Chapter 4. China

Chapter 4 presents a detailed CropWatch analysis for China, focusing on the seven most productive agro-ecological regions of the east and south. After a brief overview including a production outlook for 2014, detailed analysis including maps and profiles for NDVI, VCIx, CALF, and BIOMSS are provided for the individual regions. Additional information on the agroclimatic indicators for agriculturally important Chinese province are provided in table A.11 in Annex A.

4.1 Overview

The current monitoring period is a crucial time for summer crops in China. In the northeast, maize and soybean were sowed in late April and early May. In the north, winter wheat has been harvested and maize has been planted, while in the south early rice was harvested and the planting of late rice began in late July. Figures 4.1-4.5 illustrate the distribution and profiles of RAIN and TEMP indicators, as well as the fraction of cropped arable land (CALF), maximum Vegetation Condition Index (VCIx), and minimum Vegetation Health Index (VHIn). Indicator values are provided in table 4.1.

Figure 4.1. China spatial distribution of rainfall profiles, April-July 2014

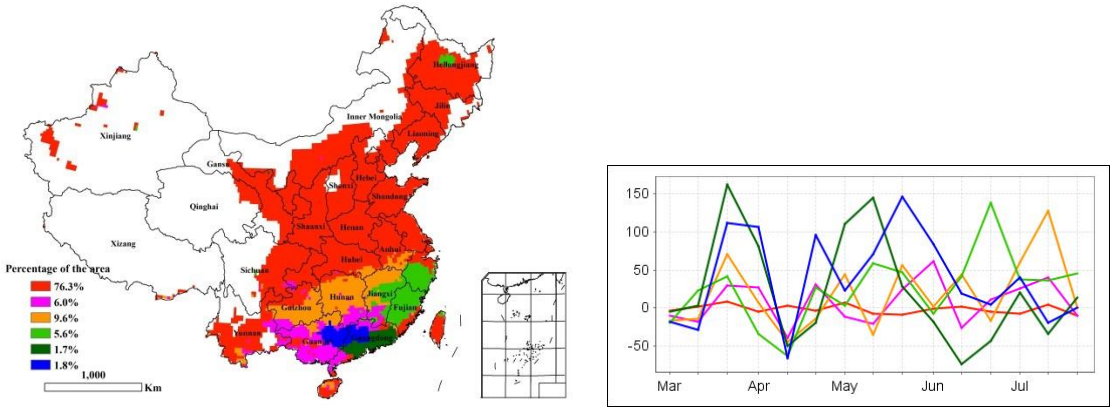


Figure 4.2. China spatial distribution of temperature profiles, April-July 2014

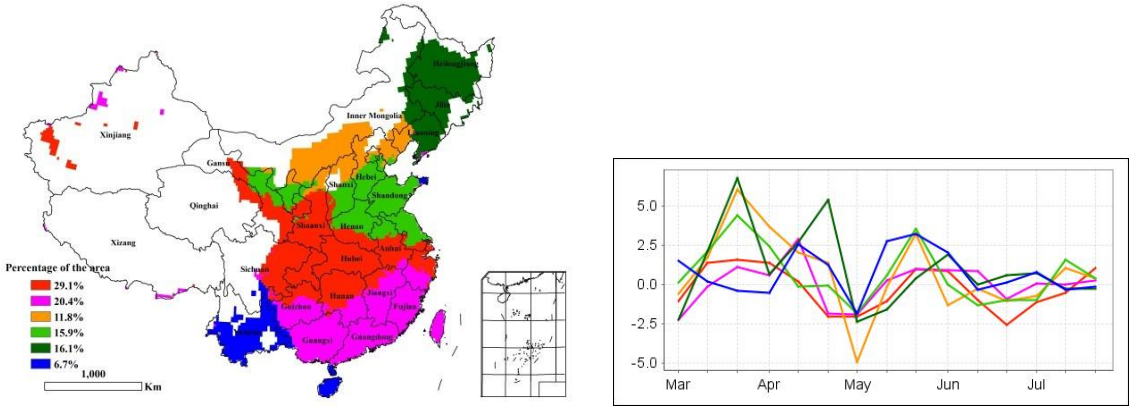


Figure 4.3. China cropped and uncropped arable land, by pixel, April-July 2014

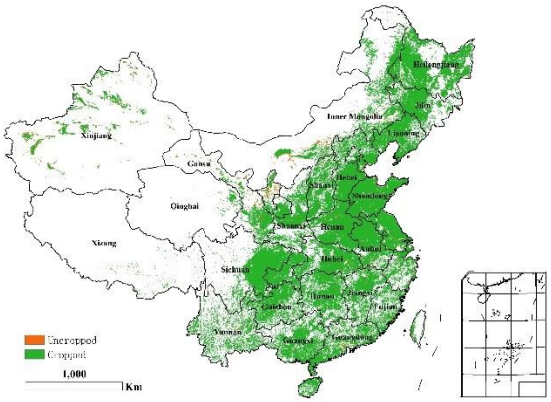


Figure 4.4. China maximum Vegetation Condition Index (VCIx), by pixel, April-July 2014

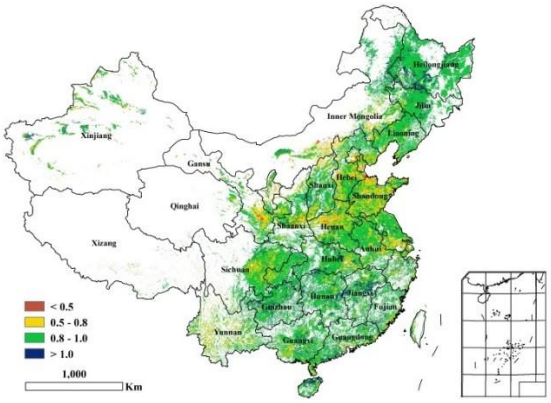
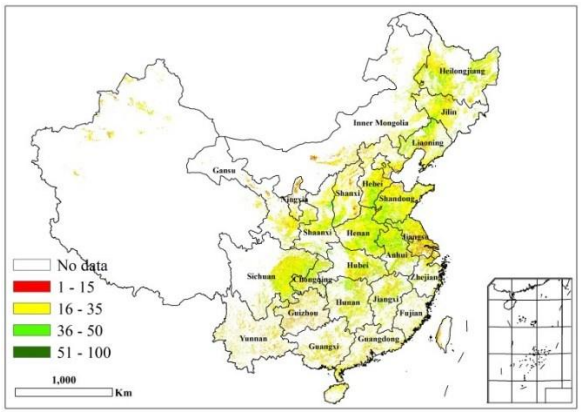


Figure 4.5. China minimum Vegetation Health Condition Index (VHIn), by pixel, April-July 2014



When compared with the averages for the same period over the past thirteen years, RAIN increased 10%, TEMP increased 0.7°C, and RADPAR dropped 2%. The abundant rainfall and suitable temperature lead to a BIOMSS estimate of 2% above average. In more than 75% of the country, rainfall in the past five months was almost the same as the thirteen-year average, while it was above average in the north of Guangdong and Guangxi provinces. Temperature was below average in early March and May and above average during late March.

In Southern China, above average RAIN, TEMP, and RADPAR resulted in higher BIOMSS. In the Huanghuaihai region, below average rainfall led to water stress and the BIOMSS index decreased 11% compared to average. High VCIx values are mostly distributed in Southern China and in the Northeast. Low VCIx values are mainly located in the North and Northwest, in particular in Gansu and Henan provinces. Crop condition in the northeast of China is above the thirteen-year average (VCIx is 0.93), as temperature and PAR are higher than average and rainfall just slightly below.

The cropped arable land fraction (CALF) increased 1.6% during the monitoring period compared to the five-year average, with most of the uncropped land found in the central areas of Gansu and Shaanxi, in Inner Mongolia, and along the Yangtze River. China's Loess region and the Northeast are the only two regions with above average CALF (increases of 4.6% and 0.5%, respectively).

Minimum VHI indicates that drought was experienced by almost all regions in north China, along with the south of Hebei, eastern and southern Henan, southwest Shandong, north-east China, and northern Anhui (figure 4.5).

Table 4.1. CropWatch agroclimatic and agronomic indicators for China, April-July 2014, departure from 5YA and 13YA

Region	Agroclimatic indicators			Agronomic indicators		
	departure from 13YA (2001-2013)			departure from 5YA (2009-2013)		Current
	RAIN (%)	TEMP (°C)	RADPAR (%)	BIOMSS (%)	CALF (%)	Maximum VCI
Huanghuaihai	-25	1.0	1	**-5**	-0.7	0.81
Inner Mongolia	24	0.8	-1	**16**	-13.5	0.81
Loess region	-7	0.4	-0.7	**-2**	4.6	0.81
Lower Yangtze	22	0.4	-4	**10**	-0.4	0.89
North-East	-9	1.2	0.5	**-12**	0.5	0.93
Southern China	11	1.2	2	**2**	-0.1	0.85
South West	2	0.5	-5	**-3**	-0.1	0.89

Note: Departures are expressed in relative terms (percentage) for all variables, except for temperature, for which absolute departure in degrees Celsius is given. Zero means no change from the average value; Relative departures are calculated as (C-R)/R*100, with C=current value and R=reference value, which is the five (5YA) or thirteen-year average (13YA) for the same period (April-July). VCI=Vegetation condition index.

China production outlook

Tables 4.2 and 4.3 list the estimated production numbers for maize, rice, wheat, and soybean in China, for 2014, with table 4.3 providing details about the 2014 rice production.

Table 4.2. China, 2014 production (thousand tons) and difference with 2013 (percentage)

	Maize		Rice (paddy)		Wheat		Soybean	
	2014	Δ%	2014	Δ%	2014	Δ%	2014	Δ%
Anhui	3632	-4	17151	3	11375	-2	1098	0
Chongqing	2099	3	4785	1	1119	-2		
Fujian			2812	1				
Gansu	4604	-7			4490	-4		
Guangdong			11073	2				
Guangxi			10983	2				
Guizhou	5004	6	5148	1				
Hebei	16237	-2			10609	-2	172	-1
Heilongjiang	26303	3	20231	4	1460	-7	4586	-1
Henan	16008	-4	3895	1	25747	-1	737	-5
Hubei			15912	3	4450	-3		
Hunan			25394	5				
Inner Mongolia	14360	-5			5762	-2	836	-1
Jiangsu	2227	3	16569	3	9501	1	781	-2
Jiangxi			17365	4				
Jilin	24032	0	5022	1			660	2
Liaoning	12889	-3	4709	1			511	-2
Ningxia	1797	7	545	0	2315	5		
Shaanxi	3870	-3	1040	0	3953	-8		
Shandong	18356	-1			21886	1	659	-5
Shanxi	9593	-2			2095	-5	187	-3
Sichuan	7101	1	14676	3	4596	2		
Yunnan	5613	-5	5332	1				
Zhejiang			2786	1				
Sub-total	173725	-1	185430	0	96393	1	10227	-1
Other 12 provinces	18226	0	15740	1	19140	3	2852	-1
China total	191952	-1	201167	1	119735	1	13079	-1

Note: Δ%=percentage difference with 2013.

As shown in table 4.2, the production of maize and soybean is estimated to decrease compared with the previous season, while winter wheat increases 1% and rice is average. The maize production is expected

to reach 192 million tons, which represents a decrease of 1% compared to 2013, mainly due to a decrease in yield. Soybean production will reach 13 million tons, with a drop of 1% because of the decrease in harvested area compared to last year. Rice production is just slightly above last year's due to low yield. Rice in China consists of "single rice," early rice, and late rice; for 2014, the production of single rice and late increases, while it falls for early rice (table 4.3).

Of the 17 monitored provinces, Chongqing, Guizhou, Heilongjiang, Jiangsu, and Ningxia all have an estimated increase in maize production above 2%. To the contrary, Gansu, Henan and Inner Mongolia have the largest decreases in maize production because of a drop in harvested area in Gansu and a yield decrease in Henan and Inner Mongolia. Liaoning and Henan are the two provinces with the largest decreases (3% below) in maize yield due to the server drought in August. Soybean in Henan shows the largest drop in production, as both area and yield are low. Due to an increase in area, soybean production in Anhui and Jilin rises by 1% and 2%, respectively. The single rice production in Shaanxi and Henan province decreases by 1% and 5% respectively, mostly because of drought. In Ningxia, single rice production increases by 18% thanks to an increase in cultivated area.

Overall, CropWatch puts the combined production of cereals, legumes, and tubers in China for 2014 at 563 million tons, a stagnation in production compared with the 2013 output (-0.1%). Total outputs for summer crops is projected at 405 million tons, a decrease of 2 million tons (-0.5%) compared with 2013.

Table 4.3. China, 2014 single rice, early rice, and late rice production and difference with 2013, by province (thousand tons).

	Single rice		Early rice		Late rice	
	2014	**Δ%**	**2014**	**Δ%**	**2014**	**Δ%**
Anhui	13448	3	1910	-1	1792	1
Chongqing	4785	-2				
Fujian			1680	0	1132	-1
Gansu						
Guangdong			5207	-1	5866	1
Guangxi			5428	-1	5556	2
Guizhou	5148	0				
Hebei						
Heilongjiang	20231	1				
Henan	3895	-5				
Hubei	10688	1	2399	-2	2826	-1
Hunan	8338	3	8278	-3	8777	-1
Inner Mongolia						
Jiangsu	16569	-1				
Jiangxi	2876	3	7297	2	7192	-1
Jilin	5022	-1				
Liaoning	4709	0				
Ningxia	545	18				
Shaanxi	1040	-1				
Shandong						
Shanxi						
Sichuan	14676	1				
Yunnan	5332	5				
Zhejiang			1509	-1	1277	-1
Sub total	117302	1	33708	-1	34418	0
Other provinces	12865	3	1679	-1	1196	8
China	130167	1	35387	-1	35614	0

Note: Δ%=percentage difference with 2013.

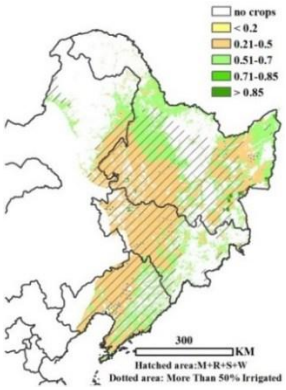
4.2 Regional analysis

Figures 4.6 through 4.12 present crop condition information for each of China's seven regions. The provided information is as follows: (a) General setting: NDVI background; combined maize, rice, soybean and wheat cultivation area, and areas where more than 50 percent of the land is irrigated; (b) Crop condition development graph based on NDVI, comparing the October 2013-September 2014 period to the previous season, to the five-year average (5YA), the five-year maximum; (c) Spatial NDVI patterns from March to July 2014 (compared to the (5YA); (d) NDVI profiles associated with the spatial patterns under (c); (e) maximum VCI (over arable land mask); (f) Cropped arable land fraction (CALF); and (g) biomass for April-July. Additional information about agroclimatic indicators and BIOMSS for China is provided in Annex A, table A.11.

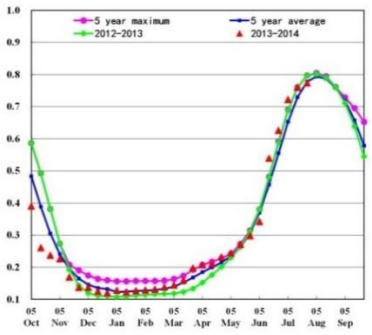
North-east region

In China's Northeast, the period from April to July 2014 mainly covers the growing of spring maize, spring wheat, one-season rice, and soybean. Overall and across the monitoring period, crop condition was slightly above the recent five-year average. The NDVI clusters and profiles also illustrate this, with 30.6% of the area being below average (mostly Liaoning and the central part of Jilin province). This also coincides with maximum VCI (VCIx) values between 0.5 and 0.8. Overall, the average VCIx of the area for the current period is 0.85, indicating good crop condition. Over the reporting period, only 0.5% of arable land was uncropped. The CropWatch agroclimatic and agronomic indicators indicate that the region experienced a 9% drop in rainfall (RAIN) (compared to the thirteen-year average), while air temperature (TEMP) and PAR (RADPAR) accumulation were just above average. Biomass accumulation (BIOMSS) was 42% above the five-year average. Some reports from local governments focus on the severe drought that occurred in some areas, especially in Jilin and Liaoning in July, but the drought did not affect all crops in the region.

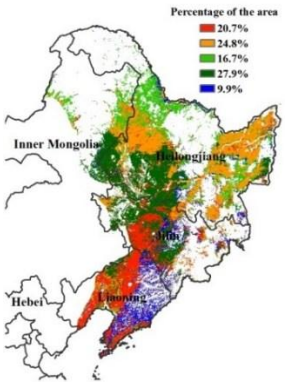
Figure 4.6. Crop condition China North-east region, April-July 2014



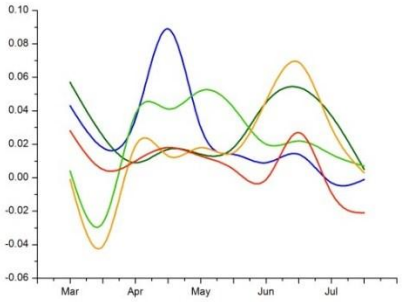
(a) NDVI background



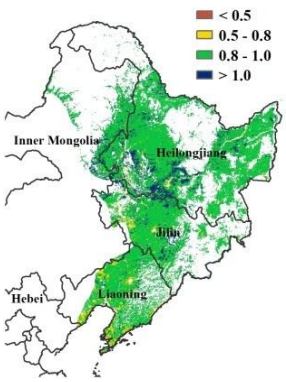
(b) Crop condition development graph based on NDVI



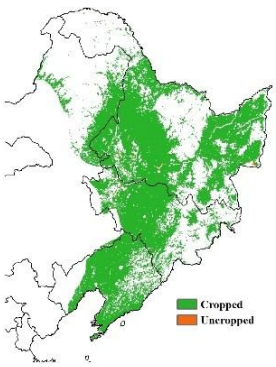
(c) Spatial NDVI patterns compared to 5YA



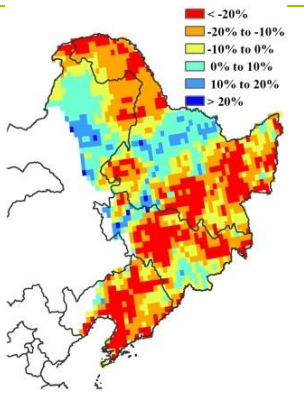
(d) NDVI profiles



(e) Maximum VCI



(f) Cropped arable land fraction

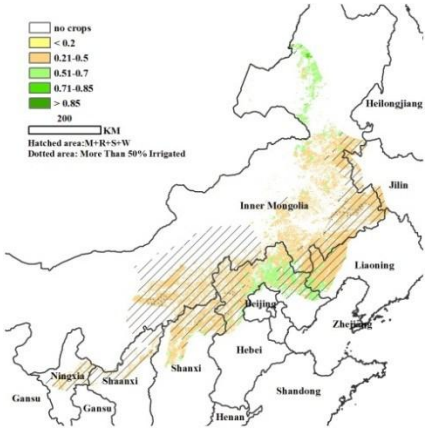


(g) Biomass

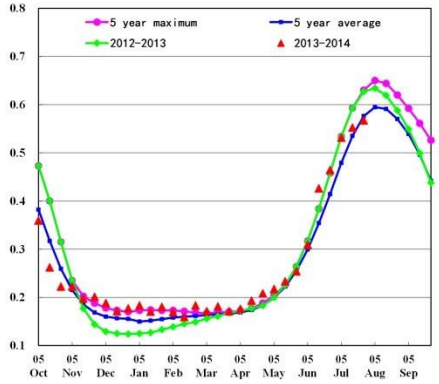
Inner Mongolia

The condition of spring crops is generally favorable in Inner Mongolia for the current reporting period: Rainfall (RAIN) and temperature (TEMP) indices were above the thirteen-year average (24% and 0.8°C), which benefited crop growth and resulted in a significant BIOMSS increase (16%). As a result, conditions were favorable for the sowing and growing of spring crops, as illustrated in the crop development graph from April to June. In July, however, dry weather affected crop growth, which is clearly shown by sharply decreasing NDVI profiles. West Liaoning, central and southeastern parts of Inner Mongolia, northern Ningxia, Shaanxi, Shanxi, and Hebei all suffered unfavorable vegetation condition according to the VCIx map, as further confirmed by the map of uncropped areas and potential BIOMSS.

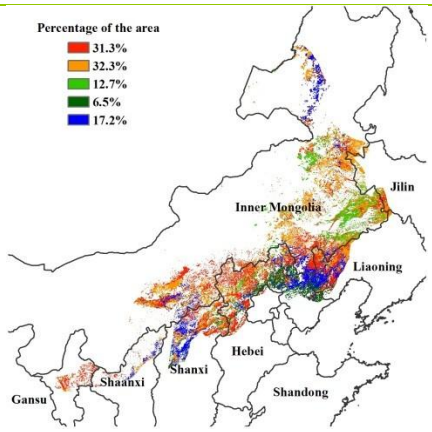
Figure 4.7. Crop condition China Inner Mongolia region, April-July 2014



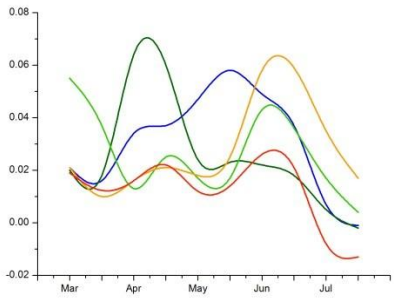
(a) NDVI background



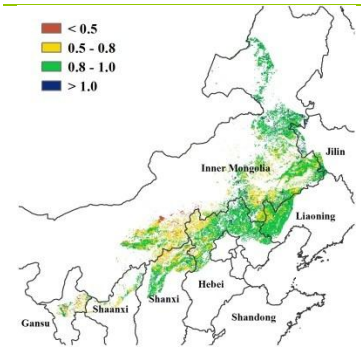
(b) Crop condition development graph based on NDVI



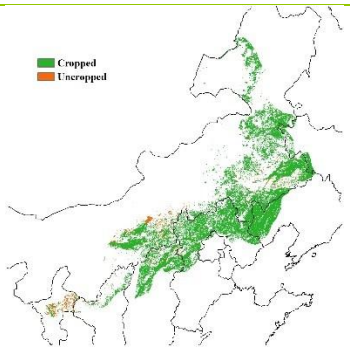
(c) Spatial NDVI patterns compared to 5YA



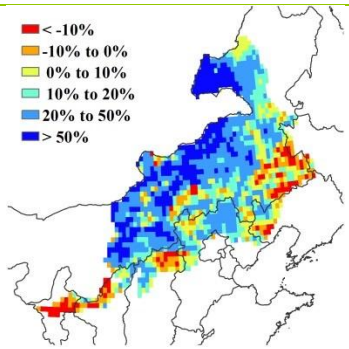
(d) NDVI profiles



(e) Maximum VCI



(f) Cropped arable land fraction

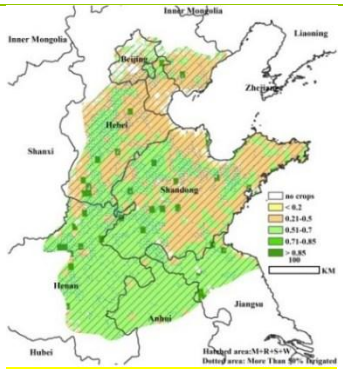


(g) Biomass

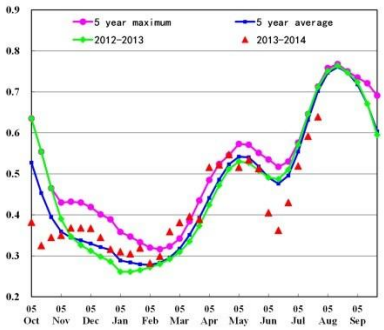
Huanghuaihai

Crop condition in Huanghuaihai region was generally unfavorable from April to July. The harvesting of winter crops (mainly winter wheat and rapeseeds) concluded in June. Currently, maize is in the tasseling stage. Huanghuaihai experienced generally below normal precipitation and above average temperature, which induced a 5% decrease in BIOMSS. The most severe decline in BIOMSS was observed in central Henan, central Hebei, and central and eastern Shandong due to drought. According to the spatial NDVI patterns (compared to the 5YA) and the corresponding NDVI profiles, NDVI for most areas in the region is at an average level, with the exception of central Shandong and the west coast of Bohai Bay. Across the region, the crop condition development graph shows that crop condition is below both last year's and the five-year average, indicating a decreased expectation of maize yield. Meanwhile, cropped arable land was 0.7% below average for the region from April to July, a significant decrease in planted area. Areas with low VCIx value are found mostly in the north-east of the region, which is consistent with the distribution of BIOMSS and other indicators.

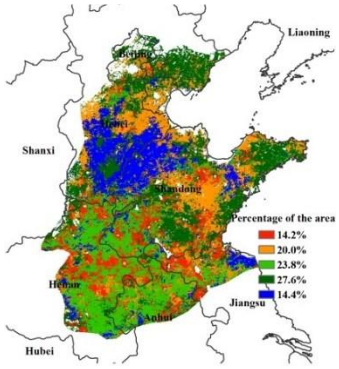
Figure 4.8. Crop condition China Huanghuaihai region, April-July 2014



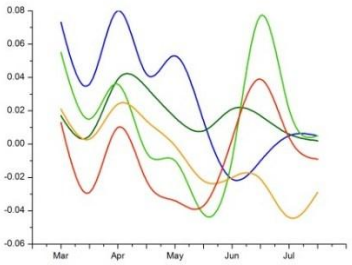
(a) NDVI background



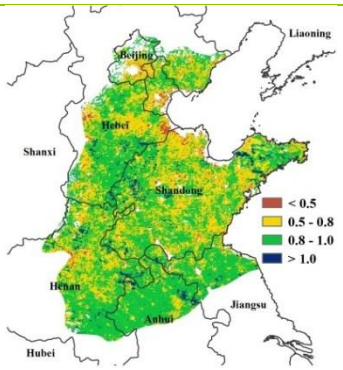
(b) Crop condition development graph based on NDVI



(c) Spatial NDVI patterns compared to 5YA

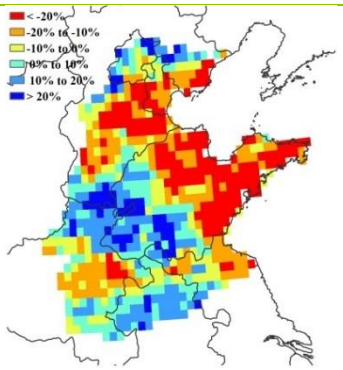


(d) NDVI profiles



(e) Maximum VCI

(f) Cropped arable land fraction

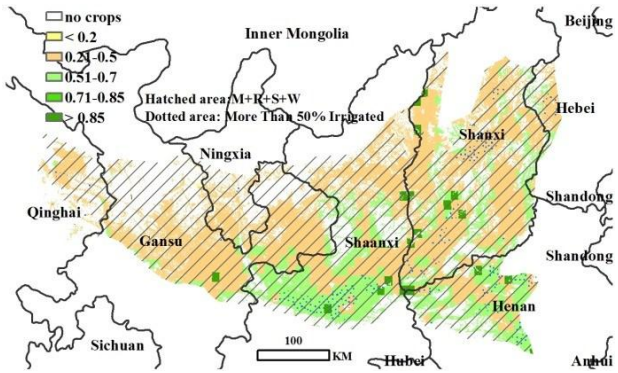


(g) Biomass

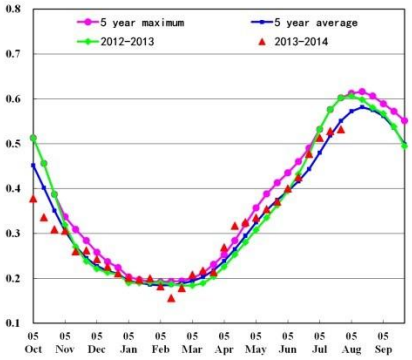
Loess region

The Loess region has two main crops: winter wheat and maize. When compared to the thirteen-years average, temperature increased by 0.4°C, while precipitation and PAR accumulation decreased by 7% and 0.7%, respectively. Over the monitoring period, winter wheat in the region was harvested (by late June) and maize has been sowed. By the end of July, the condition of crops is below both the recent five-year average and last year's values, with a VCIx of 0.81. The analysis of spatial NDVI clusters and profiles indicates that crop condition is favorable in central Gansu, north of Shaanxi, and in most parts of Shanxi, due to the abundant rainfall and suitable temperature and sunlight. On the contrary—and mostly because of severe drought (as confirmed by the maps of potential biomass and VCIx), crops are in poor condition (compared to the five-year average) in the north of Henan and the center of Shaanxi. The fraction of arable land actually cropped increased 4% due to suitable temperature and PAR, while uncropped arable land is mainly located in Gansu, central Shaanxi, and scattered areas of Henan province.

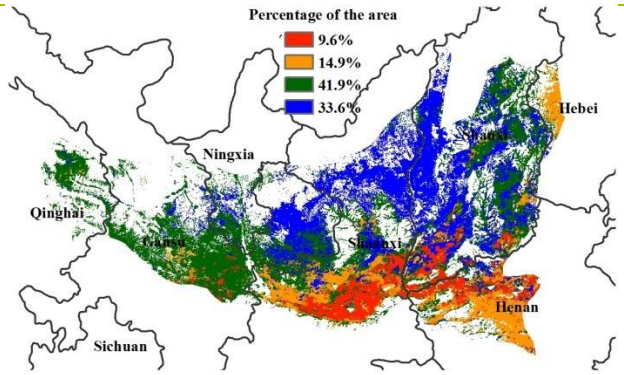
Figure 4.9. Crop condition China Loess region, April-July 2014



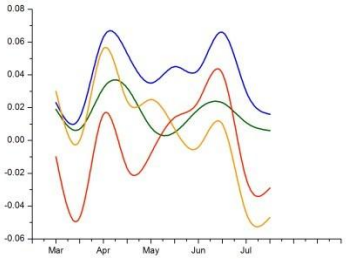
(a) NDVI background



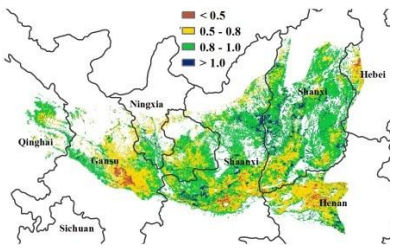
(b) Crop condition development graph based on NDVI



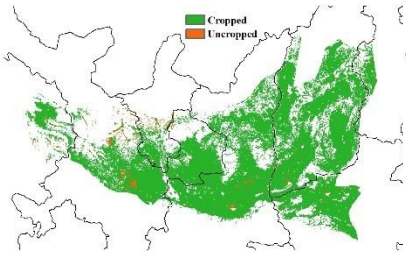
(c) Spatial NDVI patterns compared to 5YA



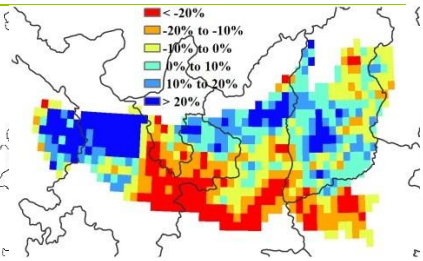
(d) NDVI profiles



(e) Maximum VCI



(f) Cropped arable land fraction

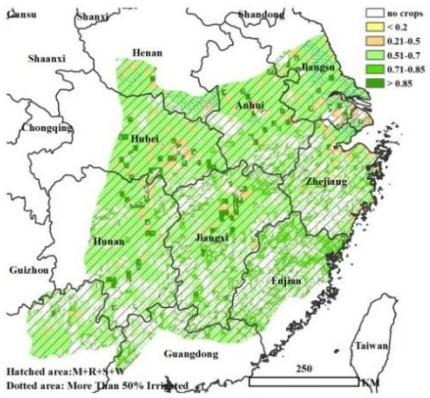


(g) Biomass

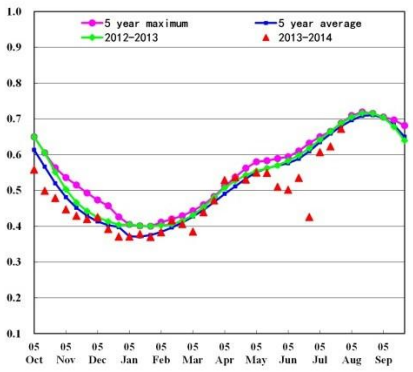
Lower Yangtze region

Rice is the main crop in this area, although winter wheat and rape are also planted. The analysis shows that TEMP and RAIN are above average, while RADPAR is below average by 4%. Potential biomass (BIOMSS) shows an increase of 10% when compared to the five-year average. During the past five months, early rice has been planted and harvested, while late rice has been planted in some parts of the region. Average regional NDVI and NDVI profiles indicate that crop condition approaches the average of the last five years. Although NDVI fluctuated widely, crop condition in the central and north of the region remained above average, which is confirmed by the average VCIx value of 0.89 and the VCIx map. In late May and June, crop condition in the south and southwest of the region (in particular in northeast Guangxi and northern Guangdong province) dropped sharply because of heavy rainfall. Only a small amount of arable land is uncropped, with those sites mainly scattered along the Yangtze River. The map of the potential biomass also shows that crop condition in most parts better than the five-year average, with a spectacular BIOMSS increase of 10 percent when compared to the five-year average.

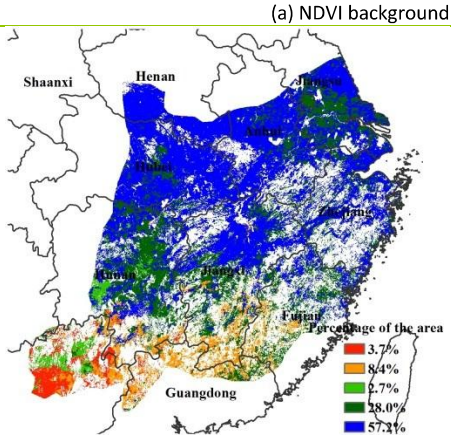
Figure 4.10. Crop condition Lower Yangtze region, April-July 2014



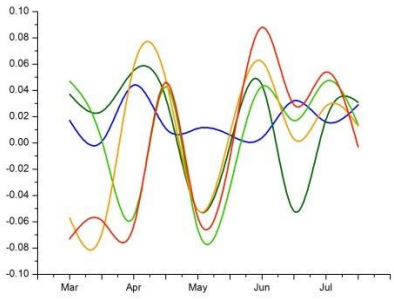
(a) NDVI background



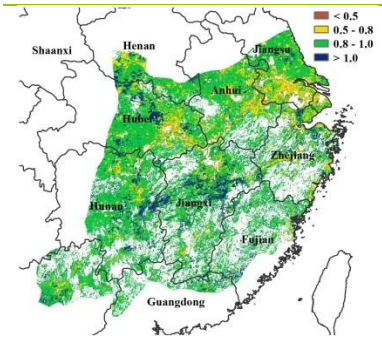
(b) Crop condition development graph based on NDVI



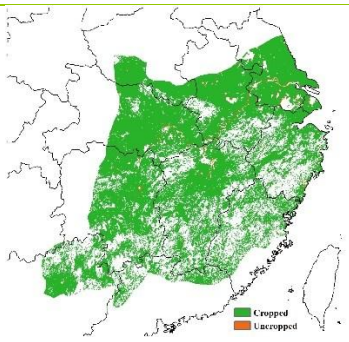
(c) Spatial NDVI patterns compared to 5YA



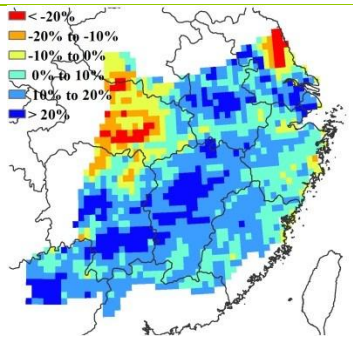
(d) NDVI profiles



(e) Maximum VCI



(f) Cropped arable land fraction

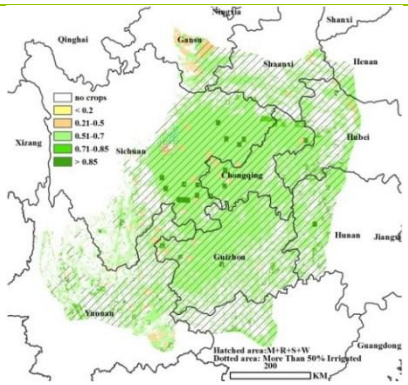


(g) Biomass

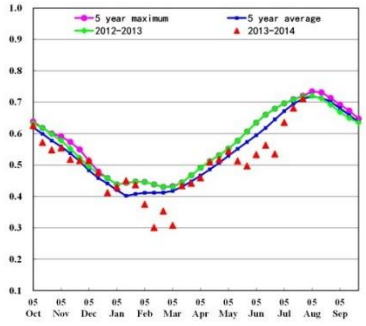
South-west China

The ongoing season in South-west China shows overall below average conditions. Compared with the thirteen-year average, precipitation (RAIN) in South-west China slightly increased by 2%, temperature (TEMP) increased by 0.5°C, while PAR (RADPAR) decreased by 5%. This resulted in an overall decrease of biomass potential (BIOMSS) by 3%, compared to the five-year average. According to the crop condition development graph based on NDVI, in April and July, crop condition in the region reached the five-year average level, while in May and June, it was below, especially in northern Yunnan, Guizhou, western Hunan, and north-west Guangxi. This is also reflected by the spatial NDVI pattern and profiles. The other regions, accounting for 50.8% of Southwest China, including eastern Sichuan, southern Gansu, southern Shaanxi, western Hubei, and western Chongqing areas, showed a relative stable situation according to the NDVI profiles. Nearly all arable land was actually cropped over the region, with fraction of cropped arable land reaching 0.98. The BIOMSS indicator shows a favorable situation in Guizhou, north-west Guangxi, south-west Hunan, and north-east Yunnan. On the contrary, poor conditions in north-east and south-east Sichuan and in the south of Shaanxi province will need close monitoring in the coming months.

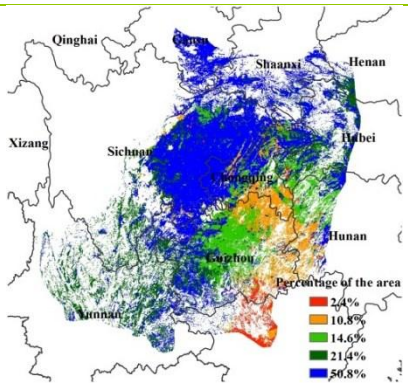
Figure 4.11. Crop condition Southwest China region, April-July 2014



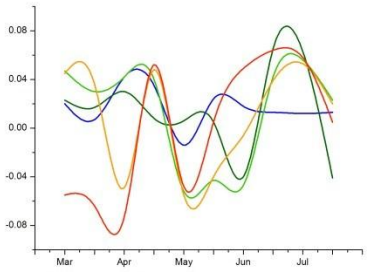
(a) NDVI background



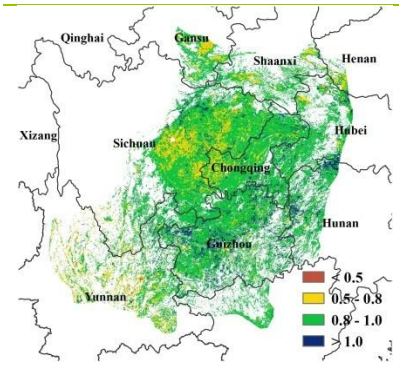
(b) Crop condition development graph based on NDVI



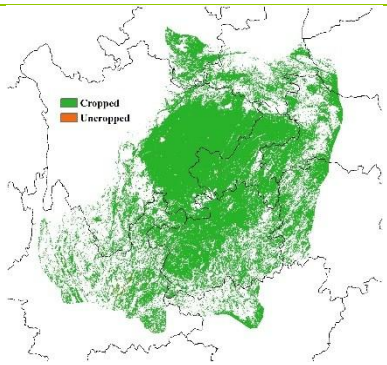
(c) Spatial NDVI patterns compared to 5YA



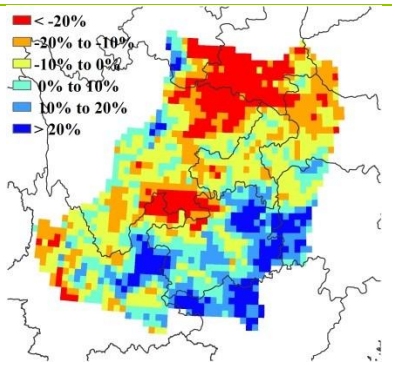
(d) NDVI profiles



(e) Maximum VCI



(f) Cropped arable land fraction

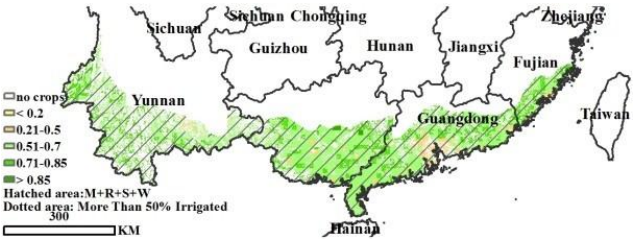


(g) Biomass

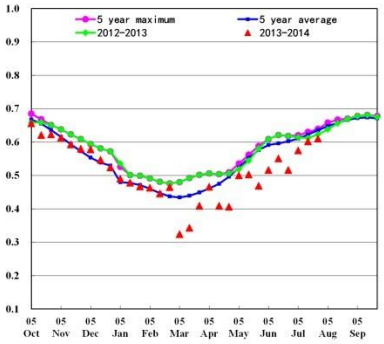
Southern China

The period from April to July 2014 covers the growing period of early rice, one-season rice, spring maize, and summer maize. Crop condition was below the average of the recent five years during the whole monitoring period, especially in late April (central and eastern part of Guangxi province) and June (western part of Yunnan province), which is well illustrated by the NDVI clusters map and the graphs of corresponding profiles. The CropWatch agroclimatic and agronomic indicators show that RAIN was 11% above the recent thirteen-year average, while the region also recorded increased TEMP (+1.2°C) and RADPAR (+2%). As a result, BIOMSS shows a 81% increase compared to the five-year average. Most of the uncropped arable land is distributed in the southern part of Yunnan province, where the biomass accumulation was 20% below average.

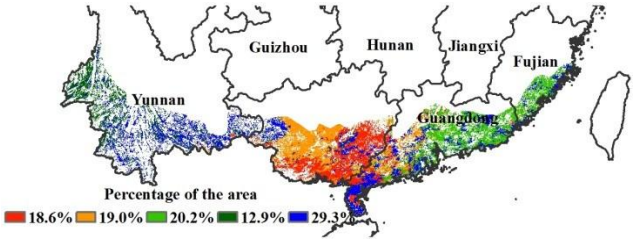
Figure 4.12. Crop condition Southern China region, April-July 2014



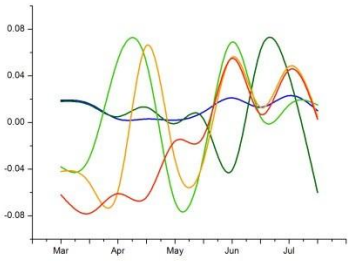
(a) NDVI background



(b) Crop condition development graph based on NDVI

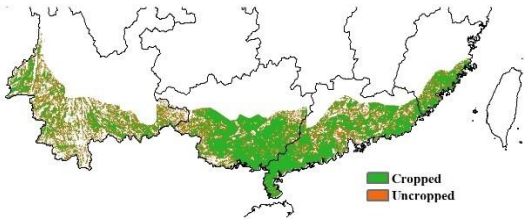


(c) Spatial NDVI patterns compared to 5YA

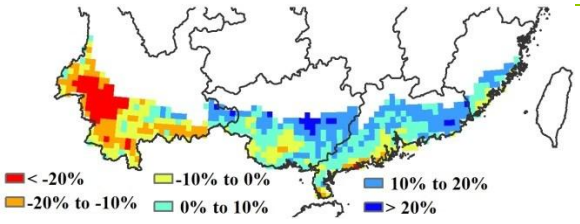


(d) NDVI profiles

(e) Maximum VCI



(f) Cropped arable land fraction



(g) Biomass