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 generally normal to below normal.
- Inhambane, southern Manica and northern Gaza have experienced below normal rainfall.
- In contrast, northern Niassa, northern Cabo Delgado, most of Maputo and southern Gaza had above-normal rainfall.
- The temporal distribution in Southern and parts of the Central Regions was erratic. The Northern Region, on the other hand, had relatively stable distribution, especially up to dekad 5 (February 20).

**Drought:**
- According to the sowing criteria defined in *Africa RiskView*, most of Inhambane, northern Gaza, southern Manica and parts of eastern Sofala encountered complete sowing failure.
- The modelled WRSI values for parts of the country where sowing was successful ranges between 80% to 130% of the benchmark (median of the last 5 years).

**Affected Populations:**
- *Africa RiskView* estimated that 447,715 people, 10% of the total vulnerable population of 4,432,069, were affected by drought during the 2019/20 agricultural season. Historically, this estimate is the 11th highest since 2001/02.

**Rainfall**

The growing season of the reference crop selected for Mozambique 2019/20 *Africa RiskView* customisation, maize, runs from dekad 29 to dekad 11, i.e. October 11 to April 20. Based on RFE2 satellite estimates, the cumulative rainfall received during this period was largely normal to below normal, with the overall national average standing at 92% of the normal as defined in *Africa RiskView* (average cumulative rainfall for the period between 2001-2018).

As depicted in Figure 1, notable below-normal performance was observed in most of Inhambane, southern Manica and northern Gaza. In contrast, the northern parts of Mozambique, covering the northern halves of Niassa and Cabo Delgado, had significantly higher than normal rain. Similarly, most of Maputo, southern Gaza and pockets in Zambize, Sofala, Tete and Manica had higher than normal rainfall.

The first two dekads of the growing period - i.e., dekad 29 to 30 (October 11 to 31), registered significantly lower than normal rainfall throughout Mozambique - see Figure 2. The rainfall showed improvement in November with most parts of the country registering higher than normal rain. Maputo, Zambezia, Tete, Manica, Sofala and southern Gaza had

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1The satellite dataset selected for the 2019/20 customisation of *Africa RiskView* to Malawi
above normal rainfall during the month of November. On the other hand, the below normal performance continued in most of Inhambane, northern Gaza, southern Manica and southern Sofala- see Figure 3. The December rainfall in most parts of the country was below normal, with the exception of Zambeze, and isolated areas across the country - see Figure 4.

In January, an above normal rainfall was registered in most of the Northern and Central Region. However, most of the Southern Region, except Maputo, experienced below normal rainfall -see Figure 5. In February, near to above normal rainfall was received in most parts of the country, with areas along the costal line experiencing significantly lower than normal rainfall- see Figure 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 some pockets in Central and Southern Regions-see Figure 7.

Looking at dekadal distribution, rainfall patterns in southern parts of the country, including Maputo, Gaza and Inhambane were erratic and below-average for most dekads up to dekad 11 (April 20). This observation is also true for the central provinces of Manica and Sofala. By contrast, the provinces in northern and central Mozambique, including Niassa, Cabo Delgado, Zambezia, Nampula and Tete, had a relatively stable rainfall distribution for the period between dekad 32 (November 21-30) up to dekad 5 (February 11-20). The rainfall for many of the dekads after dekad 5 (February 20) was generally below normal in all the provinces- see Figure 8.

Sowings in Africa RiskView are detected based on pre-defined dekadal rainfall criteria. In Mozambique these criteria require a minimum of 15mm of rain in one dekad followed by 5mm of rain in two subsequent dekads within the sowing window. If this condition is not met, it is assumed that planting was unsuccessful. In addition, the “Average” sowing opportunity aggregation method was assumed to model farmers response to sowing chances. According to this assumption, farmers are expected to take advantage of any one of the sowing opportunities within the sowing window. Thus, season performance is evaluated based on average drought conditions calculated on all the sowing opportunities realised.

According to the sowing criteria definition described above, southern Mozambique, covering most of Inhambane and northern Gaza, was modelled to have had a complete sowing failure. Similarly, failed sowing was modelled in southern
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Figure 2: Rainfall as % of normal (October 11–31, 2019), RFE2

Figure 3: Rainfall as % of normal (November 1–30, 2019), RFE2

Figure 4: Rainfall as % of normal (December 1, –31, 2019), RFE2

Figure 5: Rainfall as % of normal (January 1, –January 31, 2020), RFE2

Figure 6: Rainfall as % of normal (February 1, –February 28, 2020), RFE2

Figure 7: Rainfall as % of normal (March 1, –April 20, 2020), RFE2

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Manica and parts of eastern Sofala. This was confirmed by the FEWS NET February 2020 report\(^2\), which indicated that poor rainfall performance at the start of the season had driven crop losses in southern parts of Mozambique.

In most areas where sowing was successful, the first sowing opportunity was detected in dekad 32. Pockets in central and southern Mozambique had an earlier sowing opportunities in dekad 31, while small parts of Manica had sowing in dekad 34, see Figure 9.

Three to six sowing opportunities (within the sowing window) were detected in most parts of Tete, Zambezia and Manica and in parts of Sofala - see Figure 10. Except for pockets with three to four sowing opportunities, the majority of Maputo had two sowing opportunities.

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

As shown in Figure 11, the entire Southern Region and parts of Central Region, covering Maputo, Gaza and Inhambane as well as the southern parts of Manica and Sofala, had either complete sowing failure or poor WRSI conditions. By contrast, average to very good (70% to 95%) WRSI conditions were detected in North\(^3\) and parts of the central region.

In comparison to the benchmark selected for the 2019/20 customization (the median of the past 5 years), the modelled WRSI values for most of the country where sowing was successful was near to above the benchmark - see Figure 12.

Based on a similar WRSI based approach, FEWS NET\(^4\) estimated that the 2019/20 crop production in the northern region was above the five-year average. Similarly, the crop produc-

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\(^3\) 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.
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tion in the central region was estimated to be close to the five-year average, while production in the southern region was estimated to be below the five-year average. This is in line with the modelled results of Africa RiskView.

MODELED DROUGHT IMPACTS

For the 2019/20 agricultural season of Mozambique, Africa RiskView estimated that a total of 447,715 people – equivalent to 10% of the vulnerable population - were affected by drought. In terms of number of people affected, the year ranks as the 11th worst drought year since 2001/02. All the people affected are located in Inhambane province, where 100% of the vulnerable populations are affected by drought. The extreme impact in this province is due to the inadequate sowing conditions encountered during the sowing window.

The Ministry of Agriculture and Food Security (MASA) Agrometeorological Bulletin\(^5\) estimates a total of 222,819 ha of land covered with food crops (representing about 3.7% of the total planted area) and 191,976 producers were affected by the combined effect of drought and floods in the country. The southern part of the country, with 189,033 ha of land covered with variety of crops affected, was the most impacted by drought and extreme temperatures. The area affected includes Maputo (18,419 ha), Inhambane (93,410 ha) and Gaza.

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\(^4\) [https://fews.net/southern-africa/mozambique/key-message-update/march-2020](https://fews.net/southern-africa/mozambique/key-message-update/march-2020)

In the Central Region, the combined effect of drought and flooding affected a total of 30,776 ha of different crops; Sofala (14,338 ha), Manica (1,044 ha), Tete (13,787 ha) and Zambezia (1,607 ha) were provinces affected by drought and flooding.

Similarly, FEWS NET\(^5\) estimated that nearly 200,000 hectares of various crops and more than 150,000 farmers across the country were affected by a combination of heavy rains, localized floods and drought. Moreover, the organization estimated that drought conditions in the southern zone accounted for 160,000 hectares of affected agricultural land in Gaza, Inhambane and Maputo. According to FEWS NET classification, most of the central and northern parts of Mozambique are predicted to face Minimal (IPC Phase 1) or Stressed (IPC Phase 2) outcomes up to September 2020. In the south, covering Gaza, Inhambane, northern Maputo, southern Sofala

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and southern Manica, Crisis (IPC Phase 3) outcomes are predicted to persist.

**Modelled Drought Response Costs**

Based on the response costs selected by the in-country Africa RiskView customisation TWG, USD 43 per person, the Modelled Drought Response Cost (MDRC) for the 2019/20 season was estimated at USD 19.2 million (Figure 14).

**Figure 11:** Number of people modelled as affected by drought in 2019/20 and the previous production years

**Figure 12:** Modelled drought response cost in 2019/20 and the previous production years
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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.

Disclaimer: The data and information contained in this report have been developed for the purposes of, and using the methodology of, Africa RiskView and the African Risk Capacity Group. The data in this report is provided to the public for information purposes only, and neither the ARC Agency, its affiliates nor each of their respective officers, directors, employees and agents make any representation or warranty regarding the fitness of the data and information for any particular purpose. In no event shall the ARC Agency, its affiliates nor each of their respective officers, directors, employees and agents be held liable with respect to any subject matter presented here. Payouts under insurance policies issued by ARC Insurance Company Limited are calculated using a stand-alone version of Africa RiskView, the results of which can differ from those presented here.

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