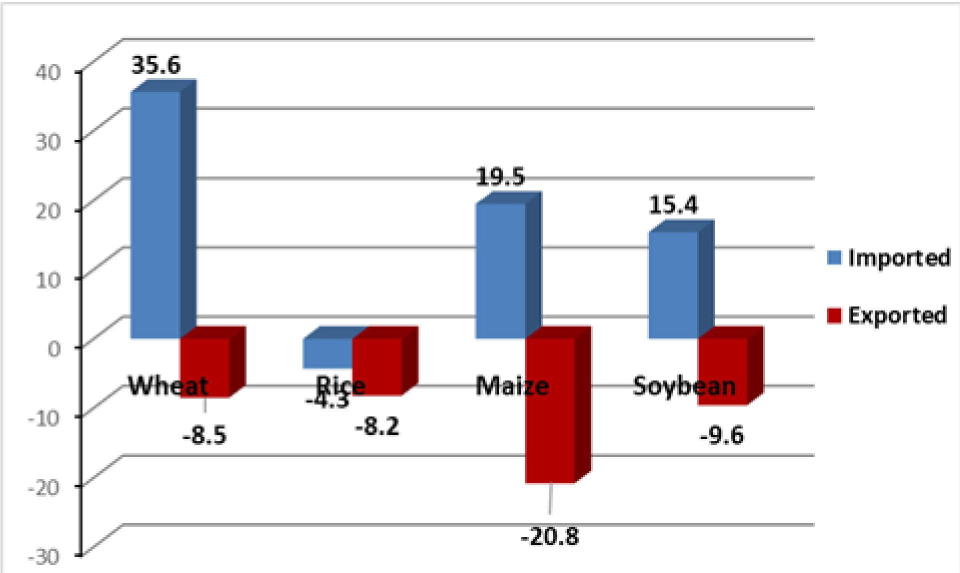


Figure 4.19 Rate of change of imports and exports for rice, wheat, maize, and soybean in China in 2020 compared to those for 2019(%)