GDO Analytical Report

Drought in Zimbabwe, Zambia and south Mozambique February 2020

JRC Global Drought Observatory and ERCC Analytical Team - 13/02/2020

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Executive summary

- Zimbabwe, southern Mozambique and parts of Zambia are facing an extreme rainfall deficit, after a scarce 2018/2019 wet season, combined with a very poor first half of the current season. Some areas received only 20% of the total precipitation expected in a year, with many more at a mere 50%.
- Food insecurity is already widespread and the low yield expectations for the 2020 harvest loom over the next months. Food prices are increasing. In addition, water supply is intermittent and unsafe. Major damages to the economy of the involved countries are reported, also in relation to the low water level at the Kariba dam that is threatening power supply to both Zambia and Zimbabwe.
- The outlooks for February and up to April overall predict a normal second half of the rainy season, however insufficient to offset the cumulated deficits in the first half. Indeed, given the strong precipitation seasonality over the region, a multi-month long water deficit may be expected.

This document builds on the previous reports about southern Africa[1], please refer to them for more insight on the drought and earlier reported impacts.

[1] https://edo.jrc.ec.europa.eu/gdo/php/index.php?id=2050

Risk of drought impact for agriculture (RDrI-Agri)

The indicator RDrI-Agri shows the risk of having impacts from a drought, by taking into account the exposure and socio-economic vulnerability of the area, with particular focus to the agricultural impacts.

Figure 1 shows the areas currently under risk: southern Mozambique, central and southern Zimbabwe and parts of western Zambia. Across these countries, at least 15 million people are exposed to a varying degree (figure 2). Chronic food insecurity and economic issues cripple these regions, where the majority of labour force is employed in agriculture. The rural communities are bond to just three or four months for the yearly water supply, due to the strong precipitation seasonality, which severely exposes rain-fed crops and rangelands. In addition, natural rainfall variability is particularly high from year to year. The current underperforming rainfall hits at the core of the growing season, entailing an increased risk of widespread food insecurity.

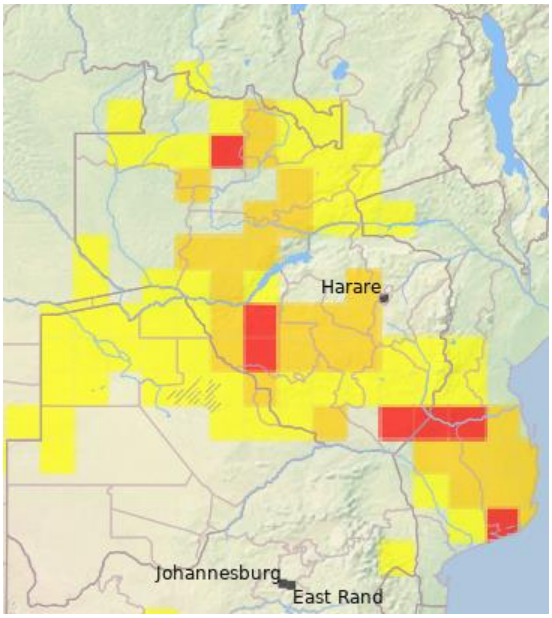


***Figure 1**: Risk of drought impact for agriculture (RDrI-Agri) from 21st to 31st of January 2020.*

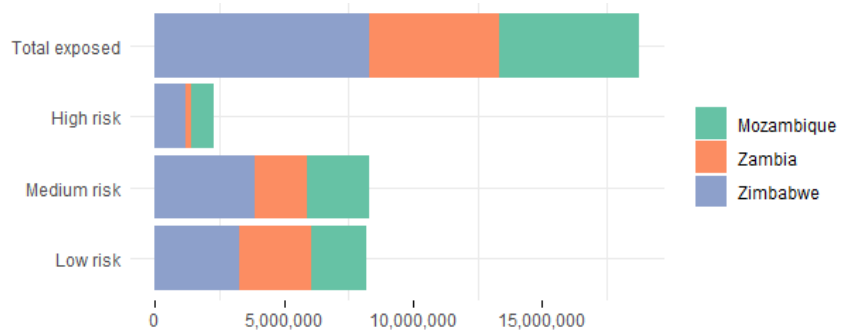
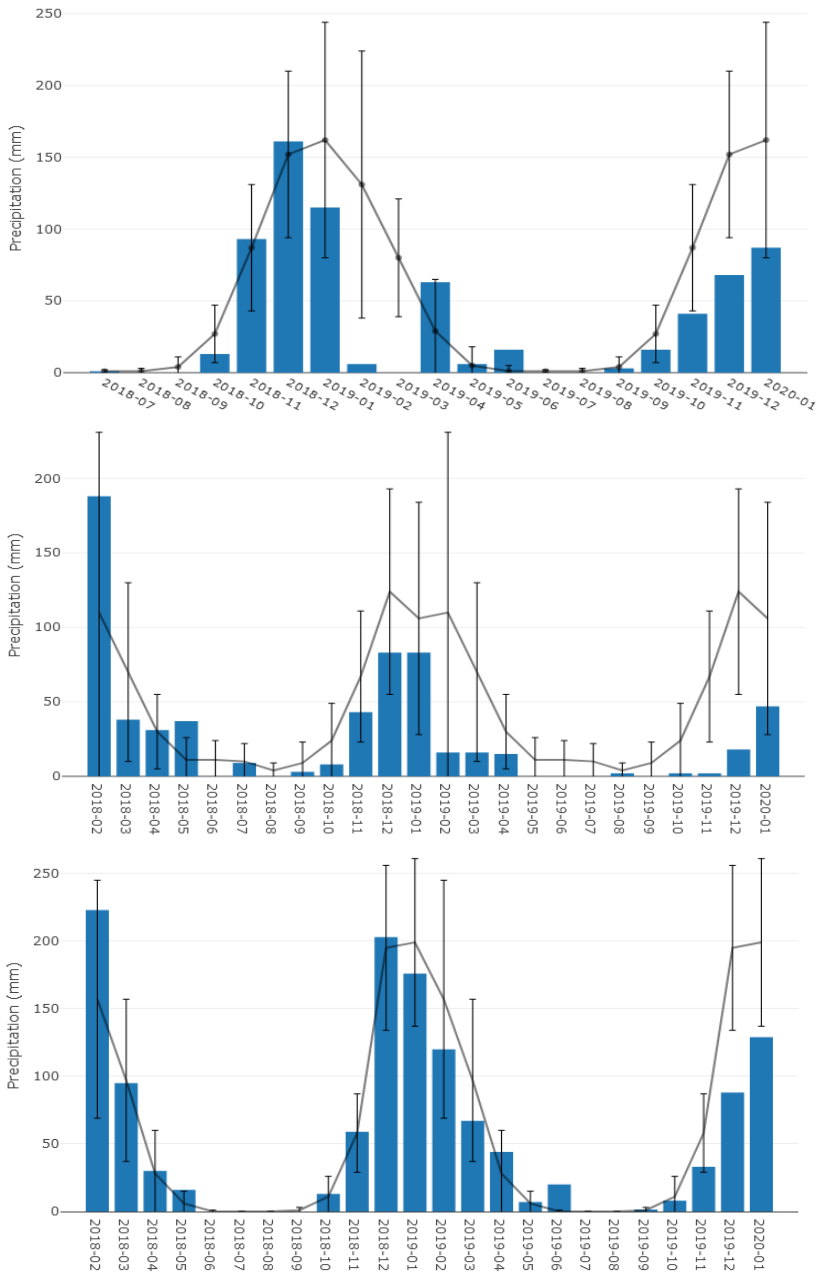


***Figure 2:** Population exposed to risk of drought impact (RDrI-Agri), by country and risk class.*

Precipitation



Queque, Zimbabwe
(-18.6 N, 29.4 E)

Machaz, Mozambique
(-21.4 N, 32.9 E)

Chirundu, Zambia
(-15.3N, 29.5E)

Figure 3: *Monthly total precipitation (blue bars, in mm) in selected locations, with the long-term monthly averages (solid line, period of reference is 1981 to 2010) and one standard deviation (vertical lines).*

As from figure 3, up until January, total rainfall summed up to a mere 45% of what the long-term climatology indicates over twelve months. An even wider relative gap is recorded for southern Mozambique, down to 20% of the yearly total average, according to GPCC data. In central Zambia, this figure is about 70%, with December and January, usually the two wettest months, below the standard variability.

Standardized Precipitation Index (SPI)

The SPI indicator is used to monitor the occurrence of meteorological drought. The lower (i.e., more negative) the SPI, the more intense is the drought.

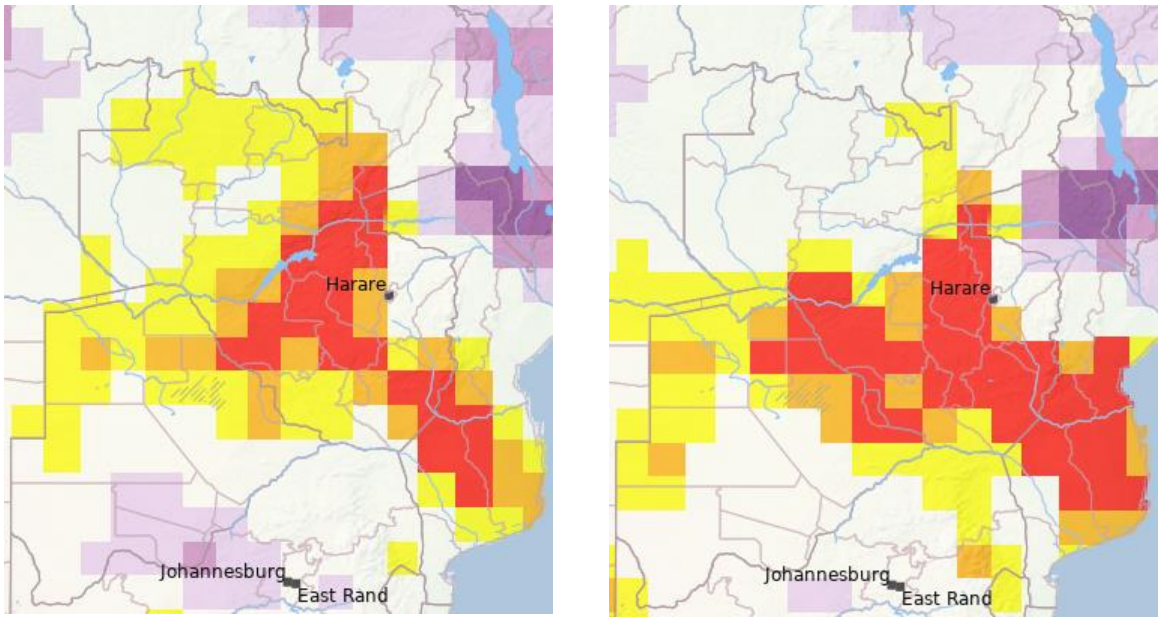


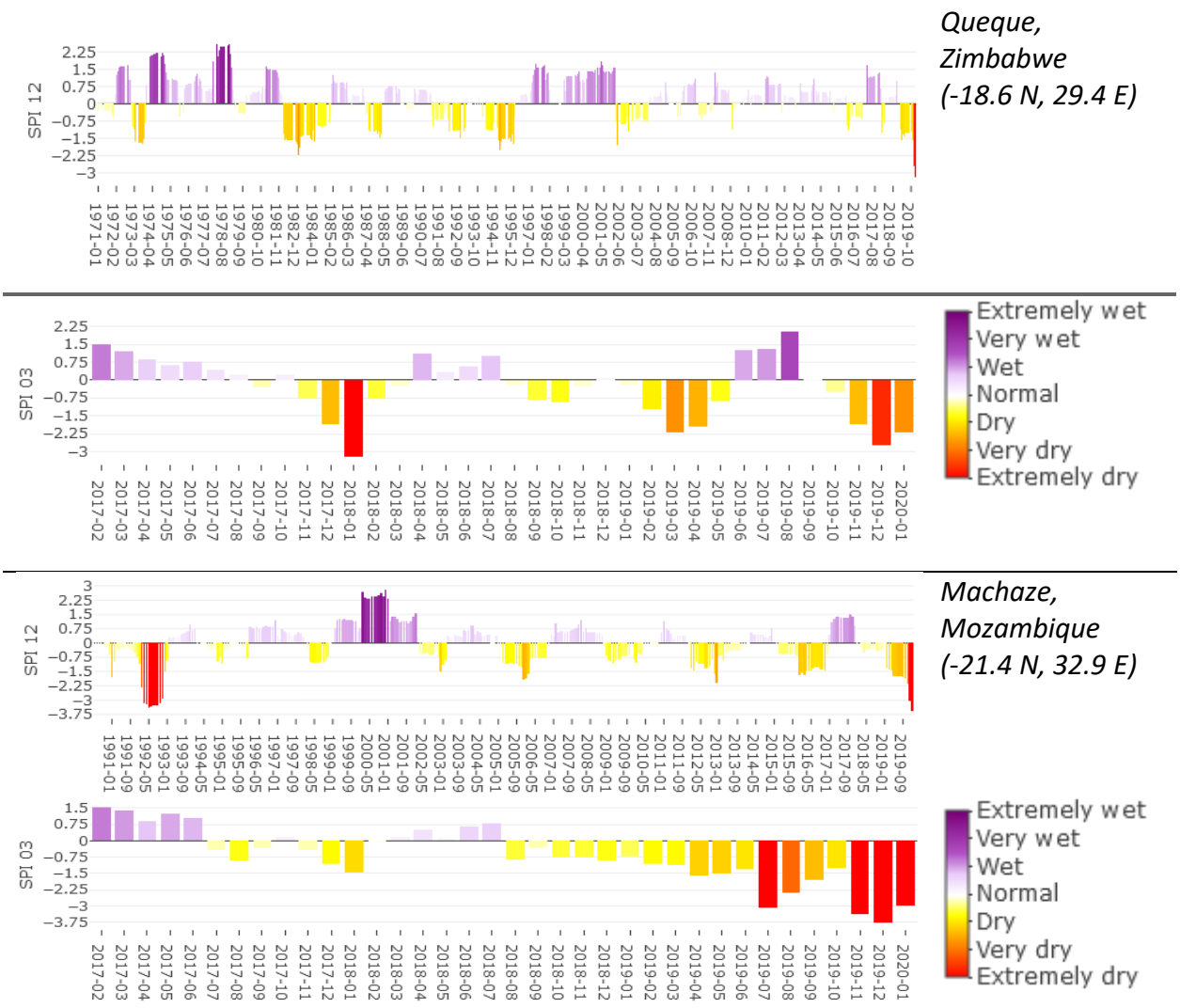
Figure 4: *SPI over the affected area for a cumulative period of 3 months (left, November 2019 to January 2020) and 12 months (right, February 2019 to January 2020).*

Negative anomalies of rainfall are persistent over the whole of Zimbabwe and southern Mozambique, and further into Zambia and north-east Botswana, at both the three and twelve months cumulative period, encompassing the first half of the current wet season and the entire year of precipitation (figure 4).

The bar charts of figure 5 show the evolution of precipitation anomaly in time, at different intervals. As of January 2020, the yearly rainfall balance is the worst on record for central

Zimbabwe, with less than half of average expected precipitation (SPI-12, figure 5, top). Southern Mozambique displays a similar condition, matching the only other recent event of 1992 (figure 5, third from top). The SPI at 3 months cumulative period explains at a finer temporal scale the succession of underperforming rain during key months (figure 5, second from top and bottom).

Concerning central and western Zambia, the SPI dropped steeply in the last few months, but does not reach such extreme values yet thanks to a relatively better 2018/19 rainy season (not shown).



Queque, Zimbabwe (-18.6 N, 29.4 E)

Machaze, Mozambique (-21.4 N, 32.9 E)

***Figure 5**: time-series of SPI for two selected locations. Notice the different cumulative periods on the vertical axis and the different time periods for SPI 03 and SPI 12.*

SPI outlook

The SPI forecasts for February (figure 6, left) and February to April (figure 6, right) do not highlight any deviations from normal over both Zimbabwe and southern Mozambique, nor for the marginally affected areas of Botswana and Zambia. Further South and North, but outside the core areas currently affected by deficits, wetter than usual weather is expected. Even a normal second half of the rainy season will be unable to offset the deficits accumulated during the first half of the current season and the last season. Given the strong precipitation seasonality over the region, if the dry season will start on a negative rainfall balance, such deficit will extend for several months ahead. ENSO is currently neutral and is forecasted to stay so in the next months[2].

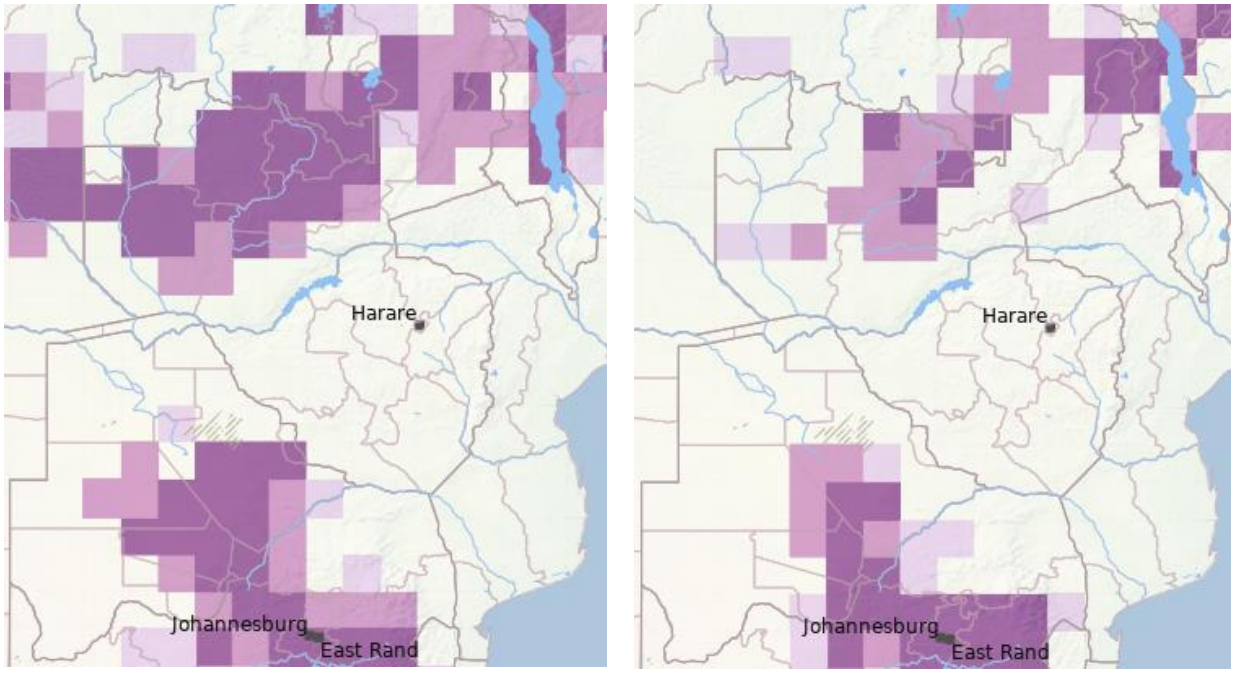


***Figure 6**: Precipitation anomaly forecasts for a cumulative period of one month (February 2020, left) and three months (February to April 2020, right).*

[2] https://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/

fAPAR anomaly

The fraction of Absorbed Photosynthetically Active Radiation (fAPAR) represents the fraction of the solar energy absorbed by leaves. fAPAR anomalies, specifically the negative deviations from the long-term average over the same period, are an indicator of drought impacts on vegetation.

Despite the consistent and uninterrupted rainfall scarcity, the fAPAR anomaly shows an improvement from early January to late January (figure 7). This might relate to the combination of two factors. The delayed sowing at the end of 2019, in response to dry conditions, shifted forward the whole crop cycle, therefore deceiving the long-term values upon which the anomaly indicator is computed. Second, despite the much lower precipitation in relative terms, January brought significant rain, which may have temporarily patched the deficit of water available to vegetation. However, a strong negative anomaly persists in several and large areas and there are no signs of actual recovery from any of the affected regions. A clearer picture of the effects of precipitation will show up towards the end of February/early March, as new data is processed.

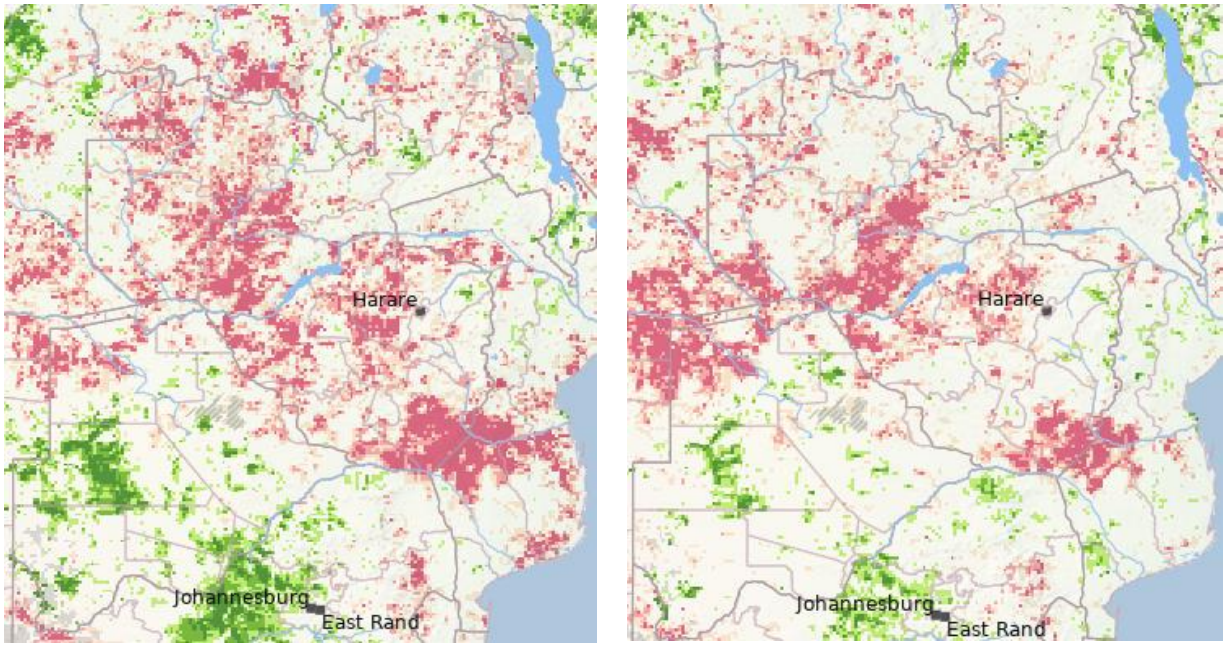


***Figure 7**: fAPAR anomaly for the period between 1st and 10th of January 2020 (left) and 21st and 31st January.*

Soil moisture anomaly

This indicator provides an assessment of the top soil water content, which is a direct measure of drought conditions, specifically the difficulty for plants to extract water from the soil.

Despite all signs of drought from prolonged below-average precipitation, the soil moisture anomaly has improved remarkably over all the affected areas during January (Figure 8). It is under investigation whether this positive trend is reversing in response to the persistent rainfall deficit or if it is holding through another dekad. However, soil conditions are definitely drier compared to the same period of the previous year, when no anomalies were detected and before dry conditions settled over the area (not shown).

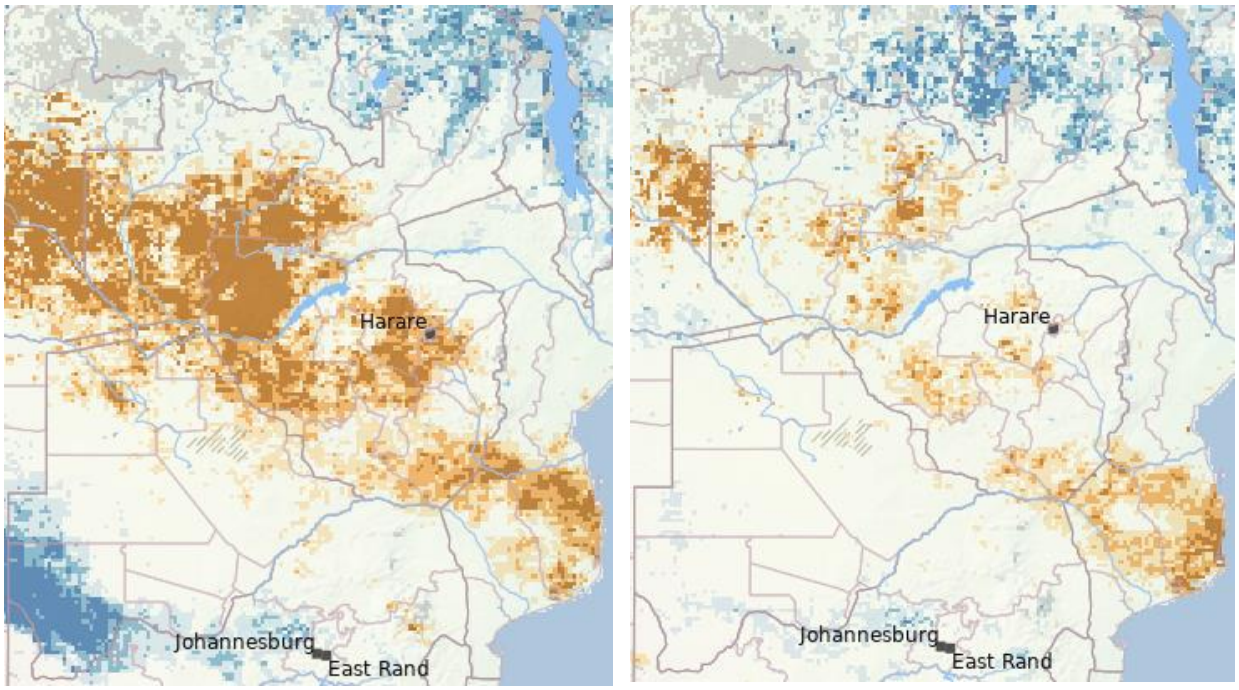
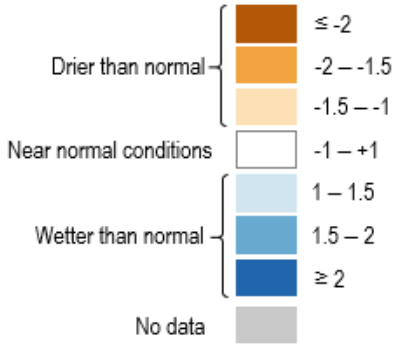


***Figure 8**: Soil moisture anomalies for early December to early January 2020 (left) and all of January 2020 alone (right).*



Looking at groundwater status, figure 9 shows a strong dry anomaly of storage at December 2019, particularly over Zimbabwe, southern Mozambique and parts of South Africa and Botswana. Its distribution matches that of mid and long-term precipitation deficit, as from SPI (see above). This is a clear indication of hydrological drought conditions, particularly of slow-responding hydrological quantities.

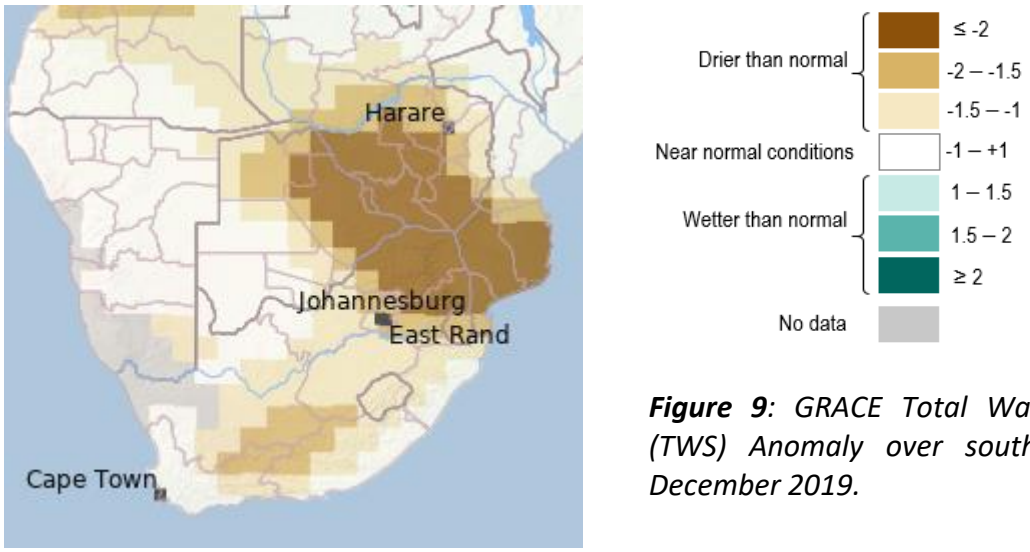


***Figure 9**: GRACE Total Water Storage (TWS) Anomaly over southern Africa, December 2019.*

Reported impacts

The incoming months of January and February are key for staple crops in southern Africa, but the combination of last year poor rainfall and the ongoing drought leaves little chance for any meaningful recovery before the end of the rainy season. The humanitarian situation is monitored by international aid organizations and becoming critical[4] [5] [6], as crops are confirmed severely hit[7] [8]. Food insecurity in Mozambique is going to deepen according to IPC reports[9], as well as the

All links accessed on 12/02/2020

[4] https://reliefweb.int/report/mozambique/mozambique-key-message-update-crisis-ipc-phase-3-outcomes-likely-emerge-due

[5] https://reliefweb.int/report/zambia/united-states-contributes-us339-million-wfp-drought-response-zambia

[6] https://reliefweb.int/report/zimbabwe/tackling-southern-africa-s-climate-driven-food-crisis-update-3-14-january-2020

[7] https://mars.jrc.ec.europa.eu/asap/

[8] https://reliefweb.int/sites/reliefweb.int/files/resources/SADC%20Agromet%20Update%20Issue-03%20-%202019-2020.pdf

[9] https://reliefweb.int/report/mozambique/mozambique-key-message-update-crisis-ipc-phase-3-outcomes-likely-emerge-due

economic downturn for the primary sector[10], with related food price rally[11]. In addition, during 2019, parts of Mozambique and eastern Zimbabwe were affected by the devastating cyclones Idai and Kenneth. The chance of severe storms and cyclones is highest between January and March.

Zimbabwe is currently consuming its limited grain reserve[12] [13]. Food prices have been increasing steeply since early 2019, now twelve times higher on a yearly basis[14]. Water supply is intermittent due to low reservoirs levels, forcing people to find alternative and unsafe sources[15] [16]. People were killed allegedly in relation to wildlife in search for water and grazing vegetation[17]. Livestock are facing starvation as well, forcing farmers to sell out assets[18] [19]. The combined effect of persistent drought and economic strain in the last year is hampering power supply, with a spiraling effect on the economy of both Zimbabwe and Zambia[20] [21]. Kariba reservoir, the biggest in the world and upon which about half of both countries power supply relies, is significantly lower than usual in this period, at below 10% of its usable capacity[22]. In Zambia, funds are being diverted to mitigate drought impacts[23] [24], while food prices are increasing[25]. Despite recent floods, which caused disruptions, the effects of drought are not softening.

Figure 10 shows the timing of crop stages for the main crops under normal conditions, for Zimbabwe. February is at the core of the growing season of important staple food. The late onset of rain in late 2019 pushed forward sowing and the whole crop cycle. The risk is to not accomplish a sufficient growth before the start of the dry season and thus ruin harvest.

[10] https://observador.pt/2020/02/08/mocambique-vai-precisar-de-mais-ajuda-alimentar-este-ano/
[11] http://www.fao.org/giews/food-prices/price-warnings/detail/en/c/1261435/
[12] https://www.reuters.com/article/zimbabwe-grains/zimbabwe-says-grain-stocks-running-out-after-drought-idUSL8N29S3S1
[13] http://www.xinhuanet.com/english/2020-02/07/c_138763882.htm
[14] http://www.fao.org/giews/food-prices/price-warnings/detail/en/c/1261425/
[15] https://www.reuters.com/article/us-climate-change-zimbawe-water-idUSKBN1ZQ0IM
[16] https://www.newzimbabwe.com/60-zim-water-sources-unsafe-unicef/
[17] https://www.newzimbabwe.com/drought-ignites-human-wildlife-conflict-in-zimbabwe/
[18] https://www.newzimbabwe.com/southern-region-cattle-farmers-told-to-destock-as-drought-situation-worsens/
[19] https://www.newzimbabwe.com/21-000-cattle-die-in-mat-provinces-as-drought-takes-toll-report/
[20] https://www.newzimbabwe.com/drought-and-mounting-debt-leaves-zambia-and-zimbabwe-in-the-dark/
[21] https://www.theindependent.co.zw/2019/12/20/another-strenuous-year-for-business/
[22] http://www.zambezira.org/hydrology/lake-levels
[23] https://africanewswire.za.com/zimbabwe-african-development-bank-group-approves-grant-for-disaster-risk-management-training/
[24] https://www.infoafrica.it/2020/01/09/contributo-italiano-per-combattere-la-fame-causata-dalla-siccita-in-zambia/
[25] http://www.fao.org/giews/food-prices/price-warnings/detail/en/c/1261426/

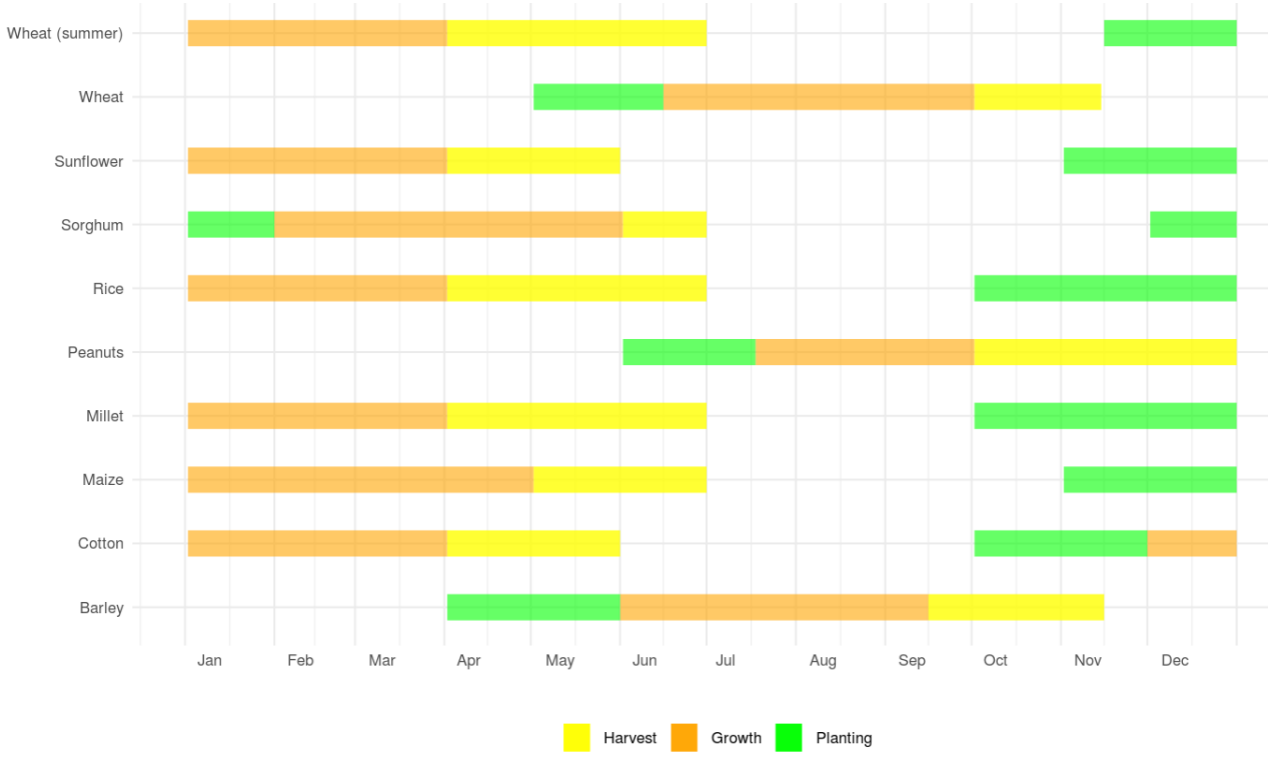


***Figure 10**: Timing of crop stages for main crops in Zimbabwe. Elaborated from Sacks et al. (2010)[26].*

[26] https://onlinelibrary.wiley.com/doi/full/10.1111/j.1466-8238.2010.00551.x

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***Authors**: Masante D.[i], Magni D.[i], Vogt J.[ii], Cammalleri C.[ii]*

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[i] External consultant for the European Commission (Arcadia SIT, Vigevano, Italy)
[ii] European Commission, Joint Research Centre, Ispra (VA), Italy