

# Indicators

These indicators are designed to assess the condition of crops and the environment in which they grow and develop; the indicators—RAIN (rainfall), TEMP (temperature), and RADPAR (photosynthetically active radiation)—are not identical to the weather variables, instead, they 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. These indicators are expressed using the usual physical units and were thoroughly tested for their coherence over space and time. CWSU are the CropWatch Spatial Units that include MRUs, MPZs, countries, and the first-level administrative districts in specific large countries.

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BIOMSS (Biomass accumulation potential)			
<b>Crop/ Model simulation</b>	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 CWSU, or tables giving average values for the CWSU. Values are compared to the average value for the same period in the previous fifteen years, with departures expressed in percentage.
CALF (Cropped arable land and cropped arable land fraction)			
<b>Crop/Satellite</b>	[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, with departures expressed in percentage.
CROPPING INTENSITY(Cropping intensity Index)			
<b>Crop/Satellite</b>	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, 43 countries, and 7 regions for China. Values are compared to the average of the previous five years, with departures expressed in percentage.

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NDVI (Normalized Difference Vegetation Index)			
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, and as spatial patterns compared to the average showing the time profiles, where they occur, and the percentage of pixels concerned by each profile.
RADPAR (Photosynthetically Active Radiation)			
Weather/Ground and 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 fifteen-year average, 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.
RAIN (CropWatch indicator for rainfall, based on pixel-based rainfall)			
Weather/Ground and satellite	mm, 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 fifteen- year average, 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.
TEMP(CropWatch indicator for air temperature, based on pixel-based temperature)			
Weather/Ground and satellite	°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 fifteen years, 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.
VCIX (Maximum vegetation condition index)			
Crop/Satellite	Number,	Vegetation condition of the	VCIX compares NDVI peak value during

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	pixel to CWSU	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.	<p>the growing season with peak NDVI over same period during the historical years using the following equation:</p> $VCI_x = \frac{NDVI_{max_c} - NDVI_{min_h}}{NDVI_{max_h} - NDVI_{min_h}}$ <p>NDVI<sub>max_c</sub> is the maximum NDVI of targeting period, NDVI<sub>max_h</sub> and NDVI<sub>min_h</sub> is respectively the historical maximum NDVI and historical minimum NDVI over the same period using time series NDVI data sets during the previous five years (targeting year is not included). Considering the crop minimum NDVI may be contaminated by cloud or non-vegetation pixels, an empirical minimum vegetation NDVI value (0.15) is introduced to recalculate NDVI<sub>min_h</sub>. NDVI<sub>min_h0</sub> is the original minimum NDVI of the monitoring period from time series NDVI datasets.</p>
<b>VHI (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 (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 4km/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.