



**Western Cape  
Government**

Agriculture

**BETTER TOGETHER.**

# **USING SENTINEL-2 SATELLITE IMAGERY**

A CLOUD-DRIVEN APPROACH

WCSIF

F.C. Basson

20 February 2019

# Background

- 1972 – Apollo 17 captures the “*Blue Marble*” image
  - Stored on film in a freezer
- Landsat 1 launched in 1972
- 2008 – NASA makes Landsat free to the public
  - Web Portals for downloading satellite imagery
- Today – Petabytes of data streamed
  - High resolution
  - High frequency revisit period
  - Easier access to satellite imagery



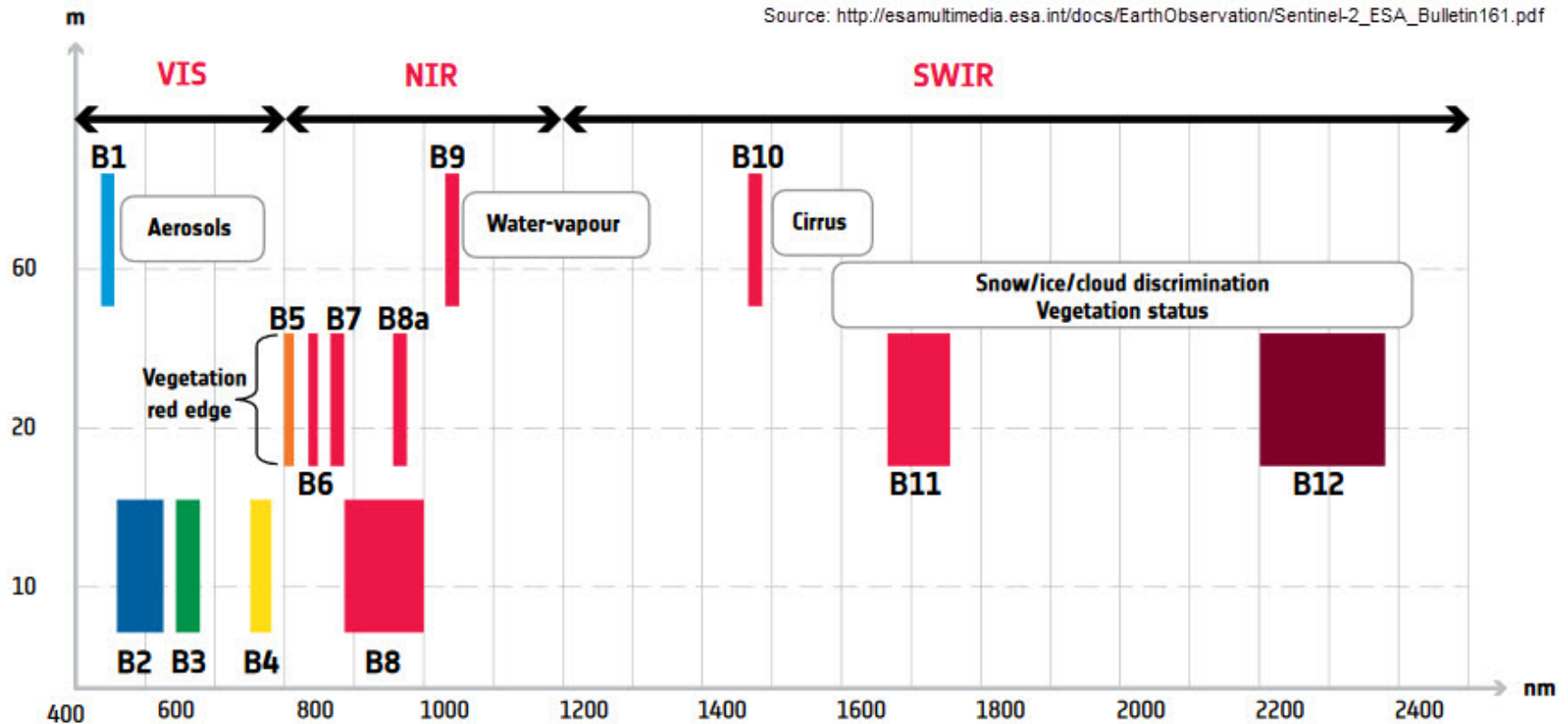
# Sentinel-2

---

- Earth Observation mission from EU Copernicus Programme
  - Twin Satellites: Sentinel-2A (2015) and Sentinel-2B (2017)
- Wide range of applications:
  - agricultural monitoring, emergencies management, land cover classification or water quality
- Multi-spectral data with **13 bands**
- Spatial resolution of **10m, 20m and 60m**
- 290km field of view (swath width)
- Revisit time of **5 days**

# Sentinel-2 Multi-Spectral Bands

Source: [http://esamultimedia.esa.int/docs/EarthObservation/Sentinel-2\\_ESA\\_Bulletin161.pdf](http://esamultimedia.esa.int/docs/EarthObservation/Sentinel-2_ESA_Bulletin161.pdf)

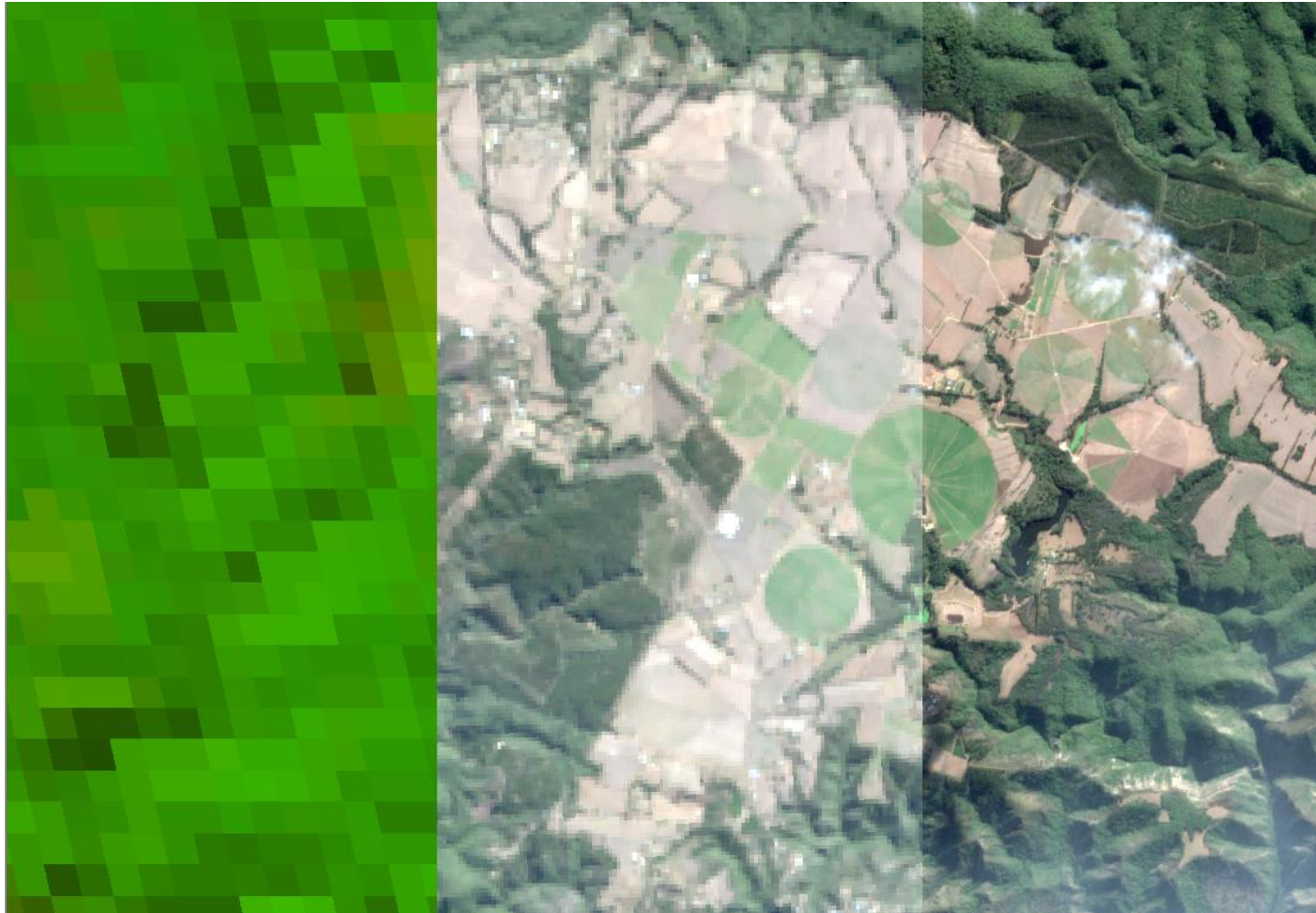


# Sentinel-2: Comparing Spatial Resolutions

MODIS 250m

LANDSAT 30m

SENTINEL-2 10m



# Sentinel-Hub

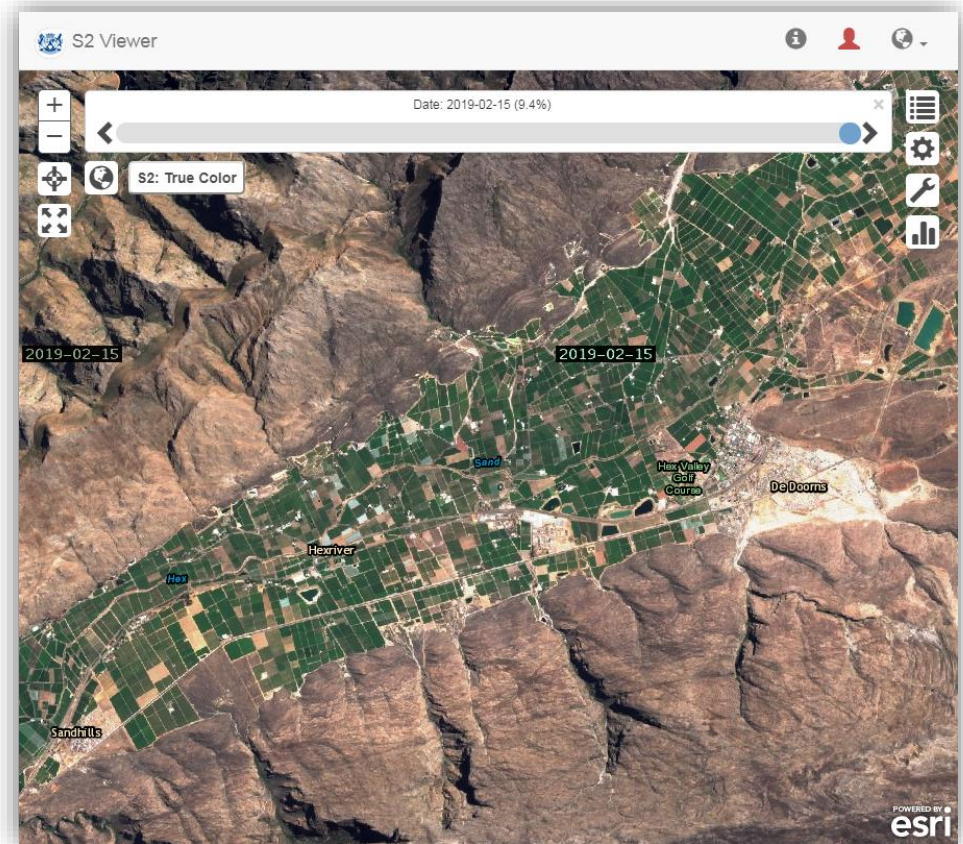
---

- Cloud-based platform providing access to Sentinel-2 data
  - Developed by Sinergise (Ljubljana, Slovenia)
  - Global coverage
  - Multi-temporal
- API for consuming and integrating Web Services
  - Visualise: WMS, WMTS
  - Tile Information: WFS
  - Statistical Information: FIS
- Custom scripts for band processing and visualisation

# Sentinel-2 Application

# Viewer

- HTML 5 / Javascript
- Esri Javascript API
- Mobile-friendly
- Features:
  - Various layers and indices
  - Time-enabled
  - Cloud filter
  - GPS locator
  - Temporal Statistics
  - User login (optional)





# Layers

### Layers

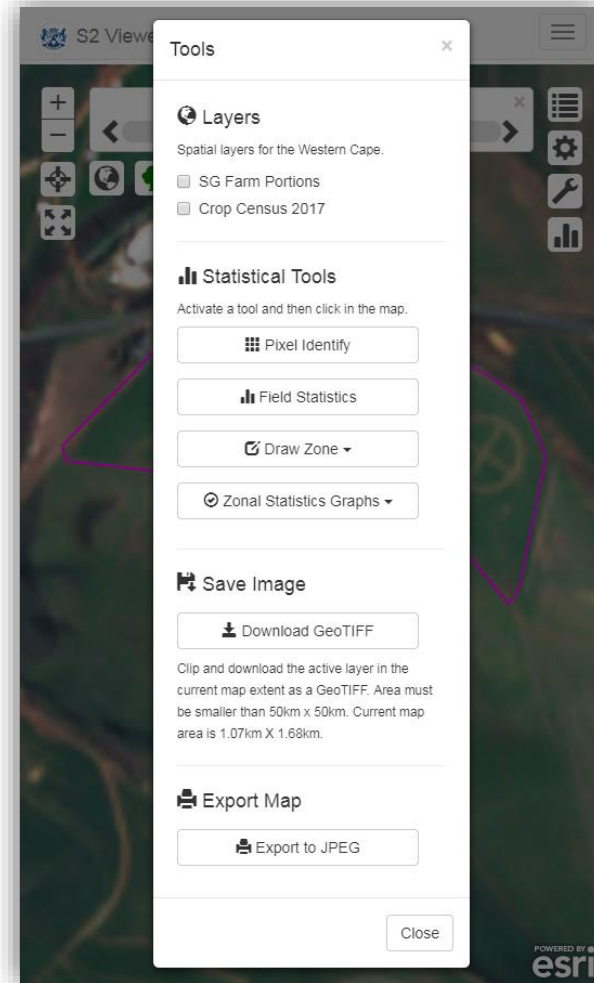
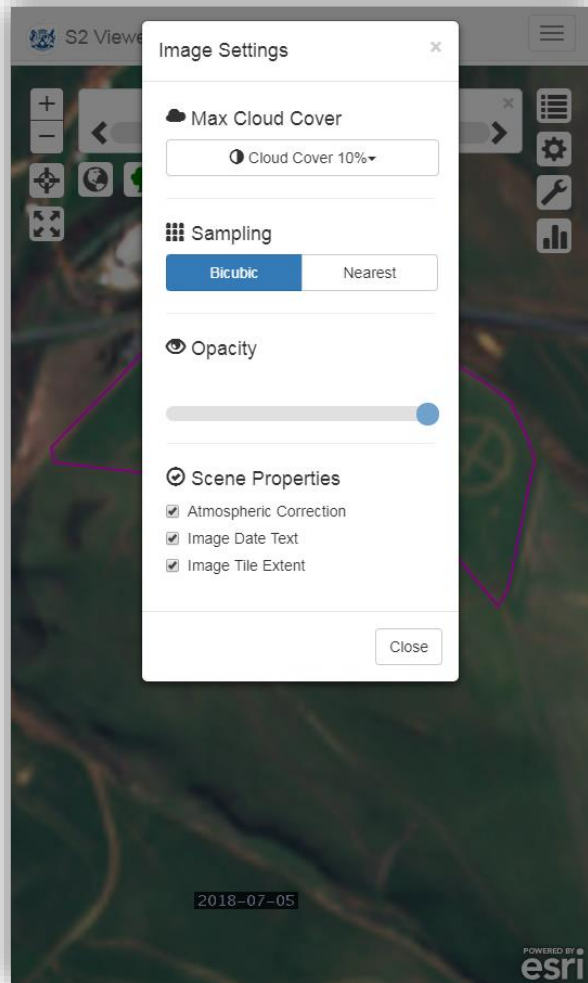
Platform: Sentinel-2

Filter

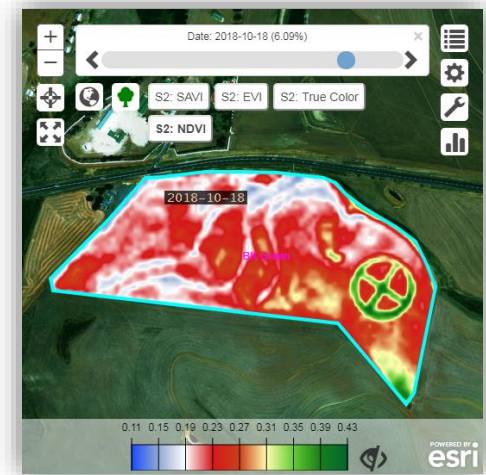
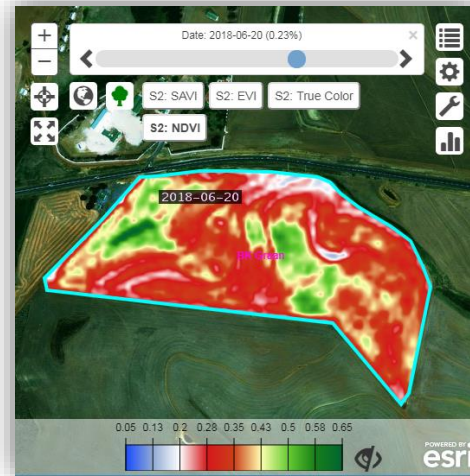
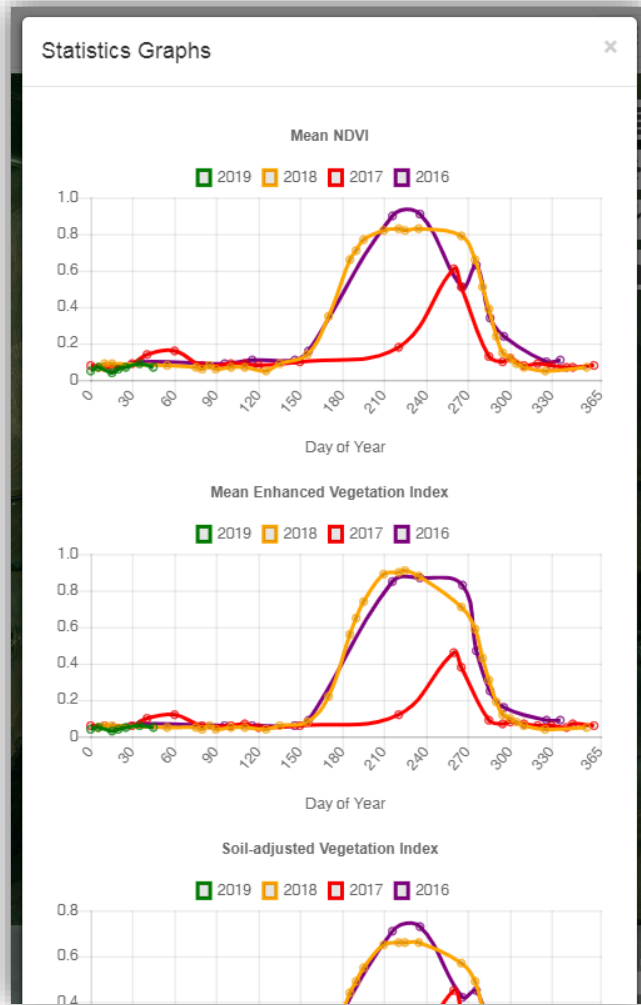
- True Color
- False Color  
Bands 8, 4, 3
- SWIR  
Short Wave Infrared (Bands 12,8A,4)  
Burn scar and fire detection.
- NDVI  
Normalized Difference Vegetation Index  
Indicator for vegetation health, where healthy vegetation generally falls between values of 0.3 to 0.8.
- EVI  
Enhanced Vegetation Index  
Indicator for vegetation health for dense canopies, where healthy vegetation generally falls between values of 0.2 to 0.8.
- SAVI  
Soil-adjusted Vegetation Index  
Indication of plant growth vigour  
A vegetation index that less affected by exposed soil background reflectance (e.g. when crops are grown in rows and unplanted soils are exposed to the satellite) and less susceptible to saturation (e.g. when crops are fully grown and form a closed canopy).
- SRI  
Simple Ratio Index  
Vegetation Health, where healthy vegetation generally falls between values of 2 to 8.
- MCARI  
Modified Chlorophyll Absorption Ratio Index



# Settings and Tools



# Field Statistics



# User Fields

### User Login

User registration is free and allows a user to create bookmarks for selected fields.

User Email:

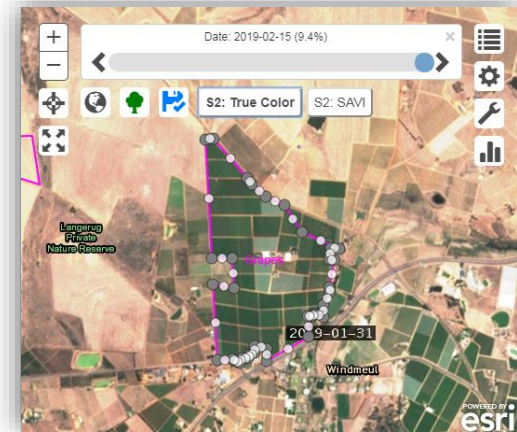
Password:

User sign in successful.

### My Fields

Select a field to display in the map

- Apples 1
- Big variation
- BK Graan  
Boontjieskraal - 100 jaar
- Bloemhofdam Pivot  
Mike was here
- Bloemhofdam Pivot 2
- Canola-1  
Hopefield Canola 2018
- Ebenhaeser 1
- Ebenhaeser 2
- Edit Pivot  
Toets
- Fallow 1  
New block
- Gavin 1
- Gavin 2
- Grapes  
Windmeul
- Grapes G1  
Livestock Expo



### Edit Field Information

Edit the selected field details.

Field ID \*

Description

Crop History:

Year

Crop

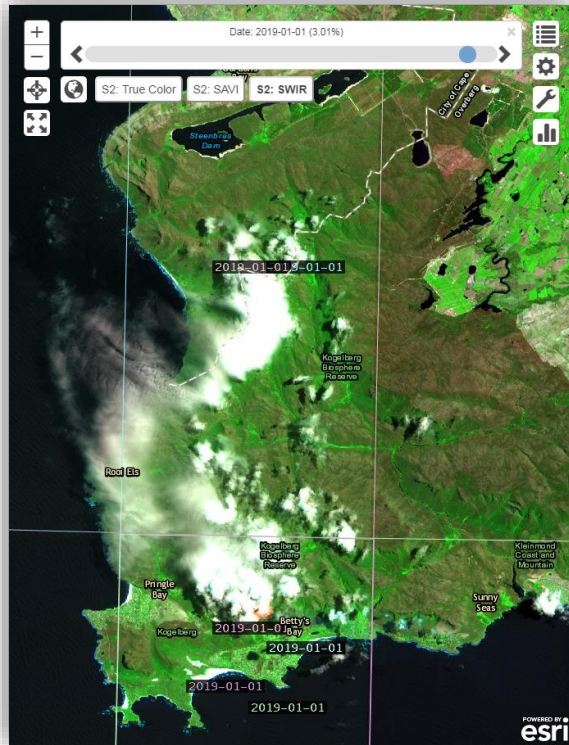
Cultivar

# Example: Betty's Bay Fire Damage

2019-01-01

2019-01-06

2019-01-26



# Way Forward

---

- WCDOA Research project
  - Define and describe indices for practical use
  - Field verification of data
- Application development
  - Improve user interface and tools
- Free tool for farmers, researchers, agri-business in many different spheres
- Improved information leads to better decision-making

---

Thank you

# Contact Us



Western Cape  
Government

Agriculture

BETTER TOGETHER.

**F.C. Basson**

Research Support Services

**Tel:** +27 (0)21 808 5416

**Fax:** +27 (0)21 808 5380

[fcbasson@elsenburg.com](mailto:fcbasson@elsenburg.com)

[www.elsenburg.com](http://www.elsenburg.com)