agriculture
Department:
Agriculture
REPUBLIC OF SOUTH AFRICA

UMLINDI
The Watchman

ISSUE 2009-06 5 JUNE 2009

INSTITUTE FOR SOIL, CLIMATE AND WATER

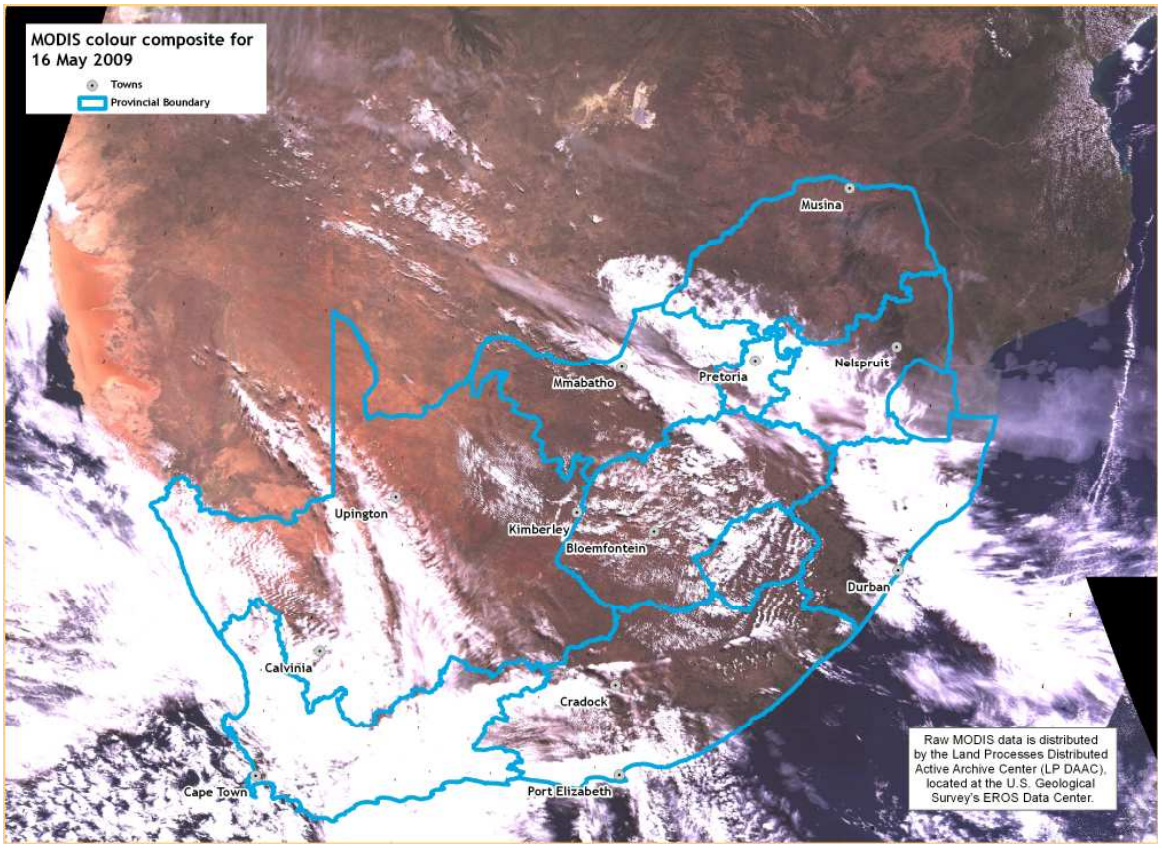
- Latest vegetation conditions as deduced from SPOT VEGETATION
- Rainfall for May 2009

CONTENTS:

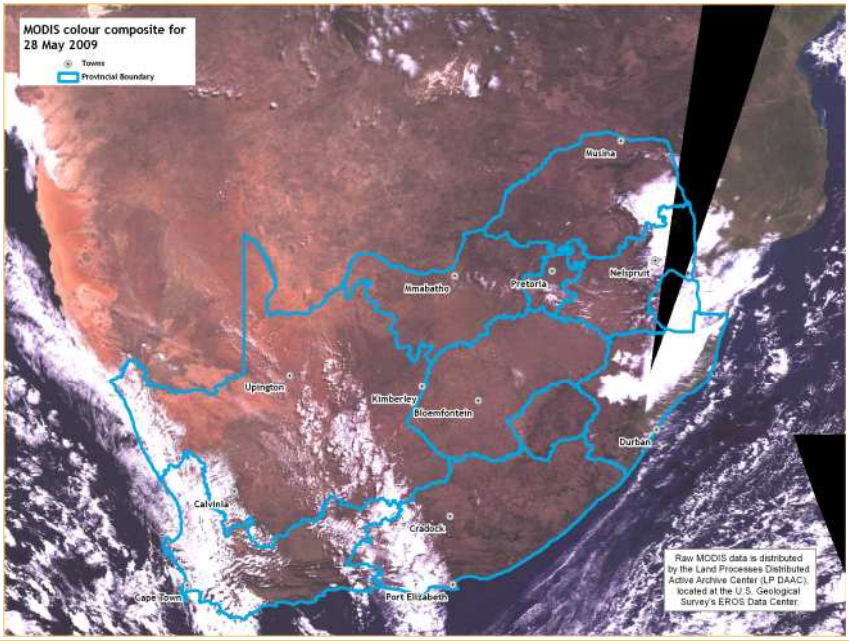
Vegetation Conditions	2
Vegetation Conditions & Rainfall	4
Rainfall	8
Agrometeorology	10
Remote Sensing	11
CRID	12
Contact details	12

ARC • LNR
Excellence in Research and Development

Images of the Month



The winter rainy season really started in May this year with the first strong cold front causing widespread heavy rain over the southwestern parts of the country on the 15th of the month. The first image shows a cloud mass over the southwestern parts of the country associated with the surface cold front and upper air low pressure system moving from the west over the area and responsible for the widespread rain. The broken cloud to the southwest shows the cold air moving in behind the front. Cloud bands over the country were orientated northwest-southeast associated with the upper air low pressure system to the southwest. Showers also occurred over the central interior due to the upper air trough. The system was followed by colder drier conditions over the interior with frost over some areas. This was one of several fronts that caused rain over the winter rainfall area during the month.



The second image shows the situation on the 28th of the month when another strong cold front moved over the southwestern parts of the country causing rain there. As this front moved over the interior it was responsible for a sharp drop in temperatures and frost occurred even over the northern interior in the wake of the front. There was, however, no rain associated with this front as it moved over the interior.

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.

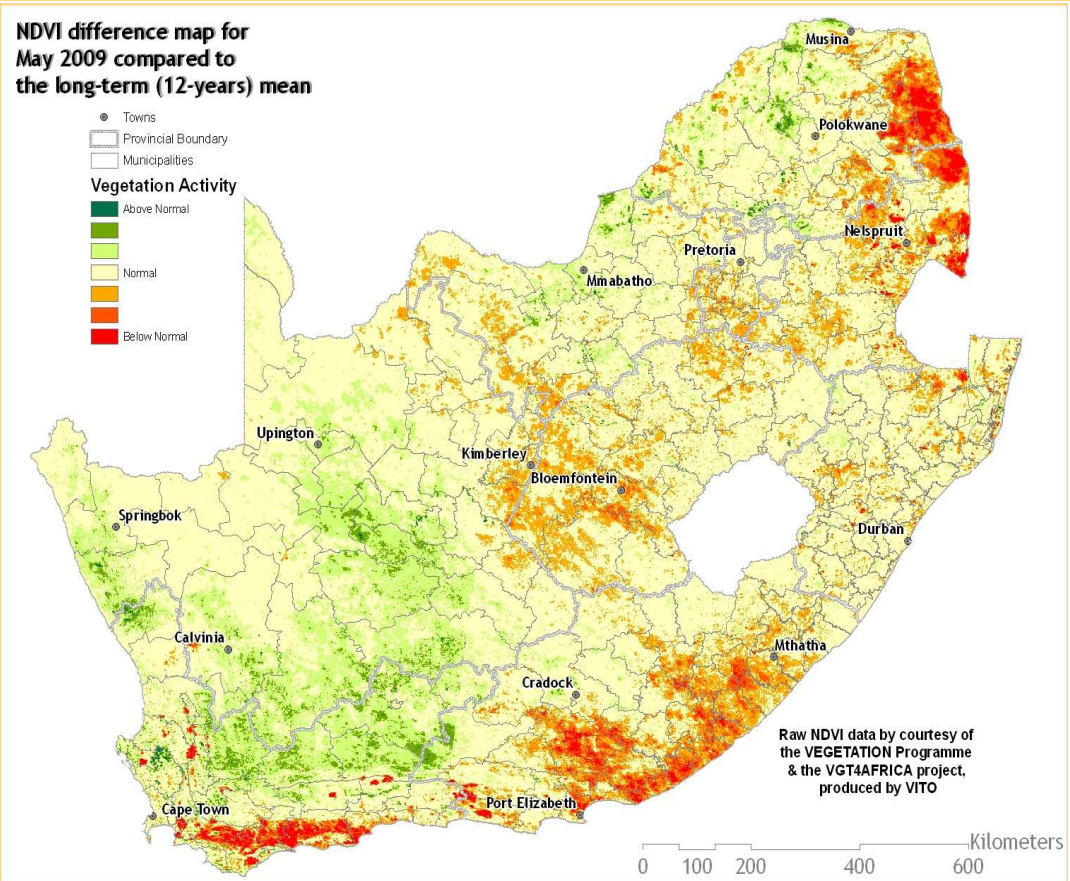


Figure 1

Figure 1:
Vegetation conditions for May were normal throughout most of the summer rainfall region. However, lower vegetation activity can be seen in the southern Free State, Eastern Cape, eastern Limpopo and Western Cape provinces (see also Figures 10-11, 13 & 14).

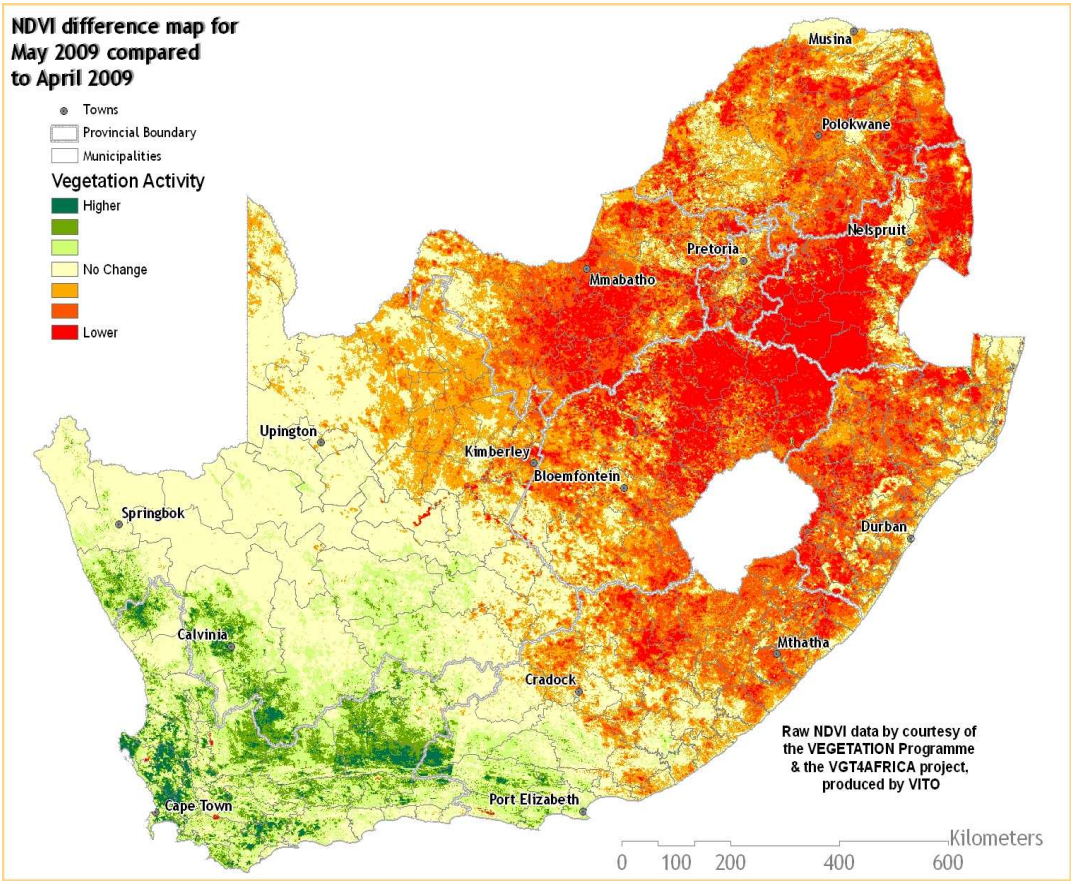


Figure 2

Figure 2:
Vegetation activity for May 2009 is much lower in the summer rainfall region than in April 2009. The opposite is true for the winter rainfall areas, where much higher vegetation activity can be seen. Winter 2009 has arrived!

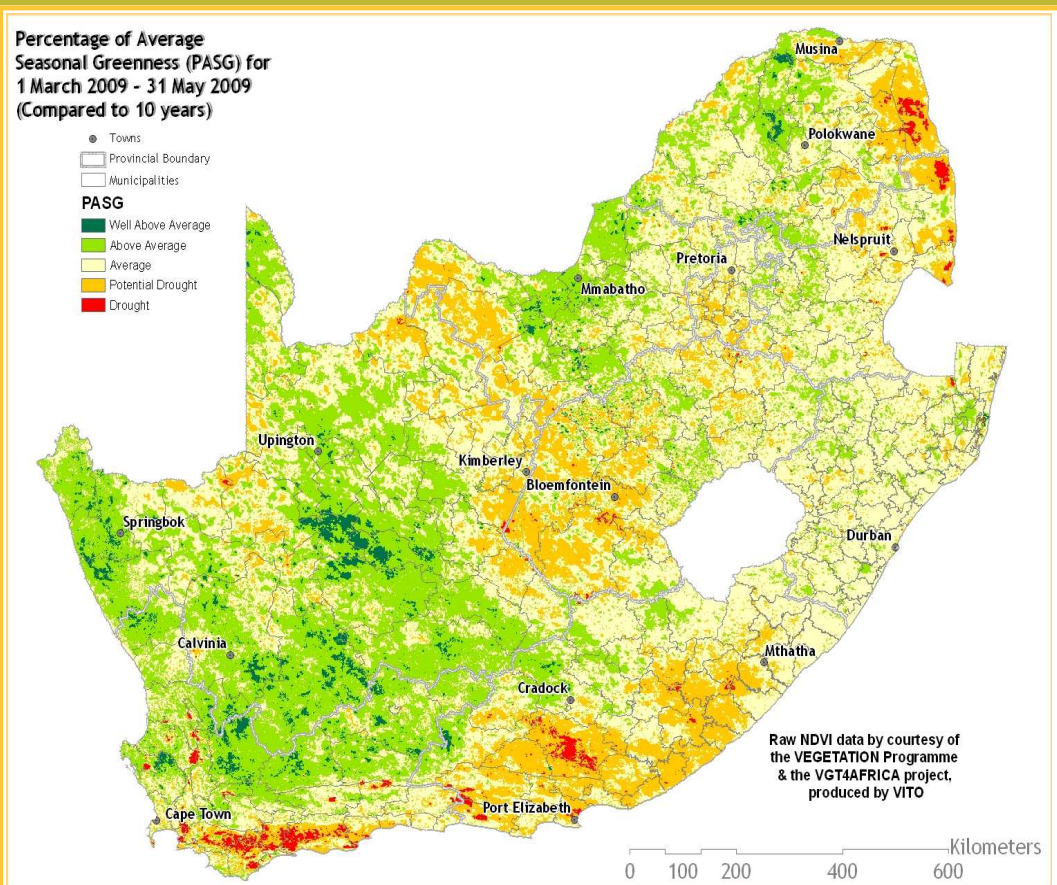


Figure 3

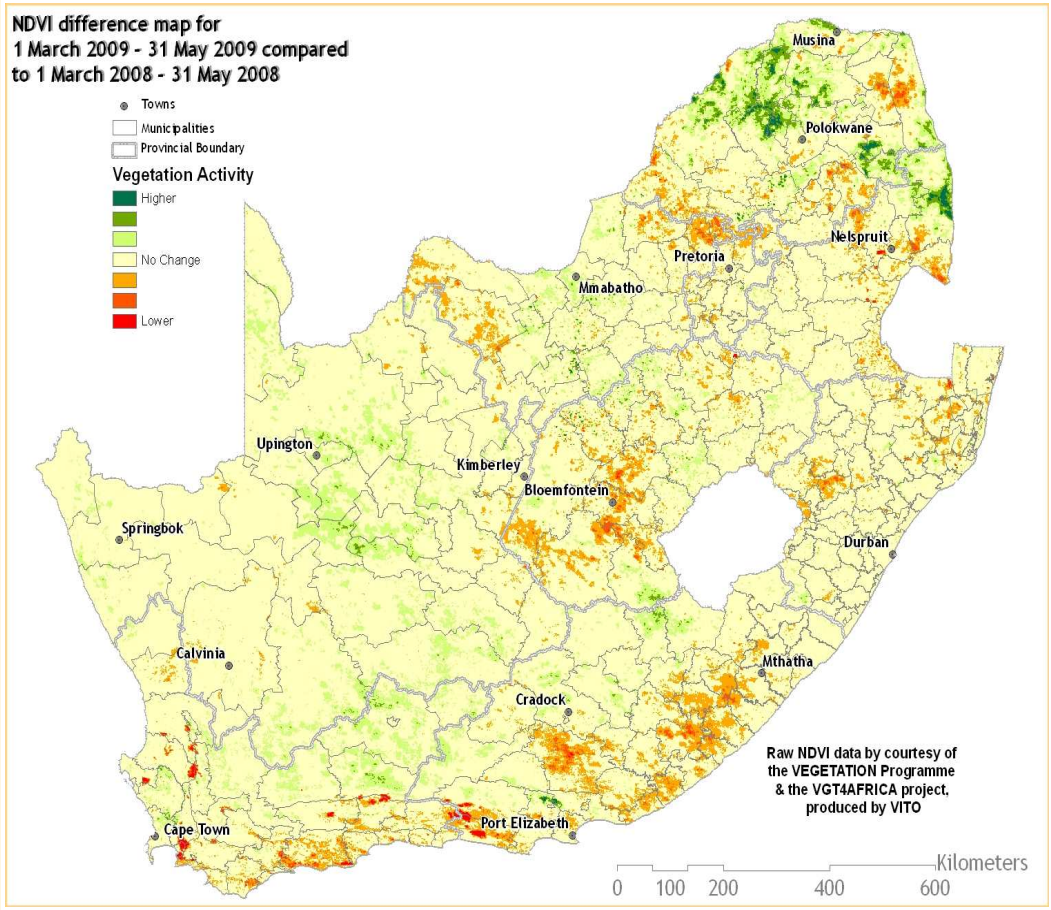


Figure 4

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 March to May 2009 shows normal to higher vegetation conditions over the western half of South Africa (see also Figures 6-9). Areas of concern, with lower vegetation conditions, include large parts of eastern Limpopo (Figure 12), southern Free State, southern region of the Western Cape and the Eastern Cape (Figures 10-11 & 13-14).

Figure 4:
The three-month difference map for March to May 2009 shows similar vegetation activity in the 2008/09 season compared to the 2007/08 season.

Vegetation Conditions & Rainfall

NDVI and Rainfall Graphs

Figure 5: Orientation map showing the areas of interest for May 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.

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

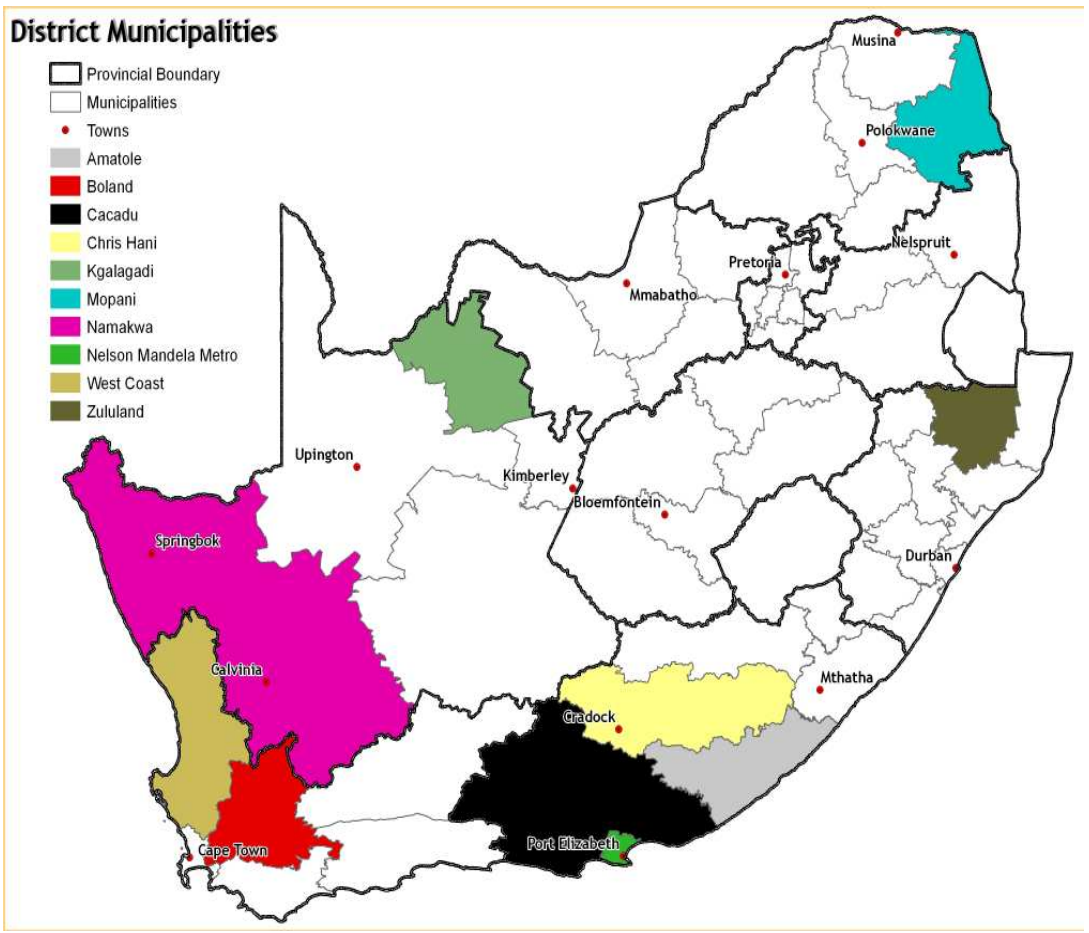


Figure 5

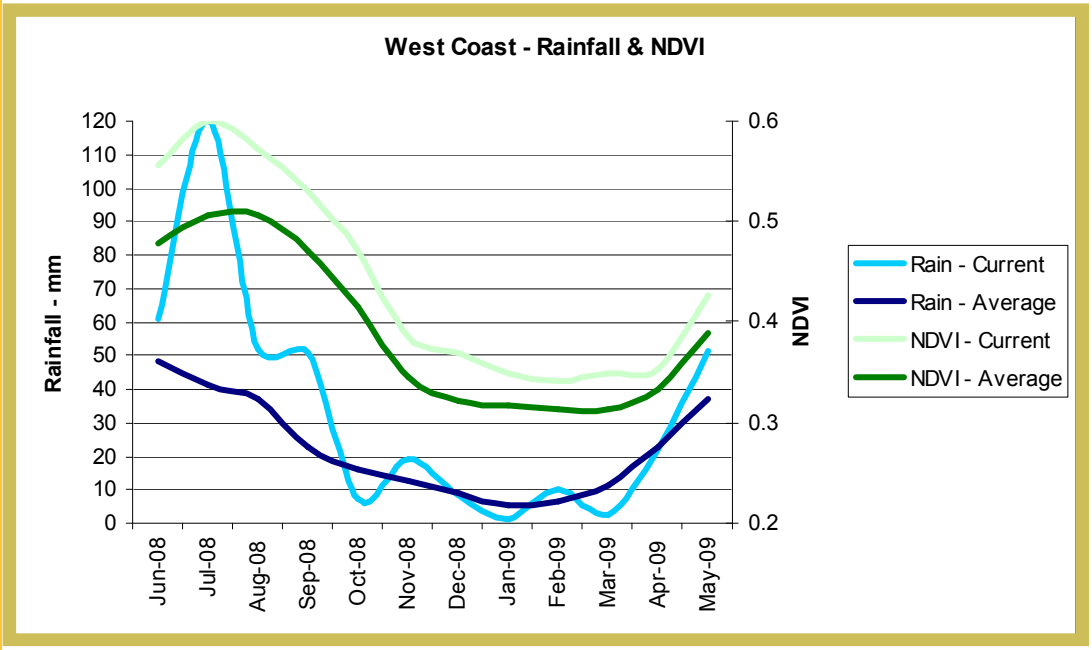


Figure 6

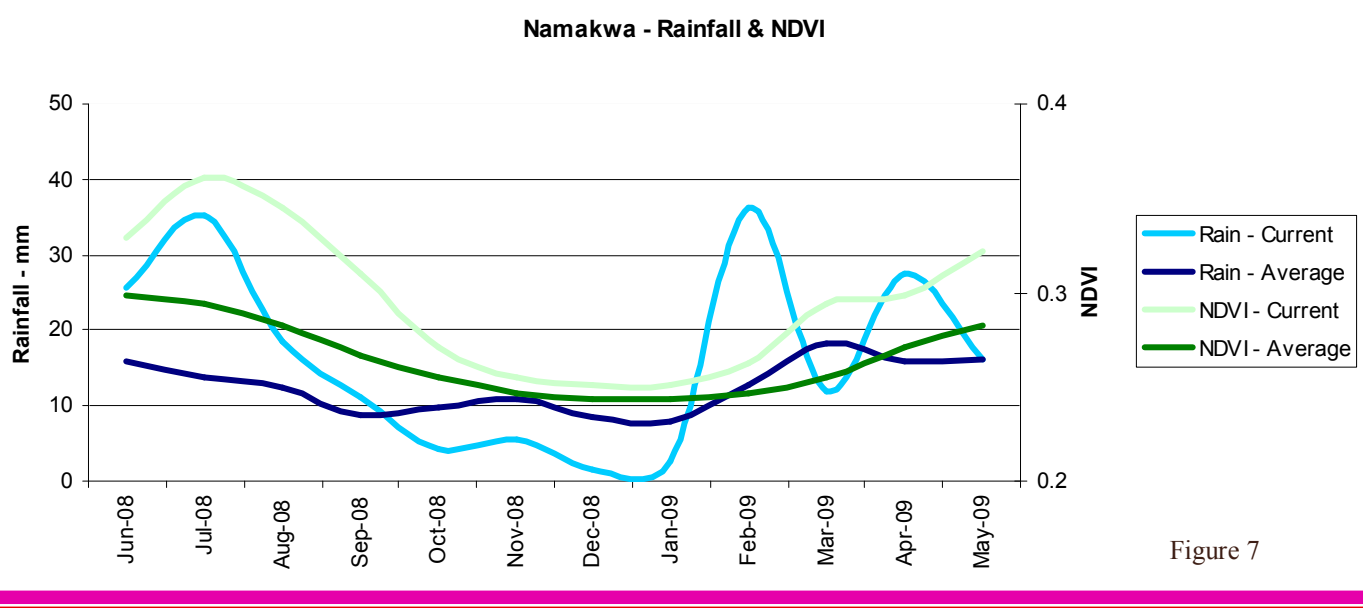


Figure 7

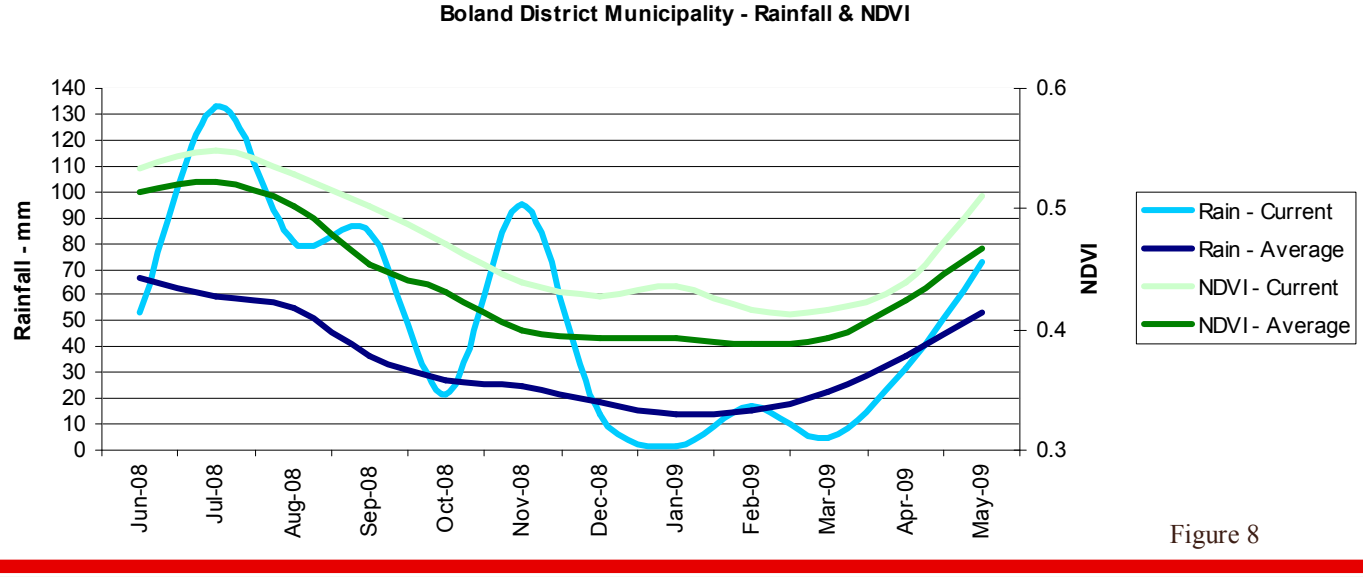


Figure 8

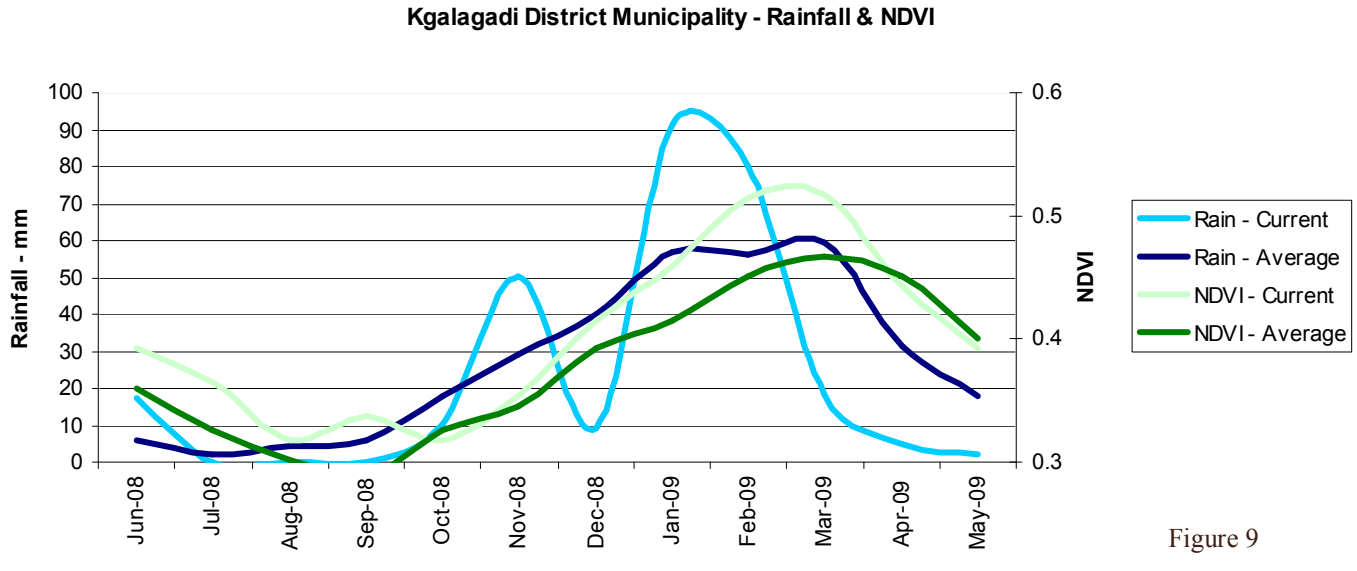


Figure 9

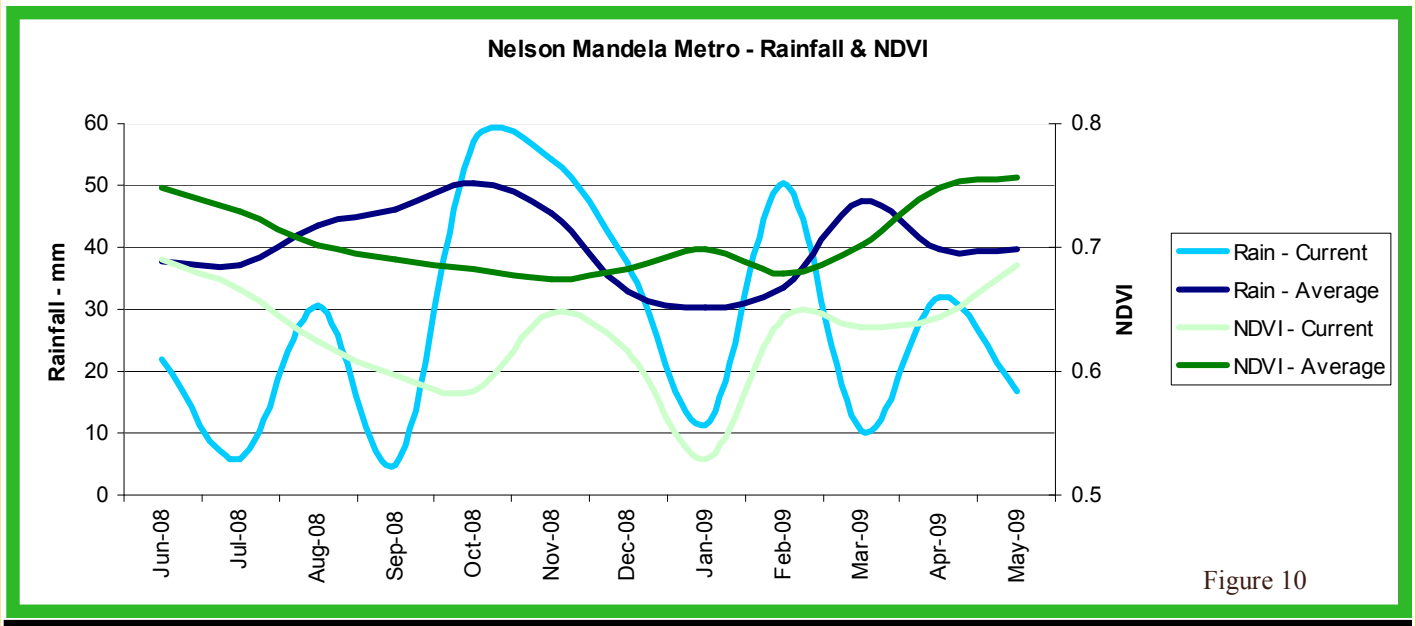


Figure 10

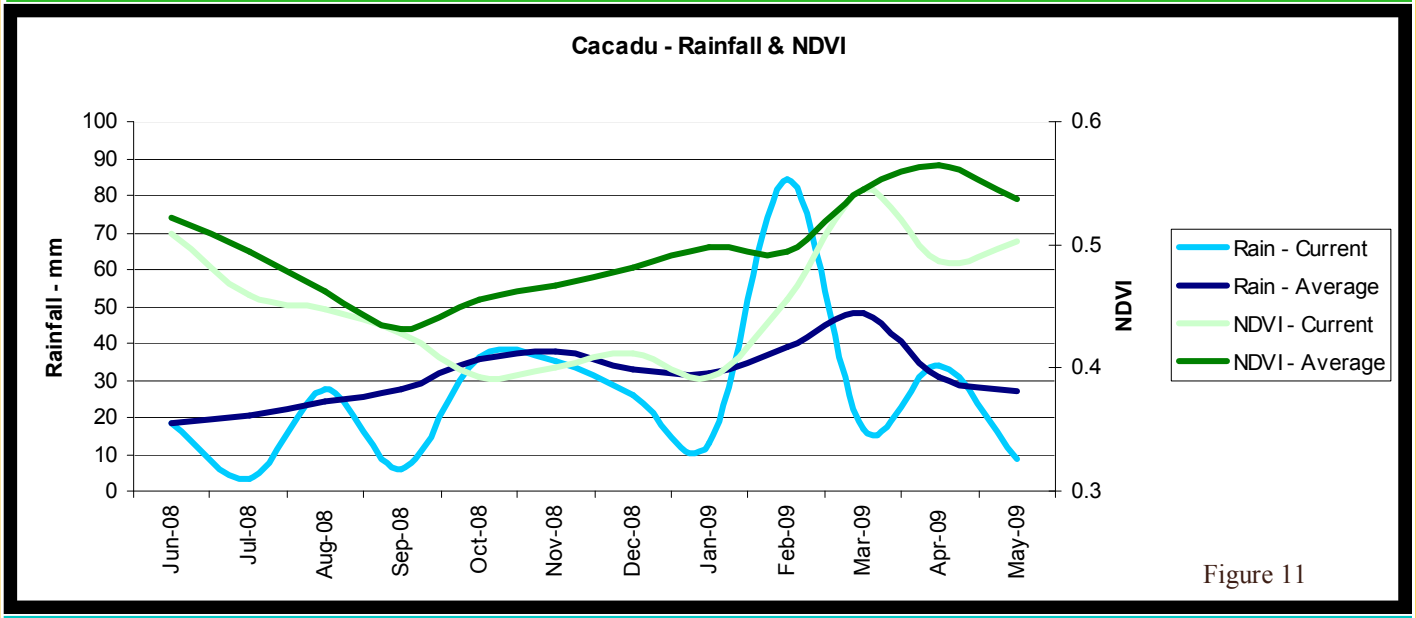


Figure 11

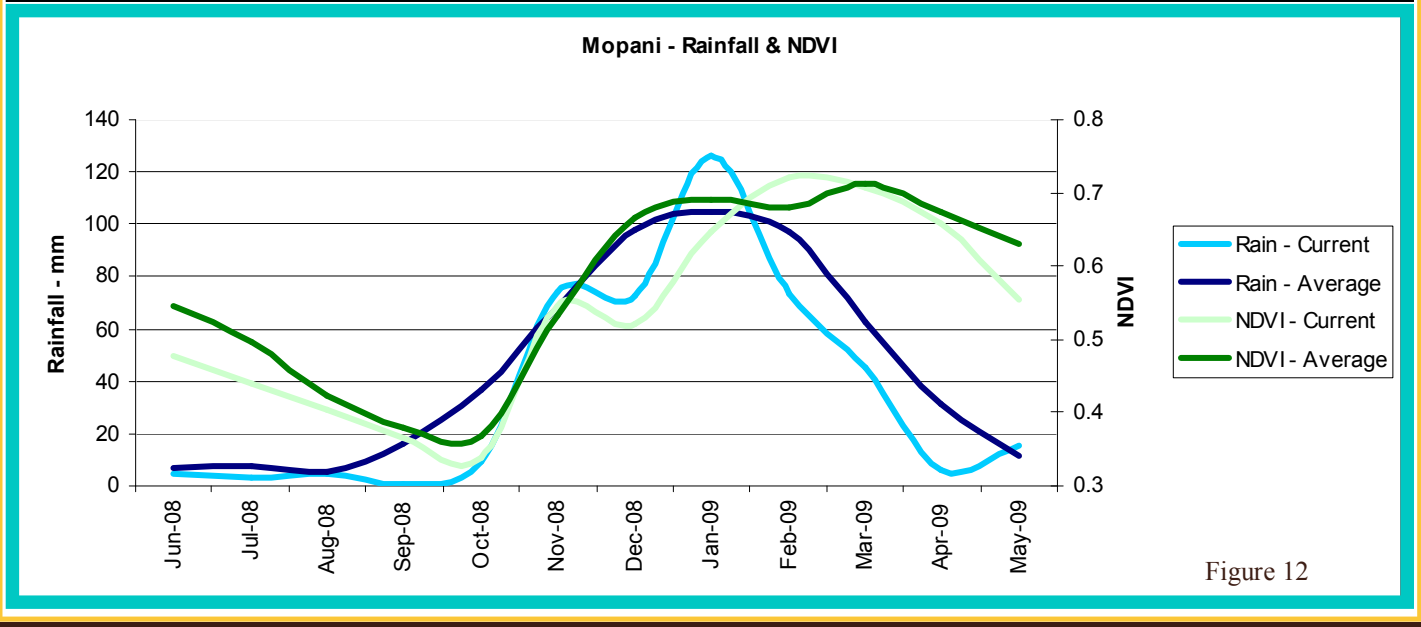


Figure 12

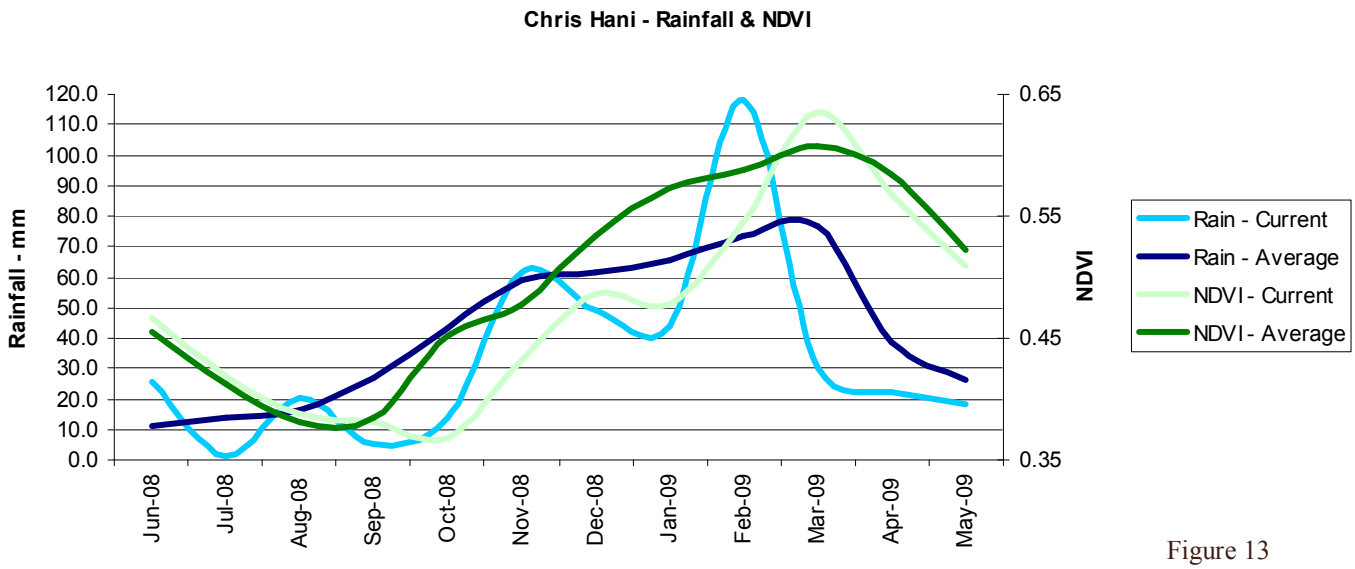


Figure 13

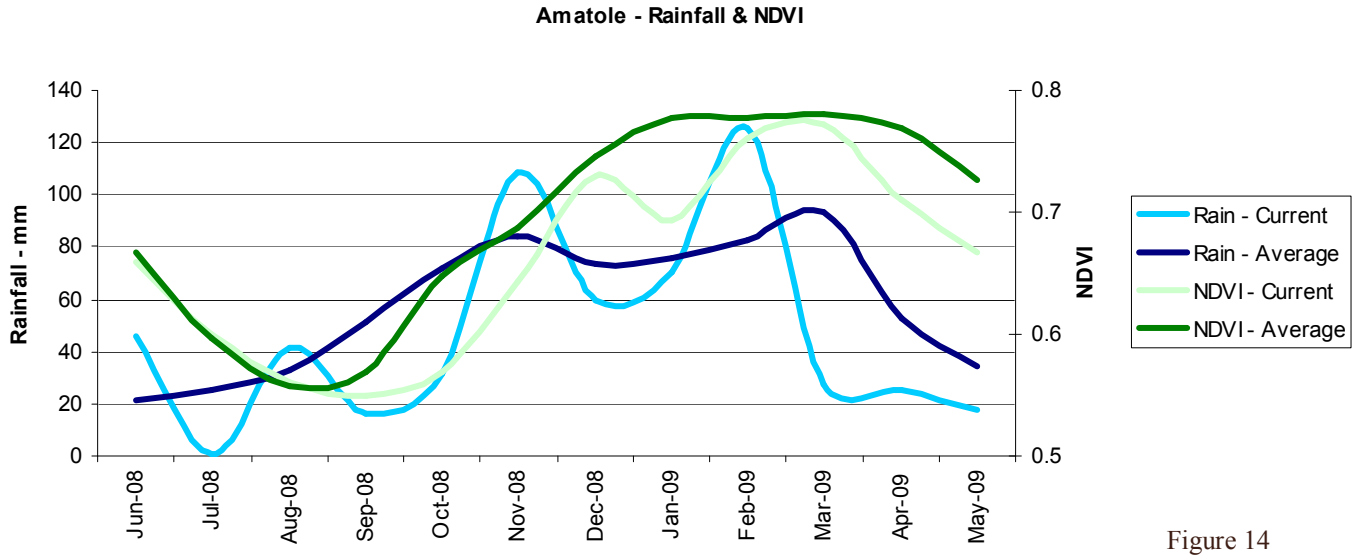


Figure 14

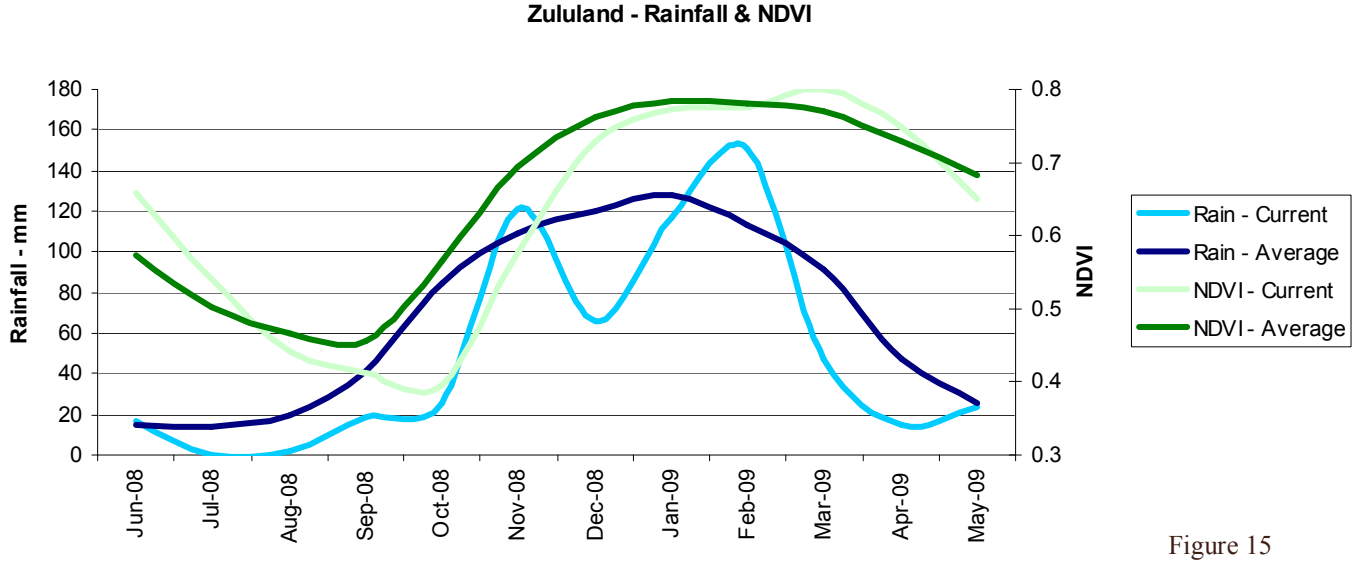


Figure 15

Rainfall

Overview May 2009: During the beginning of the month, two upper air troughs moved over the country causing widespread showers over the northern and eastern parts until the 7th. A redevelopment over the eastern interior of an upper air low caused further showers over those parts until the 9th. Frontal systems associated with the troughs were responsible for some precipitation over the winter rainfall area too. The first big winter storm hit the Cape on the 15th of the month. Heavy rain occurred over the southwestern parts of the country with some reports of local flooding over the Cape Town area. The associated upper air trough was also responsible for some precipitation over the central interior. Cold conditions spread into the interior where frost occurred in the aftermath of the surface cold front. Conditions remained cool and clear for the next few days.

Other strong cold fronts moved over the area around the 21st and 28th of the month causing widespread and sometimes heavy rain over the winter rainfall area. The last system particularly was responsible for the introduction of cold air over the interior with widespread frost occurring even over the northern parts of the country due to the cold air behind the front.

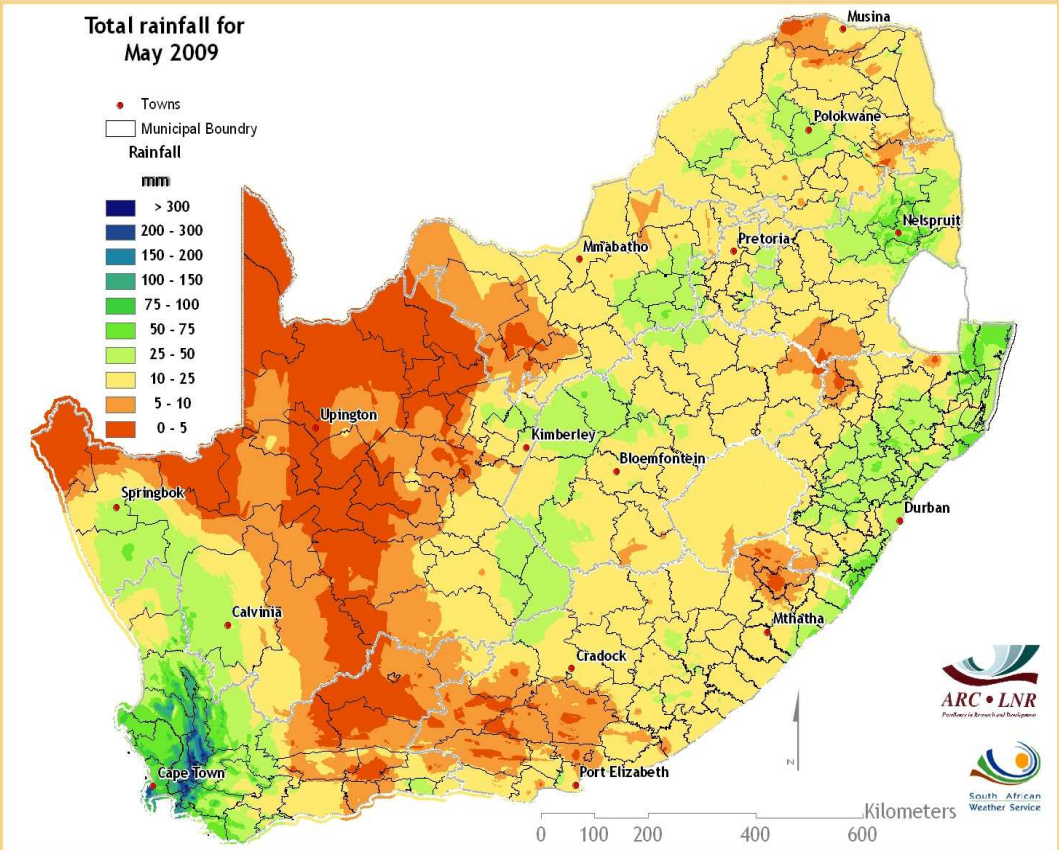


Figure 16

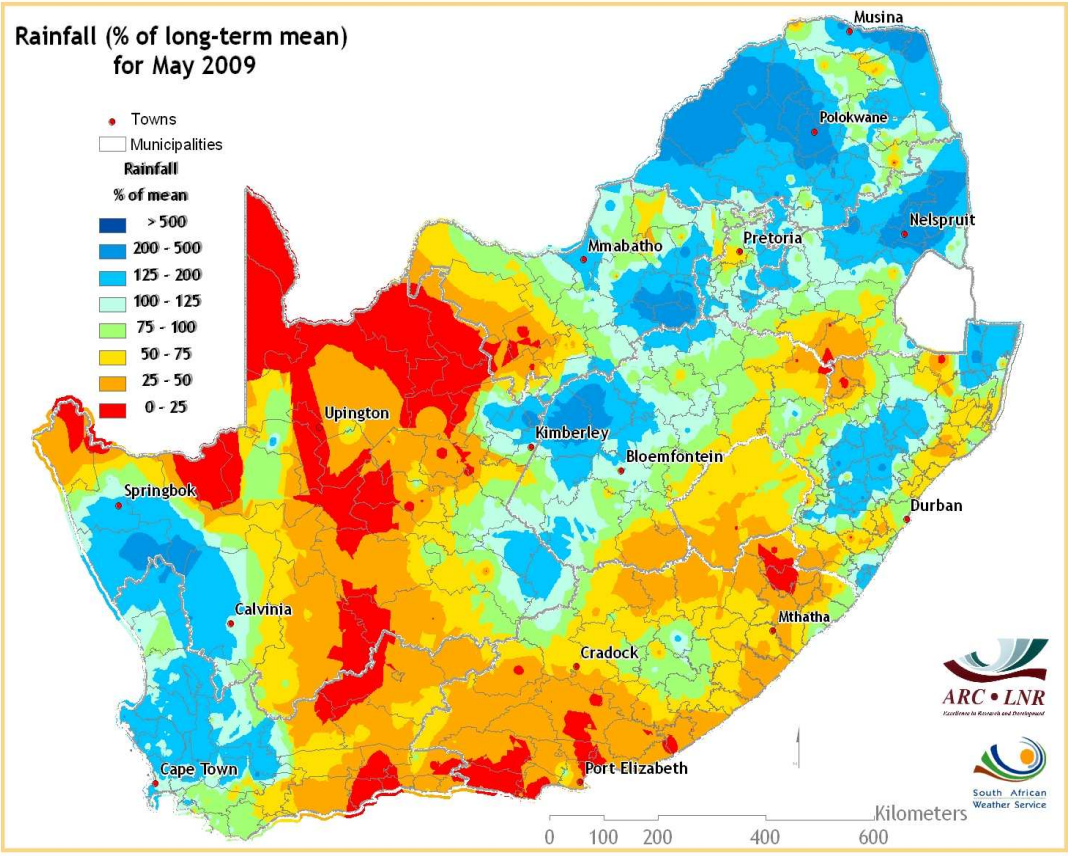


Figure 17

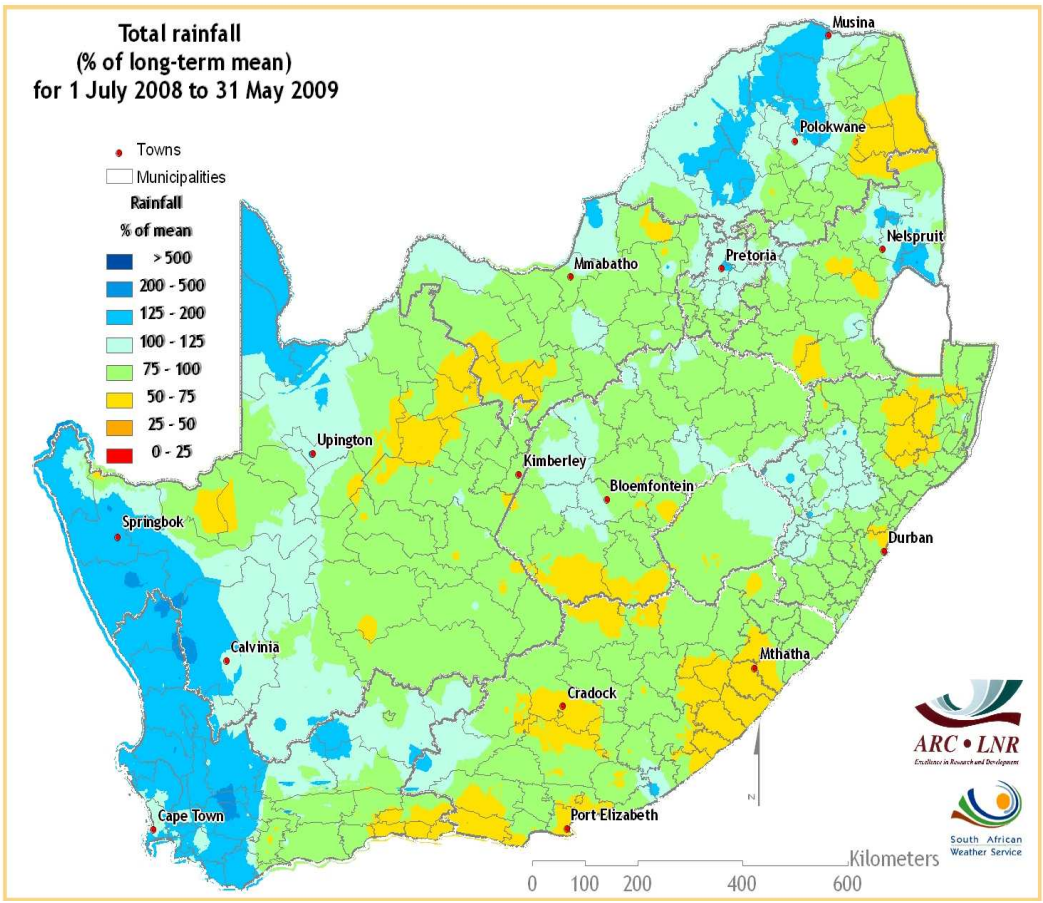


Figure 18

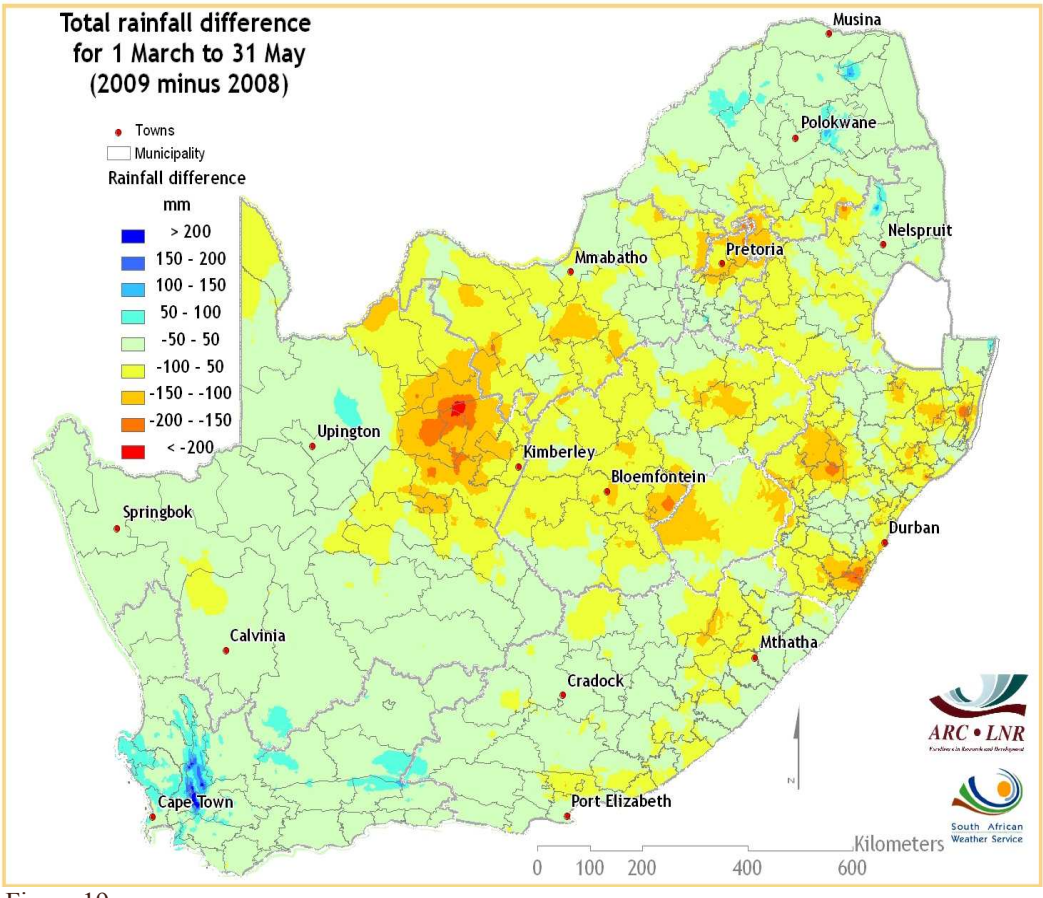


Figure 19

Figures 16 & 17:
Large parts of the summer rainfall area received between 10 and 25 mm of rain during May. This occurred exclusively during the first ten days of the month over the eastern parts and around the 15th over the central parts. The coastal areas of KwaZulu-Natal and some parts of the eastern escarpment received more than 50 mm of rain. Almost the entire winter rainfall area received more than 25 mm with the Swartland receiving more than 50 mm of rain while the Ruens received in the order of 25 mm. The mountainous areas of the southwestern Cape received more than 100 mm of rain with some areas recording more than 300 mm in total.
The situation represents above-normal rainfall over the winter rainfall areas and most of the northern and eastern parts of the country while a north-south band over the central parts of the Northern Cape, eastern parts of the Western Cape and the western parts of the Eastern Cape provinces received below-normal rainfall.

Figure 18:
For the period July 2008 to May 2009, above-normal rainfall was reported over most of the northern and western parts of the country, while normal to below-normal rainfall occurred over the southeastern and eastern parts as well as over the southwestern Free State and the western parts of the North West Province. In some areas along the western escarpment rainfall exceeded 200% of the average for this 11-month period.

Figure 19:
When comparing total rainfall for the March-May period between 2009 and 2008, it can be deduced that the summer rainfall came to an earlier end over most of the central and eastern parts of the country while winter rainfall commenced earlier over the southwestern parts of the country this year than in 2008.

ARC-INSTITUTE FOR SOIL, CLIMATE AND WATER

ARC • LNR
Excellence in Research and Development

Your Partner in Natural Resources Research and Information

Agrometeorology

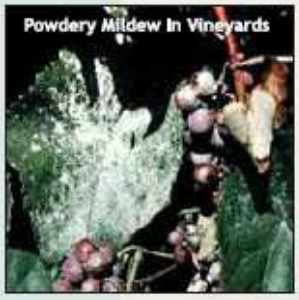
The AgroMet Division of ARC-ISCW conducts and implements research in the field of Agrometeorology and Climatology to promote sustainable utilization of the region's climate, soil and water resources.

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**



Private Bag X79, Pretoria 0001
Tel: 012 310 2500 • Fax 012 323 1157
E-mail: ISCWinfo@arc.agric.za
Website: www.arc.agric.za

06/2008

ARC-INSTITUTE FOR SOIL, CLIMATE AND WATER

ARC • LNR
Excellence in Research and Development

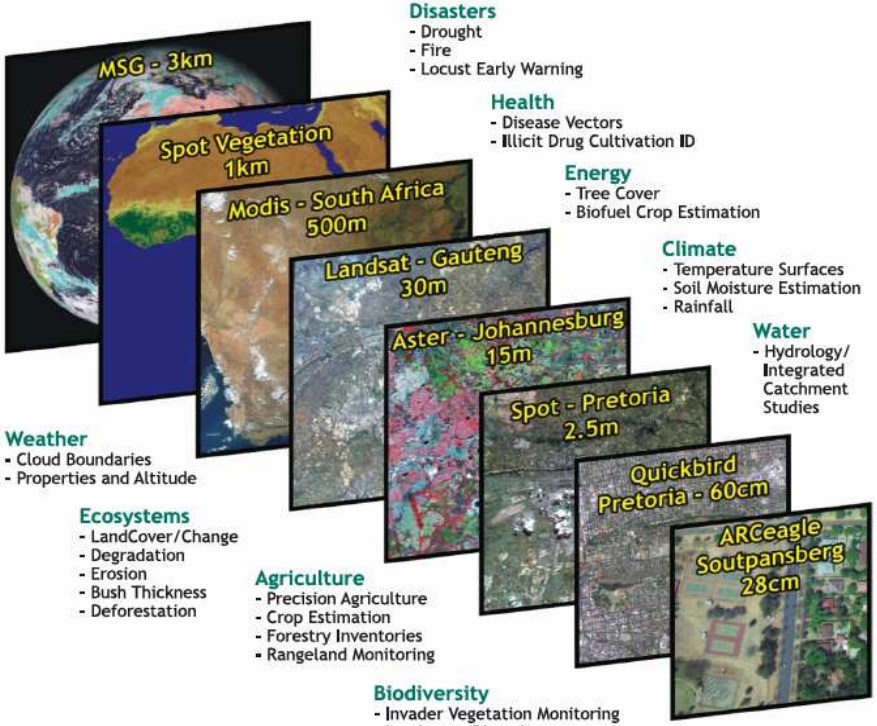
Your Partner in Natural Resources Research and Information

arcsense
arcsat arcterra

Earth Observation/Remote Sensing

APPLICATIONS IN SOCIETAL BENEFIT AREAS

arcsat



Disasters
- Drought
- Fire
- Locust Early Warning

Health
- Disease Vectors
- Illicit Drug Cultivation ID

Energy
- Tree Cover
- Biofuel Crop Estimation

Climate
- Temperature Surfaces
- Soil Moisture Estimation
- Rainfall

Water
- Hydrology/ Integrated Catchment Studies

Weather
- Cloud Boundaries
- Properties and Altitude

Ecosystems
- LandCover/Change
- Degradation
- Erosion
- Bush Thickness
- Deforestation

Agriculture
- Precision Agriculture
- Crop Estimation
- Forestry Inventories
- Rangeland Monitoring

Biodiversity
- Invader Vegetation Monitoring
- Landscape Diversity

Private Bag X79, Pretoria 0001
Tel: 012 310 2500 • Fax 012 323 1157
E-mail: ISCWinfo@arc.agric.za
Website: www.arc.agric.za

Earth Observation/
Remote Sensing

ARC • LNR
Excellence in Research and Development

06/2008

Your Partner in Natural Resources Research and Information

arcsense
arcsat arcterra

GROUND TRUTHING

arcterra

Soil Profiles

Weather Station Information

Field Spectrometry

Infrared Temperature Measurements

Leaf Area Index
Photosynthetically Active Radiation

Soil Water Content

Private Bag X79, Pretoria 0001
Tel: 012 310 2500 • Fax 012 323 1157
E-mail: ISCWinfo@arc.agric.za
Website: www.arc.agric.za

ARC-Institute for Soil, Climate and Water

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.

ARC • LNR
Excellence in Research and Development

Institute for Soil, Climate and Water

Private Bag X79, Pretoria 0001,
South Africa
600 Belvedere Street, Arcadia, Pretoria, South Africa

Dawie van Zyl
Project Leader: Coarse Resolution Imagery Database (CRID)
Cert.Sci.Nat. (2000019/05)
GISc Technician (GT 0653)
Tel: +27 (0) 12 310 2679 (Remote Sensing Lab)
Fax: +27 (0) 12 323 1157
E-mail: dawie@arc.agric.za

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.

For further information please contact the following:
Johan Malherbe – 012 310 2577, Johan@arc.agric.za
Adri Theron – 012 310 2518, iscwinfo@arc.agric.za

To subscribe to the newsletter, please submit a request to:
dawie@arc.agric.za

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

http://www.agis.agric.za