# CropWatch Bulletin

QUARTERLY REPORT ON GLOBAL CROP PRODUCTION

Monitoring Period: October 2015 - January 2016

**February 4, 2016** Vol. 16, No. 1 (total No. 100)



Institute of Remote Sensing and Digital Earth Chinese Academy of Sciences

Crophatch

### February 2016 Institute of Remote Sensing and Digital Earth (RADI), Chinese Academy of Sciences P.O. Box 9718-29, Olympic Village Science Park West Beichen Road, Chaoyang Beijing 100101, China

This bulletin is produced by the CropWatch research team at the Digital Agriculture Division, Institute of Remote Sensing and Digital Earth (RADI), Chinese Academy of Sciences, under the overall guidance of Professor Bingfang Wu. Contributors are Sheng Chang, René Gommes, Mingyong Li, Prashant Patil, Mrinal Singha, Shen Tan, Fuyou Tian, Qiang Xing, JiamingXu, Nana Yan, Mingzhao Yu, Hongwei Zeng, Miao Zhang, Xin Zhang, Yang Zheng, and Weiwei Zhu.

Thematic contributors (Outlook of domestic price of four major crops section): Jingxin Fang (13426277825@163.com).

Thematic contributors (the Zambezi Basin section): Sue Walker (sue.walker@agro-impact.com).

English version editing was provided by Margaux Schreurs.

#### Corresponding author: Professor Bingfang Wu

Institute of Remote Sensing and Digital Earth, Chinese Academy of Sciences Fax: +8610-64858721, E-mail: cropwatch@radi.ac.cn, wubf@radi.ac.cn

**CropWatch Online Resources:** This bulletin along with additional resources is also available on the CropWatch Website at http://www.cropwatch.com.cn.

*Disclaimer:* This bulletin is a product of the CropWatch research team at the Institute of Remote Sensing and Digital Earth (RADI), Chinese Academy of Sciences. The findings and analysis described in this bulletin do not necessarily reflect the views of the Institute or the Academy; the CropWatch team also does not guarantee the accuracy of the data included in this work. RADI and CAS are not responsible for any lossesas a result of the use of this data. The boundaries used for the maps are the GAUL boundaries (Global Administrative Unit Layers) maintained by FAO; where applicable official Chinese boundaries have been used. The boundaries and markings on the maps do not imply a formal endorsement or opinion by any of the entities involved with this bulletin.

## Contents

• *Note:* CropWatch resources, background materials and additional data are available online at www.cropwatch.com.cn.

### **Table of Contents**

Contents	iii
Abbreviations	vi
Bulletin overview and reporting period	vii
Executive summary	8
Chapter 1. Global agroclimatic patterns	10
Chanter 2 Cron and environmental conditions in major production zones	14
2.1 Overview	
2.2 West Africa	
2.3 North America	
2.4 South America	
2.5 South and Southeast Asia	19
2.6 Western Europe	
2.7 Central Europe to Western Russia	21
Chanter 2 Main producing and experting countries	24
2 1 Overview	24
3.2 Country analysis	
	20
Chapter 4.China	
4.1 Overview	
4.2 Outlook of domestic price of four major crops	
4.3 Regional analysis	
Chapter 5.Focus and perspectives	71
5.1 Disaster events	71
5.2 Southern hemisphere updates	73
5.3 The Zambezi basin	75
5.4 El Niño	
Annex A. Agroclimatic indicators and BIOMSS	82
Annex B. 2015 production estimates	91
Annex C. Quick reference guide to CropWatch indicators, spatial units, and production estimation met	hodology92
Data notes and bibliography	98
Acknowledgments	99
Online resources	100

#### FIGURES

October 2015-January 2016 (percentage)11
Figure 1.4. Global map of biomass accumulation (BIOMSS) by MRU, departure from 5YA, October 2015-January 2016
(percentage)
Figure 2.1. West Africa MPZ: Agroclimatic and agronomic indicators, October 2015-January 201613
Figure 2.2. North America MPZ: Agroclimatic and agronomic indicators, October 2015-January 201614
Figure 2.3. South America MPZ: Agroclimatic and agronomic indicators, October 2015-January 201616
Figure 2.4. South and Southeast Asia MPZ: Agroclimatic and agronomic indicators, October 2015-January 201617
Figure 2.5. Western Europe MPZ: Agroclimatic and agronomic indicators, October 2015-January 2016
Figure 2.6. Central Europe-Western Russia MPZ: Agroclimatic and agronomic indicators, October 2015-January 201620
Figure 3.1. Global map of rainfall (RAIN) by country and sub-national areas, departure from 14YA (percentage),
October 2015-January 2016
Figure 3.2. Global map of temperature (TEMP) by country and sub-national areas, departure from 14YA (degrees),
October 2015-January 2016
Figure 3.3. Global map of PAR (RADPAR) by country and sub-national areas, departure from 14YA (percentage),
October 2015-January 2016
Figure 3.4. Global map of biomass (BIOMSS) by country and sub-national areas, departure from 14YA (percentage),
October 2015-January 2016
Figures 3.5-3.34. Crop condition for individual countries ([ARG] Argentina- [ZAF] South Africa) for October 2015-January
2016
Figure 4.1. China spatial distribution of rainfall profiles60
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. Historical soybean data from January 2004 to December 201461
Figure 4.6. Historical rice paddy data from January 2005 to December 201562
Figure 4.7. Historical maize data from January 2004 to December 201562
Figure 4.8. Historical wheat data from January 2004 to December 2015
Figure 4.9. Crop condition China Northeast region, October 2015-January 2016
Figure 4.6.Crop condition China Inner Mongolia, October 2015-January 201665
Figure 4.7.Crop condition China Huanghuaihai, October 2015-January 2016
Figure 4.8.Crop condition China Loess region, October 2015-January 2016
Figure 4.9. Crop condition Lower Yangtze region, October 2015-January 2016
Figure 4.10. Crop condition Southwest China region, October 2015-January 2016
Figure 4.11. Crop condition Southern China region, October 2015-January 201670
Figure 5.1: Percentage of disasters due to main geophysical factors between 1995 and 201572
Figure 5.2: Development of NDVI profiles over maize growing areas in 2014-15 and 2015-16
Figure 5.3: Relative distribution of maize in 2014-15 and 2015-1675
Figure 5.4: The Zambezi basin in southern Africa
Figure 5.5: Victoria Falls
Figure 5.6: Farming systems variation across the Zambezi basin countries
Figure 5.7: Average annual rainfall distribution across the Zambezi basin
Figure 5.8: Ploughing a field with animal traction ready to plant maize in southern Zambia
Figure 5.9: A young farmer preparing for a simple irrigation system; and goats drinking from a well; both near
Vionze, southern Zambia
Figure 5.10: The contribution of agriculture to GDP (Gross Domestic Product) in main countries of Zambezi basin80
Figure 5.11: Trans-frontier conservation areas in the Zambezi basin
Figure 5.12: Benaviour of the Southern Oscillation Index (SOI) from January-December 2015

#### TABLES

Table 2.1. October 2015-January 2016 agroclimatic indicators by Major Production Zone, current value and depart     from 14YA	ture 14
Table 2.2.October 2015-January 2016 agronomic indicators by Major Production Zone, current season values a departure from 5YA	and 14
Table 3.1.CropWatchagroclimatic and agronomic indicators for October 2015-January 2016, departure from 5YA 14YA	and .26
Table 4.1.CropWatchagroclimatic and agronomic indicators for China, October 2015-January 2016, departure from and 14YA	5YA 59
Table A.1.October 2015-January 2016agroclimatic indicators and biomass by global Monitoring and Reporting Unit… Table A.2.October 2015-January 2016agroclimatic indicators and biomass by country	82 83
Table A.3.Argentina, October 2015-January 2016agroclimatic indicators and biomass (by province) Table A.4. Australia, October 2015-January 2016agroclimatic indicators and biomass (by state)	85 85
Table A.5.Brazil, October 2015-January 2016agroclimatic indicators and biomass (by state)	85 86
Table A.7. India, October 2015-January 2016agroclimatic indicators and biomass (by state)     Table A.8. Kazakhstan, October 2015-January 2016agroclimatic indicators and biomass (by province)	86
Table A.9.Russia, October 2015-January 2016agroclimatic indicators and biomass (by oblast)   Table A.10, United States, October 2015-January 2016agroclimatic indicators and biomass (by state)	88
Table A.11. China, October 2015-January 2016 groclimatic indicators and biomass (by province)	89

Table B.2. Australia, 2015-2016 wheat production, by state (thousand tons)	<b>∂1</b>
Table B.1. Brazil, 2015-2016 wheat production, by state (thousand tons)	)1

# Abbreviations

5YA	Five-year average, the average for the four month period from October-January,		
1 4)/ 4	from 2010-2011 to 2014-2015; one of the standard reference periods.		
141A	Fourteen-year average, the average for the four month period from October-		
	January, from 2001-2002 to 2014-2015; one of the standard reference periods and		
	typically referred to as "average.		
BIONISS	Agrocilmatic indicator for biomass production potential		
BOIM	Australian Bureau of Meteorology		
CALF	Cropped Arable Land Fraction		
CAS	Chinese Academy of Sciences		
CWSU	CropWatch Spatial Units		
DM	Dry matter		
EC/JRC	European Commission Joint Research Centre		
ENSO	El Niño Southern Oscillation		
FAO	Food and Agriculture Organization of the United Nations		
GAUL	Global Administrative Units Layer		
GMO	Genetically Modified Organism		
GVG	GPS, Video, and GIS data		
ha	hectare		
kcal	kilocalorie		
MPZ	Major Production Zone		
MRU	Monitoring and Reporting Unit		
NDVI	Normalized Difference Vegetation Index		
OCHA	UN Office for the Coordination of Humanitarian Affairs		
PAR	Photosynthetically active radiation		
RADI	CAS Institute of Remote Sensing and Digital Earth		
RADPAR	PAR agroclimatic indicator		
RAIN	Rainfall agroclimatic indicator		
SOI	Southern Oscillation Index		
TEMP	Air temperature agroclimatic indicator		
Ton	Thousand kilograms		
VCIx	Maximum Vegetation Condition Index		
VHI	Vegetation Health Index		
VHIn	Minimum Vegetation Health Index		
W/m <sup>2</sup>	Watt per square meter		

# Bulletin overview and reporting period

This CropWatch bulletin presents a global overview of crop stage and condition between 1 October 2015 and 10 January 2016 (from hereon referred to as October-January). It is the 100<sup>th</sup> bulletin produced by the CropWatch group at the Institute of Remote Sensing and Digital Earth (RADI) at the Chinese Academy of Sciences, Beijing. CropWatch analyses are based mostly on several standard and new ground-based and remote sensing indicators, following a hierarchical approach. The analyses cover large global zones; major producing countries of maize, rice, wheat, and soybean; and detailed assessments of Chinese regions.

In parallel to the increasing spatial precision of the analyses, indicators become more focused on agriculture as the analyses zoom into smaller spatial units. CropWatch uses two sets of indicators: (i) agroclimatic indicators—RAIN, TEMP, and RADPAR, which describe weather factors; and (ii) agronomic indicators—BIOMSS, VHIn, CALF, CI, and VCIx, describing crop condition and development. The indicators RAIN, TEMP, RADPAR and BIOMSS do not directly describe the weather variables rain, temperature, radiation, or biomass, but rather they are spatial averages over agricultural areas, which are weighted according to the local crop production potential. For more details on the CropWatch indicators and spatial units used for the analysis, please see the quick reference guide in Annex C, as well as online resources and publications posted at www.cropwatch.com.cn.

Chapter	Spatial coverage	Key indicators
Chapter 1	World, using Monitoring and Reporting Units (MRU), 65	RAIN, TEMP, RADPAR,
	large, agro-ecologically homogeneous units covering the	BIOMSS
	globe	
Chapter 2	Major Production Zones (MPZ), six regions that	As above, plus CALF, VCIx, and
	contribute most to global food production	VHIn, Cl
Chapter 3	30 key countries (main producers and exporters)	As above plus NDVI
Chapter 4	China	As above
Chapter 5	Special topics: Southern hemisphere production update, disaster events, an overview of	
	agricultural and environmental issues in the Zambezi basin, and El Niño.	
Online Resources	www.cropwatch.com.cn	

#### Newsletter and online resources

The bulletin is released quarterly in both English and Chinese. To sign up for the mailing list, please e-mail cropwatch@radi.ac.cn or visit CropWatch online at www.cropwatch.com.cn. Visit the CropWatch Website for additional resources and background materials about methodology, country agricultural profiles, and country long-term trends.

### Executive summary

The period from October 2015 to mid-January 2016 is a relatively quiet period from an agricultural point of view. In the temperate northern hemisphere summer crops have been harvested, while winter crops were planted and are mostly dormant. In some tropical and equatorial countries, including the Philippines, Thailand, Vietnam and Brazil, planting of the second maize and rice generally starts around January, while in the southern hemisphere summer crops are at advanced development stages and nearing flowering, for example maize and soybean in Argentina, Brazil and South Africa.

In the same countries, wheat harvesting was mostly completed or is about to be completed and the current CropWatch Bulletin provides a production update as well a first quantitative assessment of maize in South Africa, a region badly hit by El Niño-related drought, the most noteworthy feature of the current reporting period (sections 5.1, 5.2 on disasters and the South Africa page in section 3.2).

In Argentina, the updated CropWatch wheat output estimate stands at 10.7 million tons, 11% below the 2014-2015 production; both harvested area and yield decreased when compared to last year due to complex agroclimatic patterns. In neighboring Brazil, wheat production is up 4.5% over last year, to reach a total of 7 million tons.

For Australia, CropWatch puts the overall output at 25 million tons, 1% below last year, due to prevailing drought conditions (maximum vegetation condition index VCIx at 0.68, one of the lowest national values recorded) in spite of a CALF increase of 4%. Other countries with low VCIx values include Russia, Ukraine, Kazakhstan and India.

According to the CropWatch cropped arable land fraction indicator (CALF; see tables 2.2 and 3.1) the major food producing areas in South America, which are located in Argentina and Brazil, cultivated almost all available arable land (98%), an increase of 9% over the average of the recent five years (8% in Argentina and 14% in Brazil). In contrast, all other main producers in Asia, Europe and North America cultivated about 85% of arable land, which is about the same area (referring to the October 2015-January 2016 period) as during the previous season. In none of them does the change come close to the South American values: Russia, +4%; USA +2%; France, Germany, United Kingdom, Thailand, Vietnam, Philippines: all 0%. There are also negative values which can mostly be linked with agroclimatic conditions, including Canada, -2%; Poland, -3%; Romania -5%; Ukraine, -3%; Turkey, -3% and Pakistan, -2%.

South Africa is one of the countries most seriously hit by adverse weather conditions during the current reporting period. Due to drought, CALF of South Africa dropped 12% and VCIx reached just 0.48, the absolute record low for any country. CropWatch analyses show a considerable reduction of area cultivated under maize (-34%) in otherwise significant producer provinces (Free State, North West and Limpopo). Combined with low yields (down 16% from last year) the estimated total maize output of South Africa will be down to 7.3 million tons, a 45% reduction from last year's 13.2 million tons output. The precipitation deficit reached 44% in Lesotho, 42% in Zimbabwe and 36% in Malawi.

Abnormal weather conditions are also reported from several other, spatially coherent areas (Chapter 1 and section 3.1, Figures 1.1. to 1.4 and 3.1 to 3.4). Even if, for some of them, it is still early to evaluate impacts in terms of production, they include (1) the Horn of Africa, especially Ethiopia (See sections 3.2 and 5.2) where more than ten million people are severely food insecure due to drought; (2) many southern European and Mediterranean countries, which all grow winter crops planted at the end of the year and which recorded a drop in precipitation close to or exceeding 50% (Morocco, -74%; Portugal, -55%)

and Lebanon, -54%); (3) northern South America (-56% of rainfall on average, e.g. -70% in Suriname and -62% in Guyana and several states in Brazil, such as Roraima (-78%) and Amapa (-71%); (4) south-east Asia to New-Zealand (New Zealand, -66%; Timor Leste, -57%; Tasmania, -75%); (5) the northern part of the Indian subcontinent, with an average precipitation departure of -52% affecting Bangladesh and Bhutan (-38% and -37%, respectively) as well as several Indian states (Meghalaya, -81%; Jharkhand, -80%; West Bengal, -73%).

Several of the same areas have also suffered from floods; (6) California (-37% precipitation over the reporting period), north-eastern USA and Canada with deficits ranging from -52% (Maine) to -39% (Massachusetts) and (7) Baltic states (Estonia, -41%; Latvia, -37%) as well as the adjacent Russian areas to the east: S. Petersburg (-48%), Adygeya Republic, Tverskaya and Pskovskaya Oblasts.

In China, the reporting period is the major planting time of winter crops including winter wheat and rapeseed, right after the harvest of autumn crops. Agroclimatic conditions were generally warm and wet (Figures 4.1 and 4.2) in all seven agricultural regions recorded above average rainfall, especially in the areas south of Yangtze River. VCIx (Figure 4.4) was distributed unevenly, with high values mostly in Sichuan and Central Hebei Province and low values in the North China Plain and north-west region. CALF was close to average. Assuming average agro-climatic conditions to the time of harvest, CropWatch estimates that 2015-16 winter crop output will be slightly above 2014-2015.

Based on the combination of agroclimatic and agronomic indicators, CropWatch lists the following countries as likely to under-perform in terms or production: South Africa and some neighboring countries, Ethiopia, Indonesia, Turkey and other Mediterranean countries. Output is expected to only be fair in India (due to widespread and repeated environmental shocks) and Bangladesh, Ukraine and possibly Poland and Romania, where cropped arable land decreased under water stress conditions. Both Russia and Kazakhstan recorded satisfactory precipitation but poor vegetation condition is widespread. In Brazil, the overall situation is unclear due to low rainfall in the major soybean producing state of Mato Grosso.