agriculture
Department:
Agriculture
REPUBLIC OF SOUTH AFRICA

UMLINDI
The Watchman

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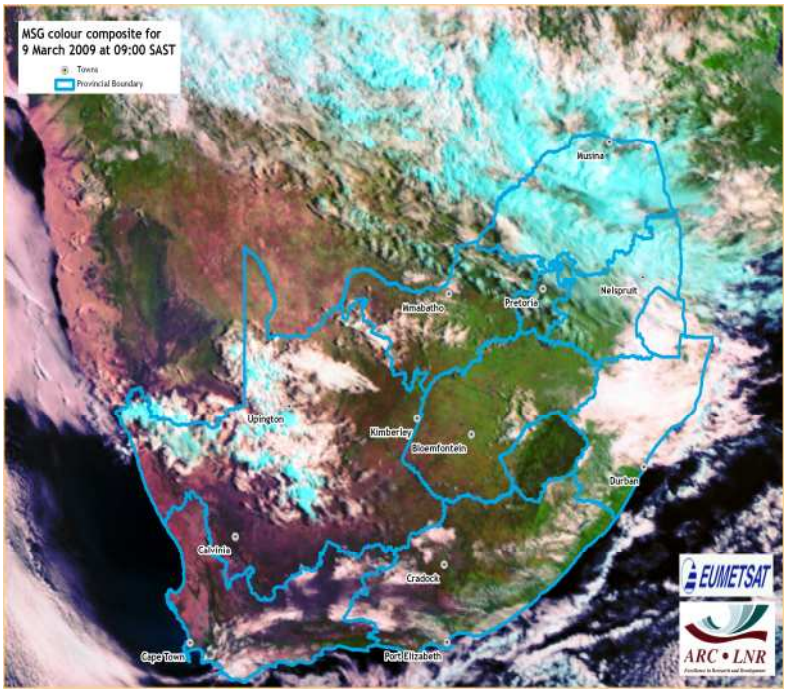
INSTITUTE FOR SOIL, CLIMATE AND WATER

- Latest vegetation conditions as deduced from SPOT VEGETATION
- Rainfall for March 2009

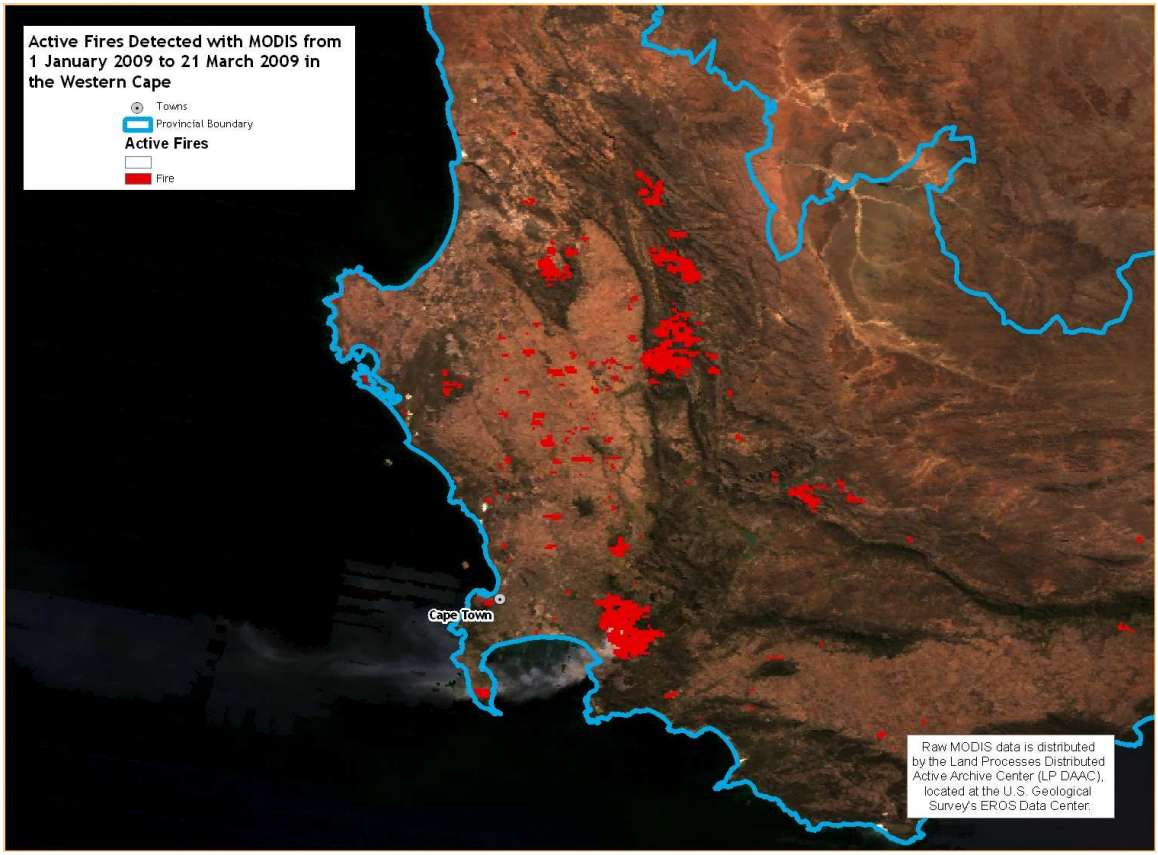
CONTENTS:

ARC • LNR
Excellence in Research and Development

Images of the Month



This image represents the situation during the first of the two widespread rain events that occurred over the interior during March. With a tropical low pressure area just to the north, and another upper air low pressure area over the south-western parts of Namibia. The cloud band over the northeastern parts represents a link between the system to the west and the tropical moist air to the north. Widespread rain occurred over the northeastern parts in the cloud band close to the tropical low pressure area during this event while scattered thunder-showers also occurred over the western parts due to the upper air low pressure area over the southwestern parts of Namibia. The system moved slowly east-ward during the following days.



The Western Cape has been ravaged with wildfires in the past couple of months (January to March). The wildfires in the Stellenbosch, Hout Bay and Simon's Town area were driven by high winds and temperatures (up to 41°C in January). A large smoke plume from the 23 February Stellenbosch fire can be seen. This burn scar can also be seen in the NDVI difference maps (Figures 1 & 4).

Vegetation Conditions

Vegetation Mapping

The Normalised Difference Vegetation Index (NDVI) is computed from the equation:

NDVI=(IR-R)/(IR+R)

where:
IR = Infrared reflectance &
R = Red band

NDVI images describe the vegetation activity. A decadal NDVI image shows the highest possible "greenness" values that have been measured during a 10-day period.

Vegetated areas will generally yield high values because of their relatively high near infrared reflectance and low visible reflectance. For better interpretation and understanding of the NDVI images, a temporal image difference approach for change detection is used.

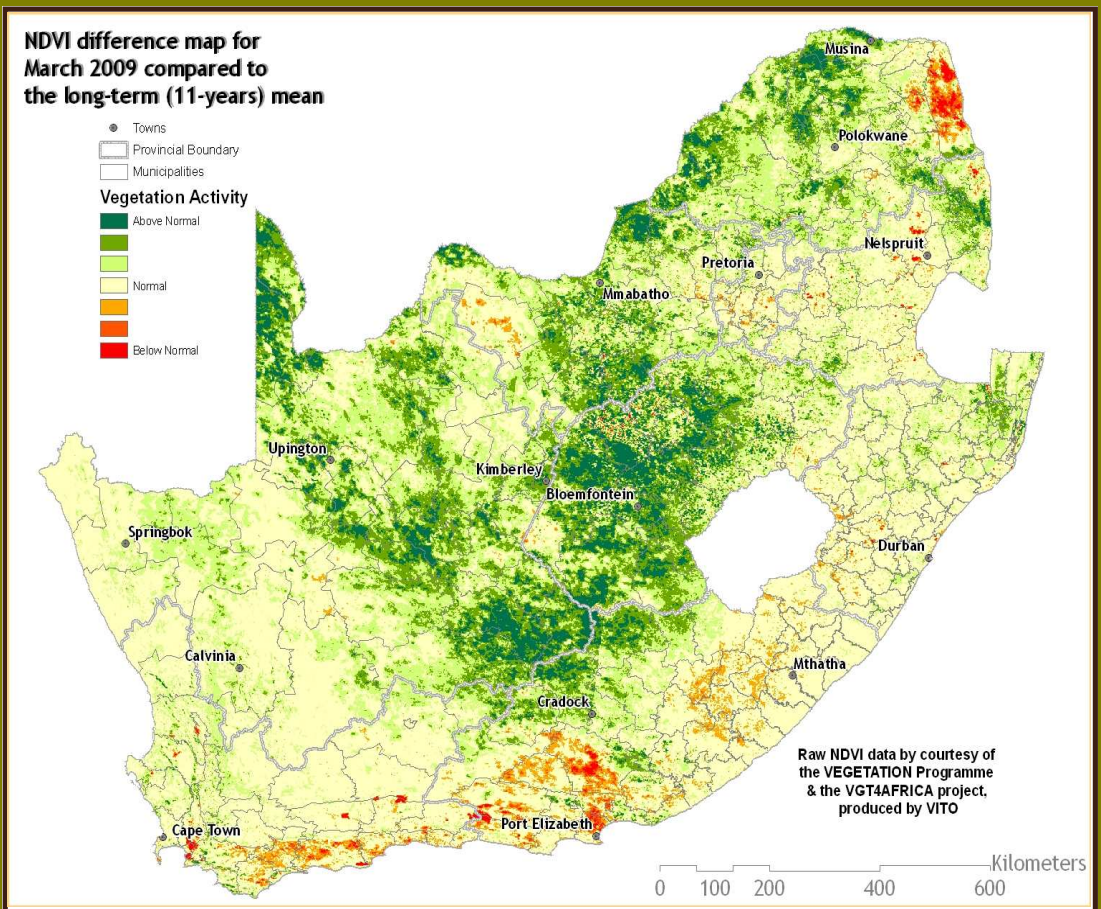


Figure 1

Figure 1:
Vegetation conditions for March were normal throughout most of the summer rainfall region, however, lower vegetation activity can be seen in the northeastern region of Limpopo. Lower vegetation activity can also be seen in the Eastern Cape and Western Cape provinces (see also Figures 10-11, 13 & 14). A burn scar near Stellenbosch is visible.

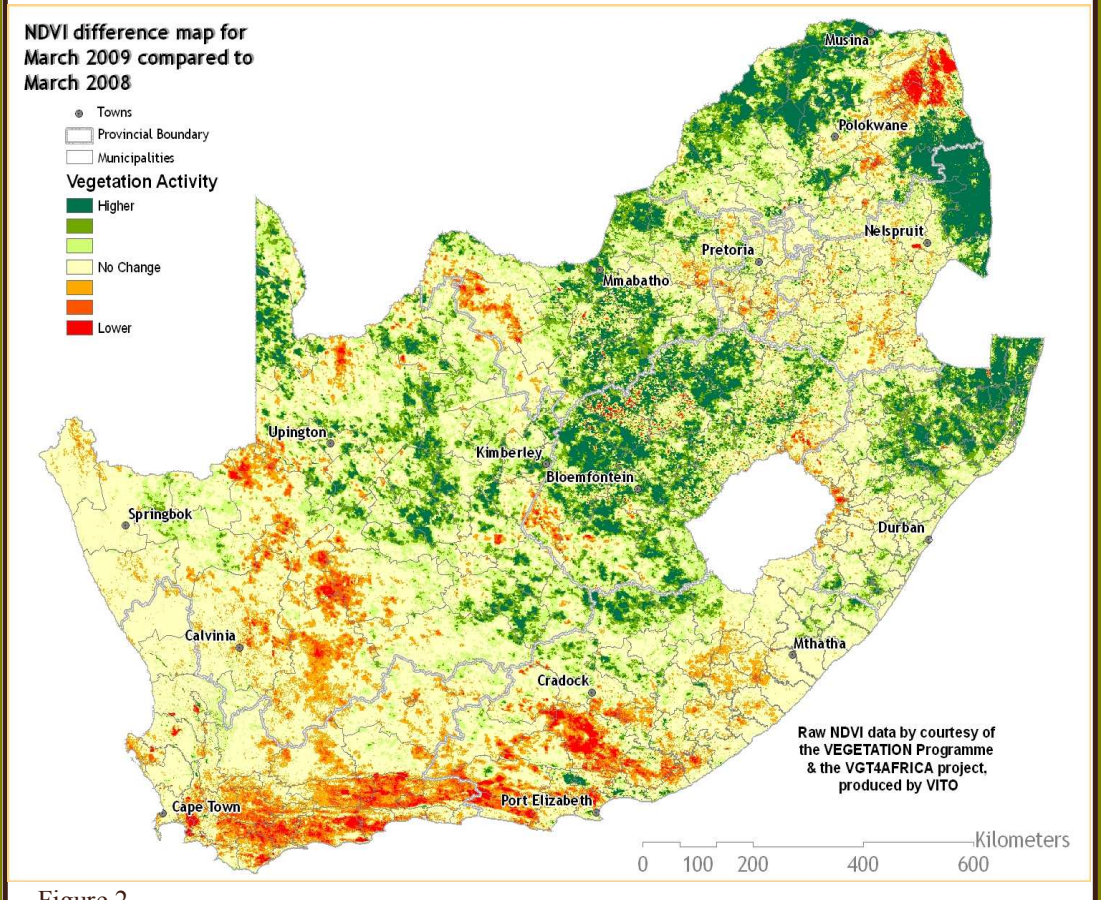


Figure 2

Figure 2:
Vegetation activity is higher throughout the central region of South Africa in March 2009 than it was in 2008. Very low vegetation activity can be seen in the Eastern Cape, southern Western Cape and the northeastern region of Limpopo.

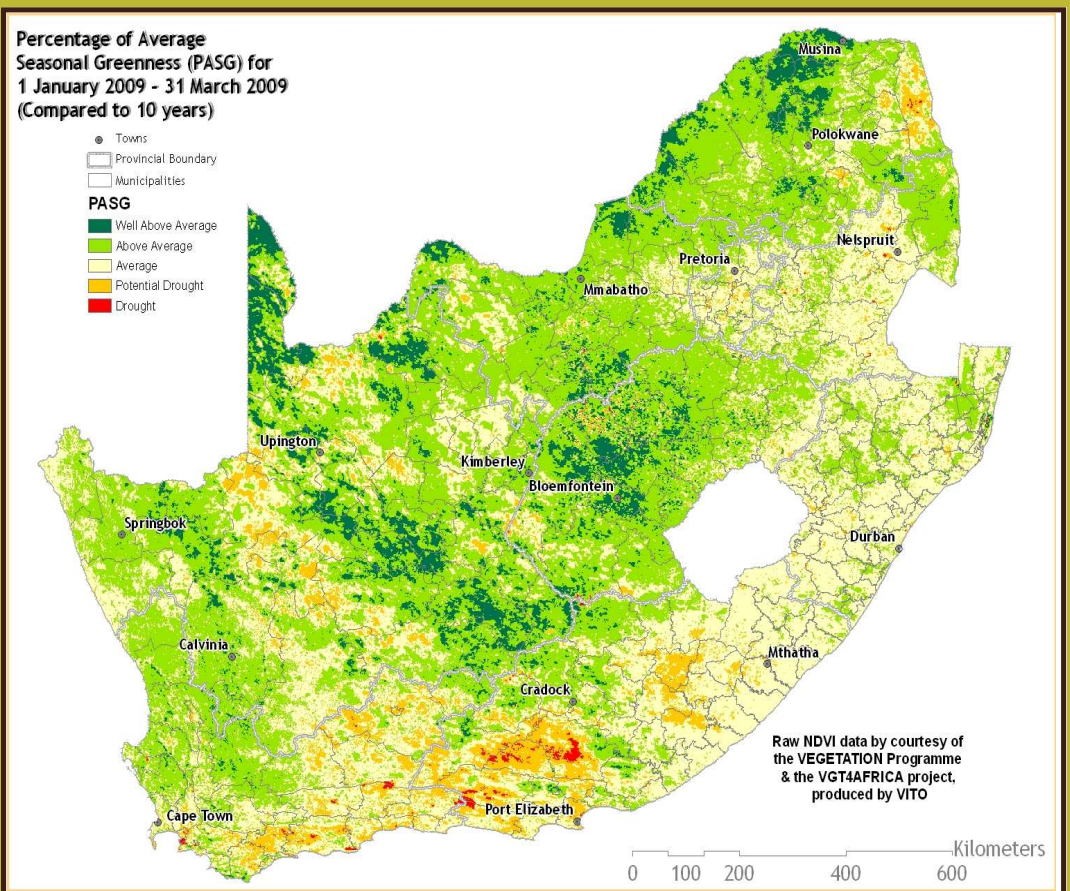


Figure 3

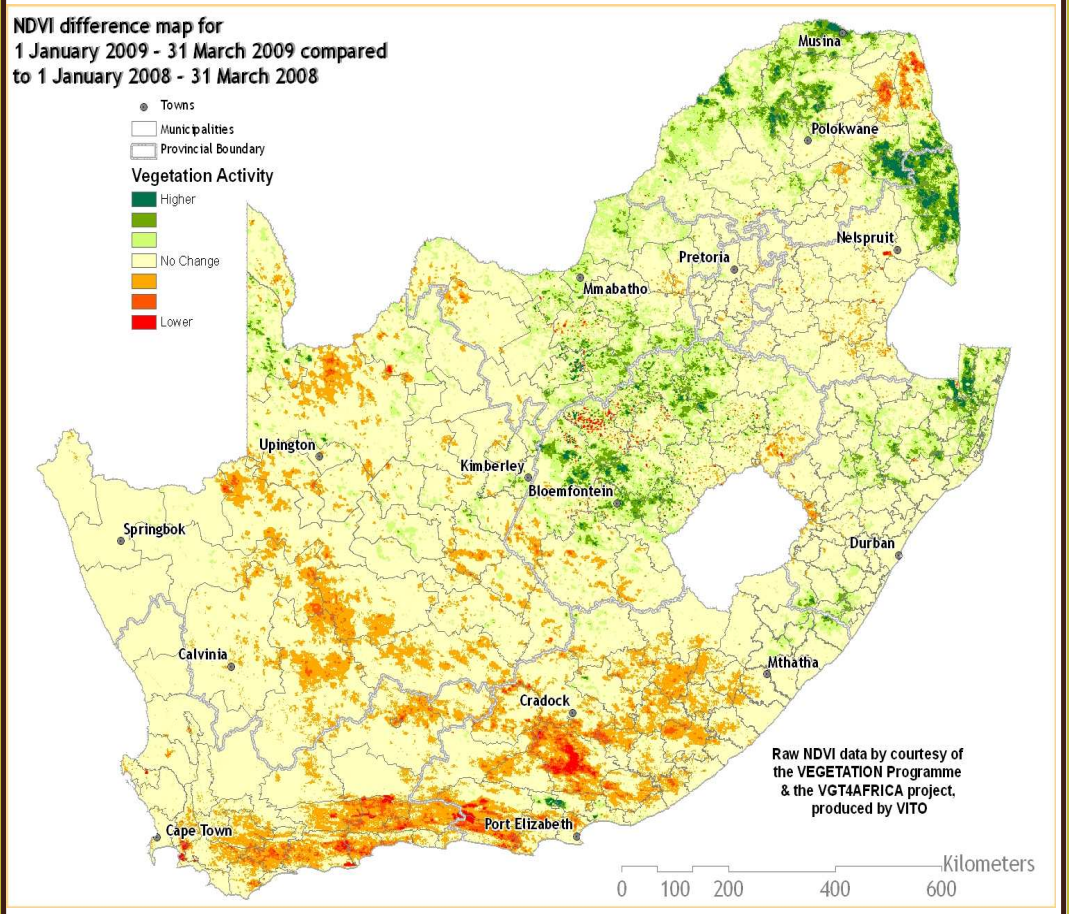


Figure 4

Vegetation Mapping cont.... ***(from p. 2)***

Interpretation of map legend

NDVI values range between 0 and 1. These values are incorporated in the legend of the difference maps, ranging from –1 (lower vegetation activity) to 1 (higher vegetation activity) with 0 indicating normal/the same vegetation activity or no significant difference between the images.

Cumulative NDVI maps: Two cumulative NDVI datasets have been created for drought monitoring purposes:
Winter - January to December.
Summer - July to June

Figure 3:
The PASG map for January to March 2009 shows higher vegetation conditions over parts of the central summer rainfall region (see also Figures 8 & 9). Areas of concern, with lower vegetation conditions, include large parts of eastern Limpopo (Figure 12), and the Eastern Cape (Figures 10-11, 13 & 14).

Figure 4:
The three-month difference map for January to March 2009 shows normal vegetation activity in the 2008/09 season than in the 2007/08 season over most of South Africa, with lower vegetation activity in the Eastern Cape and southern Western Cape.

Vegetation Conditions & Rainfall

NDVI and Rainfall Graphs

Figure 5: Orientation map showing the areas of interest for March 2009. The district colour matches the border of the corresponding graph.

Figures 6-9: Indicate areas with higher cumulative vegetation activity for the last year. These areas are all located over the western parts of the country.

Figures 10-15: Indicate areas with lower cumulative vegetation activity for the last year.

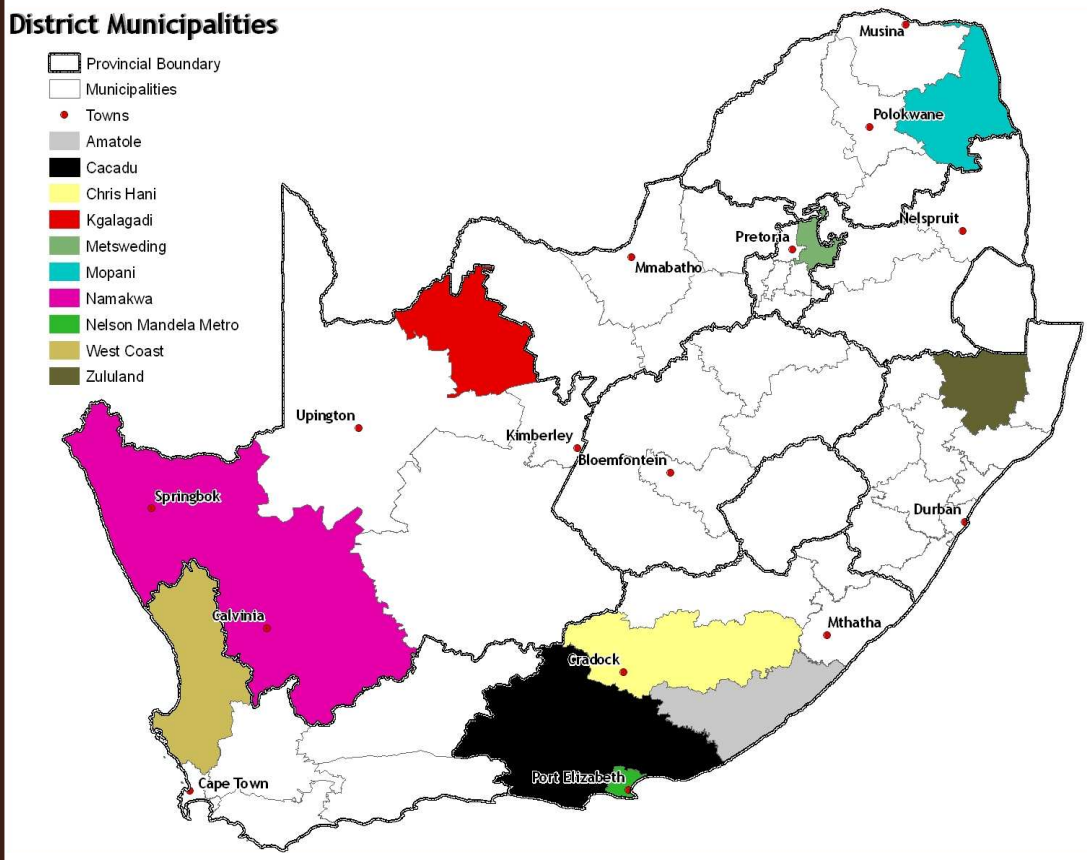


Figure 5

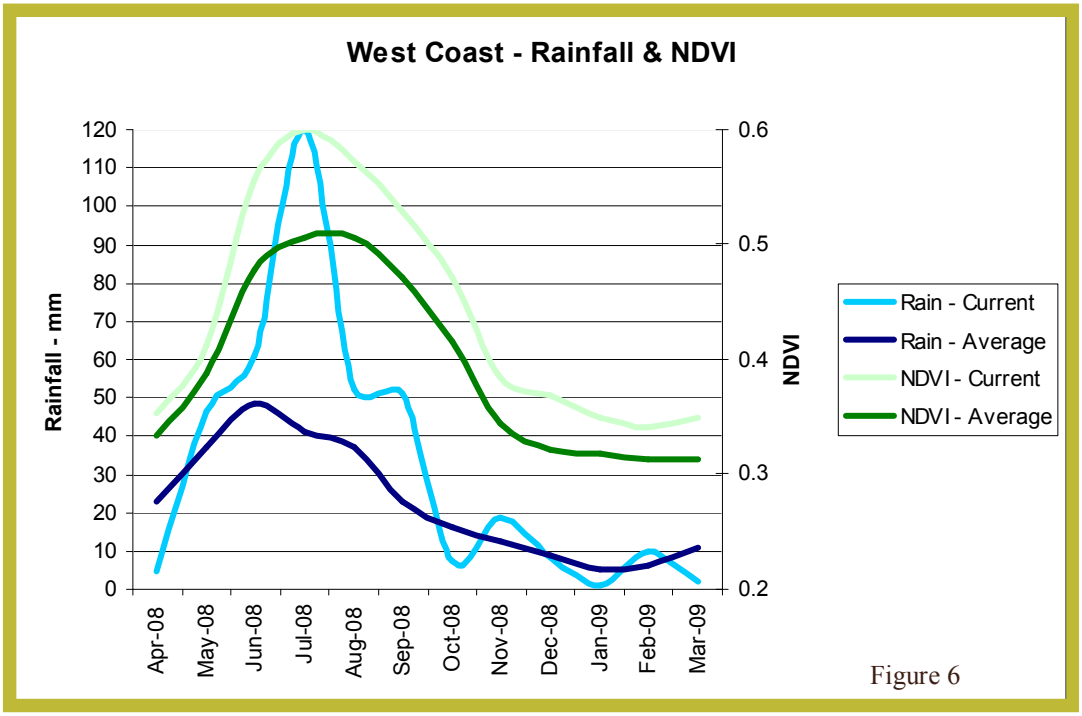


Figure 6

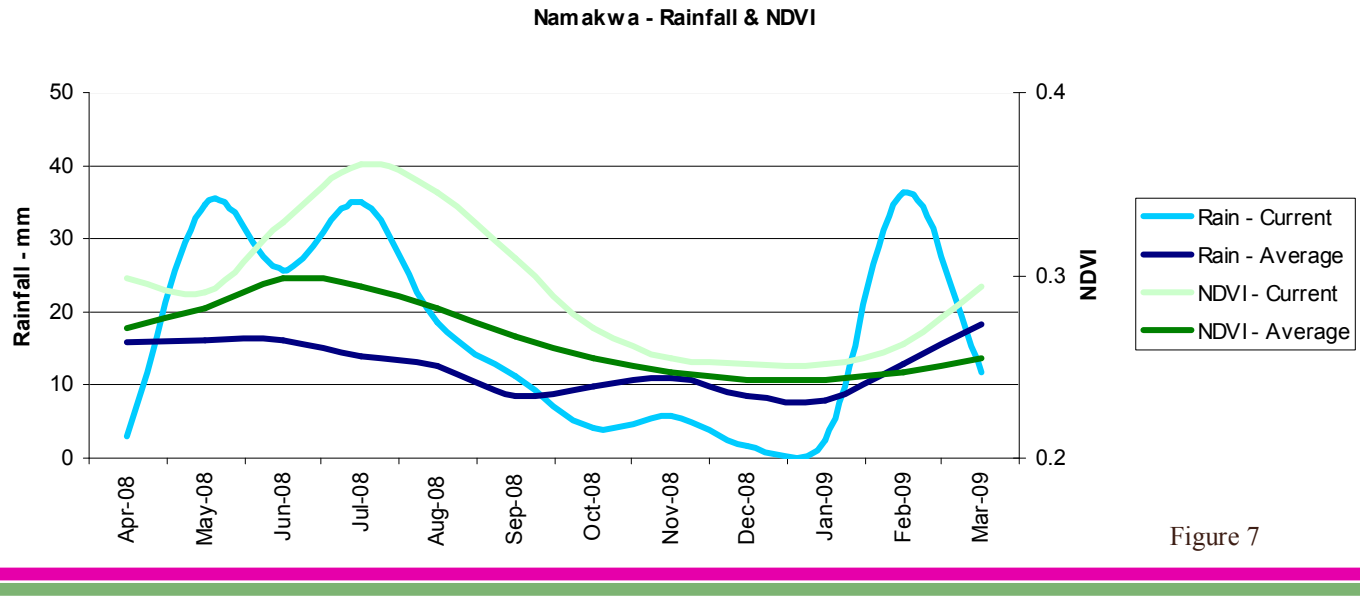


Figure 7

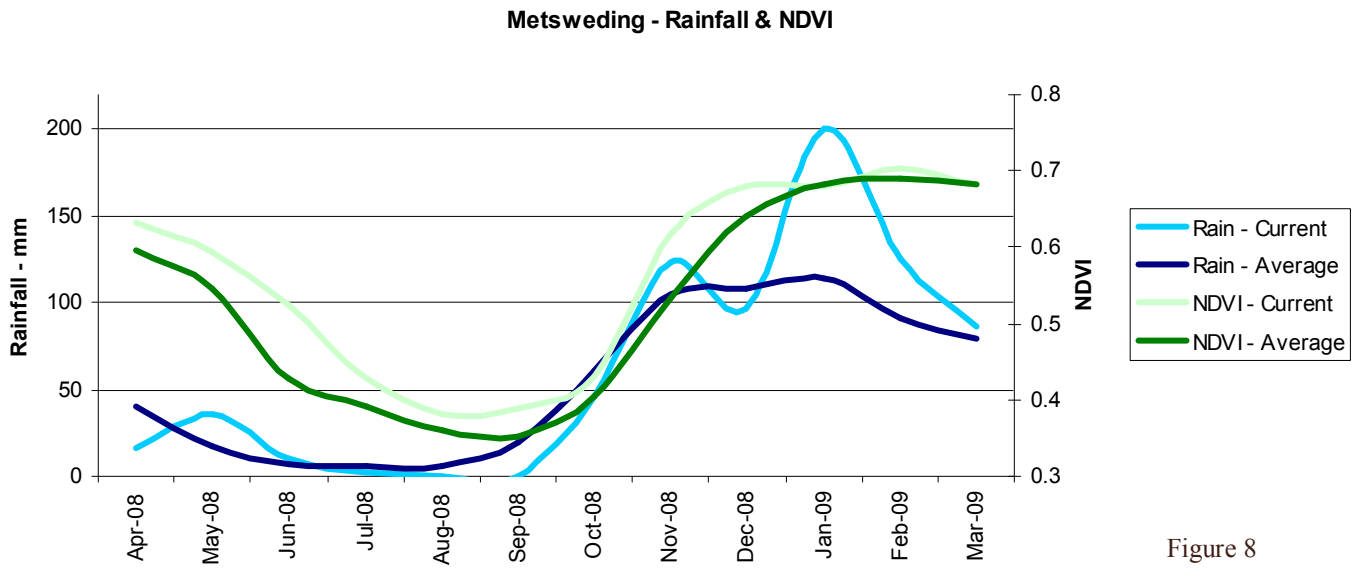


Figure 8

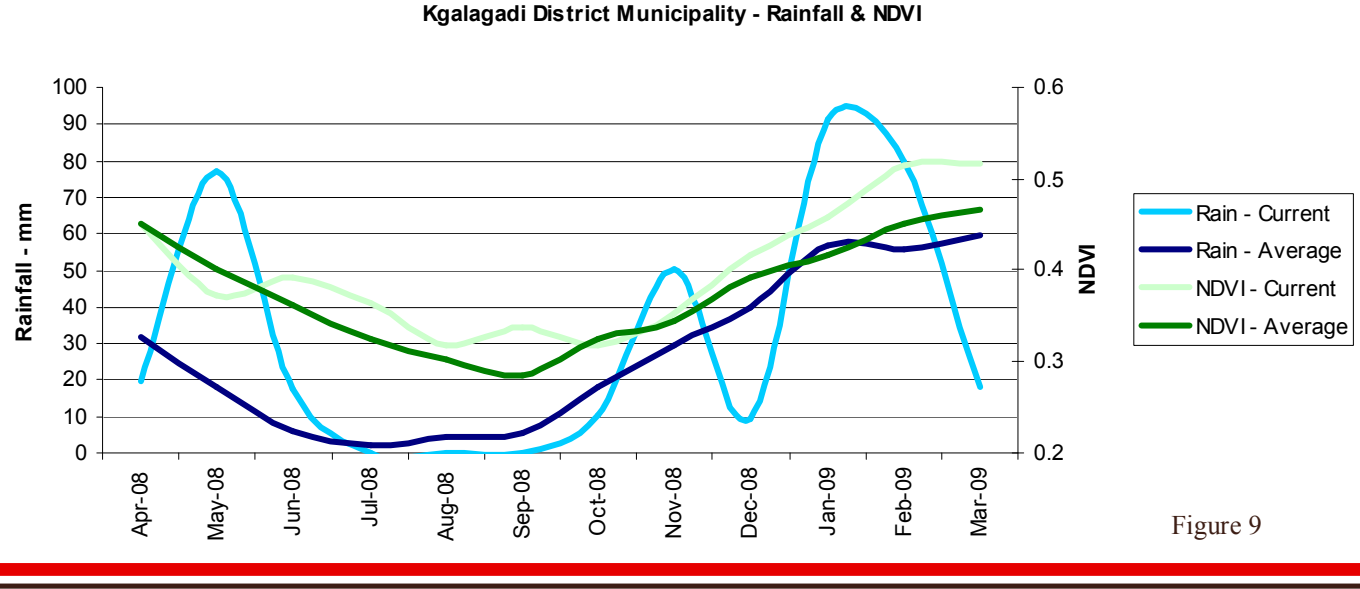


Figure 9

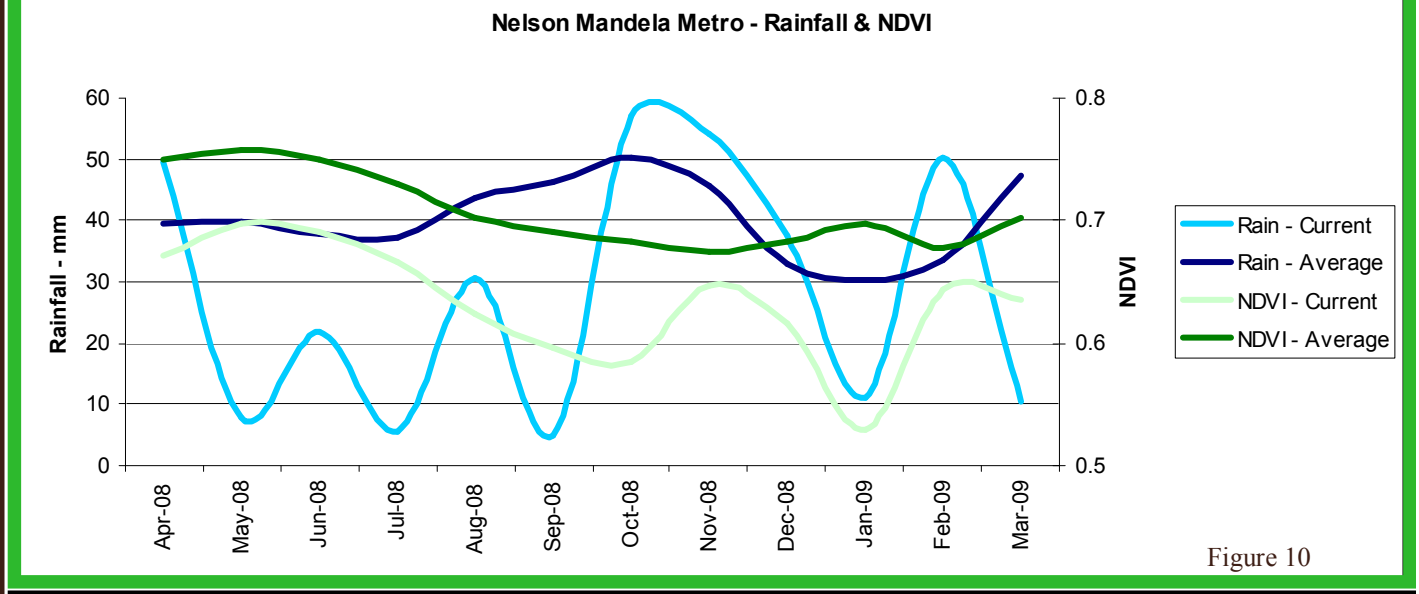


Figure 10

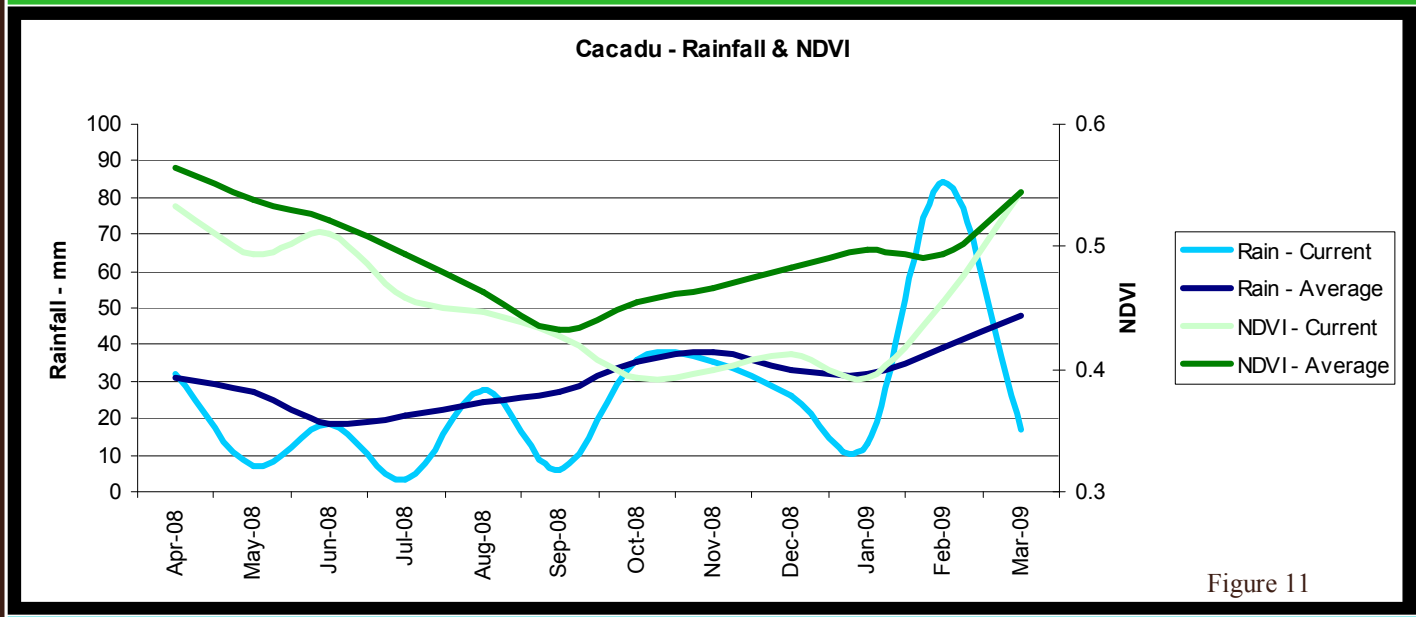


Figure 11

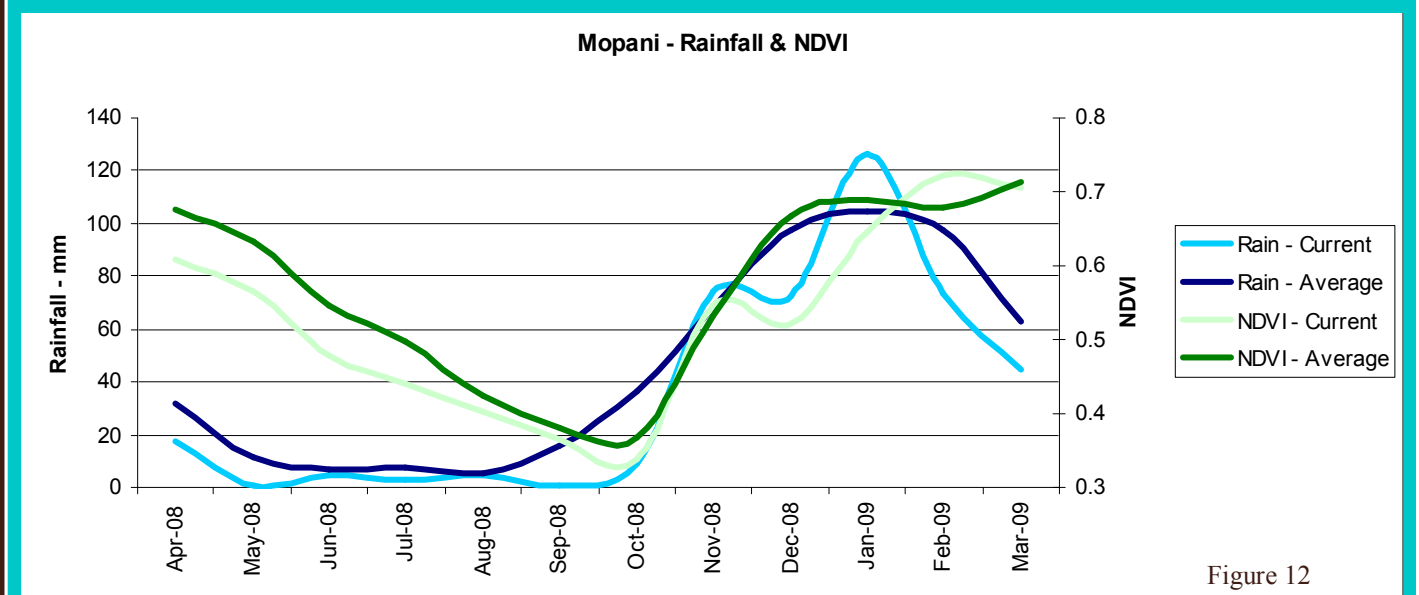


Figure 12

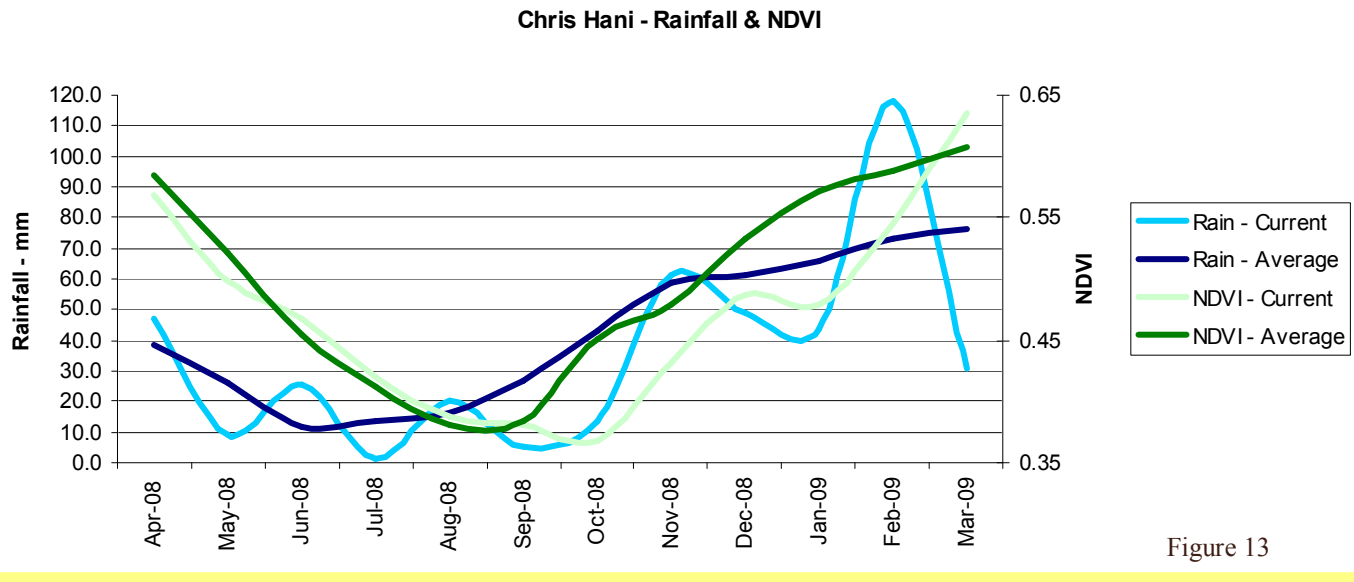


Figure 13

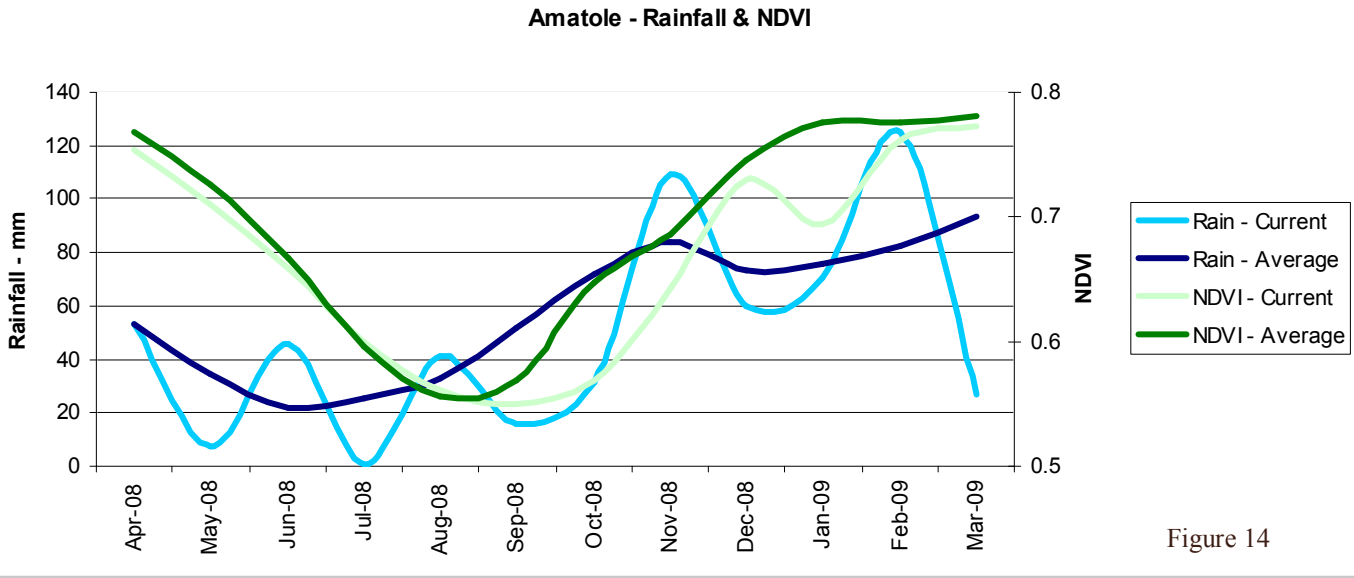


Figure 14

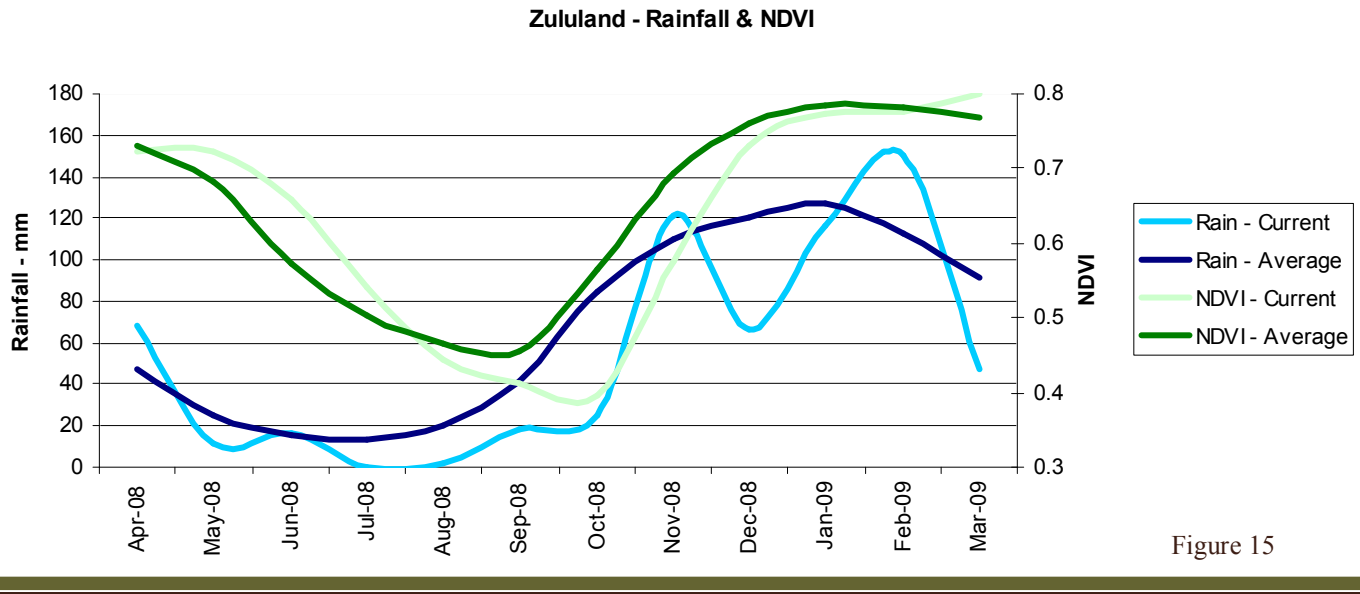


Figure 15

Rainfall

Overview:
Rainfall during March 2009, in contrast to the situation during February, was mainly confined to the northern parts of the country. Rain occurred mainly during two wet periods. The first occurred between the 9th and the 14th when a tropical low pressure system moved eastward just to the north of South Africa from Botswana towards Zimbabwe. An upper air low pressure system also developed over southwestern Namibia, moving slowly eastward and causing rain over the western parts of the country. A cloud band developed between the upper air low to the west and the tropical low pressure system to the northeast. The pattern was responsible for widespread rain and thundershowers over the northeastern parts of the country and scattered thundershowers over most of the rest of the interior. It was especially parts of the Limpopo Province that received high rainfall totals during this event.
Between the 17th and 21st another upper air trough moved over the country causing widespread showers and thundershowers. This time the area of highest rainfall totals was located further south over Mpumalanga, Gauteng, North West and the northern Free State. After this system moved over the country, settled conditions prevailed with upper air anticyclonic circulation dominating over most parts. The month ended with isolated thunder-showers occurring over the central and western parts around the peripheries of the upper air high. The main area of rainfall activity shifted into the Indian Ocean.

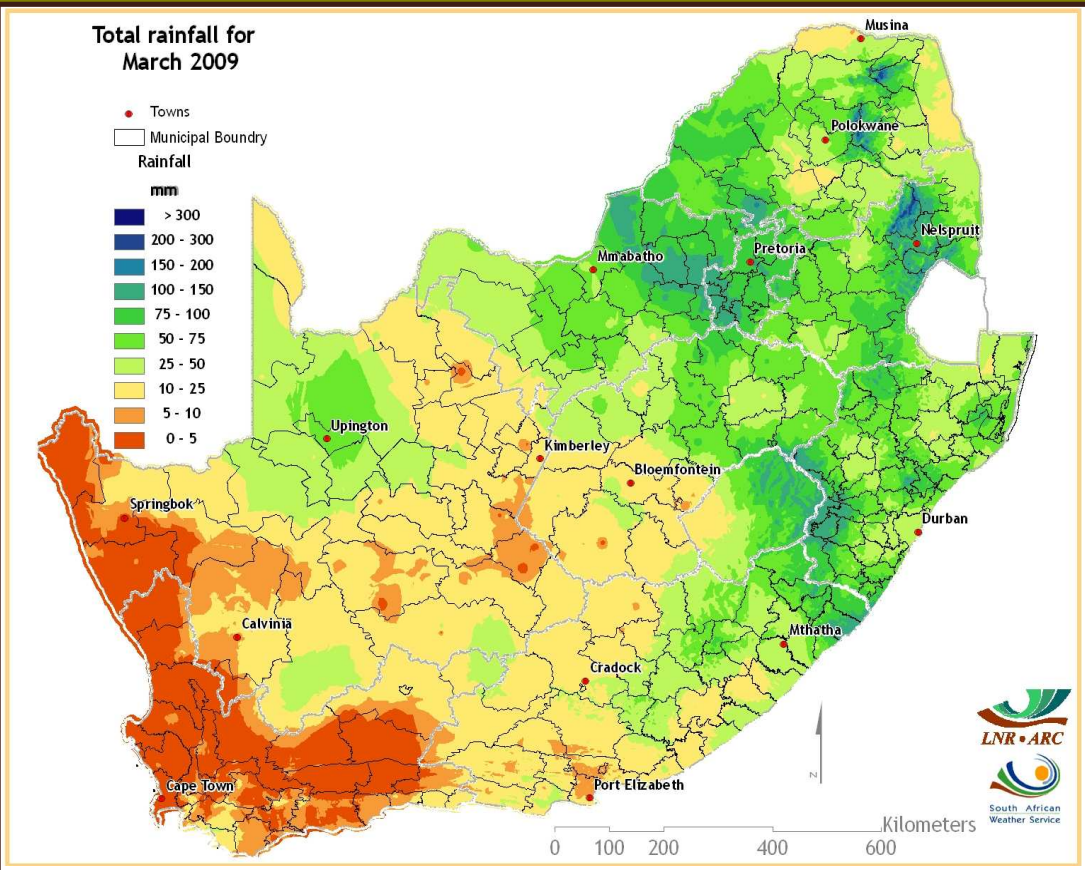


Figure 16

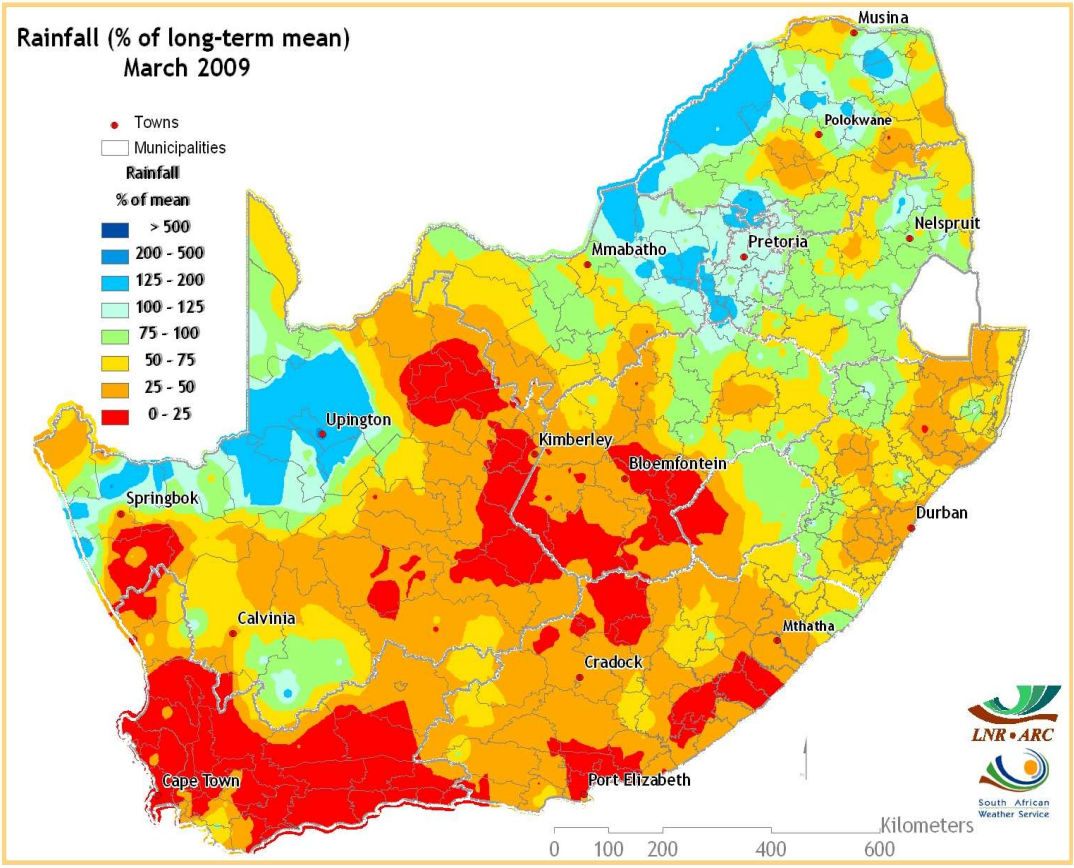


Figure 17

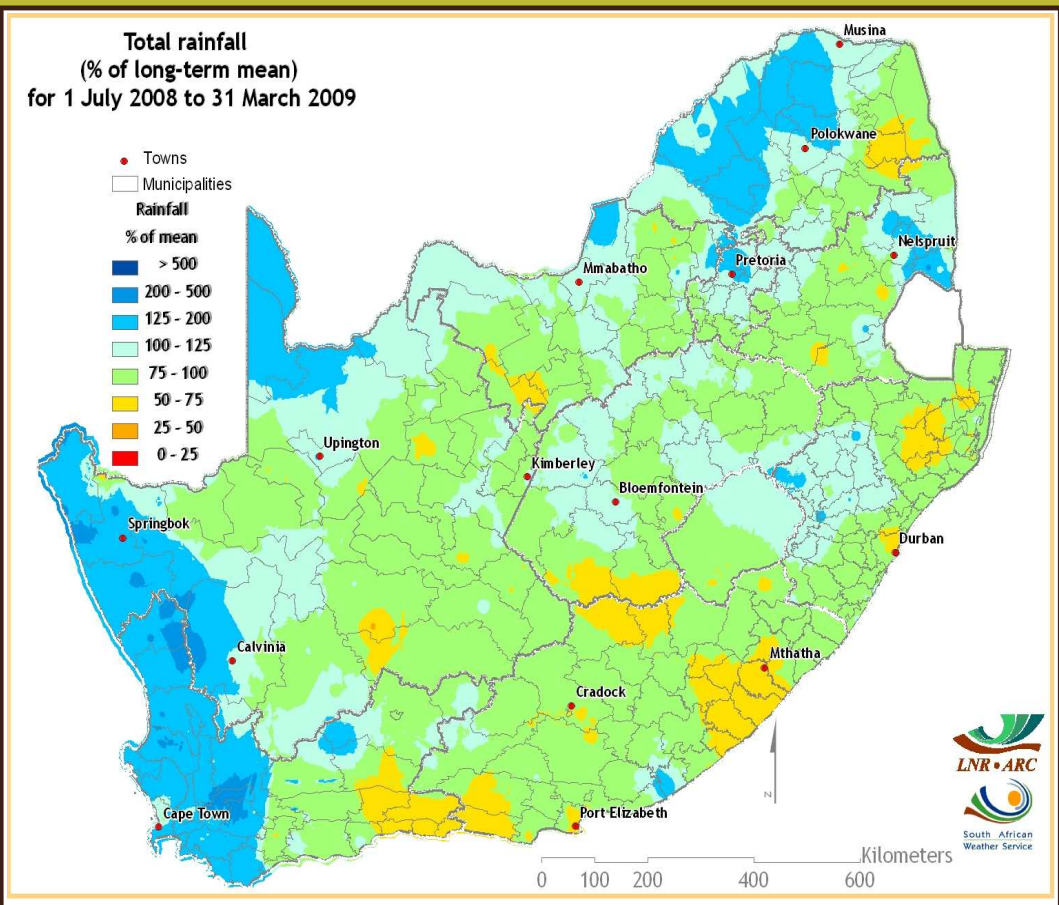


Figure 18

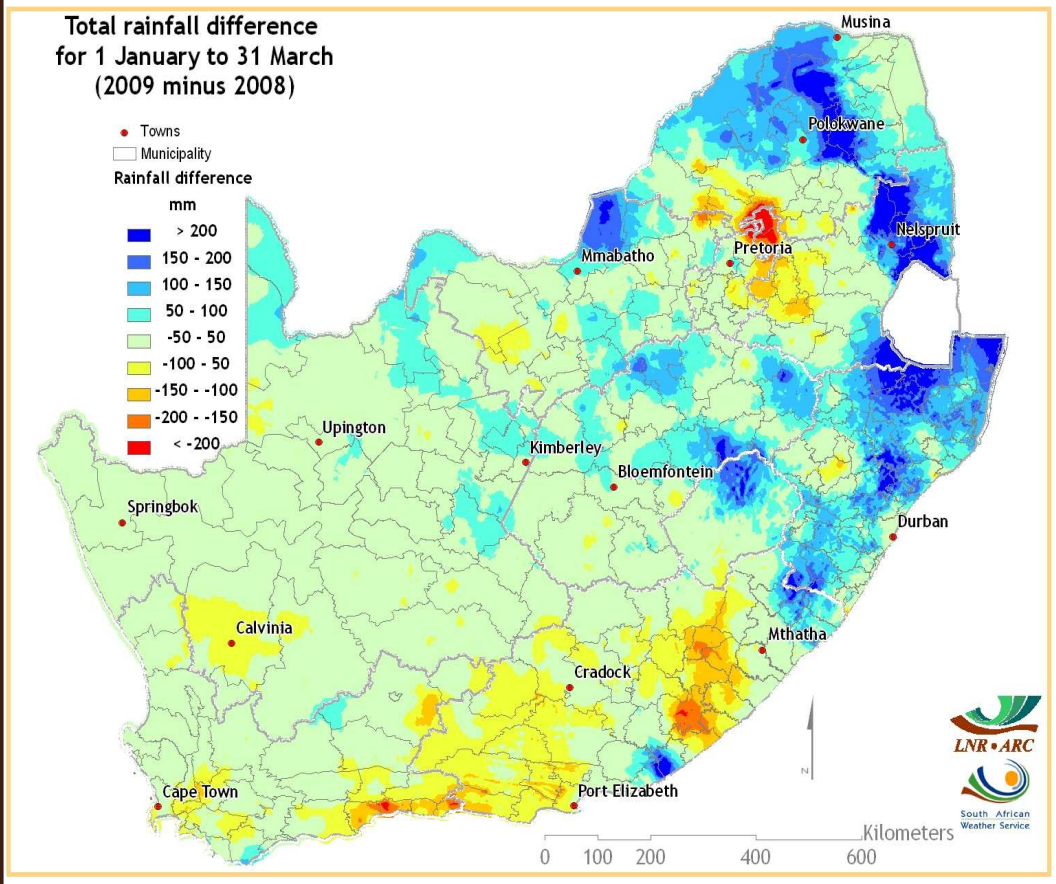


Figure 19

Figures 16 & 17:
Most areas over the northeastern half of the country received more than 50 mm of rain. Large areas over Gauteng, eastern North West and along the escarpment received more than 100 mm of rain. Rainfall totals diminished steadily southwestward and the southwestern areas of the country, especially the winter rainfall area received no rain. The rainfall distribution gave rise to above-normal rainfall over large areas in the north and east while below-normal rainfall occurred over the central, western and southern parts of the country.

Figure 18:
For the period July 2008 to March 2009, above-normal rainfall totals have been reported from the northern parts of the summer rainfall area as well as the winter rainfall area, especially the western parts. Large areas over the central and southern parts of the country received less than 75% of the average rainfall for this period.

Figure 19:
During the period January to March, more rain occurred generally over the northeastern parts of the country than during the previous year. However, over the southern and central parts most areas received less rain than during the previous year.

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Agrometeorology

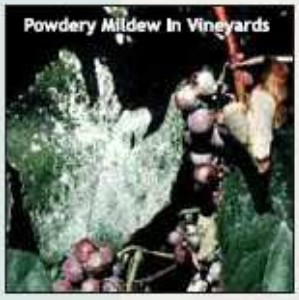
The AgroMet Division of ARC-ISCW conducts and implements research in the field of Agrometeorology and Climatology to promote sustainable utilization of the region's climate, soil and water resources.

Since 1940, ARC-ISCW AgroMet has installed a countrywide network of weather stations aimed at satisfying the climatological requirements of Agriculture in particular. This network has grown to the stage where there are now 110 mechanical weather stations and 455 automatic weather stations.

Since 1940, ARC-ISCW AgroMet has collected all the available climate information from its own climate monitoring network as well as from other organizations such as the South African Weather Service. This collection has now grown to ± 10 000 data points in the climate databank.

ARC-ISCW AgroMet is involved in the following activities:

- **Climate Monitoring (Weather Station Network), Data Management and Dissemination**
  - *Sending out reports, including Disease Warnings, Indices and Daily Data Reports*
  - *Disease warnings include: Powdery Mildew and Downy Mildew warnings*
  - *Indices calculated are: Evapotranspiration, Chill Units, Heat Units and other Temperature Thresholds*
  - *Elements include: Rainfall, Air Temperature, Sunshine Duration, Solar Radiation, Relative Humidity, Evaporation, Wind Speed and Wind Direction*
- **Climate Analysis for Agricultural Purposes**
- **Crop Micro- and Meso-Climate Monitoring**
- **Crop-Climate Matching**
  - *Crop Suitability Surfaces*
- **Crop Growth Modeling**
- **Developing new Climatic Related Early Warning Systems**
- **Spatial Interpolation of Climate Elements**
  - *Long-term Climate Surfaces*
  - *Climate Monitoring*
- **Climate Classification according the Köppen Climate Zones**



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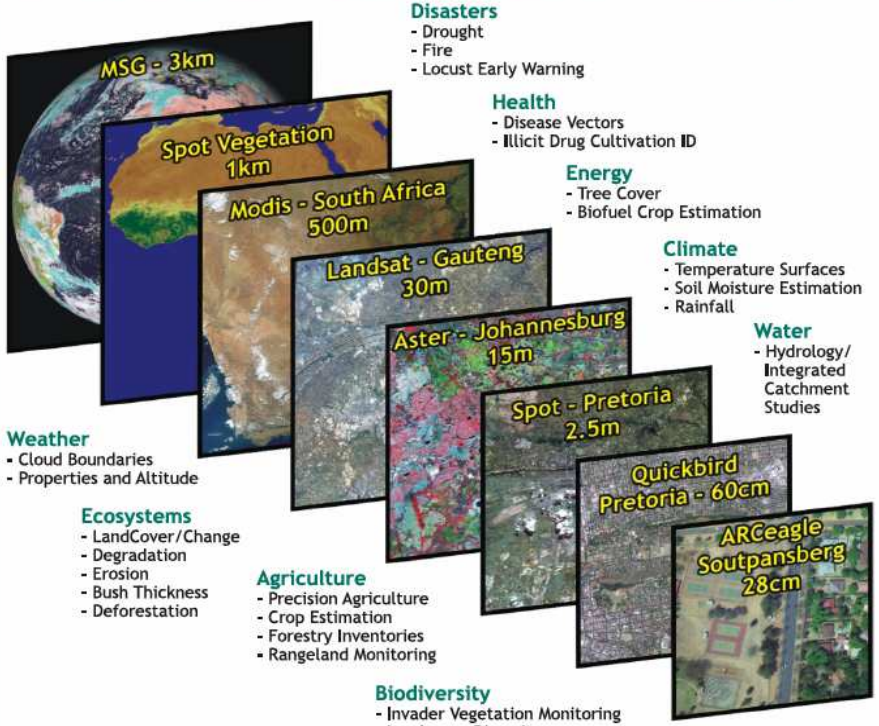

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- Locust Early Warning

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- Illicit Drug Cultivation ID

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- Biofuel Crop Estimation

Climate
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- Soil Moisture Estimation
- Rainfall

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- Erosion
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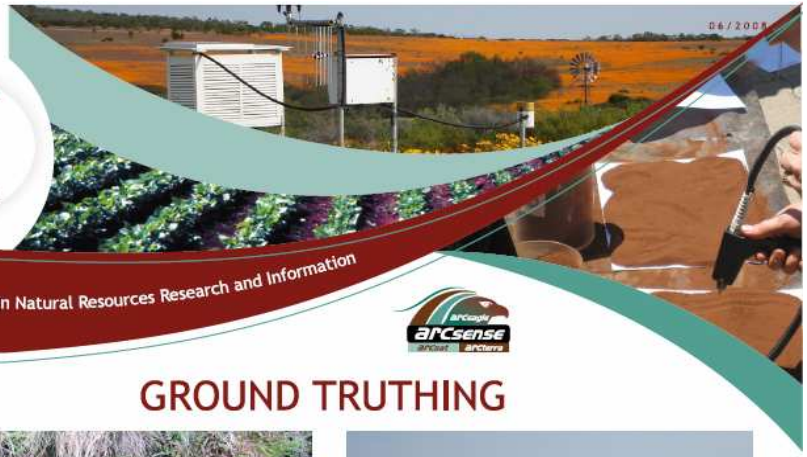

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The Coarse Resolution Imagery Database (CRID)

NOAA AVHRR

The ARC-ISCW has an archive of daily NOAA AVHRR data dating from 1985 to 2004. This database includes all 5 bands as well as the Normalised Difference Vegetation Index (NDVI), Active Fire and Land Surface Temperature (LST) images. The NOAA data are used, for example, for crop production and grazing capacity estimation.

MODIS

MODIS data is distributed by the Land Processes Distributed Active Archive Center (LP DAAC), located at the U.S. Geological Survey's EROS Data Center. The MODIS sensor is more advanced than NOAA with regard to its high spatial (250 m^2 to 1 km^2) and spectral resolution. The ARC-ISCW has an archive of MODIS (version 4 and 5) data.

- MODIS V4 from 2000 to 2006
- MODIS V5 from 2000 to present

Datasets include:

- MOD09 (Surface Reflectance)
- MOD11 (Land Surface Temperature)
- MOD13 (Vegetation Products)
- MOD14 (Active Fire)
- MOD15 (Leaf Area Index & Fraction of Photosynthetically Active Radiation
- MOD17 (Gross Primary Productivity)
- MCD43 (Albedo & Nadir Reflectance)
- MCD45 (Burn Scar)

Coverage for version 5 includes South Africa, Namibia, Botswana, Zimbabwe and Mozambique.
More information:
http://modis.gsfc.nasa.gov

VGT4AFRICA and GEOSUCCESS

SPOT NDVI data is provided courtesy of the VEGETATION Programme and the VGT4AFRICA project. The European Commission jointly developed the VEGETATION Programme. The VGT4AFRICA project disseminates VEGETATION products in Africa through EUMETCast. ARC-ISCW has an archive of VEGETATION data dating from 1998 to the present. Other products distributed through VGT4AFRICA and GEOSUCCESS include Net Primary Productivity, Normalised Difference Wetness Index and Dry Matter Productivity data.

Meteosat Second Generation (MSG)

The ARC-ISCW has an operational MSG receiving station. Data from April 2005 to the present have been archived. MSG produces data with a 15-minute temporal resolution for the entire African continent. Over South Africa the spatial resolution of the data is in the order of 3 km. The ARC-ISCW investigated the potential for the development of products for application in agriculture. NDVI, LST and cloud cover products were some of the initial products derived from the MSG SEVIRI data. Other products derived from MSG used weather station data, including air temperature, humidity and solar radiation.

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The operational Coarse Resolution Imagery Database (CRID) project of ARC-ISCW is funded by the National Department of Agriculture. Development of the monitoring system was made possible through LEAD funding from the Department of Science and Technology.

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What does Umlindi mean?
UMLINDI is the Zulu word for "the watchman".

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