# 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), section 4.2 looks at the outlook of prices for domestic crops, 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

In China, the beginning of the reporting period for this bulletin, October, is the major planting period of winter crops including winter wheat and rapeseed, following on from the harvesting of the autumn crops.

From October 2015 to January 2016, agroclimatic conditions were generally favourable (Figures 4.1 and 4.2). Specifically, above average temperature was beneficial for winter crops' survival during winter. It is noteworthy that 85% above average rainfall was observed, accompanied by 12% below average RADPAR. Altogether, favorable agroclimatic conditions resulted in a 41% above average potential biomass in China.

As indicated in Table 4.1, the 2015-2016 winter was generally warm and wet with temperature above average in all seven regions and rainfall 60% or more above average. Spatially, rainfall patterns in China can be assigned to two categories: (1) slightly above average rainfall from October to January in most areas north of Yangtze River and (2) significantly above average rainfall in early October, mid-November, early December and early January in the areas south of Yangtze River. Temperature departure from average followed similar temporal patterns throughout the whole of China. Extreme low temperatures hit the whole country in late November as well as mid-January, but since it was wintering period for crops, the impact of the cold waves in terms of agricultural loss was limited.

**Table 4.1. CropWatch agroclimatic and agronomic indicators for China, October 2015-January 2016, 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 | 63 | 0 | -9 | 43 | 0 | 0.78 |
| Inner Mongolia | 122 | 0.7 | -4 | 41 | 1 | 0.60 |
| Loess region | 88 | 0.8 | -6 | 58 | -1 | 0.69 |
| Lower Yangtze | 110 | 0.4 | -22 | 58 | 0 | 0.87 |
| Northeast China | 59 | 0.8 | -3 | 9 | 2 | 0.76 |
| Southern China | 93 | 0.2 | -14 | 51 | 0 | 0.90 |
| Southwest China | 69 | 0.6 | -10 | 33 | 0 | 0.91 |

*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 (October-January).

Maximum VCI (VCIx, Figure 4.4) was distributed unevenly, resulting from complex agroclimatic situations. Crops in northeast China, Inner Mongolia, and southern China are off growing season and vegetation condition monitoring is irrelevant in those regions. High VCIx values occurred mostly in Sichuan and Central Hebei province. Low VCIx values are mainly located in the North China Plain and north-western region. The low VCIx in those regions results from below average crop development before wintering period due to the low temperature in late October and late November 2015. Thanks to abundant rainfall during the wintering period, warm temperatures will activate winter crops to catch up with normal crop phenology.

Cropped arable land fraction (CALF) was at the recent five-year average level. The Loess region is the only one out of the seven regions with 1% lower CALF when compared to the five-year average. Cropped and uncropped land (Figure 4.3), was determined based on China Environmental Satellite images (HJ-1 CCD) and China high-resolution satellite images (GF-1).

Total winter crops' planting was the same as during 2014-2015. Areas planted with winter crops in Gansu, Shandong and Sichuan were 1.4%, 3.3% and 1% lower than last year's season, respectively. Increased planting was observed in other major producing provinces, for example in Shaanxi and Shanxi the area increased by more than 2%. Assuming average agroclimatic conditions and normal farm management, winter crops production will be slightly above levels observed in the 2014-2015 season. Due to the significant drop of planted area, winter crop production in Shandong province is foreseen to decrease. CropWatch will provide a first production forecast for winter crops in the May Bulletin.

**Figure 4.1. China spatial distribution of rainfall profiles**

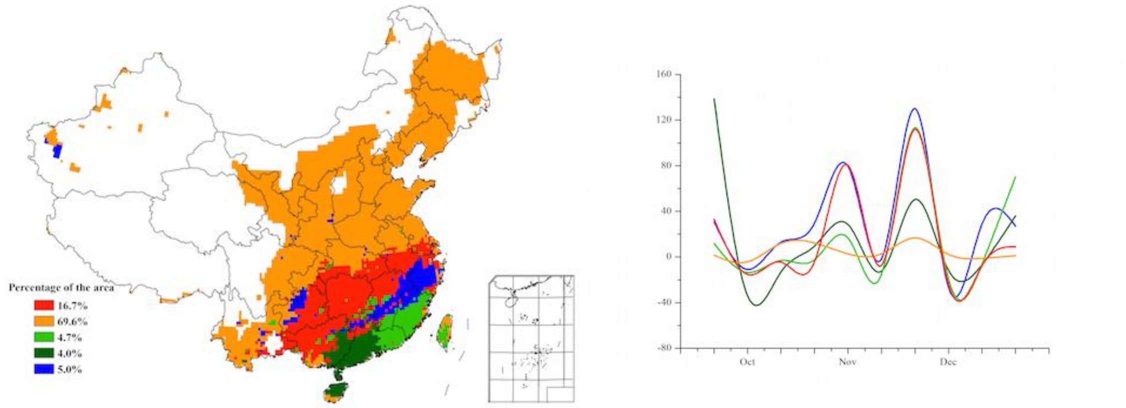



**Figure 4.2. China spatial distribution of temperature profiles**

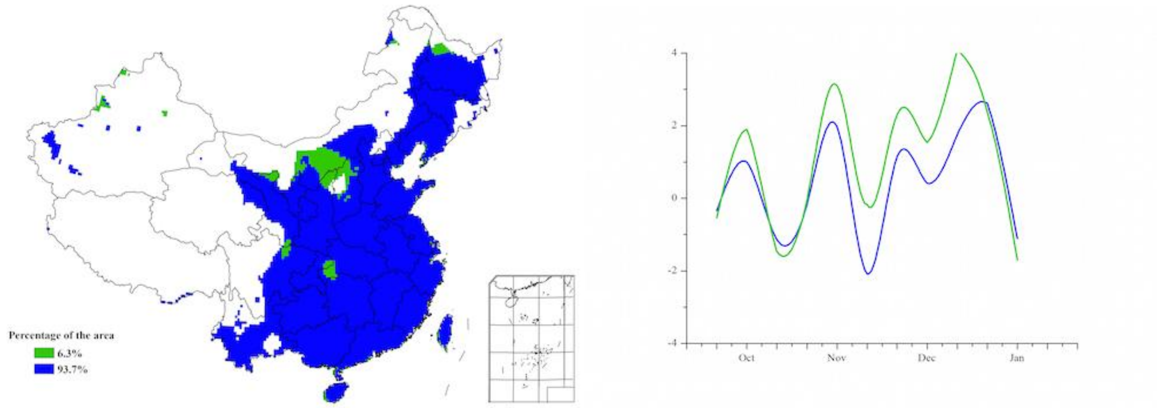


**Figure 4.3. China cropped and uncropped arable land, by pixel**

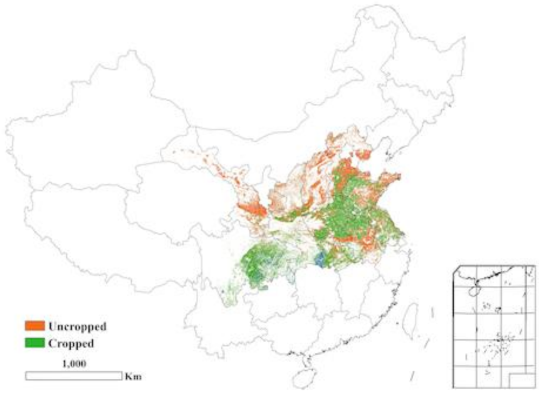
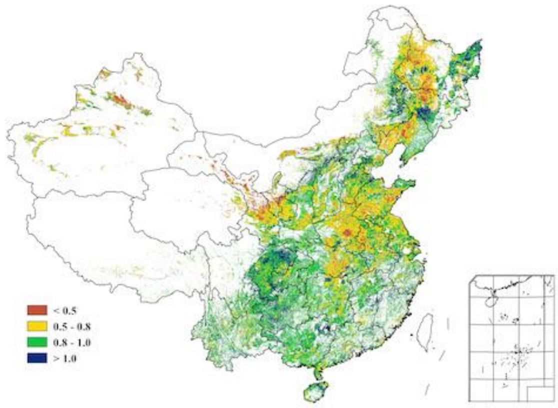



**Figure 4.4. China maximum Vegetation Condition Index (VCIx), by pixel**




## 4.2 Outlook of domestic price of four major crops

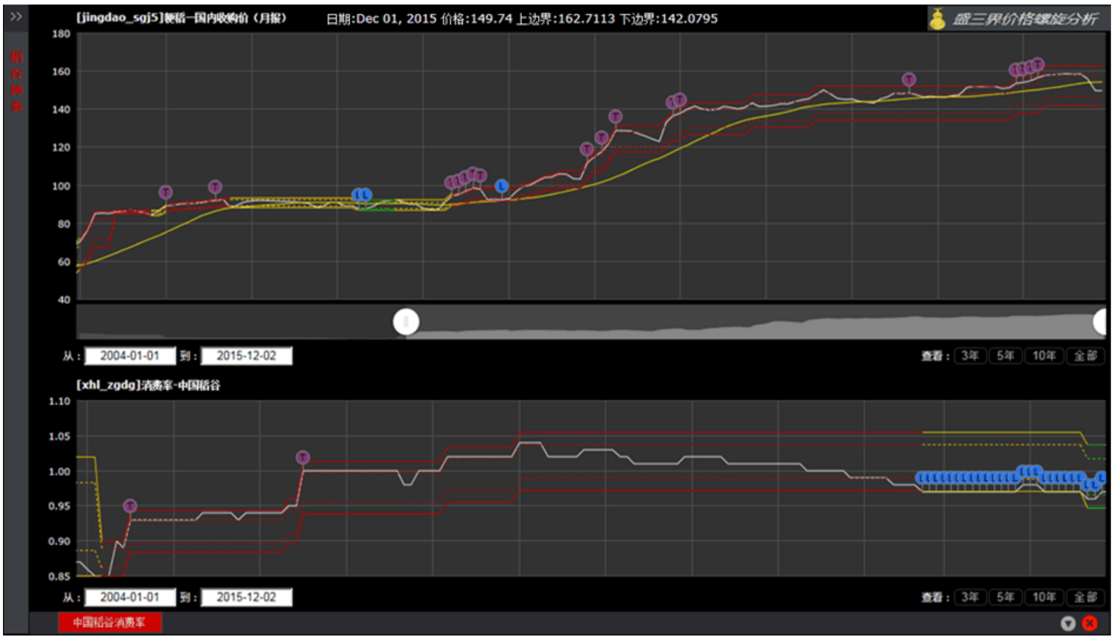
Historical domestic prices of soybean from January 2004 to December 2015 were analysed based on the theory of price spiral model (PSM) (Fang, 2011) and the historic ratio of world soybean consumption to the global soybean production (consumption ratio). According to the data for the last six months (Figure 4.5), the soybean international consumption ratio is at equilibrium. Domestic soybean prices are also at equilibrium but with a downward trend. They are anticipated to continue fluctuating within an equilibrium interval while also maintaining the negative trend.

**Figure 4.5. Historical soybean data from January 2004 until December 2015**


Note: Top, domestic price (Yuan/50Kg). White curve: monthly average price; yellow curve: 20-weeks moving average. Bottom: Consumption ratio. The upper and lower horizontal threshold lines are the outcomes from the PSM.

According to the data for the last six months (Figure 4.6), the paddy rice and wheat consumption ratio are both out of equilibrium with signs that they have reached a minimum. Domestic rice and wheat prices are at equilibrium but their trend is decreasing. Although it is weakening, it is expected to continue for some time.

**Figure 4.6. Historical rice paddy data from January 2005 to December 2015**




Note; Top, domestic price (Yuan/50Kg). White curve: monthly average price; yellow curve: 20-weeks moving average. Bottom: Consumption ratio. The upper and lower horizontal threshold lines are the outcomes from the PSM.

According to the long-term (2005-2015) data and data for the last six months, the maize consumption ratio and domestic price are both below the lower threshold of equilibrium intervals with signs of “bottoming”. The domestic maize price is expected to increase in the near future.

**Figure 4.7 Historical maize data from January 2004 to December 2015**


Note: Top, domestic price (Yuan/50Kg). White curve: monthly average price; yellow curve: 20-weeks moving average. Bottom: Consumption ratio. The upper and lower horizontal threshold lines are the outcomes from the PSM.

**Figure 4.8 Historical wheat data from January 2004 to December 2015**


**Note: Top, domestic price (Yuan/50Kg). White curve: monthly average price; yellow curve: 20-weeks moving average. Bottom: Consumption ratio. The upper and lower horizontal threshold lines are the outcomes from the PSM.**

## 4.3 Regional analysis

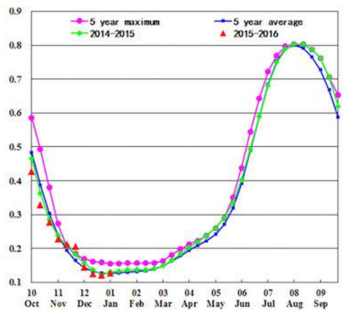
Figures 4.9 through 4.15 present crop condition information for each of China's seven agricultural regions. The provided information is as follows: (a) Crop condition development graph based on NDVI, comparing the current season up to July 2015 to the previous season, to the five-year average (5YA), the five-year maximum; (b) Spatial NDVI patterns from October 2015 to January 2016 (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 October 2015 to January 2016. Additional information about agroclimatic indicators and BIOMSS for China is provided in Annex A, table A.11.

# Northeast region

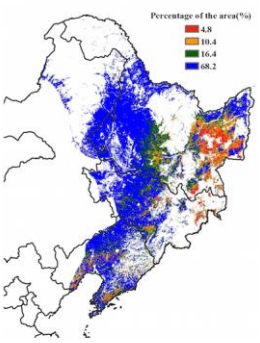
No crops are grown between late October and January in Northeast China due to the low temperatures. For the period under consideration, however, agro-climatic conditions were favorable for crops to be planted in April.

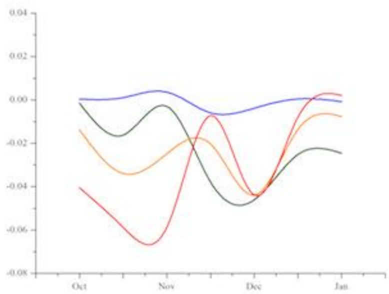
The CropWatch agro-climatic indicators show markedly above average rainfall (+59%) and a slight decrease in PAR (-3%). Temperature (+0.8°C) was generally about average. These favorable agro-climatic conditions resulted in 9% above average potential biomass in the region, the only exception being the Liaohe Plain, which shows below average BIOMSS due to the severe drought during the previous monitoring period. In general, abundant snow will ensure good soil moisture, which will benefit spring crops in 2016.

**Figure 4.9. Crop condition China Northeast region, October 2015-January 2016**

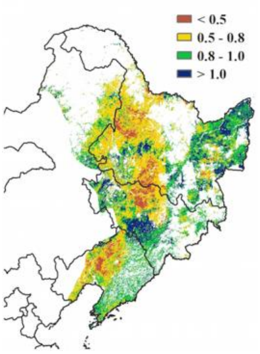


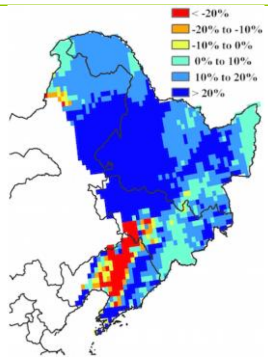

(a) Crop condition development graph based on NDVI




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



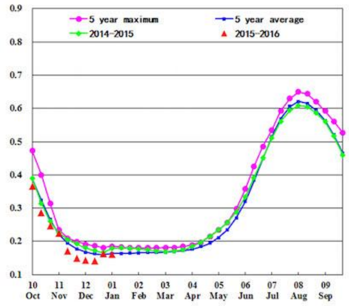

(d) Maximum VCI (e) Biomass

# Inner Mongolia

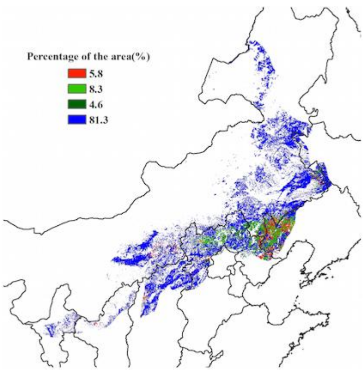
Winter crops cannot survive in Inner Mongolia due to low temperatures from October to March. Compared with average conditions, the environmental indices show a significant increase of RAIN (+69%) and a large decrease of RADPAR (-10%), while temperature was slightly above average. BIOMSS, however, was significantly above the five-year average for the same period (+33%).

As a result, abundant snow since December will provide favorable soil moisture for the sowing of upcoming spring crops. Potential biomass during the monitoring period in most areas of Inner Mongolia was at least 20% above average (Figure 4.6). However, temperature was higher than average in most areas in Inner Mongolia, which may have some influence on spring crops by prematurely depleting soil moisture reserves.

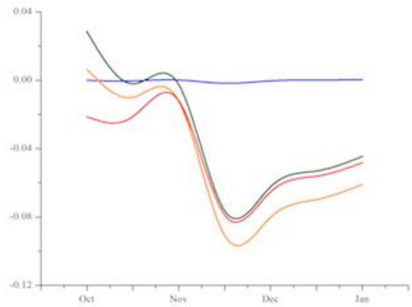
**Figure 4.10. Crop condition China Inner Mongolia, October 2015-January 2016**



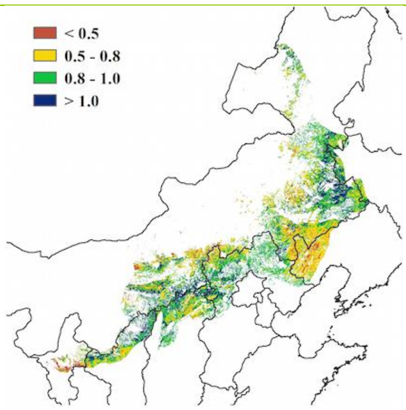

(a) Crop condition development graph based on NDVI



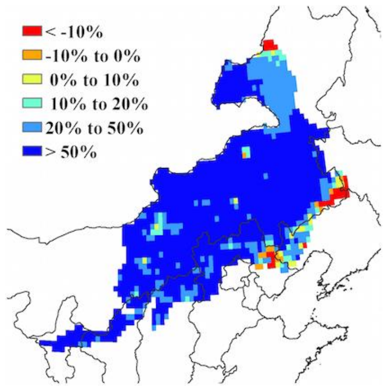

(b) Spatial NDVI patterns compared to 5YA




(c) NDVI profiles




(d) Maximum VCI



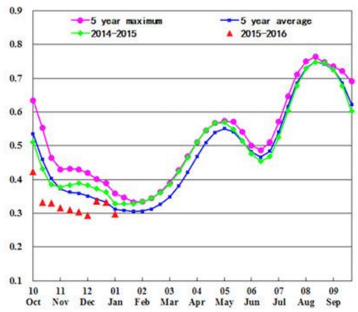

(e) Biomass

# Huanghuaihai

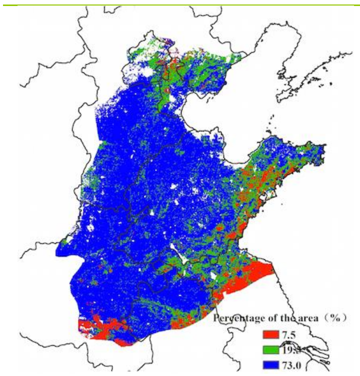
In Huanghuahai, crop condition was generally below the five-year average, although it approached that level in January. Unfavorable meteorological conditions during the last monitoring period may have impacted the sowing and crop development at early growing stage. In addition, dry weather from July to October hindered the germination of winter wheat, which is confirmed by the well below average NDVI value before December in the NDVI development graph (Figure 4.7). Significantly above average rainfall (63%) from October 2015 to January 2016 provides sufficient soil moisture for winter wheat to develop after the wintering period.

As shown in the spatial pattern of the NDVI departure map, crop condition was below average before December in almost the whole region, especially in the east of Shandong province, and the southern fringe of the region. Since December, crops in the region, except for the most southern part, recovered to average, mainly due to abundant rainfall. The maximum VCI presents high values in Tianjin and southern Hebei provinces, while low values occur in central Henan and southern and eastern Shandong. Overall, climatic conditions so far will benefit the development of the winter wheat after dormancy.

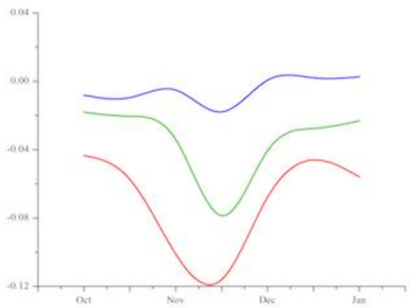
**Figure 4.11. Crop condition China Huanghuaihai, October 2015-January 2016**



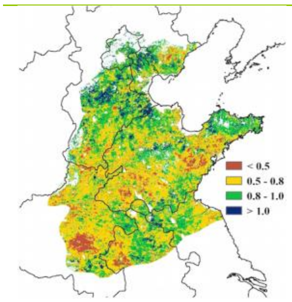

(a) Crop condition development graph based on NDVI



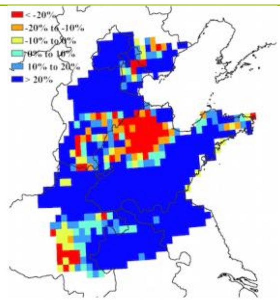

(b) Spatial NDVI patterns compared to 5YA




(c) NDVI profiles




(d) Maximum VCI




(e) Biomass

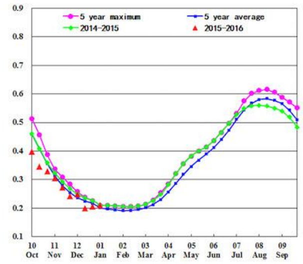
# Loess region

Crop condition in the Loess region was slightly below the five-year average for the monitoring period of October 2015 to January 2016. The precipitation significantly exceeded average (+88%) and temperature was just slightly higher (+0.8°C) than average, while radiation decreased (-6%).

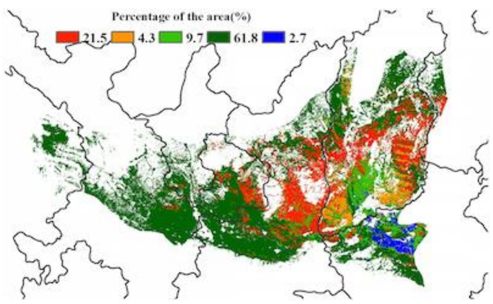
Suitable rainfall and temperature lead to higher biomass when compared to the average (+58%). Winter wheat was sown in October and is currently in its dormant stage, and winter crops will start growing again in late February or early March.

The NDVI clusters and profiles (Figure 4.8) show crop condition at average levels in 62% of the region, especially in the centre of Gansu, southern Ningxia and neighboring areas in Shaanxi provinces. Above average NDVI values can be observed in the northwest of Henan province from the beginning of November. However, in the centre of Shaanxi and Shanxi province, crop condition was below average due to reduced sunshine. The cropped arable land fraction was slightly below average (-1%).

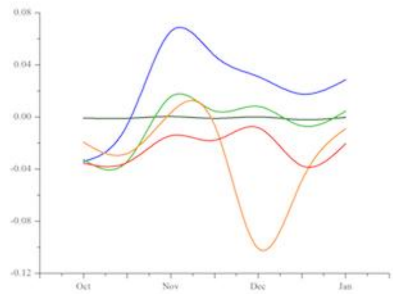
**Figure 4.12. Crop condition China Loess region, October 2015-January 2016**



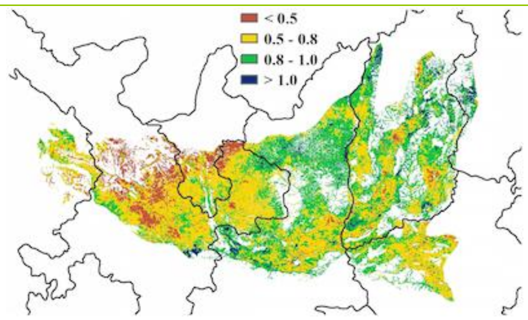

(a) Crop condition development graph based on NDVI



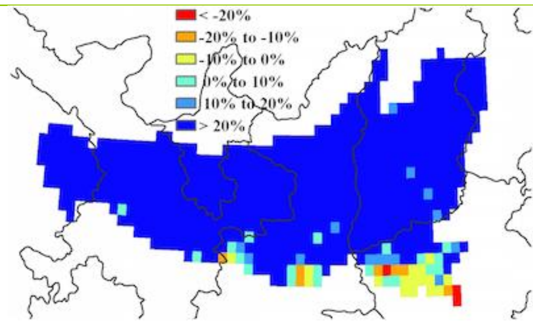

(b) Spatial NDVI patterns compared to 5YA




(c) NDVI profiles




(d) Maximum VCI




(e) Biomass

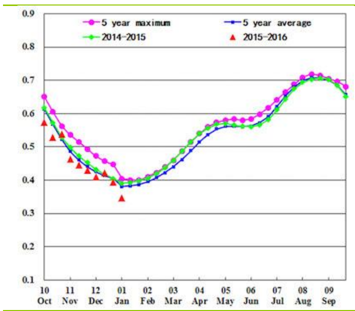
# Lower Yangtze region

During the monitoring period, few crops were in the field except for winter wheat growing in the northeast and northern parts of the Lower Yangtze region. In general, crop condition was slightly below average over the reporting period.

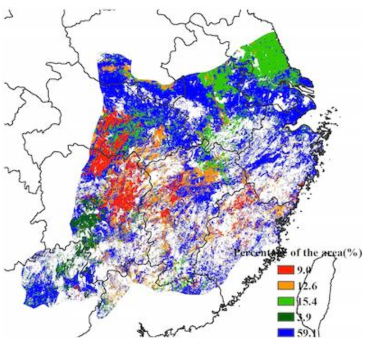
The CropWatch agro-climatic indicators (Figure 4.9) show that rainfall was far above average (+110%) and temperature was slightly above (+0.4°C). Although RADPAR decreased by 22% compared to average, favorable rainfall and temperature conditions brought about a marked increase of BIOMSS in the region (>20%). The BIOMSS departure map also shows values at least 20% above average in most parts of the Lower Yangtze region.

The average value of maximum VCI in the whole region was 0.87, with VCIx values larger than 0.8 appearing in the central and southern parts of the region. According to the graph of spatial NDVI patterns compared to the five-year average and corresponding NDVI profiles, about 59% of crops were continuously close to the recent five-year average level over the reporting period. Other areas show variable conditions. CropWatch estimates that the yield of winter wheat in the region will be average.

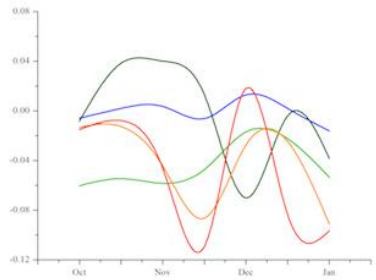
**Figure 4.13. Crop condition Lower Yangtze region, October 2015-January 2016**



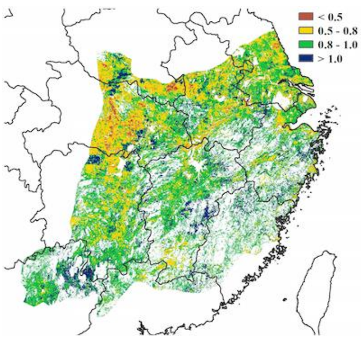

(a) Crop condition development graph based on NDVI



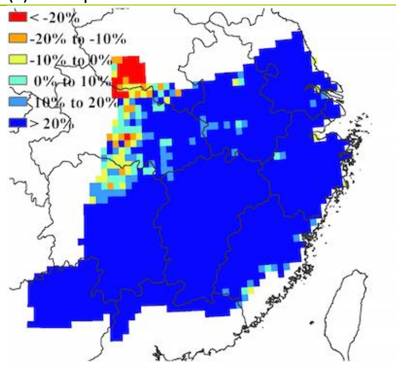

(b) Spatial NDVI patterns compared to 5YA




(c) NDVI profiles




(d) Maximum VCI




(e) Biomass

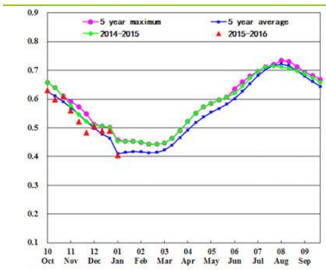
# Southwest China

Winter wheat was planted during this monitoring period; the overall crop condition is average compared to the last 5YA. The CropWatch RAIN indicator reported a 13% decrease of precipitation accompanied by a positive temperature anomaly of 1.2°C.

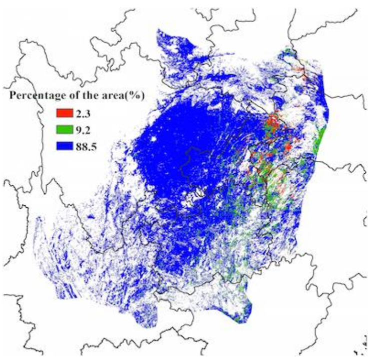
NDVI was generally average in October, dropped below average in November and recovered in both December and January. The spatial NDVI patterns and profiles also show that crops are fair in about 88.5% of the area.

The low average NDVI in November is possibly due to the below average condition of the eastern part of Sichuan, resulting from decreased precipitation, of which the low potential biomass is another indicator (Figure 4.10). The cropped arable land fraction stayed at the same level as the last five-year average. Altogether, the expected output of winter crops is fair in Southwest China.

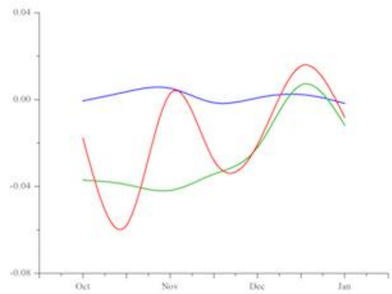
**Figure 4.14. Crop condition Southwest China region, October 2015-January 2016**



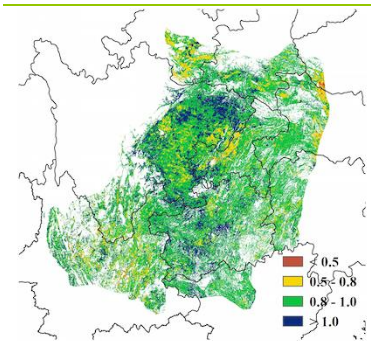

(a) Crop condition development graph based on NDVI



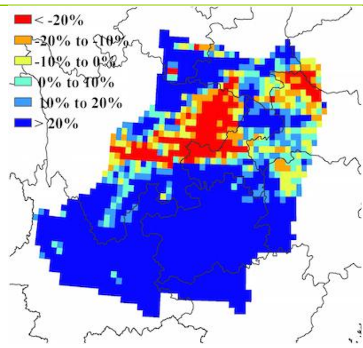

(b) Spatial NDVI patterns compared to 5YA




(c) NDVI profiles




(d) Maximum VCI



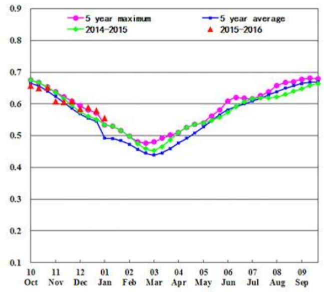

(e) Biomass

# Southern China

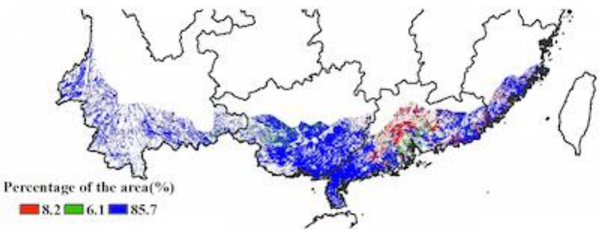
In southern China, the monitoring period covers the harvest season of late rice. Overall crop condition is average, compared to the last five-year average, as clearly shown by the NDVI-based crop condition development graph (Figure 4.11). NDVI was generally average in October, dropped slightly below average at the beginning of November, then recovered and reached above average levels in December and January. The overall precipitation over cropped land of Southern China has decreased by 24% (reaching 725mm). The average maximum VCI was at 0.9 and the cropped arable land fraction kept at the same level as the last five-year average.

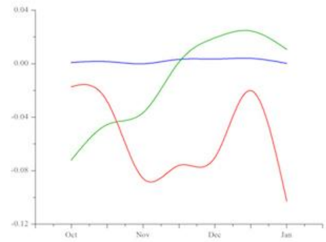
Crops in the middle of Guangdong province should be paid attention to especially, due to their below average condition throughout, as reflected by the NDVI spatial patterns and profiles. It is possibly due to the heavy increase of precipitation (+155%) and the reduction of RADPAR (-19%) in Guangdong province.

**Figure 4.15. Crop condition Southern China region, October 2015-January 2016**



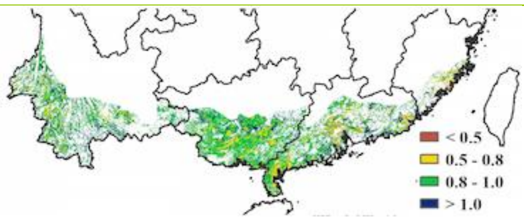

(a) Crop condition development graph based on NDVI



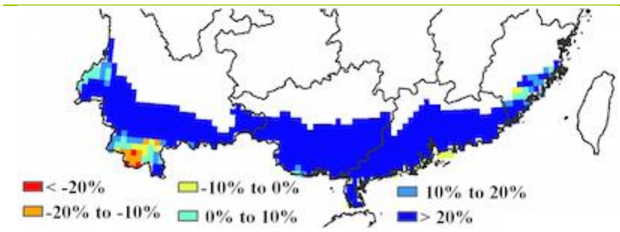



(b) Spatial NDVI patterns compared to 5YA

(c) NDVI profiles




(d) Maximum VCI




(e) Biomass