# Africa RiskView

## END OF SEASON REPORT | ZAMBIA (2020/21)

This ***Africa RiskView* End of Season Report** is a publication by the **African Risk Capacity (ARC)**. The report discusses *Africa RiskView's* estimates of rainfall, drought and population to be affected, comparing them to information from the ground and from external sources. It also provides the basis of a validation exercise of *Africa RiskView*, which is conducted in each country at the end of an insured season. This exercise aims at reviewing the performance of the model and ensuring that the country's drought risk is accurately reproduced by *Africa RiskView* for drought monitoring and insurance coverage. The mid-season-sowing reports are also being continuously refined with a view to providing early warning to ARC member countries.

## HIGHLIGHTS:

**RAINFALL:**

- Overall rainfall from the start of the sowing window (11 November) up to the end of the season (30 April, 2021) was above normal and stable throughout Zambia.
- The northern parts of Zambia had an early start of the season with the rest of the country except the eastern parts recording a normal start of season.

**DROUGHT:**

- Excellent growing conditions were observed at the end of season for much of Zambia. The end of season WRSI anomaly showed normal to above normal conditions for the whole country.

**AFFECTED POPULATIONS:**

- At the end of the season i.e. dekad 12 (April dekad 3), no people were modelled to be directly affected by drought impacts according to the Africa RiskView drought model.

**AFFECTED POPULATIONS:**

- Due to the overall good performance of the rainfall season, there is no pay-out expected to be triggered for Zambia.

### RAINFALL

For much of Zambia, rainfall for the 2020/2021 season (11 November-30 April) was largely above average, with the cumulative rainfall varying across the country from 1011 mm in Siavonga to as high as 1459 mm in Nyimba (Fig: 1). In addition, the rainfall during the early part and the mid-part of the season was well distributed over the whole country (except for eastern parts), resulting in good soil moisture conditions for supporting crop development.

At the start of the season in November, above normal rainfall was received over most parts of the country except for the eastern parts which were characterised by below normal rainfall (Figure 3). The below normal rainfall was also led to late onset of the season over parts of eastern Zambia. However, as the season progressed from December to February (Figures 4,5,6) above normal rainfall received throughout the country and in particular over the eastern parts of the country helped to offset soil moisture deficits over eastern Zambia, providing conducive conditions for supporting crop development. However, the above normal rainfall from December to February was reported to have caused localised flooding which affected crops .

As the season progressed into March, the south western parts of Zambia experienced slightly below normal rainfall (Figure 8). During the month of April, which marks the end of the season, the below normal rainfall conditions gradually expanded across the whole country except for the extreme northern parts of the country



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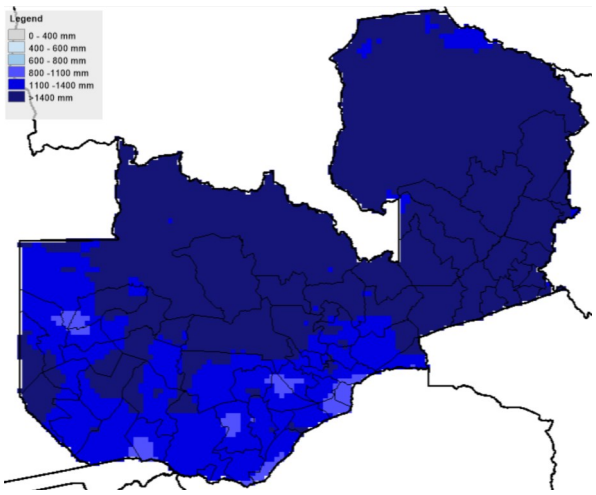


FIG 1: CUMULATIVE RAINFALL (MM) RECEIVED IN ZAMBIA (DEKAD 32-DEKAD 12), BASED ON RFE2 SATELLITE ESTIMATES.

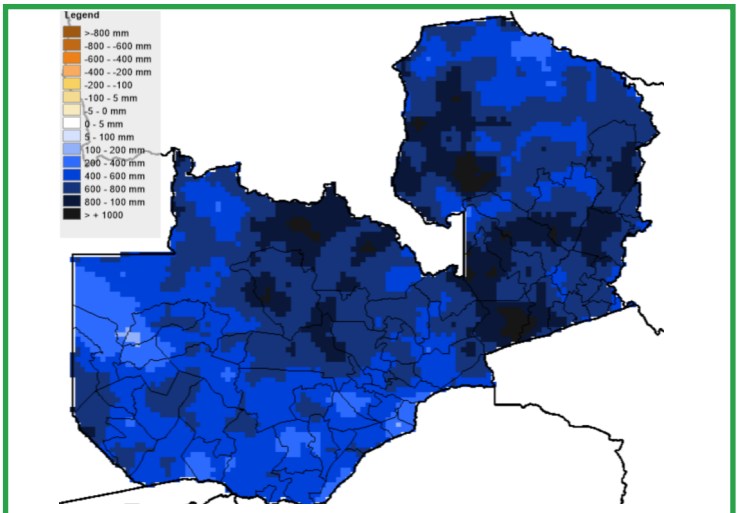


FIG 2: CUMULATIVE RAINFALL ANOMALY (MM) (DEKAD 32-DEKAD 12)

(Figure 9). Despite, the below normal rainfall condition experienced towards the end of the season, the seasonal total rainfall was generally above average over the whole country (Figure 2).

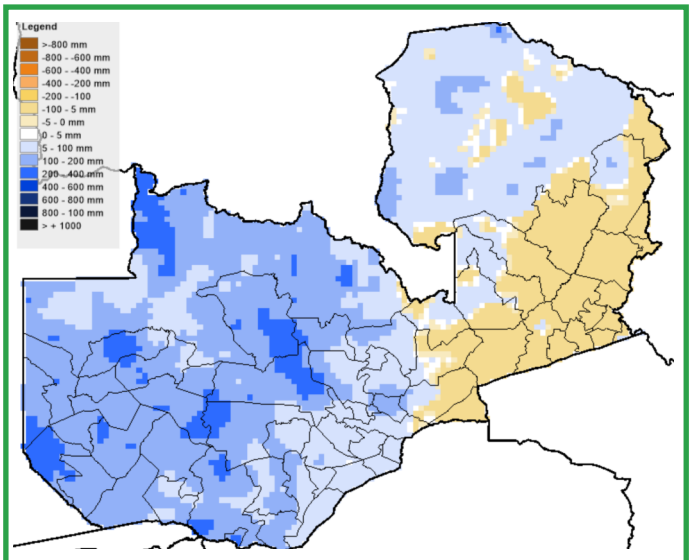


FIG 3: CUMULATIVE RAINFALL ANOMALY (MM) (NOVEMBER 2020)

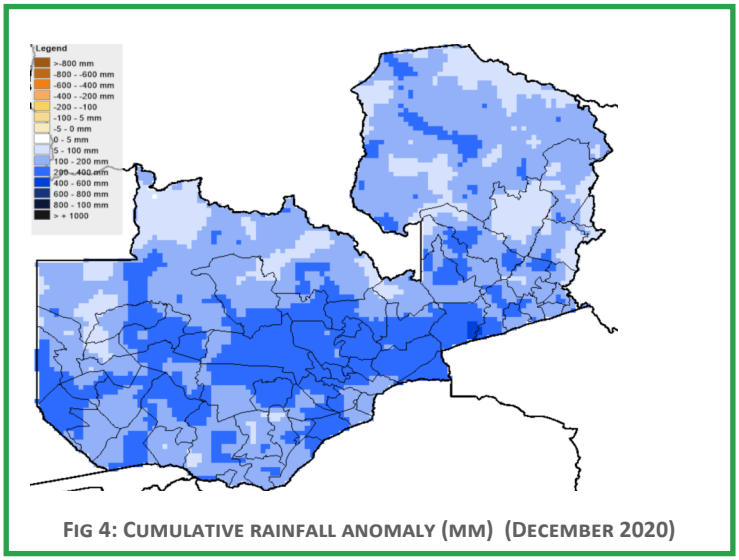


FIG 4: CUMULATIVE RAINFALL ANOMALY (MM) (DECEMBER 2020)

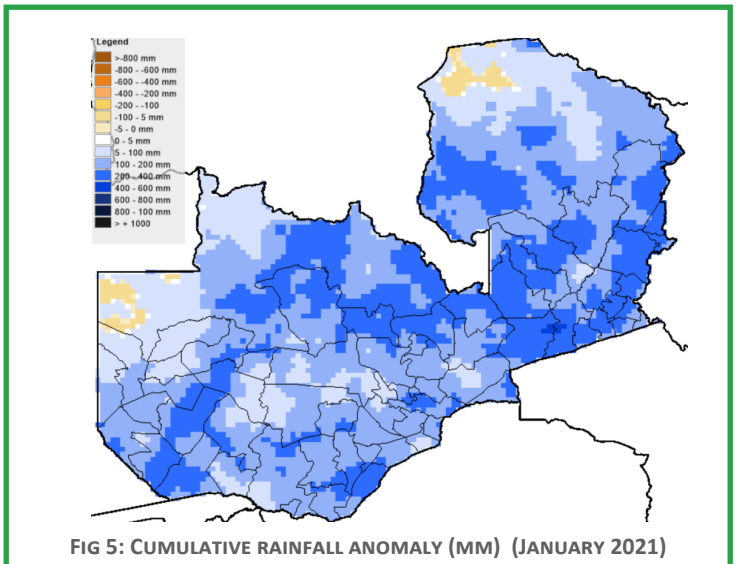


FIG 5: CUMULATIVE RAINFALL ANOMALY (MM) (JANUARY 2021)

### DROUGHT INDEX

The computation of the drought index (WRSI) starts when the sowing conditions have been met. Sowing in *Africa RiskView* is triggered when the country-specific dekadal



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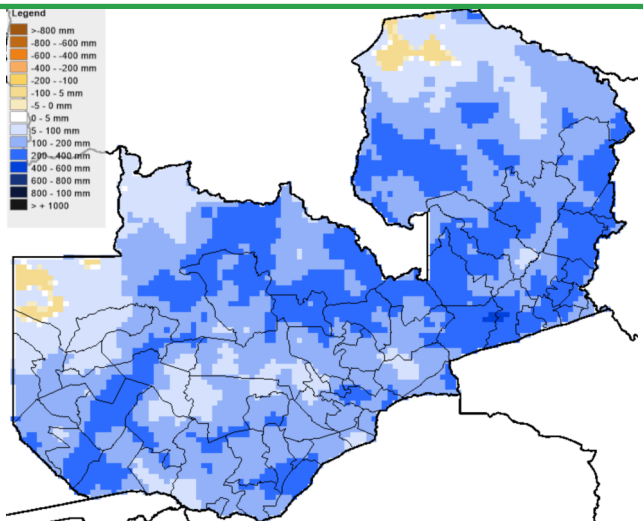


FIG 6: CUMULATIVE RAINFALL ANOMALY (MM) (JANUARY 2021)

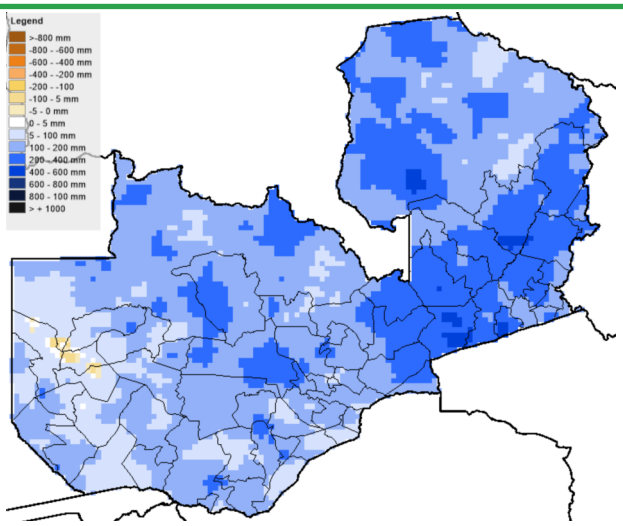


FIG 7: CUMULATIVE RAINFALL ANOMALY (MM) (FEBRUARY 2021)

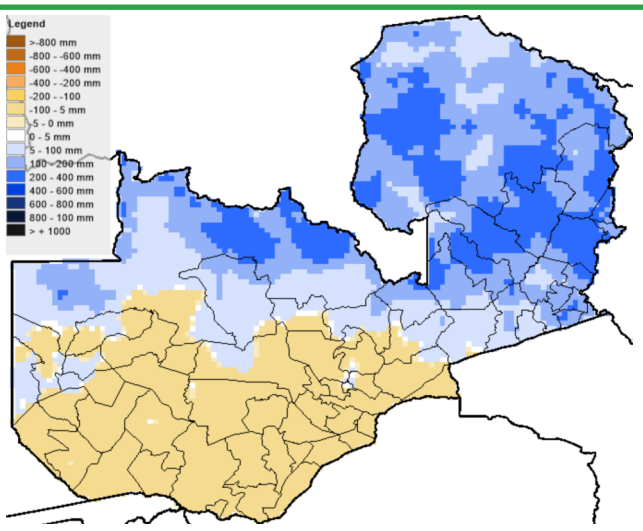


FIG 8: CUMULATIVE RAINFALL ANOMALY (MM) (MARCH 2020)

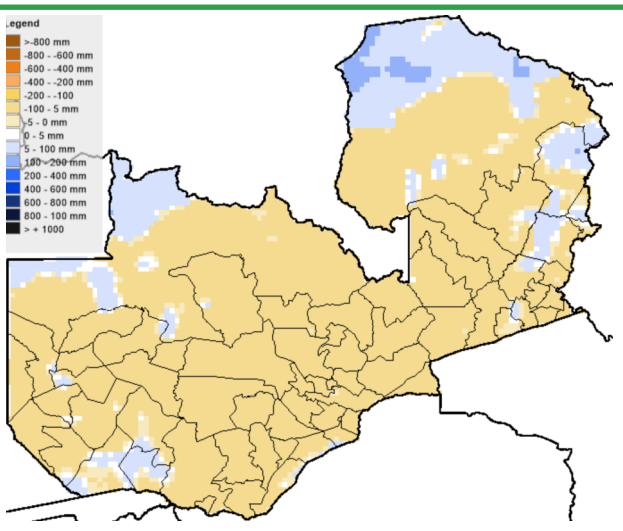


FIG 9: CUMULATIVE RAINFALL ANOMALY (MM) (APRIL 2020)

rainfall criterion is met. This criteria for Zambia require rainfall events within the sowing window in which a minimum of 20 mm of rainfall is received in one dekad followed by at least 15 mm of rainfall in the second dekad and at least 5 mm of rainfall in the third dekad. If this sowing criterion is not met, it is assumed that farmers would not have planted, or would have had unsuccessful planting. Additionally, the "First" sowing opportunity aggregation method was assumed to model farmers response to sowing chances. According to this assumption, farmers are expected to take advantage of the first sowing opportunity when and if realized.

In accordance with these definitions, all the regions of Zambia covered in the crop mask had a successful sowing for the 2020/21 season. Most of the sowing, according to Africa RiskView's customization, occurred between dekads 32 and 34 (Fig: 10) with most parts of the country ex-

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periencing no water stress.

### WRSI

*Africa RiskView* uses the Water Requirement Satisfaction Index (WRSI) as an indicator for drought. WRSI is an indicator of crop performance based on the availability of water to the crop during a growing season. The index captures the impact of timing, amount and distribution of rainfall on staple annual rain-fed crops. The WRSI was initially developed by the Food and Agriculture Organisation of the United Nations (FAO), which, based on rainfall, calculates whether a particular crop's water requirements are met at different stages of its development. In Southern Africa, maize has been used as a reference crop and parameters in *Africa RiskView* have been customised to reflect the local conditions and agricultural practices.

Estimates of crop water requirements for maize in Zambia during the sowing season, calculated using the Water Requirements Satisfaction Index (WRSI) in *Africa RiskView*, have been satisfied for much of Zambia with most of the

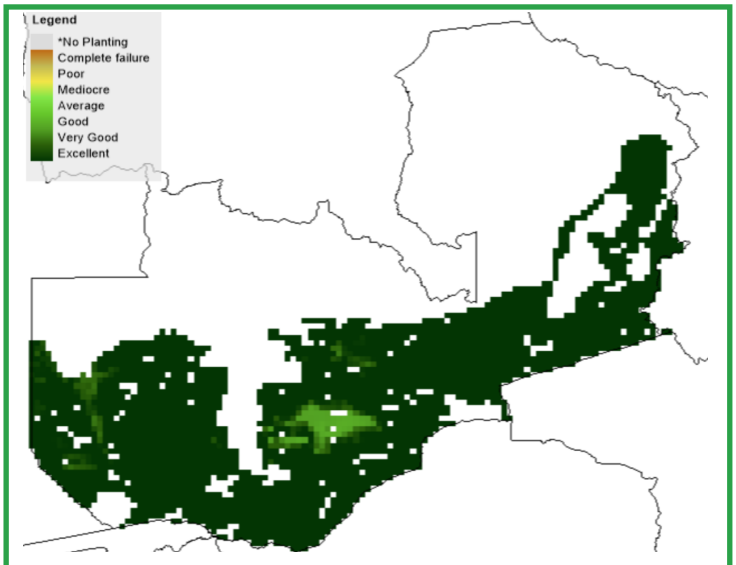


FIG 11: END-OF-SEASON WRSI FOR ZAMBIA FOR DEKAD 32 – DEKAD 12 FOR THE 2020/2021 AGRICULTURAL SEASON.

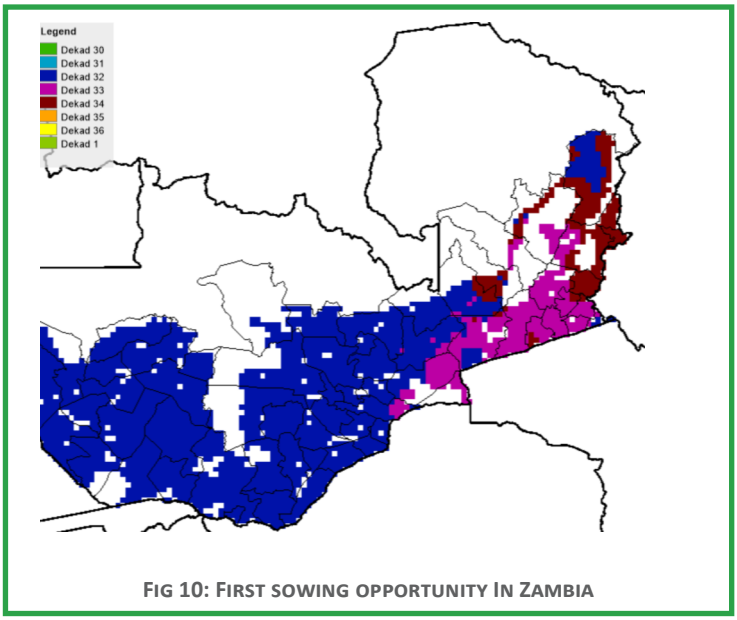


FIG 10: FIRST SOWING OPPORTUNITY IN ZAMBIA

country indicating excellent growth conditions for the 2020/2021 season (Fig: 11), The end of season WRSI anomaly also showed normal to above normal conditions (Fig 12), indicating very good vegetation growing conditions.

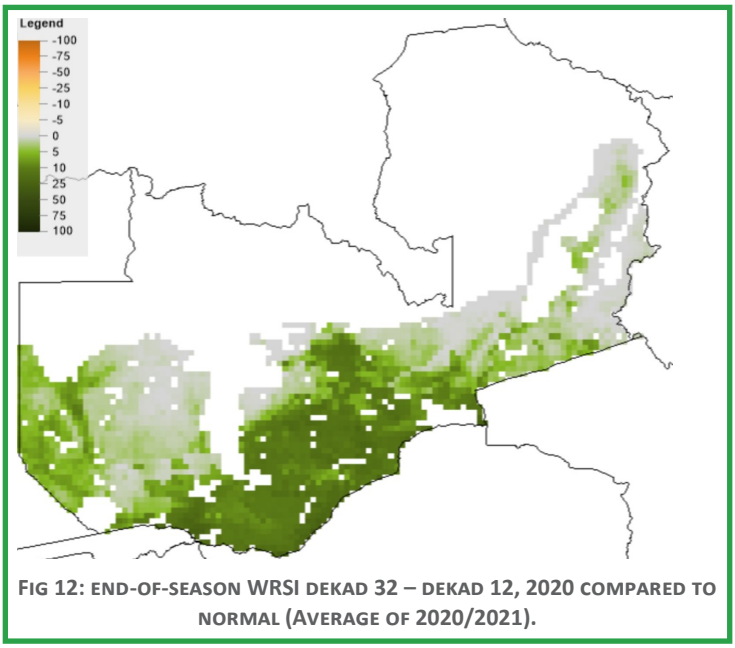


FIG 12: END-OF-SEASON WRSI DEKAD 32 – DEKAD 12, 2020 COMPARED TO NORMAL (AVERAGE OF 2020/2021).



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### Population Affected

Based on the season's rainfall performance, the Africa RiskView software can provide estimates of populations likely to be affected by drought by the end of the agricultural season. From the customisation of *Africa RiskView,* around 5.7 million people are modelled as vulnerable to drought in Zambia.

As at the end of the 2020/21 season (30 April 2020), the *Africa RiskView* drought model estimates indicated that none of the vulnerable people were affected by drought conditions (Fig: 13). This was due to combination of an early onset of rainfall and above normal rainfall which

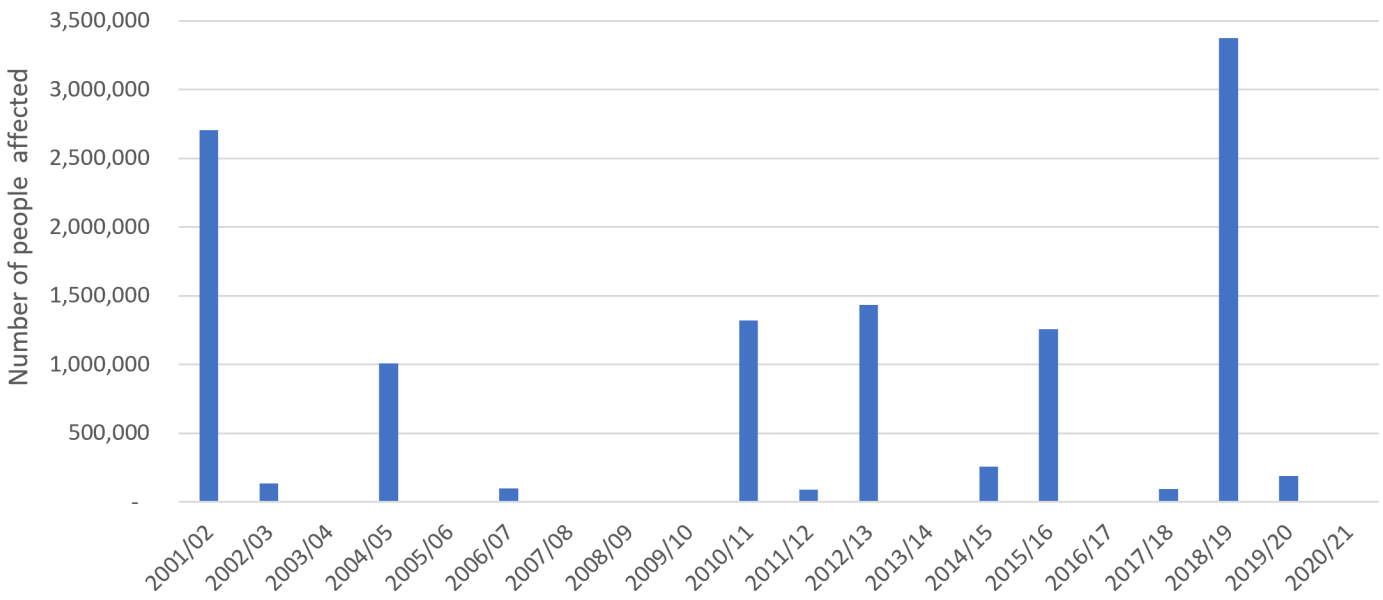


Fig 13: Estimated number of people affected by drought the end of season

was evenly distributed throughout the country and the growing season (Fig: 14 - Fig: 23). The above normal rainfall conditions provided sufficient soil moisture to sustain the crops during the season leading to a bumper harvest in Zambia.

The findings presented in the report are consistent with reports from Zambia meteorological department, FEWSNET, FAO and SADC. These reports also noted the above normal rainfall condition which resulted in good harvests which were 7% higher than the previous season. The maize yield for the 2020/21 season was reported to be above 3.5 million tonnes (FAO, 2021 -GIEWS country brief).

# Africa RiskView

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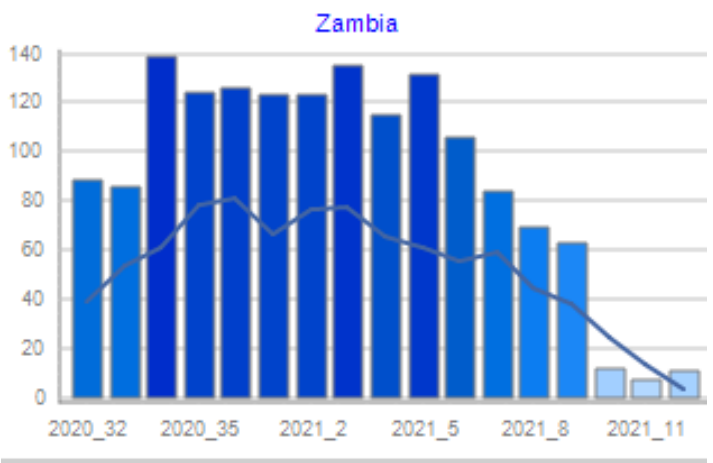


FIG 14: TEMPORAL DISTRIBUTION OF RAINFALL IN ZAMBIA COMPARED TO

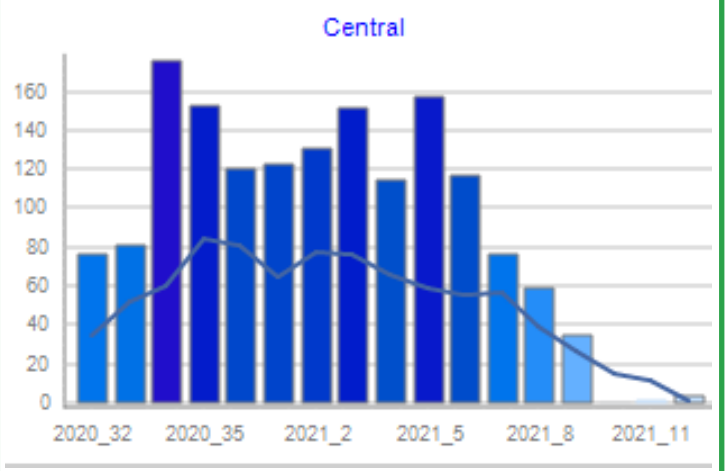


FIG 15: TEMPORAL DISTRIBUTION OF RAINFALL IN CENTRAL COMPARED TO

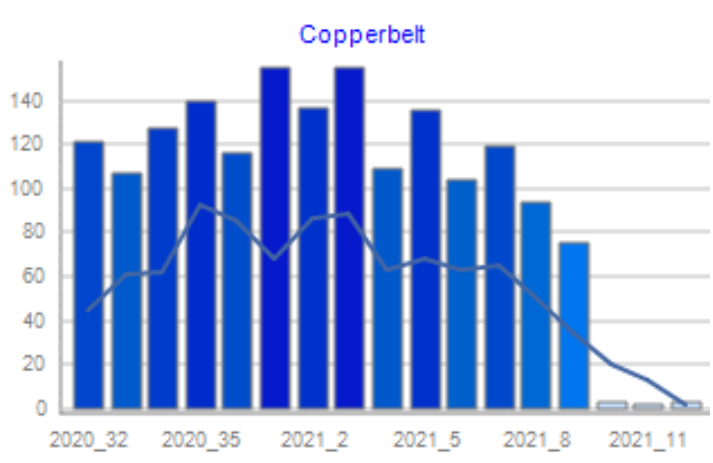


FIG 16: TEMPORAL DISTRIBUTION OF RAINFALL IN COPPERBELT COMPARED TO THE LONG-TERM AVERAGE (DEKAD 32 TO DEKAD 12), RFE 2.

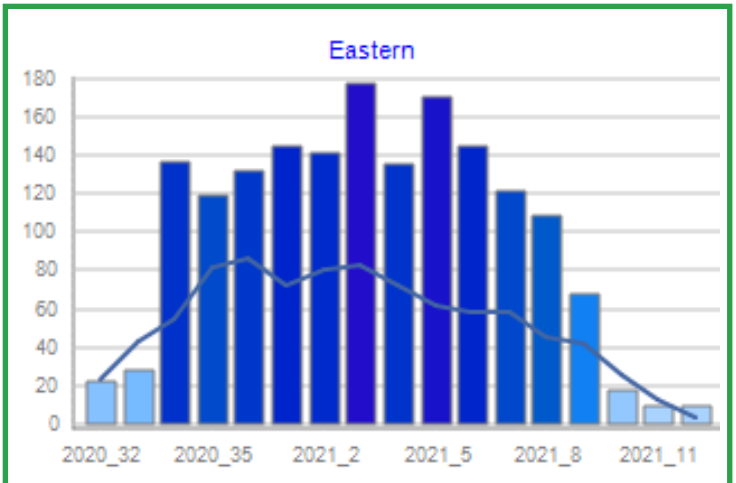


FIG 17: TEMPORAL DISTRIBUTION OF RAINFALL IN EASTERN COMPARED TO THE LONG-TERM AVERAGE (DEKAD 32 TO DEKAD 12), RFE 2.

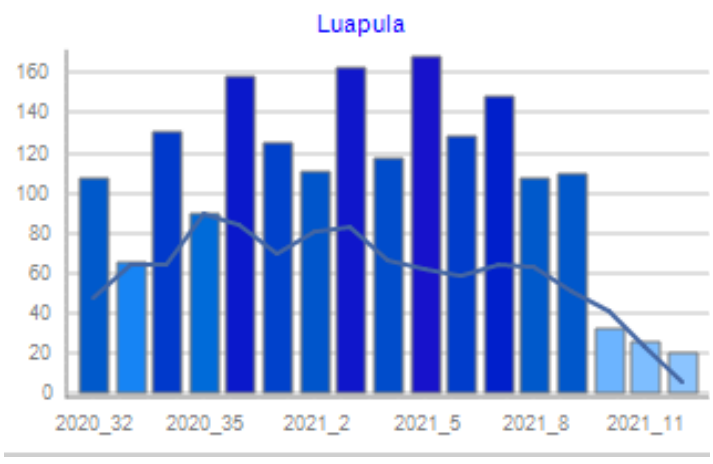


FIG 18: TEMPORAL DISTRIBUTION OF RAINFALL IN LUAPULA COMPARED TO THE LONG-TERM AVERAGE (DEKAD 32 TO DEKAD 12), RFE 2.

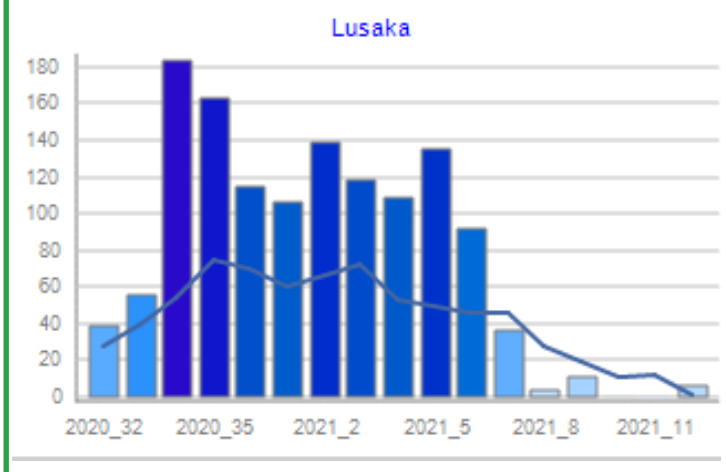


FIG 19: TEMPORAL DISTRIBUTION OF RAINFALL IN LUSAKA COMPARED TO THE LONG-TERM AVERAGE (DEKAD 32 TO DEKAD 12), RFE 2.

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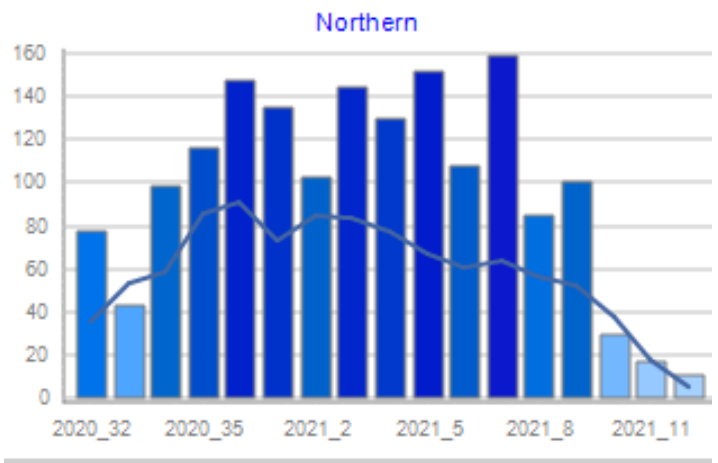


FIG 20: TEMPORAL DISTRIBUTION OF RAINFALL IN NORTHERN COMPARED TO THE LONG-TERM AVERAGE (DEKAD 32 TO DEKAD 12), RFE 2.

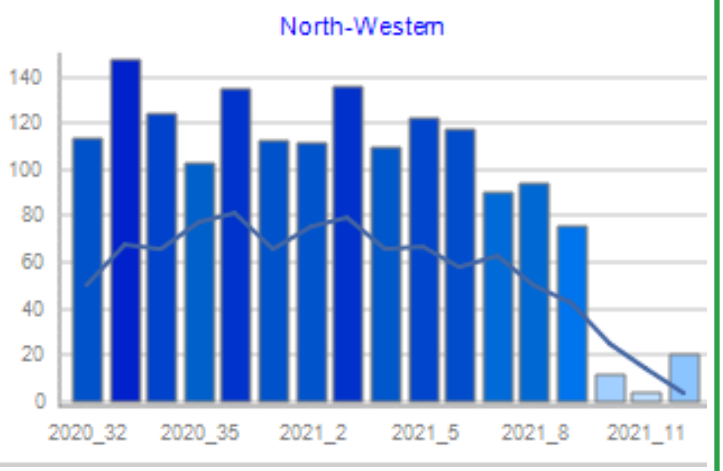


FIG 21: TEMPORAL DISTRIBUTION OF RAINFALL IN NORTH-WESTERN COMPARED TO THE LONG-TERM AVERAGE (DEKAD 32 TO DEKAD 12), RFE 2.

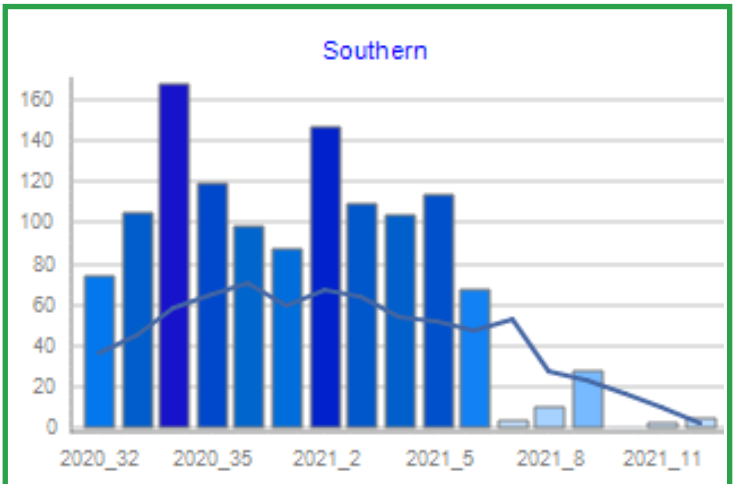


FIG 22: TEMPORAL DISTRIBUTION OF RAINFALL IN SOUTHERN COMPARED TO THE LONG-TERM AVERAGE (DEKAD 32 TO DEKAD 12), RFE 2.

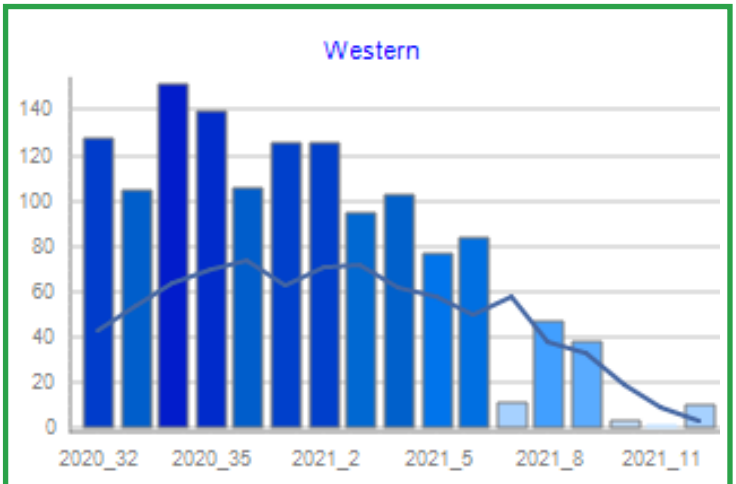


FIG 23: TEMPORAL DISTRIBUTION OF RAINFALL IN WESTERN COMPARED TO THE LONG-TERM AVERAGE (DEKAD 32 TO DEKAD 12), RFE 2.

# *Africa RiskView*

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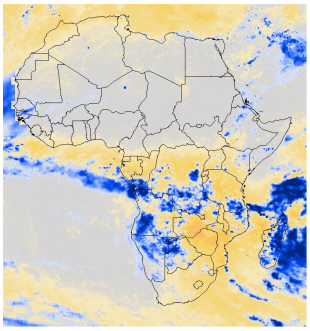
### About ARC:

The **African Risk Capacity (ARC)** is a specialised agency of the African Union designed to improve the capacity of AU Member States to manage natural disaster risk, adapt to climate change and protect food insecure populations.

The ***Africa RiskView*** software is the technical engine of ARC. It uses satellite-based rainfall information to estimate the costs of responding to a drought, which triggers a corresponding insurance payout.

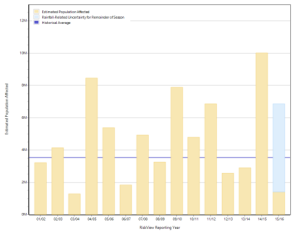
The **ARC Insurance Company Limited** is the financial affiliate of the ARC Agency, which pools risk across the continent through issuing insurance policies to participating countries.

### Note on *Africa RiskView's* Methodology:

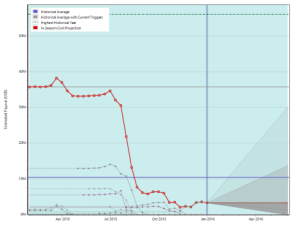


**Rainfall:** *Africa RiskView* uses various satellite rainfall datasets to track the progression of rainy seasons in Africa. Countries intending to participate in the ARC Risk Pool are required to customise the rainfall component by selecting the dataset which corresponds the best to the actual rainfall measured on the ground.

**Drought:** *Africa RiskView* uses the Water Requirements Satisfaction Index (WRSI) as an indicator for drought. The WRSI is an index developed by the Food and Agriculture Organisation of the United Nations (FAO), which, based on satellite rainfall estimates, calculates whether a particular crop is getting the amount of water it needs at different stages of its development. To maximise the accuracy of *Africa RiskView*, countries intending to take out insurance customise the software's parameters to reflect the realities on the ground.



**Affected Populations:** Based on the WRSI calculations, *Africa RiskView* estimates the number of people potentially affected by drought for each country participating in the insurance pool. As part of the in-country customisation process, vulnerability profiles are developed at the sub-national level for each country, which define the potential impact of a drought on the population living in a specific area.



**Response Costs:** In a fourth and final step, *Africa RiskView* converts the numbers of affected people into response costs. For countries participating in the insurance pool these national response costs are the underlying basis of the insurance policies. Payouts will be triggered from the ARC Insurance Company Limited to countries where the estimated response cost at the end of the season exceeds a pre-defined threshold specified in the insurance contracts.