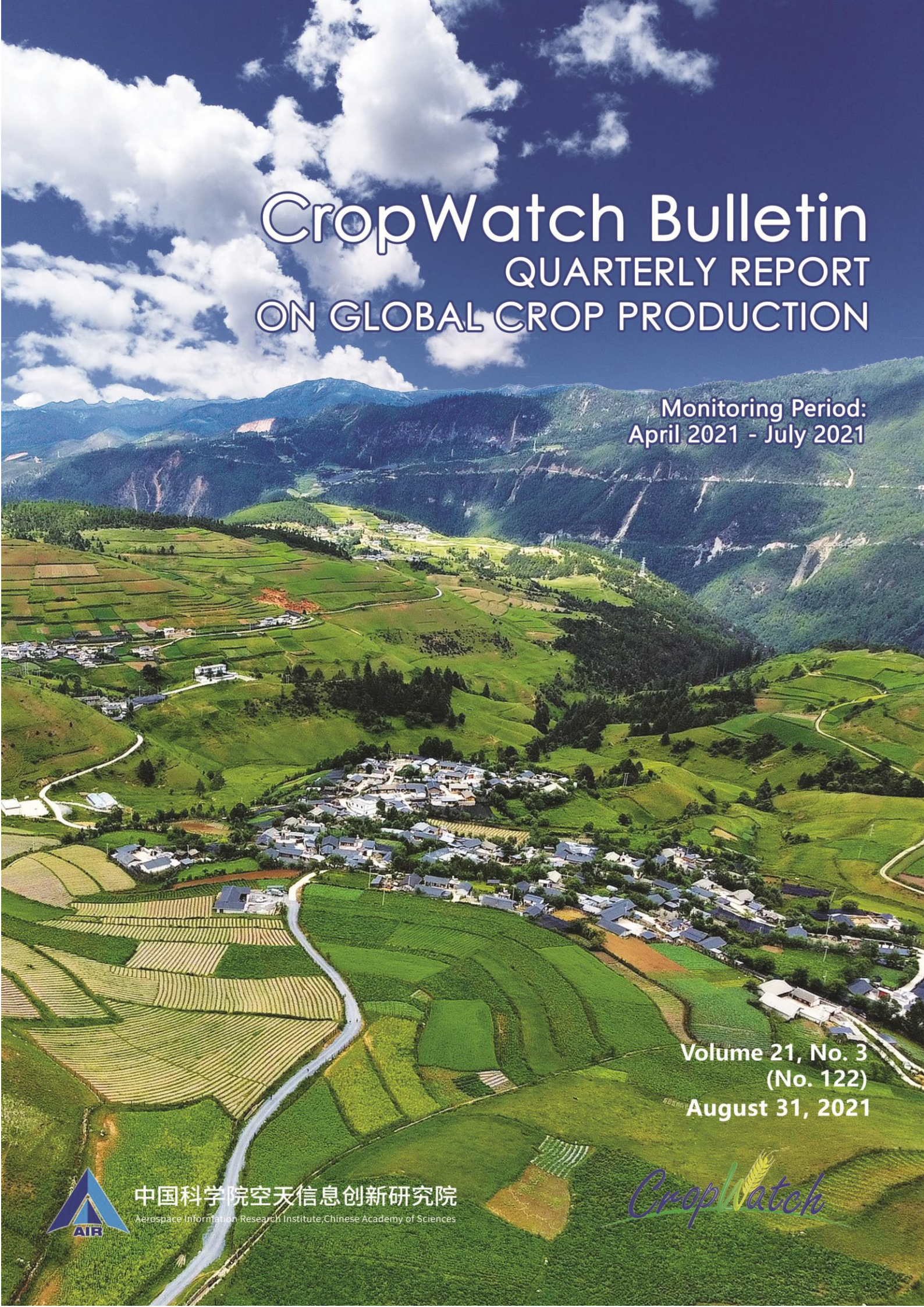

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CropWatch

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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 and http://cloud.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 from April to July for 2016-2020; one of the standard reference periods.
15YA	Fifteen-year average, the average for the four-month period from April to July for 2006-2020; one of the standard reference periods and typically referred to as "average".
AEZ	Agro-Ecological Zone
BIOMSS	CropWatch agroclimatic indicator for biomass production potential
BOM	Australian Bureau of Meteorology
CALF	Cropped Arable Land Fraction
CAS	Chinese Academy of Sciences
CWAI	CropWatch Agroclimatic Indicator
CWSU	CropWatch Spatial Units
DM	Dry matter
EC/JRC	European Commission Joint Research Centre
ENSO	EI 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	Mapping and Reporting Unit
NDVI	Normalized Difference Vegetation Index
OISST	Optimum Interpolation Sea Surface Temperature
PAR	Photosynthetically active radiation
PET	Potential Evapotranspiration
AIR	CAS Aerospace Information Research Institute
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 April and July 2021, a period referred to in this bulletin as the AMJJ (April, May, June and July) period or just the "reporting period." The bulletin is the 122nd such publication issued by the CropWatch group at the Aerospace Information Research Institute (AIR) of the Chinese Academy of Sciences, Beijing.

CropWatch indicators

CropWatch analyses are based mostly on several standard as well as new ground-based and remote sensing indicators, following a hierarchical approach.

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, RADPAR, and potential BIOMSS, which describe weather factors and its impacts on crops. 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; and (ii) agronomic indicators—VHIn, CALF, and VCIx and vegetation indices, describing crop condition and development. (iii) PAY indicators: planted area, yield and production.

For each reporting period, the bulletin reports on the departures for all seven 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 B, as well as online resources and publications posted at www.cropwatch.com.cn.

CropWatch analysis and indicators

The analyses cover large global zones; major producing countries of maize, rice, wheat, and soybean; and detailed assessments for Chinese regions, 42 major agricultural countries, and 217 Agro-Ecological Zones (AEZs).

This bulletin is organized as follows:

Chapter	Spatial coverage	Key indicators
Chapter 1	World, using Mapping 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, and VHIn
Chapter 3	42 key countries (main producers and exporters) and 210 AEZs	As above plus NDVI and GVG survey
Chapter 4	China and regions	As above plus high-resolution images; Pest and crops trade prospects
Chapter 5	Production outlook, and updates on disaster events and El Niño.	

Regular updates and online resources

The bulletin is released quarterly in both English and Chinese. E-mail **cropwatch@radi.ac.cn** to sign up for the mailing list or visit CropWatch online at **www.cropwatch.com.cn**, **http://cloud.cropwatch.com.cn/**

Executive summary

The current CropWatch bulletin describes world-wide crop condition and food production as appraised by data up to the end of July 2021. It is prepared by an international team coordinated by the Aerospace Information Research Institute, Chinese Academy of Sciences.

Special attention is paid to the major producers of maize, rice, wheat and soybean throughout the bulletin. The assessment is based mainly on remotely sensed data. It covers prevailing weather conditions, including extreme factors, at different spatial scales, starting with global patterns in Chapter 1. Chapter 2 focuses on agro-climatic and agronomic conditions in major production zones in all continents. Chapter 3 covers the major agricultural countries that, together, make up at least 80% of production and exports. Each is the object of a detailed analysis. Chapter 3 constitutes the bulk of the Bulletin. Chapter 4 zooms into China. The bulletin also presents this year's second CropWatch production estimates for selected countries and reviews the first production estimation in chapter 5.

This report for the period from April to July 2021 covers wheat, maize, soybean and rice production in the Northern Hemisphere. Winter wheat reached maturity in June/July and spring wheat will typically reach maturity in August. In the tropical countries, planting of the main rice crop typically starts at the beginning of the monsoon season in May or June. In the Southern Hemisphere, harvest of maize and soybean was concluded by April or May. Sowing of wheat started in May.

In most countries, the COVID-19 pandemic is still not under control. Maize, wheat, and rice prices were about 43%, 12% and 10% above their January 2020 levels, even though the global production outlook for major grains remains good. The Agricultural Commodity Price Index remained near its highest level since 2013, and as of July 16, 2021, was approximately 30% higher than in January 2020. Soaring food prices have worsened the situation of the poor.

Another plague, the outbreak of desert locusts in East Africa and the Middle East is still not under control either. The civil war in Ethiopia poses challenges to implement control measures. The impact of desert locusts on world food supply is limited but is devastating for the farmers in the areas that are hit by a swarm.

Agro-climatic conditions

Global warming continues unchecked. Temperatures set alarming records during this monitoring period according to the National Oceanic and Atmospheric Administration (NOAA) of the USA. June 2021 was the fifth-warmest June, and the warmest for Earth's land area. Temperatures were 0.88ºC above the 20th century average. North America and Africa had their hottest June on record; Europe and Asia had their second hottest June on record. Subsequently, NOAA declared that July 2021 was the Earth's hottest month on record (+0.93ºC). These temperature increases cause prolonged and more intense droughts and heat waves. Intensity of rainfall events also increases, while the number of rainy days' decreases. As a consequence, floods are more likely to occur. These extreme weather events will more and more have a negative impact on the stability and level of crop production around the globe.

Below average rainfall conditions persisted for most of Brazil and the West coast of the USA. In both regions, the drop in rainfall was more than -50% as compared to the 15-year average (15YA). In Mexico, as well as in the south of the USA, above average monsoon rains put an end to the drought conditions of last winter. In southern Africa, rainfall was 23% below the 15YA. A positive departure by 14% was observed for the

Western Cape. This is important for its winter wheat production. The onset of the monsoon rains was delayed in the Gulf of Guinea, causing a decline by 36% in West Africa. Rain in Europe was generally abundant, although the Caucasus, which had experienced a rainfall deficit already during the last monitoring period, continued to stay drier than usual (-17%). Most of the other wheat producing regions such as the Ukraine to the Ural had received slightly above average rainfall (+12%). The south of China, as well as Myanmar and most of the Middle East and parts of Central Asia were affected by below average rainfall. Most of the countries in the Middle East and Central Asia are suffering from prolonged drought conditions that had already started in the previous monitoring period. Especially in Turkey, Lebanon, Syria, Palestine, Iraq, Iran and Afghanistan, the severe drought is causing additional hardships for the local population. Good rainfall in Australia has been creating favorable conditions for its wheat production. In East Asia, Huanghuaihai (China) a strong positive departure by +50% was observed. This was mainly due to an extreme rainfall event that had occurred in late July that caused flooding of urban areas and cropland.

Record setting heat waves hit the west of the USA and Canada. The drier than usual areas in Brazil also experienced above average temperatures. Western Europe experienced cooler than usual temperatures mainly in April and May, whereas the Caucasus and the region from the Ukraine to the Ural Mountains were much warmer than usual. In the other regions, temperatures had stayed close to the 15YA.

2021 Production estimate

Affected by persistent hot and dry weather in Northwestern North America, Brazil, Central Asia, West Africa and Southern Africa, global rice, wheat, and soybean production is expected to be lower than last year's. In 2021, the total global production of four major food crops is expected to be 2.864 billion tonnes, a decrease of 28.16 million tonnes, or 1.0% from the previous year; among them, global maize production is expected to be 1.082 billion tonnes, an increase of 1.1%, or 11.3 million tonnes; global rice production is expected to be 751 million tonnes, a decrease of 1.3%; global wheat production is expected to be 711 million tonnes, a decrease of 3.7% year-on-year, with a decrease of 26.99 million tonnes; global soybean production is estimated to be 321 million tonnes, a decrease of 0.9%.

Maize: The United States, China and Ukraine are forecasted to significantly increase maize production. Estimates are as follows: USA 384.06 million tonnes (+2.6%), China 231.60 million tonnes (+2.4%), Ukraine 34.86 million tonnes (+28.4%). These increases are due to favorable agro-meteorological conditions and larger maize growing areas. In Brazil, the world's third largest maize producer, output declined by 4.8% to 83.34 million tonnes. This country was affected by above average temperatures and drought conditions. Mexico's maize growing area and yield increased simultaneously, resulting in a production increase of 1.95 million tonnes. Romania recovered from the 2020 drought year with an increase of 1.08 million tonnes in maize production to 1.08 million tonnes. Changes in production in each of the remaining major maize producing and exporting countries were less than 1 million tonnes, and therefore will have a relatively small impact on total global maize production.

Rice: Asian rice production accounts for more than 90% of the global production. Agro-meteorological conditions varied widely among the major producing countries. Bangladesh, Myanmar and Iran were affected by drought conditions, and rice production decreased by 1.21 million tones (2.6%), 690,000 tones (2.7%) and 500,000 tones (17.0%), respectively. In Pakistan, production is estimated to decline by 1.08 million tonnes due to a reduction in rice acreage. In China and India, the world's two largest rice producers, the overall rice production situation is good, and production is forecasted to increase by 1.62 million tonnes and 4.76 million tonnes, respectively. Thanks to sufficient precipitation and favorable water supply from the Mekong River, rice production in Thailand is forecasted to increase by 900,000 tonnes and in Vietnam

by 760,000 tonnes. In comparison to last year, the total rice production of the remaining major producing countries is forecasted to decrease in 2021 and the global rice production is expected to decline slightly.

Wheat: In some important production regions, production was hampered by below average rainfall, resulting in drought conditions. Production, as compared to 2020, is estimated to decline in the following countries: Iran (-26%), Afghanistan (-25%), Uzbekistan (-22.4%), Canada (-15.2%), Kyrgyzstan (-14.7%), Turkey (-13.1%), Pakistan (-6.1%) and India (-2.5%). In addition, wheat production in most countries of Western Europe also declined slightly due to rainy weather during harvest. Drought conditions in the Pacific Northwest and north of the USA limited spring wheat production. However, winter wheat production benefitted from generally favorable rainfall. The country's total wheat production is estimated to increase by 0.7% year on year. Russia's winter wheat production also benefitted from favorable rainfall, prompting a 3.5% increase in production year on year. Most countries in Eastern Europe also achieved an increase in wheat production. Morocco's wheat production increased significantly by 43.2 % compared to the severe drought year of 2020. For China, the world's top wheat producer, an increase in acreage and yield is estimated to increase production by 0.9%.

Soybean: The widespread drought in South America led to a decline in soybean production in Brazil and Argentina. Affected by persistent hot and dry weather, Brazil's soybean output slumped to 96.3 million tonnes, down 4.74 million tonnes or -4.7% year-on-year, the lowest production in the past three years. In Argentina, soybean production is estimated to decline by 980,000 or -1.9% to 51.61 million tonnes due to below average rainfall which affected the late season crops. Most soybean producing regions of the USA benefitted from favorable weather conditions. Total production is forecasted to increase by 0.7% to 105.24 million tonnes. The increase in soybean acreage in India led to a year-over-year increase in total soybean production by about 6.7%, an increase of 780,000 tonnes. The year-over-year decline in soybean acreage in northeast China, influenced by market factors such as the continued rise in maize prices, led to a year-over-year decrease in soybean production in China by about 1.4%.

China crop prospects

In China, the overall favorable weather conditions benefitted winter crops. During the overwintering to regreening and jointing stages, rainfall (+25%) and temperatures (+0.8°C) were above the 15YA. Benefitting from good agro-climatic conditions and proper crop management, winter crop conditions were overall favorable. CropWatch puts the total crop production in 2021 at 638.87 million tonnes, an increase of 7.44 million tonnes or 1.2% up from last year. Among them, the total output of summer crops (including maize, semi-late rice, late rice, spring wheat, soybeans, tuber crops and other minor crops) is expected to be 472.7 million tonnes, an increase of 6.379 million tonnes or 1.4% over 2020. Rice yields are up, more than compensating for some reductions in planted area of early rice. The area of maize increased by 1.4% over last year, aided by higher market prices for maize. Yields are also forecasted to increase by 0.7%. Area of soybean declined by 1.7%. This was the first time in 5 years that a decline was reported. Yields are expected to increase by 0.3%, resulting in a decline of total production by 1.4%. The total output of winter crops in 2021 is estimated to be 132.48 million tonnes using the latest remote sensing data, an increase of about 0.982 million tonnes or 0.7% year-on-year. Planted area and yield of summer crops increased by 0.5% and 0.3%, respectively.