Africa RiskView

END OF SEASON REPORT | Mozambique (2020/21 SEASON)

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 reports are also being continuously refined with a view to providing early warning to ARC member countries.

Highlights:

Rainfall:

- The cumulative rainfall for the growing season in Mozambique, spanning from dekad 29 (October 11) to dekad 11 (April 20), was substantially above normal.
- The season had a poor start in southern and parts of the central regions, with below-normal rainfall amounts recorded in October and November. This later improved, with significantly above-normal rainfall reported in December, January, and February.
- The period towards the end of the growing season, spanning from March 1 to April 20, was characterized by below-normal rainfall in most parts of Mozambique.

Drought:

- According to the sowing criteria defined in *Africa RiskView*, sowing was successful throughout Mozambique.
- The comparison of the WRSI values as modelled by *Africa RiskView* with the selected reference benchmark (the median of the past 5 years) shows that the modelled WRSI values were normal (near to above benchmark) in most parts of the country.

Affected Populations:

- According to the *Africa RiskView* agricultural drought model, no people were estimated as affected by drought in Mozambique. This was due to the relatively favourable agroclimatic conditions of the 2020/21 agricultural season.

Rainfall

The growing season of the reference crop selected for Mozambique 2020/21 *Africa RiskView* customisation, maize, runs from dekad 29 to dekad 11, i.e. October 11 to April 20. Based on RFE2[1] satellite estimates, the cumulative rainfall received during this period was significantly above normal. At the national level, cumulative rainfall amounts reached 155% of the normal as defined in *Africa RiskView* (average cumulative rainfall for the period from 2001 to 2019) .

As depicted in Figure 1, the cumulative rainfall for the period between dekad 29 to dekad 11 was substantially higher than normal across the entire calculation mask[2] of Mozambique, with some districts registering double the normal rainfall amount. During the same period, districts in the Southern Region received cumulative rainfall amounts ranging from 115% to 194% of the normal. Similarly, cumulative rainfall in the Central Region districts was between 112% to 197% of the normal. The two districts in the Northern Region that are part of the areas for drought risk modelling, namely Moma

[1] The satellite rainfall dataset selected for modelling drought risk in Mozambique
[2] The geographical domain considered for the drought risk modelling

and Larde, had cumulative rainfall amounts of 127% and 122% of the normal, respectively.

The rainfall at the beginning of the season, i.e., from the second to the third dekad of October, was below normal in most parts of Mozambique, except for most of Tete and western Zambezia, where rainfall was slightly higher than normal—Figure 2. The subsequent month of November witnessed improvements with most parts of Mozambique registering close to normal to above normal conditions. During the same period, the eastern parts of Zambezia and pockets throughout the country received below normal cumulative rainfall—see Figure 3. The rainfall conditions further improved during the months of December, January and February. Most of Mozambique received above normal cumulative rainfall during this period, especially in January and the first two dekads of February—Figures 4 to 6. The period toward the end of the growing season, spanning from March 1 to April 20, was characterised by below normal performance except for pockets in Southern Region and northern parts of the Central Regio—Figure 7.The below normal rainfall towards the end of the season is expected to have minimal effect on yield since crops would be reaching physiological maturity by then.

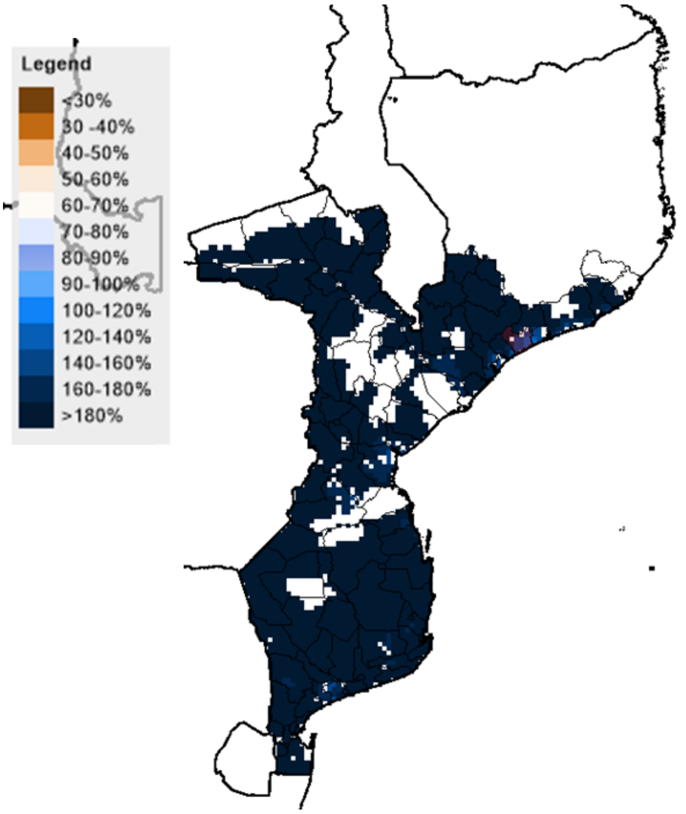

Figure 1: Cumulative Rains as % of normal, (November 11, 2020 –April 20, 2021), RFE2

Looking at the temporal distribution, the season in southern Mozambique (Maputo, Gaza and Inhambane provinces) had a poor start, characterised by below normal rainfall in dekad 30 and 32. The situation improved in the subsequent period, ranging from dekad 33 (November 21 to 30 of 2020) up to dekad 5 (February 11 to 20 of 2021), with normal to above normal rainfall conditions experienced in most of the country's southern parts. Some of the dekads after dekad 5 recorded below normal rainfall. Similar conditions were observed in the central provinces of Manica and Sofala. In contrast, Tete province received above-normal rainfall that extended up to dekad 9, followed by slightly below normal rainfall in April (dekad 10 and 11). Zambezia and Nampula provinces experienced below normal rainfall in dekad 32 and 33, followed by close to normal to above normal rain up to dekad 36 of 2020. Subsequently, below normal rainfall was received from dekad 36 of 2020 to dekad 1 of 2021 in Nampula, and from dekad 36 of 2020 to dekad 2 of 2021 in Zambezia —see Figure 8.

Sowing in *Africa RiskView* triggers upon the fulfilment of predefined dekadal rainfall criteria. These criteria for Mozambique require a minimum of 15mm rain in any dekad within the sowing window, followed by 5mm of rain in the two subsequent dekads following it. If these conditions are not met,

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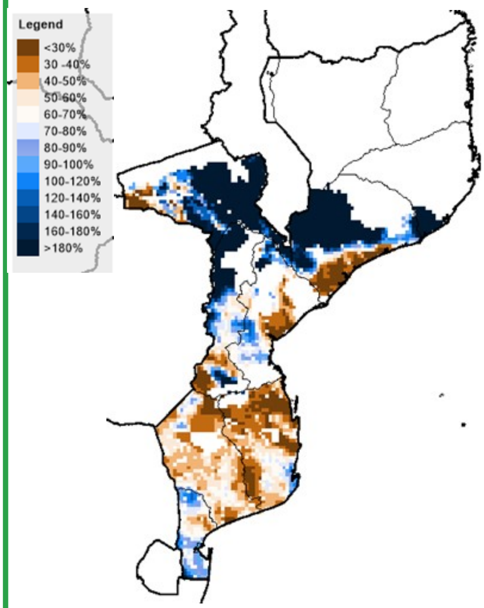


Figure 2: Rainfall as % of normal (October 11–31, 2020), RFE2

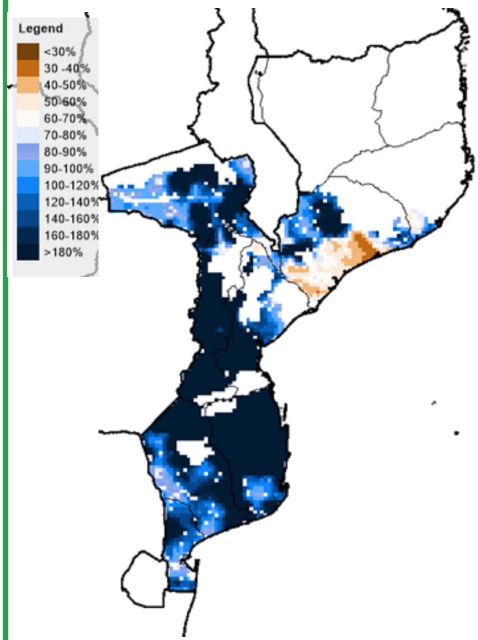


Figure 3: Rainfall as % of normal (November 1–30, 2020), RFE2

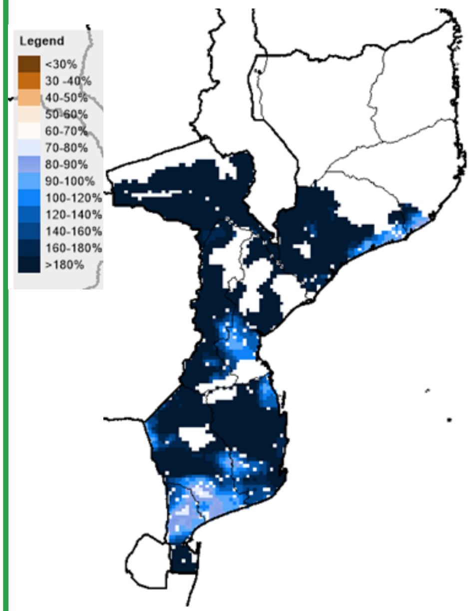


Figure 4: Rainfall as % of normal (December 1, –31, 2020), RFE2

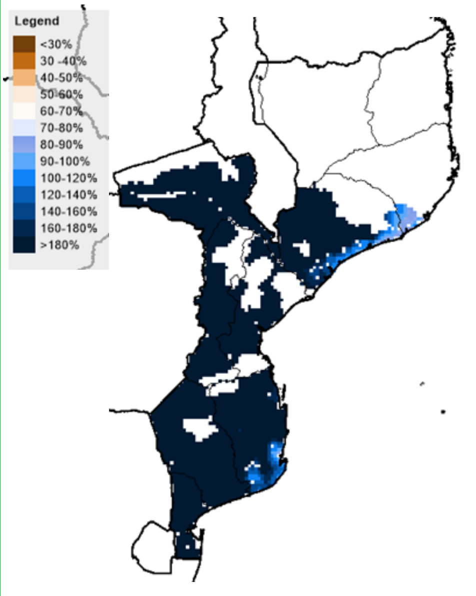


Figure 5: Rainfall as % of normal (January 1, –January 31, 2021), RFE2

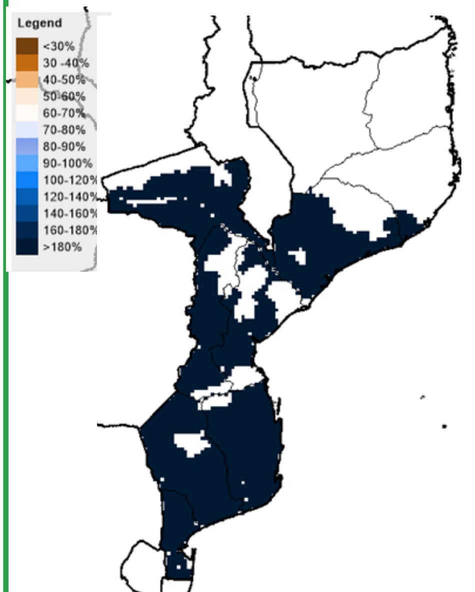


Figure 6: Rainfall as % of normal (February 1, –February 28, 2021), RFE2

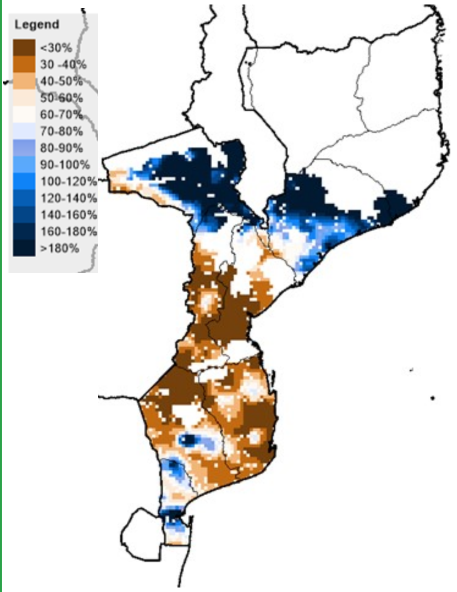


Figure 7: Rainfall as % of normal (March 1, – April 20, 2021), RFE2

it is assumed that optimal conditions to facilitate successful sowing have not been achieved and as such, sowing is modelled as unsuccessful. Additionally, the "Average" WRSI aggregation method was assumed to model farmers' response to sowing opportunities. According to this assumption, farmers are assumed to take advantage of any one of the sowing opportunities within the sowing window and, season performance is evaluated based on average conditions calculated using all the successful sowing opportunities realised within the sowing window.

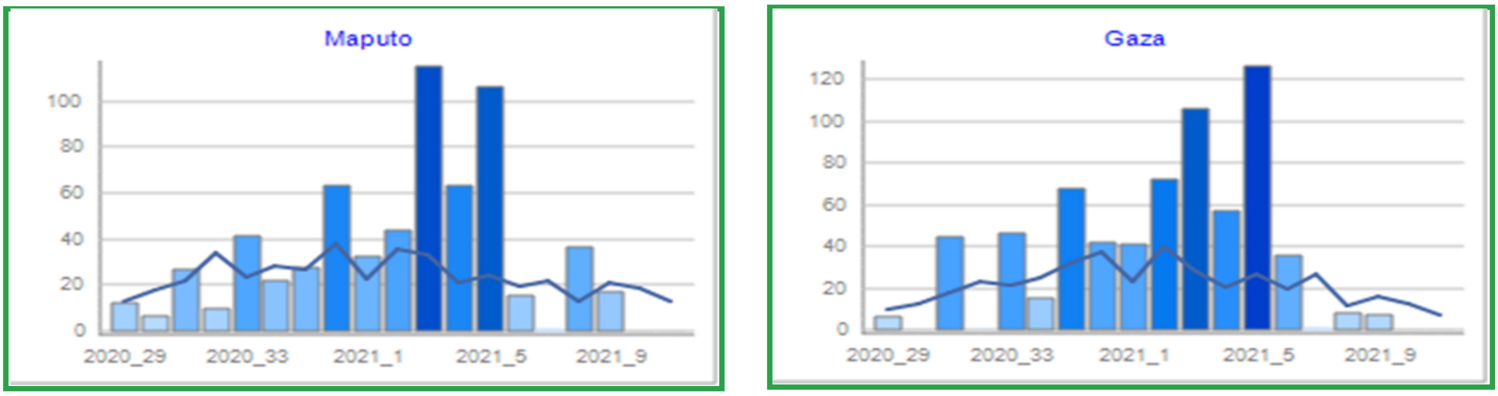
Based on the sowing criteria described above, up to eight sowing opportunities were detected across Mozambique. In most parts of Maputo, Gaza and Inhambane, three to four sowing opportunities were realised, although some parts of these provinces had two sowing chances. Isolated areas in Maputo had as many as eight sowing opportunities. In central Mozambique, covering most of Manica, Sofala and Tete, four sowing opportunities were realised. Most of Zambezia province had three to four sowing chances. The north western parts of Zambezia had six to seven sowing opportunities, while the coastal area in the east had one sowing chance—Figure 9.

The first sowing opportunity in most parts of Mozambique was realized in dekad 33. Pockets in central and southern Mozambique had their first sowing chance earlier than dekad 33, while small parts of Maputo, Gaza and Inhambane had relatively delayed sowing with the first sowing opportunity realised in dekad 35—see Figure 10.

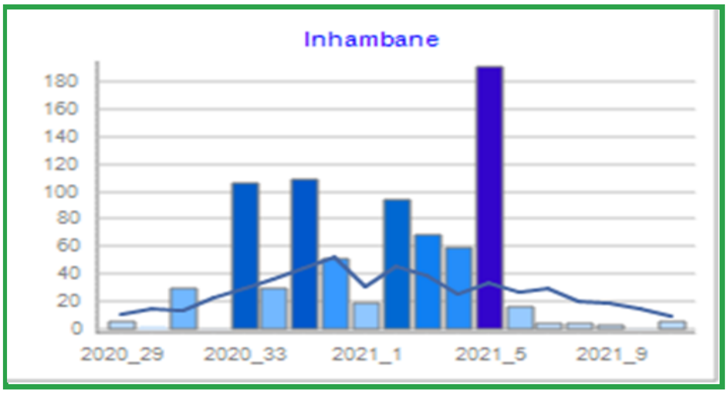
Drought Index

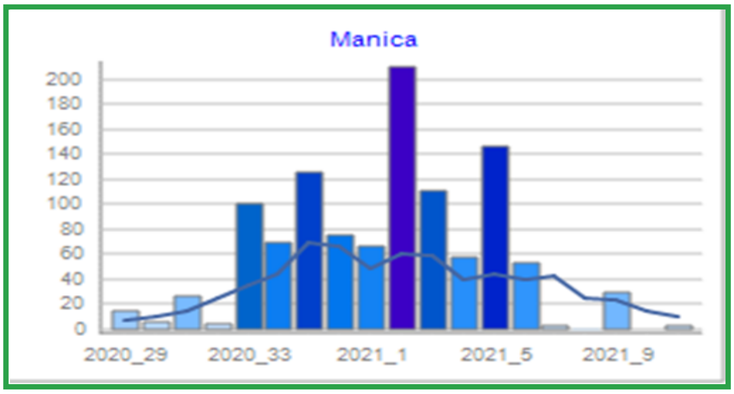
Africa RiskView uses the Water Requirements Satisfaction Index (WRSI) as a proxy indicator for drought. The WRSI is an index originally developed by the Food and Agriculture Organisation of the United Nations (FAO), which, based on satellite rainfall estimates, calculates whether a particular crop is receiving the amount of water it needs at different stages of its development. In Mozambique, maize was used as the ref-

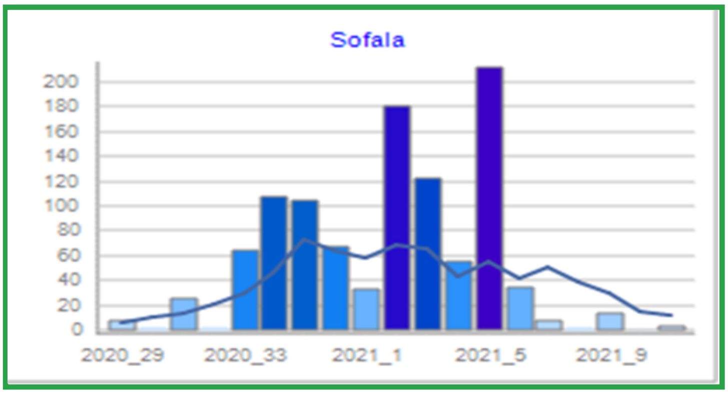
Figure 8: Dekadal distribution of rainfall (dekad 29, 2020– dekad 5,2021), RFE2

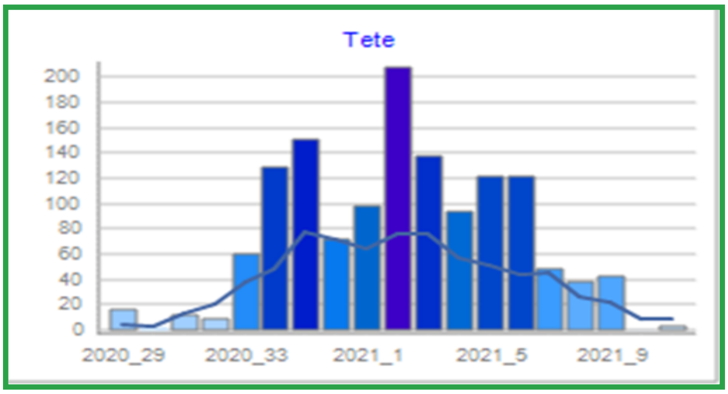


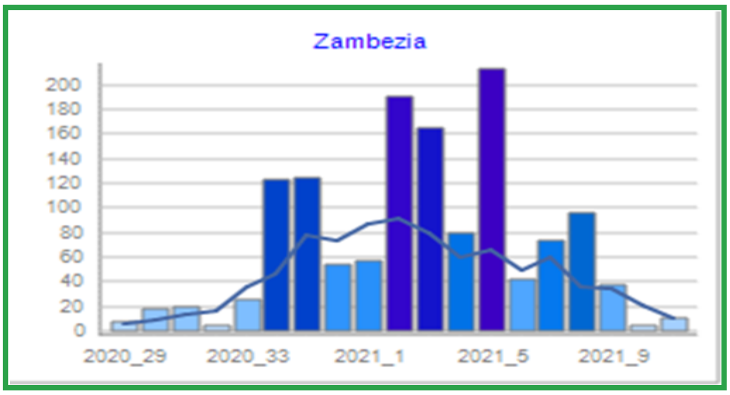
[2] https://fews.net/sites/default/files/documents/reports/MOZAMBIQUE_Food_Security_Outlook_02.2020_FINAL_EN.pdf
[3] The calculation mask does not cover the entire Northern Region and the WRSI analysis covered only parts of the Northern region included in the calculation mask.

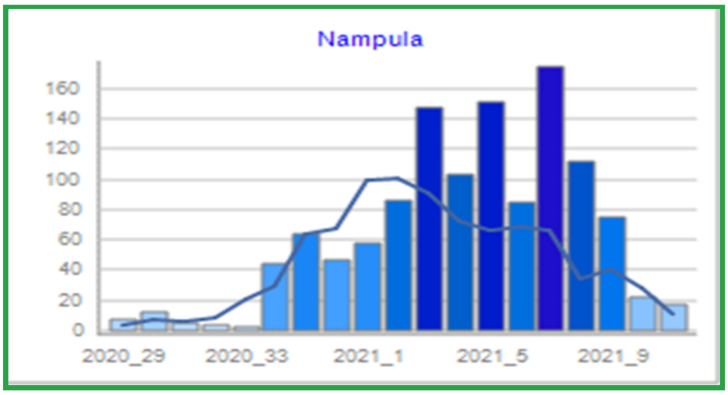












erence crop and the WRSI within *Africa RiskView* was customised in response to the water need of this crop.

As shown in Figure 10, average to very good (80% to 95%) WRSI conditions were modelled by *Africa RiskView* for most parts of Mozambique. Isolated areas in Sofala province had WRSI values lower than 70%—Figure 11. Comparing the WRSI values with the benchmark selected for the customisation of 2020/21 (the median of the past 5 years) shows that the modelled WRSI values in Maputo, Gaza and Inhambane were well above the benchmark. The provinces in the Central Region, namely Manica, Sofala, Tete and Zambizia, observed WRSI values close to the benchmark. Moma and Larde districts in Nampula province recorded higher than benchmark WRSI values—Figure 12.

The FEWS NET April report[3] indicated that the current agricultural season has recorded average to above-average cumulative rainfall, especially in the semi-arid interior of Gaza and Inhambane provinces. As a result, near average to above-average harvests are expected in most areas. This finding generally matches with what was modelled by *Africa RiskView*. The report also indicated that localized events in some parts of the country has forced farmers to replant. Among these events, the early-season drought conditions in lowland areas along major rivers in the Gaza and Maputo provinces, combined with high temperatures in October and November and flooding in January and February, resulted in considerable crop losses, requiring affected households to replant. Most of the households in this area are expected to recover their harvests, except poor households with limited seed stocks who failed to replant. Similarly, tropical storms/cyclones affected parts of the Central Region, including Sofala and Manica provinces, while fall armyworm (FAW) affected some areas in the Central Region (FAW)

Modelled Drought Impacts

To estimate the drought conditions on the ground, the WRSI at the end of a season is compared to the reference benchmark selected by the TWG (the median of the past five years, covering the year from 2015/16 to 2019/20 in the case of

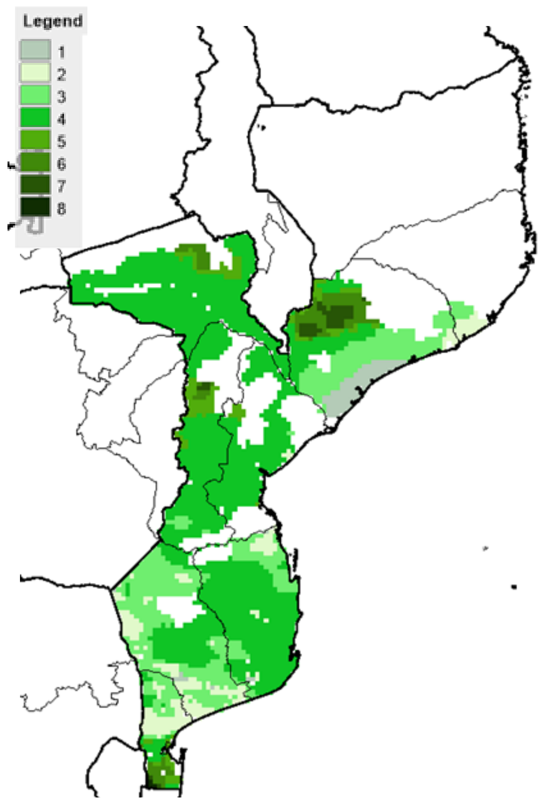


Figure 9: Number of possible sowing opportunities within the planting window (November 11, 2020 –January 20, 2021), RFE2

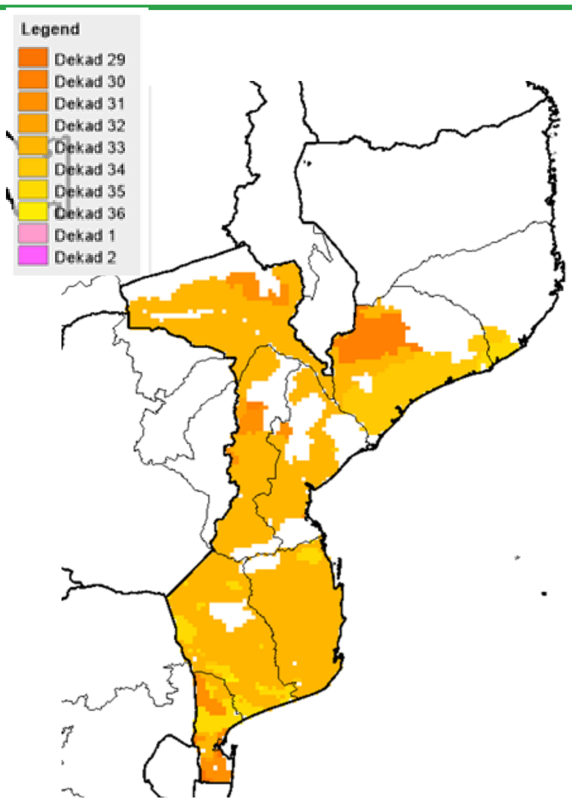


Figure 10: First sowing opportunity modelled within the planting window, (November 11, 2020 – January 20, 2021), RFE2

[3]. https://fews.net/southern-africa/mozambique/food-security-outlook-update/april-2021

Mozambique). The drought exposure in a specific area and season (the extent of the deviation of the WRSI from the benchmark) and the vulnerability of the population in the affected area are used to model the number of people affected. For the 2020/21 agricultural season, the end-of-season WRSI was close to the benchmark in most parts of Mozambique, while provinces in Southern Region realised an end-of-season WRSI well above the selected benchmark. Hence, no people were modelled as affected by drought by the ARC agricultural drought model at the end of the 2020/21 agricultural season in Mozambique—Figure 13.

Modelled Drought Response Costs

The response costs selected by the in-country *Africa RiskView* customisation TWG was USD 43 per person. For the 2020/21 agricultural season no people are modelled as affected by drought, as a result, no Modelled Drought Response Cost (MDRC) was estimated for the 2020/21 season —Figure 14.

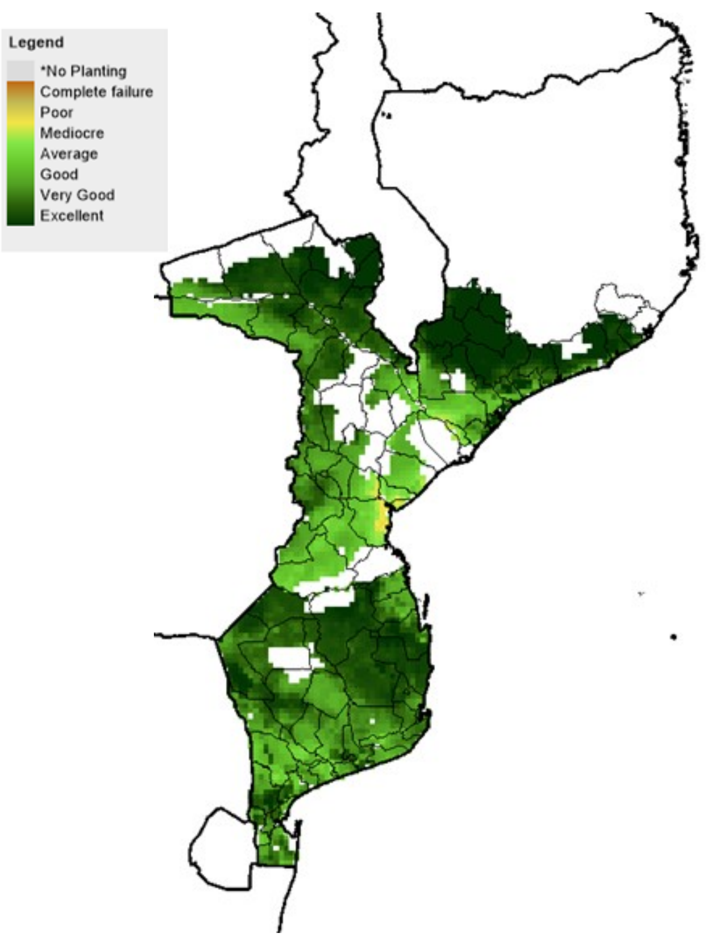


Figure 11: Final End-of-season WRSI (RFE2, 2020/21)

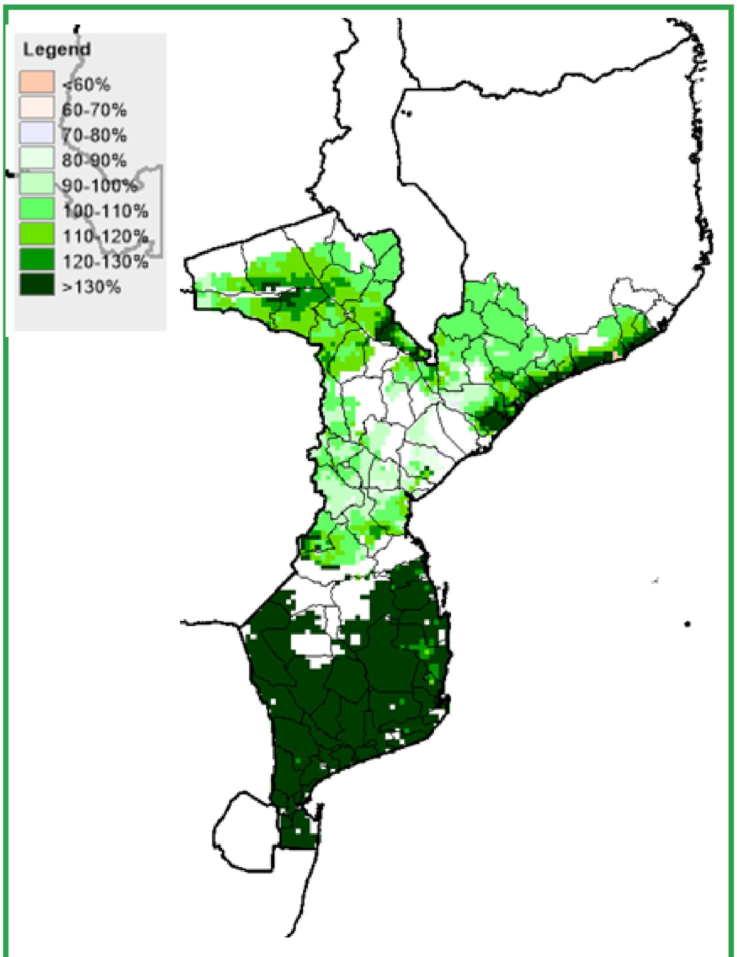


Figure 12: End-of-season WRSI compared to the median WSRI of the past five years (RFE2, 2020/21)

5. https://fews.net/sites/default/files/documents/reports/MOZAMBIQUE_Food_Security_Outlook_02.2020_FINAL_EN.pdf

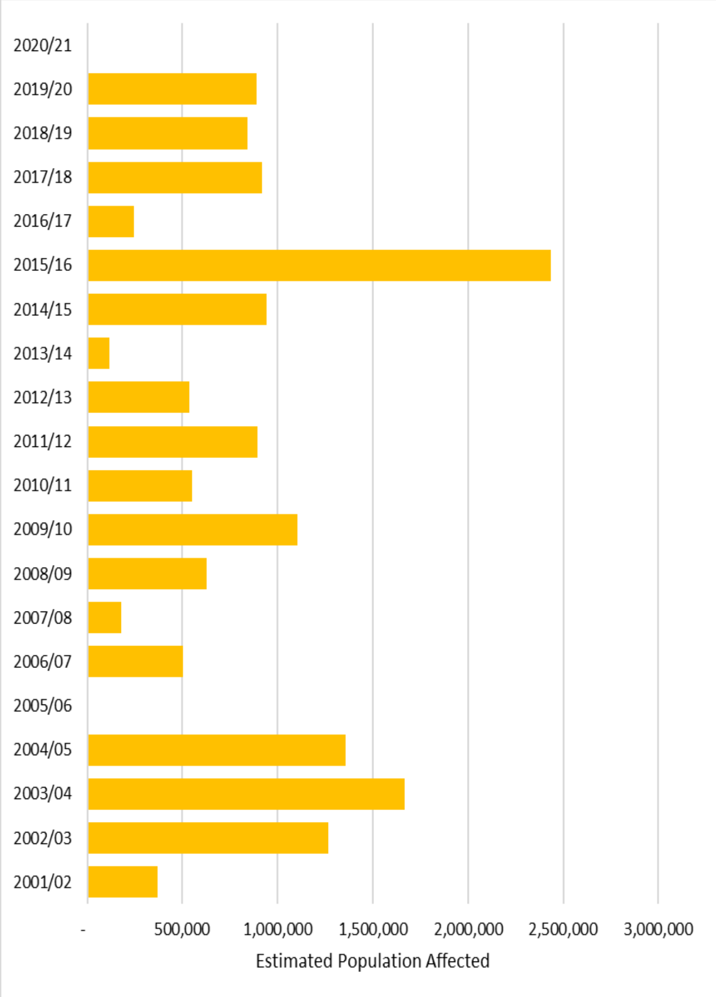


Figure 13: Modelled number of people affected, 2001/02-2020/21

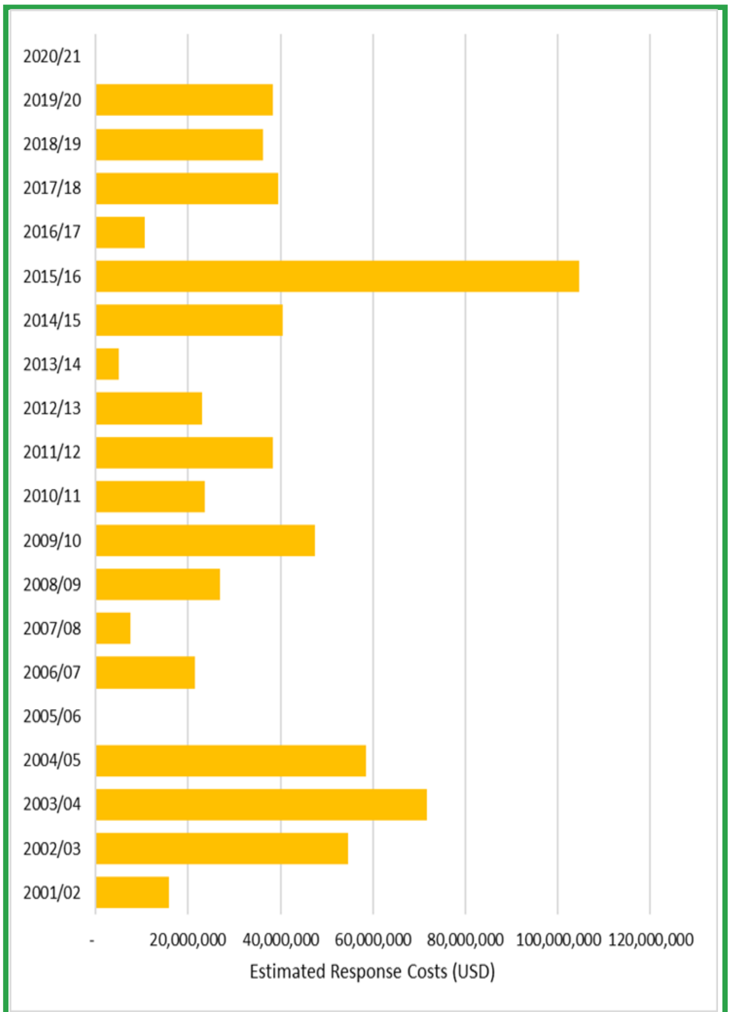


Figure 14: Modelled drought response cost, 2001/02-2020/21

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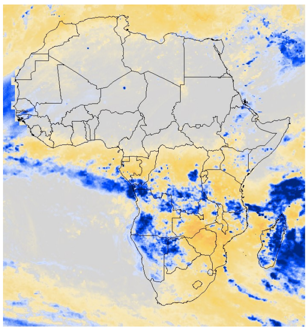
About ARC:

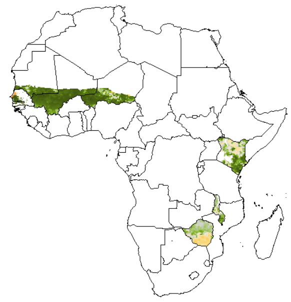
The **African Risk Capacity (ARC)** is a specialised agency of the African Union designed to improve the capacity of AU Member States to manage natural disaster risk, adapt to climate change and protect food insecure populations.

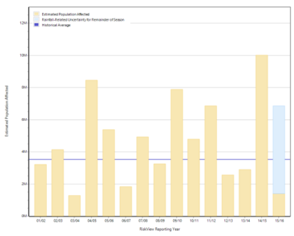
The ***Africa RiskView*** software is the technical engine of ARC. It uses satellite-based rainfall information to estimate the costs of responding to a drought, which triggers a corresponding insurance payout.

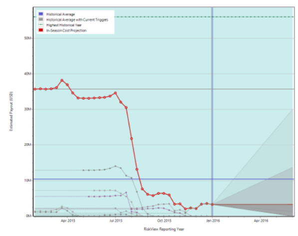
The **ARC Insurance Company Limited** is the financial affiliate of the ARC Agency, which pools risk across the continent through issuing insurance policies to participating countries.

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.