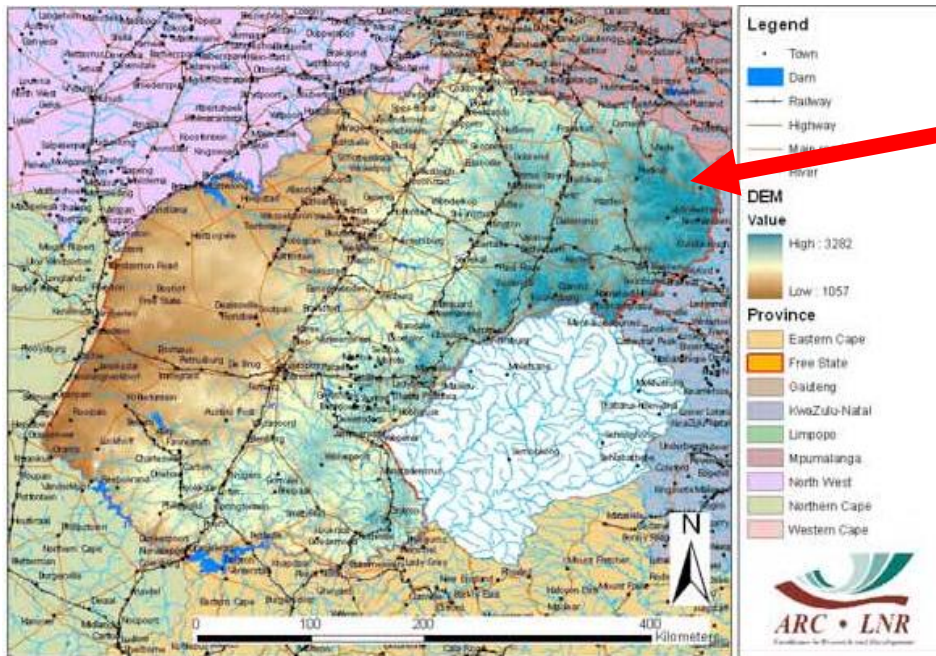


FREE STATE JECAM SITE SOUTH AFRICA

JECAM/GEOGLAM Science Meeting
Brussels, Belgium
16-17 November, 2015

Site Description

- Location & Topography

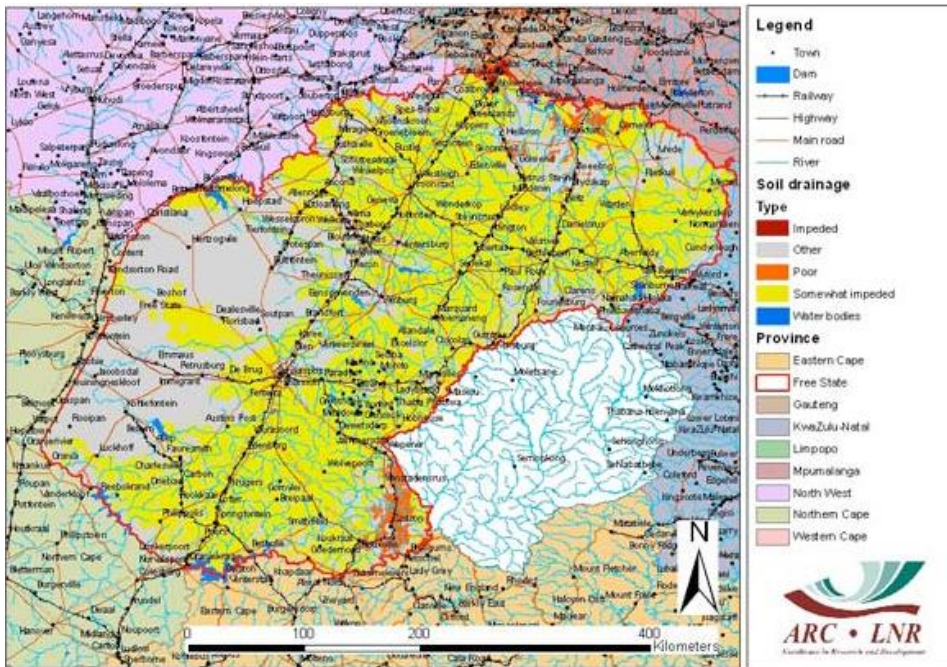


Mountains in East
Undulating in West

Site Description

- Soils

Where crops are grown - Mainly Sandy – Sand Loam



Drainage – Some what impeded



Wind Erosion - Bloemfontein

Site Description

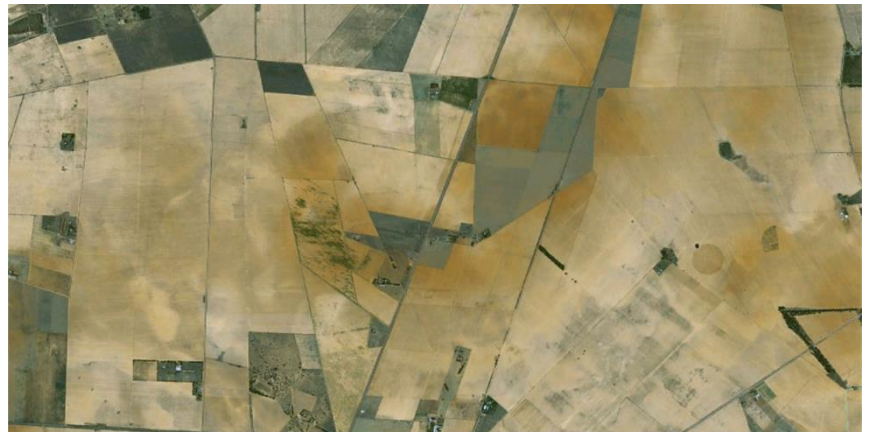
- Crop calendar

Typical Crop calendar (Colours in lower rows simulate CIR imagery)

	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Maize Phenology (Long)												
Maize Reflectance (Long)												
Maize Phenology (Short)												
Maize Reflectance (Short)												
Sunflower Phenology (Early)												
Sunflower Reflectance (Early)												
Sunflower Phenology (Late)												
Sunflower Reflectance (Late)												
Soya/Dry Beans Phenology												
Soya/Dry Beans Reflectance												
Groundnuts Phenology												
Groundnuts Reflectance												
Sorghum Phenology												
Sorghum Reflectance												
Pasture Phenology												
Pasture Reflectance												
Wheat Phenology												
Wheat Reflectance												
WinterGrazing Phenology												
WinterGrazing Reflectance												
MaizeWheatPivot Phenology												
MaizeWheatPivot Reflectance												
Lucerne Cut/Growth Phenology												
Lucerne Cut/Growth Reflectance												

Site Description

- Field size



East Free State : 18Ha Commercial
Western Free State: 35Ha Commercial

Small Holders: 1- 20Ha (often Clustered)

JECAM

Joint Experiment for Crop Assessment and Monitoring

 GROUP ON
EARTH OBSERVATIONS

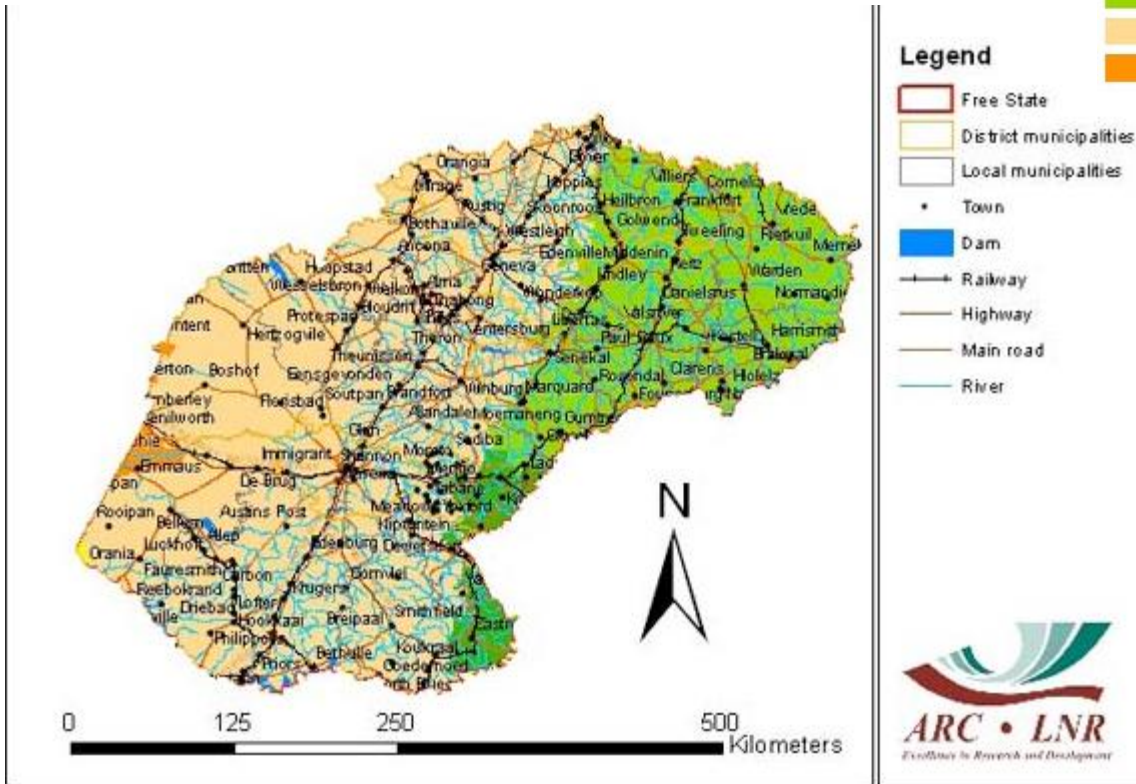
Site Description

- Climate and weather

Koppen zone

Description

- Arid with summer rainfall and cool (average annual temperature <18°C)
- Humid Subtropical with annual rainfall and cool (warmest month <22°C)
- Humid Subtropical with summer rainfall and cool (warmest month <22°C)
- Semi-arid with summer rainfall and cool (average annual temperature <18°C)
- Semi-arid with summer rainfall and warm (average annual temperature >18°C)

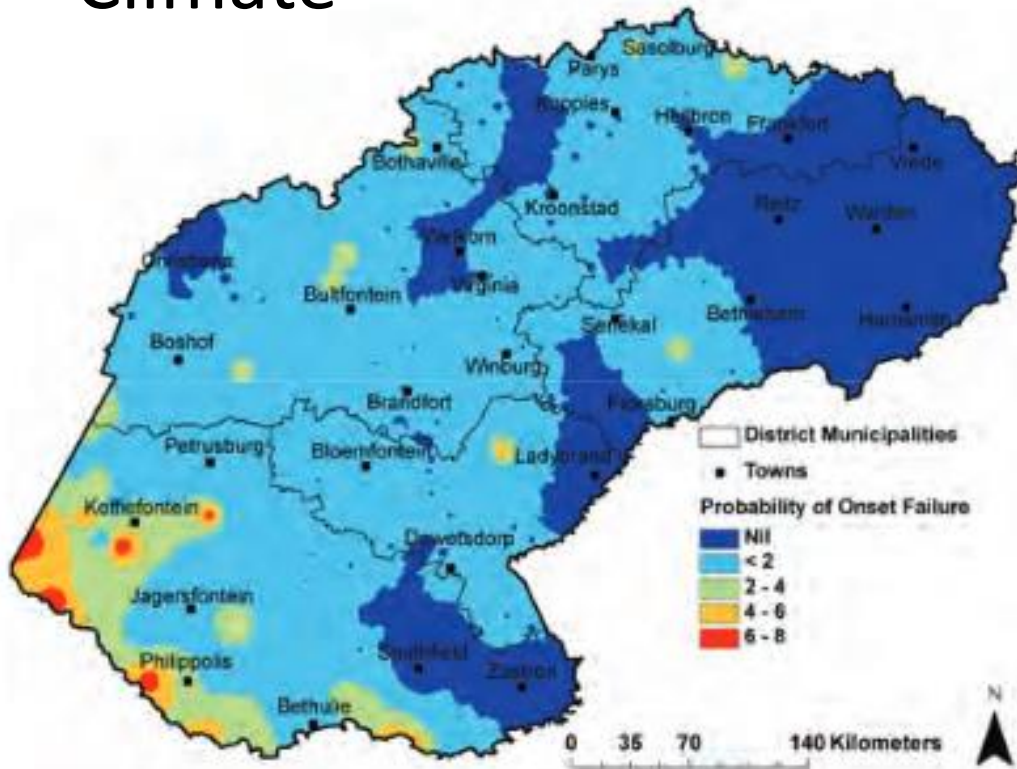


Humid Subtropical – summer
Semi-arid – summer
Wheat on stored water



Site Description

- Climate



- Generally assured of rain
- Time & Quantity not always suitable
- Frost / Drought



ME Moeletsi and S Walker, 2012 Rainy season characteristics of the Free State Province of South Africa with reference to rain-fed maize production. Water SA Vol. 38 No. 5

Site Description

- **METHODS**
- Dryland – Rotation & Fallow (Occasional supplementary Irrigation)
- Irrigated – 2 crops per year
- Wheat grown on stored soil water.
- Small holder & Subsistence dry land



Project Objectives

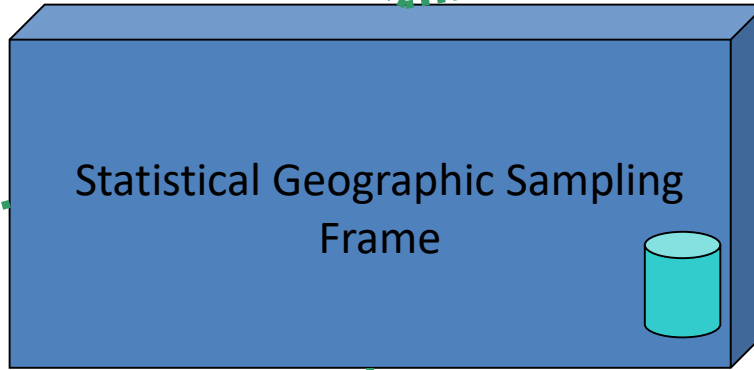
- **Crop identification and Crop Area Estimation**
 - Operational system – Continual Improvement
 - Producer Independent Crop Estimation System (PICES)
 - Area at: Provincial (+- 10%) National (+- 5%)
 - Crop Type for selected provinces as required

PICES

Aircraft



Technology

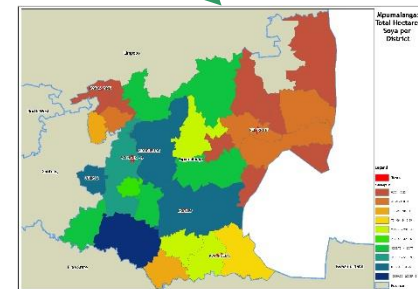


PICES Team

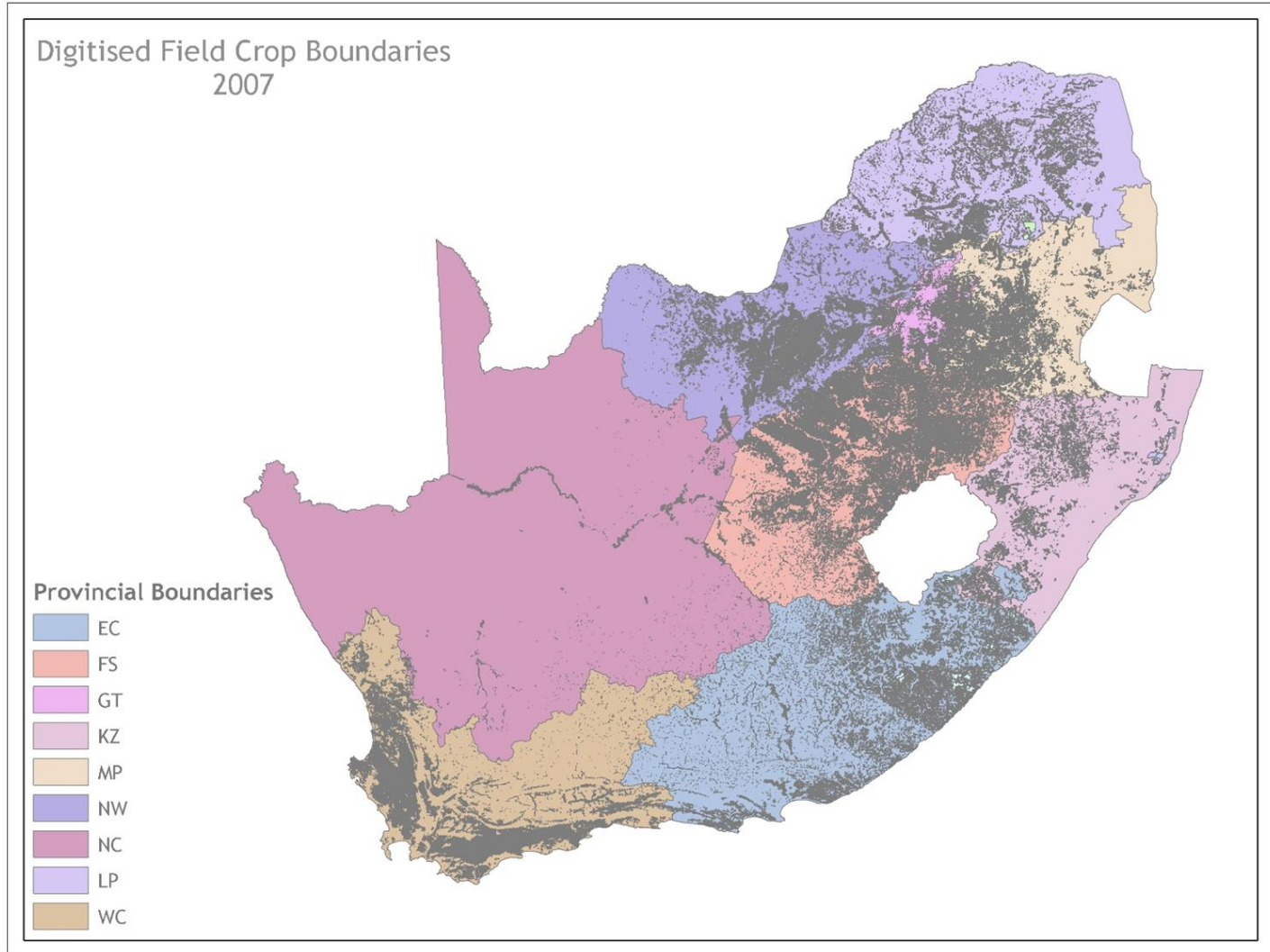
Satellite imagery



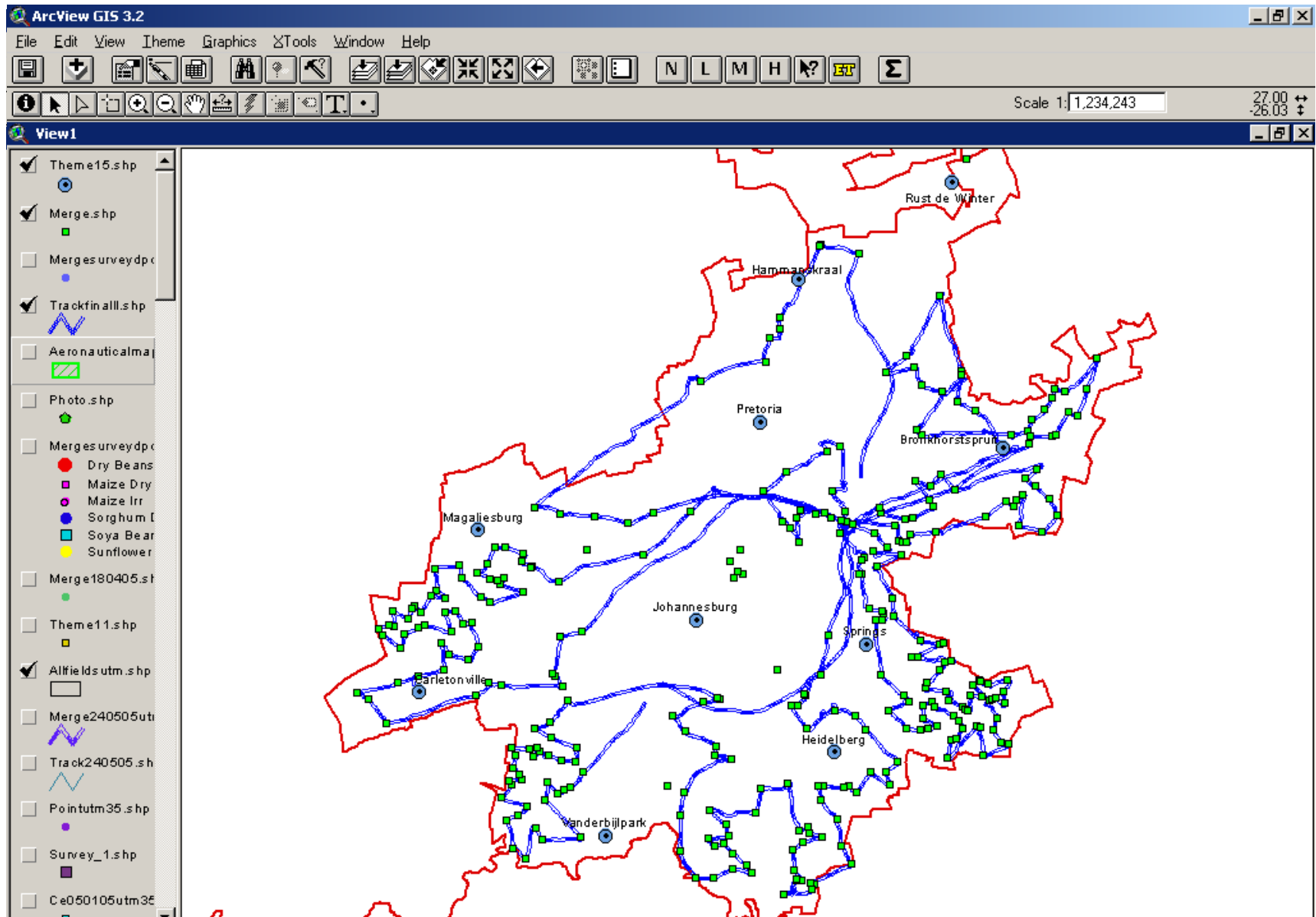
GIS



Crop Field Boundaries



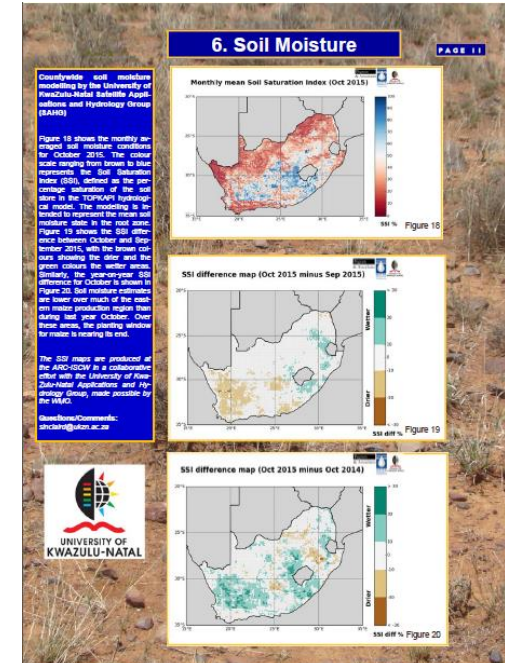
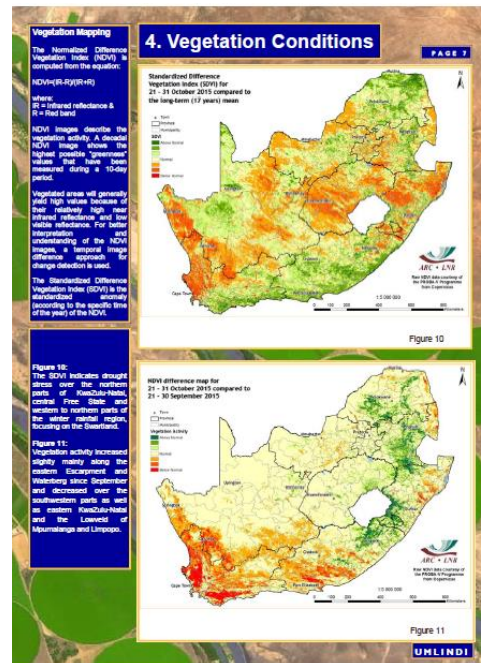
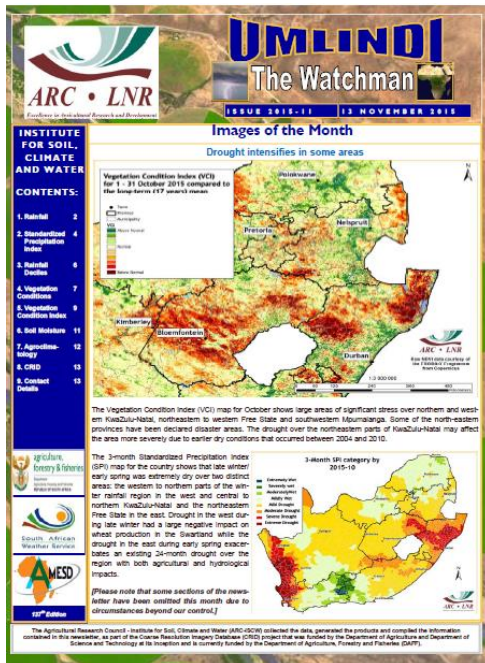
STEP 5 –flight planning



Shortest routing algorithm

Project Objectives

- Crop Condition/Stress & Soil Moisture
- Operational Monitor
- UMLINDI Monitor (Monthly) (www.arc.agric.za)



JECAM

Joint Experiment for Crop Assessment and Monitoring

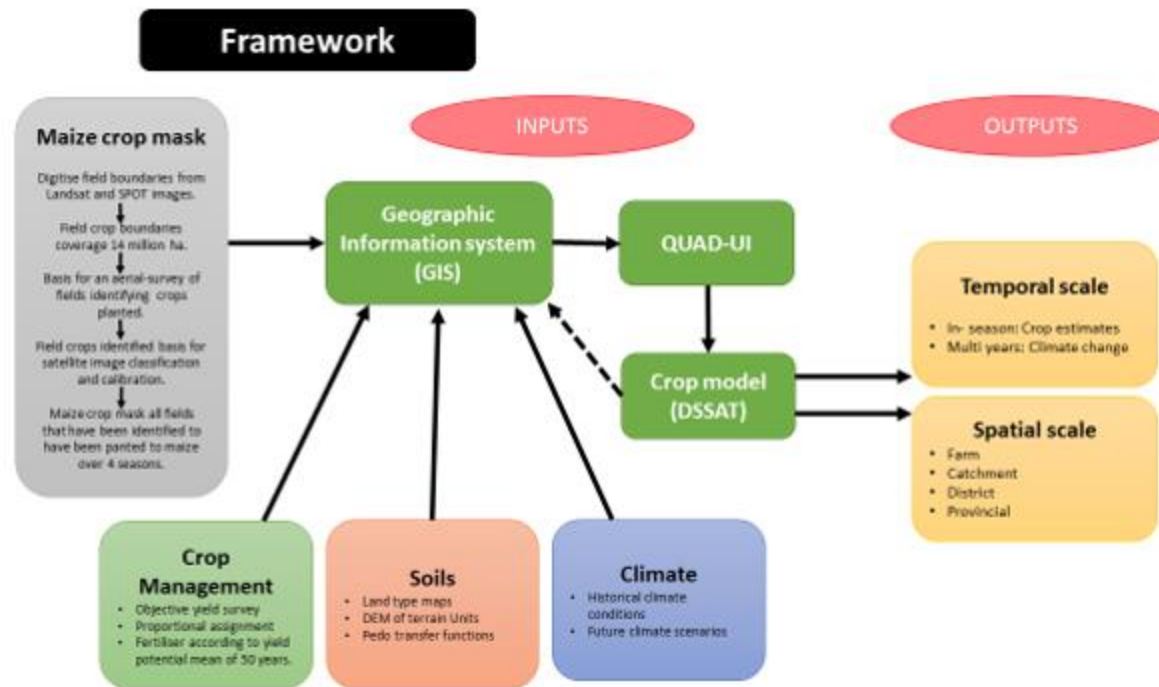
Project Objectives

- Yield Prediction and Forecasting
 - Operational system of in field measurement (Maize & Wheat)
 - Sample is a subset of PICES
 - Design is for provincial yield
 - Crop Modeling being tested



Project Objectives

(Crop Modelling Framework - AgMIP)



www.agmip.org

Earth Observation (EO) Data Received/Used

Satellite	Supplier	Type	Number	Challenge
Landsat	USGS	Optical	4/season (Crop area)	
SPOT 6	SANSA	Optical	1 scene Mosaic	SANSA staff change
ProbaV and other course resolution	Geonetcast VITO	Optical	Decadal	
SPOT 4 T 5 SPOT 5 T 5	ESA	Optical	1 scene x 24 1 scene x 24	
RADAR	UCL	RADAR		Contracts

In situ Data

- Aerial Observations (PICES)
- Harvester yield surfaces (Collaborating farmers)
- Cultivar trials (Limited use)
- Weather data



JECAM

Joint Experiment for Crop Assessment and Monitoring

GEO GROUP ON
EARTH OBSERVATIONS

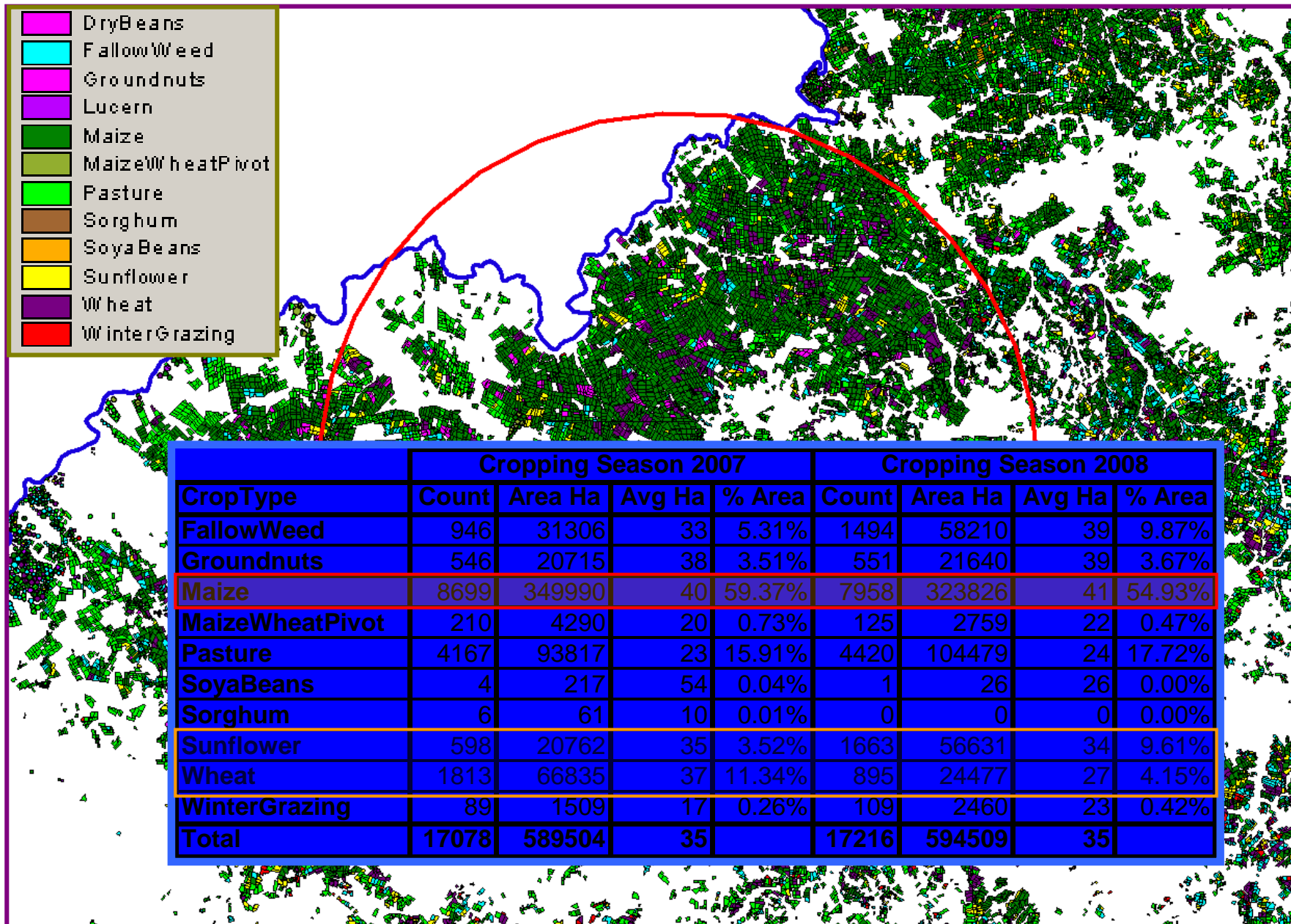
Collaboration

- SEN2Agric
- SIGMA
- Some Data sharing

Results

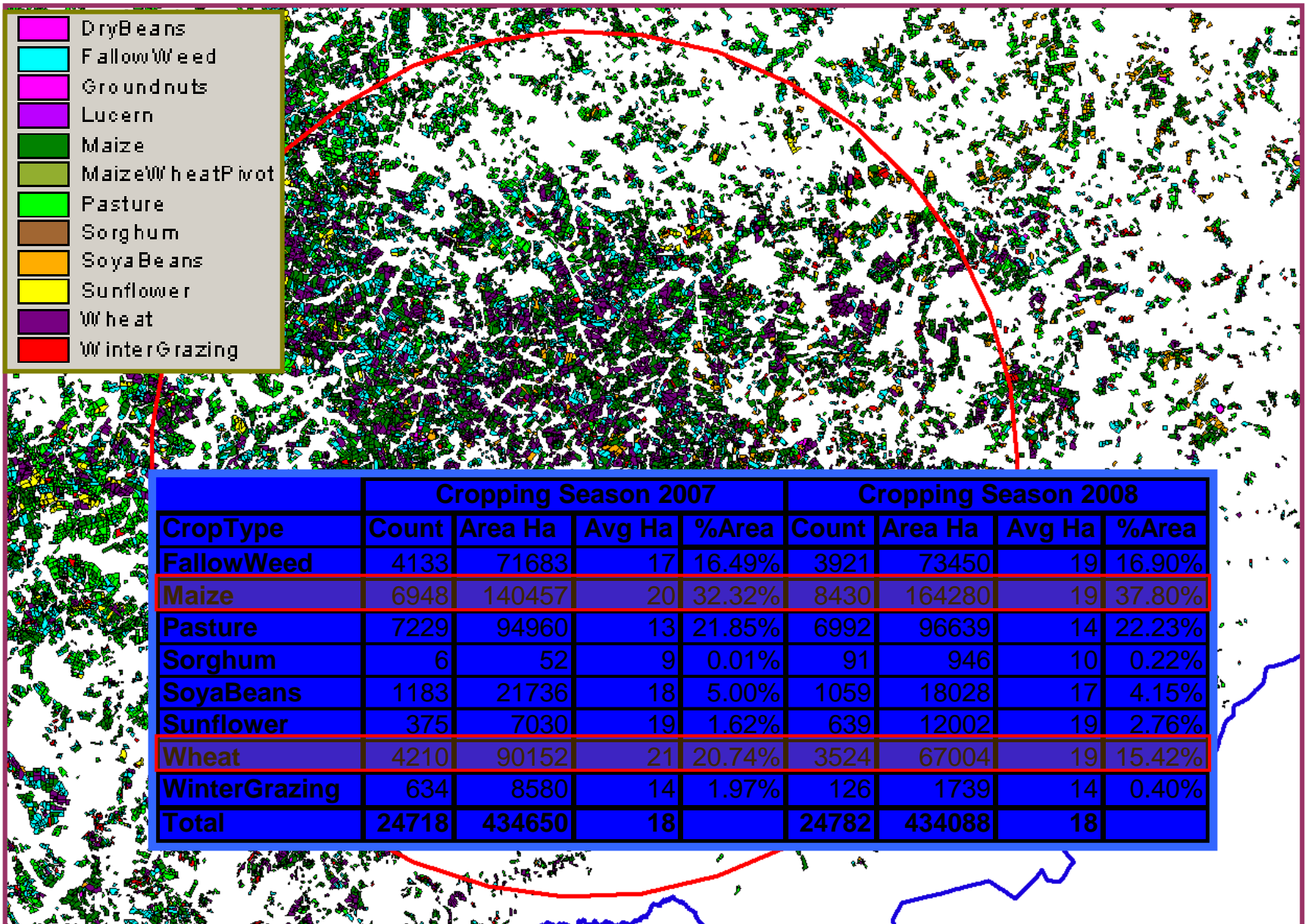
- Operationally produce crop area & yield for the province
- Monthly monitor crop condition & soil Moisture.
- CEC – Monthly estimate
- CELC – Advises CEC
- NCSC – Input to CEC
- CELC recommended NCSC as most reliable source

Western Freestate

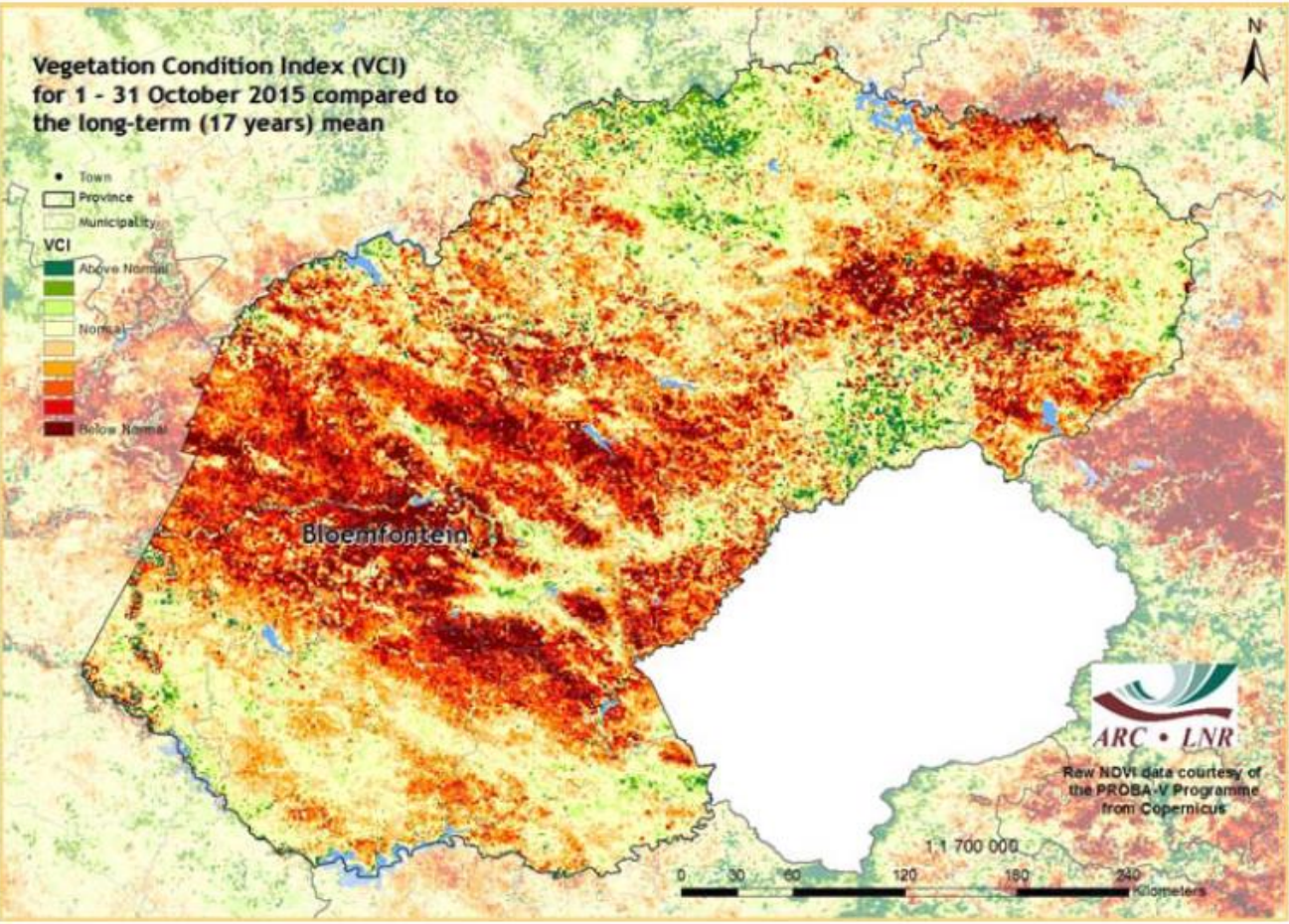


CropType	Cropping Season 2007				Cropping Season 2008			
	Count	Area Ha	Avg Ha	% Area	Count	Area Ha	Avg Ha	% Area
FallowWeed	946	31306	33	5.31%	1494	58210	39	9.87%
Groundnuts	546	20715	38	3.51%	551	21640	39	3.67%
Maize	8699	349990	40	59.37%	7958	323826	41	54.93%
MaizeWheatPivot	210	4290	20	0.73%	125	2759	22	0.47%
Pasture	4167	93817	23	15.91%	4420	104479	24	17.72%
SoyaBeans	4	217	54	0.04%	1	26	26	0.00%
Sorghum	6	61	10	0.01%	0	0	0	0.00%
Sunflower	598	20762	35	3.52%	1663	56631	34	9.61%
Wheat	1813	66835	37	11.34%	895	24477	27	4.15%
WinterGrazing	89	1509	17	0.26%	109	2460	23	0.42%
Total	17078	589504	35		17216	594509	35	

Eastern Freestate



Results



The VCI map for October indicates below-normal vegetation activity over the western and northeastern parts of the Free State.

Research Plans for Next Growing Season

- Keep improving the system
- Focus on Modelling of yields with EO (AgMIPS)
- Umlindi will be interactive (web based)
- Small field – Techniques for area / crop type & Yield (Resource dependant)
- Collaboration with SIGMA and Sen2Agri.
- Student activity growing.
- Focus on operational satellite image application



THE FREE STATE PROVINCE

