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QUARTERLY REPORT ON GLOBAL CROP PRODUCTION

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

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

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Abbreviations

5YA	Five-year average, the average for the four-month period for July-October from 2011 to 2015; one of the standard reference periods.
15YA	Fifteen-year average, the average for the four-month period from July-October from 2001 to 2015; one of the standard reference periods and typically referred to as “average.”
BIOMSS	CropWatch agroclimatic indicator for biomass production potential
BOM	Australian Bureau of Meteorology
CALF	Cropped Arable Land Fraction
CAS	Chinese Academy of Sciences
CI	Cropping Intensity
CWAI	CropWatch Agroclimatic Indicator
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
GVG	GPS, Video, and GIS data
ha	hectare
kcal	kilocalorie
MPZ	Major Production Zone
MRU	Monitoring and Reporting Unit
NDVI	Normalized Difference Vegetation Index
OISST	Optimum Interpolation Sea Surface Temperature
PAR	Photosynthetically active radiation
PET	Potential Evapotranspiration
RADI	CAS Institute of Remote Sensing and Digital Earth
RADPAR	CropWatch PAR agroclimatic indicator
RAIN	CropWatch rainfall agroclimatic indicator
SOI	Southern Oscillation Index
TEMP	CropWatch air temperature agroclimatic indicator
Ton	Thousand kilograms
VCIx	CropWatch maximum Vegetation Condition Index
VHI	CropWatch Vegetation Health Index
VHIn	CropWatch minimum Vegetation Health Index
W/m^2	Watt per square meter

Bulletin overview and reporting period

This CropWatch bulletin presents a global overview of crop stage and condition between July 1 and October 31 2016, which is referred to as the "July-October" period. The bulletin is the 103rd such publication issued by the CropWatch group at the Institute of Remote Sensing and Digital Earth (RADI) at the Chinese Academy of Sciences, Beijing.

CropWatch analyses and indicators

CropWatch analyses are based mostly on several standard as well as 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 an increasing spatial precision of the analyses, indicators become more focused on agriculture as the analyses zoom in to 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, VCIx, and Cropping Intensity, describing crop condition and development. Importantly, 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 each reporting period, the bulletin reports on the *departures* for all eight indicators, which (with the exception of TEMP) are expressed in relative terms as a percentage change compared to the average value for that indicator for the last five or fifteen years (depending on the indicator). 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.

This bulletin is organized as follows:

Chapter	Spatial coverage	Key indicators
Chapter 1	World, using Monitoring and Reporting Units (MRU), 65 large, agro-ecologically homogeneous units covering the globe	RAIN, TEMP, RADPAR, BIOMSS
Chapter 2	Major Production Zones (MPZ), six regions that contribute most to global food production	As above, plus CALF, VCIx, VHIn, and Cropping Intensity
Chapter 3	30 key countries (main producers and exporters)	As above plus NDVI and GVG survey
Chapter 4	China	As above plus high resolution images
Chapter 5	Production outlook, crop growth in the Middle East, and an update on El Niño.	
Online Resources	www.cropwatch.com.cn	

Regular updates 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 current CropWatch bulletin is prepared jointly by several institutes of the Chinese Academy of Sciences (CAS) under the overall coordination of the Digital Agriculture Division of the Institute of Remote Sensing and Digital Earth (RADI). The bulletin is based mainly on geophysical data and models and focuses on crops that have been harvested in 2016 or were still growing between July and October, to be harvested later this year. The bulletin is global and comprehensive; it covers prevailing weather conditions in all countries and pays special attention to thirty major agricultural countries and China (the "30+1" countries) where crop condition, size of cultivated areas, and global food production is assessed with specific agronomic indicators. Together, the "30+1" make up at least 80% of the production and exports of maize, rice, wheat, and soybean. The bulletin also includes specific sections on global production, as well as pests and diseases, trade, and prices in China.

Global agroclimatic patterns

Weather is the major single factor behind the variability of global food production. The current reporting period from July to October included several large, coherent areas with weather conditions favorable or unfavorable to crop production.

Areas with excess precipitation

Several major areas with excess precipitation over the reporting period included:

- *The Sahelian region,* covering the usually semi-arid Sahelian region of northern Africa (Senegal to north Sudan), extending east into the Arabian Peninsula.
- *Western Russia to northern-central Europe and Greece,* including several regions that received precipitation amounts that are beneficial to the early crop stages of their beginning winter crop season.
- *Central and southern Asia,* where—not unlike the previous season—vast expanses of land in and around central and southern Asia recorded abundant precipitation compared to average (+67%). The area includes more than 30 countries and large sub-national units; temperature was systematically below average (-0.4°C) and so was radiation (-5%). The area extends east as far as Shanxi and Hebei provinces in China (+44% and +46%), Tajikistan and Kyrgyzstan (+143% and +196%, with about normal temperature and sunshine) and several regions in Kazakhstan. The contiguous regions of Jambyl in southern-central Kazakhstan, Kyrgyzstan, and the Xinjiang Uygur autonomous region of China are at the core of the high precipitation area: Xinjiang experienced an increase in precipitation of 224% over the average, while Kazakhstan increased its cropped arable land fraction by a spectacular 23 percentage points.
- *Eastern Asia to central-eastern Australia,* probably resulting from the fading El Niño that affects Southeast Asia and Oceania alike.
- *Northern United States and Canada,* where some areas recorded more than double the average precipitation (such as in Iowa, Minnesota, South Dakota and Montana).

Areas with a deficit in precipitation

In contrast, many other areas experienced a deficit in precipitation compared to average. Notable among them are:

- *Thirty countries from Sweden and Germany to Great Britain to Morocco, Iran, and Afghanistan, and the Black Sea countries,* where on average the deficit reaches 34%; the largest water stress occurred in the eastern Mediterranean while northern and north-western Europe were less

affected. Nevertheless, both France and Germany list a decrease in cropping intensity (-8% and -16%, respectively), and so did the Ukraine (-18%), where winter crops have now been planted and where prospects will need to be improved by winter rainfall.

- *Russia,* with two patches of deficit precipitation: one centered around the Perm oblast and east of if, the other around the Tomsk oblast.
- *Eastern Asia*, with three Chinese provinces (Henan, Chongqing, and Shandong), Japan, the Republic of Korea, and the Democratic People's Republic of Korea. In the latter country, the current deficit (-45%) follows another drought year.
- *The Indian states of Tamil Nadu, Kerala, and Karnataka, as well Sri Lanka,* all suffering an average precipitation deficit of 50%.
- *Eastern and Southern Africa,* specifically fourteen countries south of Ethiopia and Uganda, Zambia, and Namibia. In eastern Africa, crops are currently growing at the higher elevations, while southern Africa is just planting after a severe drought year that affected much of the region in 2015. Zambia reduced the cropped arable land fraction by 10 percentage points compared to the recent five-year average.
- *Southern Oceania and Western Australia*; *the southern United States*; as well as the *"Southern cone" of South America,* three unrelated patches of deficit precipitation. In the Southern Cone, this covers Chile, Uruguay, and nine provinces in Argentina.

Global crop production in 2016

CropWatch put the total output of the crops produced during 2016 at 2,460 million tons of major grains and 316 million tons of soybeans. The major grains are made up almost exactly by 40% maize (995 million tons; a 1.2% increase over 2015), 30% rice (as paddy, 736 million tons and down 0.8%), and 30% wheat (730 million tons; up 1.2%).

Major cereal producers. For the three major cereal producers, China's output reached 520 million tons, while those for the United States and India were 435 million and 261 million tons respectively. Neither China nor India performed well in 2016 due to the poor environmental conditions. In China, while maize stagnates and both rice and wheat production drop 1%, for the first time in over a decade the production of soybean is up by a non-negligible 2%. In India, only rice is up by 1% compared to 2015; soybean is on par with 2015, while maize is down 1% and wheat as much as 6%, one of the largest decreases of all countries monitored by CropWatch. In the United States, on the other hand, while wheat remains stable, the output of all other major commodities increases significantly, with soybean up 3%, and both maize and rice improving at least 5% over last year's output.

Rice. The early 2016 rice crops did poorly in a number of Asian countries because of the prevailing El Niño drought in Southeast Asia that was reported on in detail in the February and May 2016 CropWatch bulletins. The list includes Cambodia (rice -10% compared to 2015), Myanmar (-8%), Bangladesh and Vietnam (both -6%), and Pakistan (-3%).

Maize. Maize production increased in Iran (+9%) as well as in a group of countries in Central Asia that benefited from unusually favorable rain for the second consecutive year, as mentioned in the agroclimatic overview above.

Wheat. The most spectacular drop in wheat production occurred in Turkey (-17%), followed by some major producers and exporters such as India (-6%), Argentina (-4%), and France and the United Kingdom (both -3%). Large increases are those of Australia (+14%) and Iran (+15%), a country that did well for most crops after a run of mediocre years.

Soybean. For soybean, Egypt, Iran, Canada, and—one of the largest producers—Argentina all underwent a drop of 1%. Brazil increased production by 2%, while both Russia and the United States improved by 3%.

The current bulletin also assesses domestic production of the major exporters and importers, which is likely to affect trade patterns. The major importers have generally increased their domestic output, with the notable exceptions of rice (resulting from a 1% production drop in China) and wheat, with Turkey—mentioned above—estimated to have lost 17% of production compared with 2015. Exporters did generally well with a marked increase in wheat availability among the major exporters (+8.0%), resulting from the excellent performance of Canada and Australia. The reduced rice availability for the top exporters (-0.6%) results from the poor performance of several countries, including Pakistan (-3%), Vietnam (-6%), and Brazil (-7%). On the contrary, rice availablity has increased in Australia (+14%) and the United States (+6%). The most noteworthy variations among maize exporters include mainly the large drop of production in Brazil (-12%).

China

In China, all crops for 2016 have now been harvested, and the total production is put by CropWatch at 200.4 million tons for maize (same as 2015), 200.5 million tons for rice (-1% compared to 2015), 118.6 million tons for wheat (-1%), and 13.3 million tons for soybean (+2%). For summer crops, CropWatch puts the total (including maize, single rice, late rice, spring wheat, soybean, minor cereals, and tubers) at 414.3 million tons, a marginal decrease (-0.4%) from 2015. The total annual food production (including cereals, tubers, and legumes) reaches 570 million tons, a drop of 1.0% (5.9 million tons) compared with last year.

The government's recent decision to end the procurement of maize at a guaranteed minimum purchasing prices resulted in farmers shifting to other crops. This year's maize area, however, was only 0.8% below 2015, with the most significant decreases occurring in Inner Mongolia and Heilongjiang provinces. Increases are listed for Liaoning (+4%) and Yunnan (+5% due to yield increase).

For soybean, as already mentioned above, 2016 witnessed a reversal of a decade-long downward trend in production. The largest increases occurred in Inner Mongolia (+23% resulting from an increase in planted area just above 26%). The drop in rice production was brought about mainly from decreases in early rice (-3%) and late rice (-2%) due to shrinking planted areas. Some areas nevertheless increased their rice production, including Jilin (+12%), Liaoning (+9%), and Yunnan (+6%).

To a large extent, the listed variations can also be ascribed to environmental conditions that were favorable to pests and weakened crops, making them vulnerable to rice planthoppers (which damaged 14.7 million hectares) and rice sheath blight that took a toll on a slightly smaller area (13.3 million hectares). The variations in production will affect prices and trade; specific sections of the CropWatch bulletin provide details.