Chapter 4. China

Chapter 4 presents a detailed analysis for China, focusing on the seven most productive agro-ecological regions of the east and south. After a brief overview of the 2014-2015 winter crops growing season (section 4.1) and the production outlook for 2015 (4.2), detailed analyses including maps and profiles are provided for NDVI, VCIx, and BIOMSS in the regions (4.3). Additional information on the agroclimatic indicators for agriculturally important Chinese provinces are listed in table A.11 in Annex A.

4.1 Overview

The CropWatch agroclimatic indicators were generally close to average in China over the monitoring period; RAIN was 5% above average, while RADPAR was -2%. Table 4.1 provides an overview of the agroclimatic and agronomic indicators for selected provinces. Although temperature fluctuated severely, TEMP was above average in all regions and provinces during the period, which indicates that the country experienced a warm season (TEMP, +1.2°C), especially in Inner Mongolia (+1.4°C), Northeast China (1.6°C), and Southwest China (1.3°C). In about ten provinces, the departure in temperature exceeded 1°C, including Anhui and Sichuan province. Rainfall was below average in the Lower Yangtze (RAIN, -16%) and Northeast China (-2%), but particularly so in the southern islands of Hainan (-45%) and Taiwan (-42%). Rainfall was more than 80% above average in Inner Mongolia, Gansu, Shaanxi, and Zhejiang provinces. PAR (RADPAR) was below the average, except for Inner Mongolia (0%) and Southern China (+3%); it was about average in almost all the provinces except Hunan and Guizhou, where the departure exceeded 8%. High temperature and abundant rainfall resulted in BIOMSS values larger than 50% above the average in the Loess region and Southwest China.

Table 4.1. CropWatch agroclimatic and agronomic indicators for China, January-April 2015, departure from 5YA and 14YA

Region	Agroclimatic indicators			Agronomic indicators		
	Departure from 14YA (2001-14)			Departure from 5YA (2010-14)		Current
	RAIN (%)	TEMP (°C)	RADPAR (%)	BIOMSS (%)	CALF (%)	Maximum VCI
Huanghuaihai	21	0.9	-2	31	0	0.89
Inner Mongolia	91	1.4	0	62	/	0.89
Loess region	76	0.8	-4	54	2	0.89
Lower Yangtze	-16	0.8	-3	-1	1	0.84
Northeast China	-2	1.6	-1	21	/	0.64
Southern China	9	1	3	22	-1	0.85
Southwest China	59	1.3	-5	63	-2	0.88

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 fourteen-year average (14YA) for the same period (January-April).

Figures 4.1 to 4.5 illustrate China's spatial distribution of rainfall (figure 4.1) and temperature profiles (figure 4.2), and maps of cropped and uncropped arable land (figure 4.3), maximum VCI (figure 4.4.), and VHI minimum (figure 4.5). Both high and low maximum VCI values are scattered in almost all provinces, with high values mainly located in the east of Guizhou, north Jiangsu, and south Shandong, and low values (below 0.5) in the north of Hunan and south of Hubei, indicating unfavorable crop condition in these areas. Low rainfall in the Lower Yangtze region resulted in low biomass, while above average temperature in the other six regions may lead to high biomass: the potential biomass was 60% above average in Inner Mongolia and Southwest China. Normal rainfall in the Northeast region resulted in average soil moisture, which is conducive to the sowing and emergence of spring wheat, soybean, and

maize. During the growing season of winter wheat, suitable temperature and adequate rainfall in the major production provinces may result in a higher production than the previous year.

Overall, the cropped arable land fraction (CALF) was 3% above the five-year average for China. Because of relatively low temperatures, most of the uncropped land is found in the Northeast and Northwest China regions, as well as in Inner Mongolia. The sowing of spring crops has been under way since late April. The CALF of the Loess region and Lower Yangtze region was above average (increases of 2% and 1%, respectively), while it was below average in Southern China and Southwest China (-1% and -2%, respectively), indicating a decrease in the cropped area for this period. Minimum VHI indicates that southern Anhui, the northeast of Hunan, and central Shanxi province all experienced mild water stress, while in other regions water was adequate for crop growth or planting, especially in the east of Shandong and almost the entire Henan province.

Figure 4.1. China spatial distribution of rainfall profiles, January-April 2015

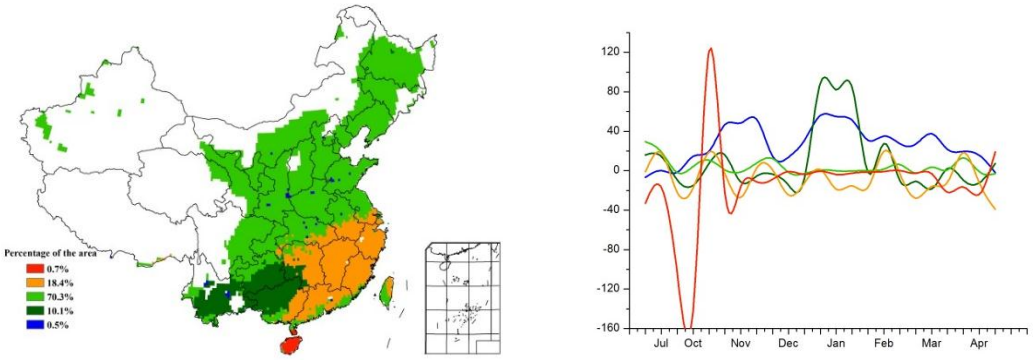


Figure 4.2. China spatial distribution of temperature profiles, January-April 2015

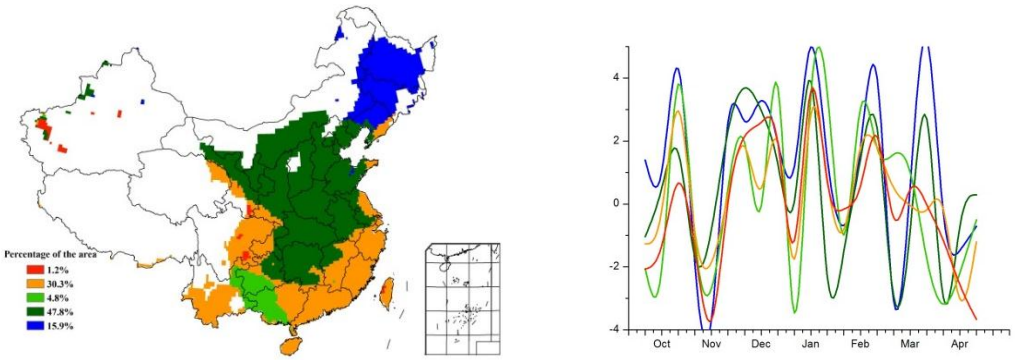


Figure 4.3. China cropped and uncropped arable land, by pixel, January-April 2015

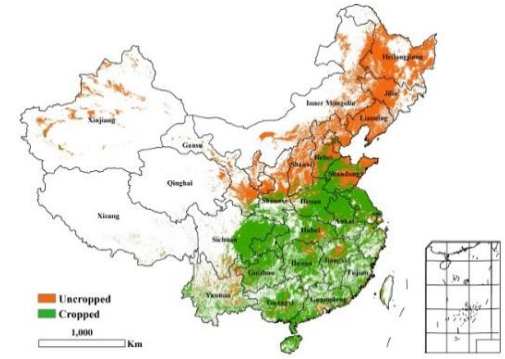


Figure 4.4. China maximum Vegetation Condition Index (VCIx), by pixel, January-April 2015

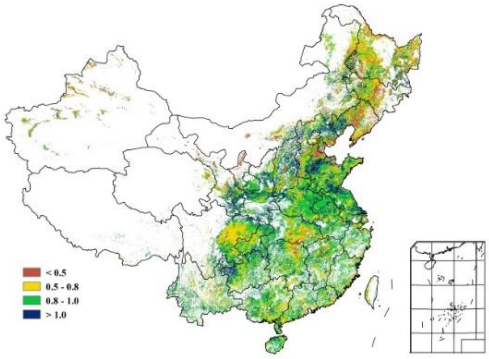
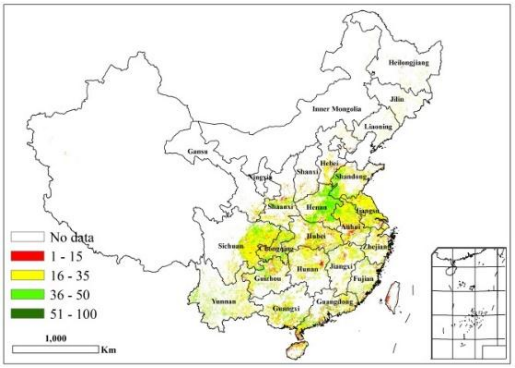


Figure 4.5. China VHI minimum, by pixel, January-April 2015



4.2 Winter crops production

Favorable conditions during the wintering period in China have provided good prospects for winter crops: the total production in China is expected to reach 125.4 million tons, an increase of 1.85 million tons or 1.5% compared to 2014 (table 4.2). Only three of the eleven major winter crops producing provinces—Anhui, Hubei, and Gansu—show decreased production compared to the previous year. A combination of decreases in both yield and planted area resulted in lower production in Anhui and Hubei. The most significant decrease in planted area (-6.3%) was observed in Gansu, but this was compensated by a 5.3% increase in yield. Shandong and Henan—the top two winter crops producing provinces—benefited from favorable agro-climatic conditions, with 4.3% and 1.1% increases in production respectively. Increased production was also observed in Shanxi, Jiangsu, Chongqing, Sichuan, and Shaanxi.

Table 4.2. China, 2015 winter crops production (thousand tons) and percentage difference with 2014, by province

	2014 (thousand ton)	2015			
		Area change (%)	Yield change (%)	Production change (%)	Production (thousand ton)
Hebei	10783	0.9	1.0	1.9	10989
Shanxi	2170	-0.5	1.2	0.7	2184
Jiangsu	9995	1.7	-1.2	0.6	10050
Anhui	12122	-1.2	-1.8	-3.0	11764
Shandong	22107	2.4	1.8	4.3	23062
Henan	25862	0.2	0.8	1.1	26139
Hubei	6120	-0.6	-3.6	-4.2	5865
Chongqing	2297	-0.8	1.9	1.1	2323
Sichuan	5495	0.9	1.5	2.4	5626
Shaanxi	4389	-0.4	0.6	0.1	4395
Gansu	3108	-6.3	5.3	-1.3	3067
Sub total	104448	-	-	1.0	105465
Other provinces	19093	-	-	4.3	19921
National total*	**123541**	**0.9**	**0.6**	**1.5**	**125386**

Note: * National total production does not include Taiwan province.

In China, winter wheat is an important part of the winter crop output, and over the past ten years winter wheat has accounted for 91% of that output. For 2015, CropWatch puts the Chinese winter wheat production forecast at 113.5 million tons, 1.1% above the previous year's production (table 4.3). Both yield and planted area contributed to the increased production. Only three provinces suffered from reduced yield due to abnormal weather conditions. This included Hubei, which suffered from continuous rainy weather that interfered with yield formation and ripening. In northern Jiangsu and Anhui, rainfall

followed by windy weather resulted in wheat lodging and decreased yield. The planted area of winter wheat area was stable (the variation was less than 1%) compared to 2014, except in Jiangsu, Shandong, and Gansu provinces. Increased wheat planting in the first two provinces was the result of a shift away from rapeseed in Jiangsu and from cotton in Shandong.

Up to early May, most winter wheat was heading towards the grain-filling stage. If the agroclimatic conditions stay favorable until harvest, the production of winter crops in China will be above the 2014 record.

Table 4.3. China, 2015 winter wheat area, yield, and production and percentage difference with 2014, by province

	Area (kha)			Yield (kg/ha)			Production (thousand ton)		
	2014	2015	Δ(%)	2014	2015	Δ(%)	2014	2015	Δ(%)
Hebei	2016	2035	0.9	5262	5315	1.0	10609	10815	1.9
Shanxi	511	509	-0.5	4097	4146	1.2	2095	2109	0.7
Jiangsu	1990	2036	2.3	4775	4709	-1.4	9501	9586	0.9
Anhui	2625	2605	-0.7	4334	4256	-1.8	11375	11088	-2.5
Shandong	4103	4217	2.8	5334	5430	1.8	21886	22898	4.6
Henan	4945	4961	0.3	5207	5239	0.6	25747	25992	0.9
Hubei	1052	1043	-0.9	4229	4152	-1.8	4450	4328	-2.7
Chongqing	360	356	-1.1	3111	3144	1.1	1119	1118	-0.1
Sichuan	1266	1272	0.5	3629	3673	1.2	4596	4673	1.7
Shaanxi	1017	1016	-0.2	3885	3901	0.4	3953	3962	0.2
Gansu	419	392	-6.3	3874	4075	5.2	1622	1599	-1.4
Sub total	20305	20442	0.7	-	-	-	96953	98170	1.3
Other provinces	3199	3253	1.7	-	-	-	15274	15332	0.4
National total*	23503	23694	0.8	4775	4790	0.3	112228	113502	1.1

Note: * National total production does not include Taiwan province.

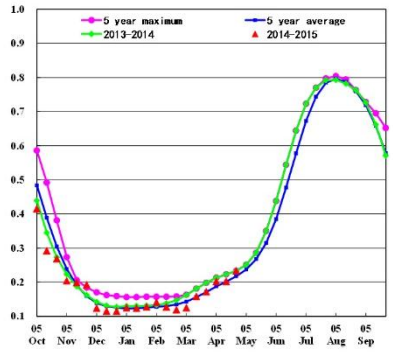
4.3 Regional analysis

Figures 4.6 through 4.12 present crop condition information for each of China's seven regions. The provided information is as follows: (a) Crop condition development graph based on NDVI, comparing the current season up to April 2015 to the previous season, to the five-year average (5YA), the five-year maximum; (b) Spatial NDVI patterns from January to April 2015 (compared to the (5YA); (c) NDVI profiles associated with the spatial patterns under (b); (d) maximum VCI (over arable land mask); (e) biomass for January-April 2015. Additional information about agroclimatic indicators and BIOMSS for China is provided in Annex A, table A.11.

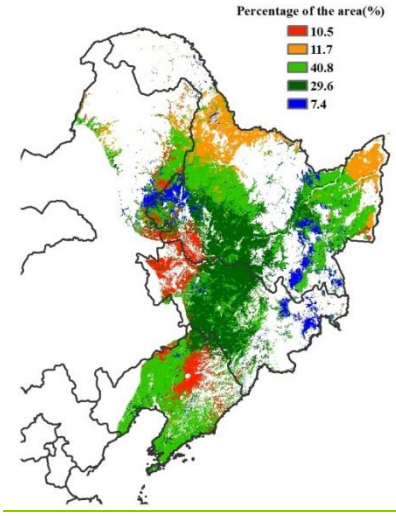
Northeast region

No crops are cultivated in northeast China from January to mid-April. Maize and soybean sowing both start in late April only. CropWatch agroclimatic indicators show markedly above average temperature (+1.6°C) compared with average; on the contrary, rainfall and PAR show a slight decrease by 2% and 1%, respectively. Abundant snow over the last winter ensured good soil moisture, which will benefit spring crops in 2015.

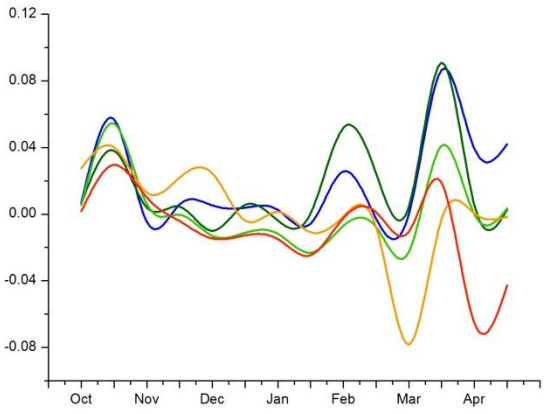
Figure 4.6. Crop condition China Northeast region, January-April 2015



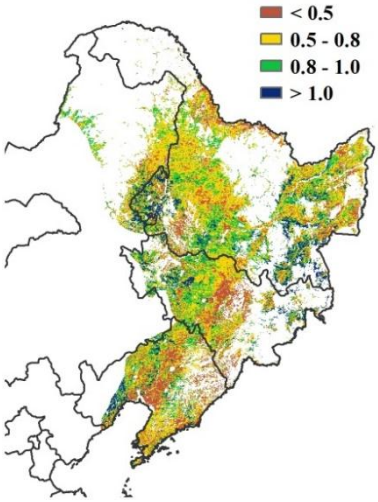
(a) Crop condition development graph based on NDVI



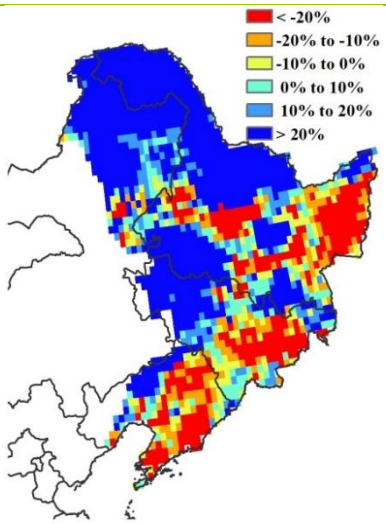
(b) Spatial NDVI patterns compared to 5YA



(c) NDVI profiles



(d) Maximum VCI

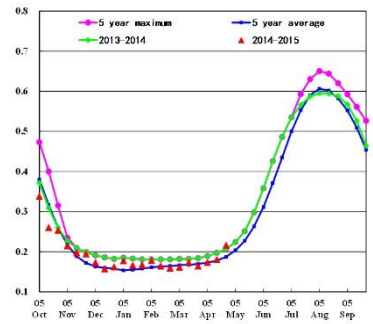


(e) Biomass

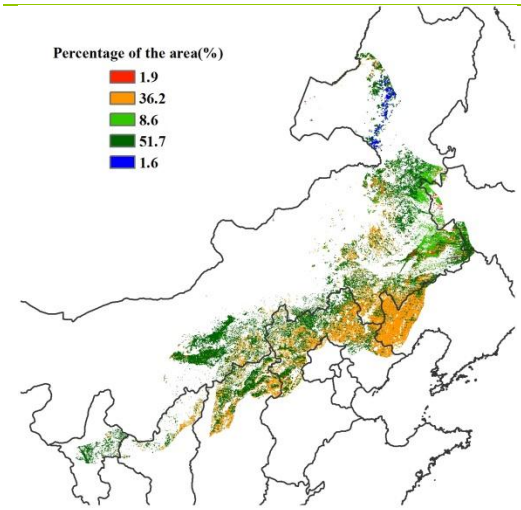
Inner Mongolia

Due to the low temperatures, no crops are cultivated between January and April in this region. Along with gradually increasing temperatures, crops are starting to be sowed from late April on forward. Considering the last four months, rainfall and temperature indices were well above average (RAIN +79% and TEMP +1.4°C), resulting in a large potential biomass increase of 62% and record VCIx. If favorable conditions are maintained over the whole cycle, the outcome may be an exceptionally good season.

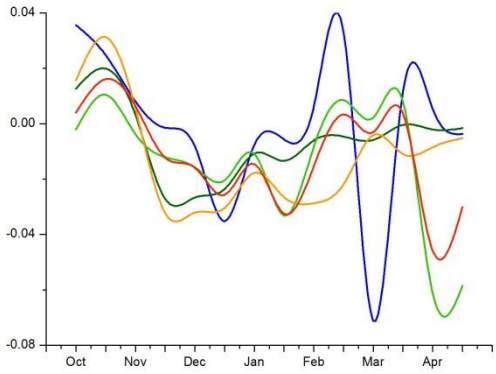
Figure 4.7. Crop condition China Inner Mongolia, January-April 2015



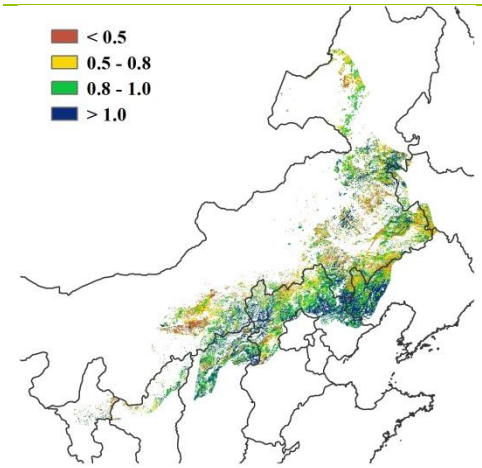
(a) Crop condition development graph based on NDVI



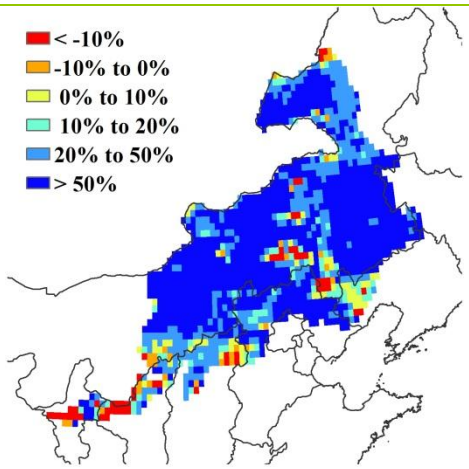
(b) Spatial NDVI patterns compared to 5YA



(c) NDVI profiles



(d) Maximum VCI

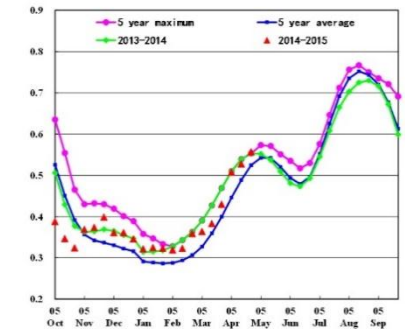


(e) Biomass

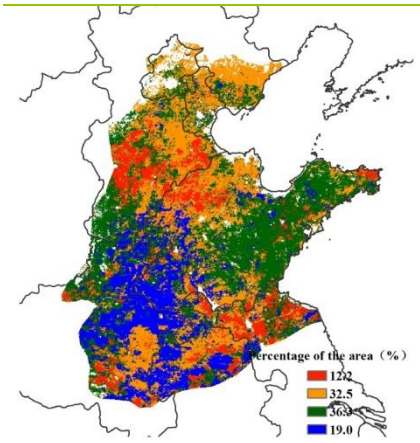
Huanghuaihai

The condition of winter crops in the Huanghuaihai region has been generally favorable so far. By early May, winter crops (mainly winter wheat and rapeseeds) were heading to their grain-filling stage, and the crops will be harvested by early June. Over the reporting period, agroclimatic conditions were favorable for crops, with 21% above average rainfall (RAIN), 0.9°C higher temperature (TEMP) and average radiation (RADPAR), which overall resulted in an increase of 31% in the biomass accumulation potential (BIOMSS). Spatially, below average BIOMSS is observed in northern Jiangsu, northern Anhui, and the coastal region of Bohai Bay. These areas coincide with below average NDVI regions from February to April, according to the spatial patterns and NDVI departure profiles compared with the five-year average. The overall NDVI development graph shows above average crop condition at and after the wintering stage. By late April, crop condition reached the same level as in 2014. According to the maximum VCI map, below average conditions occurred south of Tianjing, which is an area where crops are sown in spring or summer and sowing was delayed.

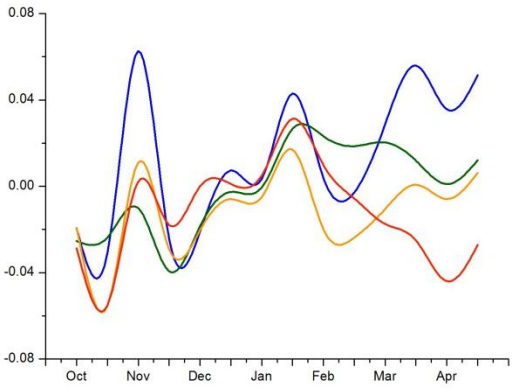
Figure 4.8. Crop condition China Huanghuaihai, January-April 2015



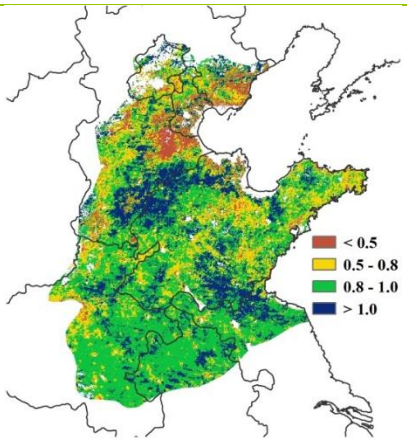
(a) Crop condition development graph based on NDVI



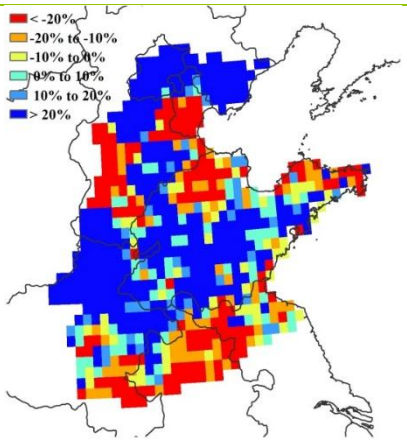
(b) Spatial NDVI patterns compared to 5YA



(c) NDVI profiles



(d) Maximum VCI

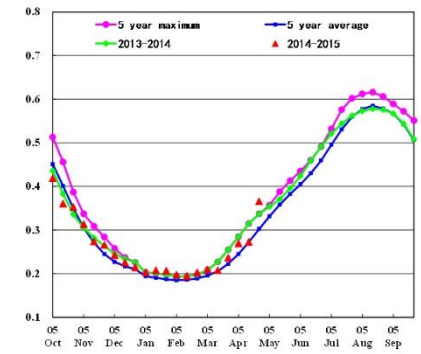


(e) Biomass

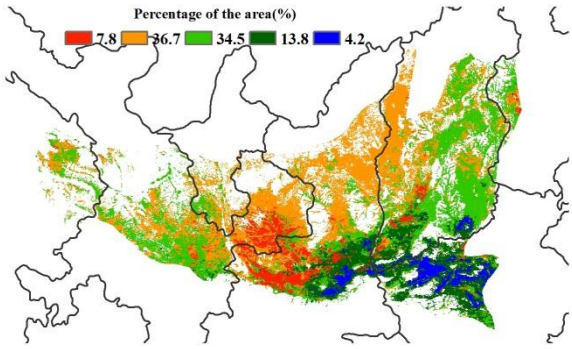
Loess region

The average NDVI profile indicates that crop condition in the Loess region is better than last year's and also above the five-year average. The main crops are spring wheat and winter wheat. Winter wheat was sowed in October and will be harvested in early June. During the monitoring period, rainfall and temperature exceeded average by 76% and 0.8 degrees, respectively. Radiation, however, was decreased by 4%, which is correlated with excess precipitation. The additional detail provided by the NDVI clusters and profiles shows that the crop condition fluctuated widely over the monitoring period. However, at the end of April, condition was better than the five-year average in most parts of the region, especially in the northeast of Henan province. CALF increased 2% when compared with the five-year average, which indicates more land is cropped. The potential biomass was 54 percent above the average, especially in the north of Shaanxi and south of Hebei provinces.

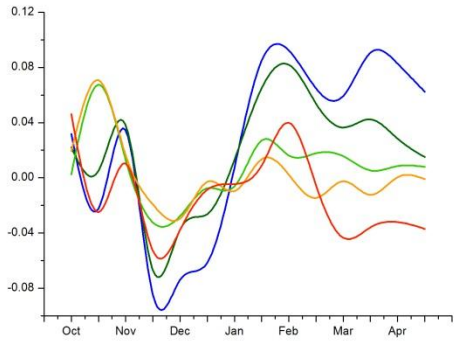
Figure 4.9. Crop condition China Loess region, January-April 2015



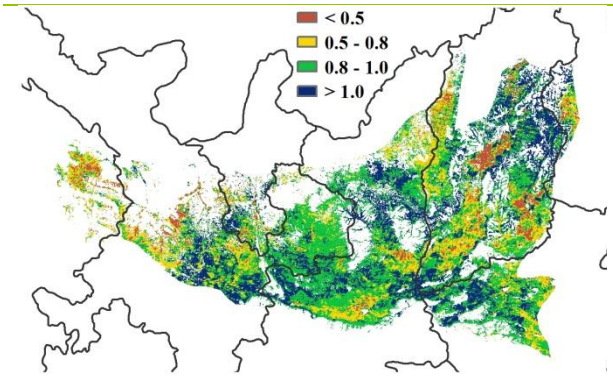
(a) Crop condition development graph based on NDVI



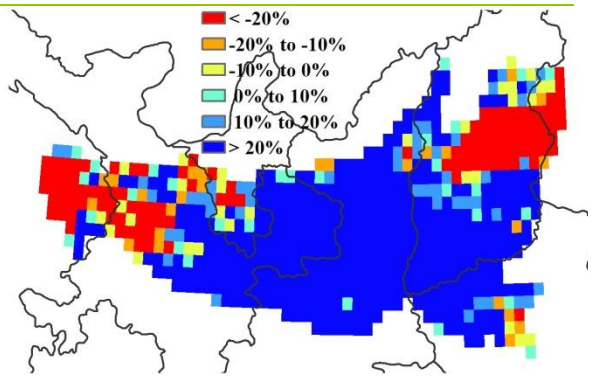
(b) Spatial NDVI patterns compared to 5YA



(c) NDVI profiles



(d) Maximum VCI

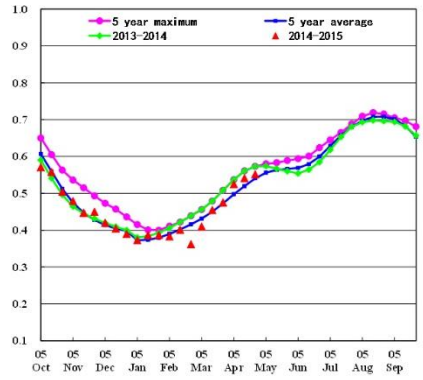


(e) Biomass

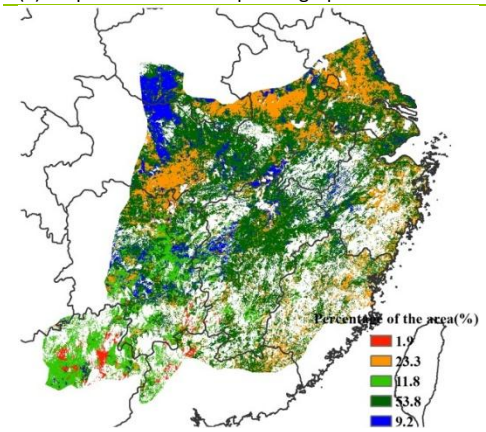
Lower Yangtze region

The average NDVI development curves show that crop condition in this area is below last year's level, but above the five-year average. In the north of the region (such as in Henan, Anhui, and Jiangsu provinces) winter wheat is sowed in October and harvested in late May and early June; in the south, early rice is planted in late April and early May. The agroclimatic indicators show that rainfall and PAR were below the average, while the temperature anomaly reached 0.8°C. The NDVI clusters and profiles show that crop condition fluctuated between October and April in most parts of the area, but nevertheless remained above average during most of the monitoring period. In mid-April, due to low rainfall, crop condition in the whole region decreased. In the south of Jiangsu and east of Hunan, crop condition was persistently above the recent five-year average, as confirmed by the map of the maximum VCI. The fraction of cropped arable land (CALF) is 1% above average. The biomass production potential (BOMSS) was below average in most of the region, particularly in the north of Guangdong, Fujian, and Zhejiang provinces.

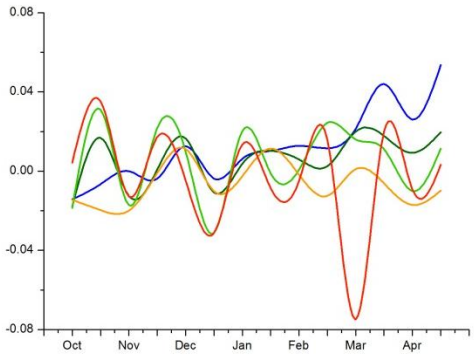
Figure 4.10. Crop condition Lower Yangtze region, January-April 2015



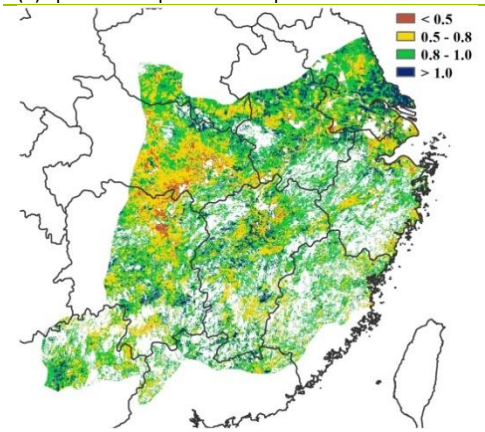
(a) Crop condition development graph based on NDVI



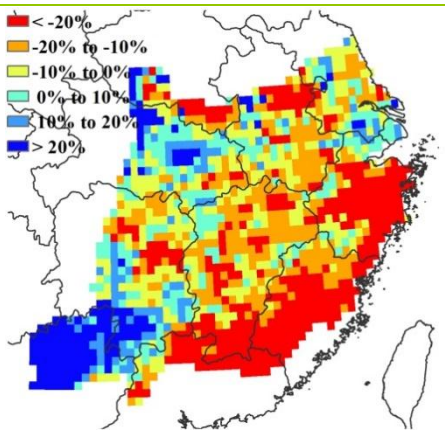
(b) Spatial NDVI patterns compared to 5YA



(c) NDVI profiles



(d) Maximum VCI

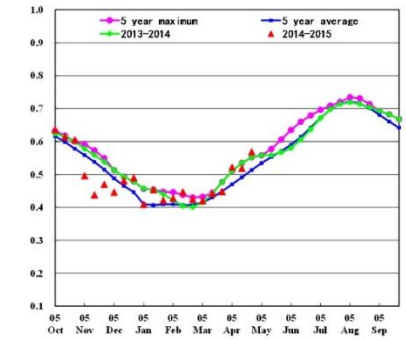


(e) Biomass

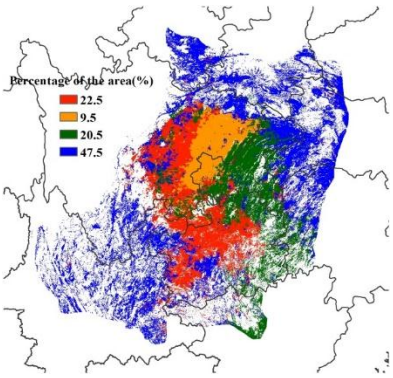
Southwest China

In Southwest China, the monitoring period covers the planting of maize and single rice[4] and the late stages of winter wheat. The ongoing growing season can generally be described as having a somewhat above average condition. Crop condition was average from January to March, after which it improved to above average. The agroclimatic indicators (RAIN, +59%; TEMP, +1.3°C; and RADPAR, -5% compared to average) show abundant rainfall, a marked positive temperature anomaly, and a significant loss of sunshine. Potential accumulated biomass (BIOMSS) reaches +63% compared with the recent five-year average. The CALF was relatively stable, decreasing 2% compared to the average of the last five seasons. Marked spatial differences, however, occur within the region, with east Sichuan, Chongqing (where rainfall was 14% below average), most of Guizhou, and part of northwest Guangxi showing below average conditions at the end of March; these areas will require close monitoring. Altogether, condition of crops is currently at least average (VCIx of 0.88). Combined with likely pockets of poor crops and decreased CALF, average production is likely.

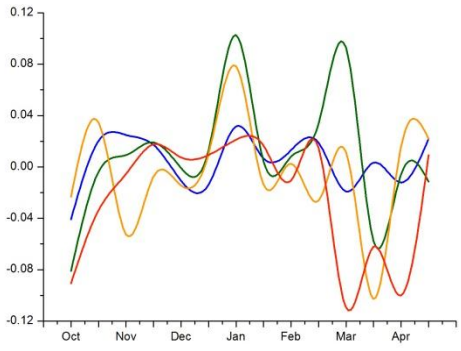
Figure 4.11. Crop condition Southwest China region, January-April 2015



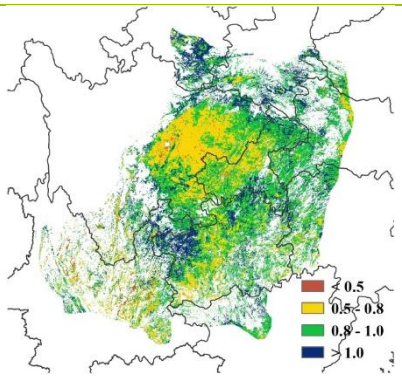
(a) Crop condition development graph based on NDVI



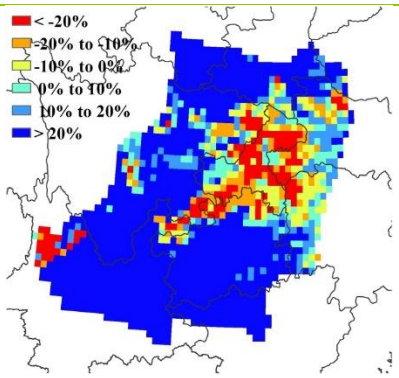
(b) Spatial NDVI patterns compared to 5YA



(c) NDVI profiles



(d) Maximum VCI



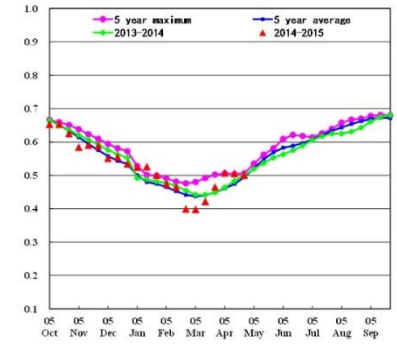
(e) Biomass

[4] Single rice" is the crop grown in areas where only one rice crop is produced every year, as opposed to southern areas with cropping intensities above 100%.

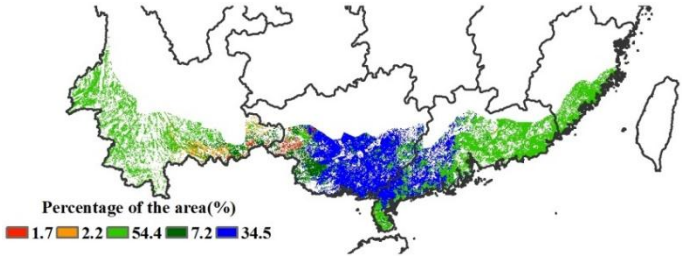
Southern China

In southern China, the period from January to April mainly covers the planting of early rice and the growing season of winter wheat. The crop condition was generally average during the entire period. In February and the beginning of March, crop condition was below average in Southwest Guangxi and part of Southeast Yunnan, accounting for about 11.1% of the monitored region in Southern China. The result is confirmed by the NDVI profiles and results from drought in Guangxi starting in March (as reported by the National Climate Center of China). Condition returned to average between mid-March and April, to the extent that, compared to the recent five-year average, 88.9% of the monitored regions in Southern China, including south Yunnan, south Guangxi and Guangdong, and south Fujian display average levels at the end of the reporting period. The agroclimatic indicators (RAIN, +9%, TEMP, +1°C, and RADPAR, +3%) also show average to better than average conditions and result in a BIOMSS increase of 22% over the average of the last five years. The maximum VCI is 0.85 with almost stable CALF (-1%). Compared to the recent average, a 47% decrease of rainfall occurred in Fujian, and a 43% drop in Guangdong, which should thus be watched closely in the coming months.

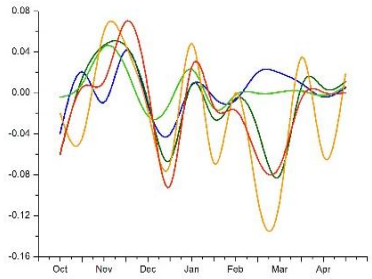
Figure 4.12. Crop condition Southern China region, January-April 2015



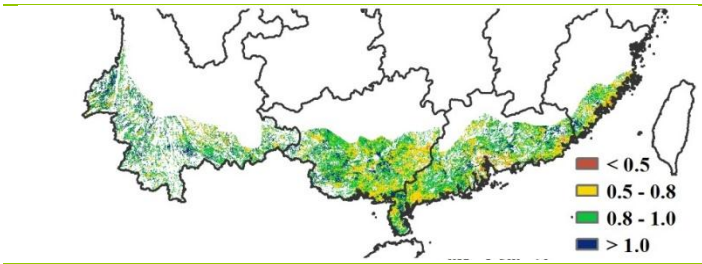
(a) Crop condition development graph based on NDVI



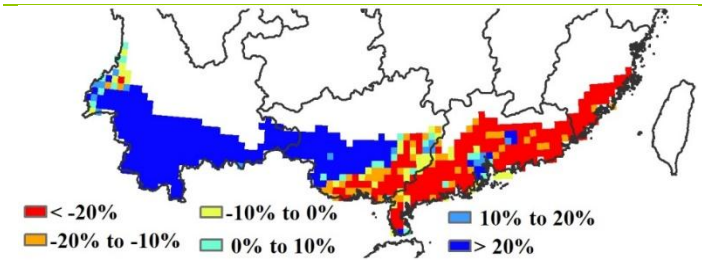
(b) Spatial NDVI patterns compared to 5YA



(c) NDVI profiles



(d) Maximum VCI



(e) Biomass