

# AGBIZ Symposium

## Agricultural Information from Satellite Imagery

Fanie Ferreira  
Jens Hiestermann  
2017-08-15



**GEOTERRA**  
IMAGE

*Unleashing the power of imagery, improving your business intelligence*

# Content

- Introduction
- RSA Field Boundaries
- Crop Types
- Harvest Progress
- GEOFARMER

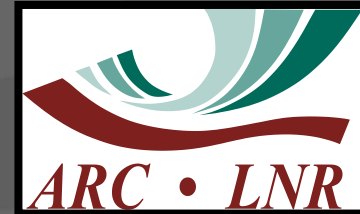
# GeoTerraImage (Pty) Ltd

- Established in 1999
- Based in Grain Building, Pretoria
- Over 200 years of experience: Earth Observation
- Value added services & products
  - TeleComs: information for planning RF/3G/4G....
  - Urban Land Use: Demographic
  - LandCover: Natural Resources
  - Agriculture: Crop Estimates



# DAFF: Crop Estimates Committee (CEC)

- National Crop Statistics Consortium (NCSC)
- Agricultural Research Council
  - Institute Soil Climate & Water:
    - Climatic conditions & Yield EO Research
  - Grain Institutes: objective yield measurements
- SiQ
  - PICES aerial surveys & interviews
  - Statistical processing
- GeoTerraImage
  - Satellite image processing
  - Crop type classifications



# Satellite Technology

## Recording Sun Reflectance



Canopy absorbs & reflects light



Reflectance intensity based on different types of vegetation

Satellite sensor measures canopy reflectance



Ground Receiving Station

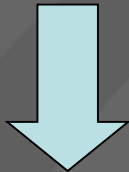
Processing and preparation for field boundaries and crop type analysis



# Use of satellite imagery

## Range of sensors

SPOT 5 / SPOT 6 & 7



Previous seasons  
2006/7/8/9/10/11/12/13/14/15/16

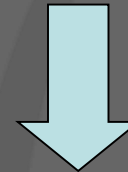


Stratification: Update of Field  
crop boundaries

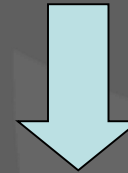


PICES Survey @ provincial level  
to determine cropped area

LANDSAT 8 & Sentinel 2A / (2B)



Winter 2016 / Summer 2017



Satellite image calibration to  
identify crop types



Satellite image classification to  
generate crop types





# SA coverage: 14 million ha

## Digitised Field Crop Boundaries



		Area of Cultivated Fields per Province (Hectare) excl Sugar Cane				
Province	Province SqKm	Total FB	Dryland	Pivot	Orchards	Subsistence
Eastern Cape	168 948	1 619 559	512 649	22 627	3 951	1 080 332
Free State	129 771	3 813 118	3 635 161	147 270	1 853	28 834
Gauteng	18 170	376 690	349 003	22 194	2 354	3 139
KwaZulu-Natal	94 417	930 505	311 460	55 392	26 076	537 577
Limpopo	125 873	1 410 226	578 253	141 324	72 489	618 160
Mpumalanga	76 588	1 340 167	1 161 398	44 048	42 103	92 617
Northern Cape	372 950	266 390	169 347	86 220	7 178	3 645
North West	104 898	2 230 766	1 886 160	76 621	4 452	263 532
Western Cape	129 441	2 027 565	1 725 131	64 848	235 586	2 000
<b>Total</b>	<b>1 221 056</b>	<b>14 014 985</b>	<b>10 328 562</b>	<b>660 544</b>	<b>396 044</b>	<b>2 629 835</b>



# Mapped Fields



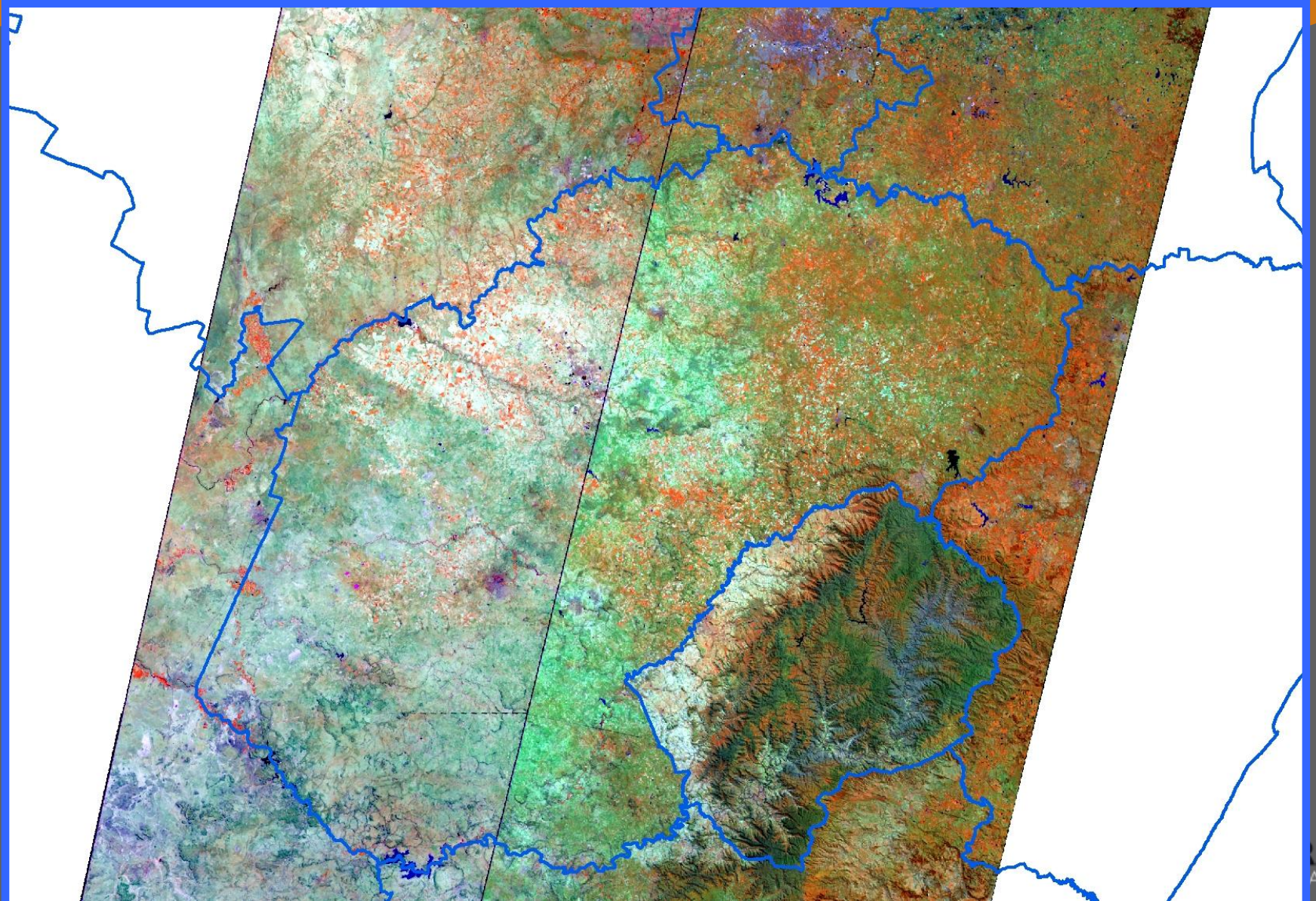


# Crop Type Identification

- **Methodology**
  - Source: Satellite Imagery
  - Imagery Calibration: PICES Survey
  - Crop Calendar
- **Results & Output**
  - Provincial Crop Type
  - District Summaries for Each Crop Type



# Satellites: Landsat 8 & Sentinel 2



# District Level Report

## Crop Type Area (Ha)

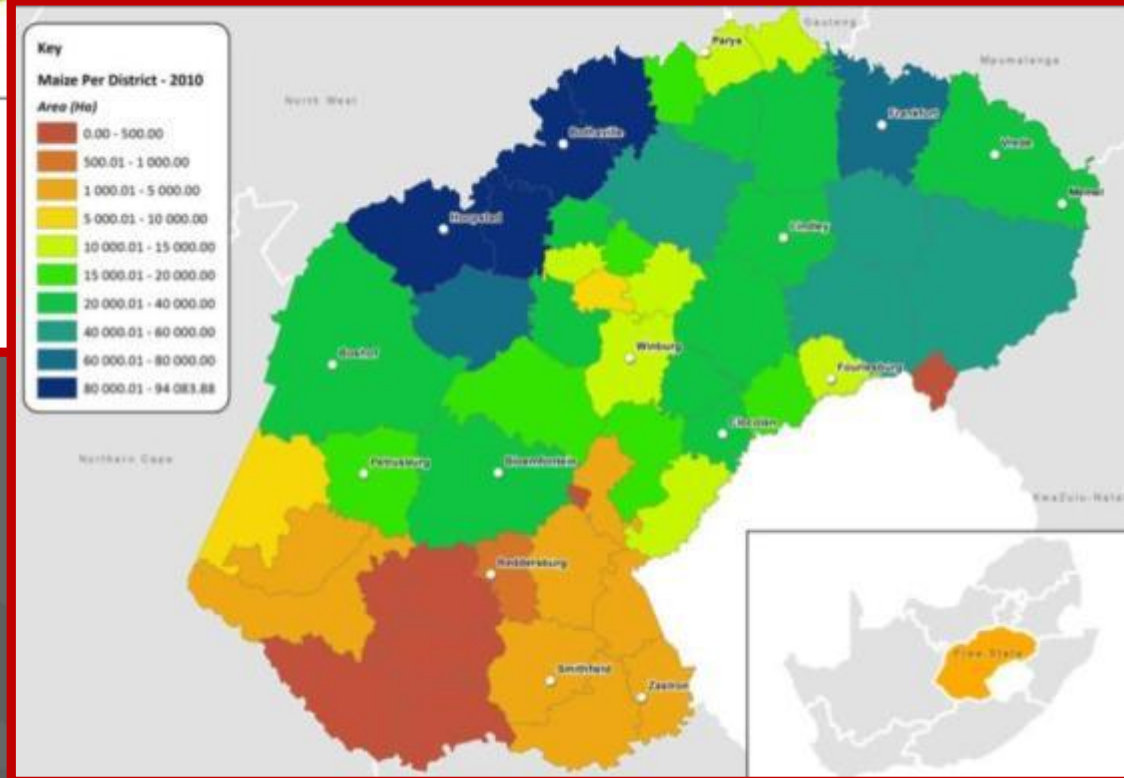
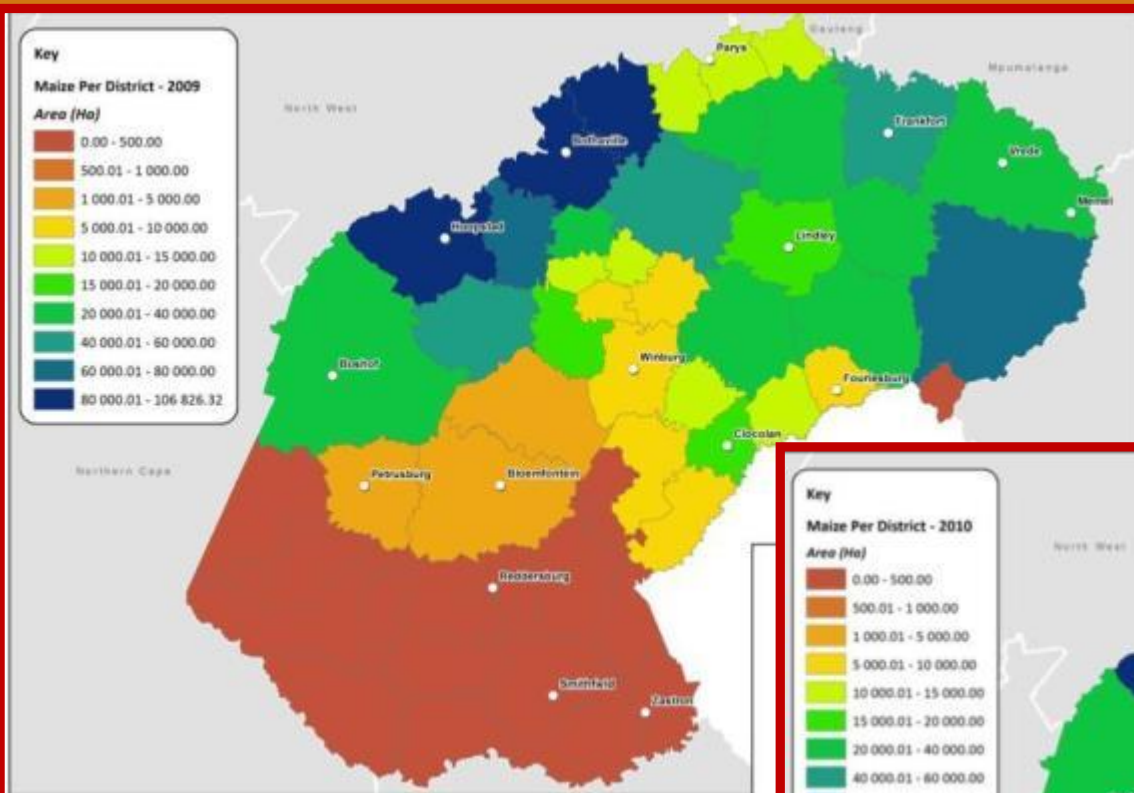
North West District CropType Breakdown Winter 2012 / Summer 2013: Area Planted (Hectares)

District	Maize	Pasture	SoyaBeans	Sunflower	Wheat	WheatMaize	WheatSoya	Fallow	Lucern	Total
BAFOKENG	1 679	1 102	0	0	0	0	0	0	0	2 781
BLOEMHOF	2 503	21 052	63	1 977	46	281	44	1 265	7	27 238
BRITS	14 174	13 428	2 808	2 142	263	3 621	2 502	14	145	39 097
CHRISTIANA	3 170	17 654	0	881	0	1 103	114	419	3	23 345
COLOGNY	52 883	20 305	632	4 161	0	113	144	479	0	78 718
DELAREYVILLE	86 292	71 185	616	43 734	0	581	73	7 065	0	209 546
DITSOBOTLA	20 912	20 987	4	8 144	0	0	0	4 098	0	54 145
GANYESA	80	284	0	0	0	0	0	911	0	1 275
KLERKSDORP	34 766	47 467	727	4 580	84	287	336	112	8	88 368
KOSTER	50 253	35 895	195	854	0	334	98	68	47	87 744
KUDUMANE	0	901	0	0	0	0	0	0	0	901
LEHURUTSHE	0	637	0	0	38	0	0	0	201	876
LICHTENBURG	157 575	74 745	1 577	28 771	267	2 900	922	4 378	75	271 211
MADIKWE	824	1 094	0	0	0	0	0	0	0	1 917
MANKWE	1 643	2 134	9	0	0	0	0	0	0	3 786
MARICO	6 646	44 123	163	227	175	987	285	1 038	236	53 880
MOLOPO	1 359	5 500	0	36	0	0	0	467	0	7 362
MORETELE	41	998	0	0	0	0	0	1 170	0	2 210
POTCHEFSTROOM	17 362	42 230	315	447	0	1 063	258	0	54	61 728
RUSTENBURG	10 502	13 688	121	20	53	96	111	5	35	24 631
SCHWEIZER-RENE	66 740	82 506	124	31 238	0	132	122	6 461	66	187 389
SWARTRUGGENS	2 769	10 813	82	5	0	161	31	58	49	13 969
TAUNG	1 631	662	63	60	1	1 792	119	6	0	4 333
VENTERSDORP	47 008	63 551	483	2 545	0	766	218	484	87	115 141
VRYBURG 1	70 491	284 559	841	47 138	1	816	325	45 533	249	449 954
WOLMARANSSTA	107 061	73 478	398	19 246	2	315	266	6 795	26	207 586
<b>Total</b>	<b>758 363</b>	<b>950 977</b>	<b>9 222</b>	<b>196 207</b>	<b>931</b>	<b>15 350</b>	<b>5 968</b>	<b>80 826</b>	<b>1 287</b>	<b>2 019 130</b>



# Maize Comparison: 2009 vs 2010

- Spatial Distribution
- Cultivated area
- Crop types

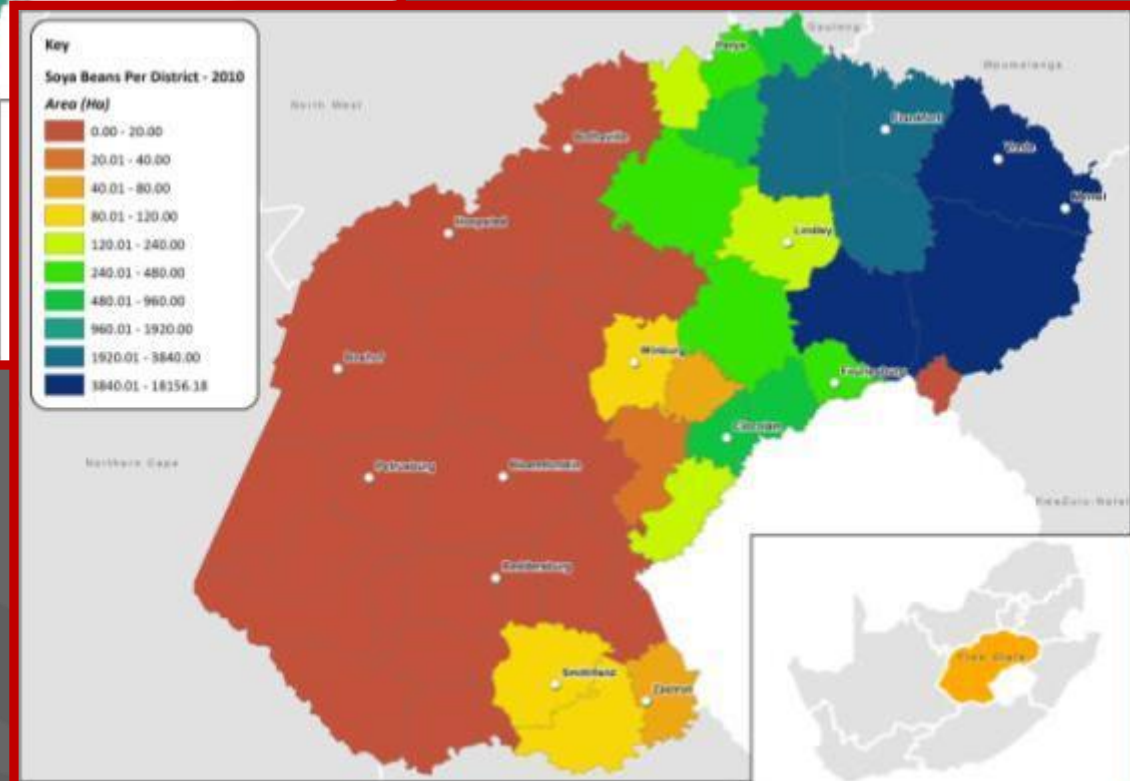
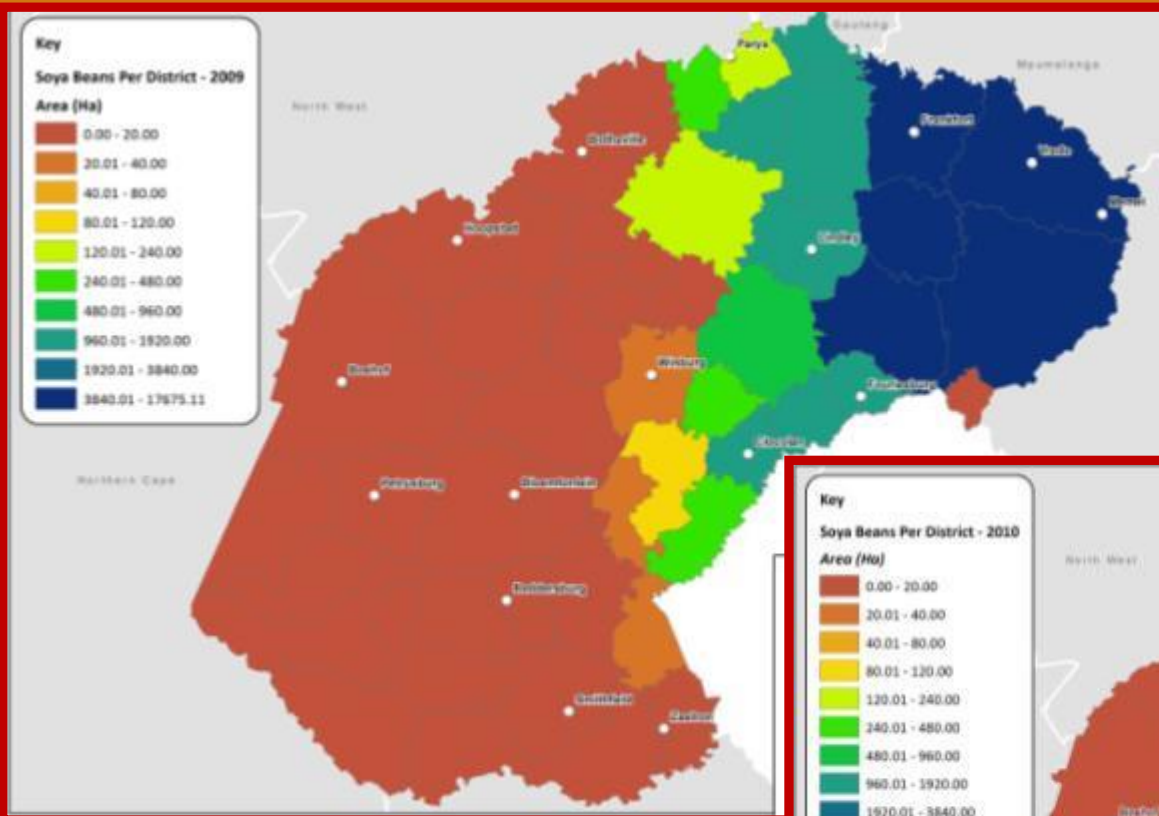


District level comparison:  
✓ Maize area / district



# SoyaBean Comparison: 2009 vs 2010

- Spatial Distribution
- Cultivated area
- Crop types



District level comparison:  
✓ Soya area / district

# Farm Management Practices

- **Double Cropping (Irrigation)**
  - Wheat-Maize
  - Wheat-Soya Beans
- **Crop Rotation**
  - Crop Frequency
  - Maize rotation with Soy Beans
- **Cultivation Practices**
  - Conservation Farming

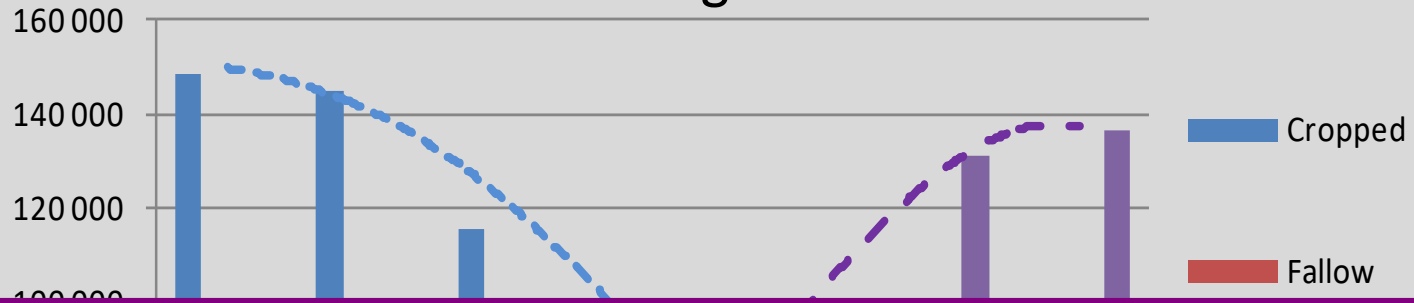


# Harvest Progress

- Harvesting: May - August
- Cultivated Fields change to Harvested
- Monthly summaries per District (or selected area)
- Example for Bothaville District

# Report: Area Harvested

## Bothaville Harvest Progress Winter 2014



	20-March-2014		05-April-2014		31-May-2014		16-June-2014		02-July-2014		03-August-2014	
CropType	Fields	AreaHa	Fields	AreaHa	Fields	AreaHa	Fields	AreaHa	Fields	AreaHa	Fields	AreaHa
Cropped	3934	148 717	3813	145 060	2919	115 074	2308	89 390	1640	58 307	860	17 475
Fallow	262	6 943	262	6 943	262	6 943	262	6 943	262	6 943	262	6 943
Pasture	1980	45 771	1980	45 771	1980	45 771	1980	45 771	1980	45 771	1980	45 771
Harvested	0	0	121	3 657	1015	33 644	1626	59 327	2294	90 411	3074	131 242
<b>Total Fields</b>	<b>6176</b>	<b>201 431</b>	<b>6176</b>	<b>201 431</b>	<b>6176</b>	<b>201 431</b>	<b>6176</b>	<b>201 431</b>	<b>6176</b>	<b>201 431</b>	<b>6176</b>	<b>201 431</b>

