

## Annex C. Quick reference guide to CropWatch indicators, spatial units, and production estimation methodology

The following sections give a brief overview of CropWatch indicators and spatial units, along with a description of the production estimation methodology. For more information about CropWatch methodologies, visit CropWatch online at [www.cropwatch.com.cn](http://www.cropwatch.com.cn).

### CropWatch indicators

The CropWatch indicators are designed to assess the condition of crops and the environment in which they grow and develop; the indicators—RAIN (for rainfall), TEMP (temperature), and RADPAR (photosynthetically active radiation, PAR)—are not identical to the weather variables, but instead are value-added indicators computed only over crop growing areas (thus for example excluding deserts and rangelands) and spatially weighted according to the agricultural production potential, with marginal areas receiving less weight than productive ones. The indicators are expressed using the usual physical units (e.g., mm for rainfall) and were thoroughly tested for their coherence over space and time. CWSU are the CropWatch Spatial Units, including MRUs, MPZ, and countries (including first-level administrative districts in select large countries). For all indicators, high values indicate "good" or "positive."

INDICATOR			
Type/ source	Unit, spatial scale	Description	Presentation and legend
<b>BIOMSS</b>			
<b>Biomass accumulation potential</b>			
Crop/ Ground and satellite	grams dry matter/m <sup>2</sup> , pixel or CWSU	An estimate of biomass that could potentially be accumulated over the reference period given the prevailing rainfall and temperature conditions.	Biomass is presented as maps by pixels, maps showing average pixels values over CropWatch spatial units (CWSU), or tables giving average values for the CWSU. Values are compared to the average value for the last five years (2009-13), with departures expressed in percentage.
<b>CALF</b>			
<b>Cropped arable land and cropped arable land fraction</b>			
Crop/ Satellite	[0,1] number, pixel or CWSU average	The area of cropped arable land as fraction of total (cropped and uncropped) arable land. Whether a pixel is cropped or not is decided based on NDVI twice a month. (For each four-month reporting period, each pixel thus has 8 cropped/ uncropped values).	The value shown in tables is the maximum value of the 8 values available for each pixel; maps show an area as cropped if at least one of the 8 observations is categorized as "cropped." Uncropped means that no crops were detected over the whole reporting period. Values are compared to the average value for the last five years (2009-13), with departures expressed in percentage.

<b>CROPPING INTENSITY</b>			
<b>Cropping intensity Index</b>			
Crop/ Satellite	0, 1, 2, or 3; Number of crops growing over a year for each pixel	Cropping intensity index describes the extent to which arable land is used over a year. It is the ratio of the total crop area of all planting seasons in a year to the total area of arable land.	Cropping intensity is presented as maps by pixels or spatial average pixels values for MPZs, 31 countries, and 7 regions for China. Values are compared to the average of the previous five years, with departures expressed in percentage.
<b>NDVI</b>			
<b>Normalized Difference Vegetation Index</b>			
Crop/ Satellite	[0.12-0.90] number, pixel or CWSU average	An estimate of the density of living green biomass.	NDVI is shown as average profiles over time at the national level (cropland only) in crop condition development graphs, compared with previous year and recent five-year average (2009-2013), and as spatial patterns compared to the average showing the time profiles, where they occur, and the percentage of pixels concerned by each profile.
<b>RADPAR</b>			
<b>CropWatch indicator for Photosynthetically Active Radiation (PAR), based on pixel based PAR</b>			
Weather/ Satellite	W/m <sup>2</sup> , CWSU	The spatial average (for a CWSU) of PAR accumulation over agricultural pixels, weighted by the production potential.	RADPAR is shown as the percent departure of the RADPAR value for the reporting period compared to the recent thirteen-year average (2001-13), per CWSU. For the MPZs, regular PAR is shown as typical time profiles over the spatial unit, with a map showing where the profiles occur and the percentage of pixels concerned by each profile.
<b>RAIN</b>			
<b>CropWatch indicator for rainfall, based on pixel-based rainfall</b>			
Weather/ Ground and satellite	Liters/m <sup>2</sup> , CWSU	The spatial average (for a CWSU) of rainfall accumulation over agricultural pixels, weighted by the production potential.	RAIN is shown as the percent departure of the RAIN value for the reporting period, compared to the recent thirteen-year average (2001-13), per CWSU. For the MPZs, regular rainfall is shown as typical time profiles over the spatial unit, with a map showing where the profiles occur and the percentage of pixels concerned by each profile.
<b>TEMP</b>			
<b>CropWatch indicator for air temperature, based on pixel-based temperature</b>			
Weather/ Ground	°C, CWSU	The spatial average (for a CWSU) of the temperature time average over agricultural pixels, weighted by the production potential.	TEMP is shown as the departure of the average TEMP value (in degrees Centigrade) over the reporting period compared with the average of the recent 13 years (2001- 13), per CWSU. For the MPZs, regular temperature is illustrated as typical time profiles over the spatial unit, with a map

			showing where the profiles occur and the percentage of pixels concerned by each profile.
<b>VCIx</b>			
<b>Maximum vegetation condition index</b>			
Crop/ Satellite	Number, pixel to CWSU	Vegetation condition of the current season compared with historical data. Values usually are [0,1], where 0 is "NDVI as bad as the worst recent year" and 1 is "NDVI as good as the best recent year." Values can exceed the range if the current year is the best or the worst.	VCIx is based on NDVI and two VCI values are computed every month. VCIx is the highest VCI value recorded for every pixel over the reporting period. A low value of VCIx means that no VCI value was high over the reporting period. A high value means that at least one VCI value was high. VCI is shown as pixel-based maps and as average value by CWSU.
<b>VHI</b>			
<b>Vegetation health index</b>			
Crop/ Satellite	Number, pixel to CWSU	The average of VCI and the temperature condition index (TCI), with TCI defined like VCI but for temperature. VHI is based on the assumption that "high temperature is bad" (due to moisture stress), but ignores the fact that low temperature may be equally "bad" (crops develop and grow slowly, or even suffer from frost).	Low VHI values indicate unusually poor crop condition, but high values, when due to low temperature, may be difficult to interpret. VHI is shown as typical time profiles over Major Production Zones (MPZ), where they occur, and the percentage of pixels concerned by each profile.
<b>VHIn</b>			
<b>Minimum Vegetation health index</b>			
Crop/ Satellite	Number, pixel to CWSU	VHIn is the lowest VHI value for every pixel over the reporting period. Values usually are [0, 100]. Normally, values lower than 35 indicate poor crop condition.	Low VHIn values indicate the occurrence of water stress in the monitoring period, often combined with lower than average rainfall. The spatial/time resolution of CropWatch VHIn is 16km/week for MPZs and 1km/dekad for China.

Note: Type is either "Weather" or "Crop"; source specifies if the indicator is obtained from ground data, satellite readings, or a combination; units: in the case of ratios, no unit is used; scale is either pixels or large scale CropWatch spatial units (CWSU). Many indicators are computed for pixels but represented in the CropWatch bulletin at the CWSU scale.

### CropWatch spatial units (CWSU)

CropWatch analyses are applied to four kinds of CropWatch spatial units (CWSU): Countries, China, Major Production Zones (MPZ), and global crop Monitoring and Reporting Units (MRU). The tables below summarize the key aspects of each spatial unit and show their relation to each other. For more details about these spatial units and their boundaries, see the CropWatch bulletin online resources.

#### SPATIAL UNITS

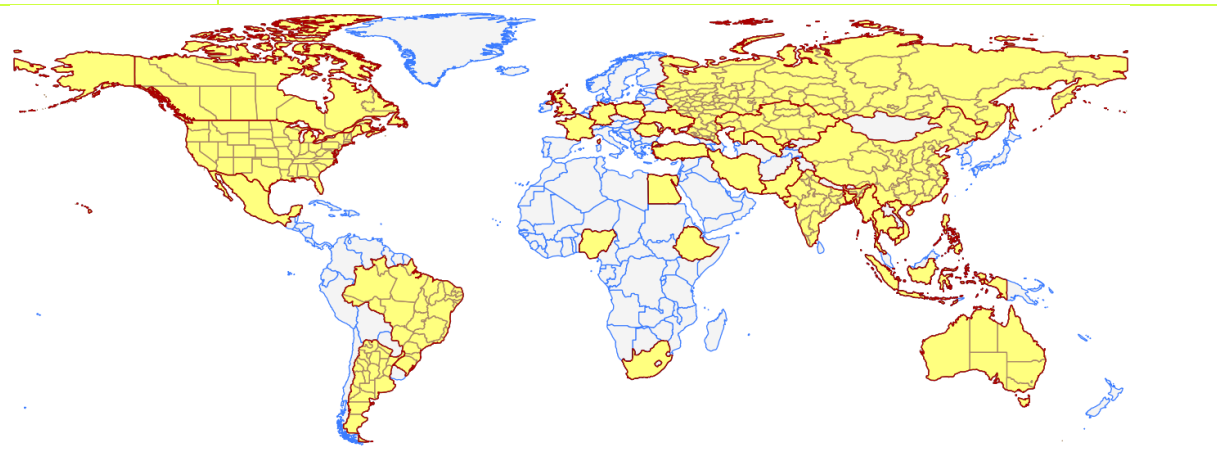
##### CHINA

Overview	Description
Seven monitoring regions	The seven regions in China are agro-economic/agro-ecological regions that together cover the bulk of national maize, rice, wheat, and soybean production. Provinces that are entirely or partially included in one of the monitoring regions are indicated in color on the map below.



##### Countries (and first-level administrative districts, e.g., states and provinces)

Overview	Description
“Thirty plus one” countries to represent main producers/exporters and other key countries.	CropWatch monitored countries together represent more than 80% of the production of maize, rice, wheat and soybean, as well as 80% of exports. Some countries were included in the list based on criteria of proximity to China (Uzbekistan, Cambodia), regional importance, or global geopolitical relevance (e.g., four of five most populous countries in Africa). The total number of countries monitored is “thirty plus one,” referring to thirty countries and China itself. For the nine largest countries—Canada, United States, Brazil, Argentina, Russia, Kazakhstan, India, China, and Australia, maps and analyses may also present results for the first-level administrative subdivision. The CropWatch agroclimatic indicators are computed for all countries and included in the analyses when abnormal conditions occur. Background information about the countries’ agriculture and trade is available on the CropWatch Website, <a href="http://www.cropwatch.com.cn">www.cropwatch.com.cn</a> .



**Major Production Zones (MPZ)**

Overview	Description
Seven globally important areas of agricultural production	The seven MPZs include West Africa, South America, North America, South and Southeast Asia, Western Europe, Central Europe to Western Russia, and Southern Australia. The MPZs are not necessarily the main production zones for the four crops (maize, rice, soybean, wheat) currently monitored by CropWatch, but they are globally or regionally important areas of agricultural production. The seven zones were identified based mainly on production statistics and distribution of the combined cultivation area of maize, rice, wheat and soybean.



**Global Monitoring and Reporting Unit (MRU)**

Overview	Description
65 agro-ecological/agro-economic units across the world	MRUs are reasonably homogeneous agro-ecological/agro-economic units spanning the globe, selected to capture major variations in worldwide farming and crops patterns while at the same time providing a manageable (limited) number of spatial units to be used as the basis for the analysis of environmental factors affecting crops. Unit numbers and names are shown in the figure below. A limited number of units (e.g., MRU-63 to 65) are not relevant for the crops currently monitored by CropWatch but are included to allow for more complete coverage of global production. Additional information about the MRUs is provided online under <a href="http://www.cropwatch.com.cn">www.cropwatch.com.cn</a> .

