

## **CROP ESTIMATION & ASSESSMENT IN SA : A EO APPLICATION**

Terry Newby (obo SA-GEO Ag CoP)

Brussels : Nov 2013



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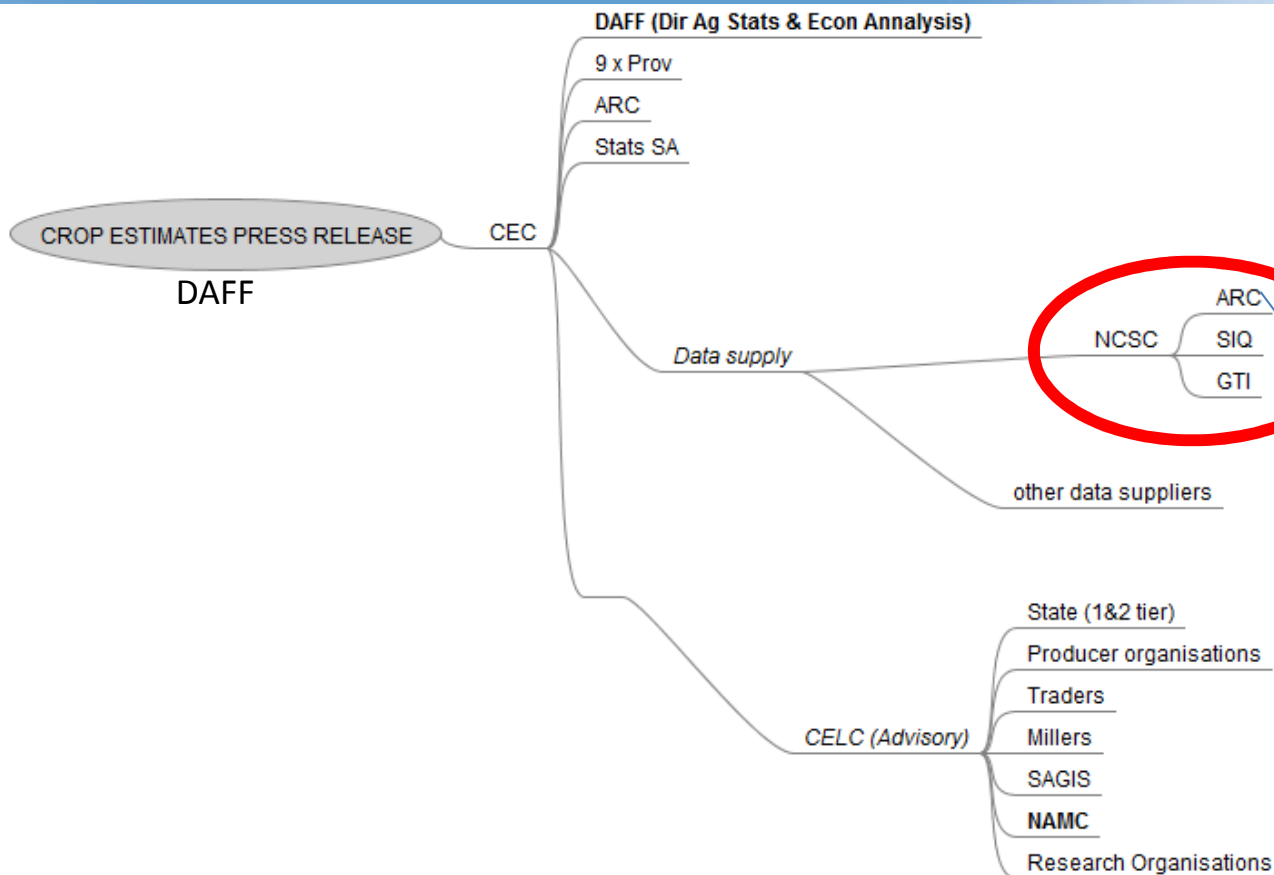
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# PRESENTATION OUTLINE



- THE SA CROP ESTIMATION & MONITORING LANDSCAPE
- THE METHODOLOGIES
  - AREA & TYPE
  - YIELD
  - CONDITION
  - RESULTS
- CONSTRAINTS & CONCLUSIONS

# Landscape



- Consensus
- Mandated
- No Legal requirement

Condition (Umlindi)

# METHOD

# AREA ESTIMATION



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# Use of satellite imagery

**SPOT5**



**Previous seasons  
2006/7/8/9/10/11/12**



**Field crop boundary**



**PICES survey @  
provincial level**

**SPOT4 / LANDSAT**



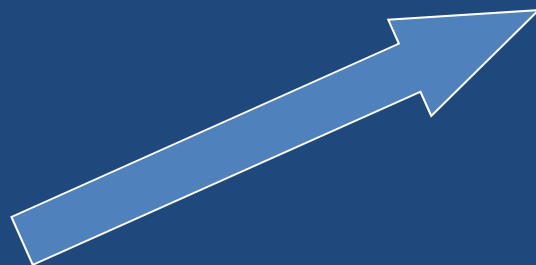
**In-season 2013**



**Satellite image  
calibration**



**Satellite image  
analysis @ field level**



# Mapped Field Boundaries



# SA coverage: 13 million ha

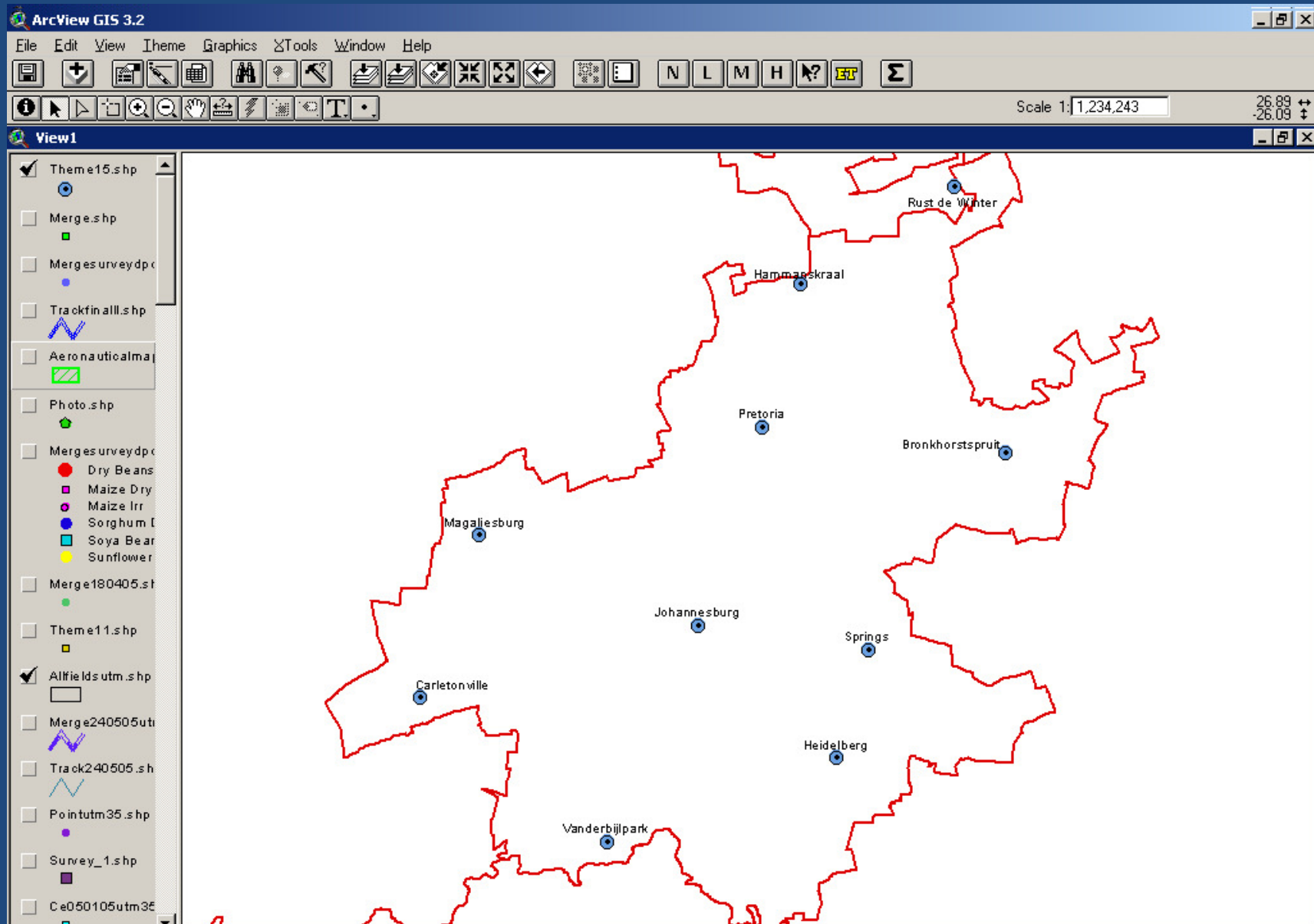
Digitised Field Crop Boundaries

Advantage of Field Boundaries: Survey Area (Ha) Reduced				
Province	Stratification	MappedFields	Reduction	% Reduction
Free State	10,794,982	3,712,625	7,082,357	65.61%
North West	5,776,803	1,921,927	3,854,876	66.73%
Mpumalanga	4,118,568	1,103,706	3,014,862	73.20%

SA Provinces

- Eastern Cape
- Free State
- Gauteng
- KwaZulu-Natal
- Limpopo
- Mpumalanga
- North West
- Northern Cape
- Western Cape

# PICES: Sample selection



Gauteng Province



# PICES Infrastructure

Team: GREEN | User: KC

GPS new id DEL R R 200 500 FIELD ON OFF MT ON OFF 1 2 RGB

The screenshot displays the PICES Infrastructure software interface. At the top, it shows the user information 'Team: GREEN | User: KC' and a toolbar with various navigation and tool icons. Below the toolbar is a status bar with labels like 'GPS', 'new', 'id', 'DEL', 'R', 'R', '200', '500', 'FIELD ON OFF', 'MT ON OFF', and zoom levels '1', '2', 'RGB'. The main area is a map of agricultural fields with numerous numbered points (e.g., 1400, 874, 330, 31, 299, 293, 282, 270, 277, 872, 87, 257, 868, 868, 252, 867, 239, 236, 238, 862, 217, 225, 227, 219, 218, 223, 200, 197, 189, 187, 184, 855, 859, 206, 193, 851, 172, 171, 185, 178, 175, 179, 173, 137, 351, 1401, 352, 355, 356, 339, 325, 326, 324, 1308, 302, 292, 273, 270, 259, 258, 253, 250, 241, 232, 233, 230, 219, 223, 199, 178, 175, 179, 173, 137). A dialog box titled 'GDACE - Capture Info' is open in the center, containing the following fields and options:

**GDACE - Capture Info**

CROP: MIELIES PUNT: 101

MIELIES SONNEBLOM SORGHUM BONE GRONDBONE NIE GEMAP

AW\_1 AW\_MEER NAT WEIDING BRAAK / STOP ONKRUID NVT

DROELAND BESPROEI IRRIG: DROELAND  NO LIVESTOCK

TONNELS  SKADUNET  KLEINSKAAL DAIRY  S  L

GROENTE  BOORDE  BOORDE BEEF

BLOMME  ANDER SHEEP

POULTRY

PIGGERY

FEEDLOTS

BOERBOKKE

GAME

KOMMENTAAR

OK CANCEL

Aircraft



Technology

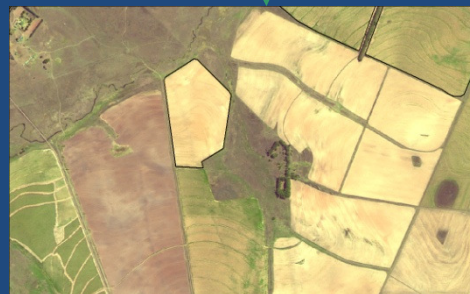


Statistical Geographic  
Sampling Frame

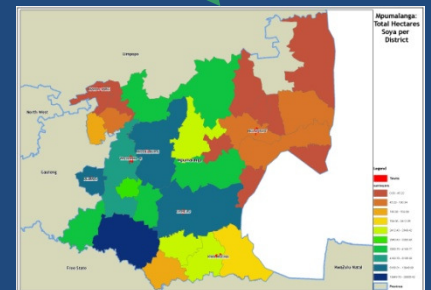


PICES Team

Satellite imagery



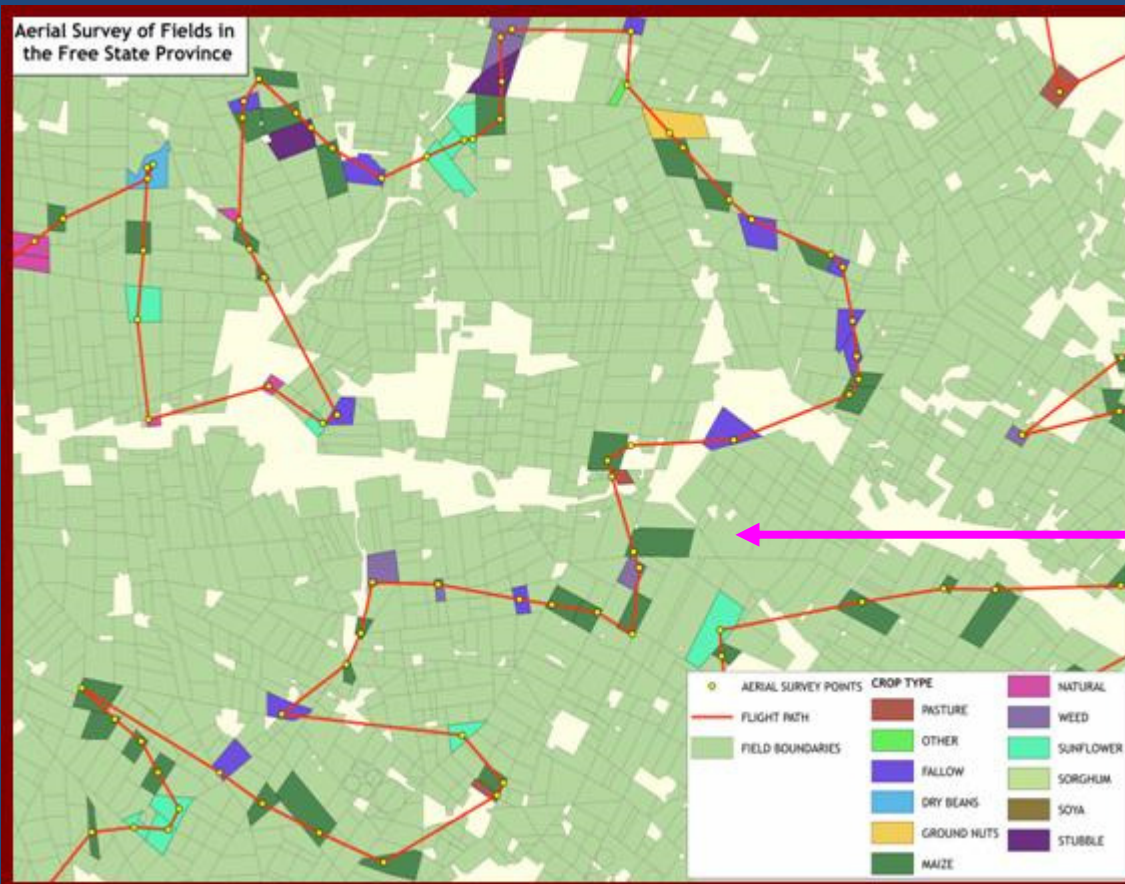
GIS



# PICES: crop verification

- Vast improvement: survey efficiency
- Support image classification
- Statistical calculation of area

Province	Selected	Additional	Total
Mpumalanga	1048	1852	2900
Freestate	1582	2618	4200
Northwest	1288	1812	3100
Gauteng	319	230	549
<b>Total</b>	<b>4237</b>	<b>6512</b>	<b>10749</b>

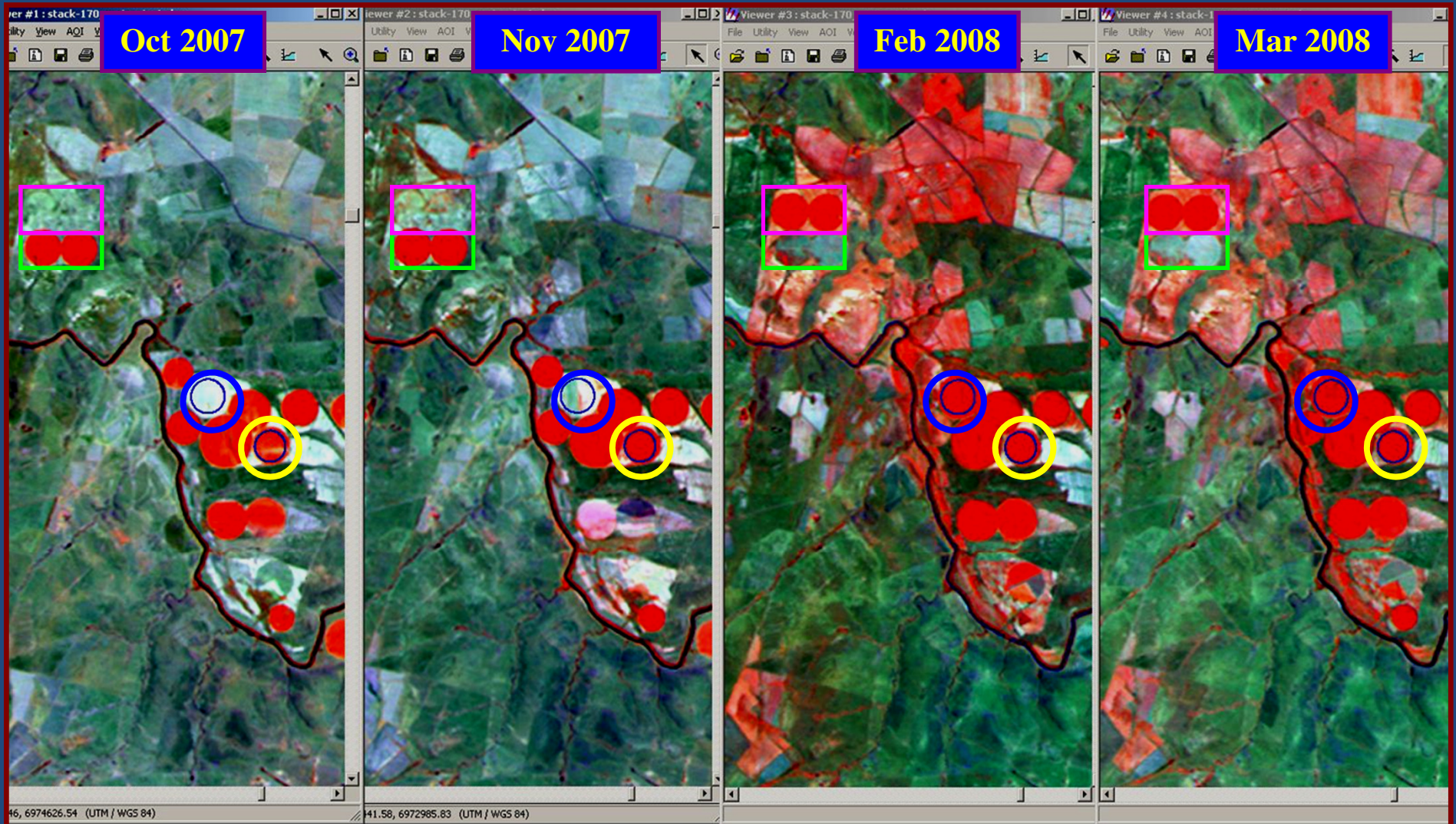


— Additional points used for image training

— Selected fields with identified crop types



# Classification: Crop Development

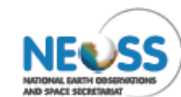


# METHOD YIELD ESTIMATION

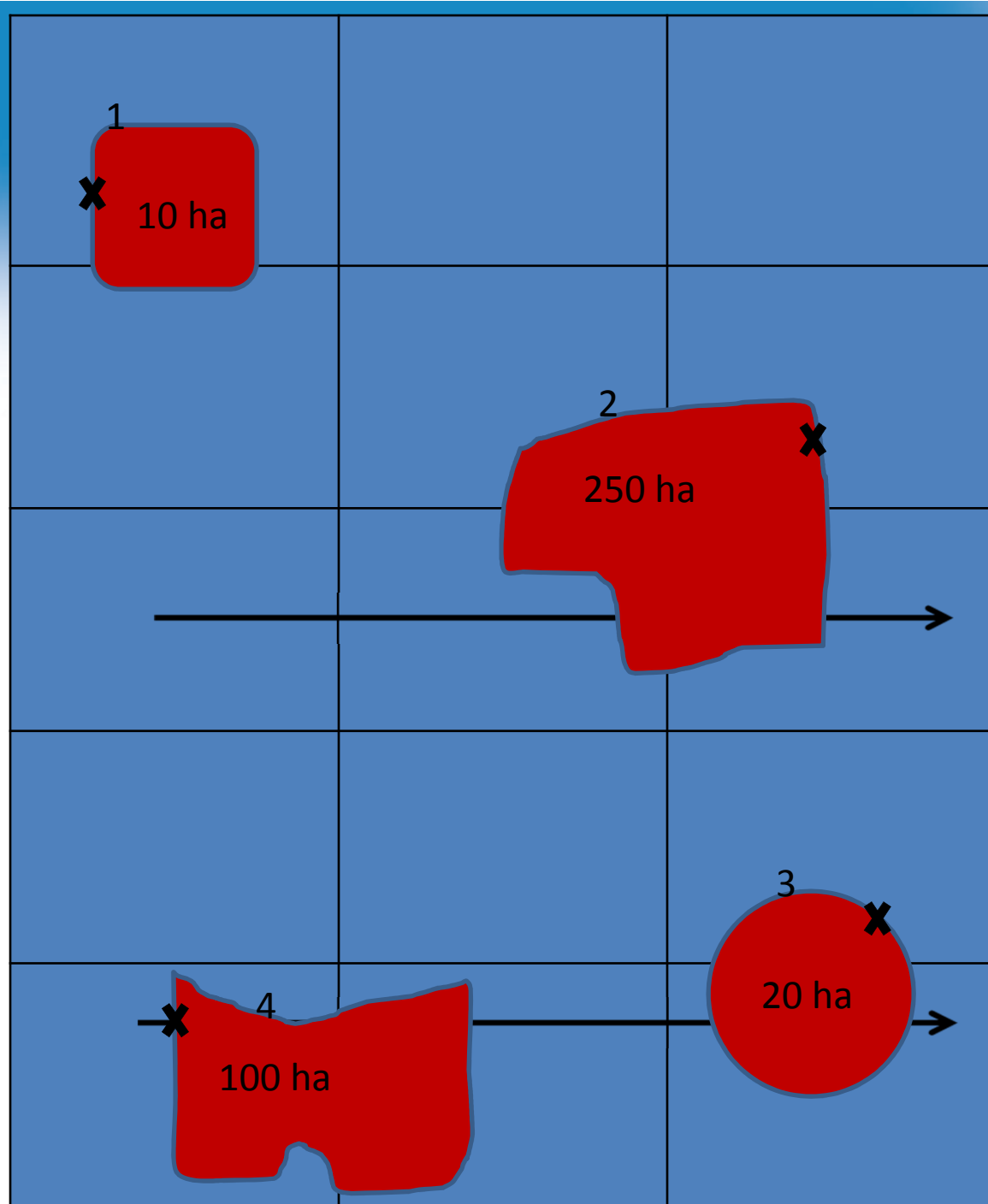


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Field #	Size (ha)	Accumulative hectares
1	10	1 - 10
2	250	11 - 260
3	20	261 - 280
4	100	281 - 380
<b>Total</b>	<b>380</b>	<b>----</b>



1.5 Meters

35 Ears

11

1

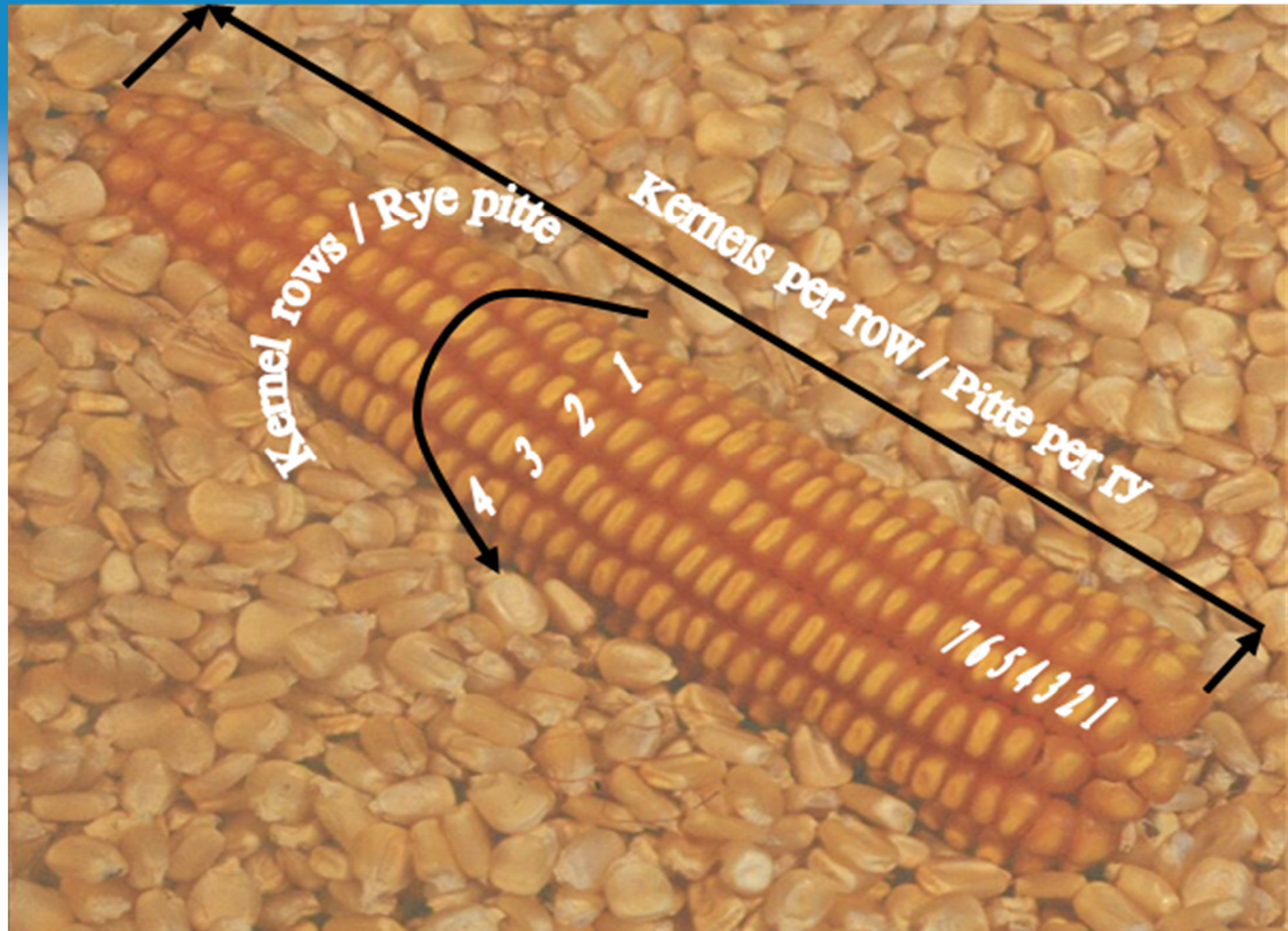
10 Meters





F. J. VanAr

1145	WMD	Nonodues	A	P: 30	RP	S:
211	0835161244			K: 72	PR	O:
				V:	M	W:
D 44	13	144	268	B	P:	RP
74	58	84	156	K:	PR	O:
				V:	M	
				C	P:	S:
				K:	PR	O:
				V:	M	
				D	P:	S:
				K:	PR	O:
				V:	M	
				E	P:	S:
				K:	PR	O:
				V:	M	



0.19 g	0.20 g	0.21 g	0.22 g	0.23 g	0.24 g
0.25 g	0.26 g	0.27 g	0.28 g	0.29 g	0.30 g
0.31 g	0.32 g	0.33 g	0.34 g	0.35 g	0.36 g
0.37 g	0.38 g	0.39 g	0.40 g	0.41 g	0.42 g

0.19 g	0.20 g	0.21 g	0.22 g	0.23 g	0.24 g
0.25 g	0.26 g	0.27 g	0.28 g	0.29 g	0.30 g
0.31 g	0.32 g	0.33 g	0.34 g	0.35 g	0.36 g
0.37 g	0.38 g	0.39 g	0.40 g	0.41 g	0.42 g

# CALCULATION



Cob mass = kernels per row x kernel rows x kernel weight

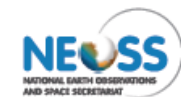
Yield = area x cobs x mass

# RESULTS



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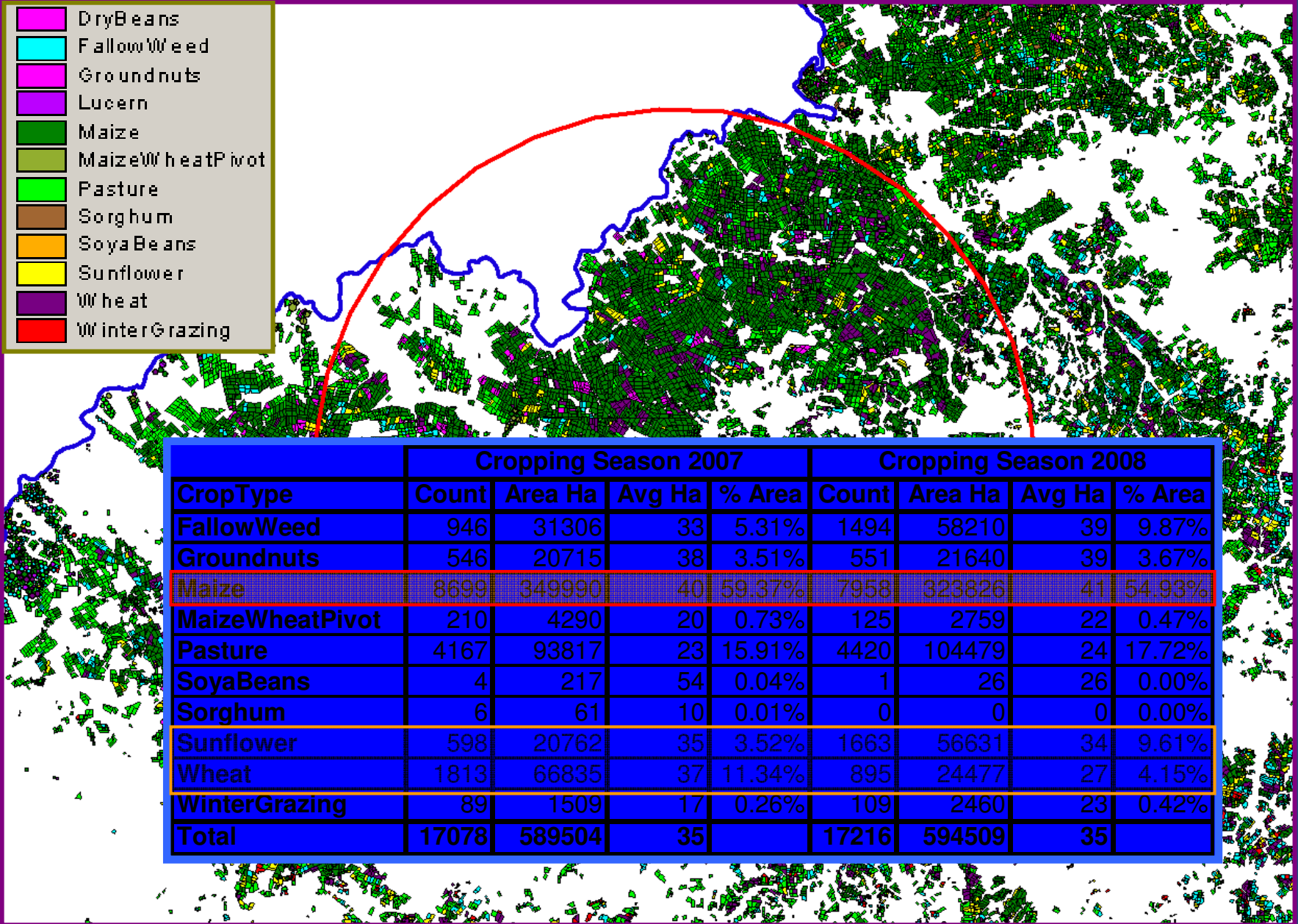
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CROP	Area planted 2013 Ha (A)	3 <sup>rd</sup> forecast 2013 Tons (B)	2 <sup>nd</sup> forecast 2013 Tons (C)	Area planted 2012 Ha (D)	Final crop 2012 Tons (E)	Change % (B) ÷ (C)
Wheat	505 500	1 790 850	1 758 500	511 200	1 870 000	+1,84
Malting barley	81 320	280 961	280 961	84 940	298 000	-
Canola	72 165	108 501	113 001	44 100	79 000	-3,98
<b>Total</b>	<b>658 985</b>	<b>2 180 312</b>	<b>2 152 462</b>	<b>640 240</b>	<b>2 247 000</b>	<b>+1,29</b>

Source: Oct 2013 CEC



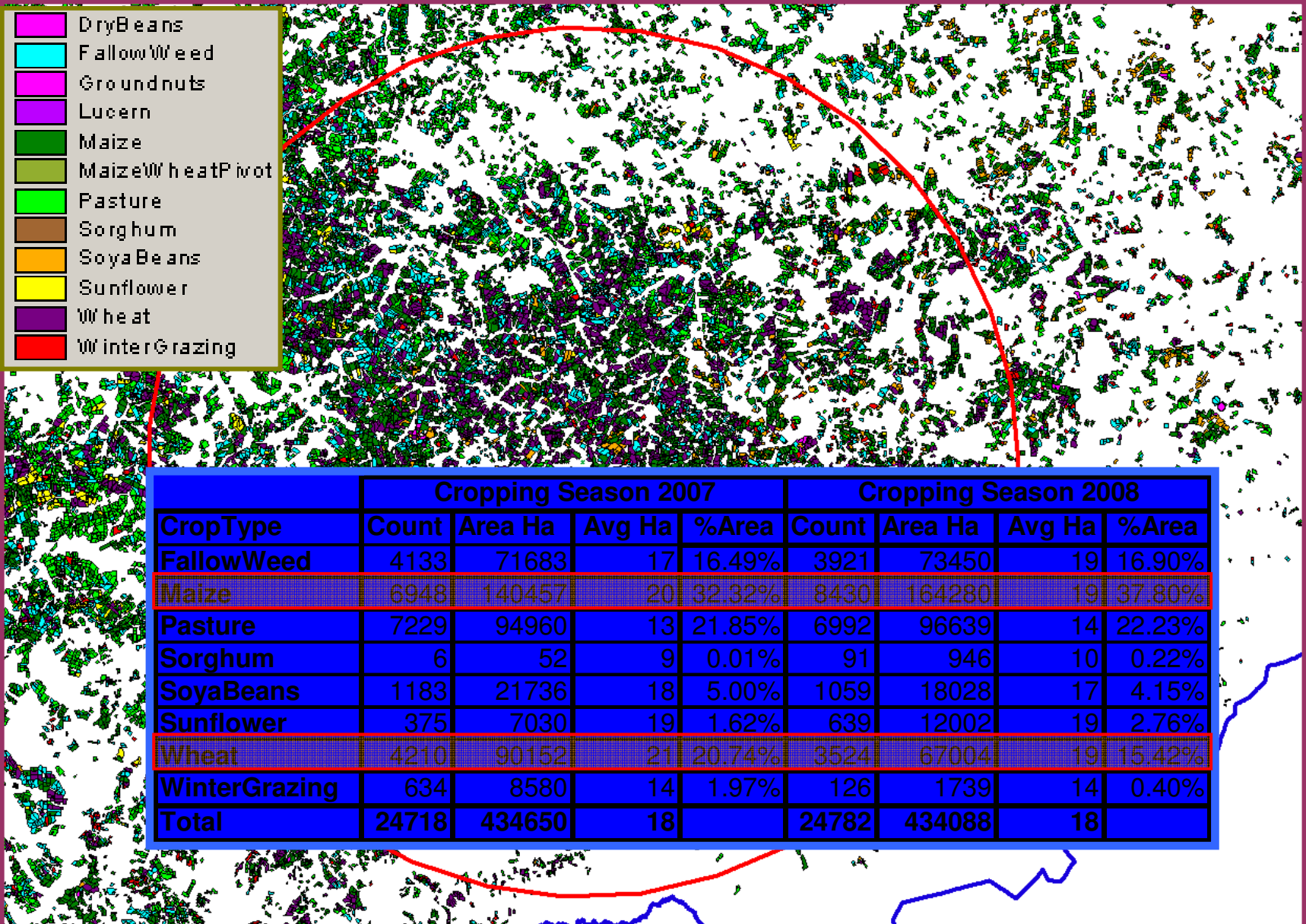
# Western Freestate



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%
<b>Total</b>	<b>17078</b>	<b>589504</b>	<b>35</b>		<b>17216</b>	<b>594509</b>	<b>35</b>	



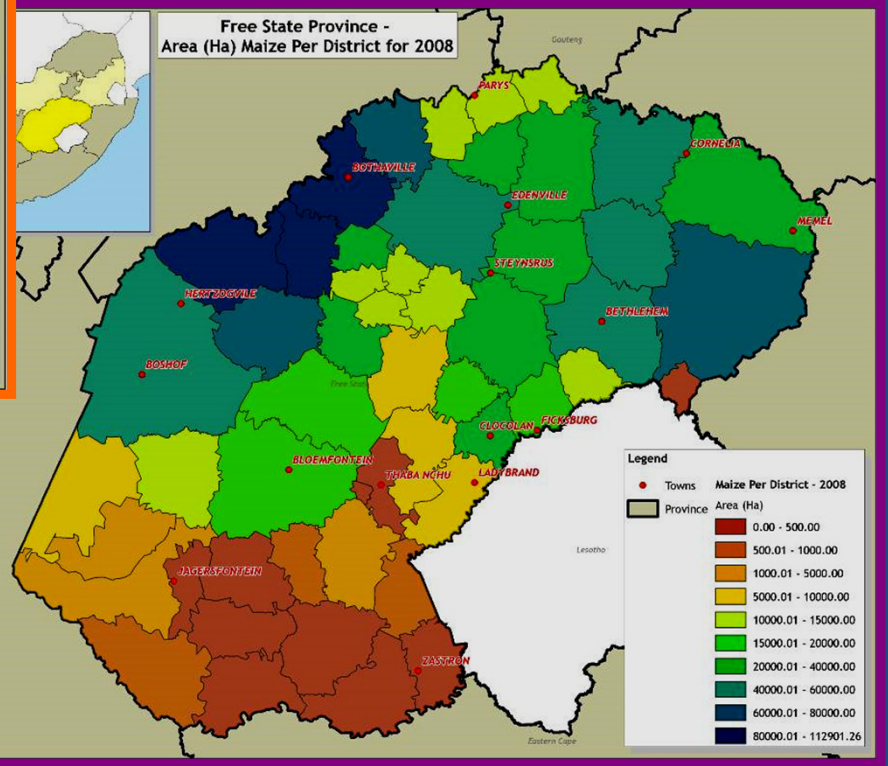
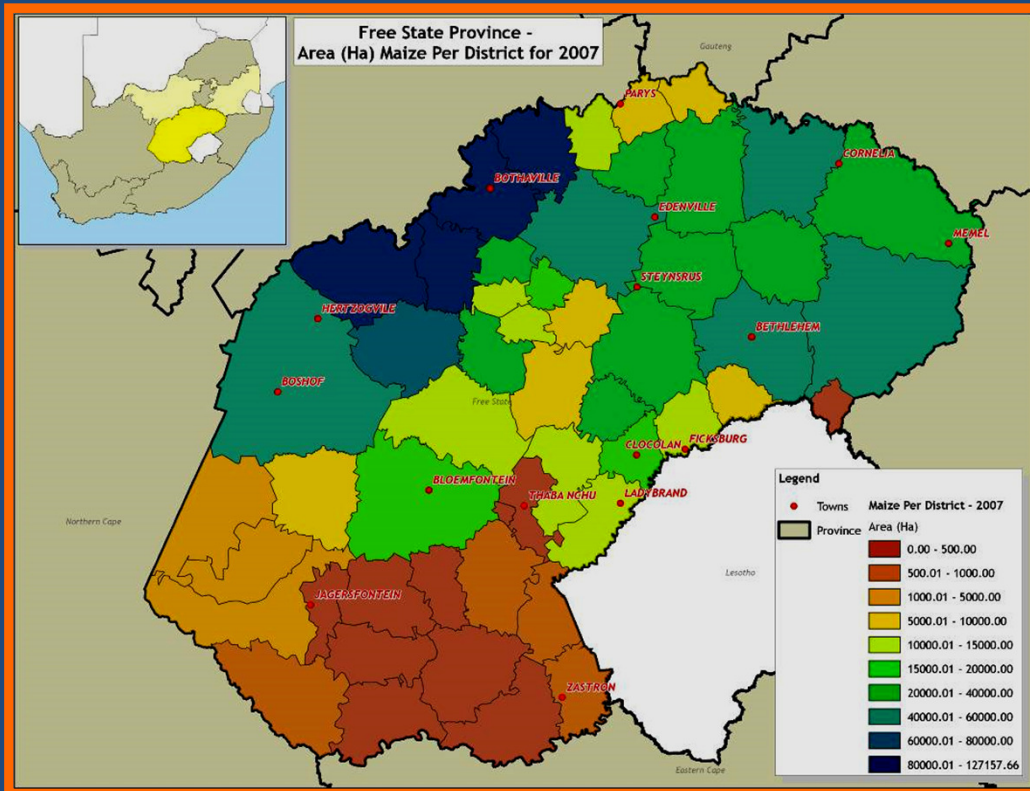
# Eastern Freestate



# Maize Comparison: 2007 vs 2008

## Spatial Distribution

- Cultivated area
- Crop type classification



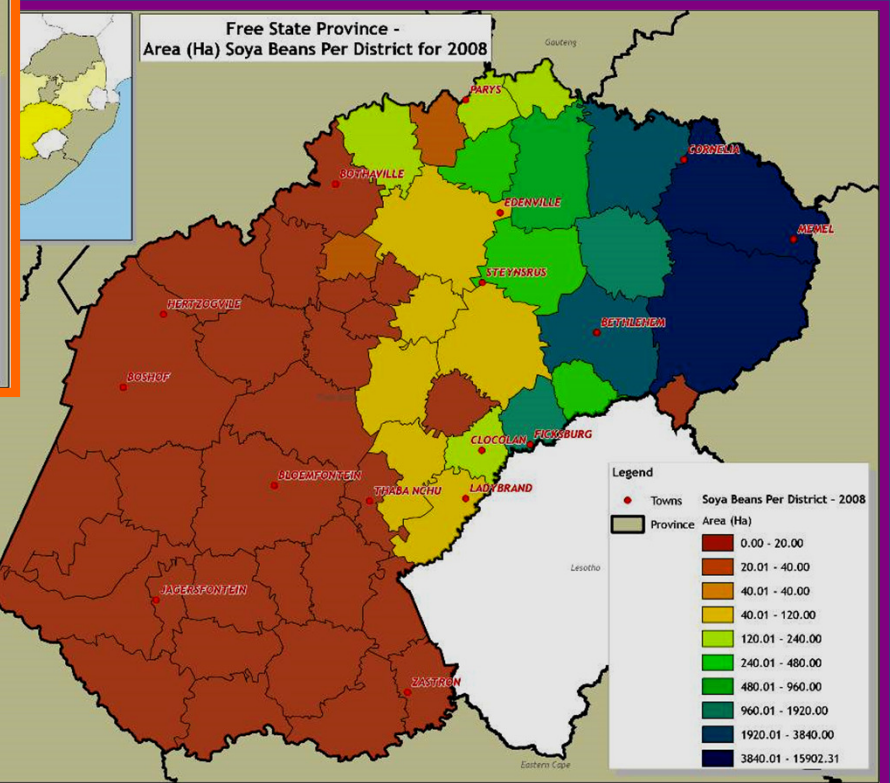
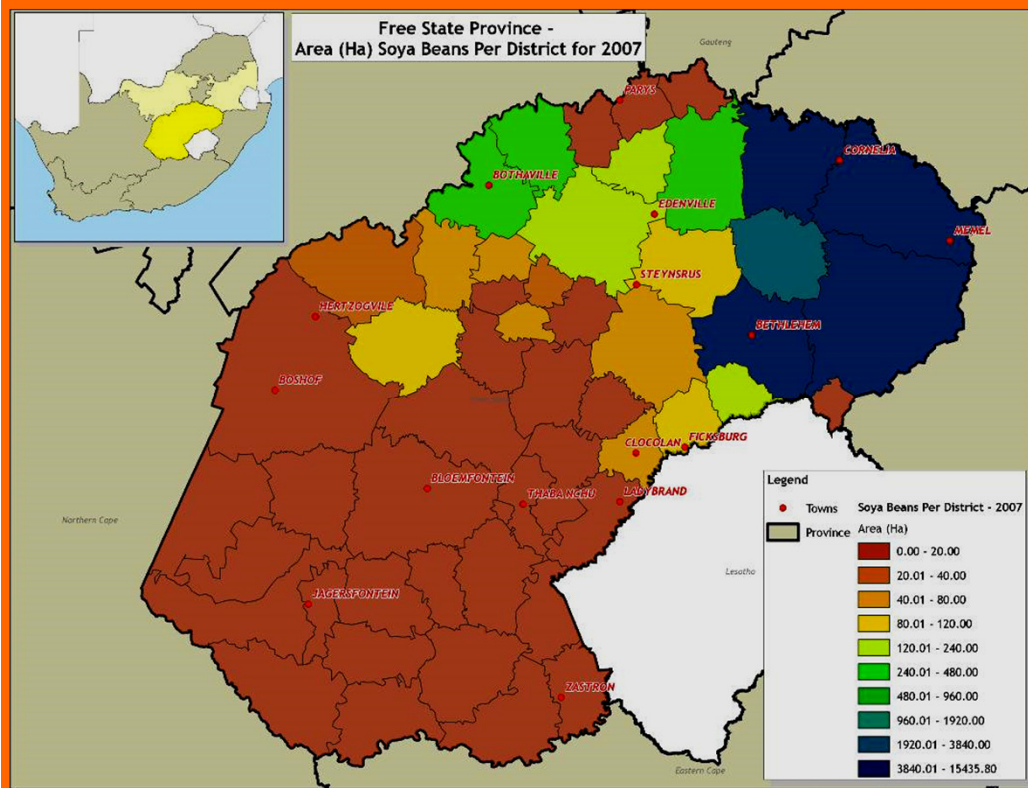
District level comparison:

✓ Maize area / district

# SoyaBean Comparison: 2007 vs 2008

## Spatial Distribution

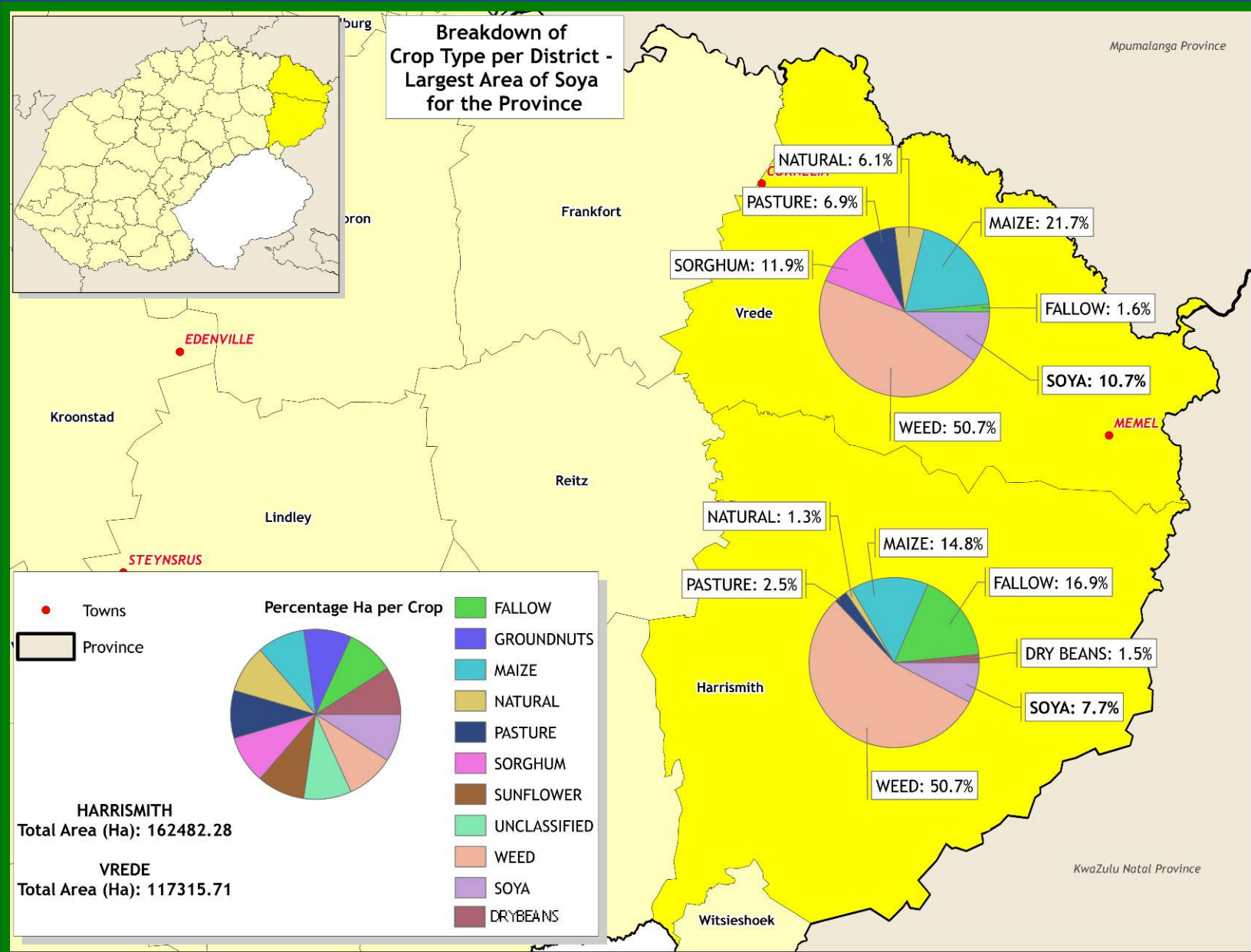
- Cultivated area
- Crop type classification



## District level comparison:

✓ Soya area / district

# District Breakdown

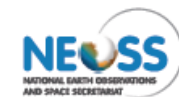


# CONDITION



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11<sup>th</sup> Edition

**Image of the month**

Delayed start to the summer rainfall



some of which became severe – providing for the outbreak of severe weather over the western parts, with conditions favourable for severe weather. In the image, the western half of the cloud cluster over the southern parts of the country also contributed to precipitation and severe weather. Above-normal rainfall occurred over most of the upper rainfall pressure systems moving out of the dry over the central and western parts of the land. October is a month with relatively few events over the eastern and northeastern parts of the country. In the image, the vegetation response is, month-to-month, in the

Questions/Comments: [John@arc.agric.za](mailto:John@arc.agric.za)

## 4. Water Balance

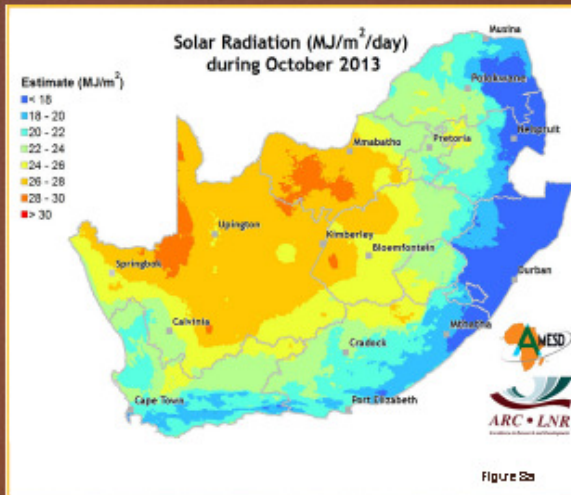


Figure 8a

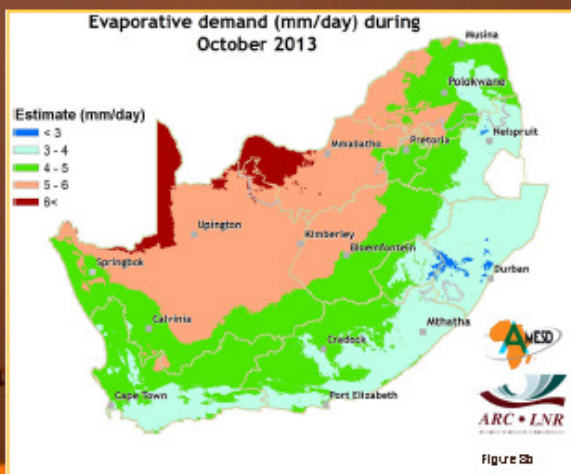


Figure 8b

ISSUE 2013-11

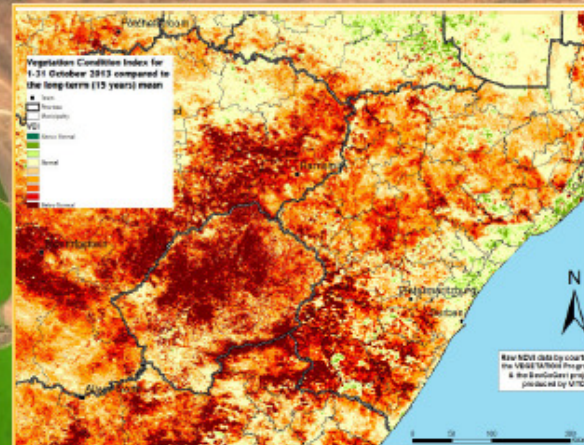


Figure 15

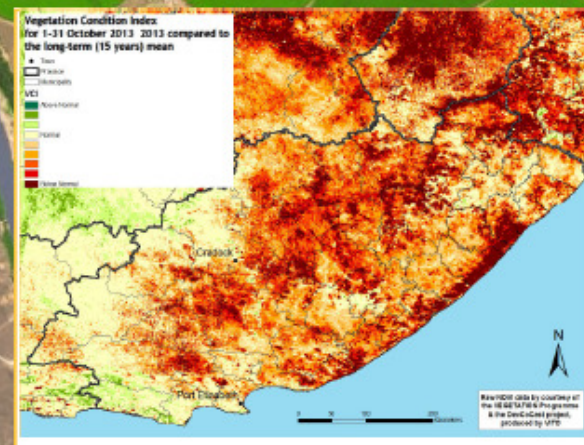


Figure 16

Figure 15: The VCI map for October 2013 indicates below-normal vegetation activity over most parts of the KwaZulu-Natal.

Figure 16: The VCI map for October 2013 indicates below-normal vegetation activity over most parts of the Eastern Cape.

Questions/Comments: [Wendie@wageningen.org](mailto:Wendie@wageningen.org)

Active fire pixels detected from 1 January to 31 October 2013

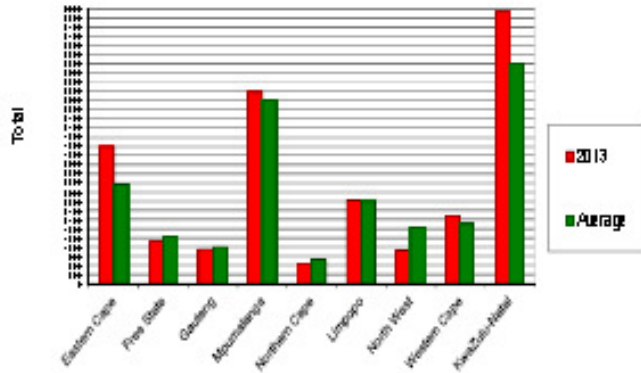


Figure 30

Figure 30: The graph shows the total number of active fires detected between 1 January and 31 October 2013 per province. Fire activity was higher in the Eastern Cape, Mpumalanga, Limpopo, Western Cape and KwaZulu-Natal compared to the average for the same period for the last 12 years.

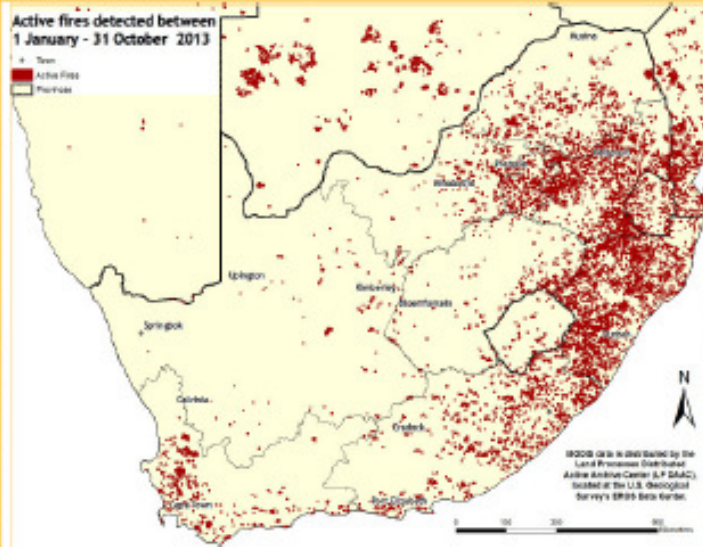


Figure 31

Figure 31: The map shows the location of active fires detected between 1 January and 31 October 2013.

Question or Comment to: [AWembele@sa.gov.za](mailto:AWembele@sa.gov.za)

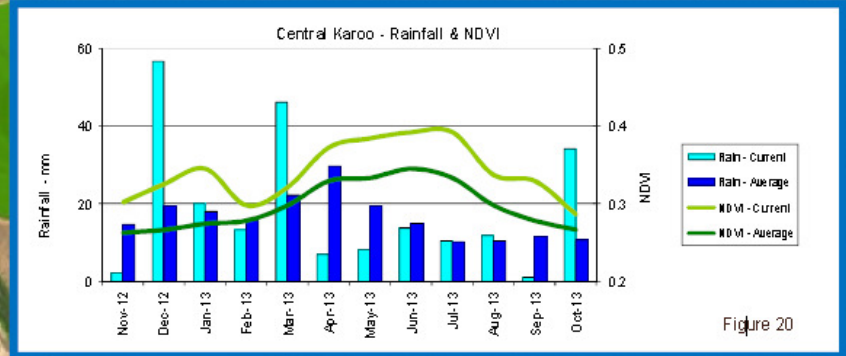


Figure 20

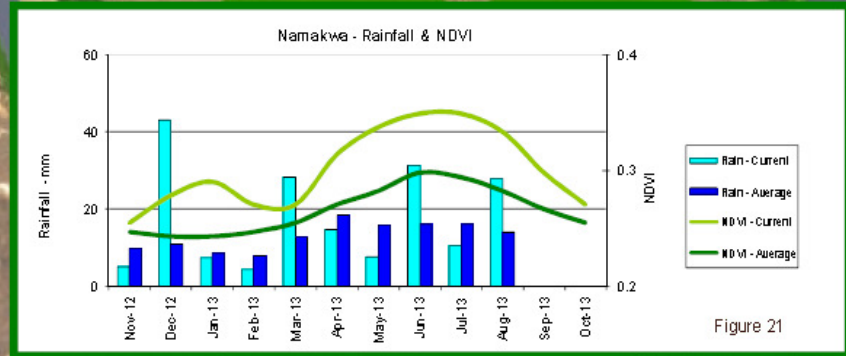


Figure 21

# Wheat yield points 2013

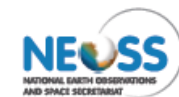


Province	Target	Enterprises selected	Points selected
Western Cape	300	196	330
Free State	300	79	330
Northern Cape	120	35	140



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# Wheat 2013



Reason	Enterprises	Points
No wheat	1	1
Refusal	5	12
Not reached	1	3
<b>Total</b>	<b>7</b>	<b>16</b>
<b>Sampled</b>	<b>189</b>	<b>314</b>

# Wheat 2013



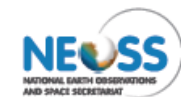
System	Yield (ton/ha)
Dryland (311 points)	2.851
Irrigation (3 points)	7.056
<b>Average</b>	<b>2.897</b>

# CONSTRAINTS & CONCLUSIONS



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# CONSTRAINTS



- Capacity (Yield modelling with EO)
- Appreciation (by snr. Decision makers)
- Infrastructure (Band width, Data-Imagery)
- Resourced research agenda (System development & continual improvement)
- Especially to small fields

# CONCLUSION



- Imported and adapted to local needs
- Can adapt & export (eg to SADC)
- Data plentiful – needs analysis
- “Working on data” programme (Crowd source)
- Improve JECAM data (resources)
- SADC / Africa GEOGLAM (AfriGEOSS)
- Other Initiatives coordinate in GEO
- EO SAT 1- Mission Vegetation

# National AMESD training workshop 2010



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# OPTIMAL MAIZE PLANTING DATES

**WESTELIKE STREEK /  
WESTERN REGION**

**MATIGE OOSTELIKE STREEK /  
TEMPERATE EASTERN REGION**

**KOU OOSTELIKE STREEK /  
COLD EASTERN REGION**

15 Nov – 25 Dec

1 Oct – 15 Nov

30 Nov – 7 Jan

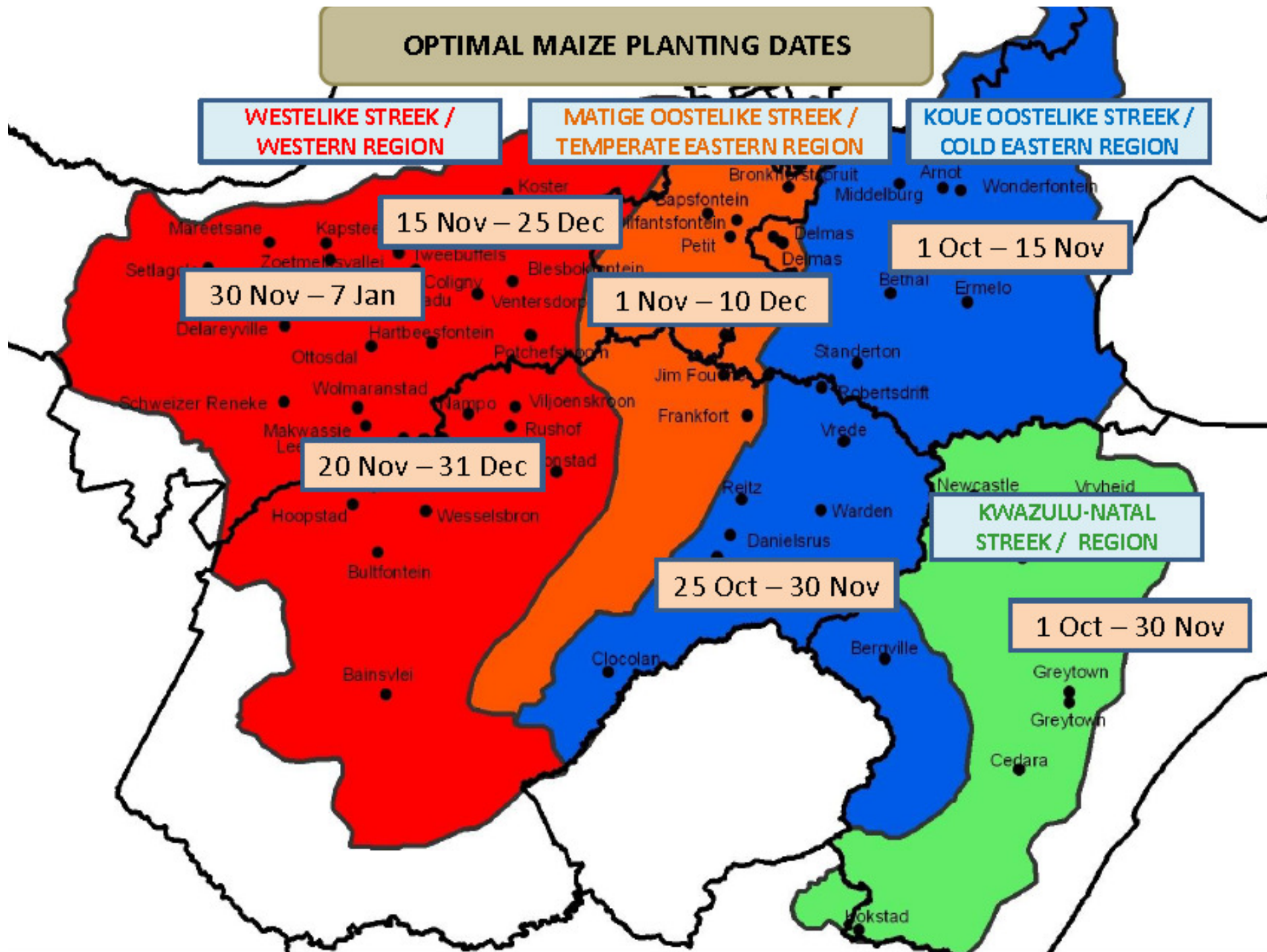
1 Nov – 10 Dec

20 Nov – 31 Dec

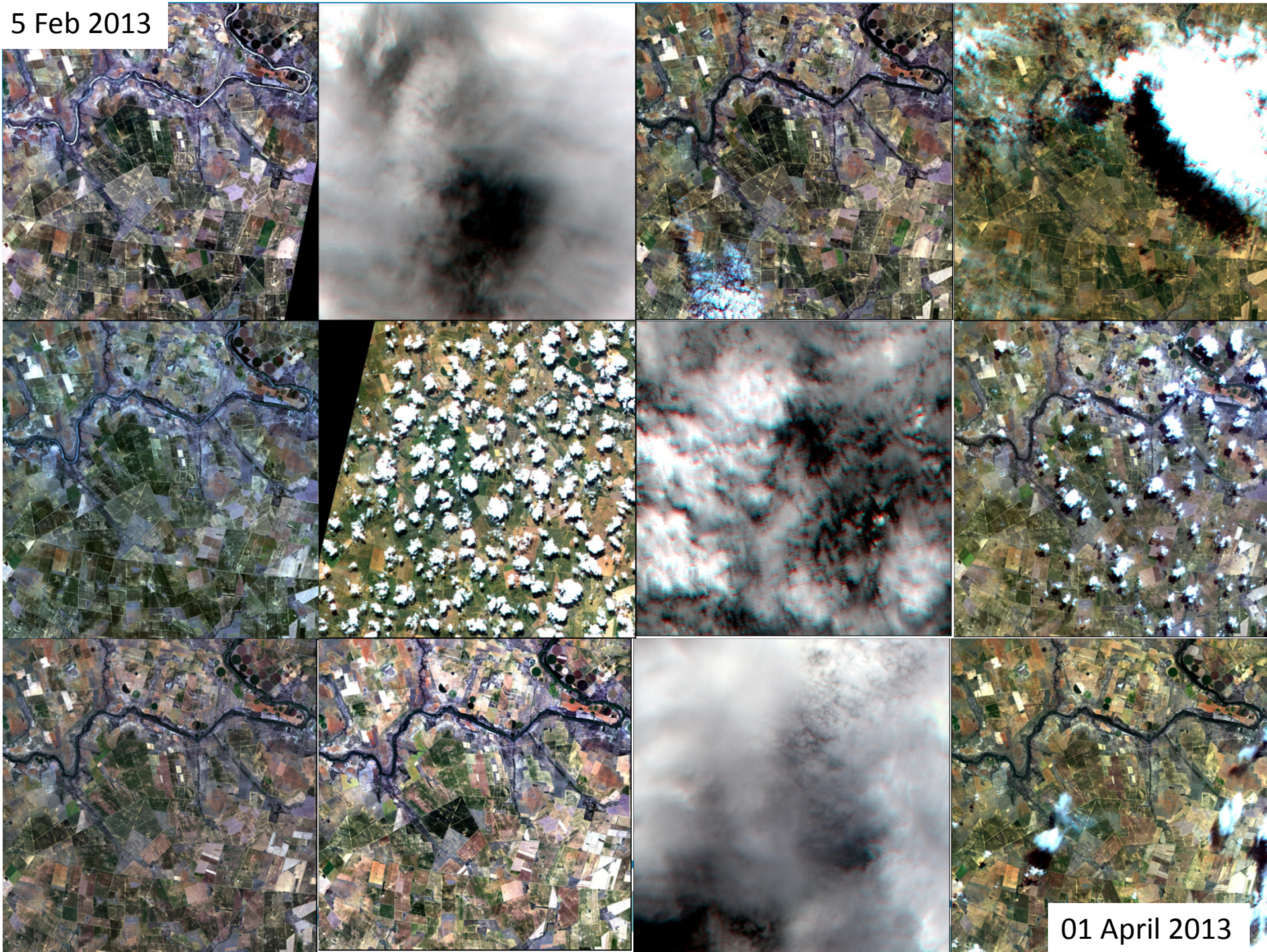
25 Oct – 30 Nov

**KWAZULU-NATAL  
STREEK / REGION**

1 Oct – 30 Nov



5 Feb 2013



01 April 2013



01 Apr 2013



22 Mar 2013



# ACKNOWLEDGEMENTS

