ZIMBABWE

MINISTRY OF ENVIRONMENT, WATER AND CLIMATE
Meteorological Services Department

Telephone: +263 (04) 778 209 **Fax:** +263 (04) 778 161
Website: www.weather.co.zw

P.O Box BE 150, Belvedere, Harare, Zimbabwe
All correspondences should be addressed to the Director

METEOROLOGICAL SERVICES DEPARTMENT

Minimizing Risks through Science

2017-2018 END OF SEASON REPORT

April 2018

1. Introduction

The Zimbabwe Meteorological Services Department (MSD) issued the 2017-2018 rainfall seasonal outlook on 28th August 2017. The 2017-2018 national outlook was downscaled from the regional outlook presented at the Southern Africa Regional Climate Outlook Forum SARCOF-21 held in Gaborone, Botswana from 15 to 22 August 2017 by the SADC Climate Services Centre (CSC). For the outlook, the country is demarcated into three (3) regions. The regions are different for each sub-season; October, November and December (OND) and January, February and March (JFM) as illustrated in Figures 1 and 2. These regions were determined using long term meteorological and physical data to delineate areas within Zimbabwe with similar characteristics (homogeneous rainfall regions).

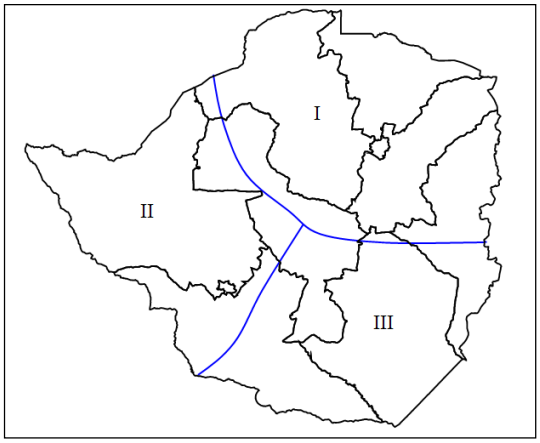
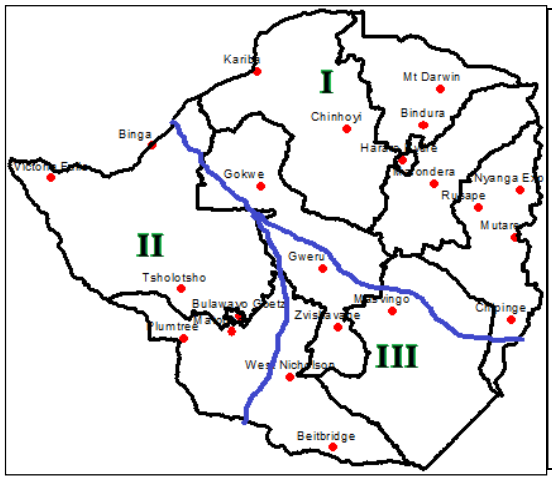


Figure1: Homogeneous rainfall regions OND

Region I: Harare, much of Mashonaland East, Mashonaland West, Mashonaland Central, northeastern parts of Midlands, most of Manicaland.

Region II: The greater part of Matabeleland North, parts of Midlands and parts of Mashonaland West.

Region III: Masvingo, the bulk of Midlands, the extreme southern parts of Manicaland and the bulk of Matabeleland South.



Region I: Harare, Mashonaland East, Mashonaland West, Mashonaland Central, northeastern parts of Midlands, most of Manicaland and northern parts of Masvingo.
Region II: Matabeleland North, southwestern parts of Midlands and northwestern parts of Matabeleland South.
Region III: Bulk of Masvingo, the southern parts of Midlands, the extreme southern parts of Manicaland and eastern parts of Matabeleland South.

Figure2: Homogeneous rainfall regions for JFM

The sub-season October to December (OND) of the 2017/18 rainfall season was forecast to receive normal to above normal rains in all Mashonaland provinces and the northern parts of Manicaland Province. The rest of the country was expected to receive normal to below normal rains. For the second half of the season; January-February-March (JFM) 2018, all regions countrywide, were forecast to receive normal rainfall. This was the updated forecast for the sub-season since the forecast issued in August 2017, had indicated normal to above normal rainfall across the country.

The 2017/2018 rainfall season was characterized by slow onset to the season and long dry spells especially in the month of January. Most of the rains occurred in February and March of 2018 and therefore were skewed towards the end of the rainy season. Figures 3 and 4 below for national daily average rainfall and national average dekadal rainfall totals respectively show an erratic pattern up until beginning of February 2018, thereafter the temporal distribution improved. An analysis of the national average dekadal rainfall totals shows the decline in rainfall end of November (third dekad) into December (first and second dekads) as is shows by the purple line.

A dekad is ten consecutive days (1-10, 11-20, 21-30/31).

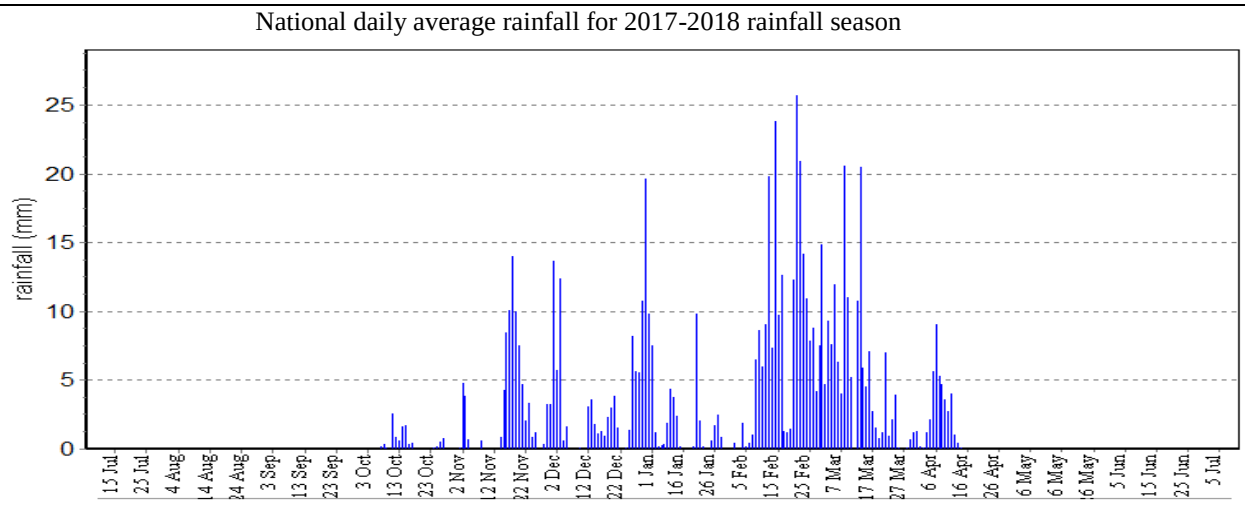


Figure 3: National daily average rainfall

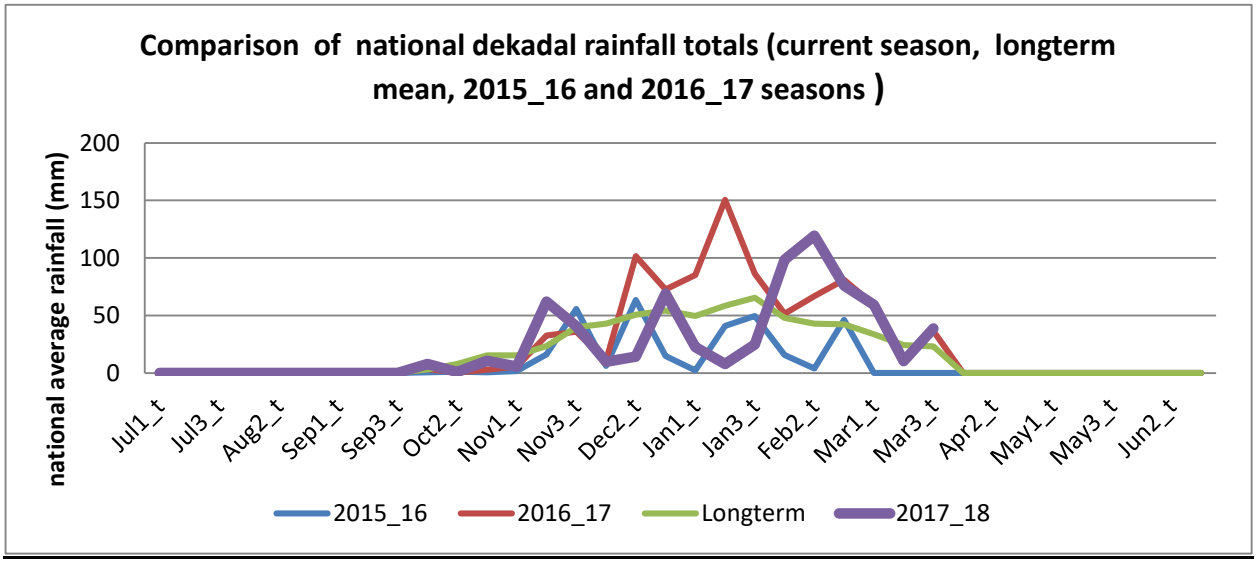


Figure 4: National dekadal rainfall totals

2. Performance of 2017-18 rainfall season

2.1 Start of the Season using gauge/ground daily data

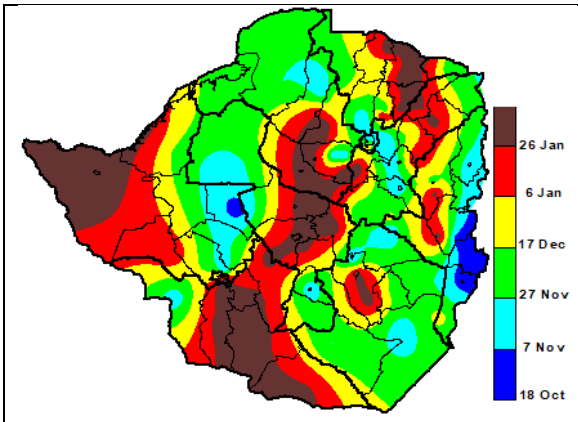


Figure 5(a) Start of season for 2017-2018 season

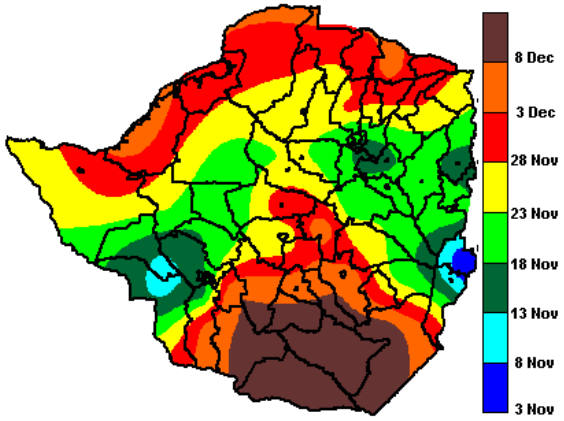


Figure5(b) Long-term average seasonal onset dates

Definitions: start of season is any day after the 1st of October that a place receives 20 mm or more in 1 or two days provided there is no dry spell of 10 days or more in the next 30 days.
Rain day: is a day which receives 0.85mm rainfall or more

2.2 Start of season (SOS) for 2017/18 rainfall season using dekadal definition (satellite data)

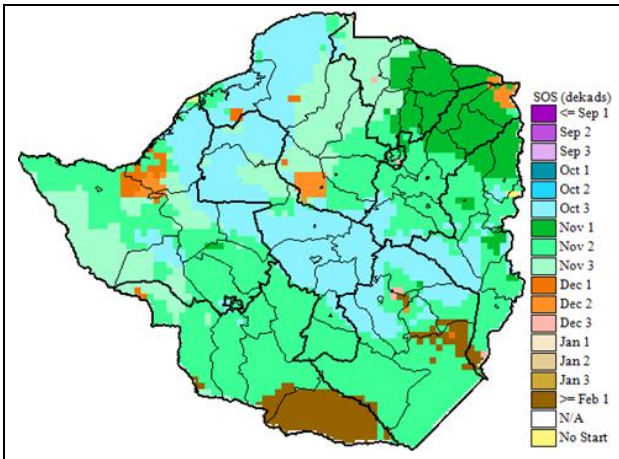


Figure 6(a):SOS (used as planting dekad for maize) defined for 2017/18 season

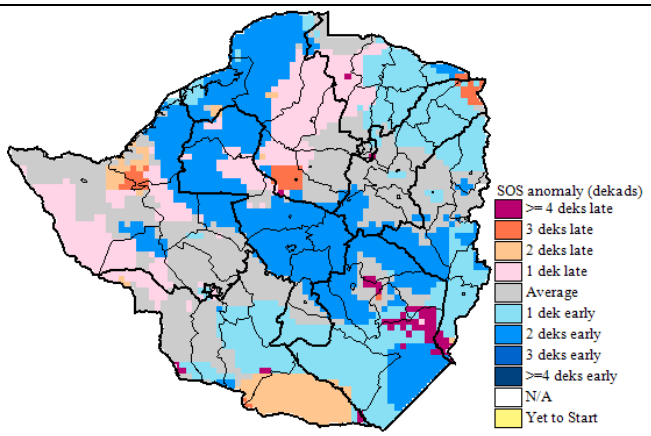


Figure 6(b): Start of season anomaly (compared to average) for 2017/18 season

Definition: rainfall accounting SOS=First dekad with 25 mm or more, followed by two more dekads summing to at least 20 mm

Figure 5(a) shows that Manicaland had the earliest start to the season (18th October to 7 November) with a stretch from Matabeleland South, Midlands into the Mashonalands recording

a delayed start. The 2017-18 season started late in comparison to the mean onset dates as shown in Figure 5(b). The long-term average seasonal onset dates were calculated using data for the period 1981 to 2010, which is the current climate period according to the World Meteorological Organization. The mean onset dates provides guidance on when areas are likely to receive their first effective rains for the season.

The bulk of the country received effective rains later than 20 December 2017. In Figures 6(a), where the Geo Water Requirement Satisfaction Index (Geo WRSI) is used, the season had started by the third dekad of October for a stretch covering Mashonaland West (Kariba, Hurungwe), Midlands into Masvingo (Chivi, Masvingo, Gutu, Bikita). The Geo WRSI indicates an early start to the season (two dekads early) for that stretch of area previously reported. A delayed start to the season by one dekad was observed in parts of the Mashonaland West and Mashonaland Central Provinces with two dekad delay in Beitbridge (Matabeleland South) as shown in Figure 6(b).

3. Analysis of dry spells during the 2017-18 season

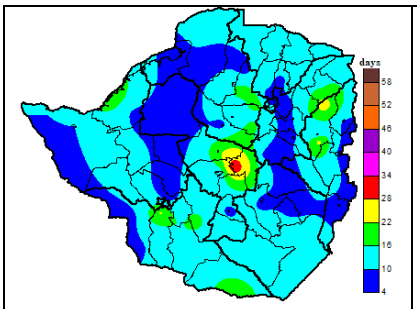


Figure7(a) : Longest dry spell in the month of December 2017

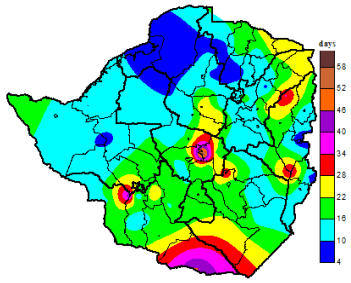


Figure 7(b) : Longest dry spell in the month of January 2018

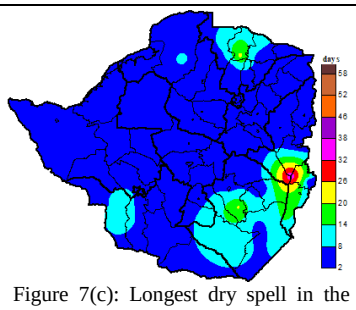


Figure 7(c): Longest dry spell in the month of February 2017

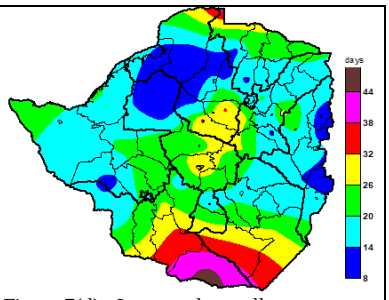


Figure 7(d): Longest dry spell experienced in 2017-18 season

Parts of the country that had received effective rains from mid-November to early December were affected by long dry spells (Figures 7(a), 7(b)). The month of January experienced the longest dry spell across the whole country when compared with the months of December and February. During January the longest dry spell was experienced in Matabeleland South (Beitbridge, Bulilima, Mangwe, Matobo) and parts of Midlands (Chirumhanzu, Gweru, Kwekwe and Shurugwi).

Contributory factors to the dry conditions in January were;

1. The ITCZ which is the main rain bearing system for Zimbabwe is usually most active during December, January and February (DJF). However as of January it had not been active.
2. The presence of a Tropical Cyclone 'AVA' to the north of Madagascar, which caused dry air to affect Zimbabwe and much of the SADC region. These conditions are

unwelcoming for the development of rain bearing clouds over the country and pushed the Inter Tropical Convergence Zone well to the north of Zambia. Accordingly, it was hot and dry.

Figure 7(d) shows that the longest dry spells in the season were experienced in the extreme southern parts of the country (with particular reference to Beitbridge) and these occurred mostly in January.

Southern districts continued to experience long dry spells in the month of March 2018.

4. Extreme rainfall events (>50mm) during 2017-2018 rainfall season

Table 1: Extreme rainfall events (>50mm) during 2017-2018 rainfall season

Station	Amount and date	Amount and date	Amount and date	Amount and date	Amount and date	Amount and date
Arcturus	77mm on 12/02/18	89mm on 23/02/18				
Banket	70mm on 30/01/18	54mm on 2/2/2018	68mm on 11/2/2018	58mm on 12/2/2018	55mm on 5/3/2018	75mm on 2/3/2018
Beatrice	126.5mm on 24/12/17	63mm on 12/02/18	50mm on 13/02/18			
Beitbridge	68.8mm on 6/10/2017					
Bikita	58mm on 10/1/2018	87mm on 4/2/2018	59.5mm on 26/02/18			
Bindura	63mm on 11/2/2018	74.9mm on 19/02/18				
Binga	64.4mm on 25/12/17	60.4mm on 26/02/18	52.4mm on 28/02/18	57.6mm on 3/3/2018		
Buffalo	68.5mm on 4/2/2018	106.1mm on 14/02/18				
Buhera	57.8mm on 2/2/2018	56.2mm on 22/02/18	102.5mm on 24/02/18	52.2mm on 28/03/18		
Byo_Airport	62mm on 26/11/17	50.7mm on 24/12/17	97.7mm on 25/12/17	60.2mm on 19/02/18	63.3mm on 27/03/18	
Byo_Goetz	59.2mm on 26/11/17	73mm on 22/12/17				
Centenary	77mm on 28/11/17	107mm on 2/2/2018				
Chakari	91mm on 1/3/2018					
Chatsworth	61.5mm on 26/03/18					
Chegutu	50.1mm on 13/02/18					
Chibero	106mm on 23/02/18					
Chimanimani	53mm on 3/1/2017	80mm on 25/02/18				
Chimhanda	92.5mm on 21/12/17	76.5mm on 11/2/2018				
Chinhoyi	50mm on 27/12/17	55.3mm on 10/2/2018	77.4mm on 11/2/2018			
Chipinge	54.3mm on 4/02/2018	65.1mm on 26/02/18				
Chisengu	113.8mm on 26/02/18					
Chisumbanje	80.8mm on 4/2/2018	112.3mm on 26/02/18				
Concession	62mm on 6/2/2018	50mm on 19/02/18	58mm on 5/3/2018			
Crowborough	102mm on 30/01/18	64mm on 5/2/2018	62.5mm on 2/3/2018			
Dotito	75mm on 13/12/17	87mm on 11/2/2018	75mm on 12/2/2018	54.5mm on 26/02/18		
Figtree	58mm on 30/01/18					
Filabusi	65mm on 28/01/18	50mm on 4/2/2018				
Gokwe	51.8mm on 23/02/18	58.9mm on 26/02/18				
Gwangwav	52mm on 12/11/2017	65mm on 11/2/2018				
Gweru	79.7mm on 2/2/2018					
HarareAp	64.4mm on 25/12/17					
Harare_B	50mm on 10/3/2018					
Henderso	51.2mm on 18/11/17	54.2mm on 12/2/2018				
Hwange_N	50mm on 14/02/18					
Kadoma	61mm on 1/3/2018					
Kanyemba	94.3mm on 10/2/2018	73.2mm on 11/2/2018	58.7mm on 2/03/2018			
Kariba	57mm on 29/10/17	57.9mm on 25/12/17	52.7mm on 10/2/2018	73.2mm on 17/02/18		
Karoi	72.9mm on 10/2/2018	58,4mm on 13/02/18				
Kezi	55.6mm on 29/01/18	54.6mm on 26/02/18				
Kotwa	50mm on 12/11/2017	69mm on 21/12/17	67mm on 11/2/2018	63mm on 1/3/2018		
Lalapanz	55.4mm on 16/02/18					

Lupane	65.9mm on 26/11/17	59.5mm on 2/2/2018				
Macheke	67mm on 26/12/17	64mm on 1/2/2018	62mm on 6/2/2018	66.5mm on 13/02/18		
Makoholi	59mm on 4/2/2018					
Makuti	60mm on 10/2/2018	63mm on 13/02/18				
Maronder	55.1mm on 24/11/17	56mm on 26/11/17	54.1mm on 15/12/17	51.1mm on 19/02/18	94.2mm on 13/03/18	
Masvingo	58.4mm on 4/2/2018	62.4mm on 22/02/18				
Mayo	53mm on 28/11/17	51mm on 25/12/17	91mm on 4/2/2018	65mm on 11/2/2018	76mm on 10/3/2018	
Mhondoro	93.4mm on 26/12/17	64.6mm on 30/01/18	61mm on 5/2/2018	50.8mm on 12/02/18	96.5mm on 23/02/18	
Murewa	58mm on 3/2/2018	59.5mm on 11/2/2018				
Mt_Darwi	56.5mm on 11/11/17	58.6mm on 6/2/2018	79.8mm on 11/2/2018			
Mutoko	68.4mm on 11/11/17	68.4mm on 27/12/17	95mm on 4/2/2018	62.6mm on 11/2/18	66.4mm on 27/02/18	
Mukandi	61.5mm on 2/2/2018	89.5mm on 26/02/18	120.5mm on 2/3/2018			
Mupfurud	52.5mm on 10/2/2018	53mm on 11/2/2018	61.5mm on 19/02/18	52mm on 26/02/18	64.5mm on 10/3/2018	
Murambin	55.4mm on 13/11/17	51mm on 25/12/17				
Mutare	64mm on 23/12/17	57.5mm on 2/2/2018				
Mutasa	101mm on 14/11/17	54mm on 21/02/18	99.5mm on 24/02/18			
Mvuma	53mm on 22/12/17	61mm on 24/02/18				
Mvurwi	50.2mm on 16/01/18	73.5mm on 11/2/2018	65.9mm on 5/3/2018			
Mwenedzi	68.5mm on 22/02/18	85mm on 26/02/18				
Nkayi	69.2mm on 25/12/17	60.1mm on 15/02/18	80.7mm on 2/3/2018			
Norton	52mm on 30/01/18	67mm on 4/2/2018	83mm on 11/2/2018	61mm on 2/3/2018		
Nyakomba	69mm on 3/2/2018	59mm on 11/2/2018	141.5mm on 12/2/18			
Nyamarop	60mm on 13/11/17	63mm on 11/2/2018	59mm on 12/2/2018			
Nyanga	61.9mm on 2/2/2018	55.1mm on 18/02/18				
Nyazura	66mm on 2/2/2018	71mm on 4/2/2018				
Odzi	51mm on 24/12/17	82.5mm on 21/02/18				
Pioneer	51mm on 14/11/17	81mm on 25/12/17	51.4mm on 4/2/2018	105mm on 11/02/18	62.5mm on 19/02/18	
Plumtree	55.6mm on 29/01/18					
Rupike	60.9mm on 26/02/18					
Rusape	50.8mm on 28/03/18					
Rushinga	68mm on 14/11/17	54.8mm on 21/12/17	59mm on 4/2/2018	52mm on 11/2/2018		
Selous	50mm on 14/11/17	60mm on 28/11/17	59mm on 24/12/17	51mm on 12/2/2018	54mm on 28/02/18	66mm on 23/02/18
Shamva	66.5mm on 10/1/2018	52mm on 12/2/2018	55mm on 19/02/18			
Shurungw	160mm on 25/12/17					
Trelawne	58.5mm on 30/01/18	50.5mm on 11/2/2018				
Tsholots	50.3mm on 25/11/17	52.5mm on 21/02/18	53.4mm on 26/02/18			
Vic_Fall	93mm on 26/12/17	69.2mm on 1/2/2018				
Wedza	56.7mm on 26/11/17	51.9mm on 23/12/17	77.6mm on 5/2/2018	59.3mm on 13/02/18		
West_Nic	169.4mm on 29/01/18	98.9mm on 18/02/18	76.4mm on 26/02/18			
Whawha	78mm on 11/11/2017					
Zaka	112.3mm on 26/02/18					
Zvimba	51mm on 12/11/2017					
Zvishava	76.5mm on 4/2/2018					

Table 1 shows stations that recorded rainfall above 50mm during the season and this occurred mostly between February and March. Most of the rainfall was received latter in the season and this could have had implications on agricultural activities (late planting). As has been mentioned earlier, these rains were attributed to the presence of the ITCZ over the country.

5. Accumulated Rainfall and Percentage of Normal for the Sub-Seasons

5.1.Analysis for October-November-December (OND)

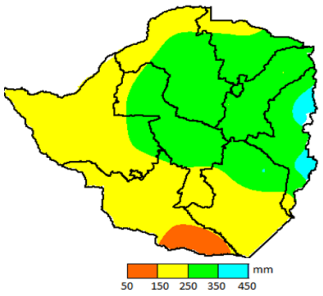


Figure8(a): Long term average for OND

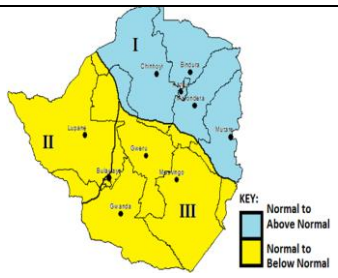


Figure8(b): Outlook for OND 2017

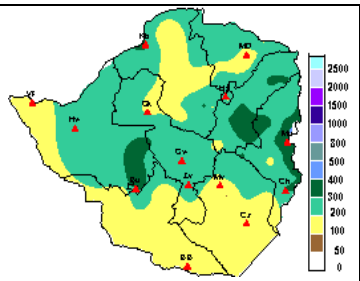


Figure8(c): Accumulated rainfall from 1 October 2017 to 31 December 2017

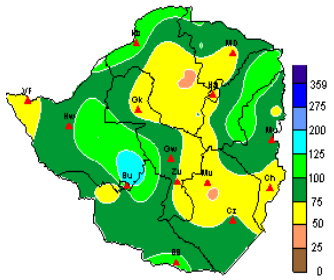


Figure8(d): Percentage of normal from 1 October 2017 to 31 December 2017

Definitions: Above normal: rainfall in excess of 125 % of the average
Normal: rainfall between 75% and 125% of the average
Below: rainfall below 75% of the average

Mostly areas to the north received more rainfall (above 200mm) than the southern areas with the exception of parts of Mashonaland West and Mashonaland Central provinces (Figure 8(c)). The bulk of the areas in the country received normal rainfall in comparison to the long-term average. This means that the rainfall received was in the range 75% to 125% of the long-term average. Some parts of Victoria Falls, Hurungwe, Gokwe, Zvishavane, Masvingo, Mt Darwin, Chiredzi and Chipinge received below normal rains (<75% of the long-term average) as shown in Figure 8(d). Both the temporal and spatial distribution of the rains were of concern during the OND sub-season.

5.2.Analysis for January-February-March (JFM)

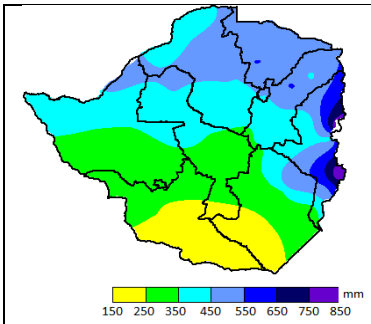


Figure 9(a): Long term average for JFM

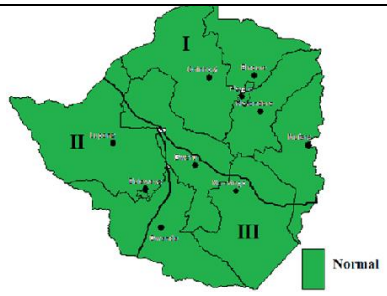


Figure 9(b): Outlook for JFM 2018

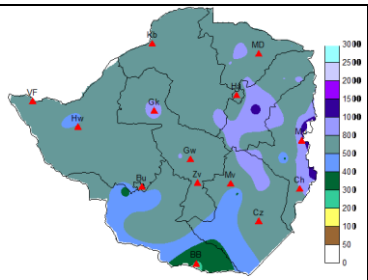


Figure 9(c): Accumulated rainfall from 1 January 2018 to 31 March 2018

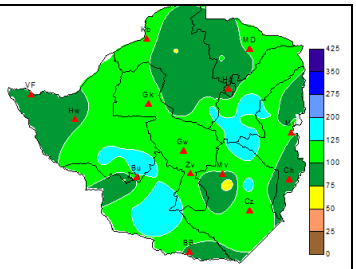


Figure 9(d): Percentage of normal from 1 January 2017 to 31 March 2018

Definitions: Above normal: rainfall in excess of 125 % of the average
Normal: rainfall between 75% and 125% of the average
Below: rainfall below 75% of the average

The JFM sub-season was affected by a prolonged dry spell in January 2018. Most areas experienced 16 or more dry days where the rainfall received was less than 0.85mm/day. However, there was significant improvement in the distribution of the rains (both temporal and spatial) in the month of February due to the arrival of the rain bearing system; the Inter-Tropical Convergence Zone (ITCZ). Parts of the eastern areas of the country recorded the highest

cumulative rainfall (Figure 9(c). By end of March 2018 the whole country had received normal rains (75% to 125% of the long-term average) for the sub-season JFM (Figure 9(d)). There were areas in the Matabelelands and Mashonaland East who received above normal rainfall (> 125% of the long-term average).

6.1.Monthly Accumulated Rainfall and Anomalies

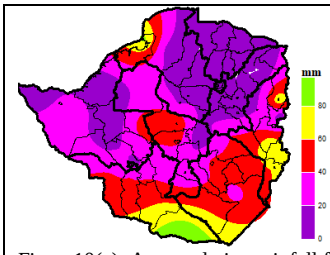


Figure10(a): Accumulation rainfall for October 2017

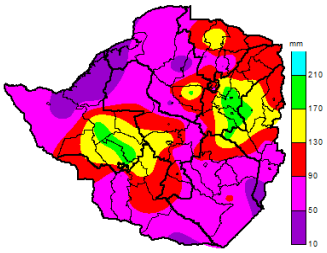


Figure10(b): Accumulation rainfall for November 2017

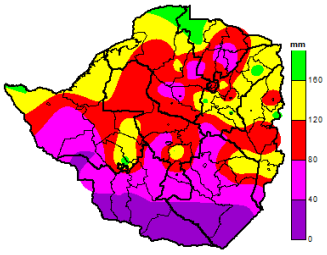


Figure10(c): Accumulation rainfall for December 2017

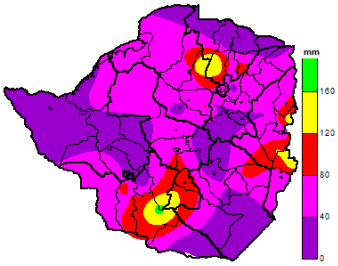


Figure10(d): Accumulation rainfall for January 2018

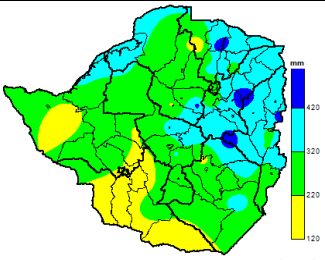


Figure10(e): Accumulation rainfall for February 2018

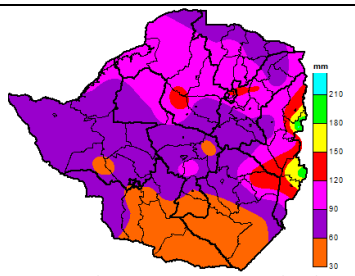


Figure10(f): Accumulation rainfall for March 2018

6.2.Anomaly maps for 2017-2018 rainfall season

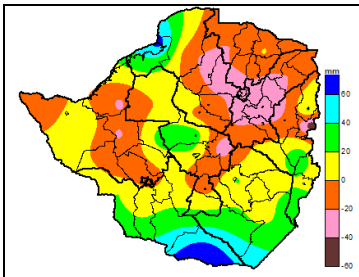


Figure11(a) October 2017 rainfall anomaly

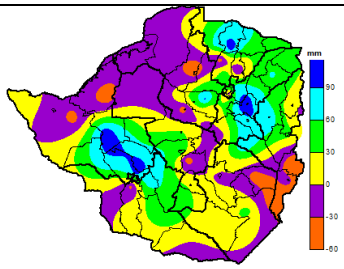


Figure11(b) November 2017 rainfall anomaly

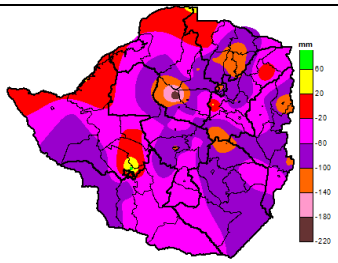


Figure11(c) December 2017 rainfall anomaly

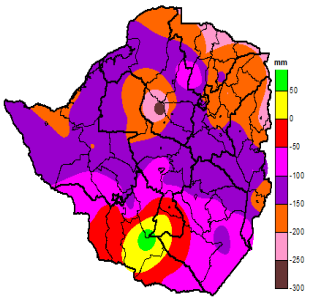


Figure11(d) January 2018 rainfall anomaly

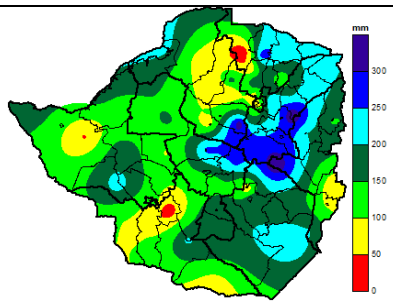


Figure11(e) February 2018 rainfall anomaly

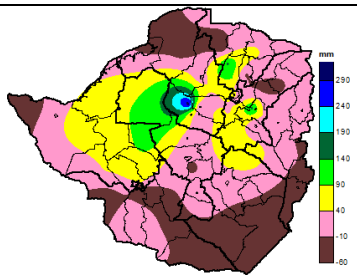


Figure11(f) March 2018 rainfall anomaly

Climatologically, October does not receive much rainfall. The accumulated rainfall received in the bulk of the country during the month was less than 60mm. An exception to this were parts of Mashonaland West, Manicaland and Matabeleland South provinces that received cumulative totals of above 60mm as shown in figure 10(a). For the extreme southern areas, more rainfall was received for the reference period than is the norm whilst for a stretch covering the Mashonalands and Midlands, the situation was different (Figure 11(a)).

In November 2017, there was an improvement in the rainfall received in parts of the Matabelelands, Midlands, Mashonaland East and Mashonaland West provinces. The monthly accumulated totals were 100mm and above in these areas but less in the remainder of the country (Figure 10(b)). The improvement in the rainfall is supported by the anomaly map which shows better rainfall performance compared to the long-term except for mostly the north-western and south-eastern areas (Figure 11(b)).

For December 2017, most of the rainfall activity was in the northern areas of the country, where accumulated totals of above 120mm were recorded (Figure 10(c)). However, the month received less rainfall in comparison to the long-term average (Figure 11(c)). With particular emphasis on Mashonaland West and Mashonaland Central provinces, there was a decline of 100mm to 140mm in parts of these compared to the from the long-term average.

The month of January 2018 also did not show much improvement in rainfall performance as it was characterized by dry conditions resulting in most parts of the country receiving accumulated rainfall less than 80mm (Figure 10(d)). An exception to this were parts of Mashonaland West, Mashonaland Central, southern Midlands and Matabeleland South, that received accumulated rainfall above 120mm. It should be noted that the rainfall that contributed to the latter figures were mainly received towards end of January (from 28th onwards). Again as in December 2018, the rainfall performance particularly in the northern areas was below the long-term average (Figure 11(d)).

Significant rainfall was received in February, which was a result of the ITCZ. Accumulated rainfall of more than 220mm was received across the country during that month (Figure 10(e)). Hence, the anomaly map shows mostly positive deviations from the norm with some areas receiving rainfall of above 100mm in comparison to the long-term mean (Figure 11(e)).

The eastern areas continued to receive significant falls in March 2018, whilst elsewhere there was a general decline in rainfall activity (Figure 10(f)). Mostly the south-eastern areas received less rainfall than is the norm for the month of March (Figure 11(f)).

7. End of Season

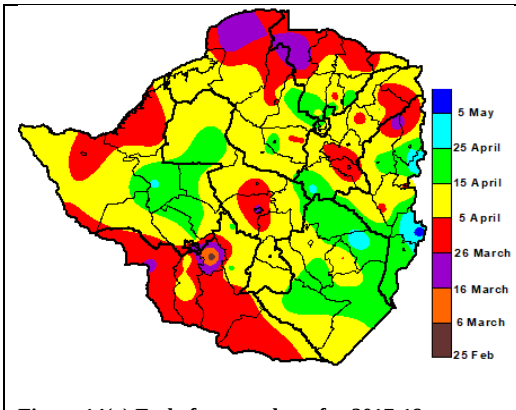


Figure 14(a) End of season dates for 2017-18 season

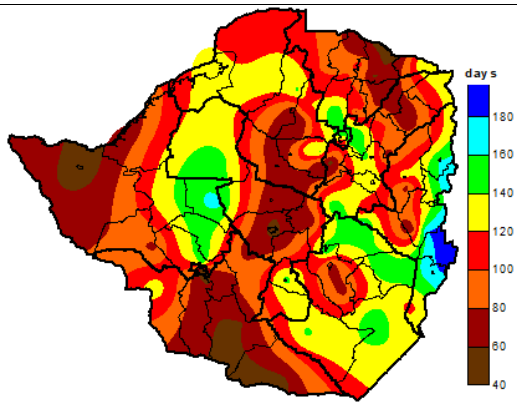


Figure 14 (b) Length of 2017-18 season

Figure 14(a) shows that the majority of the areas received their last effective rains 5 to 15 April (yellow coloured region) whilst the extreme northern and southern parts of the country had an early cessation to the season.

Figure 14(b) shows that the length of the season in the bulk of the areas was less than 140days.

8. Effect of the 2017-2018 season quality on crop production

Water Requirements Satisfaction Index (WRSI) was used to measure the impact of rainfall on crop production.

- *WRSI is a crop specific water-balance model which gives an indication of the impact of the temporal rainfall distribution (timing and quantities) on crops.*
- *WRSI determines the extent to which crops received the water that they needed throughout the growing season*
- *Highlights the extent to which the crop has been negatively affected by any water deficits it experiences each dekad throughout the season*

– *It is a supply: demand ratio between the soil water used by the crop during the season compared to the amount of water the crop needed*

For the southern parts of the country i.e. Masvingo and Matabeleland South provinces, the indices were in the ranges; mediocre, poor and failure. This shows that the crop production had been severely impacted by the dry spells that occurred December into January. The moisture deficits during crop growth had affected production. In the north, the indices were in the ranges; average or mediocre with pockets of poor. In most areas in Manicaland, Mashonaland East and Matabeleland North provinces, the indices were good, average or mediocre (Figure 15(a)). When the WRSI for this year is compared to long term average it was less than average (less than 110%) throughout the country (See Figure 15(b)).

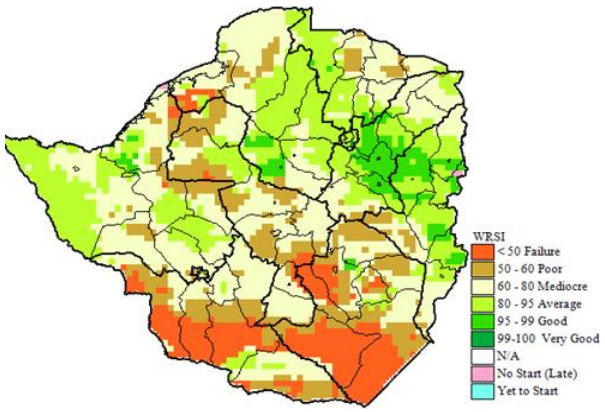


Figure 15(a):Zimbabwe WRSI for maize in 2017/18 season as of dekad 1 of April 2018

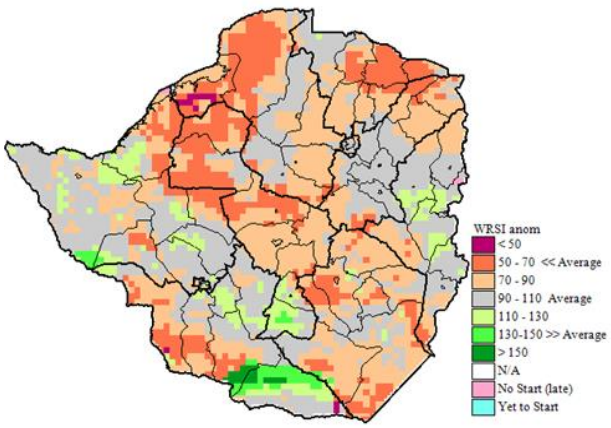


Figure 15(b): Zimbabwe WRSI anomaly (compared to average) for maize in 2017/18 season as of dekad 1 of April 2018

9. Conclusion

The 2017/2018 rainfall season was characterized by poor temporal and spatial distribution up to February. Thereafter there was a significant improvement in the rainfall performance. A late start to the season was recorded in Mashonaland West and Mashonaland Central, which are high cereal producing regions.

Normal to above normal rains were received in the OND sub-season in most parts of the country with the exception of a stretch covering parts of Mashonaland West, Mashonaland Central, Midlands (Gokwe, Chirumhanzu, Shurugwi, Zvishavane, Mberengwa), northern parts of Masvingo and southern parts of Manicaland Provinces. For the sub-season JFM, normal rains were received across the country with most of these rains received in February 2018.

The prolonged dry spell of January 2018 adversely affected the maize crop that was planted around mid-November. At the beginning of January that crop had reached the critical

phenological stage of flowering and coincided with the long dry spell. The month of February was very wet and improved some crop condition, pasture and water availability in parts of the country. March 2018 continued to be wet and hence enabling the younger crop to reach maturation. However it should be noted that there was a maize crop, which was planted in February, which when the rainfall season ended was still to reach maturity.

The Crop and Livestock Assessments carried out by the Ministry of Lands, Agriculture and Rural Resettlement should provide more information on the cropping and livestock situation for the season with the food security situation for the 2018/2019 consumption year provided by the Zimbabwe Vulnerability Assessment Committee's 2018 Rural Livelihood Assessment.