AFRICA KNOWLEDGE PLATFORM

Agriculture in Southern Africa

Monitoring climate extremes impact on agriculture in Southern Africa with the Anomaly Hotspots of Agricultural Production (ASAP) system

European Commission

Food crisis response planning can save lives if put in place in a timely manner. To do this, decision makers must be warned of climate extreme events impacting agricultural production. With two examples of recent case studies in Southern Africa, this story demonstrates the capacity of the "Anomaly Hotspot of Agricultural Production " tool to detect problems early on and advise decision makers. In combination with other information sources, this early warning system helps assessing how and when to respond to climate extremes . And consequently reducing their adverse impacts on vulnerable populations.

In the Southern African Development Community (SADC), more than 160 million people rely on agriculture for subsistence food production, income and employment.

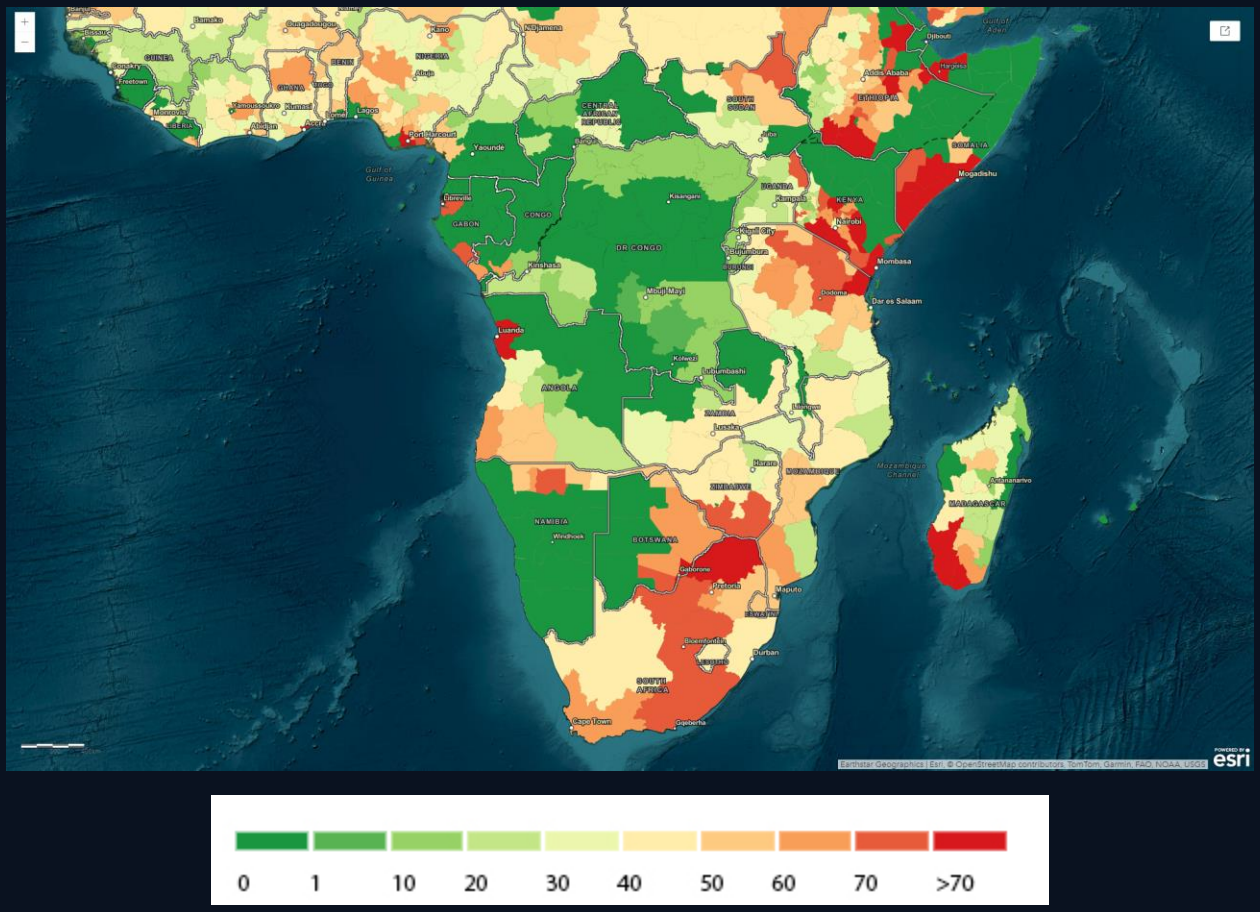
With less than 10% of crop production under irrigation, **most crops in the region are vulnerable to unfavorable precipitation**. Approximately 30 million people in the SADC region suffered from food insecurity between 2014 and 2018. Food insecurity is likely to intensify as recent climate change models predict that droughts and floods will become more frequent and more extreme in many parts of the region.

When food production becomes insufficient or food prices go up, populations at risk of starvation depend on **food assistance.** But it **can only be provided if timely warning allows for early planning and action**. Here is where the Anomaly HotSpot of Agricultural Production (ASAP) system comes into play.

ASAP is an online decision support system for early warning about hotspots of food production problems. It has been developed by the European Commission Joint Research Centre (EC JRC) for crisis prevention and response anticipation. It monitors crop growth globally, with a suite of tools at different geographical scales that use the best available data. ASAP informs the European Commission's food security and humanitarian aid policies and supports multi-agency early warning initiatives. It provides information to food security assessments such as the IPC (Integrated Food Security Phase Classification) and the Cadre Harmonisé, which are the basis for the annual Global Report on Food Crises produced by the Global Network against Food Crises . It also feeds directly into the GEOGLAM Crop Monitor for Early Warning. ASAP is available to other decision makers for whom early warning information is important like national agriculture and food security

agencies in food insecure countries, Non-Governmental Organizations (NGOs), commercial traders, farmers, as well as to the general public.

>>> mars.jrc.ec.europa.eu/asap



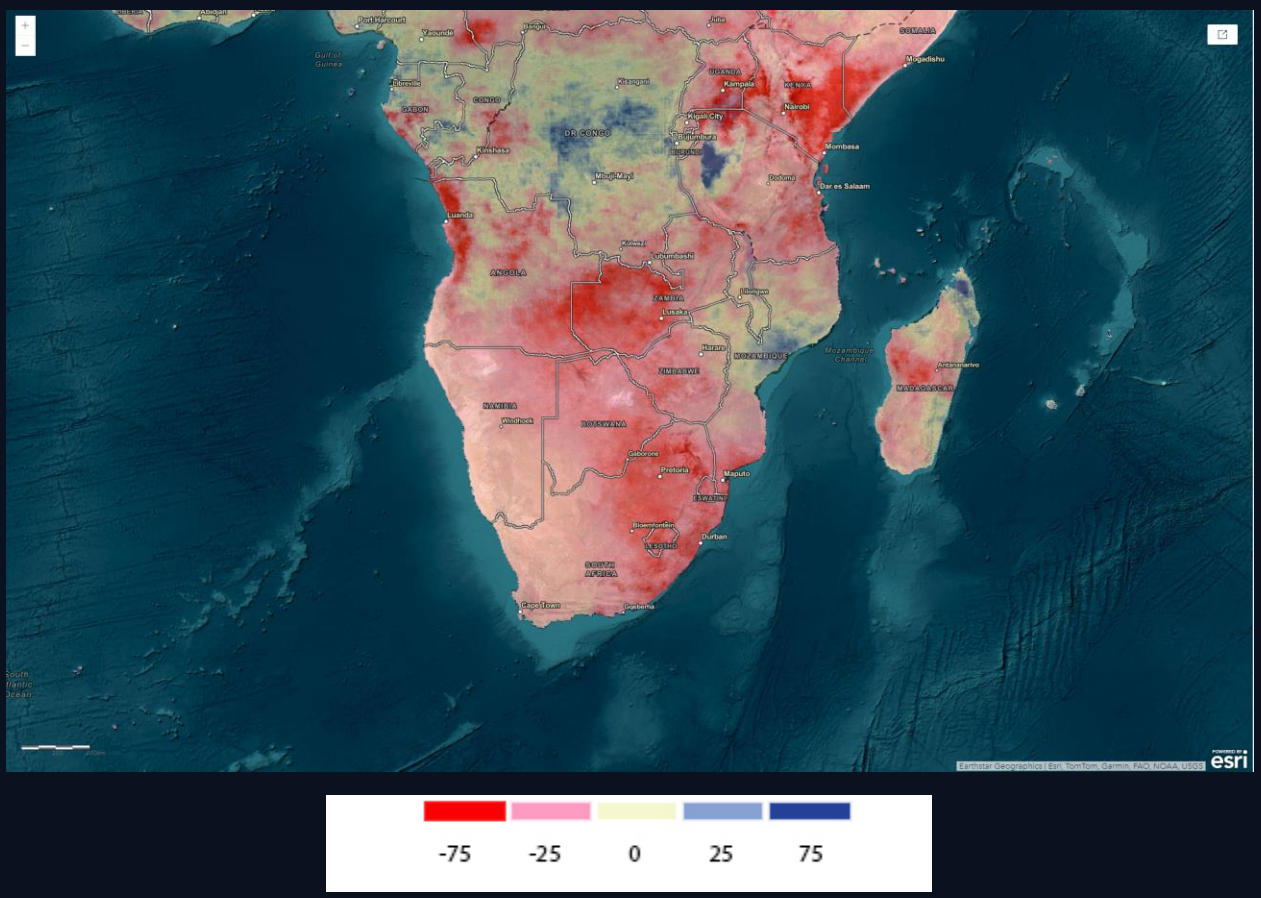
Frequency of ten-daily warnings about crop anomalies

This map shows the frequency of ASAP anomaly warnings for crop growth for 2004-2018. It confirms the high sensitivity of the main agricultural areas in the SADC region to drought conditions.

The 2018/2019 drought

A heads up at the start of a bad season

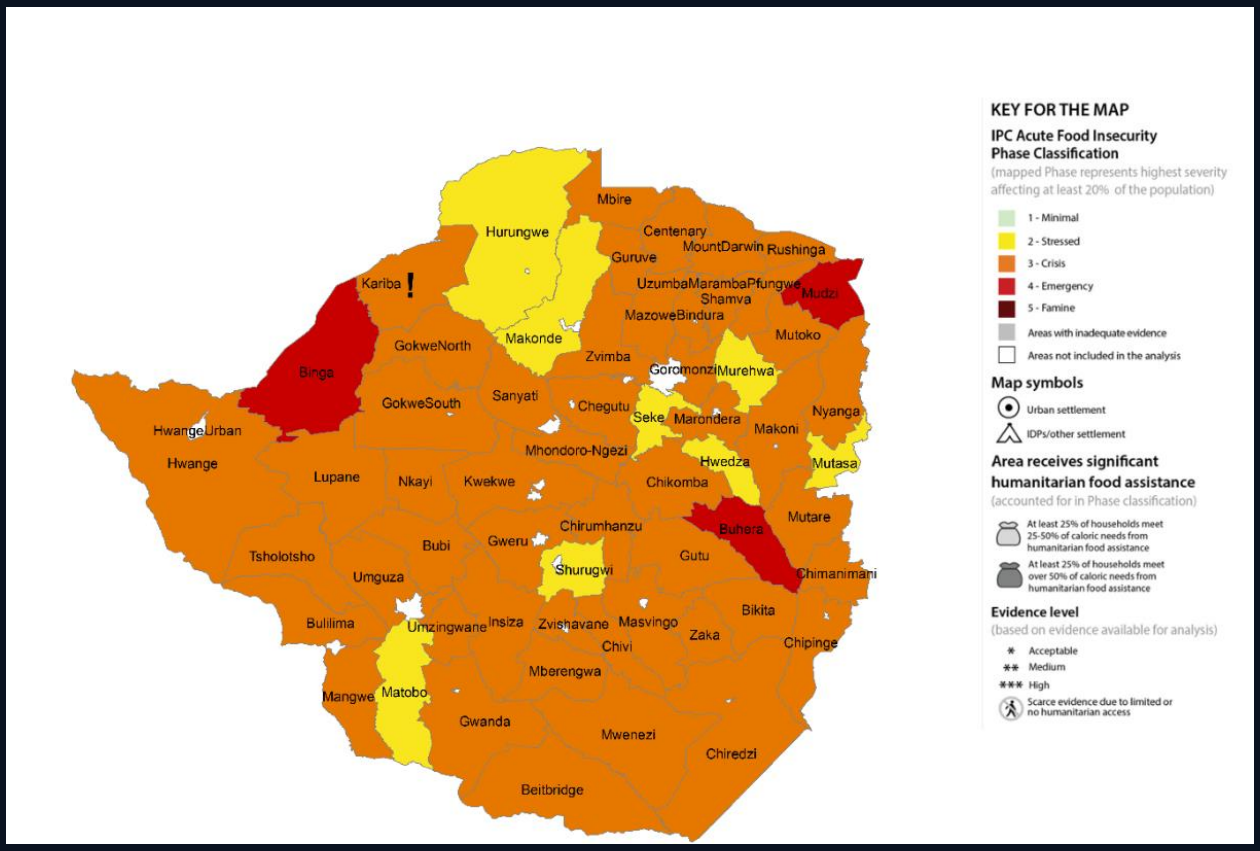
ASAP was successfully used to timely detect and monitor the severe drought that affected most of the SADC region in 2018/2019. That season, the summer rains onset in South Africa was delayed by nearly one full month. This was captured by the ASAP 30 and 90-days cumulative rainfall anomaly maps from the early stages of the season (end of November 2018).



ASAP 30-days cumulative rainfall anomaly (%)

This map shows the difference in rainfall between November 2018 and the average November rainfall of previous years. Red areas suffer from negative rainfall deficits.

In Zimbabwe, the consequences of these climate extreme events were hard felt. According to the IPC "Acute Food Insecurity Situation assessment for Feb - May 2019, "the abnormally dry conditions during the 2018/19 cropping season due to late onset of rains heavily affected agriculture activities, thereby reducing the income of the most vulnerable households relying on occasional agriculture labour. Dry conditions have also resulted in high livestock deaths, affecting the quality and capacity of beef and milk production." Between February and May 2019, an estimated 2,878,957 people in Zimbabwe's rural areas required urgent action to protect and save livelihoods, reduce food consumption gaps, and minimize acute malnutrition.

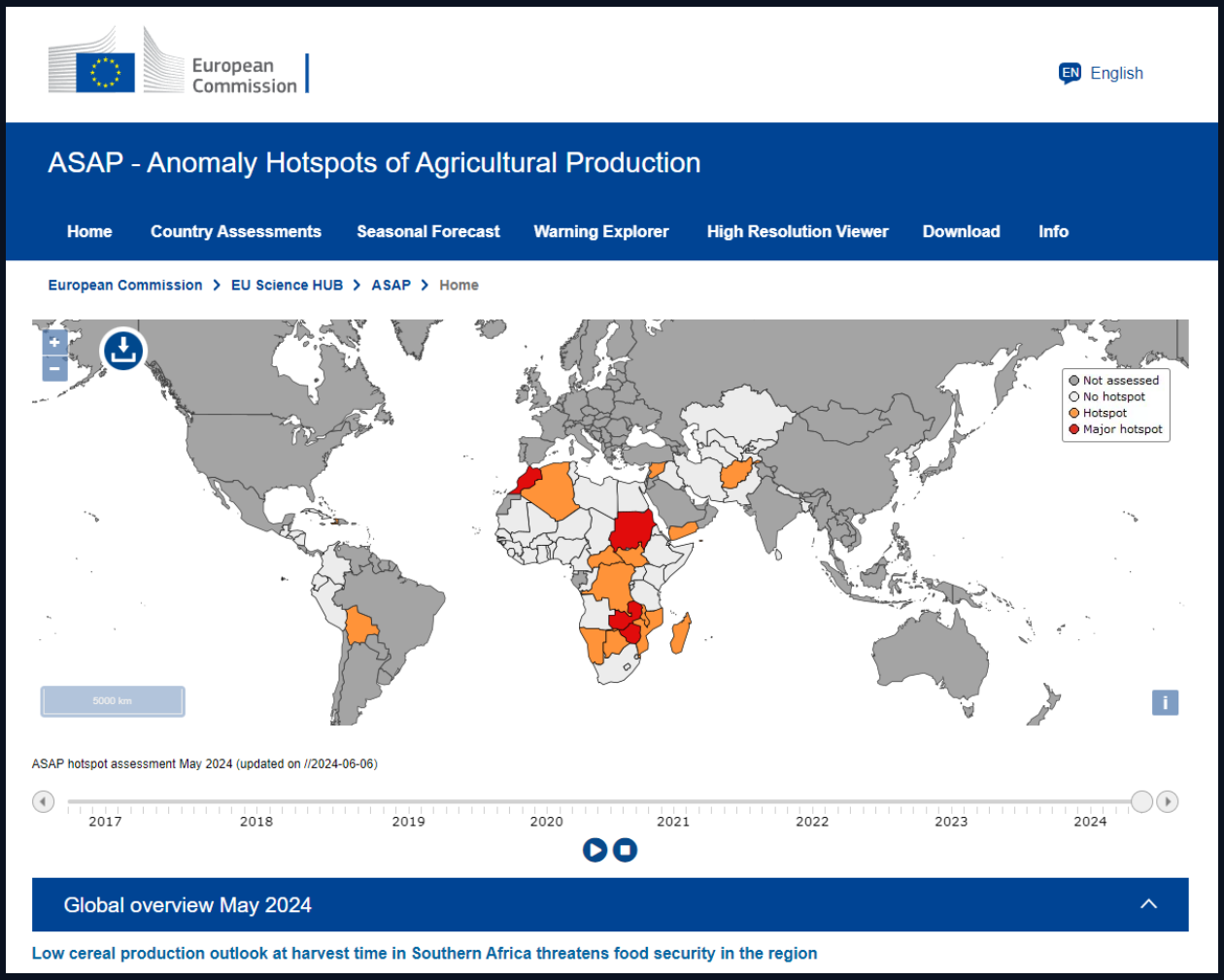


The entire territory of Zimbabwe flagged as stressed, crisis or emergency by the IPC Acute Food Insecurity Phase Classification for the period Feb - May 2019.

Warning Explorer

From the early stages of the crop season, the system classified most provinces in the region as **“drought condition warnings”**.

>>> https://agricultural-production-hotspots.ec.europa.eu/

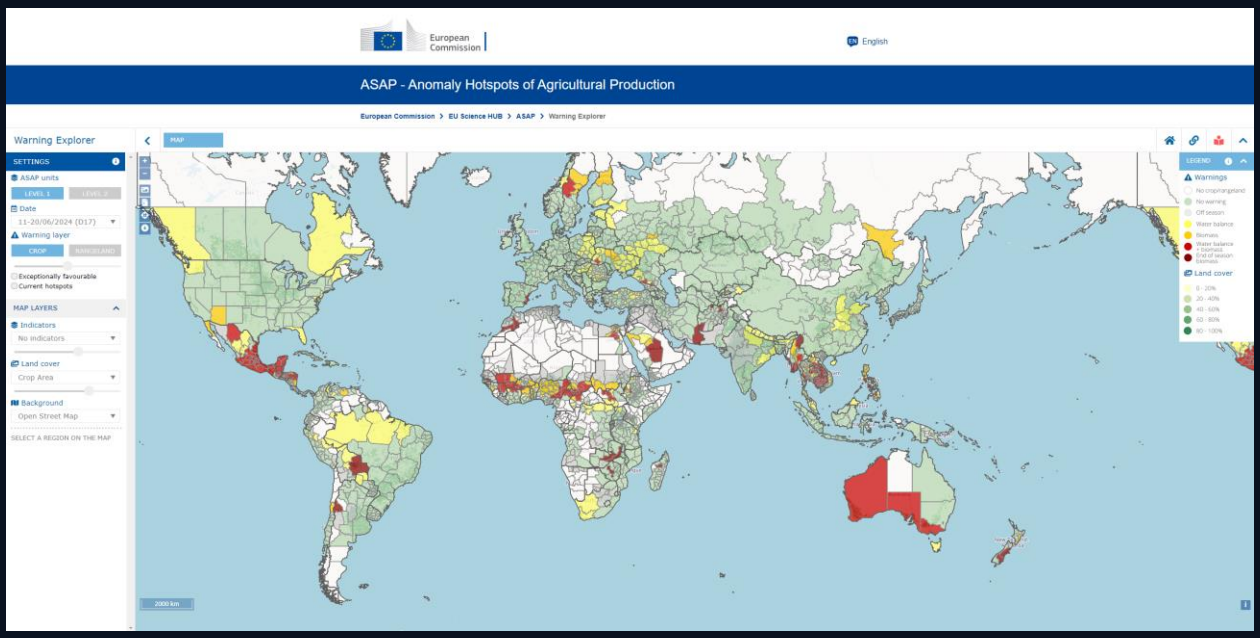


Set the date to 21-30/11/2018 (D33). Most provinces are flagged (red zones) with evidence based on negative rainfall and biomass anomalies.

Hotspots map

The ASAP hotspots assessment of December 2018 delivered **a clear, methodologically consistent, accessible and easy to interpret message to decision makers**. It warned of the potential risks five months before the end of the agricultural season. Early January 2019, limited rains in the east slightly improved the conditions. However, a continued dry spell followed from late January through early February across the central parts of the region. This resulted in widespread wilting and below-average yield prospects in the worst affected areas of Angola, Namibia, Botswana, Lesotho, Zimbabwe, southern parts of Zambia and Mozambique, and western South Africa.

Analysts maintained the region flagged as a hotspot until the end of the season in July 2019. A season that resulted in **poor harvests, as predicted by the system** that confirmed month by month the message passed early on to decision makers. Agricultural statistics data, available much later in the season, confirmed the classification of the region as agricultural production hotspot. Production of maize, the main staple crop in the region, was 10% below-average at regional level.



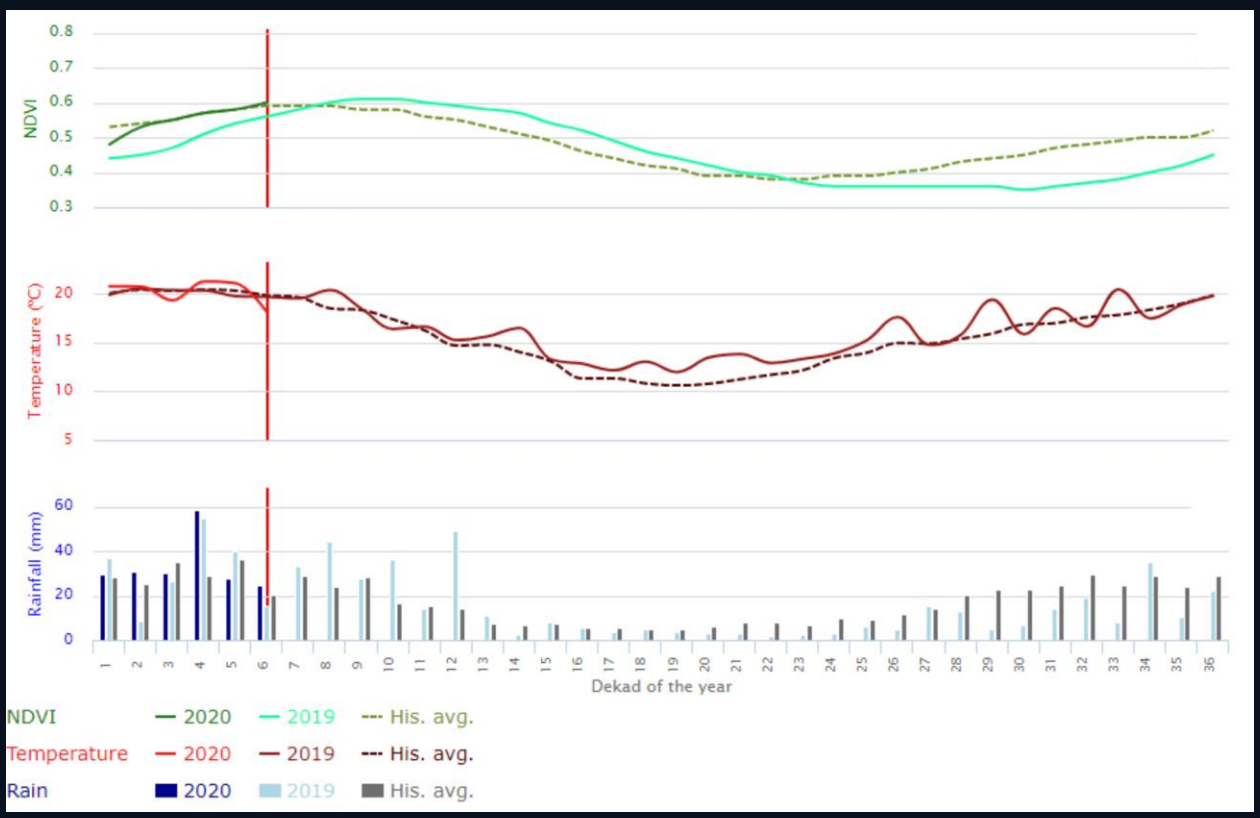
Hotspot regions are highlighted in orange, and major hotspots in red.

Early warnings are a fundamental trigger to timely launch the international response to possible food crises. This is critical considering that

response planning and implementation, for example of food aid or social safety net interventions, require long time lags for mobilizing and delivering in-country to the final beneficiaries. **When the crisis becomes a humanitarian emergency, it is often too late** for reaching the whole population in need in time.
Economically, early warning of food crisis is estimated 10 times more efficient than emergency food aid interventions.

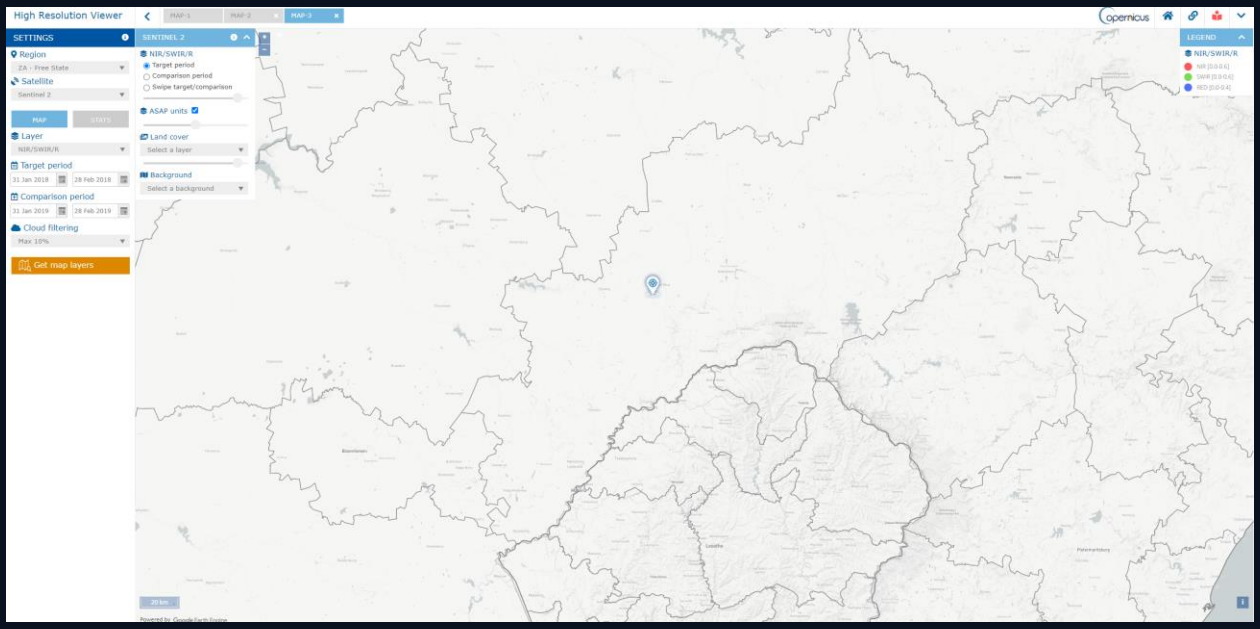
Country Assessments

The graphs available in the ASAP console at province level gave the analysts a comprehensive picture of the rainfall, temperature and cumulative NDVI (a proxy of biomass production) evolution. These kinds of data, integrated with evidence from other sources, provide the **necessary information for an assessment of the situation at national level**. They help decision makers investigate the impact of rainfall and vegetation development anomalies.



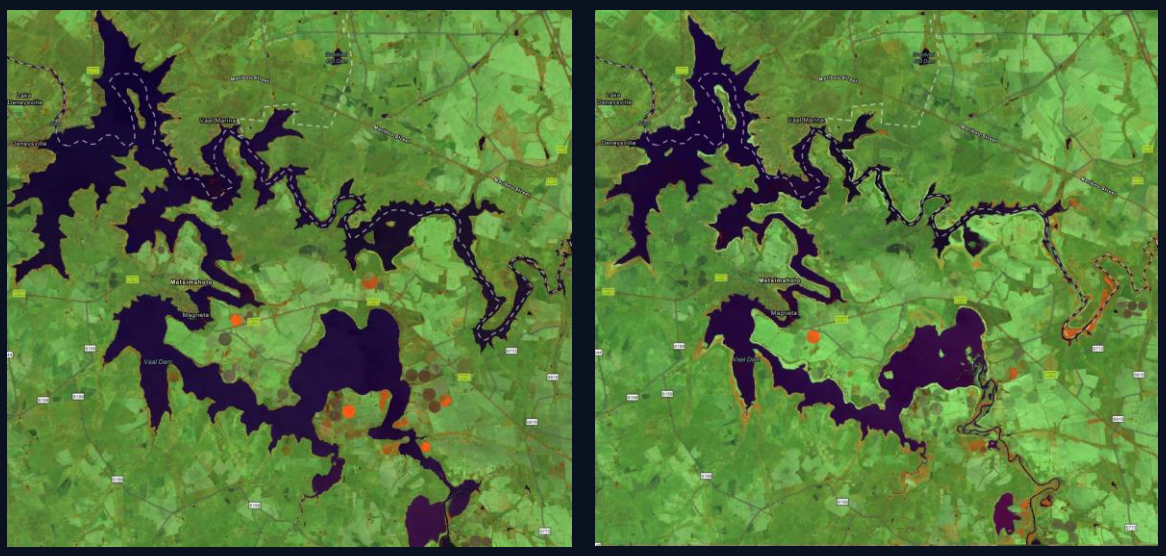
High Resolution Viewer

Zooming in to the field level (using the latest high-resolution satellite imagery of the European Sentinel 2 sensors), the impact of **reduced planted area became clearly visible** in January/February for some of the main cereal producing regions in South Africa including Free State and North West. Crop areas in 2019 show significantly less active vegetation compared to 2018. We can assume that most of the areas in bright red have not been planted during the 2018/2019 season. This information confirms and extends evidence that analysts and decision makers get from the field.



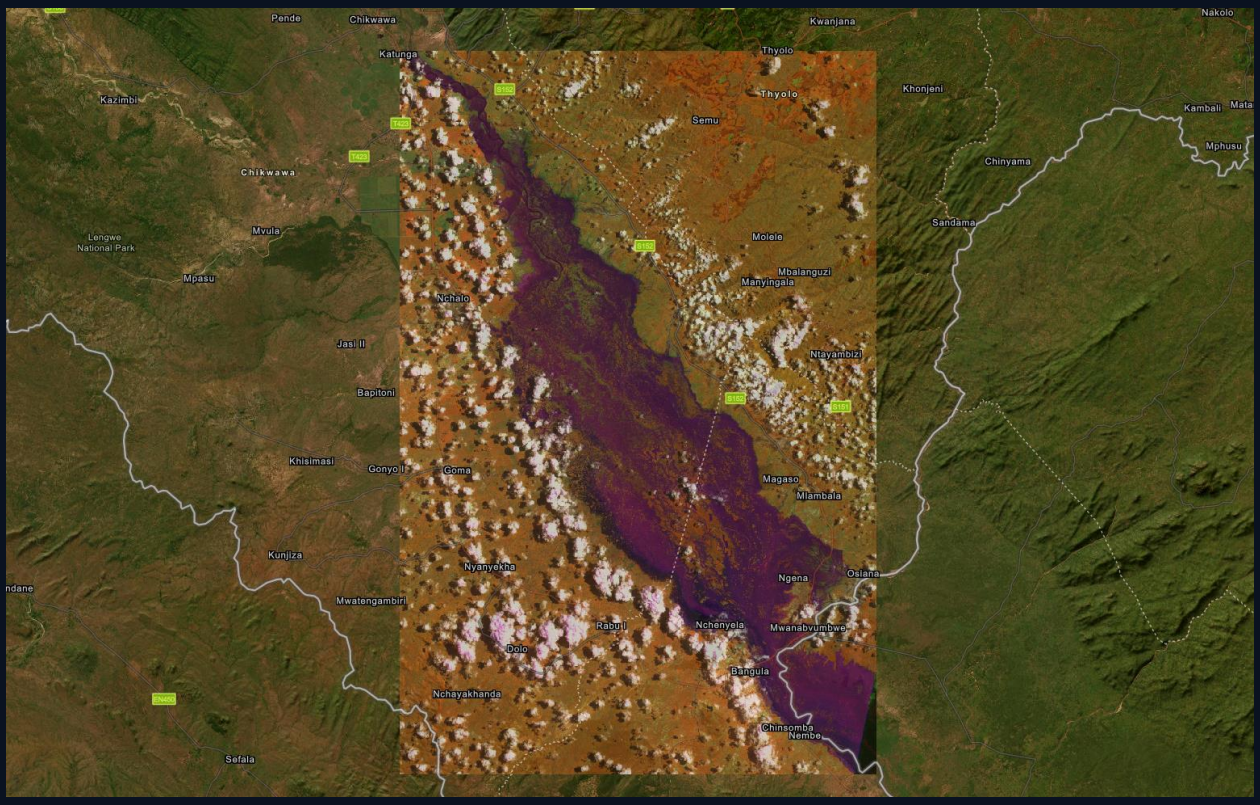
Select the "Swipe target/comparison" option then move the slider left and right to compare vegetation conditions in the Free State province (South Africa) between Jan/Feb 2019 and Jan/Feb 2018. Red areas represent dense and heathy vegetation while light green areas have very limited vegetation.

Another example of information offered to decision makers by ASAP is the identification and quantification of the consequences of droughts on water reservoirs.
During the 2018/2019 agricultural season, the replenishment of water reservoirs and dams was very limited. **The reduced dam levels severely affected irrigation activities, especially in South Africa and southern Zambia.**



The ASAP High Resolution Viewer shows the clear reduction in the water extent of the Vaal Dam in South Africa and in the number of irrigated fields (red circles) between Nov 2018 (image on the left) and Nov 2019 (image on the right).

In addition to the drought, other climate extreme events affected the region during the same period. **The eastern part of the SADC region was hit by two cyclones**: Idai and Kenneth. They brought widespread destruction, including cropping areas in central Mozambique, southern Malawi and eastern Zimbabwe. The 2019 Global Report on Food Crises indicates that the tropical cyclone Idai (that made landfall in the Sofala province, Mozambique mid-March) brought devastatingly strong winds and heavy flooding with tragic consequences on populations. Media reported that a half million people were affected in Mozambique. 400 lives were lost, as well as 259 in Zimbabwe and 56 in Malawi.



The ASAP High Resolution Viewer shows an example of flooded cropland areas along Shire River (purple zone).

2021: Angola and Madagascar under water stress

In 2021, the ASAP Early Warning Explorer again detected drought conditions at the beginning of the main crop growing season in parts of Southern Africa. Early in the season, rainfall was mixed across the region. The main agricultural regions received above-average rainfall. But along the western and the eastern oceanic costs, some areas experienced severe drought from end November 2020.

This situation was overall expected due to the ongoing La Niña conditions. However, drought intensity reached extreme levels in southern Angola and southern Madagascar. The highly vulnerable southern part of Angola is hit by drought conditions for the second time in the last three agricultural seasons. The Huila and Namibe provinces are facing the worst drought in the last 30 years.

As shown for previous drought years, the ASAP High Resolution Viewer adds further detail at the field level. Huila is a main cereal producing region in Angola, contributing to 15% of the national cereal production. But in February 2021, crops are bare.

Another example of drought impact at the field level can be seen in Androy, Madagascar . The region contributes only slightly to the national cereal production, but croplands are important for local food security conditions.

National weather services in these countries are monitoring the rainfall situation with the use of weather station data. However, the number of weather stations in most of the countries of the region is low and decreasing (Eklund et al. 2016). Therefore, the spatial coverage of ASAP information based on satellite data helps national services to improve their early warning reporting.
In Angola for example, the INAMET (Instituto Nacional de Meteorologia e Geofísica) and the Ministry of Agriculture, in collaboration with the JRC, are producing bulletins that provide an overview of the progress of the agricultural season, based on information derived from ASAP.

https://africa-knowledge-platform.ec.europa.eu/

This document has been originated from a StoryMap compiled in the context the European Commission's Africa Knowledge Platform.

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Related links
ASAP website