agriculture
Department:
Agriculture
REPUBLIC OF SOUTH AFRICA

UMLINDI

The Watchman

ISSUE 2009-05 12 MAY 2009

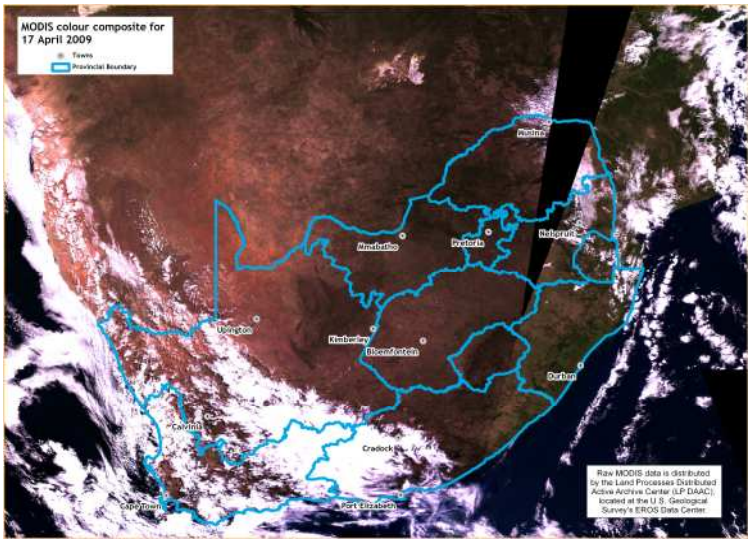
INSTITUTE FOR SOIL, CLIMATE AND WATER

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

CONTENTS:

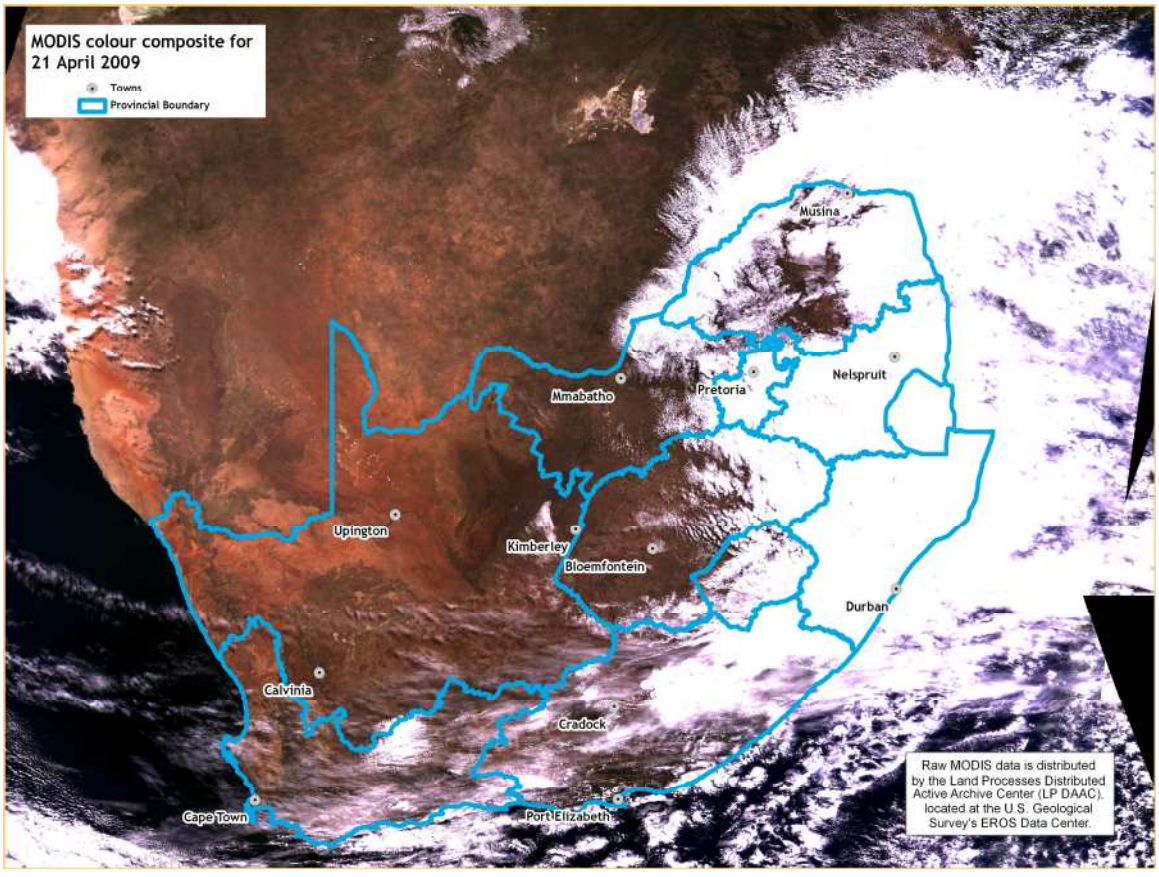
ARC • LNR
Excellence in Research and Development

Images of the Month



In contrast to March, April 2009 was a rather dry month over the northern parts of the country. This brought to an end a rather wet second half of the summer season over the summer grain producing areas and further north. However, several upper air troughs moved over the southern parts of the country during the course of the month. These systems were responsible for precipitation especially over the western and southern parts of the country, resulting in above-normal rainfall over the interior of the Western Cape, the western parts of the Eastern Cape and large parts of the Northern Cape.

The first image shows a cloud band developing over the far western parts of the country due to an advancing upper air trough to the southwest on the 17th while an upper air high-pressure system dominated the interior of the country where warm and clear conditions prevailed. As the system moved over the southern parts, scattered rain and showers or thundershowers occurred over the southern and western parts of the country, including the winter rainfall areas. The second image shows the situation a few days later. As the system moved eastward between the 17th and 21st, a surface high pressure system also ridged to the south and east of the country causing further rain also over the far eastern parts and isolated thundershowers over the interior. The cloud cover over the eastern parts is clearly visible. These were mostly low clouds as a result of the surface onshore flow due to the presence of the high pressure system to the southeast. Some high level clouds (cirrus) are also visible over the southern half of the country moving west-east with the west winds dominating in the higher levels of the atmosphere over those areas. By this time the upper air trough was already moving out into the Indian Ocean.



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.

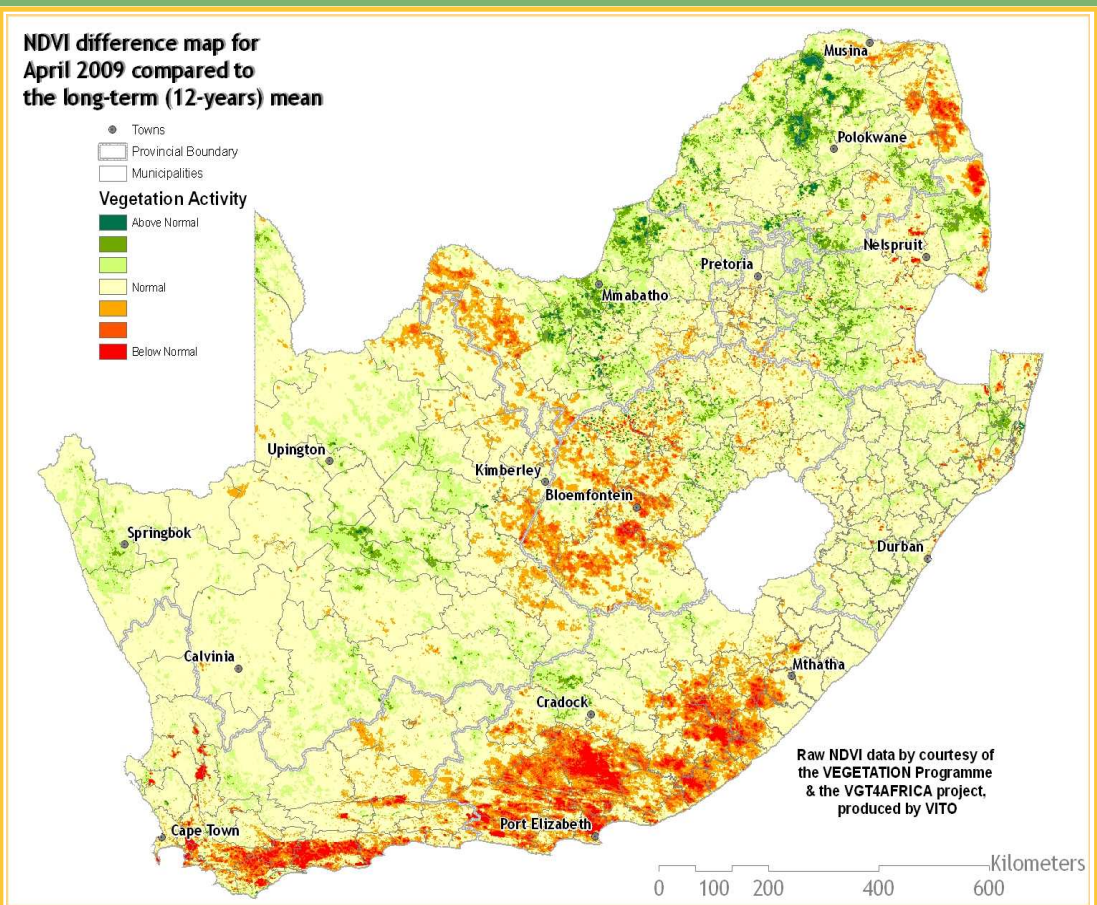


Figure 1

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

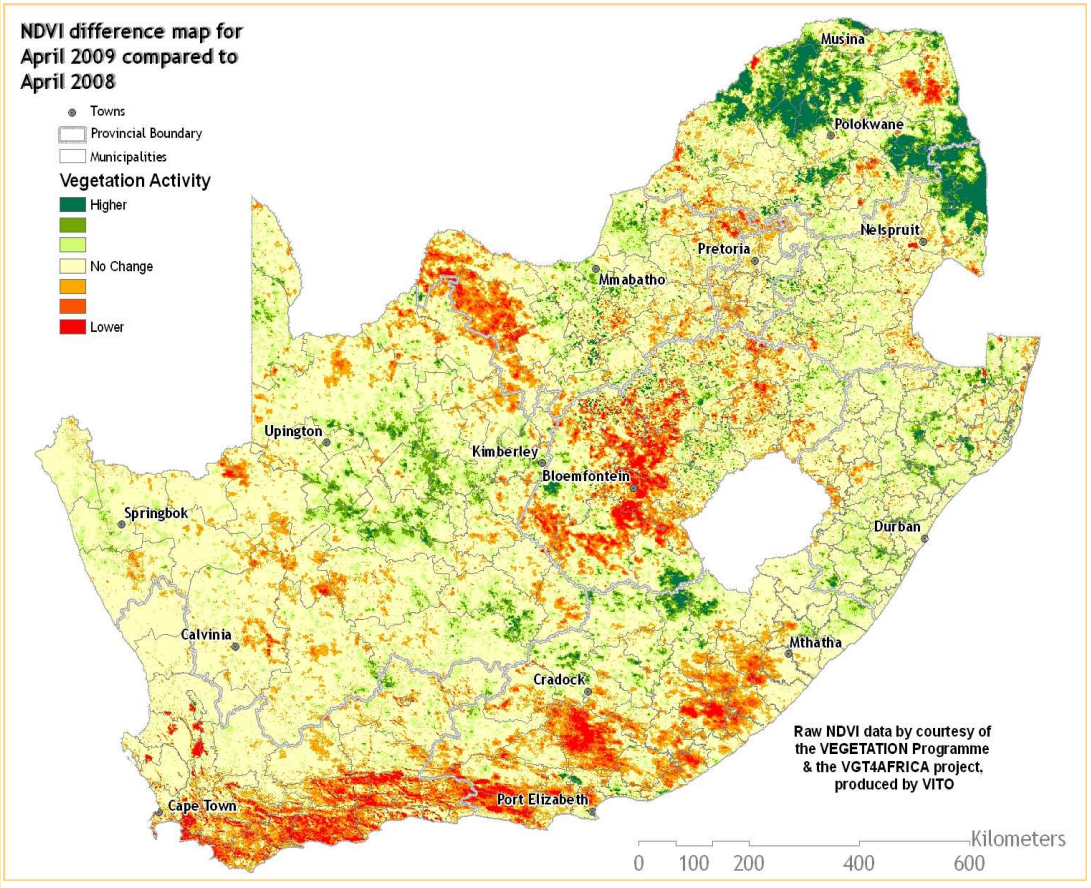


Figure 2

Figure 2:
Vegetation activity is higher in Limpopo in April 2009 than it was in 2008. Very low vegetation activity can be seen in the Eastern Cape, southern Western Cape and the southern Free State.

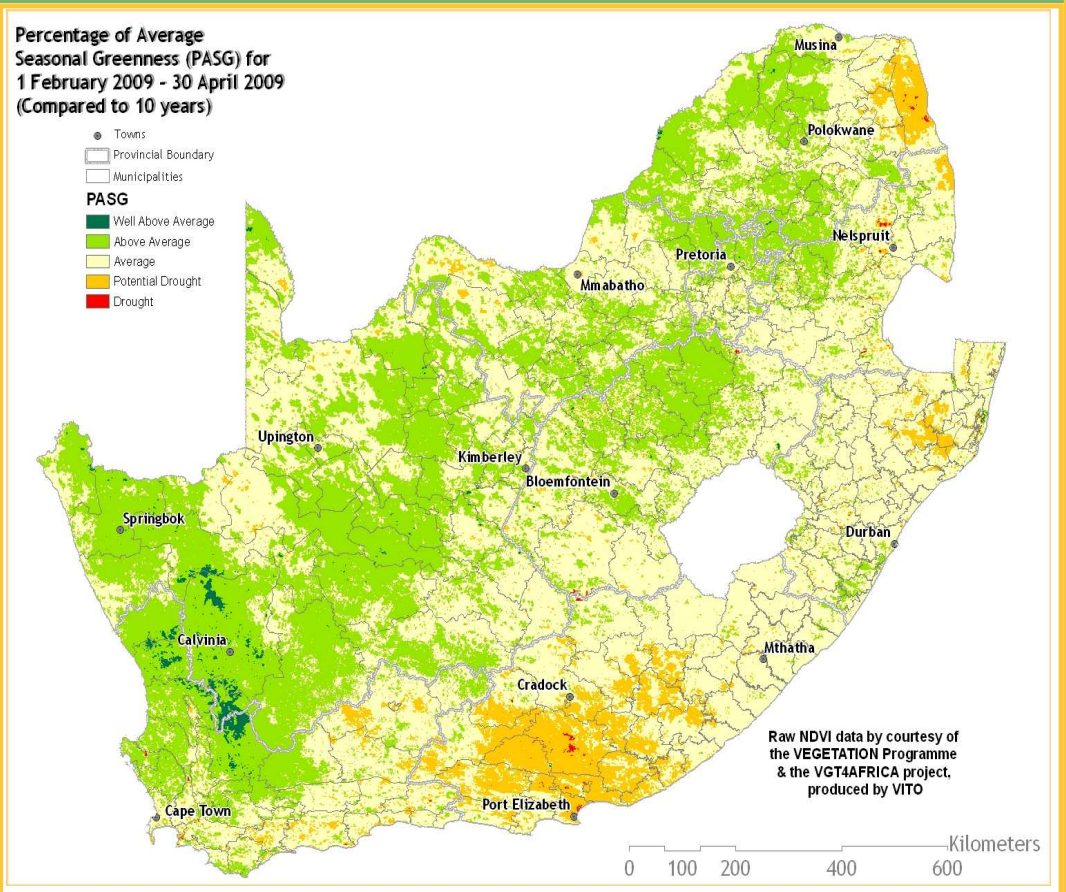


Figure 3

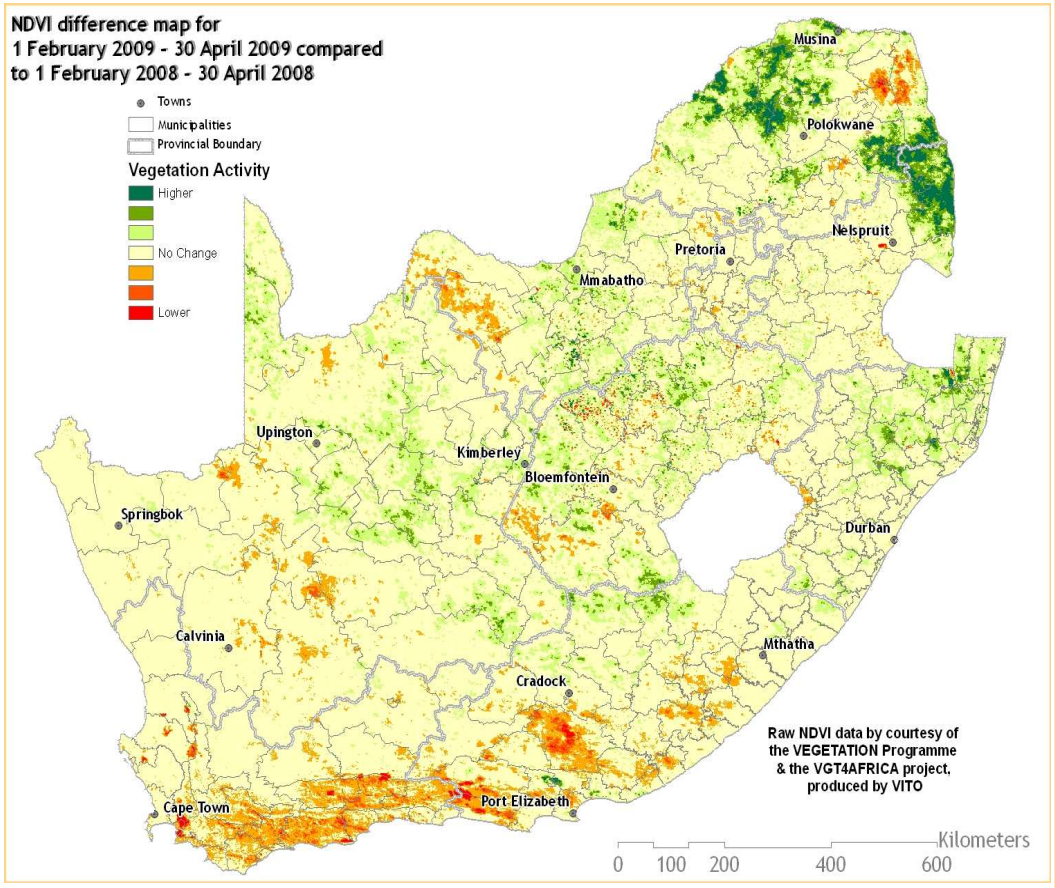


Figure 4

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 February to April 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), and the Eastern Cape (Figures 10-11, 13-14).

Figure 4:
The three-month difference map for February to April 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 April 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.

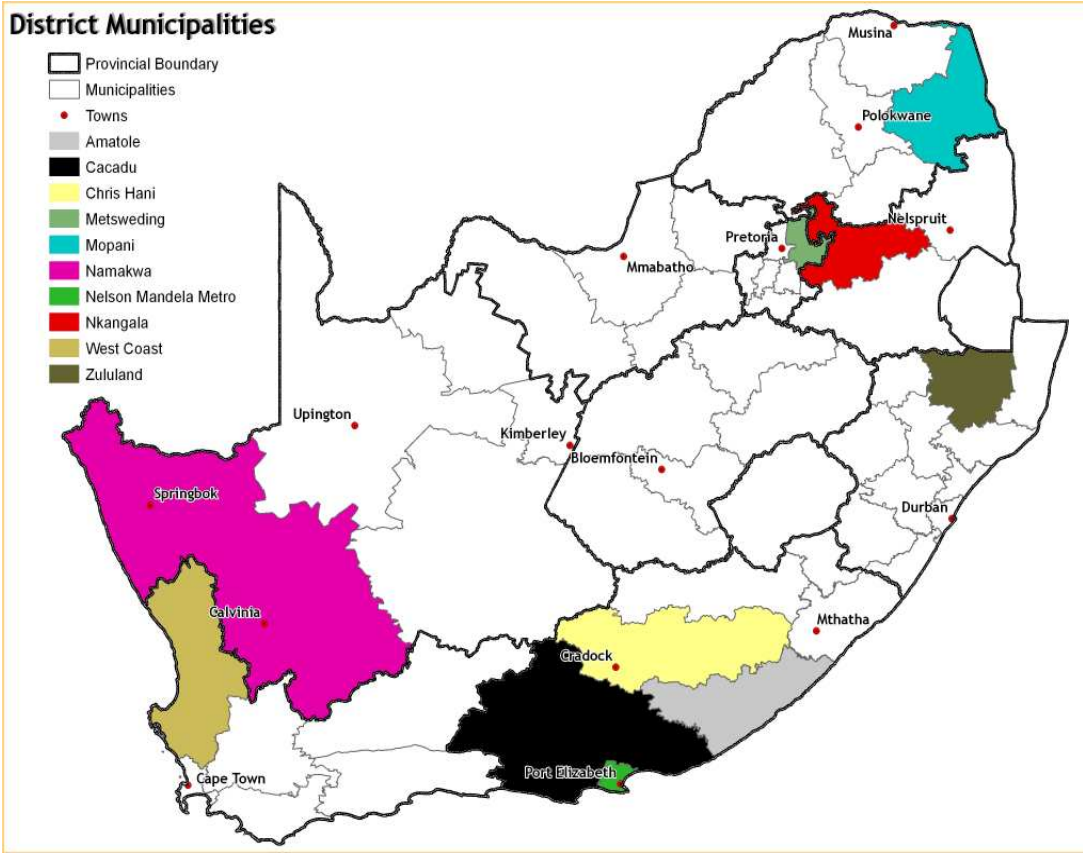


Figure 5

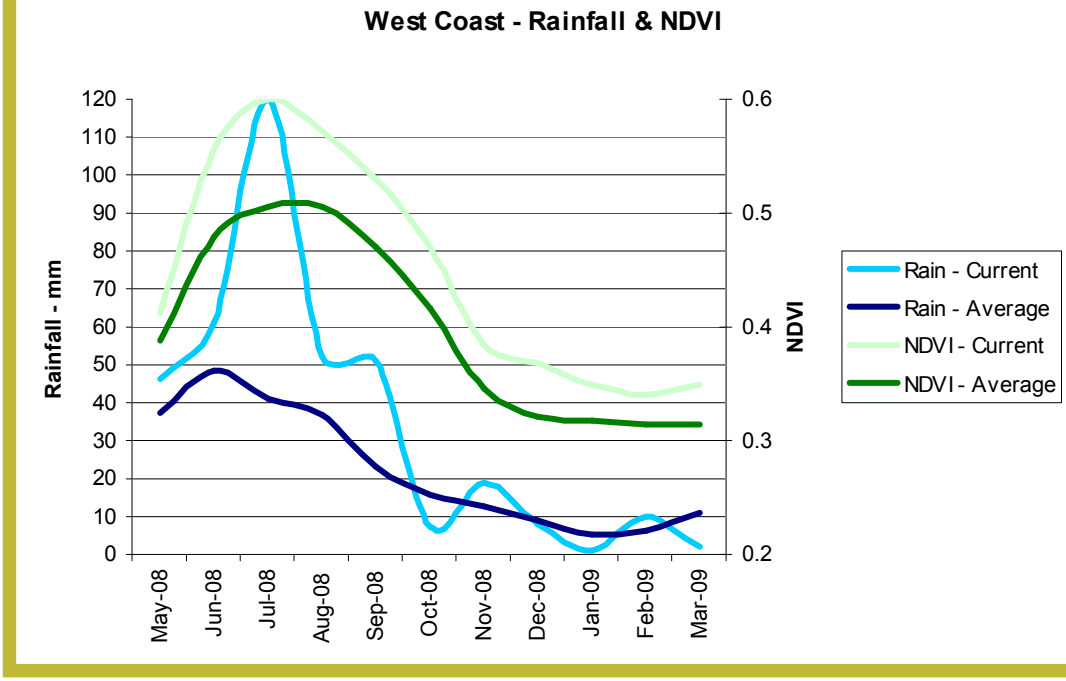


Figure 6

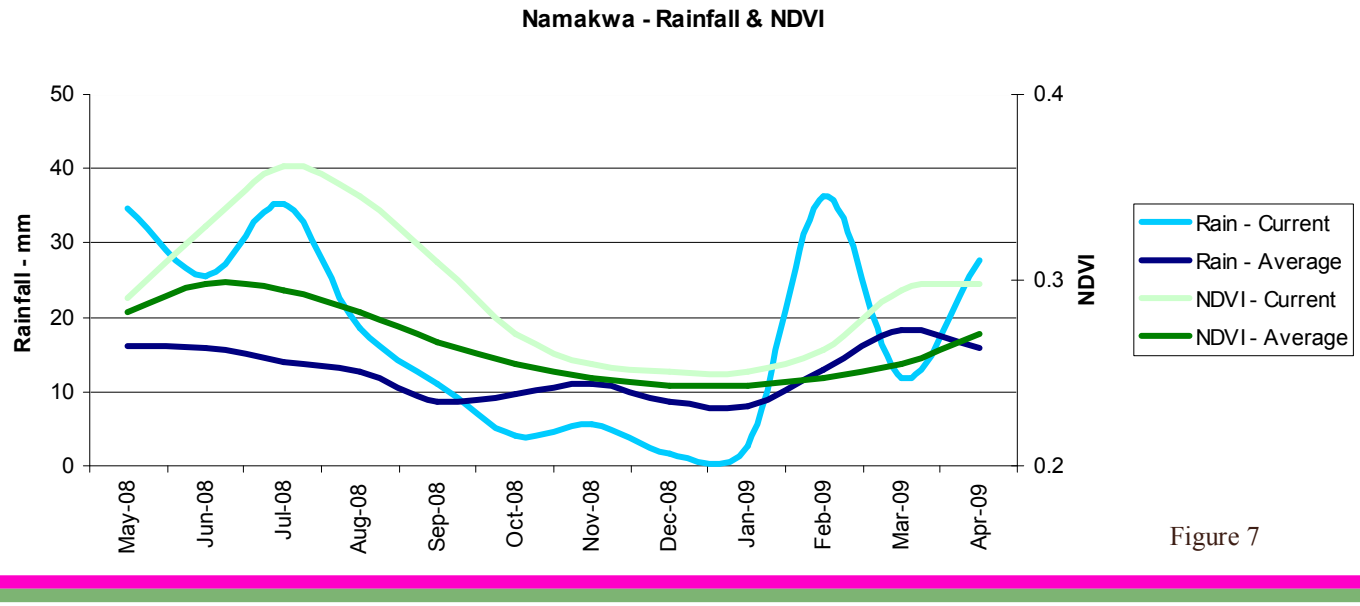


Figure 7

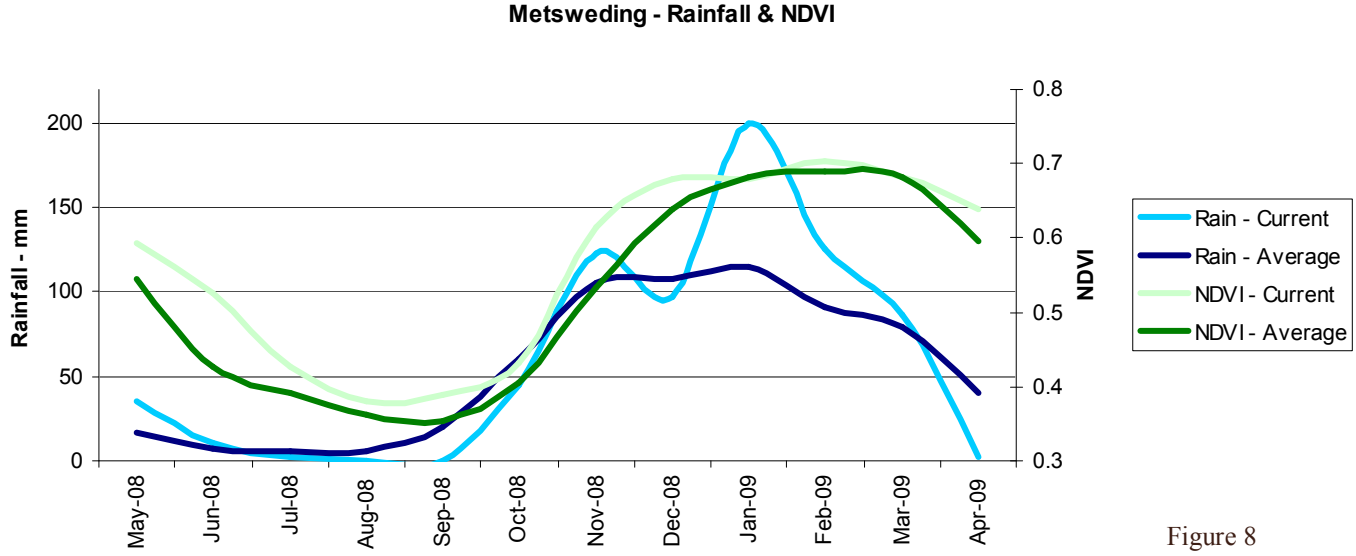


Figure 8

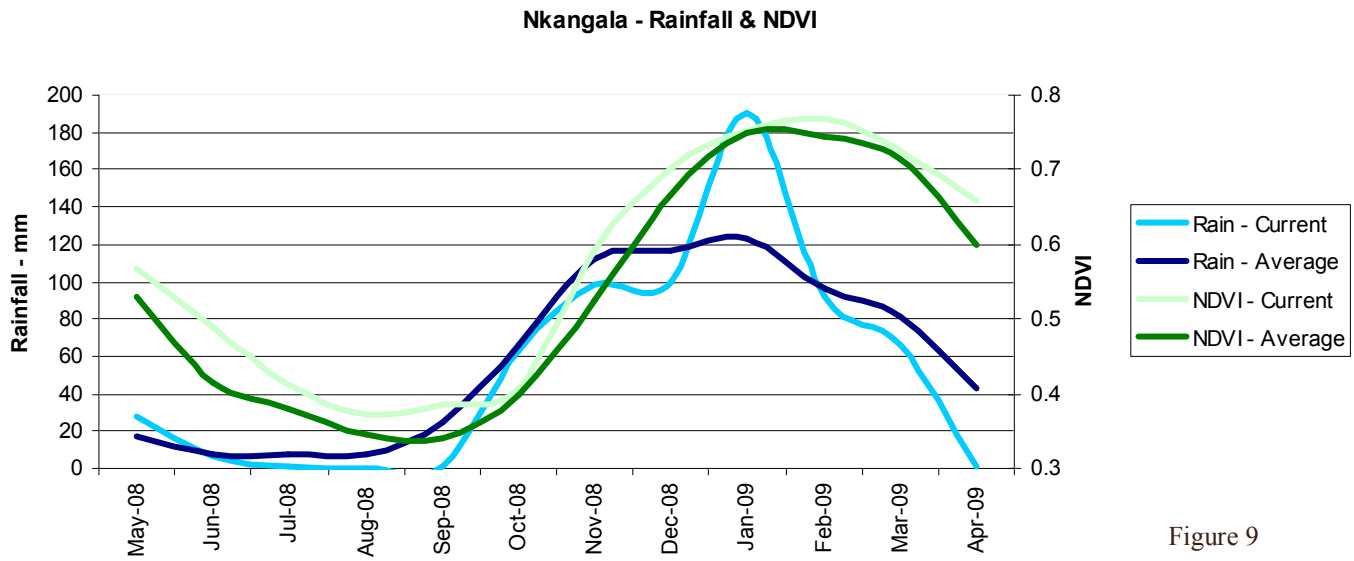


Figure 9

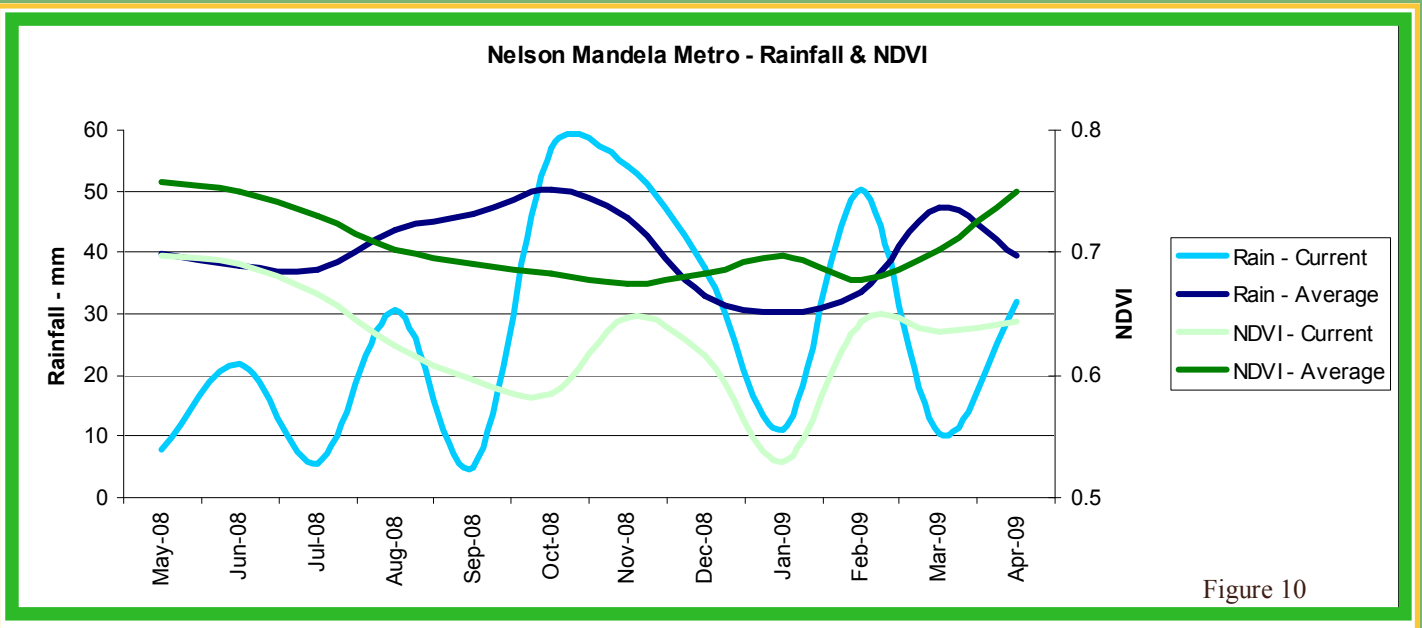


Figure 10

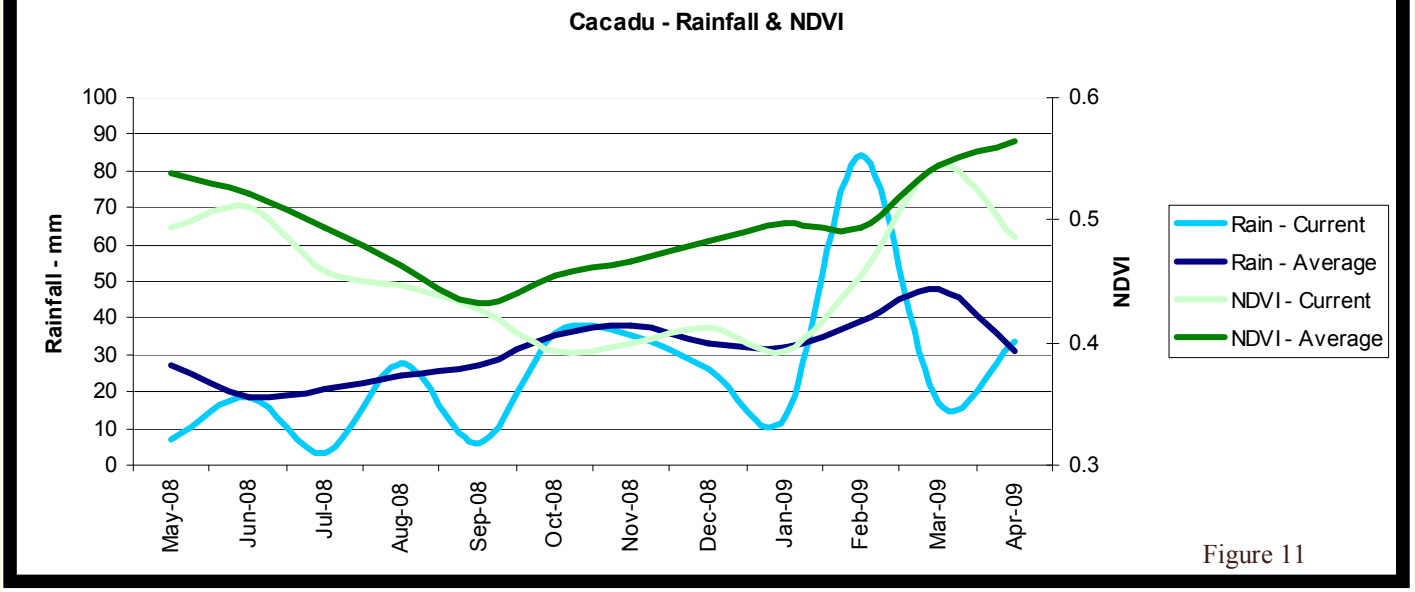


Figure 11

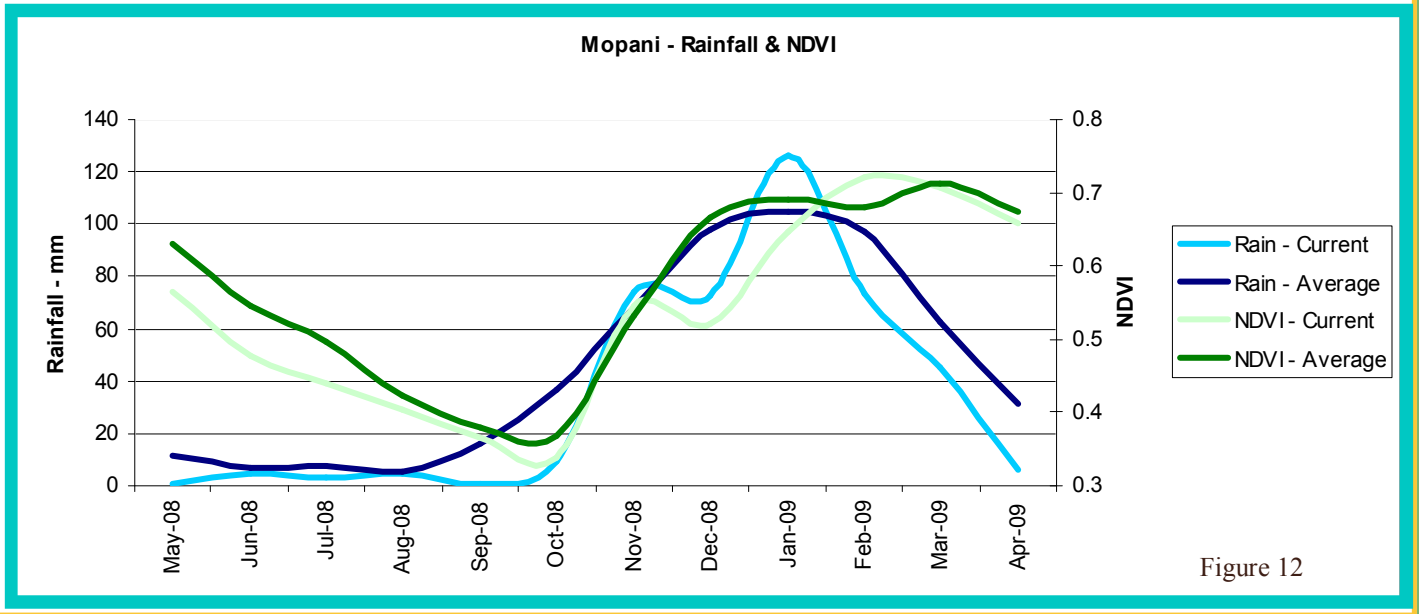


Figure 12

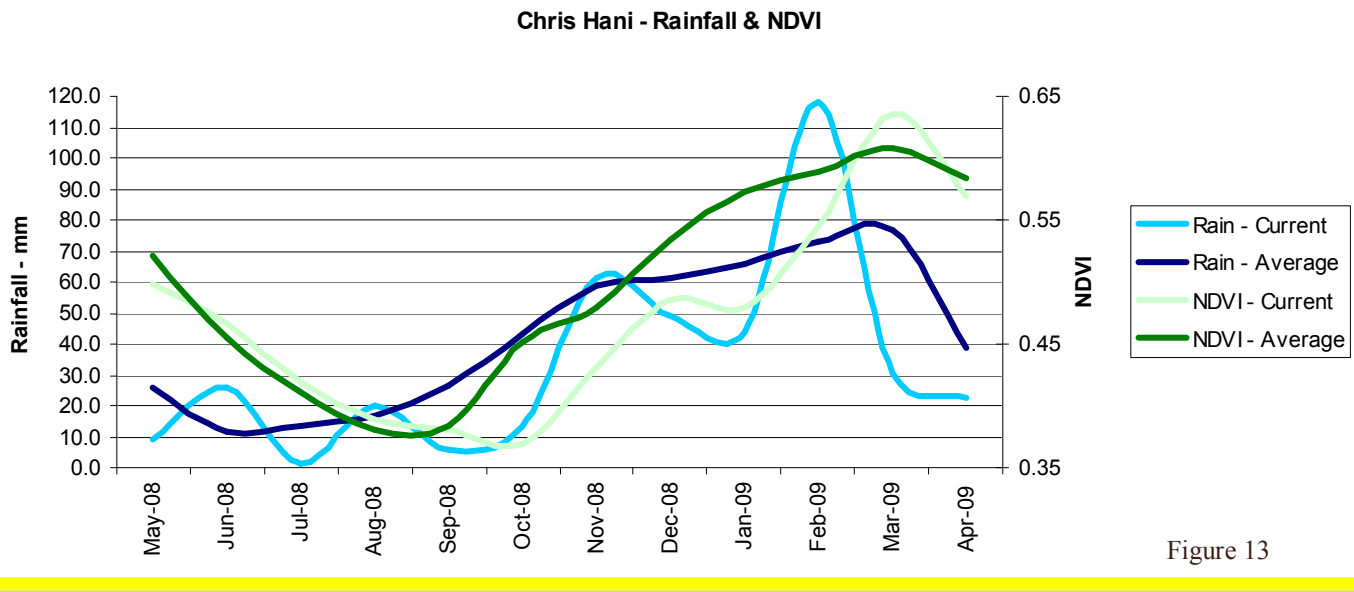


Figure 13

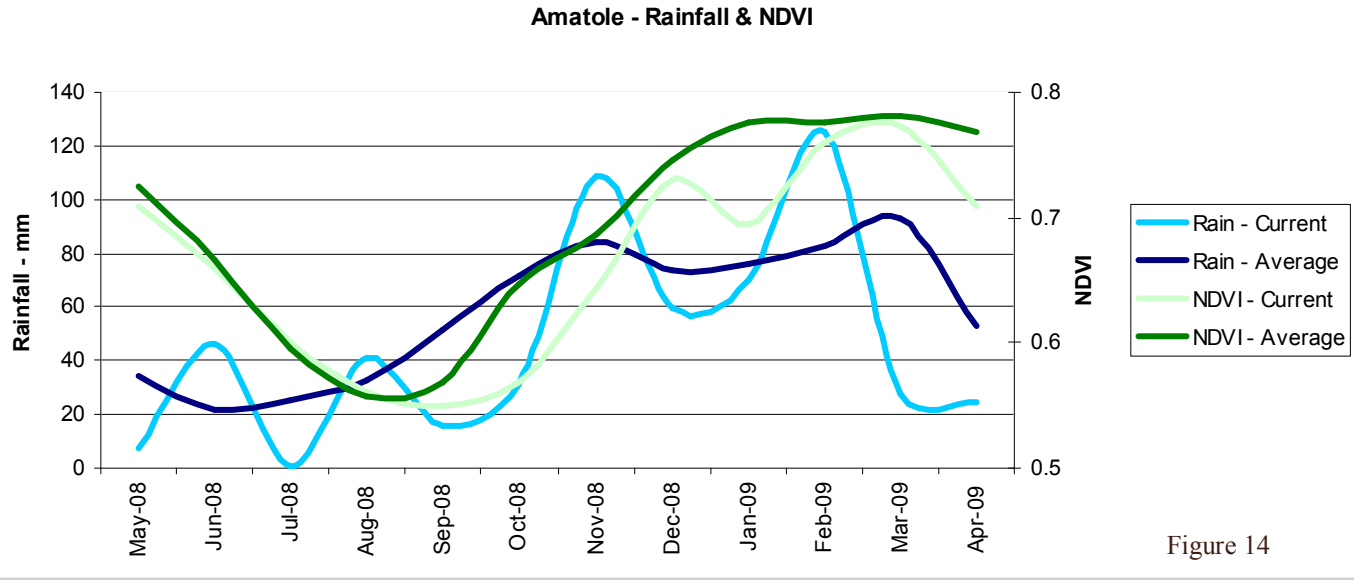


Figure 14

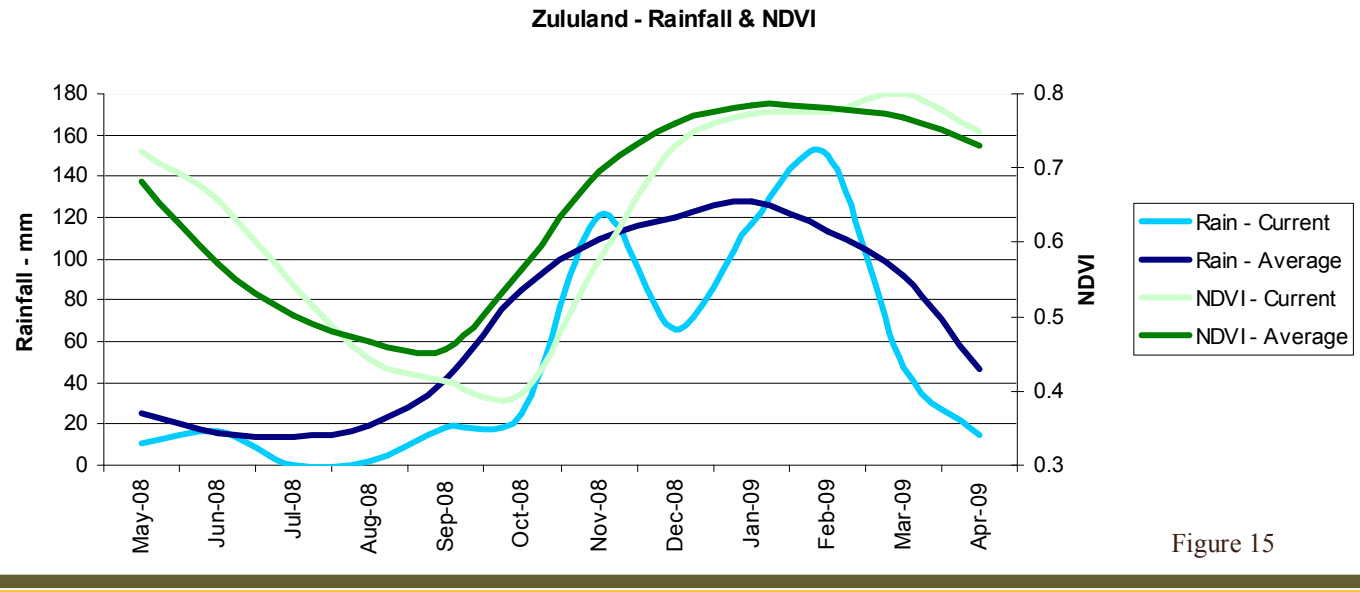


Figure 15

Rainfall

Overview:
Summer rainfall came to an abrupt end by late March and conditions during April remained largely dry over most of the northern and eastern parts of the country. The country was mostly dominated by anticyclonic upper air circulation. Around the 5th, 8th and the 17th, upper air troughs sliding over the southern parts of the country, caused scattered showers over that region. The upper air trough and surface onshore flow were responsible for showers also over the far eastern parts of the country when the second system moved through. From the 23rd, two upper air troughs moved over the country and were responsible for widespread showers over especially the western and central parts. By the end of the month a trough was building over the western parts as a cloud band formed from northern Namibia towards KwaZulu-Natal.

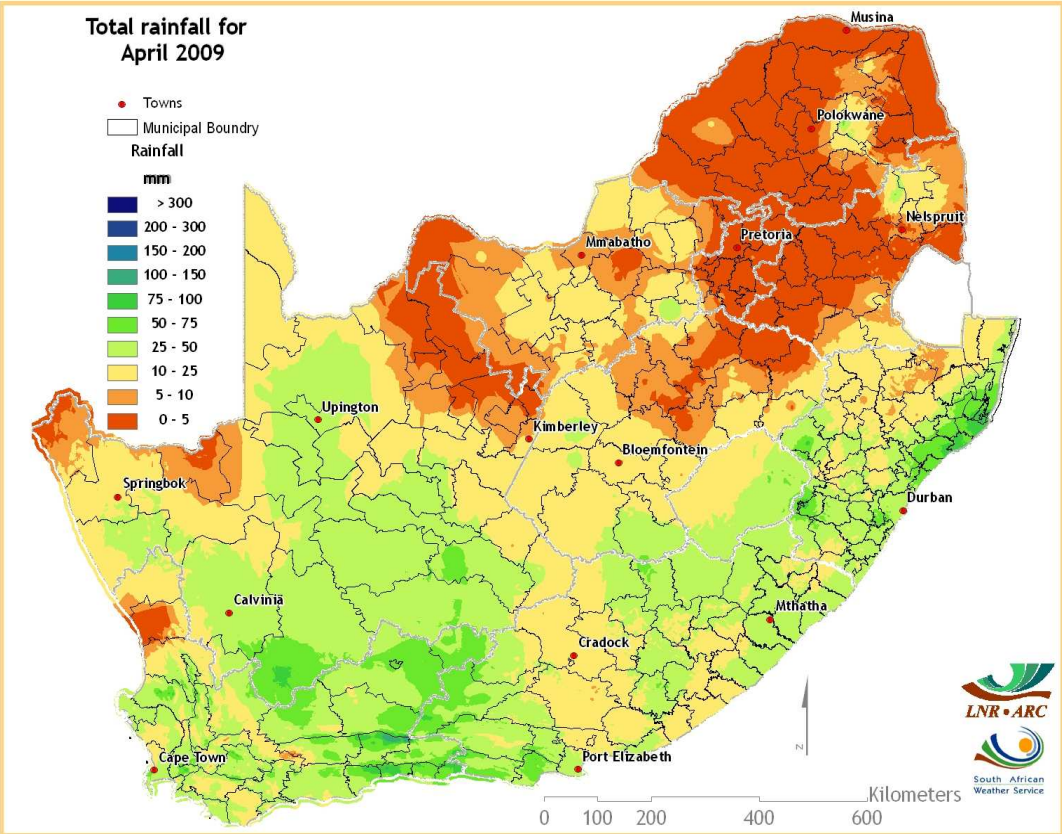


Figure 16

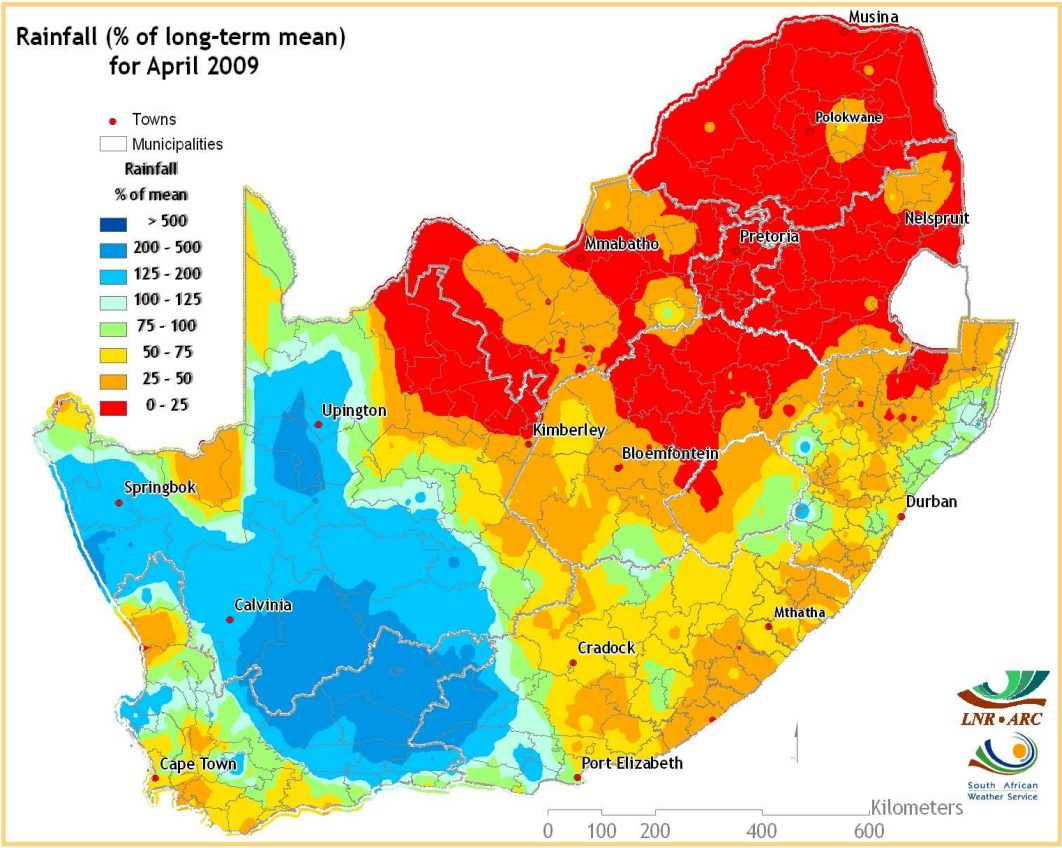


Figure 17

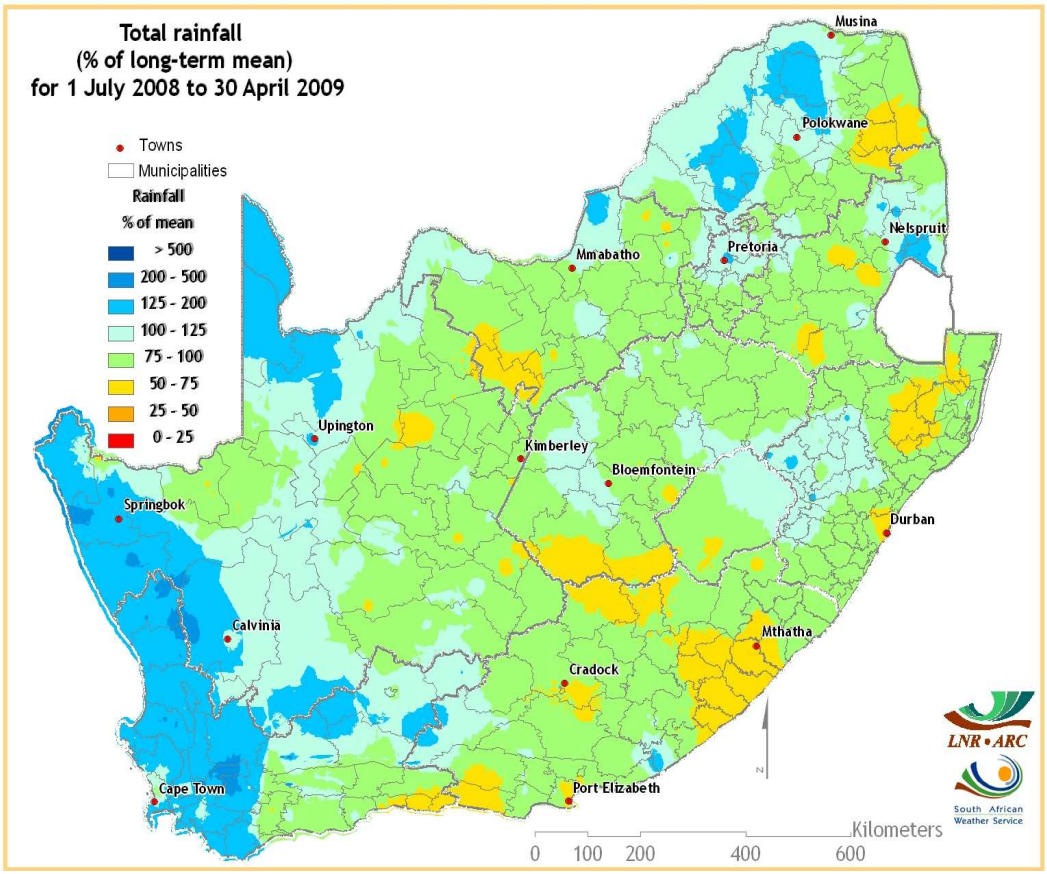


Figure 18

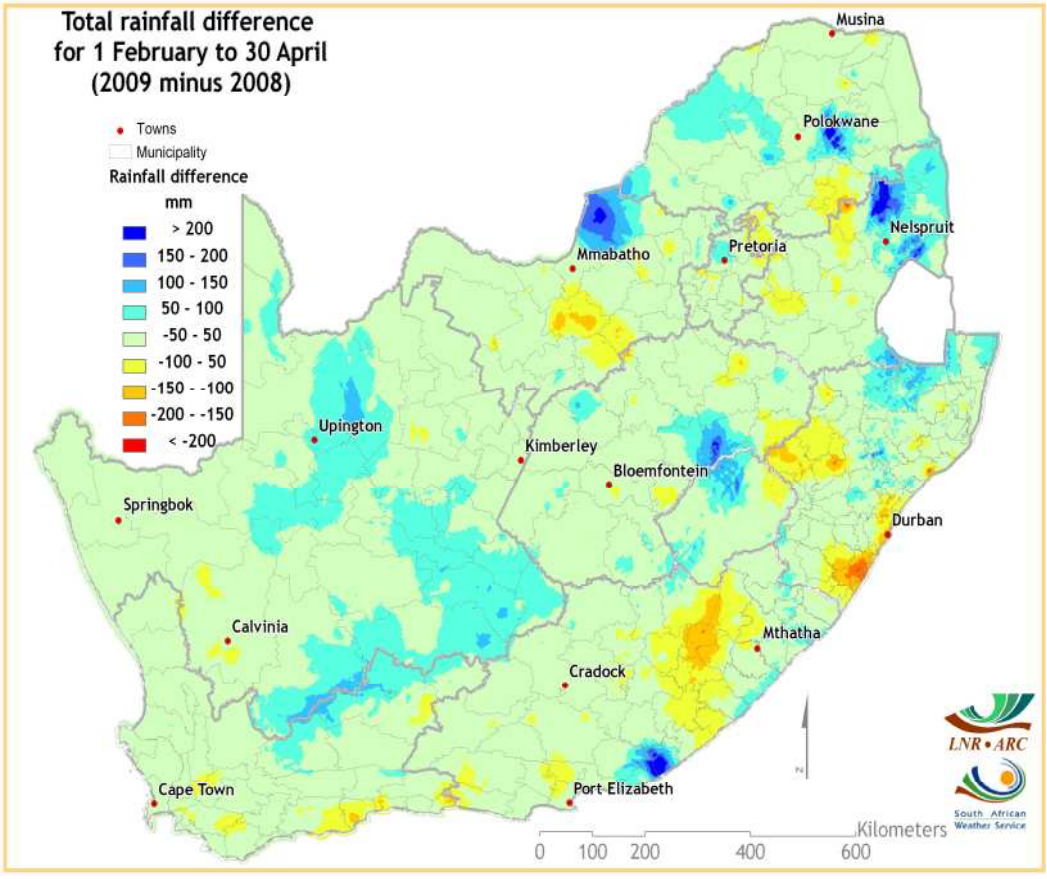


Figure 19

Figures 16 & 17:
Most of the southern half of the country received between 25 and 50 mm of rain while the northern parts of the country were mostly dry during April. Higher falls occurred over the eastern parts of the Western Cape as well as the eastern parts of KwaZulu-Natal where precipitation totals were above normal. Above-normal rainfall was recorded over most of the Northern Cape and interior of the Western Cape while the rest of the country, except for isolated areas in KwaZulu-Natal and the Eastern Cape, received normal to below-normal rainfall.

Figure 18:
For the period July 2008 to April 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.

Figure 19:
During the period February to April, the southern and western parts of KwaZulu-Natal, southern parts of the North West Province, eastern parts of the Eastern Cape and the far southern areas of the country were much drier in 2009 than in 2008. However, the northern parts of KwaZulu-Natal, eastern Mpumalanga and much of the Northern Cape were wetter 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

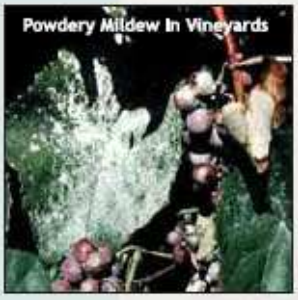
The AgroMet Division of ARC-ISCW conducts and implements research in the field of Agrometeorology and Climatology to promote sustainable utilization of the region's climate, soil and water resources.

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

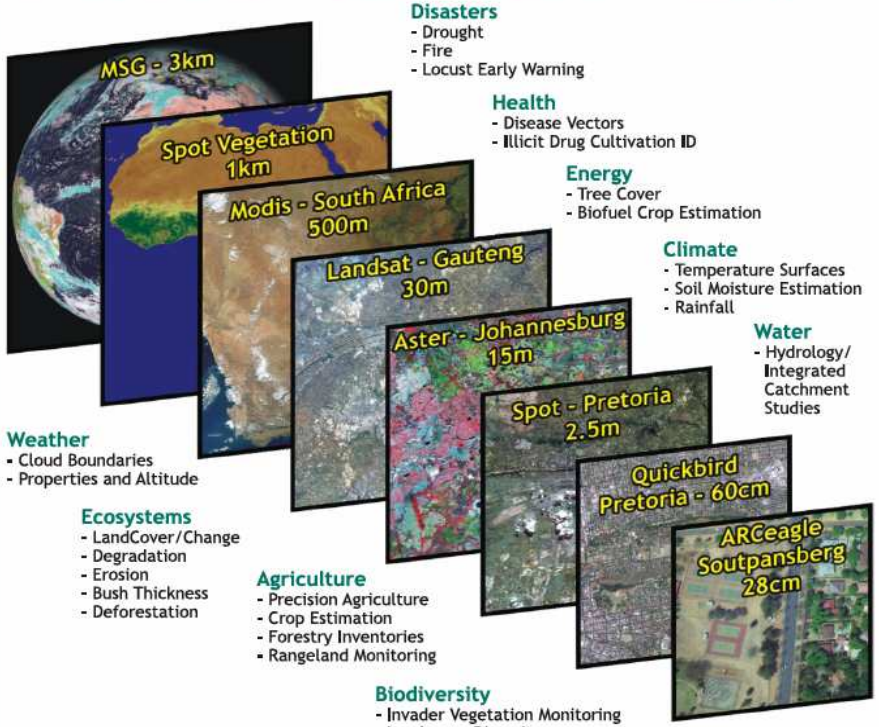
ARC • LNR
Excellence in Research and Development

Your Partner in Natural Resources Research and Information

arcsat

Earth Observation/Remote Sensing

APPLICATIONS IN SOCIETAL BENEFIT AREAS



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

Your Partner in Natural Resources Research and Information

arcterra

GROUND TRUTHING

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 GEONETCast. 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