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 presents an updated estimate of national winter crop production (4.2) and 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 (4.3). Section 4.4 describes trade prospects (import/export) of major crops. Additional information on the agroclimatic indicators for agriculturally important Chinese provinces are listed in table A.11 in Annex A.

4.1 Overview

During the current monitoring period, winter wheat and rapeseed were still at the growing stage while spring crops including spring maize and early rice were at the sowing stage. Generally speaking, agro-climatic conditions were favorable and beneficial for crop growth. At the national scale rainfall and temperature increased by 20% and 0.8°C respectively, as compared to the 15 year average, whereas RADPAR declined by 4%. Consequently, BIOMSS was 7% below average and VCIx was quite fair, with a value of 0.85.

Spatially, 71% of the arable land experienced average precipitation throughout the reporting period. The remaining areas in the south-eastern region (13.2% of cropland), went through rainfall fluctuations over time. The most pronounced high rainfall anomalies (more than 75 mm above average) affected 18.5% of agricultural areas in late March mainly in the provinces along the Yangtze River. At the national scale, the temperatures had positive anomalies before early April, and then generally dropped to negative departures until the end of the monitoring period. In contrast to rainfall, temperature anomalies were much more varying over time especially in Southern China, accounting for 19.1% of the arable land, mainly including some parts of Guizhou, Guangxi, Guangdong, Hunan, Jiangxi, Fujian, and Jiangsu province, where the anomalies ranged between -2.7 and +5.7°C. These are rather dramatic variations. Fortunately, they occcured before the start of the growing season. Uncropped areas mainly occurred in the North-west, North-east regions and the provinces of Gansu, Ningxia, Shaanxi, Shanxi, and Hebei in Northern parts of China due to the low temperatures. The potential biomass (Figure 4.4) showed significant variability across regions. Negative anomalies dominated most of the country, mainly observed in the northern, southern and southwestern regions, while positive anomalies were mainly observed in the provinces of Guangdong, Fujian, and Jiangxi in the southeastern regions, as well as in some parts of Xinjiang, Shanxi, Henan, Yunnan, Shaanxi, and Inner Mongolia.

The cropping season is well underway in southern and central China. According to the spatial VCIx patterns (Figure 4.6), favorable crop condition (VCIx larger than 0.8) occurred widely all across China; values between 0.5 and 0.8 mainly appeared in the provinces of Gansu, Shaanxi, Shandong, Hebei, and Shanxi where cropland was not cultivated during the monitoring period according to the CALF map. When it comes to VHIn (Figure 4.7), high values (above 36) are widespread in China, indicating limited drought effects on most of winter crops.

As for the main producing regions at the sub-national level, rainfall was significantly above average, ranging from +6% to +51%. Temperature departures were all positive, ranging from +0.4°C to +1.8°C, with the highest positive departure in north-east China. RADPAR in all regions was below average. Consequently, BIOMSS decreased in almost all the regions compared to average except for Lower Yangtze region, with the anomalies ranging from -16% to -3%. CALF in major winter crops regions was generally close to average, ranging from 2% below average in Huanghuaihai to 1% above average in Southern China. As for VCIx, the values were quite fair for all the regions, ranging between 0.76 and 0.90.

Table 4.1 CropWatch agro-climatic and agronomic indicators for China, January to April 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	51	1.2	-4	-9	-2	0.83
Inner Mongolia	34	0.9	-2	-11	/	0.77
Loess region	6	0.8	-1	-13	-12	0.76
Lower Yangtze	18	1.0	-2	-3	0	0.88
Northeast China	10	1.8	-4	-3	/	0.91
Southern China	12	0.6	-1	0	1	0.89
Southwest China	36	0.4	-9	-16	0	0.90

Figure 4.1 China crop calendar

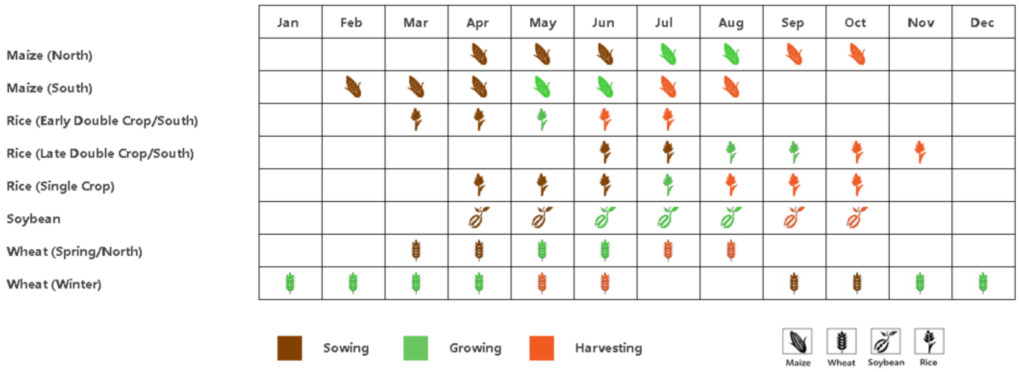


Figure 4.2 China spatial distribution of rainfall profiles, January - April 2020

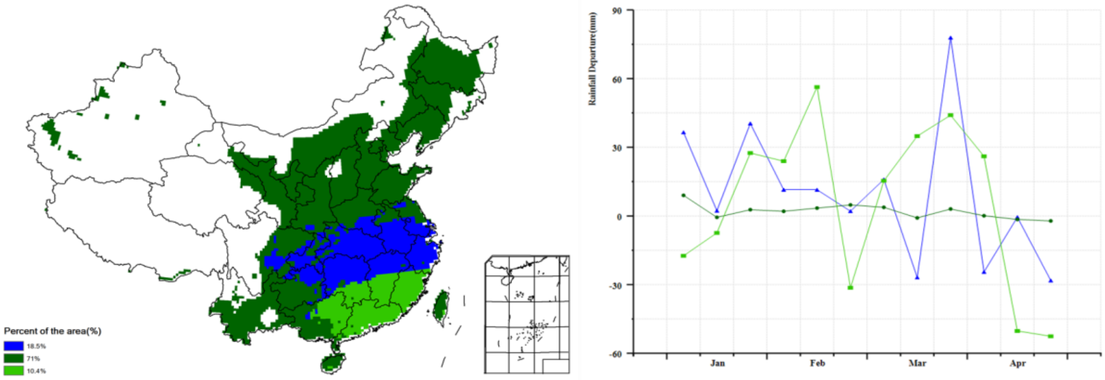


Figure 4.3 China spatial distribution of temperature profiles, January - April 2020

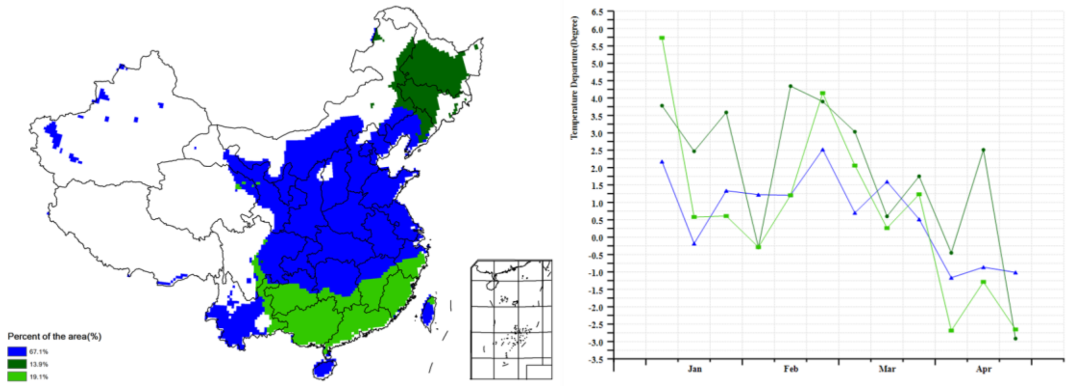


Figure 4.4 China cropped and uncropped arable land, by pixel, January - April 2020

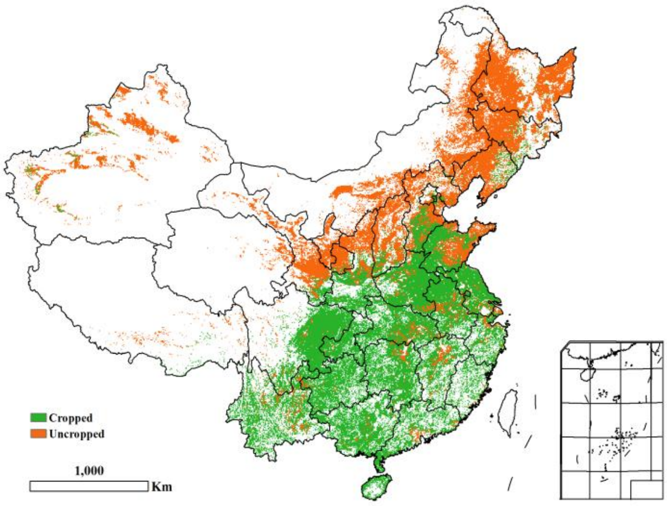


Figure 4.5 China maximum Vegetation Condition Index (VCIx), by pixel, January - April 2020

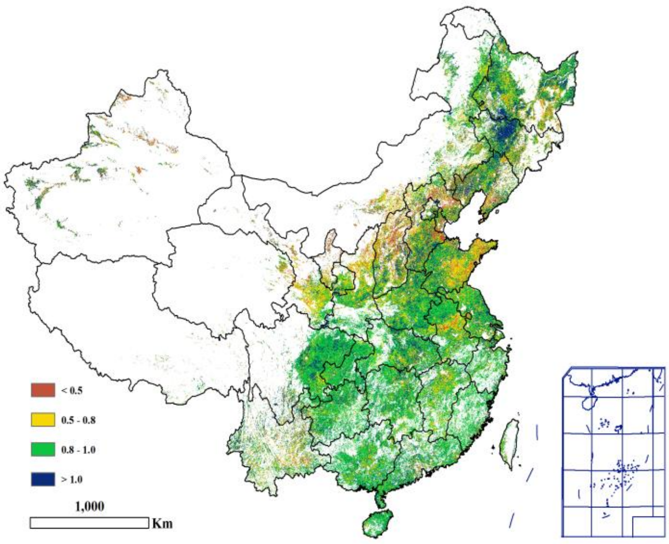


Figure 4.6 China biomass departure map from 15YA, by pixel, January - April 2020

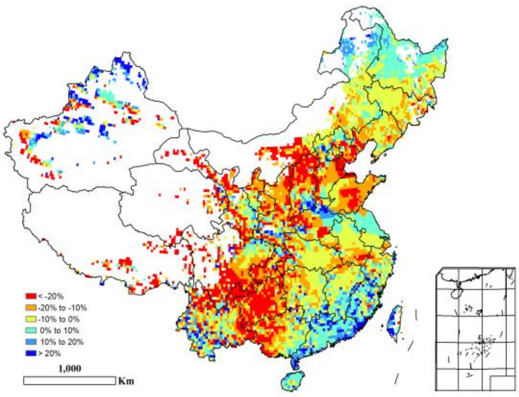
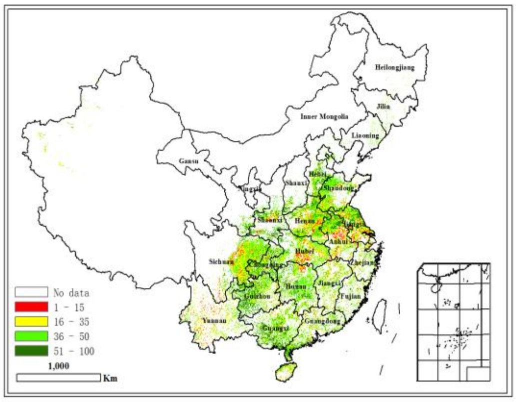


Figure 4.7 China minimum Vegetation Health Index, by pixel, January - April 2020



4.2 China crops prospects

(1) Winter crop production

Multi-source high resolution satellite images, agro-climatic and agronomic indicators as well as field surveys from winter crop producing provinces were integrated into the forecast of winter crop production.

The overall favorable weather conditions benefitted winter crops. The significantly above-average rainfall provided good soil moisture which was conductive for the development of winter crops. CropWatch puts the total output of winter crops at 132.33 million tons, up by 3% or 4.29 million tons from 2019 (Table 4.2).This is due to increased yield and expanded planted area at the national level.

Table 4.2 China, 2020 winter crop production (thousand tons) and percentage difference with 2019, by province

	2019	2020			
Provinces	Production (kton)	Area change (%)	Yield change (%)	Production change (%)	Production (kton)
Hebei	12297	−2	3	1	12417
Shanxi	2311	−1	3	2	2361
Jiangsu	10280	1	3	5	10747
Anhui	11852	2	−1	1	11923
Shandong	24916	3	0	3	25758
Henan	26952	5	0	4	28157
Hubei	5380	1	1	2	5492
Chongqing	2259	0	4	4	2345
Sichuan	5866	0	−3	−3	5683
Shaanxi	4001	1	1	3	4111
Gansu	3590	5	−2	3	3690
Sub total	109702	–	–	3	112684
Other provinces	18342	–	–	7	19650
National total*	128044	2	1	3	132334

* Production of Taiwan province is not included.

Rainy and cloudy weather dominated the dormancy to flowering stages of winter crops in most of the winter crop producing provinces. The significantly below-average radiation in Anhui and Sichuan resulted in lower yield prospects compared with the 2018-2019 season. Low rainfall in Gansu, where most crops are rain-fed, hampered the development of winter crops after the wintering period and resulted in a 2% drop in yield compared with last year. Winter crop yields in all other provinces are forecasted to be above or remain at same level as 2019. As for the planted area, decreases were observed in Hebei and Shanxi, down by 2% and 1% from 2019, respectively. The reduction of winter crops planted area might be a consequence of the water-saving and sustainable groundwater management policy. Henan, as the No. 1 winter crop producing province, planted 5% more winter crops compared with last year. It is also noteworthy that winter crops in Hubei recovered from unfavorable conditions in March (see impacts of COVID-19 section) thanks to the end of the lockdown.

The total winter wheat production in 2020 is estimated to reach 122.24 million tons, an increase of 4.44 million tons or 4% from 2019. The national winter wheat area is 23,898 thousand hectares, an increase of 3% over the same period of last year. The average winter wheat yield nationally is 5115 kg/ha, up by 1% compared to 2019 (Table 4.3).

The two main winter wheat producing provinces of Henan and Shandong further expanded the winter wheat planted area by 5% and 3%, respectively. Although drought occurred in Gansu, the planted area of winter wheat still increased by 5% because of favorable rainfall during the sowing period last year. The increased planted area compensated for the impacts of drought and lower yield, resulting in a 3% increase of winter wheat production in Gansu. Since winter wheat is the dominating crop in all winter crop producing provinces, the inter-annual yield variations of winter wheat are very similar to those of winter crops in table 4.2. Yield dropped by 1%, 3% and 2% in Anhui, Sichuan, and Gansu. Increased yield in Hebei and Shanxi compensated for the reduced planted area and resulted in 1% and 2% increase of winter wheat production. The largest inter-annual production changes in percentage are observed in Jiangsu where both planted area and yield are above 2019.

Overall, CropWatch gives a good prospect for winter crop production in 2020.

Table 4.3 China, 2020 winter wheat area, yield, and production and percentage difference with 2019, by province

	Area (kha)			Yield (kg/ha)			Production (kton)		
Provinces	2019	2020	Changes (%)	2019	2020	Changes (%)	2019	2020	Changes (%)
Hebei	2000	1965	−2	5997	6163	3	11994	12111	1
Shanxi	520	517	−1	4301	4423	3	2238	2285	2
Jiangsu	1955	1978	1	5142	5314	3	10053	10510	5
Anhui	2389	2430	2	4752	4698	−1	11350	11414	1
Shandong	4154	4281	3	5946	5963	0	24701	25528	3
Henan	5138	5373	5	5225	5219	0	26846	28038	4
Hubei	979	984	1	3951	4007	1	3868	3945	2
Chongqing	345	343	0	3234	3372	4	1115	1157	4
Sichuan	1295	1289	0	3874	3766	−3	5016	4854	−3
Shaanxi	1059	1072	1	3702	3759	2	3920	4029	3
Gansu	430	452	5	4176	4073	−2	1794	1843	3
Sub total	20263	20684	2	5078	5111	1	102896	105714	3
National total*	23315	23898	3	5053	5115	1	117801	122240	4

* Production of Taiwan province is not included.

(2) Early rice planted area

Using the multi-source satellite remote sensing data of ESA Sentinel 1 and Sentinel 2 from February 1 to April 16, 2020, combined with the crowd-sourcing of in-situ data, early rice planted area in eight major production provinces of China were estimated. In short, the significant changes of ground surface before and during land preparation and transplanting were utilized to extract early rice cultivation area. The results show that COVID-19 had limited impacts on early rice cultivation at the national level. It is expected that the area of early rice in the eight main early rice producing provinces in 2020 will increase by 2.2% compared with 2019.

In 2020, the total early rice area is estimated at 5101.4 thousand hectares, an increase of 109.7 thousand hectares or 2.2% up from 2019 (Table 4.4). As the largest early rice producing province, Hunan province planted 1543.6 thousand hectares of early rice, an increase of 27.6 thousand hectares compared with 2019 (+1.8%); The largest inter-annual increase of early rice area in percentage was observed in Guangxi with a 7.6% increase over 2019. The cultivated early rice area in Guangxi is estimated at 942 thousand hectares, an increase of 66.6 thousand hectares from 2019. The planted areas of early rice in Fujian, Zhejiang, Anhui and Guangdong increased by 5.5%, 0.7%, 4.0% and 4.1%, respectively.

Hubei and Jiangxi provinces are the only two provinces for which we observed a decreased early rice planted area compared with 2019. In Jiangxi Province it has decreased by 1.3%; while for Hubei Province, affected by the outbreak of the COVID-19 and the complete lockdown, early rice area was ignificantly reduced by 10.6% or 18.2 thousand hectares compared to 2019.

Table 4.4 China Early rice planted area for each major rice producing province in 2019 and 2020

Province	Cultivated area (kha)		Inter-annual changes	
	2019	2020	Changes (kha)	Changes in percentage
Fujian	151.0	159.3	8.3	5.5
Zhejiang	112.7	113.5	0.8	0.7
Jiangxi	1182.7	1166.8	-15.9	-1.3
Guangxi	875.4	942.0	66.6	7.6
Hunan	1516.0	1543.6	27.6	1.8
Anhui	172.1	179.0	6.9	4.0
Hubei	171.6	153.4	-18.2	-10.6
Guangdong	810.2	843.8	33.6	4.1
Sub-total	4991.7	5101.4	109.7	2.2

(3) Limited impacts of COVID-19 on winter crops

In general, growth conditions for winter wheat at the national level were better than during the same period of last year at the time of the end of the lockdown in Hubei province. The favorable crop conditions coincide with the increased yield of winter crops as described in the previous section.

Over the major winter wheat-producing areas, 36% of the cultivated area was above the 2019 crop conditions, mostly distributed in the Provinces of Hebei, northwest Shandong, central and northeast Jiangsu, and Shaanxi. Only 2% of the cultivated area showed inferior conditions compared to 2019, scattered in the different provinces.

At the provincial level, winter crops in Hebei, Shaanxi, Shanxi, Shandong, Jiangsu, Henan and Anhui provinces performed well, with 75%, 62%, 54%, 43%, 35%, 23% and 21% of cultivated area above 2019â€™s conditions, respectively. Less than 3% of the area under cultivation showed crop conditions below 2019 for all provinces except for Hubei. It is noteworthy that crop conditions were lower than in 2019 in the Jingzhou and Puyang municipal region in Hubei Province, accounting for 8% of the province's winter crop cultivation area. Overall, the outbreak of COVID-19 in China had limited impact on the production of winter crops.

Figure 4.8 **Crop growth condition in the major winter wheat-producing areas (March 1st to 10th)**

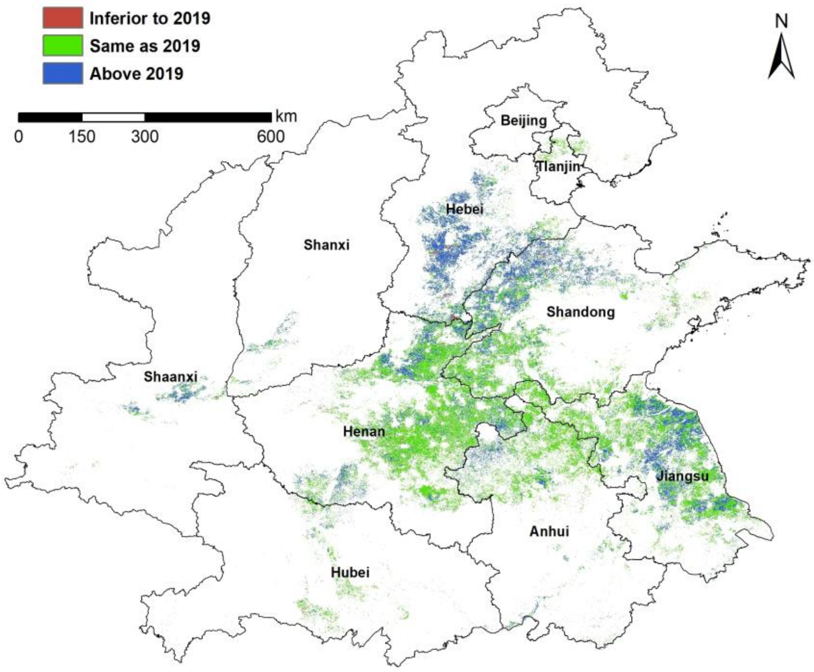
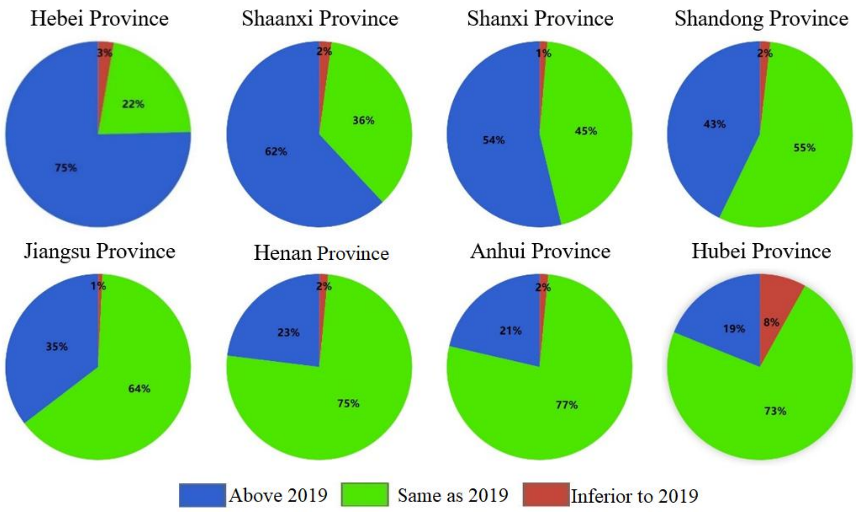


Figure 4.9 **Statistical proportion of winter crops condition compared to 2019 for each province in March**



4.3 Regional analysis

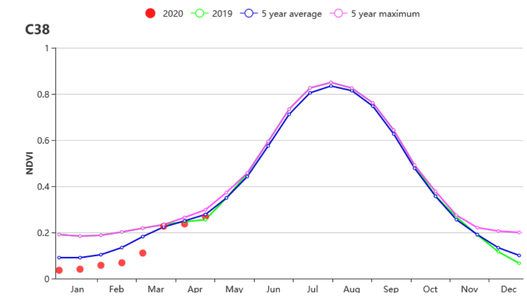
Figures 4.10 through 4.16 present crop condition information for each of China's seven agricultural regions. The provided information is as follows: (a) Phenology of major crops; (b) Crop condition development graph based on NDVI, comparing the current season up to October 2019 to the previous season, to the five-year average (5YA), and to the five-year maximum; (c) Spatial NDVI patterns for January - April 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 January - April 2020. Additional information about agro-climatic indicators and BIOMSS for China is provided in Annex A.

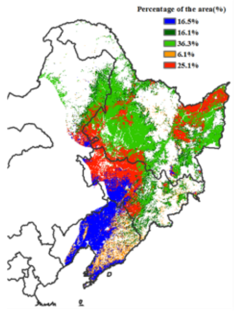
Northeast region

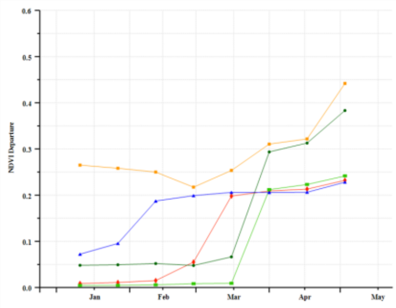
Due to the cold winter weather, no crops were grown in the northeast of China during this monitoring season (January to April 2020). Accordingly, the NDVI growth curve showed low values. CropWatch Agroclimatic Indicators (CWAIs) have shown that the precipitation and temperature greatly deviated from the average level. The overall precipitation increased by 10%, and the precipitation was above average level in mid-February, late February, mid-March and mid-April. The photosynthetically active radiation decreased by 4%, and temperature increased by about 1.8°C. The temperatures were close to average levels in mid-March, late March and early April. Altogether, the potential biomass was 3% below the fifteen-year average level.

Overall, higher precipitation and warmer temperatures are beneficial to spring sowing. A short period of cold weather in late April in the northern part (Heilongjiang Province) of northeast China may have caused a slight delay of sowing. CropWatch will continue to monitor the Northeast in the coming months.

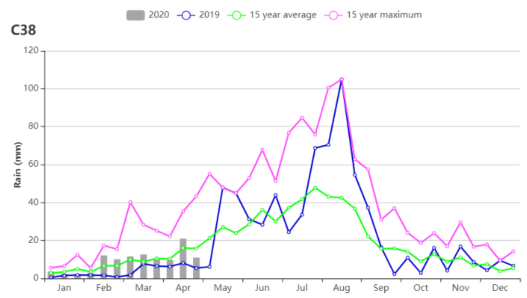
Figure 4.10 Crop condition China Northeast region, January - April 2020



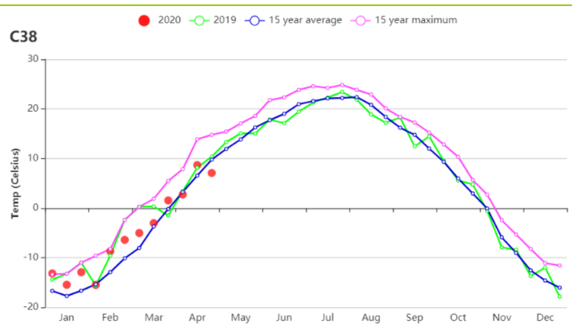




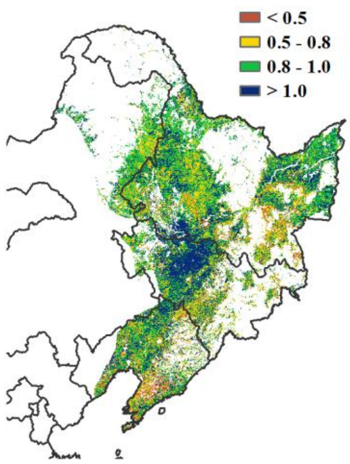
(a) Crop condition development graph based on NDVI (b) Spatial NDVI patterns compared to 5YA (c) NDVI profiles



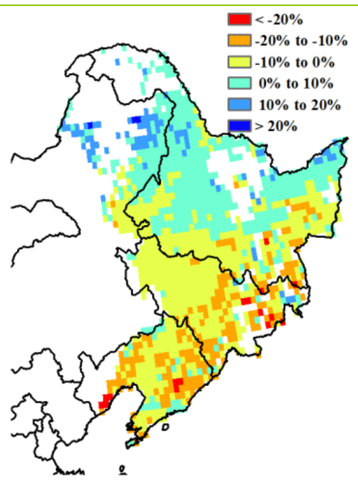
(d)Time series rainfall profile



(e)Time series temperature profile



(f) Maximum VCI

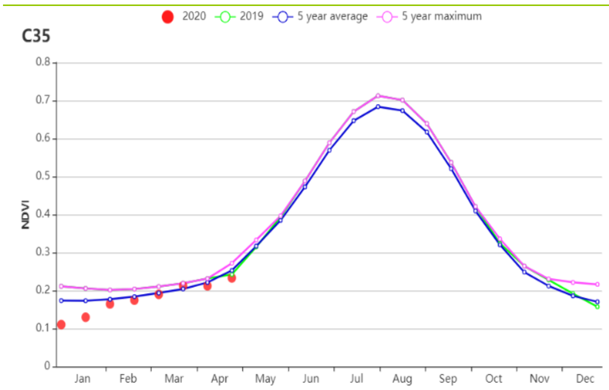


(g) Potential biomass departure from 15YA

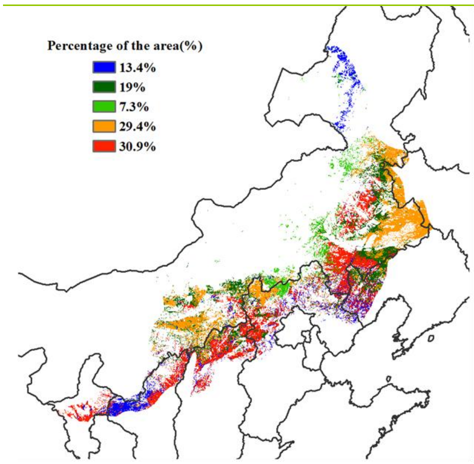
Inner Mongolia

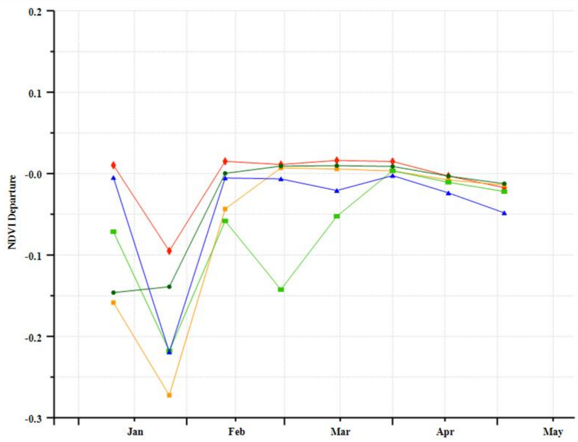
At the end of this monitoring period in late April, most crops had not yet been planted in Inner Mongolia due to the low temperatures in the winter and early spring. Sowing activities gradually started from late April, along with increasing temperatures. Agro-climatic indicators in the first four months of this year demonstrated that rain and temperature indicators were above average (RAIN +34%, TEMP +0.9°C), while the radiation (RADPAR) decreased by about 2%. Significant above-average rainfall provides sufficient soil moisture which will benefit the germination of crops and green-up of grazing lands alike. Meanwhile, the abundant rainfall also hampered the sowing of spring crops as reflected by the 45% lower CALF because of late sowing. Current prospects for the region are mixed, weather conditions in the following months are very critical.

Figure 4.11 Crop condition Inner Mongolia region, January - April 2020

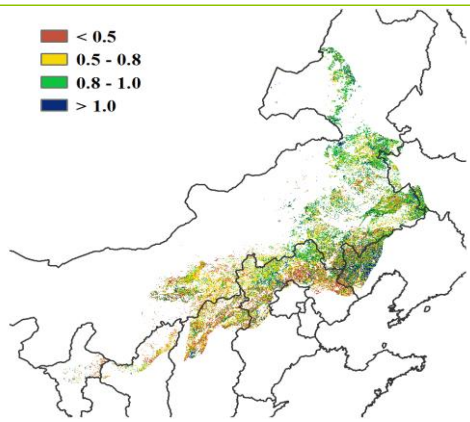


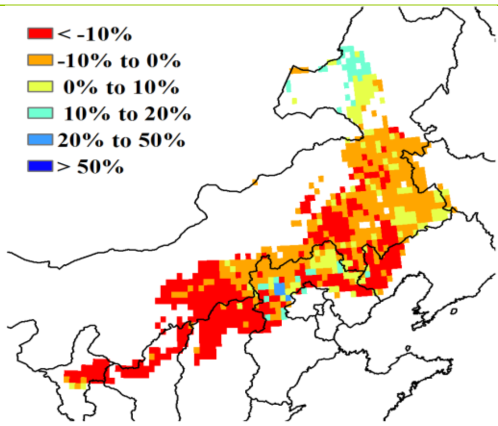
(a) Crop condition development graph based on NDVI





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





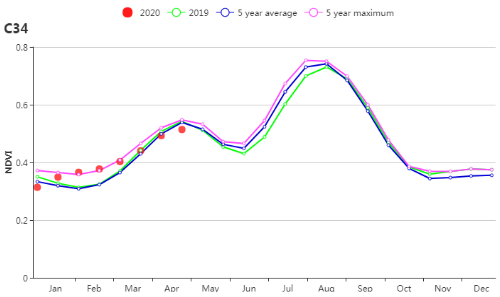
(c) Maximum VCI (d) Potential biomass departure from 15YA

Huanghuaihai

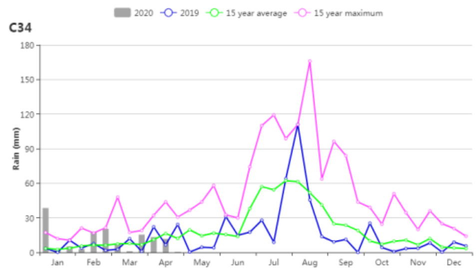
The Huanghuaihai region is located in the North China Plain, where winter wheat - summer maize double cropping is the major cropping practice. The monitoring period of this report is from January to April, during which the winter wheat progressed from winter dormancy to the flowering stage. Harvest will be completed in mid-June. The NDVI-based crop growth profile shows that the growth of winter wheat was generally above average until March, and slightly lower than the average in April. The maximum vegetation condition index (VCIx) was 0.83 indicating that the crops were in average conditions. As assessed by CropWatch indicators, the agro-climatic and agronomic conditions were generally favorable. Compared to average, the precipitation (RAIN) increased greatly by 51% and the temperature (TEMP) rose slightly (+1.2℃), while the radiation (RADPAR) showed a reduction of 4%. The low radiation potentially lowered the biomass by 9% compared with 15YA but the significant above average rainfall might benefit crops if further weather are dominated by sunny condition. The cropped arable land fraction (CALF) was 2% lower than the past 5-year average.

The whole region displayed NDVI values that were below but close to average as shown by the NDVI clusters and profiles. Northern Jiangsu showed above-average crop conditions, accounting for 16.1% of the total cultivated area, while about 38.2% of the cultivated land located in south-eastern Hebei, Tianjin and southeastern Liaoning had poor crop growth condition in mid and late January. Then the crops recovered to average levels over the regions mentioned above. The crop growth in the remaining areas of Huanghuaihai was somewhat lower than the average level, including parts of eastern Liaoning and eastern Hebei. The potential biomass departure map shows that biomass in the northern part of the region was significantly lower than the average level and higher in the south, which is consistent with the actual growth situation reflected by the NDVI anomaly cluster map.

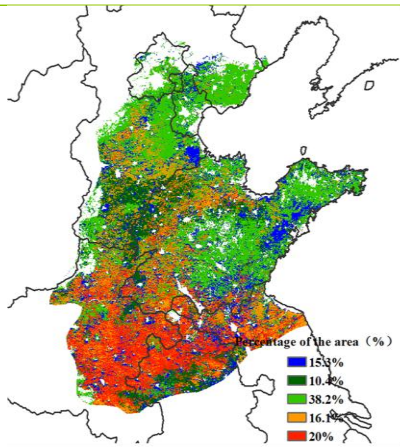
Figure 4.12 Crop condition Huanghuaihai region, January - April 2020



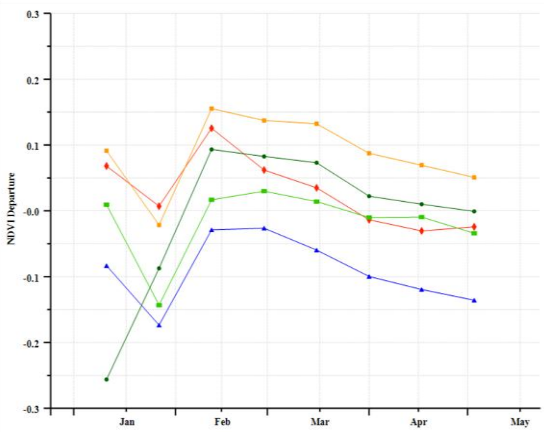
(a) Crop condition development graph based on NDVI



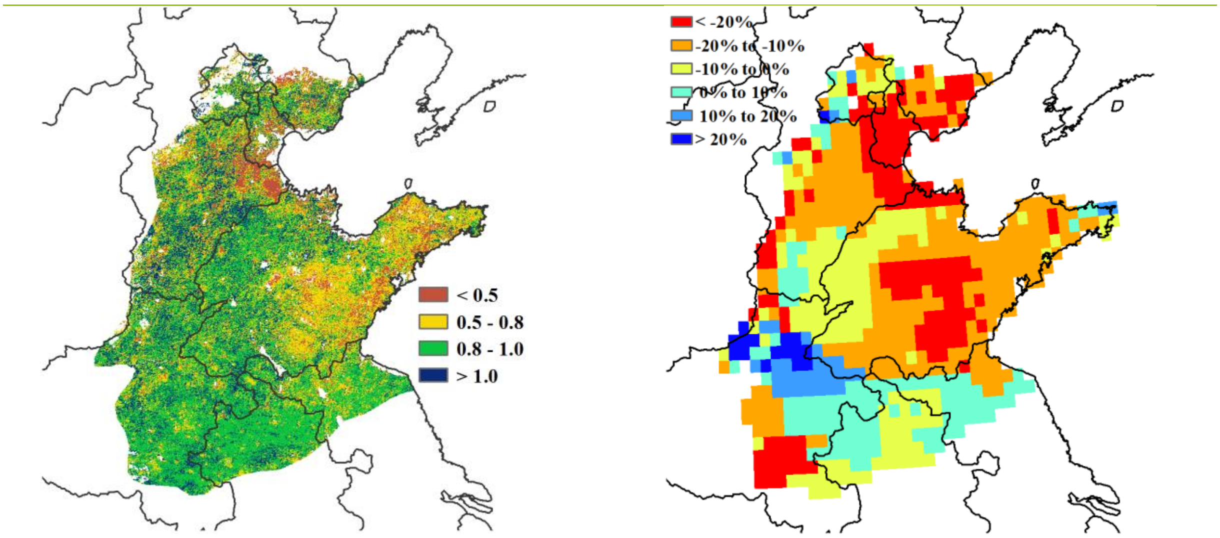
(b) Rainfall profiles



(b) Spatial NDVI patterns compared to 5YA



(c) NDVI profiles

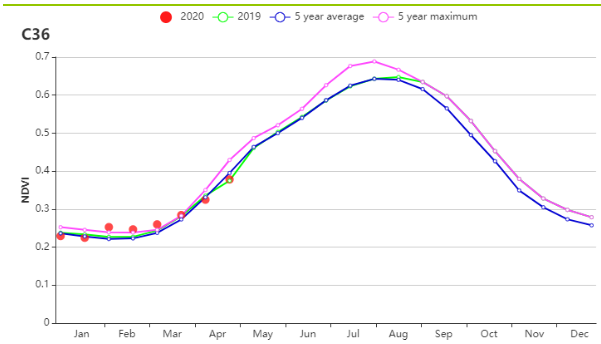


(d) Maximum VCI	(e) Biomass departure from 15YA

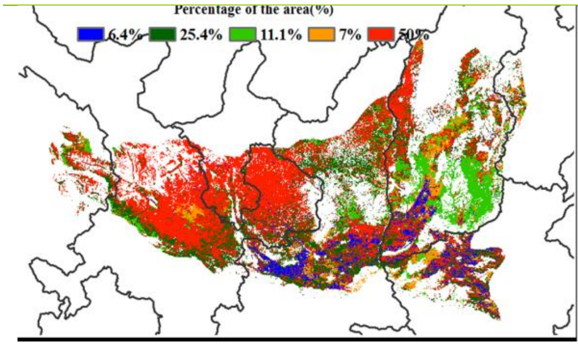
Loess region

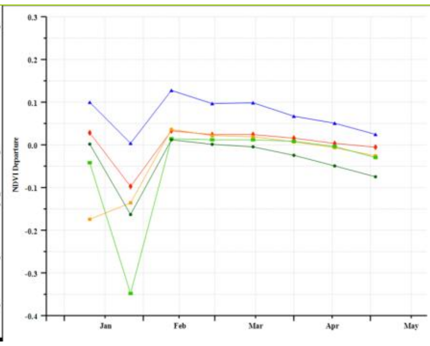
During this reporting period, the main crops grown in the Loess region were winter wheat, spring wheat and spring maize. Winter wheat was sown during late September to mid-October and will be harvested in mid-June. Planting of spring wheat and maize took place from late March to April. According to the regional NDVI development graph, crop conditions were close to the 5YA. They were generally superior to last year's and the 5-year average from February to March and close to average in April. During the monitoring period, precipitation (RAIN +6%) was above average, and so was the temperature (TEMP +0.8°C). Radiation (RADPAR -1%) was below average, which may slightly affect photosynthesis. NDVI clusters and profiles show that crop conditions were close to average in the west and north of the Loess region, while the crop conditions were below average and underwent some fluctuation from late January to early February in central and southern Shanxi. The potential biomass indicator was below average (BIOMASS -13%) for most of the Loess region. The maximumVCIx in some area was lower than 0.5, especially in the north and west. The fraction of cropped arable land was below the 5-year average (CALF -12%). Overall, the current indicators show slightly unfavorable crop prospects in the region. At the end of the monitoring period, wheat harvest was still more than a month away and average yields may result, depending on the weather conditions in May and early June.

Figure 4.13 Crop condition China Loess region, January - April 2020



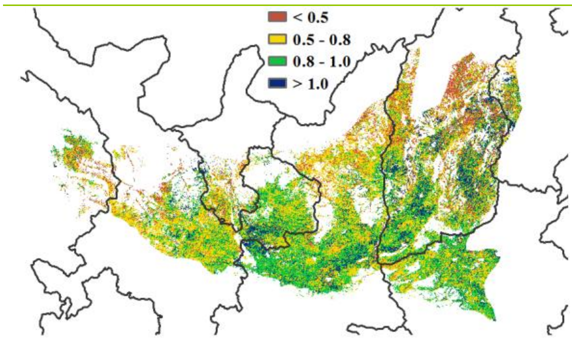
(a) Crop condition development graph based on NDVI

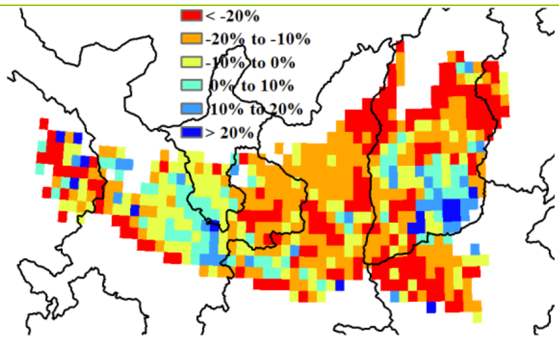




(b) Spatial NDVI patterns compared to 5YA

(c) NDVI profiles





(d) Maximum VCI

(e) Biomass departure from 15YA

Lower Yangtze region

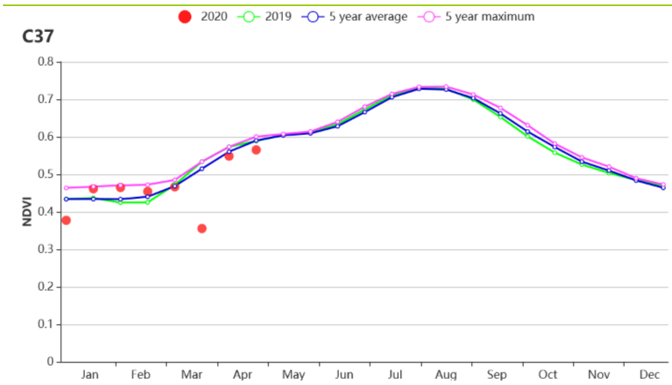
During this monitoring period, only winter crops such as wheat and rapeseed were in the field, essentially in the north of the region, including parts of Hubei, Henan, Anhui and Jiangsu provinces. There were no crops growing in the field in Fujian, the southern Jiangxi and Hunan provinces. The overall crop condition is estimated to be slightly unfavorable.

According to the CropWatch agro-climatic indicators, the Lower Yangtze region experienced a warmer and wetter season compared to the 15YA with temperatures at 1.0℃ above average and accumulated precipitation at 17% above average. The photosynthetically active radiation, however, was slightly below average (RADPAR, -2.1%). The combined environmental factors led to a 3% decrease in potential biomass compared to the 15YA. The potential biomass departure map showed the spatial variation of the weather impact on crops. Most areas in this region had negative anomalies up to 10% below average due to lower radiation.

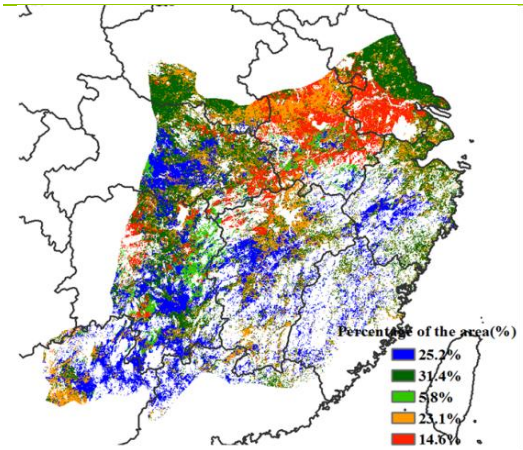
As shown in the NDVI development graph, crop conditions were slightly below the 5-year average. Only 31.4% of the area, mostly distributed in the northwest and northeast of this region including Jiangsu, Hubei and Henan provinces, showed slightly better crop conditions than the 5YA. NDVI in the remaining areas presented below-average levels.

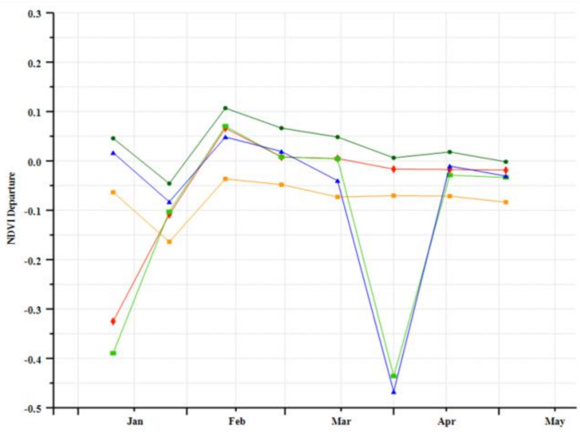
The crop conditions in the Lower Yangtze region are currently assessed as close to but below average. Meanwhile, the significantly above-average rainfall will provide favorable soil moisture for the crop development and yield formation in the following months.

Figure 4.14 Crop condition Lower Yangtze region, January 2020 - April 2020



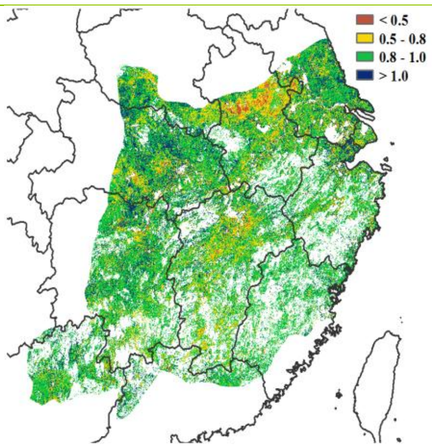
(a) Crop condition development graph based on NDVI



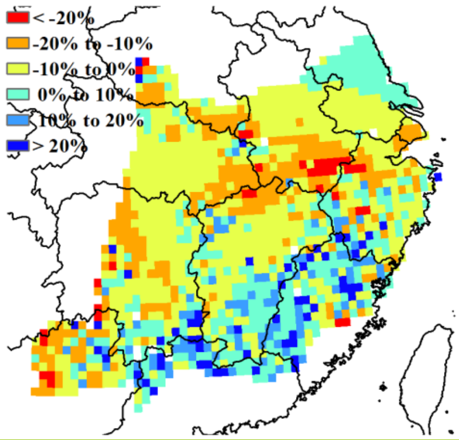


(b) Spatial NDVI patterns compared to 5YA

(c) NDVI profiles



(d) Maximum VCI



(e) Biomass departure from 15YA

Southwest China

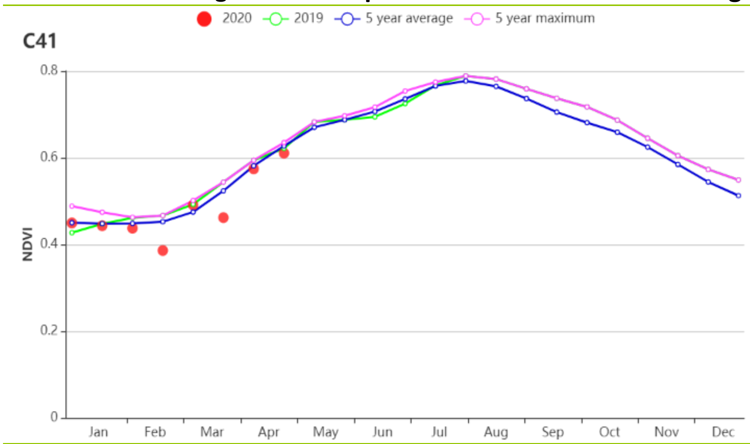
This reporting period covers the dormancy to flowering stage of winter wheat. According to the regional NDVI profile, crop conditions were slightly below the 5-year average but recovered to average levels in April.

On average, rainfall was above the fifteen-year average (Rain +36%), whereas radiation was below average (RADPAR -9%). Temperature was close to average as well (TEMP + 0.4°C). The resulting BIOMSS was 9% below average mainly due to less radiation. The cropped arable land fraction remained at the same average level as in the previous five years.

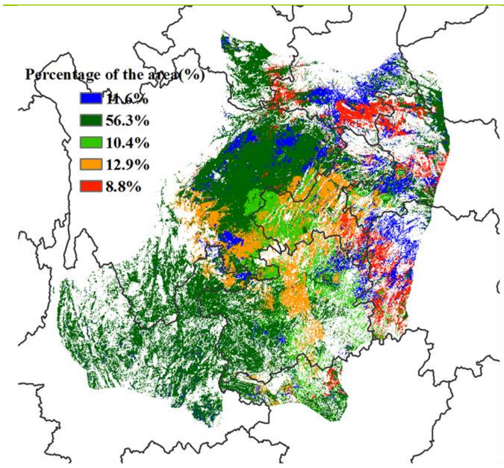
According to the NDVI departure clustering map and the profiles, values were close to average from late January to mid-April, except in Chongqing and neighboring areas in eastern Guizhou, which recorded very low NDVI due to low RADPAR (-15% and -16%, respectively). Average NDVI throughout the monitoring period was observed in eastern Sichuan and eastern Yunnan, where radiation was below average and precipitation above average (See Annex A.11). The maximum VCI reached 0.90, indicating that peak conditions were comparable to the previous five years.

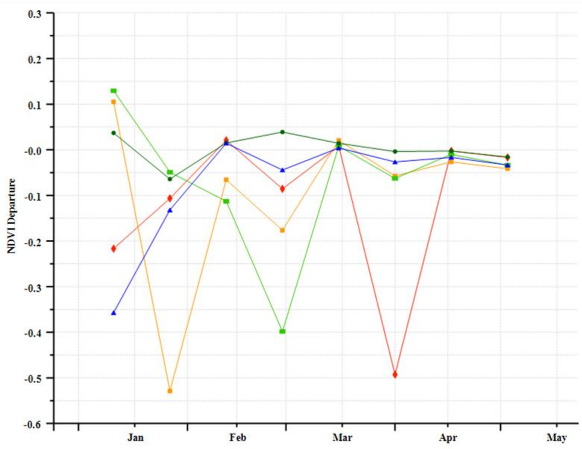
The mixture of positive and negative departures of indicators shows overall slightly below-average crop conditions. Meanwhile, the sufficient rainfall might benefit the grain-filling of the winter crops if radiation is at normal levels in May.

Figure 4.15 Crop condition Southwest China region, January - April 2020

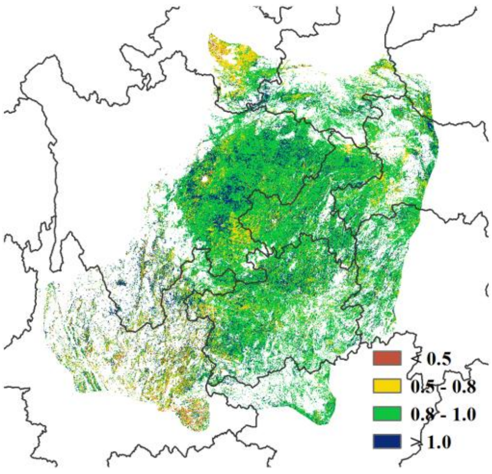


(a) Crop condition development graph based on NDVI

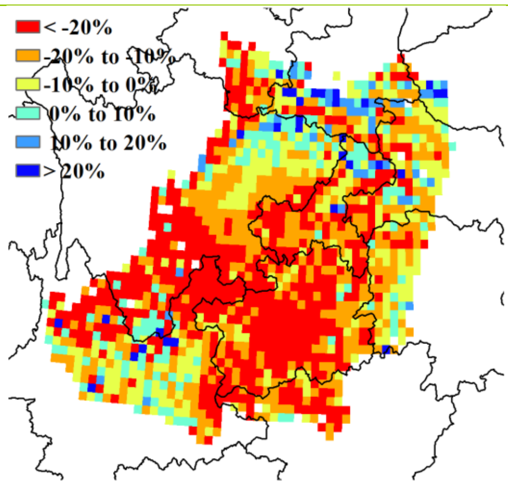




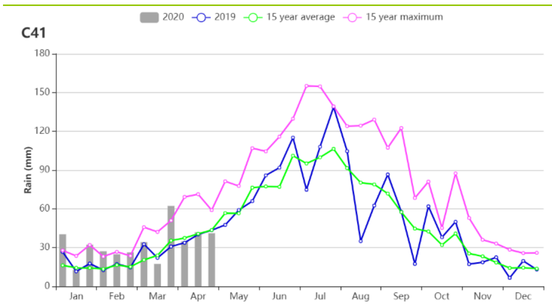
(b) Spatial NDVI patterns compared to 5YA (c) NDVI profiles



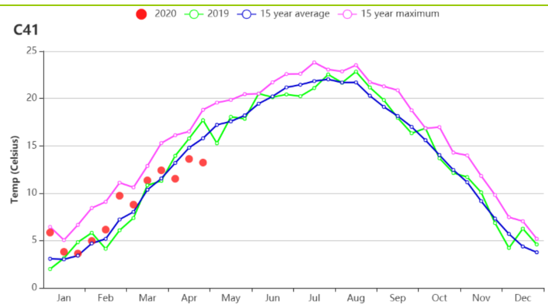
(d) Maximum VCI



(e) Biomass departure from 15YA



(f) Time series rainfall pofile



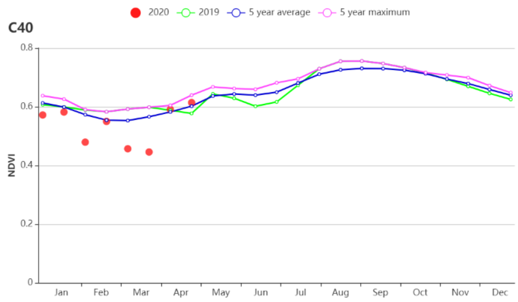
(g) Time series temperature profile

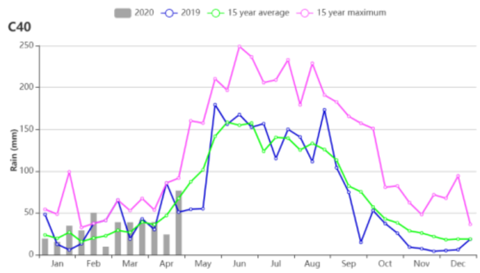
Southern region

During this monitoring period, winter wheat was approaching maturity and transplanting of early rice was almost concluded except for some areas in Yunnan. According to the crop condition development graph based on NDVI, crop conditions were generally below the 5-year average, while they gradually improved after mid-March. Rainfall was above average (RAIN +12%) and radiation and temperature were close to average (RADPAR -1%, and TEMP +0.6℃).

The average VCIx of the Southern China region during the monitoring period was 0.89, and almost all regions presented above 0.80 VCIx. The cropped arable land fraction was near average (CALF +1%), and the biomass was close to average as well. Guangdong, Fujian and some scattered areas in Yunnan experienced a significant increase of BIOMSS. Guangxi was just the opposite. As shown by NDVI clusters and profiles, 32.1% of the region displayed above-average values. 12.8% of cropland, mostly located in Guangxi, showed negative departures during late January to late March and was near average in April. During April, most areas in Southern China were slightly above average, while only 29.7% of the region was below average. Yunnan had experienced a severe drought starting in March, which caused serious crop losses. The drought intensity was greater than usual and will most likely continue until the beginning of the rainy season in early summer. A closer monitoring for this region will be needed in the coming months.

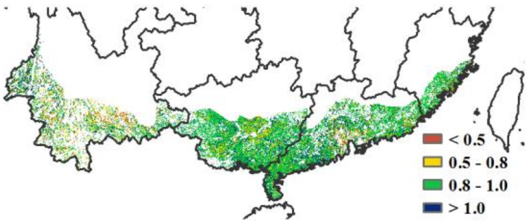
Figure 4.16 Crop condition China Northeast region, January - April 2020

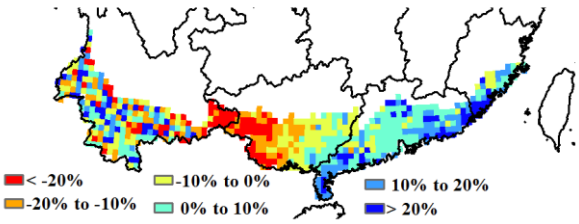




(a) Crop condition development graph based on NDVI

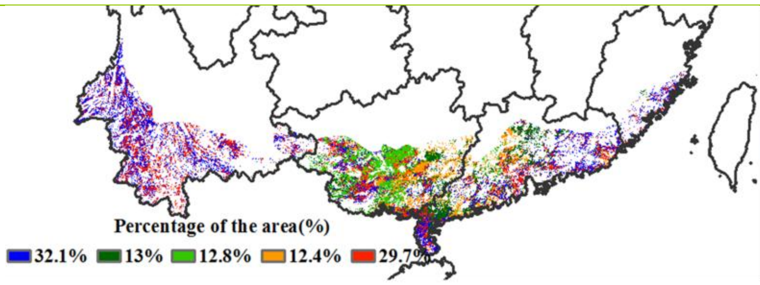
(b) Time series rainfall profile

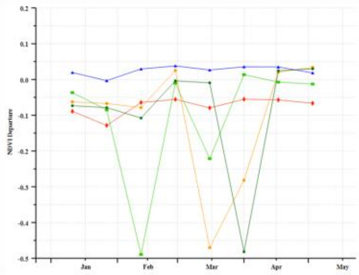




(c) Maximum VCI

(d) Potential biomass departure from 15YA





(e) Spatial NDVI patterns compared to 5YA

(f) NDVI profiles

4.4 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 quarter, China imported 563.1 ktons of rice, down by 4.0% compared to the same period last year. The main sources of rice imports were Myanmar, Vietnam, Pakistan, Thailand and Cambodia, accounting for 25.6%, 24.4%, 17.4%, 14.3% and 14.4%, respectively, with an import value of US$293 million. Rice exports totaled 521.5 ktons, an increase of 8.8% over the previous year, mainly to Egypt, the republic of Korea, Papua New Guinea, Japan and sierra leone, accounting for 16.7%, 8.4%, 7.3%, 7.1% and 6.3% of total exports, respectively, with a value of US$214 million.

In the first quarter, China imported 1.27 million tons of wheat and wheat products, an increase of 22.6% over same period in the previous year. The main sources of imports were Australia, France, Canada and Lithuania, accounting for 36.7%, 27.5%, 11.5% and 10.3% of the total imports, respectively, with an import value of US$362 million. The export volume of wheat and its products was 55.9 ktons, mainly to the DPRK and Hong Kong, accounting for 71.7% and 26.1% of the total export volume respectively, with a value of US$21 million.

In the first quarter, China imported 1.25 million tons of corn, an increase of 27.4% over the previous year. The main sources of imports were Ukraine, Bulgaria and Russia, accounting for 88.6%, 9.0% and 2.2% of the total imports, respectively, with an import value of US$266 million. Corn exports were 1.2 ktons, mainly to north Korea (100%), with an export value of US$317.3 thousand.

In the first quarter, China imported 17.79 million tons of soybeans, an increase of 6.2% over the previous year. The main sources of imports were the United States, Brazil and Argentina, accounting for 43.9%, 40.7% and 12.0% of the total imports, respectively, with an import value of US$7.193 billion. Soybean exports were 27.4 ktons, down 18.2% from 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 imports will decrease by 3.7% and exports by 8.6% in 2020.Affected by COVID-19 and "desert locust", the international rice market price will remain high, affecting Chinese rice import quantity. It is estimated that Chinese rice import will decrease marginally in 2020.

Chinese wheat import will increase by 10.2% and export by 2.6% in 2020. The global wheat supply is relatively abundant and the international price is low and fluctuating. Driven by the domestic and foreign price differences, it is estimated that the wheat import will keep increasing in 2020. However, affected by the epidemic, the international wheat price volatility risk is greater.

Chinese maize import will increase by 20.5% in 2020, and its export will be basically flat. At present, affected by the epidemic, the global demand for feeding maize is weakening, the overall supply and demand situation is easing with price going down. Domestic and foreign maize price difference is being at greater amptitude, Chinese maize import is expected to continue to increase in 2020.

Chinese soybean import will increase by 1.0% and export by 3.5% in 2020. As the differences between domestic and international soybean price is getting greater, soybean imports are expected to continue to grow. As the United States and China have reached an agreement on a Phase One trade deal, it is estimated that Chinese soybean import will remain high in 2020. However, the outbreak of the epidemic also brings uncertainties.

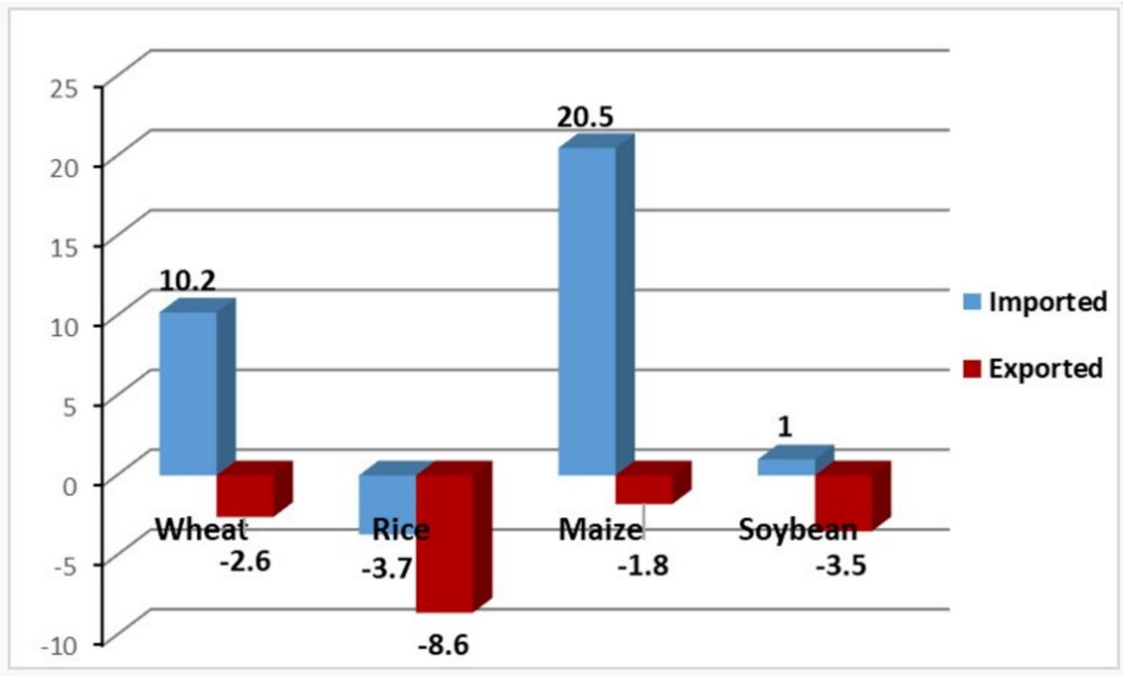


Figure 4.17 Rate of change of imports and exports for rice, wheat, maize, and soybean in China in 2020 compared to those for 2019(%)