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 agroclimatic and agronomic conditions over the monitoring period (section 4.1), a new bulletin section (4.2) describes the situation with pests and diseases that are affecting agricultural crops in China. Section 4.3 then presents an outlook for 2015 production of maize, rice, wheat, and soybean, while section 4.4 presents analyses by region. 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 monitoring period, winter wheat was harvested and summer crops (maize and soybean) were planted in the north of China. 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). Table 4.1 presents an overview of CropWatch indicators for the monitoring period.

Table 4.1. CropWatch agroclimatic and agronomic indicators for China, April-July 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	-36	-0.5	0	-14	1	0.89
Inner Mongolia	3	-0.5	1	0	-5	0.74
Loess region	-20	-0.6	1	-10	-3	0.87
Lower Yangtze	41	-0.6	-8	13	0	0.90
Northeast China	-25	-0.1	2	-17	-1	0.91
Southern China	-9	0.4	2	-9	-1	0.89
Southwest China	9	0.1	-2	0	-2	0.93

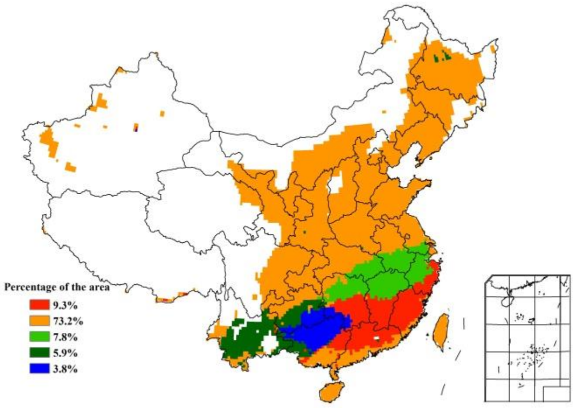
Note: Departures are expressed in relative terms (percentage) for all variables, except for temperature, for which absolute departure in degrees Celsius is given. Zero means no change from the average value; relative departures are calculated as (C-R)/R*100, with C=current value and R=reference value, which is the five (5YA) or fourteen-year average (14YA) for the same period (April-July).

Rainfall (RAIN) increased by 11%, while temperature (TEMP) and radiation (RADPAR) decreased by 0.2°C and 2%, respectively, when compared with average. The prevailing agroclimatic conditions lead to average biomass. In more than 70% of the country, mostly in central and northern China, rainfall in the past seven months was average up to July, while it was above average in the west of Guangxi and east of Guizhou provinces. Temperature fluctuated widely.

In Huanghuaihai, Loess region, and Northeast China, below average RAIN and TEMP resulted in lower BIOMSS. In the Lower Yangtze region, abundant rainfall lead to a potential BIOMSS increase of 13% over the recent five-year average. High VCIx values mostly occur in Southwest China and in the Northeast. Low VCIx values are mainly located in Northwest China and Huanghuaihai regions, in particular the south of Jiangsu and north of Shanxi and Shaanxi provinces. Crop condition in the Southwest China is above average (VCIx is 0.93), as temperature and PAR are higher than average and rainfall is just slightly below.

During the monitoring period, the cropped arable land fraction (CALF) dropped below the recent five-year average in all regions except Huanghuaihai where CALF increased by 1 percentage point. In Inner Mongolia, Loess Region, and Lower Yangtze, the drop in CALF may be the result of the low temperature, while in Northeast and Southern China below average rainfall is the most likely factor. The results for minimum VHI indicate that most areas did not experience water stress. Some major production zones, however, suffered from drought, including southern Liaoning, western Shandong, and the east of Jiangsu province (figure 4.5).

Figure 4.1. China spatial distribution of rainfall profiles



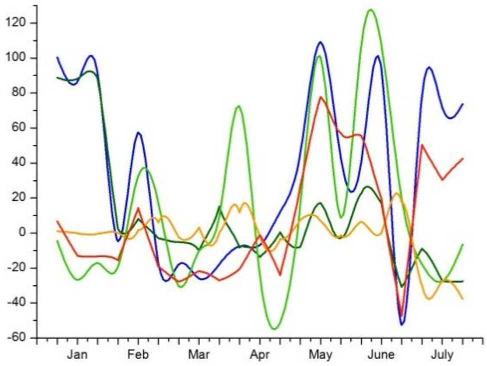
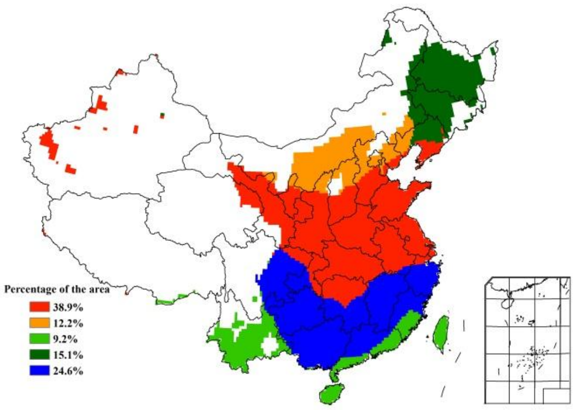


Figure 4.2. China spatial distribution of temperature profiles



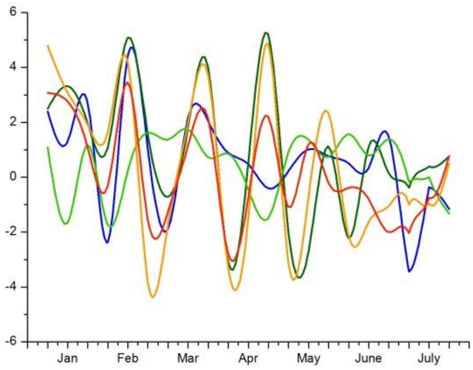


Figure 4.3. China cropped and uncropped arable land, by pixel

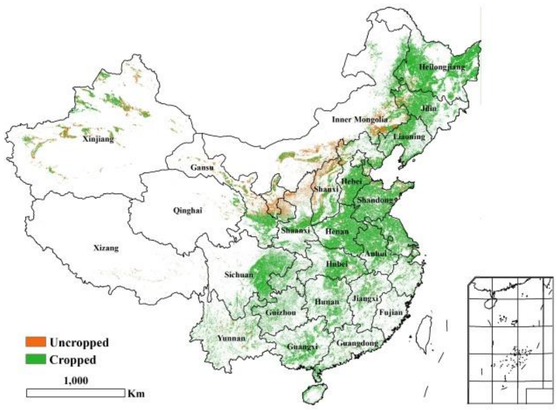


Figure 4.4. China maximum Vegetation Condition Index (VCIx), by pixel

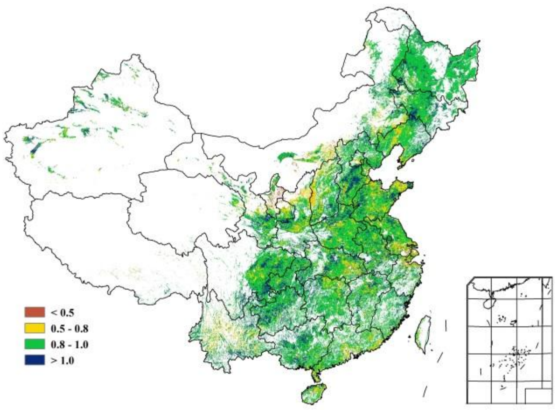
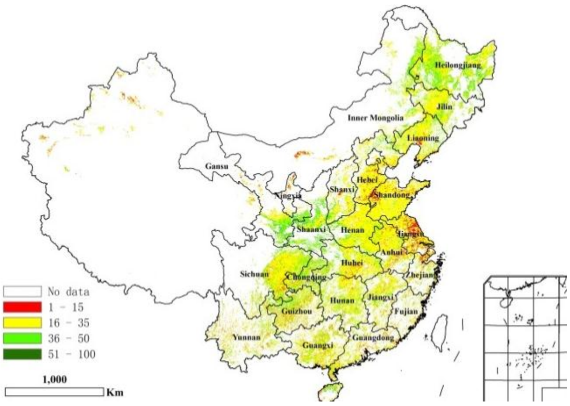


Figure 4.5. China VHI minimum, by pixel



4.2 Impact of pests and diseases

The impact of pests and diseases was relatively severe during August 2015 in the main rice regions of China. Maize areas were much less seriously affected.

Rice

For Southern China, south of the Yangtze River and in the middle reaches of the Yangtze River, due to large areas being cultivated either as single cropping rice or double cropping rice, a variety of different phenological stages coexist, which provide favorable conditions for the planthopper. The above average rainfall and normal temperature in eastern Southwest China, south of the Yangtze River, and in the Yangtze River basin has been conducive to both planthopper reproduction and sheath blight dispersal.

The distribution of the rice planthopper during August 2015 is shown in figure 4.6(a) and table 4.2. Across China, the total area affected with by the insect has reached 20 million ha, with the pest mostly occurring in the northern part of Southern China and the middle and lower reaches of the Yangtze River. The most severely affected areas include eastern Sichuan, most of Guizhou, central Hubei, most of Hunan, southern Jiangsu, central Anhui and northern Guangdong, where in total 10 million ha were damaged.

Rice sheath blight (figure 4.6(b) and table 4.3) has damaged around 15 million ha across China, with the disease mostly found along the middle and lower reaches of the Yangtze River and in most areas of Southern China and the east of Southwest China. Damage was most severe on 6.7 million ha in central Anhui, southern Jiangsu, most of Jiangxi, and in the east of Sichuan province.

Figure 4.6. Distribution of the rice planthopper (a) and rice sheath blight (b) in China, August 2015

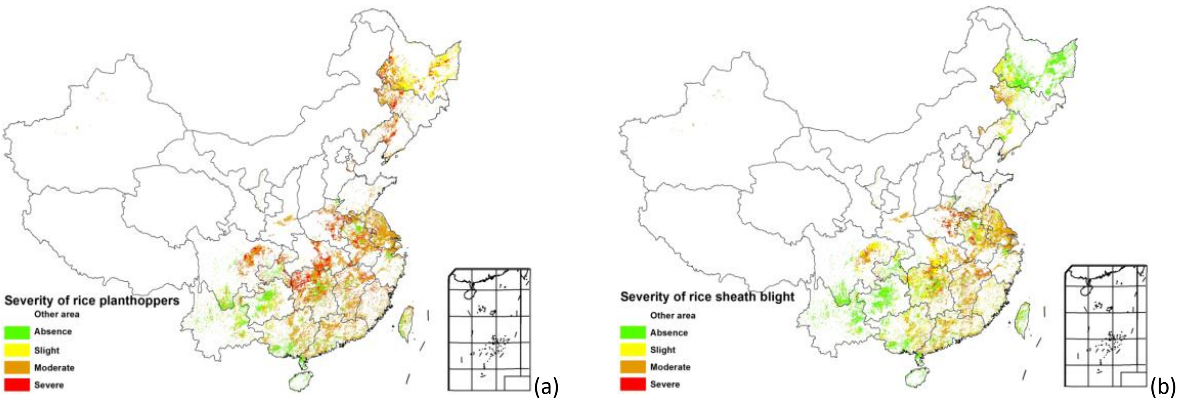


Table 4.2. Areas in China affected by rice planthopper, August 2015

Region	Area (thousand hectares)					
	Absence	Slight	Moderate	Severe	Total	Occurrence ratio
Huanghuaihai	232	2	1066	317	1617	85.6%
Inner Mongolia	5	3	247	37	292	98.4%
Loess region	3	7	127	6	143	97.7%
Lower Yangtze	879	79	6816	1701	9475	90.7%
Northeast China	30	1905	1443	880	4258	99.3%
Southern China	740	39	1431	45	2255	67.2%
Southwest China	1370	737	1757	954	4818	71.6%

Table 4.3. Areas in China affected by rice sheath blight, August 2015

Region	Area (thousand hectares)					
	Absence	Slight	Moderate	Severe	Total	Occurrence ratio
Huanghuaihai	237	129	961	290	1617	85.3%
Inner Mongolia	10	35	229	18	292	96.8%
Loess region	3	10	125	5	143	98.1%
Lower Yangtze	1121	2544	4933	877	9475	88.2%
Northeast China	2704	1165	354	35	4258	36.5%
Southern China	830	440	961	24	2255	63.2%
Southwest China	2505	1497	603	213	4818	48.0%

Maize

In general, during August 2015, the situation of maize diseases and pests in the main maize producing regions of China was relatively uneventful. In August, northern leaf blight only occurred in Northeast and Southwest China. Meanwhile, the temperature and precipitation in Northeast, Huanghuaihai and Inner Mongolia provided a proper environment for armyworm reproduction.

As shown in figure 4.7(a), only some parts of Heilongjiang, Jilin, Liaoning, Yunnan, Sichuan, and Guizhou provinces were affected by northern leaf blight. Within the diseased regions, the total damaged area is around 560 thousand ha.

For armyworms, the total area affected in China is around 1.5 million ha, with the pest mostly observed in Northeast, Inner Mongolia, and Huanghuaihai (figure 4.7(b) and table 4.4). Especially severe attacks are reported from eastern Inner Mongolia, southern Heilongjiang, Jilin, Liaoning, northern Hebei, Beijing, Tianjin, and some parts in Henan and Shandong, totaling 1.3 million ha.

Figure 4.7. Distribution of maize northern leaf blight (a) and armyworm (b) in China, August 2015

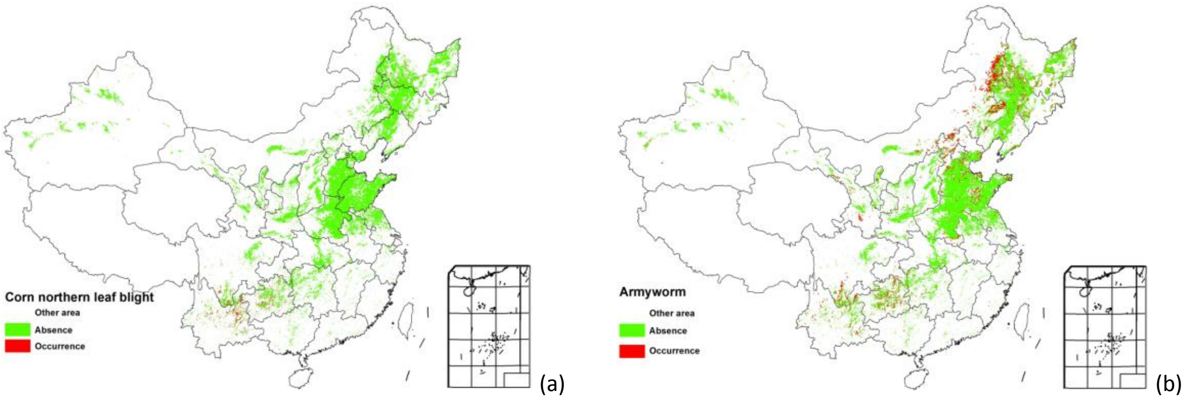


Table 4.4. Occurrence of armyworm in China, August 2015

Region	Maize area (thousand hectares)	Armyworm occurrence area (thousand hectares)	Occurrence ratio
Huanghuaihai	16385	309	1.9%
Inner Mongolia	2683	348	13.0%
Loess region	2483	7	0.3%
Lower Yangtze	2289	19	0.8%
Northeast China	10318	631	6.1%
Southern China	145	4	2.8%
Southwest China	2601	125	4.8%
Huanghuaihai	16385	309	1.9%

4.3 Crop production

CropWatch indicators point to favorable conditions for winter crops at the grain filling stage. As a result, the total production of winter crops in China is revised to 125.7 million tons, an increase of 2.16 million tons (or 1.7%) compared to 2014 and 0.3 percentage points (equivalent to 317 thousand tons) up from the previous estimates. Table 4.5 presents an overview of the estimated production levels by province. Only Anhui, Hubei, and Gansu show decreased production compared to the previous year.

Table 4.5. China, 2015 winter crop 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%	0.2%	1.1%	10904
Shanxi	2170	-0.5%	1.2%	0.7%	2184
Jiangsu	9995	1.7%	-1.0%	0.7%	10069
Anhui	12122	-1.2%	-0.6%	-1.8%	11908
Shandong	22107	2.4%	1.7%	4.2%	23037
Henan	25862	0.2%	0.8%	1.1%	26134
Hubei	6120	-0.6%	-3.4%	-4.0%	5877
Chongqing	2297	-0.8%	1.3%	0.5%	2308
Sichuan	5495	0.9%	1.4%	2.3%	5621
Shaanxi	4389	-0.4%	1.3%	0.8%	4426
Gansu	3108	-6.3%	5.7%	-0.9%	3080
Sub total	**104448**	**-**	**-**	**1.1%**	**105548**
Other provinces	19093	-	-	5.6%	20155
National total*	**123541**	**0.9%**	**0.8%**	**1.7%**	**125703**

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

Table 4.6 lists the estimated 2015 production for maize, rice, wheat, and soybean in China; table 4.7 provides additional detail about different rice crop types. The production of maize is at the same level as during 2014 (an increase just under +0.5%), but rice and wheat are estimated to respectively increase their production by 1% and 2% compared with the previous season. Soybean decreases 3%—in line with its downward trend—because of a drop in planting area; soybean production will reach 12.69 million tons. For rice, single rice production increases by 2%, while the production of early rice and late rice decrease by 1% and 2%, respectively.

Chongqing, Gansu, Hebei, Henan, and Xinjiang all have an estimated increase in maize production above 3%. On the contrary, a large decrease in the production of this crop is observed in Inner Mongolia, Ningxia, Shaanxi, and Shanxi. The factors behind the decrease vary from province to province and include drought and pests in Inner Mongolia. Yield in Shaanxi province drops mainly due to the severe drought. Soybean in Heilongjiang province—the top soybean producing province in China (representing nearly one third of the national soybean production)—decreases by 4% due to the reduced planted area. Inner Mongolia and Shanxi show the largest drop in soybean production, as both area and yield are low.

The aggregated rice production shows a decrease in Guangdong, Hunan, Jiangxi, Yunnan, and Zhejiang, while all other provinces show an estimated increase by 1% to 3%. Generally, areas that practice double cropping show a decreasing trend while the area for single rice planting increased in recent years.

Table 4.6. China, 2015 maize, rice, wheat and soybean production and percentage difference with 2014, by province

	Maize		Rice		Wheat		Soybean	
	2015	**Δ(%)**	**2015**	**Δ(%)**	**2015**	**Δ(%)**	**2015**	**Δ(%)**
Anhui	3626	0	17410	2	11245	-1	1113	1
Chongqing	2165	3	4892	2	1118	0		
Fujian			2855	2				
Gansu	4892	6			1607	-1		
Guangdong			10918	-1				
Guangxi			11247	2				
Guizhou	4935	-1	5213	1				
Hebei	17163	6			10730	1	175	2
Heilongjiang	25767	-2	20259	0			4413	-4
Henan	16625	4	3937	1	25992	1	752	2
Hubei			15903	0	4328	-3		
Hunan			25242	-1				
Inner Mongolia	13636	-5					784	-6
Jiangsu	2275	2	17111	3	9606	1	777	-1
Jiangxi			17133	-1				
Jilin	23944	0	5063	1			643	-3
Liaoning	12802	-1	4703	0			506	-1
Ningxia	1733	-4	542	0				
Shaanxi	3735	-3	1053	1	3997	1		
Shandong	18568	1			22881	5	667	1
Shanxi	9084	-5			2109	1	179	-5
Sichuan	7160	1	14834	1	4673	2		
Xinjiang	6832	6						
Yunnan	5730	2	5147	-3				
Zhejiang			6367	-2				
Sub total	**180671**	**0**	**189915**	**0**	**98286**	**1**	**10008**	**-2**
Other provinces	12151	3	12408	3	15639	2	2683	-6
National total*	**192822**	**0**	**202323**	**1**	**121613**	**2**	**12691**	**-3**

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

Table 4.7. China, 2015 single rice, early rice, and late rice production and percentage difference with 2014, by province

	Early Rice		Single Rice		Late Rice	
	2015	**Δ(%)**	**2015**	**Δ(%)**	**2015**	**Δ(%)**
Anhui	1844	-3	13775	2	1791	0
Chongqing			4892	2		
Fujian	1717	2			1137	0
Guangdong	5247	1			5671	-3
Guangxi	5581	3			5666	2
Guizhou			5213	1		
Hebei						
Heilongjiang			20259	0		
Henan			3937	1		
Hubei	2306	-4	10813	1	2784	-1
Hunan	8199	-1	8524	2	8606	-2
Jiangsu			17111	3		
Jiangxi	7336	1	2861	-1	6936	-4
Jilin			5063	1		
Liaoning			4703	0		
Ningxia			542	0		
Shaanxi			1053	1		
Sichuan			14834	1		
Yunnan			5147	-3		
Zhejiang	817	-4	4668	-1	882	-4
Sub total	**33047**	**0**	**123396**	**1**	**33472**	**-2**
Other provinces	2077	-11	8826	8	1505	-3
National total *	**35123**	**-1**	**132221**	**2**	**34978**	**-2**

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

The total summer production is forecast at 406.9 million tons, 0.5% increase or 2 million tons increase from last drought year, slightly above 2013 summer crop production. CropWatch puts the total annual output (including cereals, legumes, and tubers) at 567.7 million tons, 0.7% up from 2014 (3.9 million tons increase).

Since late rice is still at early growing stage, and maize and single rice are at grain filling stage, the production for each crop type as well as total summer crops production and annual outputs will be revised using new updated remote sensing data in the next bulletin.

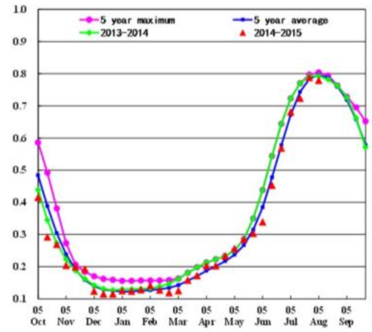
4.4 Regional analysis

Figures 4.8 through 4.14 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 July 2015 to the previous season, to the five-year average (5YA), the five-year maximum; (b) Spatial NDVI patterns from April to July 2015 (compared to the (5YA); (c) NDVI profiles associated with the spatial patterns under (b); (d) maximum VCI (over arable land mask); and (e) biomass for April-July 2015. Additional information about agroclimatic indicators and BIOMSS for China is provided in Annex A, table A.11.

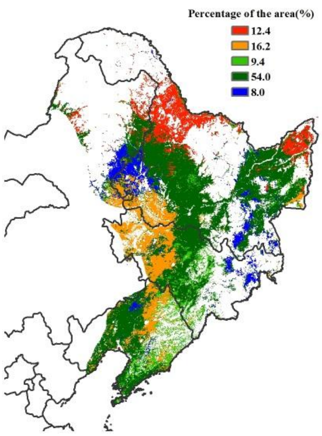
Northeast region

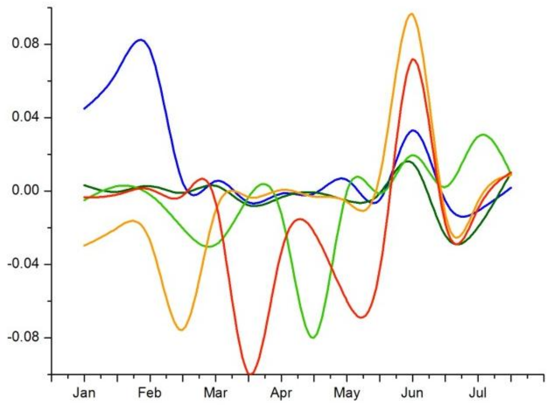
In China's Northeast, the monitoring period from April to July mainly covered the growing of spring maize, spring wheat, one-season rice, and soybean. Overall and across the monitoring period, crop condition was comparable with the recent five-year average. The NDVI clusters and profiles also illustrate this: crop condition is average in about 70% of the area and below average in parts of north Heilongjiang and west Jilin provinces before July because of the shortage of rain that affected the maturity phase. VCIx values were between 0.5 and 0.8 in nearly the entire region. Over the reporting period, only 1% of arable land was uncropped. The CropWatch agroclimatic and agronomic indicators show that the region suffered a 25% drop in rainfall (RAIN) compared to average, while temperature (TEMP) and PAR (RADPAR) accumulation were just average. Biomass accumulation (BIOMSS) was 17% below the five-year average, resulting in poor crops in the area.

Figure 4.8. Crop condition China Northeast region, April-July 2015



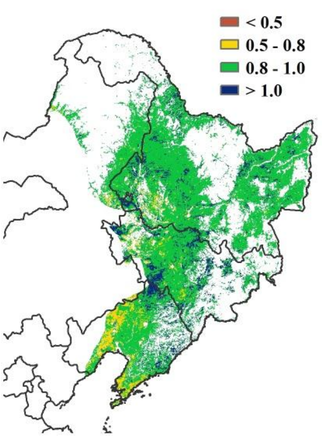
(a) Crop condition development graph based on NDVI

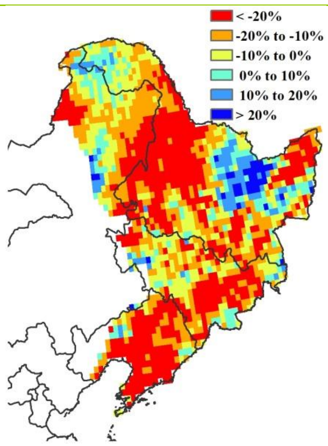




(b) Spatial NDVI patterns compared to 5YA

(c) NDVI profiles





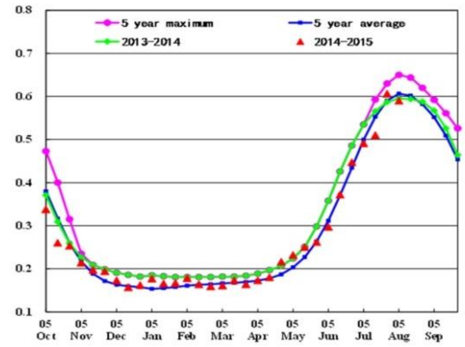
(d) Maximum VCI

(e) Biomass

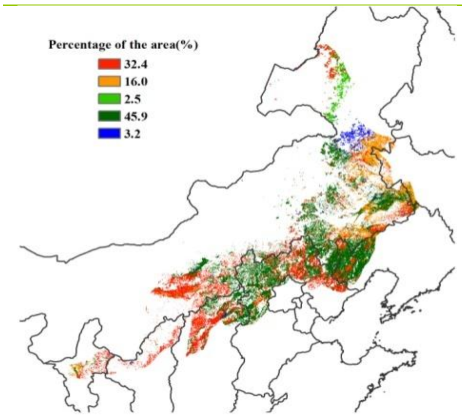
Inner Mongolia

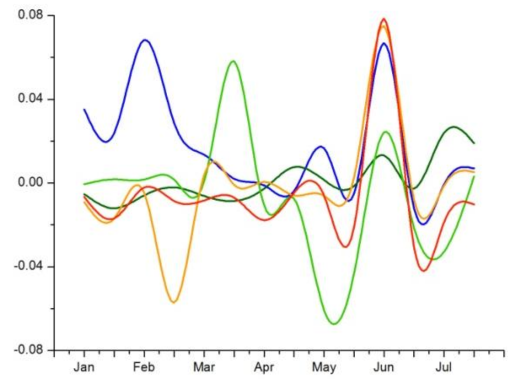
The condition of spring crops was generally unfavorable in Inner Mongolia for the current reporting period. Among the CropWatch agroclimatic indicators, RAIN was somewhat above average (+3%); TEMP was below (-0.5°C), and there was no change in the biomass production potential BIOMSS. Conditions were favorable for the sowing and early growth of spring crops, as illustrated in the crop development graph from April to late May. In June, however, dry weather affected crop growth. Crops recovered gradually, and by late July crop condition was above average. West Liaoning, central and southeast Inner Mongolia, northern Ningxia, Shaanxi, and Shanxi all suffered unfavorable vegetation condition according to the VCIx map. This is further confirmed by the presence of uncropped areas as in partly cropped arable land, the potential biomass is poor as well. Generally crop condition was unfavorable from April to July. If unfavorable conditions are maintained over the whole cycle, crop growth will be restricted and the outcome may altogether be a poor season.

Figure 4.9. Crop condition China Inner Mongolia, April-July 2015



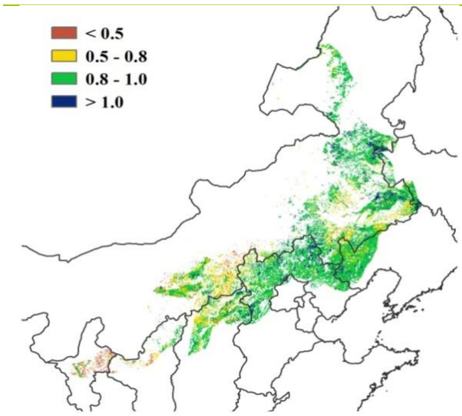
(a) Crop condition development graph based on NDVI

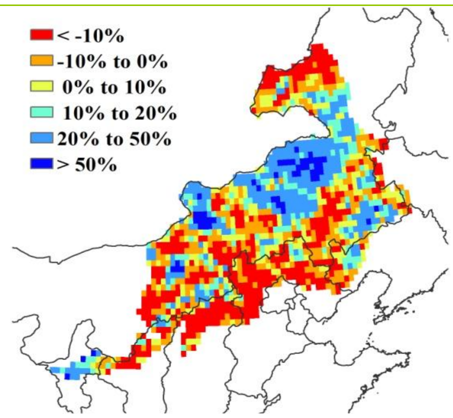




(b) Spatial NDVI patterns compared to 5YA

(c) NDVI profiles





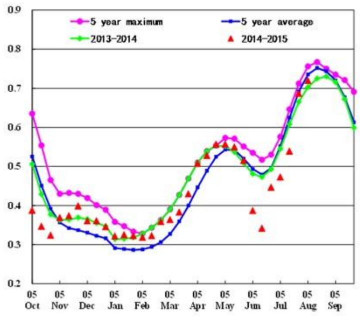
(d) Maximum VCI

(e) Biomass

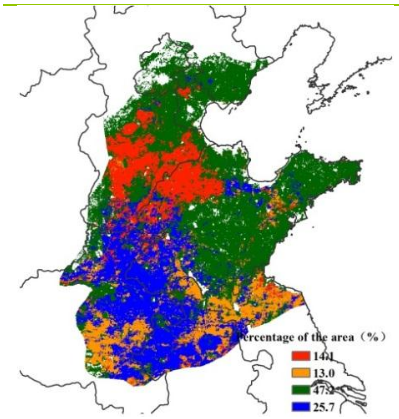
Huanghuaihai

Generally, crop condition in Huanghuaihai is not very satisfactory. The main crop for the reporting period was winter wheat, which is harvested in June, while maize is being planted. As shown by the NDVI development graph, crop condition was above the five-year average during April and May, while it was well below last year's condition and the five-year average most of the time, suggesting a decline in crop production. Agroclimatic conditions were unfavorable: 36% below average rainfall and 0.5°C below average temperature resulted in a 14% reduction in biomass, especially in Beijing, Tianjin, Hebei, northern Jiangsu, and northern Shandong. According to the NDVI clusters, crop condition in part of Hebei and Shandong was below normal, while other regions were at the average level. In addition, the fraction of cropped arable land was 1 percentage point below average. Low values for the vegetation condition index (VCIx) are distributed in the west and south of Bohai bay, which is corresponding with reduced values for BIOMSS.

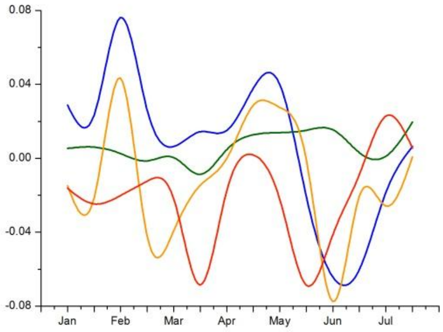
Figure 4.10. Crop condition China Huanghuaihai, April-July 2015



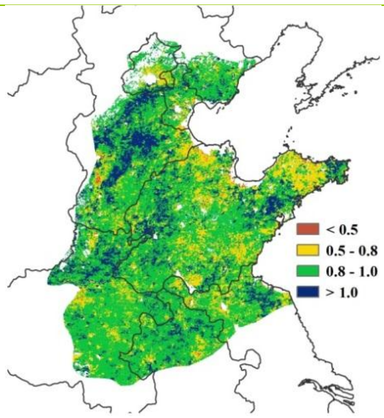
(a) Crop condition development graph based on NDVI



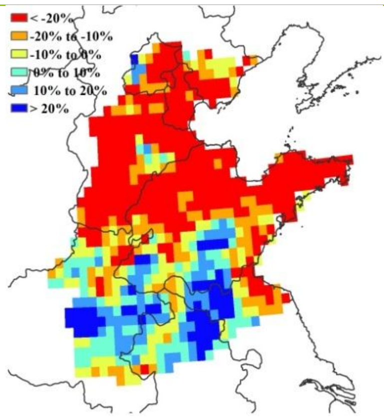
(b) Spatial NDVI patterns compared to 5YA



(c) NDVI profiles



(d) Maximum VCI

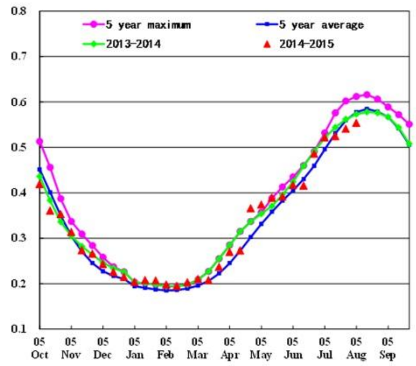


(e) Biomass

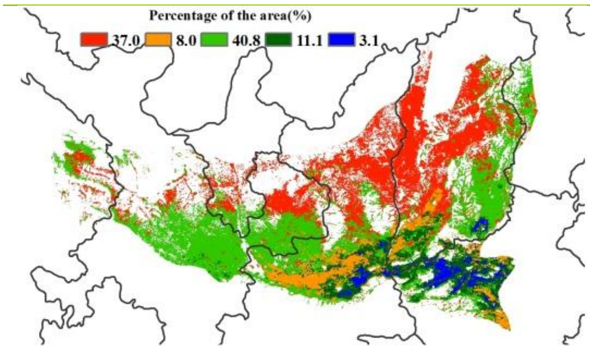
Loess region

In the Loess region, winter wheat was harvested from early to mid-June, and summer maize has been planted during the monitoring period. When compared to average, PAR accumulation (RADPAR) increased 1%, while temperature dropped by 0.6°C and rainfall by 20%. Up to June, condition of crops was only below the five-year average, but by the end of July it was below both that average and last year's level, with a VCIx value of 0.87. The spatial NDVI clusters and profiles indicate that crop condition fluctuated in almost all the seven months covered in the graphs; condition was favorable in the northwest of Henan and central Shaanxi provinces during the monitoring period, with the exception of the period in early June. On the contrary—and mostly because of the below average precipitation (which is confirmed by the maps of potential biomass), crops were in poor condition (compared to the five-year average) in the northeast of Gansu and north of Shaanxi and Shanxi provinces. The fraction of arable land actually cropped decreased 4 percentage points, possibly as a result of lower temperature and below average rainfall.

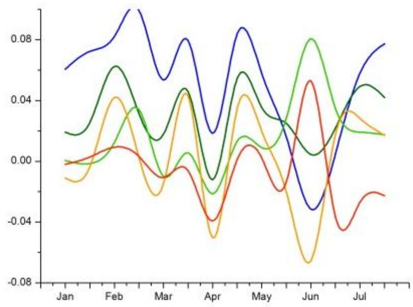
Figure 4.11. Crop condition China Loess region, April-July 2015



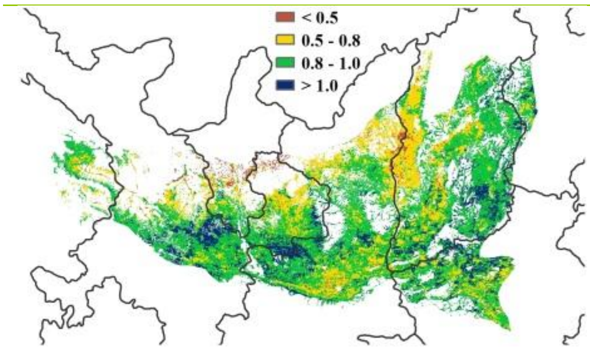
(a) Crop condition development graph based on NDVI



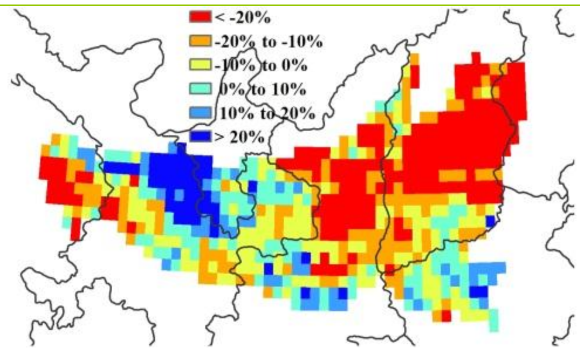
(b) Spatial NDVI patterns compared to 5YA



(c) NDVI profiles



(d) Maximum VCI

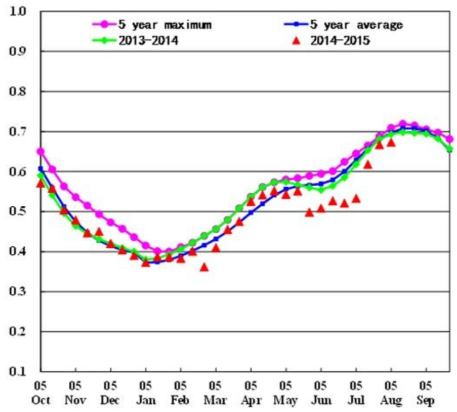


(e) Biomass

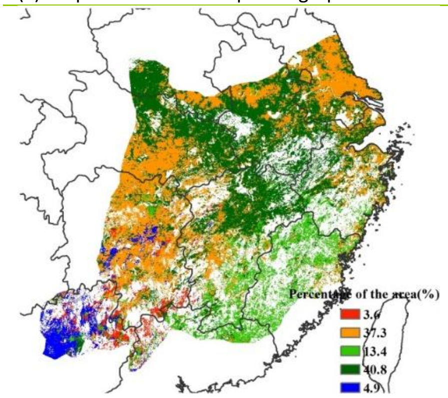
Lower Yangtze region

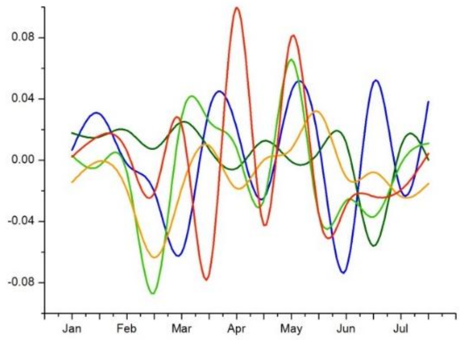
During the monitoring period, the winter wheat harvest was completed in the north of the Lower Yangtze region (Henan, Jiangsu, and Anhui provinces). In the south and center (including Fujian, Jiangxi, Hunan, and Hubei provinces), early rice was harvested while semi-late and late rice is still growing. Between April and July crop condition varied from below to close to the average of the past five years. The agroclimatic indicators show that rainfall was significantly above average (+41%), but radiation and temperature were below (-8% and -0.6°C, respectively). Due to heavy precipitation, Guangdong, Guangxi, Fujian, Jiangxi, Hunan, Hubei, and Zhejiang provinces, which together cover most of the Lower Yangtze region, suffered from serious floods between May and June. However, this did not lead to significant crop loss. The biomass production potential (BIOMSS) was above the past five-year average (+13%), and the cropped arable land fraction was average. In addition, the maximum VCI reached 0.90. Based on the above analysis, the yield of crops in the region is expected to be close to the recent five-year average.

Figure 4.12. Crop condition Lower Yangtze region, April-July 2015



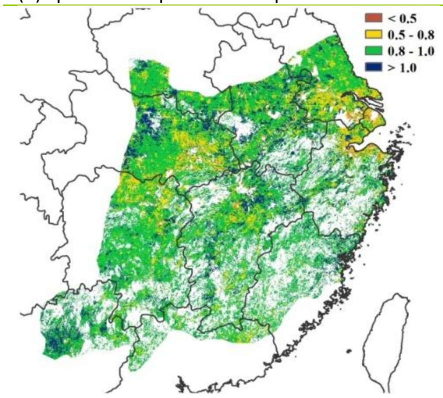
(a) Crop condition development graph based on NDVI

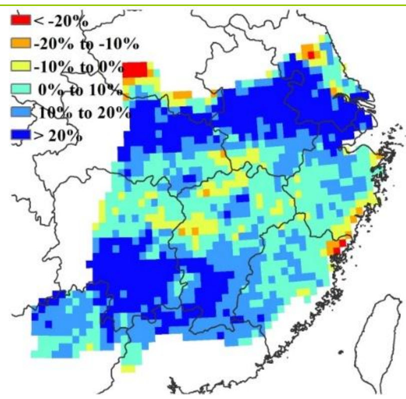




(b) Spatial NDVI patterns compared to 5YA

(c) NDVI profiles





(d) Maximum VCI

(e) Biomass

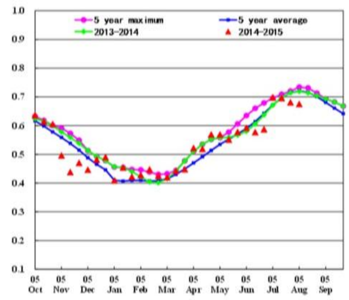
Southwest China

The ongoing season in Southwest China shows overall fair conditions. Compared with average, the precipitation increased by 9%, temperature was average (+0.1°C) and radiation decreased by 2%. This led to a stable potential accumulated biomass (0%) on the whole, compared to the five-year average. Nearly all arable land was actually cropped over the region, with the CALF decreasing by just 2 percentage points compared to average. The maximum VCI reached 0.93.

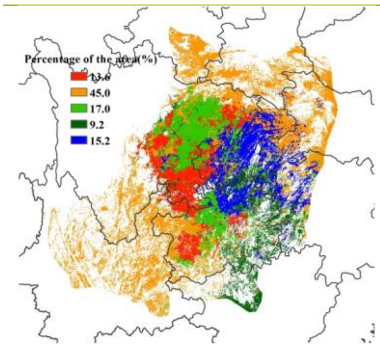
According to the crop condition development graph based on NDVI, in April crop condition in the region reached the five-year maximum level, but condition was just average in May. At the beginning of June and July, the crop condition was below average in southern Chongqing, southwestern Hunan, middle and northern Guangxi, southeastern Sichuan, and western Guizhou, accounting for about 22.8% of the cropped region, which was also reflected by the spatial NDVI pattern and profiles.

The CropWatch agroclimatic indicators for Yunnan are as follows: precipitation, -36%; temperature, +0.5°C, and radiation, +2%. As a result, potential accumulated biomass decreased by 18%. Northwestern and northeastern Yunnan suffered from severe drought, which will have a negative influence on rice output. The same situation occurred in southwestern Chongqing and small parts of south-eastern Sichuan, areas that will need close monitoring in the coming months.

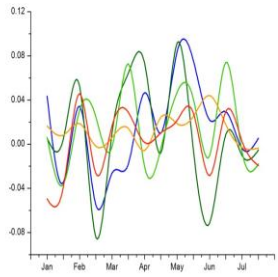
Figure 4.13. Crop condition Southwest China region, April-July 2015



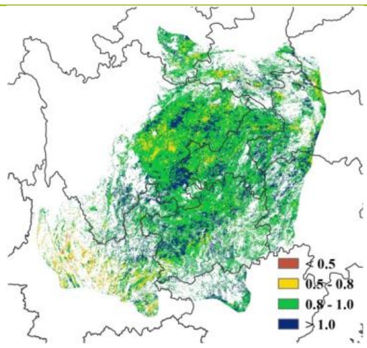
(a) Crop condition development graph based on NDVI



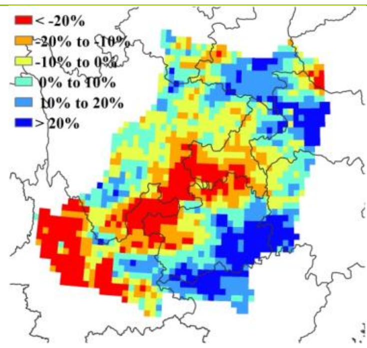
(b) Spatial NDVI patterns compared to 5YA



(c) NDVI profiles



(d) Maximum VCI



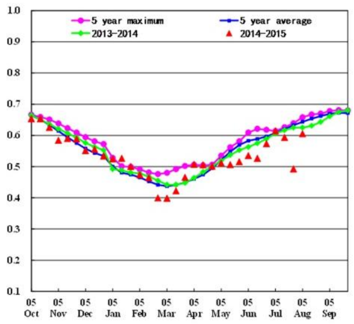
(e) Biomass

Southern China

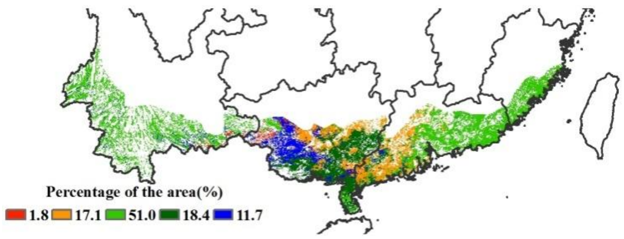
The period from April to July 2015 covers the growing and harvest period of early rice, the planting of late rice, and harvest of winter wheat. Crop condition was generally somewhat below average during the entire period. The precipitation (RAIN) dropped by 9%, temperature (TEMP) increased by 0.4°C, while radiation (RADPAR) increased by 2%. As a result, potential accumulated biomass decreased by 9% on the whole, compared to the five-year average. Nearly all arable land was actually cropped over the region, with the CALF decreasing by only 1 percentage point.

From the crop condition development graph based on NDVI, it can be seen that in April crop condition in the region reached the five-year maximum. However, condition dropped sharply to below average in May and the beginning of June. After June it showed some recovery and returned to average at the end of June. Subsequently, it dropped below average condition again, resulting from frequent rainstorms and floods (see section 5.2 for details). The overall below average condition in May and July was also reflected by the spatial NDVI pattern and profiles, covering southern Guangxi and southwestern Guangdong regions. According to CropWatch monitoring, close to average temperature (+0.5°C) and low rainfall (-36%) with stable radiation (+2%) in Yunnan led to the decrease in potential accumulated biomass (BIOMSS) by 18% compared to average. Yunnan has suffered from severe drought, including in the southern Yunnan region also mentioned in the analysis of China's Southwest region. CropWatch will closely monitor the situation in this area in the coming months.

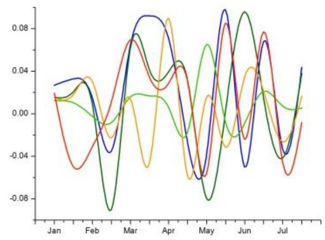
Figure 4.14. Crop condition Southern China region, April-July 2015



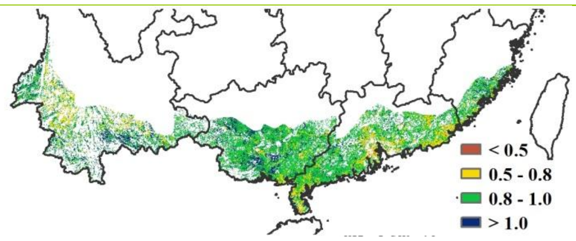
(a) Crop condition development graph based on NDVI



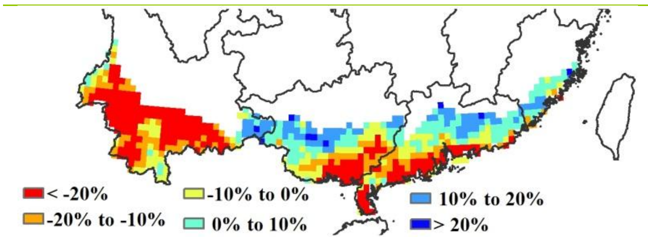
(b) Spatial NDVI patterns compared to 5YA



(c) NDVI profiles



(d) Maximum VCI



(e) Biomass