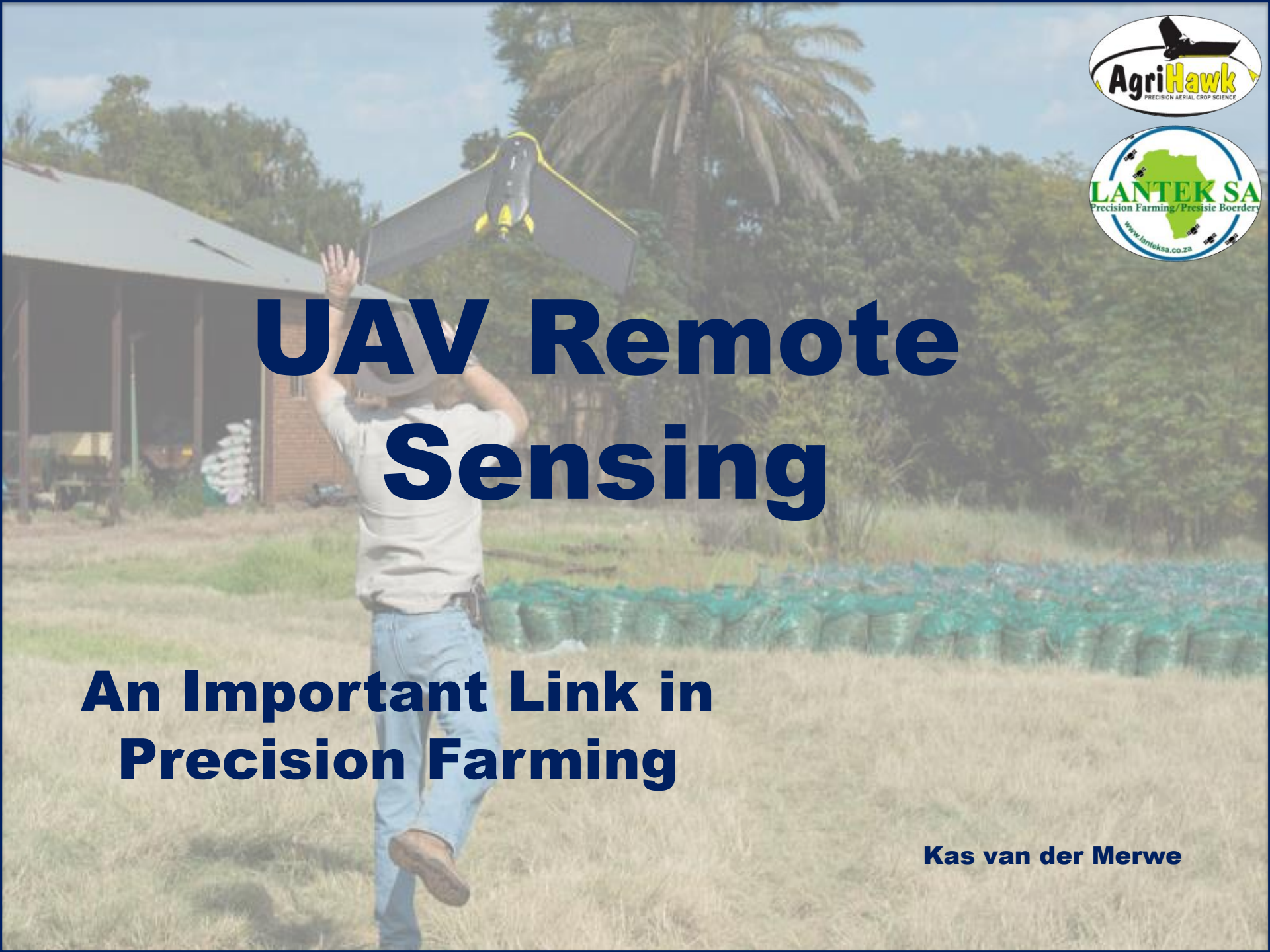
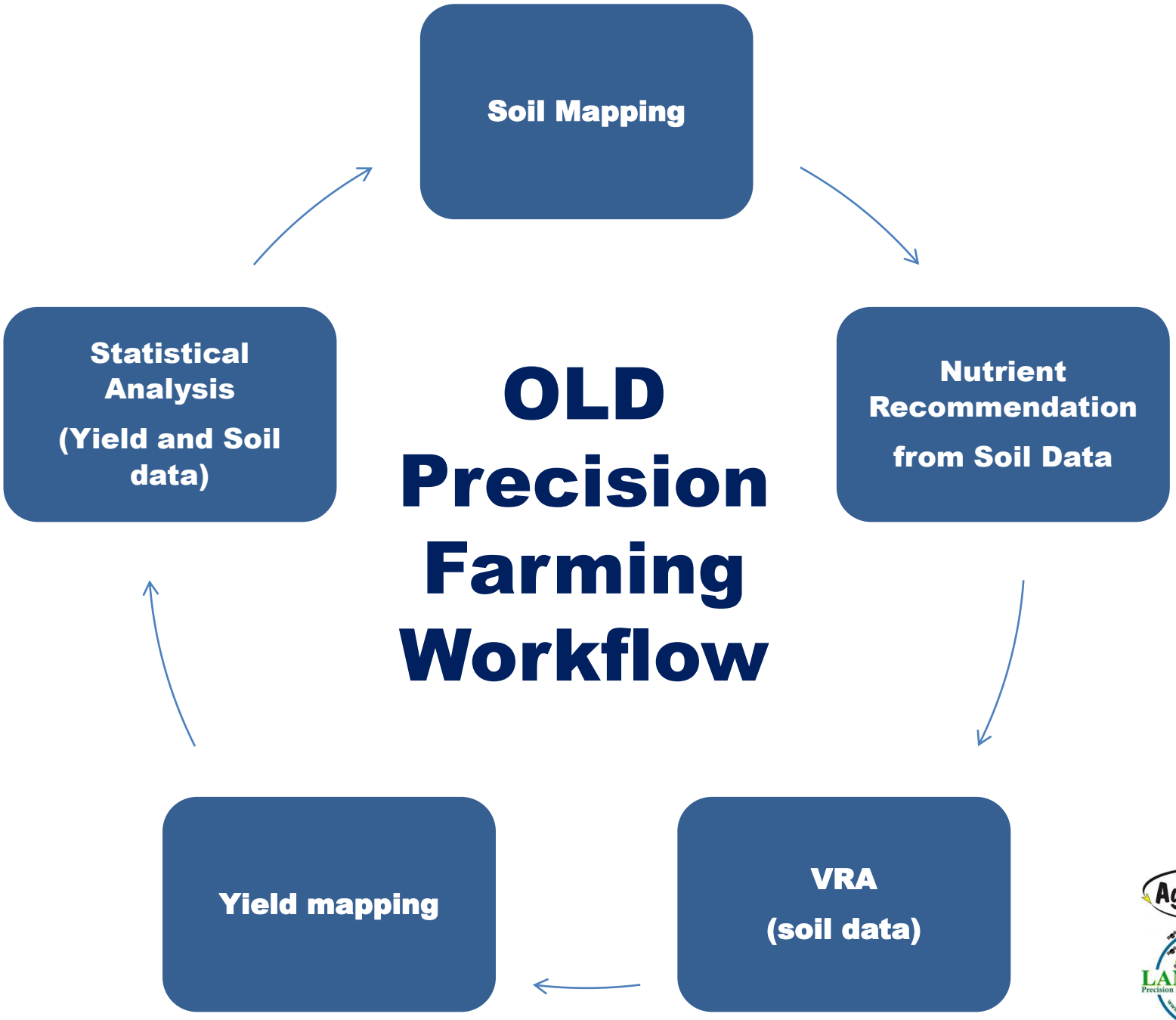


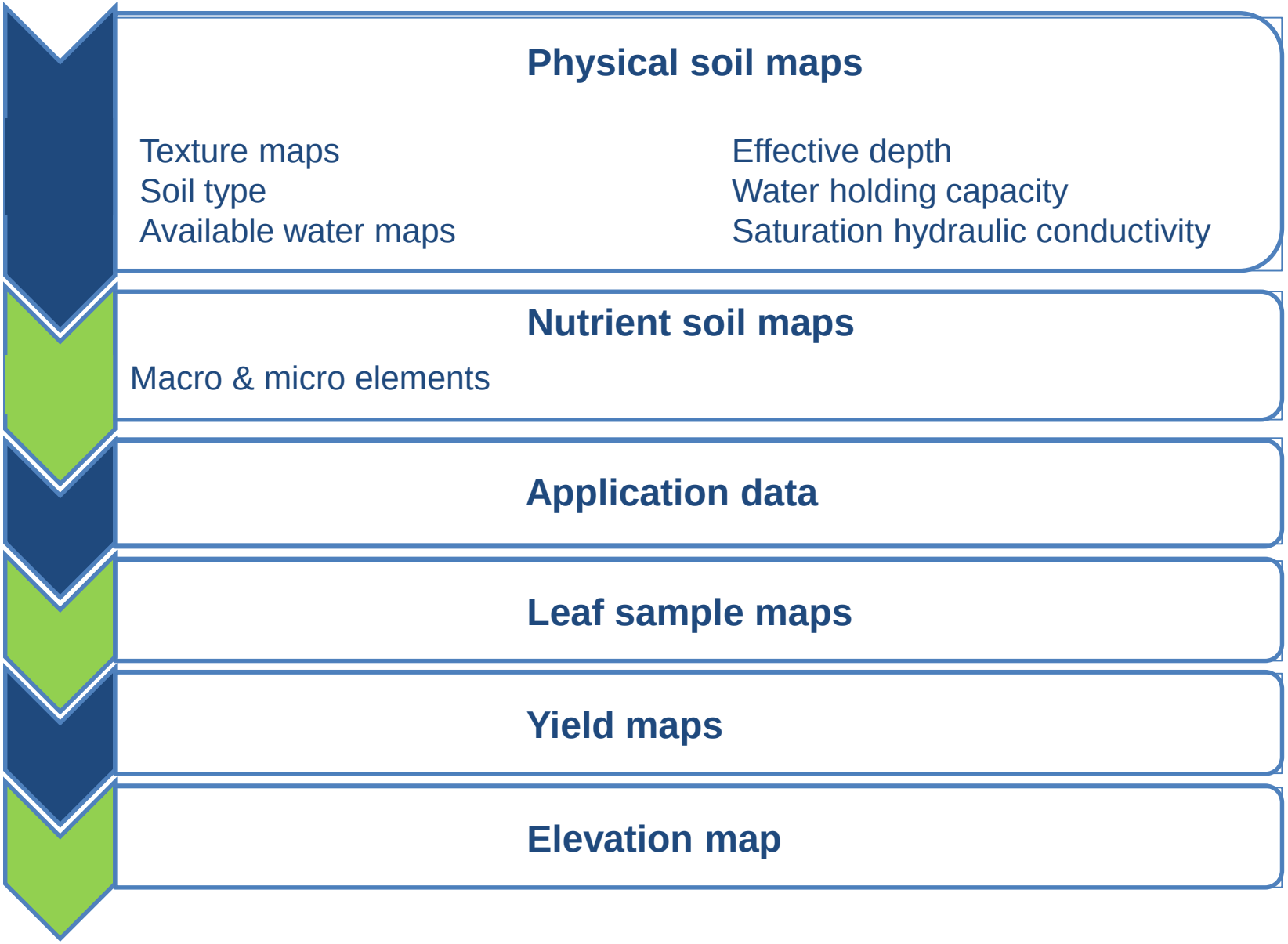
UAV Remote Sensing

An Important Link in Precision Farming

Kas van der Merwe

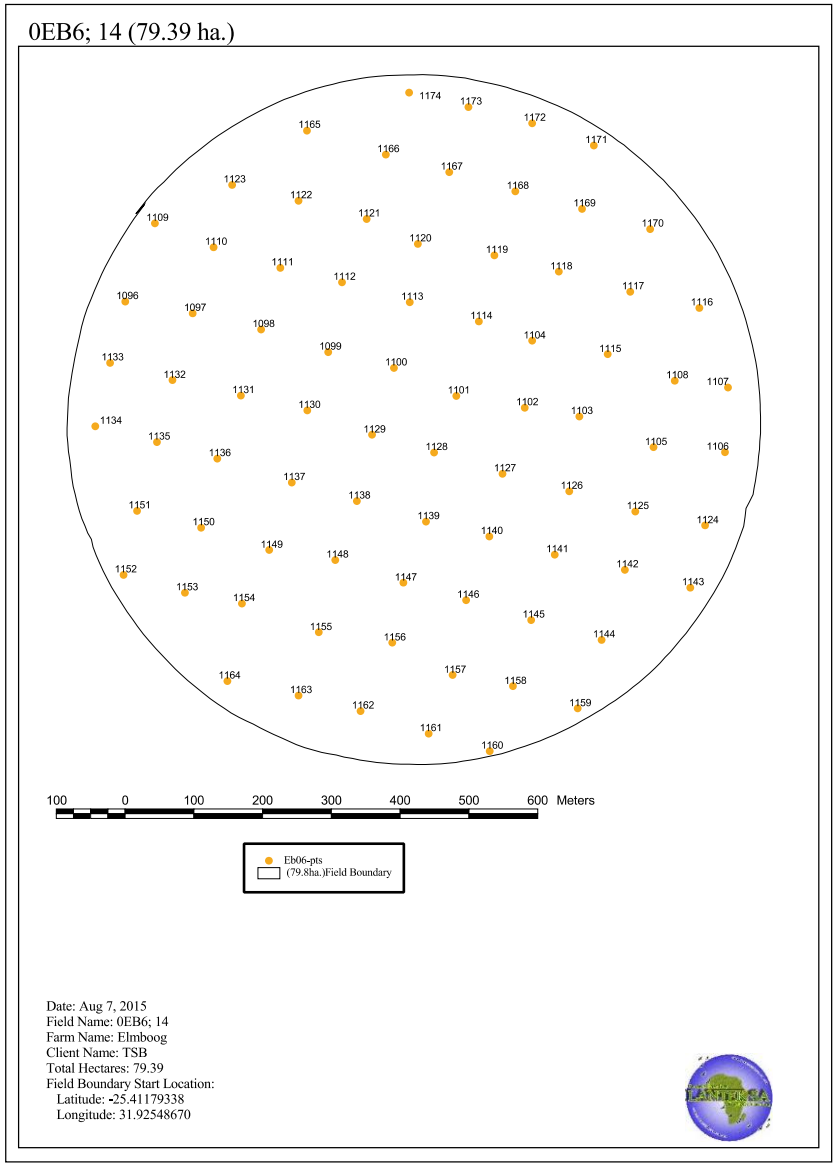

Soil Mapping
Nutrient Recommendation from Soil Data
VRA (soil data)
Yield mapping
Statistical Analysis (Yield and Soil data)
OLD Precision Farming Workflow

Precision Farming Data

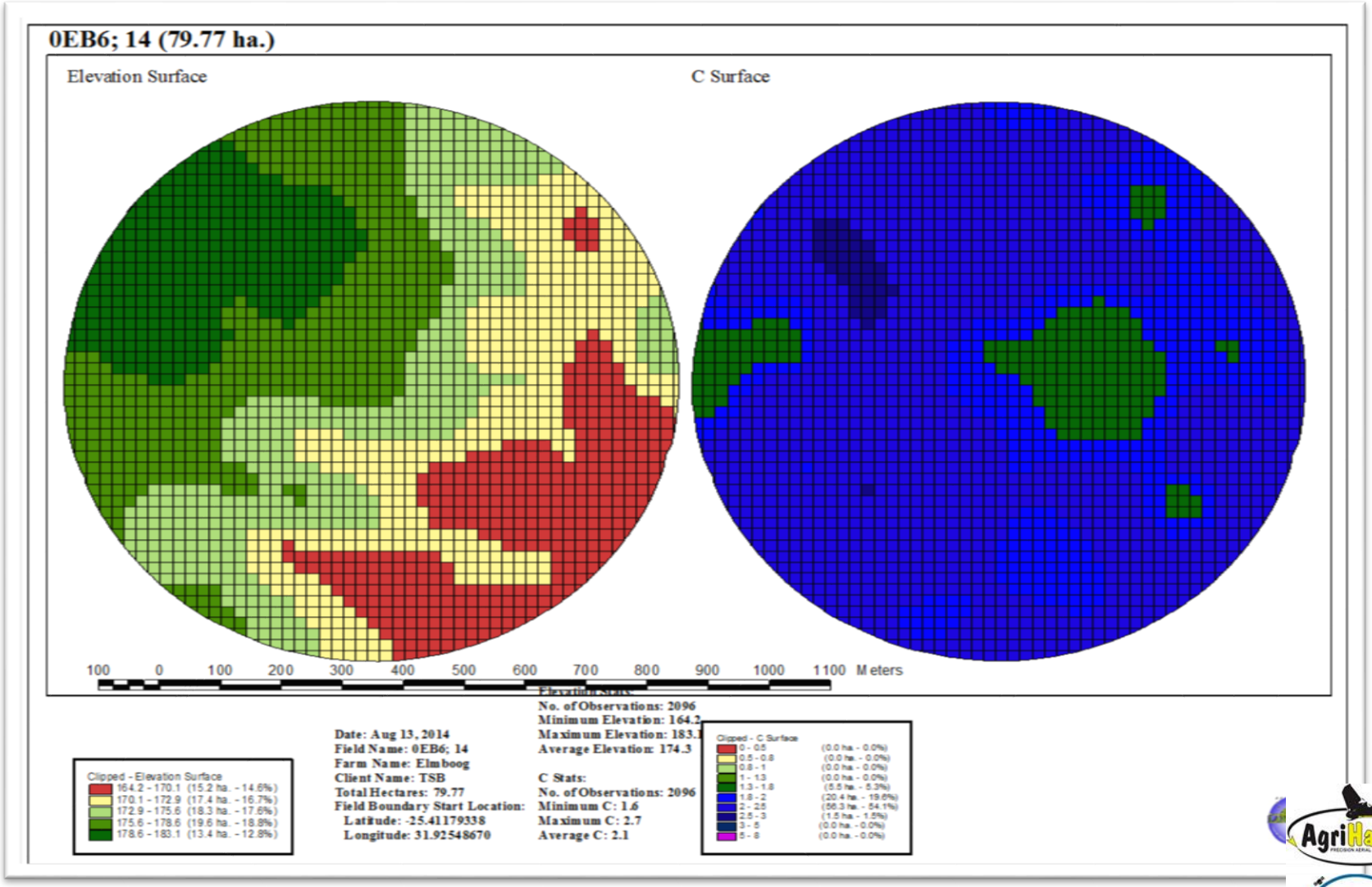


Soil Water Data Layers

Soil Test Points



Elevation - Carbon

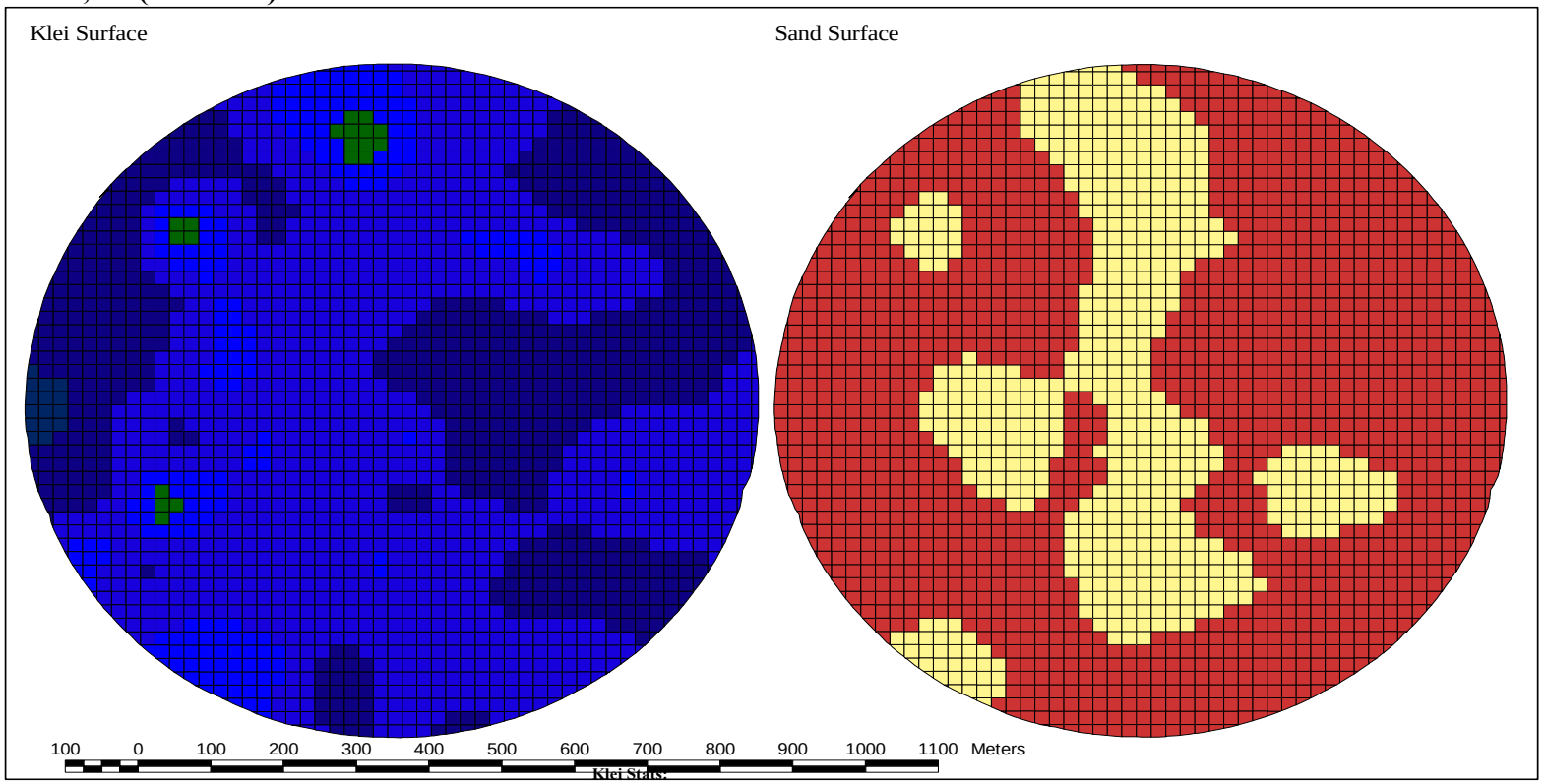


AgriHawk
PRECISION AERIAL CROP SCIENCE

LANTEK SA
Precision Farming/Pressie Boerdery

Clay - Sand

0EB6; 14 (79.77 ha.)



Clipped - Klei Surface

0 - 10	(0.0 ha. - 0.0%)
10 - 15	(0.0 ha. - 0.0%)
15 - 20	(0.0 ha. - 0.0%)
20 - 25	(0.0 ha. - 0.0%)
25 - 30	(0.7 ha. - 0.7%)
30 - 35	(8.6 ha. - 8.3%)
35 - 40	(46.0 ha. - 44.2%)
40 - 50	(27.8 ha. - 26.8%)
50 - 60	(0.6 ha. - 0.6%)

Date: Aug 13, 2014
Field Name: 0EB6; 14
Farm Name: Elmboog
Client Name: TSB
Total Hectares: 79.77
Field Boundary Start Location:
Latitude: -25.41179338
Longitude: 31.92548670

Klei Stats:
No. of Observations: 2096
Minimum Klei: 27
Maximum Klei: 53
Average Klei: 39

Sand Stats:
No. of Observations: 2096
Minimum Sand: 12
Maximum Sand: 25
Average Sand: 18

Clipped - Sand Surface

5 - 20	(60.5 ha. - 58.2%)
20 - 30	(23.3 ha. - 22.4%)
30 - 40	(0.0 ha. - 0.0%)
40 - 50	(0.0 ha. - 0.0%)
50 - 60	(0.0 ha. - 0.0%)
60 - 70	(0.0 ha. - 0.0%)
70 - 80	(0.0 ha. - 0.0%)

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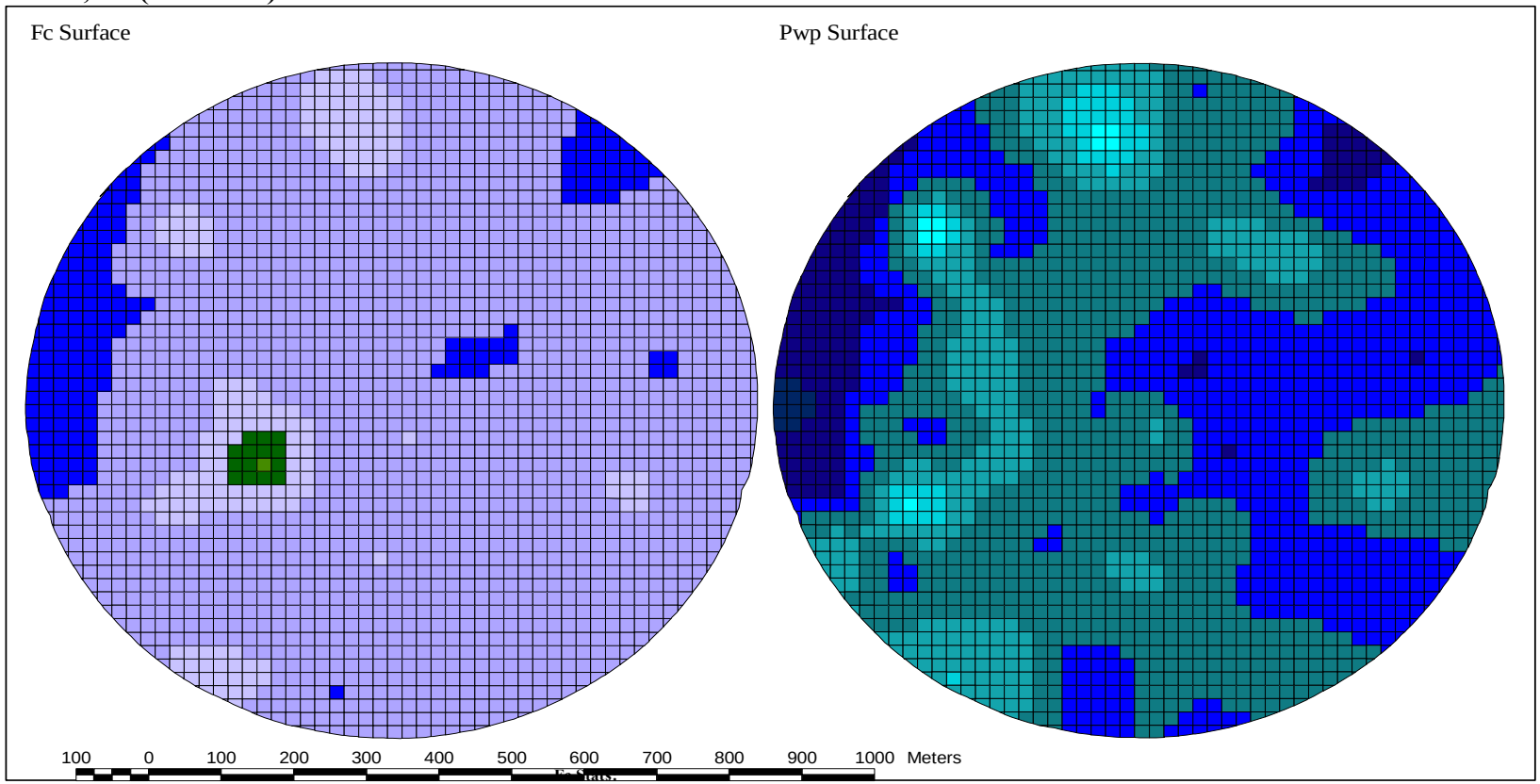
LANTEK SA Precision Farming/Pressie Boerdery

Field Capacity - PWP

0EB6; 14 (79.77 ha.)



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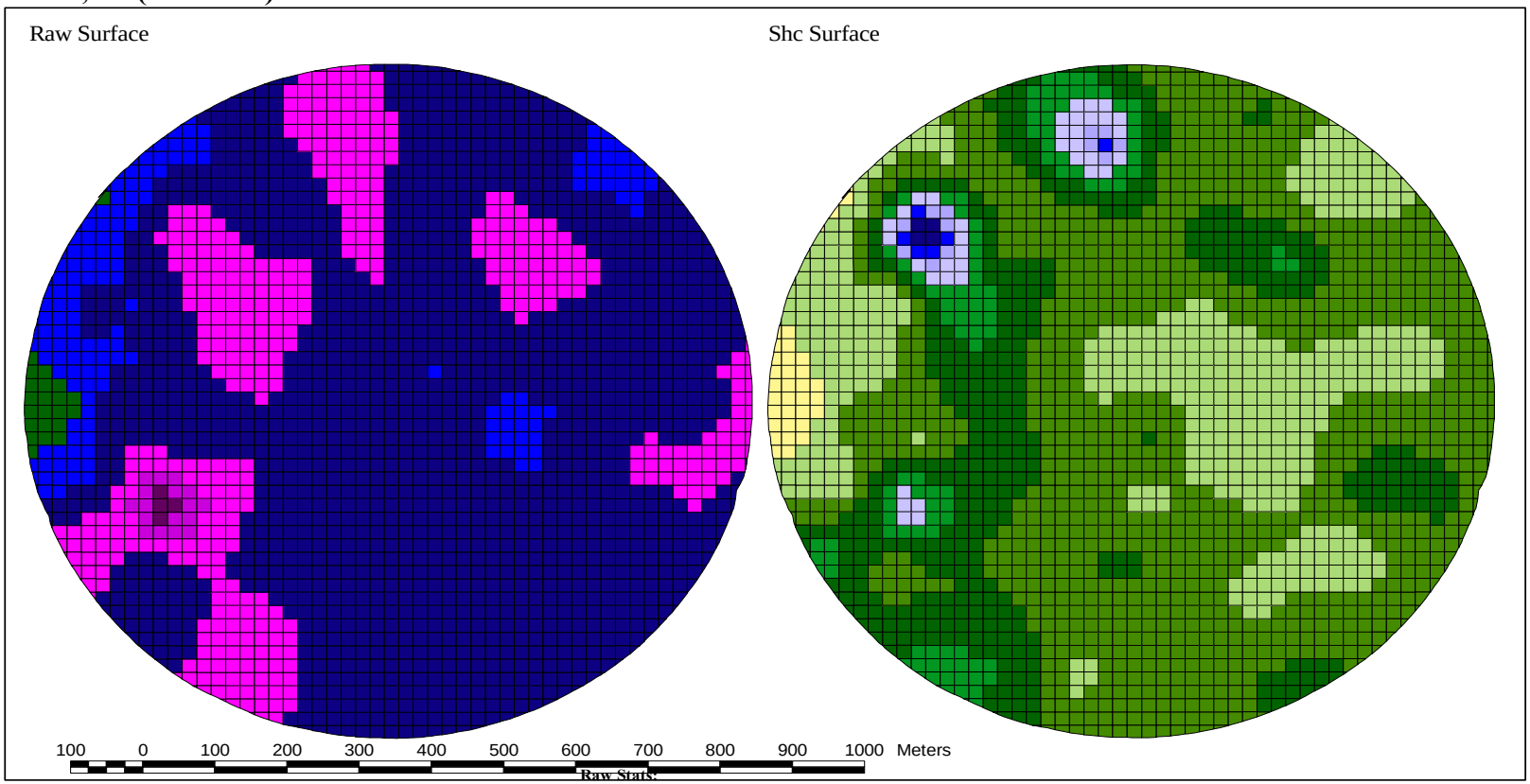
PRECISION AERIAL CROP SCIENCE

LANTEK SA
Precision Farming/Pressie Boerdery

RAW - SHC

0EB6; 14 (79.77 ha.)



Clipped - Raw Surface

40 - 45	(0.0 ha. - 0.0%)
45 - 50	(0.0 ha. - 0.0%)
50 - 55	(0.0 ha. - 0.0%)
55 - 60	(0.0 ha. - 0.0%)
60 - 65	(0.9 ha. - 0.9%)
65 - 70	(6.7 ha. - 6.4%)
70 - 75	(58.7 ha. - 56.4%)
75 - 80	(16.7 ha. - 16.0%)
80 - 85	(0.7 ha. - 0.7%)
85 - 90	(0.2 ha. - 0.2%)

Date: Aug 13, 2014
Field Name: 0EB6; 14
Farm Name: Elmboog
Client Name: TSB
Total Hectares: 79.77
Field Boundary Start Location:
Latitude: -25.41179338
Longitude: 31.92548670

Raw Stats:
No. of Observations: 2096
Minimum Raw: 61
Maximum Raw: 89
Average Raw: 73

Shc Stats:
No. of Observations: 2096
Minimum Shc: 1
Maximum Shc: 10
Average Shc: 4

Clipped - Shc Surface

0 - 1	(0.0 ha. - 0.0%)
1 - 2	(1.4 ha. - 1.3%)
2 - 3	(15.7 ha. - 15.1%)
3 - 4	(41.7 ha. - 40.1%)
4 - 5	(17.8 ha. - 17.1%)
5 - 6	(4.8 ha. - 4.7%)
6 - 7	(1.5 ha. - 1.4%)
7 - 8	(0.5 ha. - 0.5%)
8 - 9	(0.2 ha. - 0.2%)
9 - 10	(0.2 ha. - 0.2%)
10 - 15	(0.0 ha. - 0.0%)
15 - 20	(0.0 ha. - 0.0%)
20 - 30	(0.0 ha. - 0.0%)
30 - 50	(0.0 ha. - 0.0%)

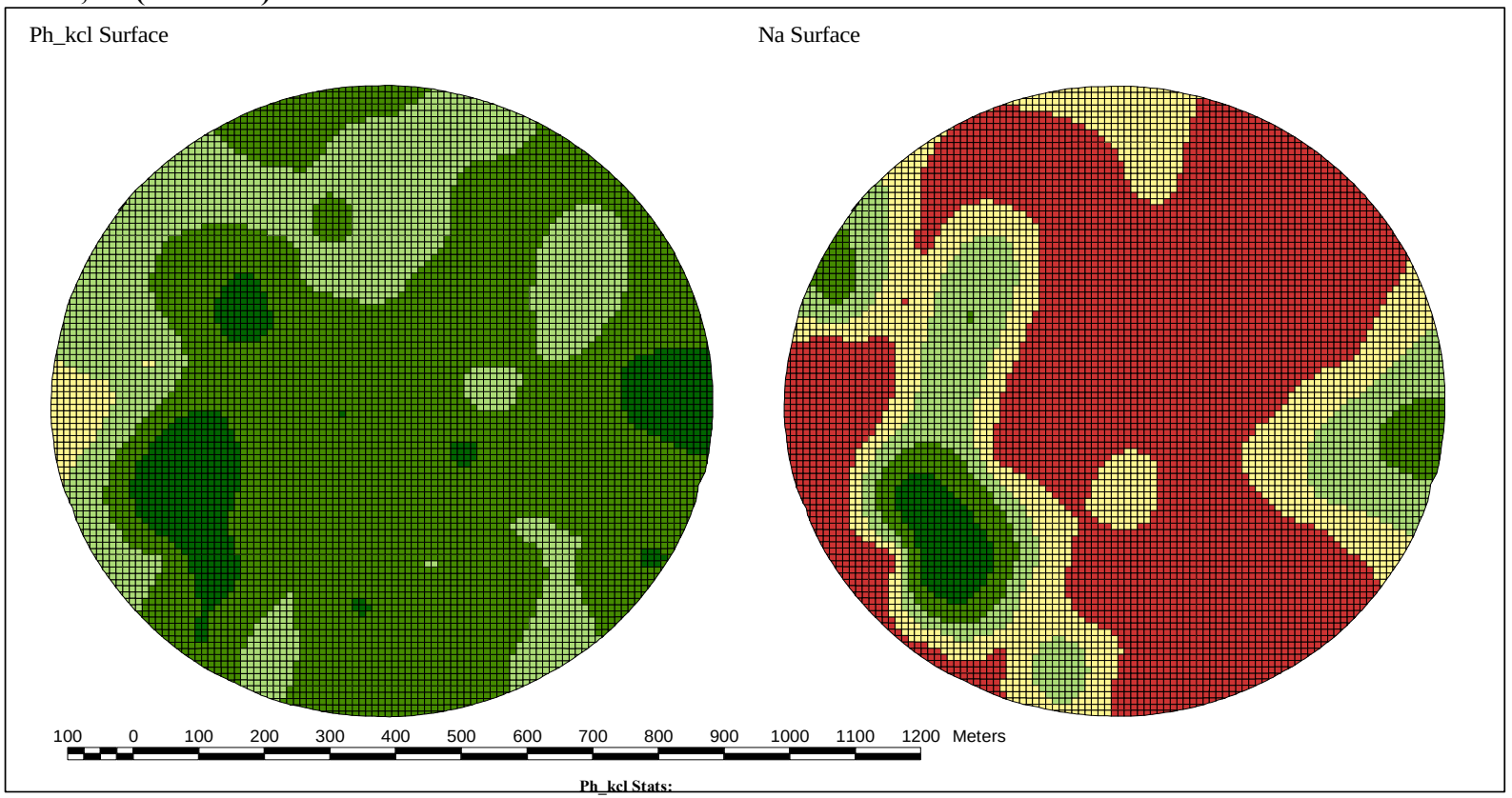
AgriHawk PRECISION AERIAL CROP SCIENCE

LANTEK SA Precision Farming/Pressie Boerdery

Nutrient Status Data Layers

pH(kcl) - Na

0EB6; 14 (79.77 ha.)



Clipped - Ph_kcl Surface
- 0 - 4.5 (0.0 ha. - 0.0%)
- 4.5 - 5 (1.0 ha. - 1.0%)
- 5 - 5.5 (18.0 ha. - 17.7%)
- 5.5 - 6 (53.1 ha. - 52.0%)
- 6 - 8 (9.6 ha. - 9.4%)

Date: Aug 4, 2015
Field Name: 0EB6; 14
Farm Name: Elmboog
Client Name: TSB
Total Hectares: 79.77
Field Boundary Start Location:
Latitude: -25.41179338
Longitude: 31.92548670

Ph_kcl Stats:
No. of Observations: 8174
Minimum Ph_kcl: 4.6
Maximum Ph_kcl: 7.3
Average Ph_kcl: 5.7

Na Stats:
No. of Observations: 8174
Minimum Na: 41.7
Maximum Na: 792.9
Average Na: 145.7

Clipped - Na Surface
- 41.7 - 120.5 (47.1 ha. - 46.1%)
- 120.5 - 188.9 (17.9 ha. - 17.5%)
- 188.9 - 279.7 (10.8 ha. - 10.6%)
- 279.7 - 438.9 (4.0 ha. - 3.9%)
- 438.9 - 792.9 (2.0 ha. - 1.9%)

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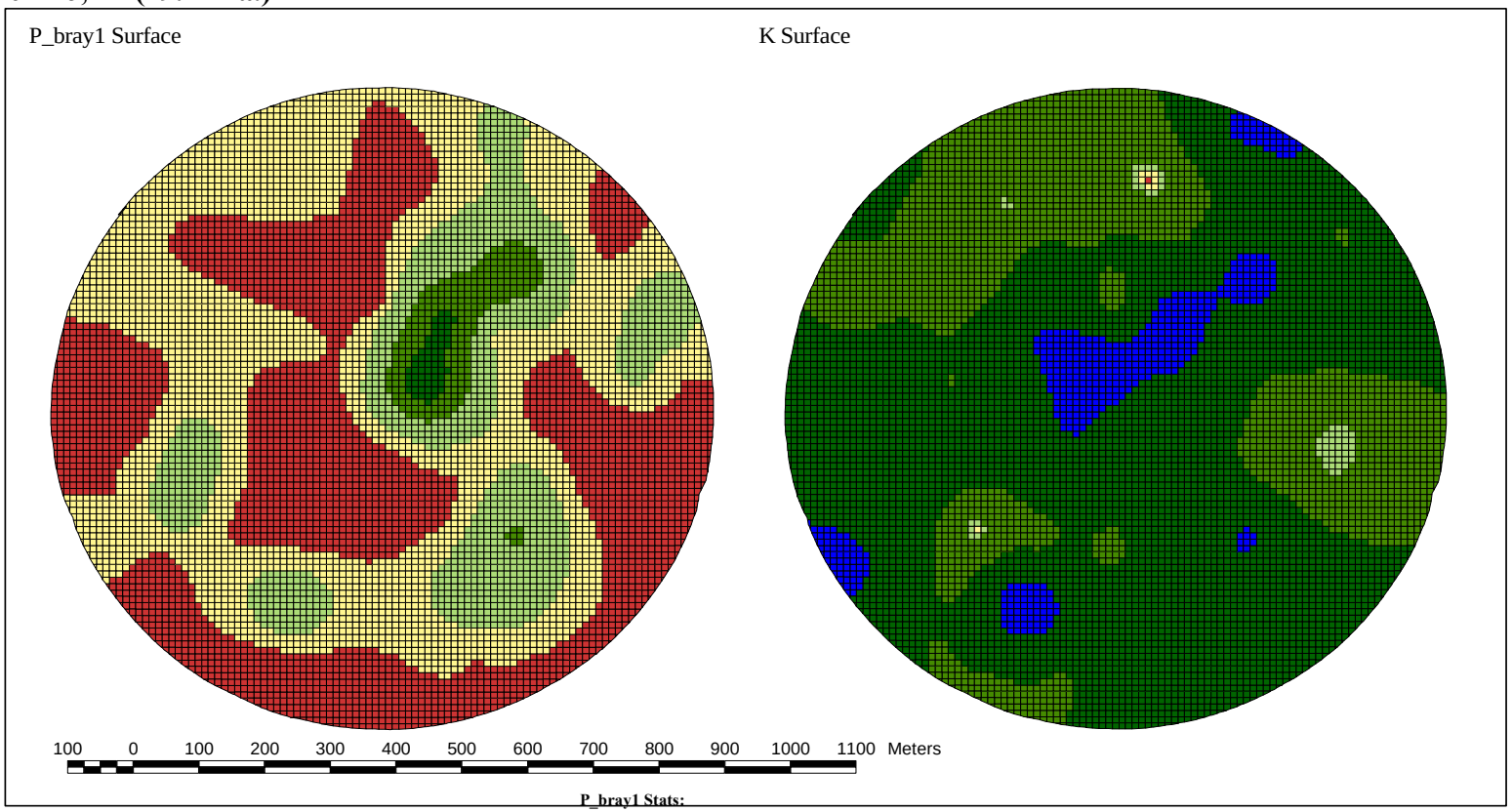
LANTEK SA Precision Farming/Pressie Boerdery

P_Bray 1 - K

0EB6; 14 (79.77 ha.)



Clipped - P_bray1 Surface
- 0 - 3
- 3 - 5
- 5 - 10
- 10 - 15
- 15 - 150

Date: Aug 4, 2015
Field Name: 0EB6; 14
Farm Name: Elmboog
Client Name: TSB
Total Hectares: 79.77
Field Boundary Start Location:
Latitude: -25.41179338
Longitude: 31.92548670

P_bray1 Stats:
No. of Observations: 8174
Minimum P_bray1: 0
Maximum P_bray1: 19
Average P_bray1: 4

K Stats:
No. of Observations: 8174
Minimum K: 66
Maximum K: 742
Average K: 319

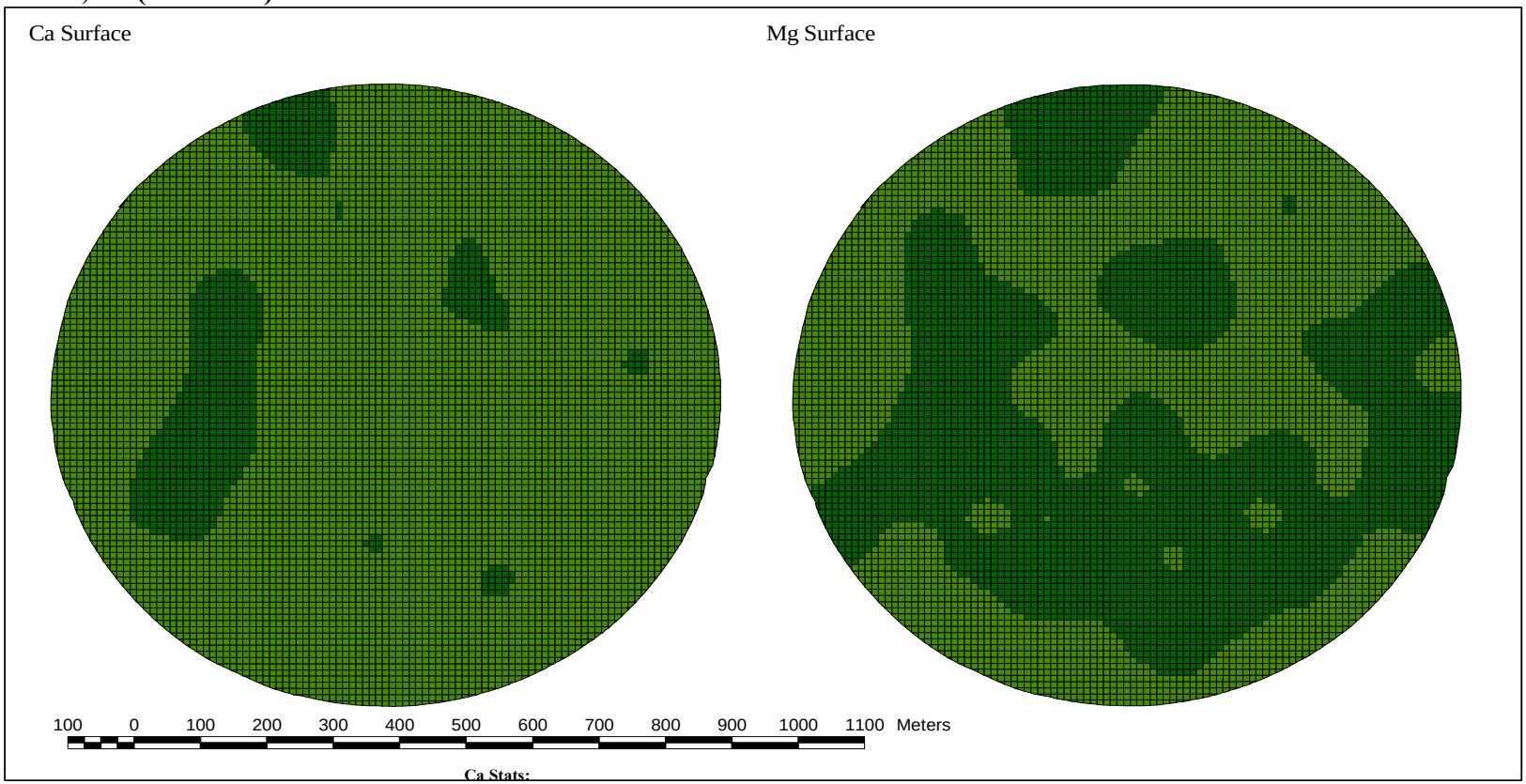
Clipped - K Surface
- 0 - 70 (0.0 ha. - 0.0%)
- 70 - 90 (0.0 ha. - 0.0%)
- 90 - 110 (0.0 ha. - 0.0%)
- 110 - 250 (0.0 ha. - 0.0%)
- 250 - 500 (0.0 ha. - 0.0%)
- 500 - 750
- 750 - 1000
- 1000 - 1250
- 1250 - 1500

AgriHawk PRECISION AERIAL CROP SCIENCE

LANTEK SA Precision Farming/Presisie Boerdery

Ca - Mg

0EB6; 14 (79.77 ha.)



Date: Aug 4, 2015
Field Name: 0EB6; 14
Farm Name: Elmboog
Client Name: TSB
Total Hectares: 79.77
Field Boundary Start Location:
Latitude: -25.41179338
Longitude: 31.92548670

Ca Stats:
No. of Observations: 8174
Minimum Ca: 1174
Maximum Ca: 3248
Average Ca: 1711

Mg Stats:
No. of Observations: 8174
Minimum Mg: 585
Maximum Mg: 1024
Average Mg: 792

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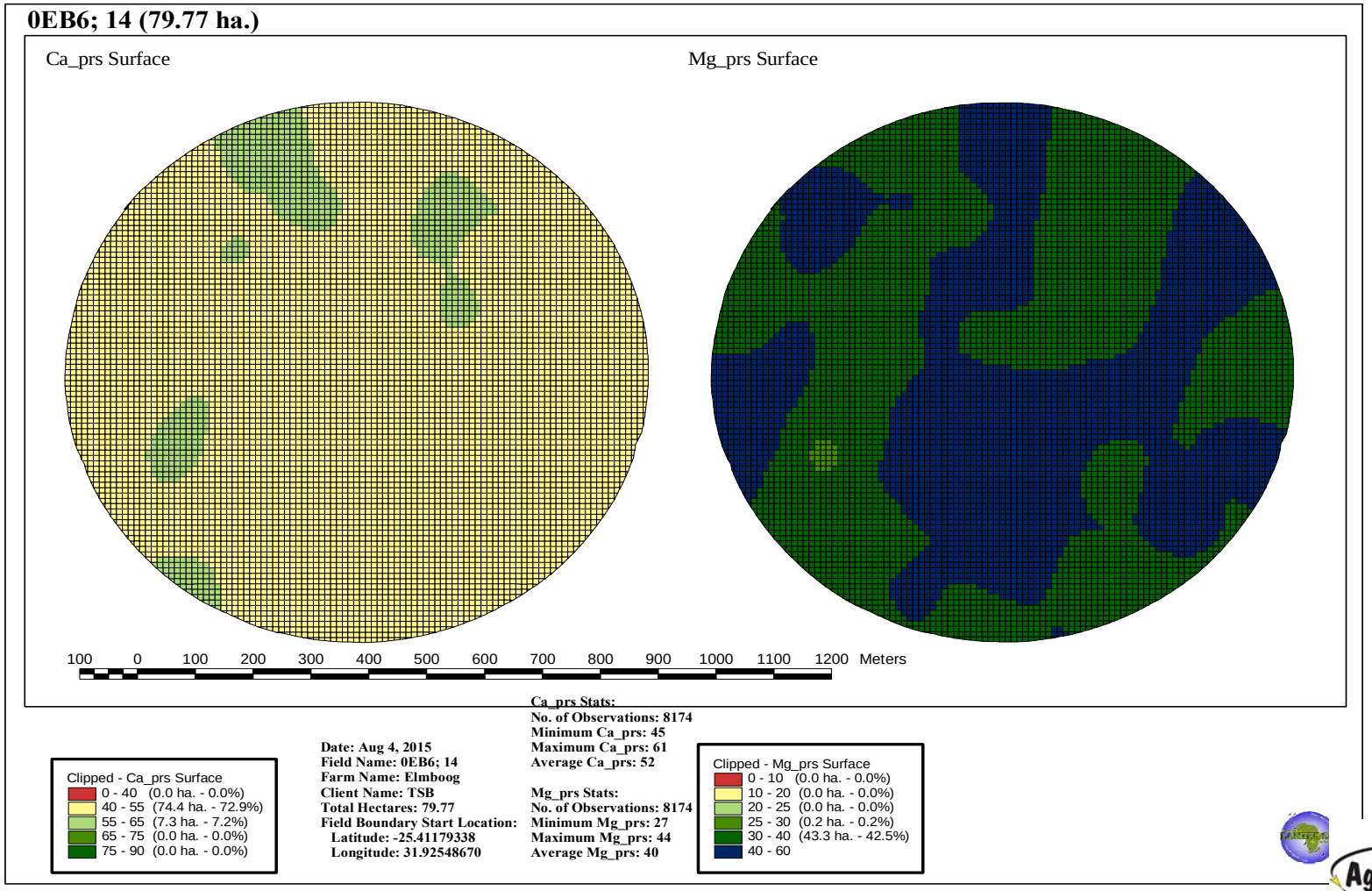
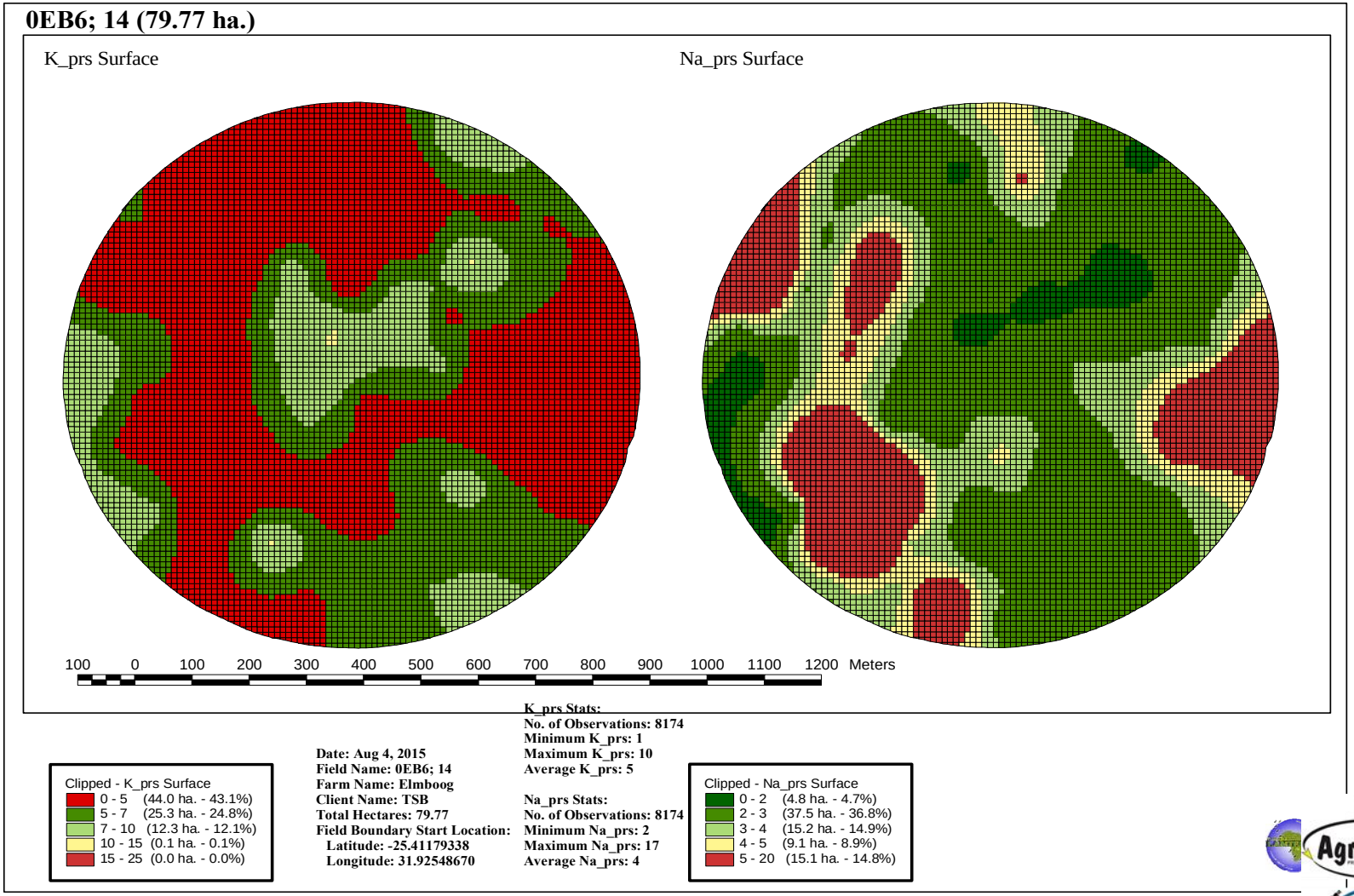
PRECISION AERIAL CROP SCIENCE

LANTEK SA
Precision Farming/Pressie Boerdery

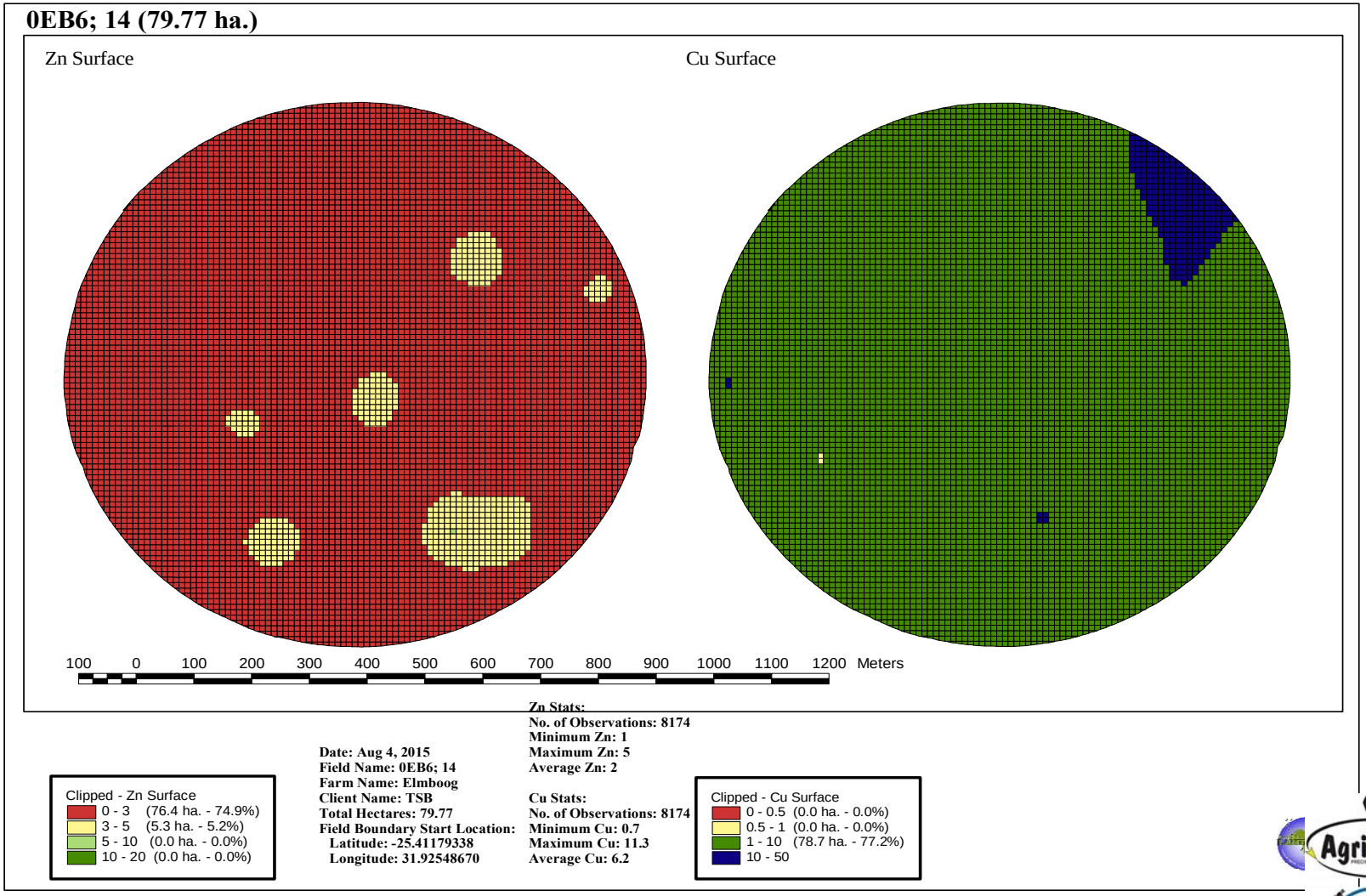
Ca% - Mg%


0EB6; 14 (79.77 ha.)
Ca_prs Surface
Mg_prs Surface
100 0 100 200 300 400 500 600 700 800 900 1000 1100 1200 Meters
Clipped - Ca_prs Surface
0 - 40 (0.0 ha. - 0.0%)
40 - 55 (74.4 ha. - 72.9%)
55 - 65 (7.3 ha. - 7.2%)
65 - 75 (0.0 ha. - 0.0%)
75 - 90 (0.0 ha. - 0.0%)
Date: Aug 4, 2015
Field Name: 0EB6; 14
Farm Name: Elmboog
Client Name: TSB
Total Hectares: 79.77
Field Boundary Start Location:
Latitude: -25.41179338
Longitude: 31.92548670
Ca_prs Stats:
No. of Observations: 8174
Minimum Ca_prs: 45
Maximum Ca_prs: 61
Average Ca_prs: 52
Mg_prs Stats:
No. of Observations: 8174
Minimum Mg_prs: 27
Maximum Mg_prs: 44
Average Mg_prs: 40
Clipped - Mg_prs Surface
0 - 10 (0.0 ha. - 0.0%)
10 - 20 (0.0 ha. - 0.0%)
20 - 25 (0.0 ha. - 0.0%)
25 - 30 (0.2 ha. - 0.2%)
30 - 40 (43.3 ha. - 42.5%)
40 - 60

K % - Na%


0EB6; 14 (79.77 ha.)
K_prs Surface
Na_prs Surface
100 0 100 200 300 400 500 600 700 800 900 1000 1100 1200 Meters
Clipped - K_prs Surface
0 - 5 (44.0 ha. - 43.1%)
5 - 7 (25.3 ha. - 24.8%)
7 - 10 (12.3 ha. - 12.1%)
10 - 15 (0.1 ha. - 0.1%)
15 - 25 (0.0 ha. - 0.0%)
Date: Aug 4, 2015
Field Name: 0EB6; 14
Farm Name: Elmboog
Client Name: TSB
Total Hectares: 79.77
Field Boundary Start Location:
Latitude: -25.41179338
Longitude: 31.92548670
K_prs Stats:
No. of Observations: 8174
Minimum K_prs: 1
Maximum K_prs: 10
Average K_prs: 5
Na_prs Stats:
No. of Observations: 8174
Minimum Na_prs: 2
Maximum Na_prs: 17
Average Na_prs: 4
Clipped - Na_prs Surface
0 - 2 (4.8 ha. - 4.7%)
2 - 3 (37.5 ha. - 36.8%)
3 - 4 (15.2 ha. - 14.9%)
4 - 5 (9.1 ha. - 8.9%)
5 - 20 (15.1 ha. - 14.8%)

Zn - Cu

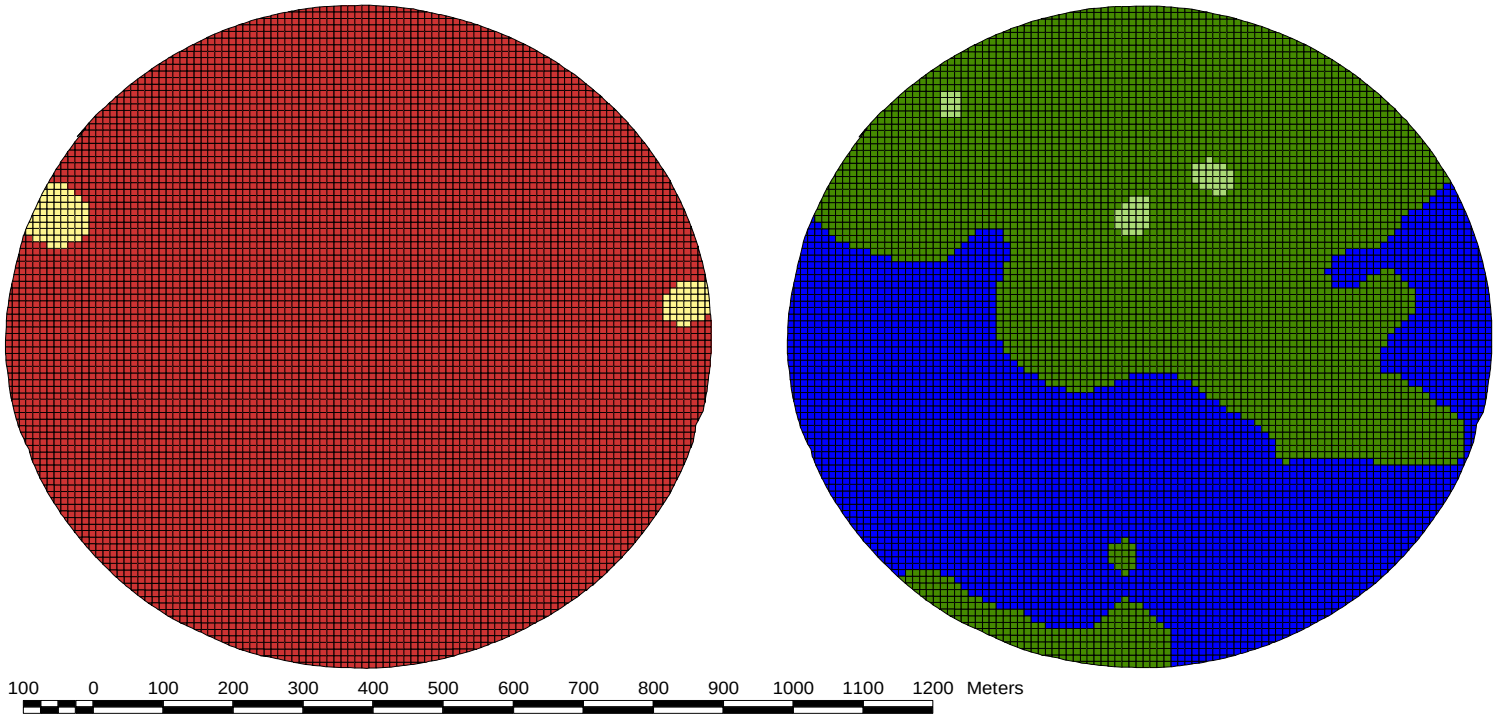

0EB6; 14 (79.77 ha.)
Zn Surface
Cu Surface
100 0 100 200 300 400 500 600 700 800 900 1000 1100 1200 Meters
Clipped - Zn Surface
0 - 3 (76.4 ha. - 74.9%)
3 - 5 (5.3 ha. - 5.2%)
5 - 10 (0.0 ha. - 0.0%)
10 - 20 (0.0 ha. - 0.0%)
Date: Aug 4, 2015
Field Name: 0EB6; 14
Farm Name: Elmboog
Client Name: TSB
Total Hectares: 79.77
Field Boundary Start Location:
Latitude: -25.41179338
Longitude: 31.92548670
Zn Stats:
No. of Observations: 8174
Minimum Zn: 1
Maximum Zn: 5
Average Zn: 2
Cu Stats:
No. of Observations: 8174
Minimum Cu: 0.7
Maximum Cu: 11.3
Average Cu: 6.2
Clipped - Cu Surface
0 - 0.5 (0.0 ha. - 0.0%)
0.5 - 1 (0.0 ha. - 0.0%)
1 - 10 (78.7 ha. - 77.2%)
10 - 50

Fe - Mn

0EB6; 14 (79.77 ha.)

Fe Surface

Mn Surface



Clipped - Fe Surface

0 - 5	(80.5 ha. - 79.0%)
5 - 10	(1.2 ha. - 1.1%)
10 - 15	(0.0 ha. - 0.0%)
15 - 20	(0.0 ha. - 0.0%)
20 - 40	(0.0 ha. - 0.0%)
40 - 200	(0.0 ha. - 0.0%)

Date: Aug 4, 2015
Field Name: 0EB6; 14
Farm Name: Elmboog
Client Name: TSB
Total Hectares: 79.77
Field Boundary Start Location:
Latitude: -25.41179338
Longitude: 31.92548670

Fe Stats:
No. of Observations: 8174
Minimum Fe: 0
Maximum Fe: 8
Average Fe: 2

Mn Stats:
No. of Observations: 8174
Minimum Mn: 9
Maximum Mn: 77
Average Mn: 22

Clipped - Mn Surface

0 - 3	(0.0 ha. - 0.0%)
3 - 5	(0.0 ha. - 0.0%)
5 - 10	(0.6 ha. - 0.6%)
10 - 20	(42.8 ha. - 42.0%)
20 - 100	(38.3 ha. - 37.5%)

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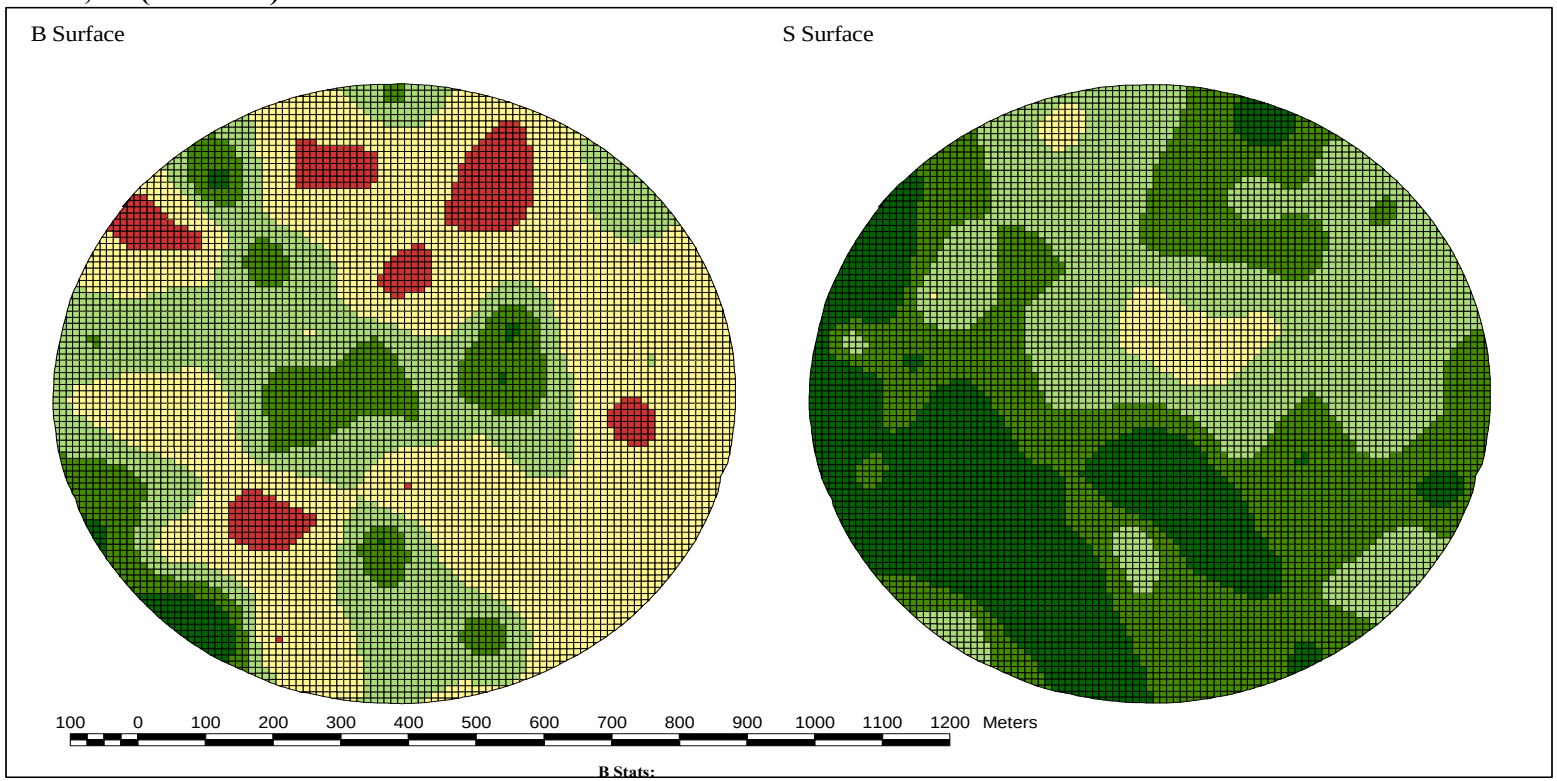
Precision Farming/Pressie Boerdery

B - S

0EB6; 14 (79.77 ha.)



Clipped - B Surface
- 0 - 0.3 (2.1 ha. - 2.1%)
- 0.3 - 0.6 (41.2 ha. - 40.3%)
- 0.6 - 0.8 (25.1 ha. - 24.6%)
- 0.8 - 1 (11.2 ha. - 11.0%)
- 1 - 5 (2.1 ha. - 2.1%)

Date: Aug 4, 2015
Field Name: 0EB6; 14
Farm Name: Elmboog
Client Name: TSB
Total Hectares: 79.77
Field Boundary Start Location:
Latitude: -25.41179338
Longitude: 31.92548670

B Stats:
No. of Observations: 8174
Minimum B: 0.1
Maximum B: 1.5
Average B: 0.6

S Stats:
No. of Observations: 8174
Minimum S: 6
Maximum S: 81
Average S: 26

Clipped - S Surface
- 0 - 5 (0.0 ha. - 0.0%)
- 5 - 10 (2.7 ha. - 2.7%)
- 10 - 20 (28.2 ha. - 27.7%)
- 20 - 30 (29.3 ha. - 28.7%)
- 30 - 50 (16.5 ha. - 16.2%)

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LANTEK SA
Precision Farming/Pressie Boerdery

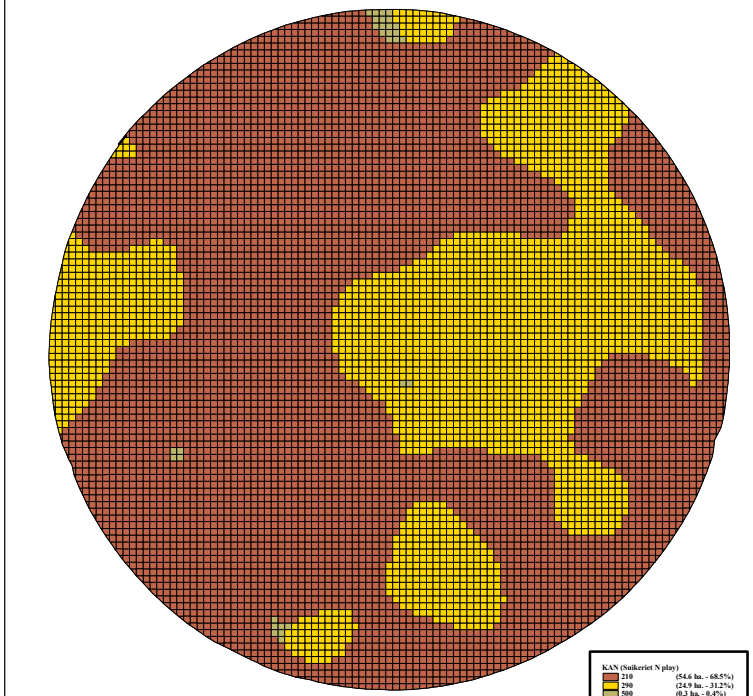
Data Usage

- Variable recommendation of **chemical fertilizer** (from the **Nutrient Maps**)
- Variable **irrigation** (from the **Soil-Water Maps**)

More information is needed from the **plant** for **in-season decision making**

N Recommendation

0EB6; 14 (79.77 ha.) - KAN Recommendation



Equation Used: Suikeriet N play

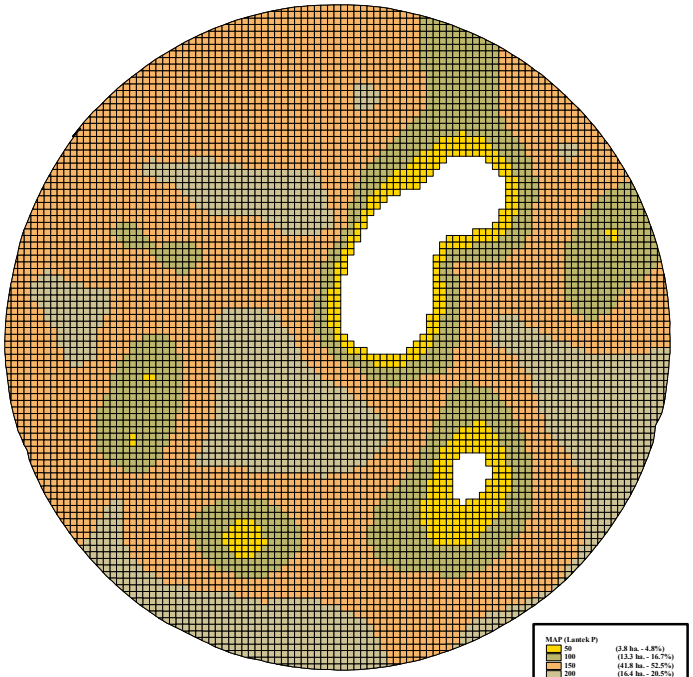
Date: Aug 4, 2015
Field Name: 0EB6; 14
Farm Name: Elmboog
Client Name: TSB
Total Hectares: 79.77
Field Boundary Start Location:
Latitude: -25.41179338
Longitude: 31.92548670

Application Estimates:

Product: KAN	
Min. Rate:	210.0 Kg./ha.
Max. Rate:	500.0 Kg./ha.
Avg. Rate:	235.7 Kg./ha.
Total KAN:	18827.6 Kg.
Total N (28%):	5271.7 Kg.
Total N-2 (100%):	18827.6 Kg.
Product Price per kilogram:	R0.00
Product Cost:	R0.00
Number of Hectares to be Applied:	79.77 Hectares
Per Hectare Application Charge:	R0.00
Anticipated Application Charge:	R0.00
Total Cost:	R0.00
Cost per Applied Hectare:	R0.00
Total Hectare Cost:	R0.00

P Recommendation

0EB6; 14 (79.77 ha.) - MAP Recommendation

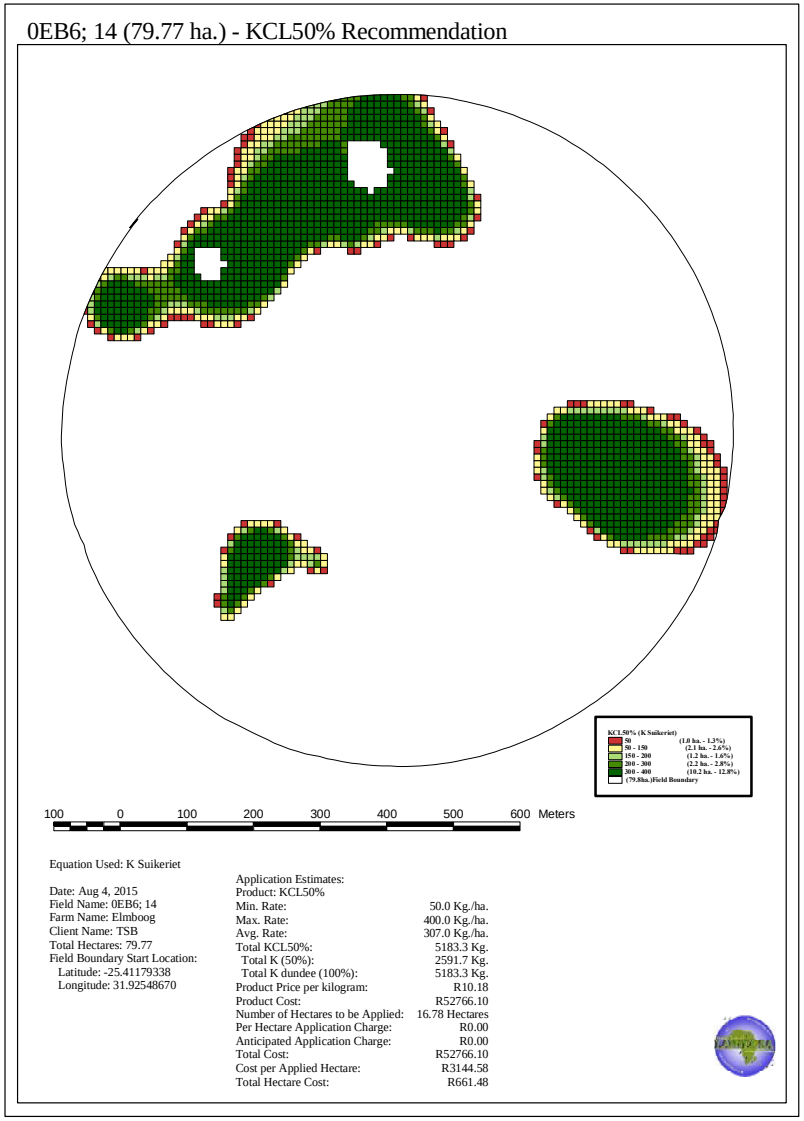


Equation Used: Lantek P

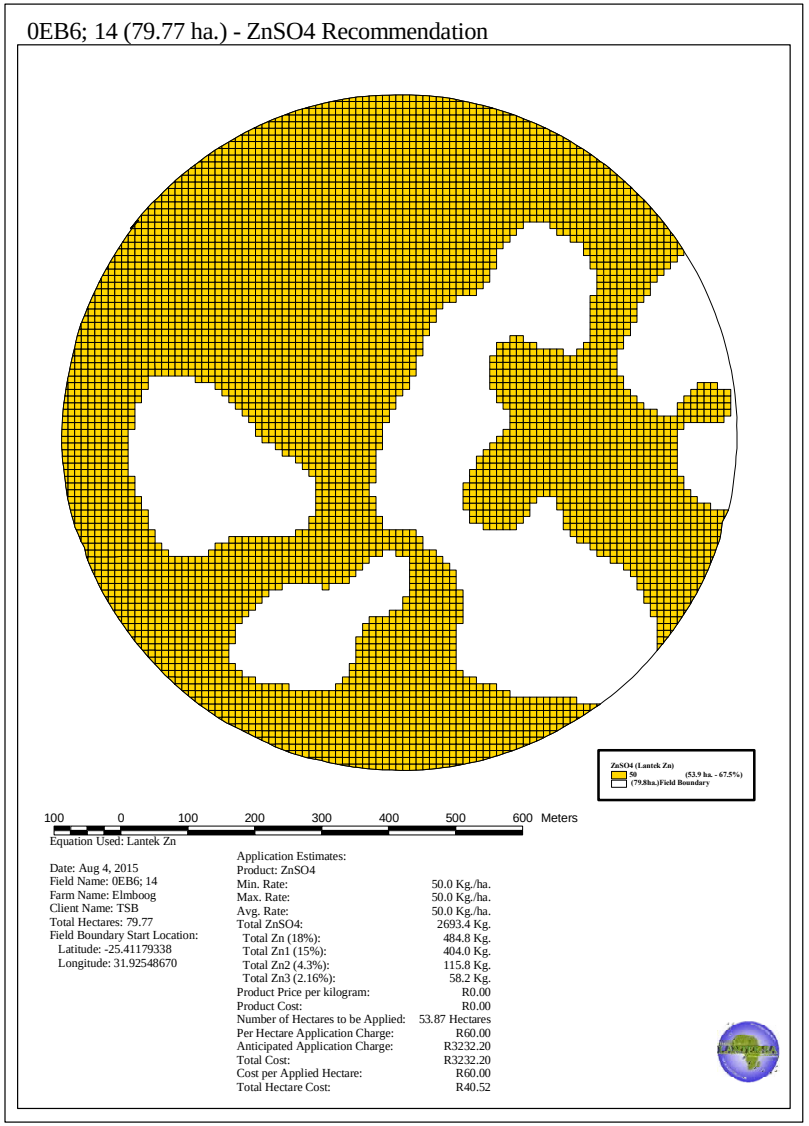
Date: Aug 4, 2015
Field Name: 0EB6; 14
Farm Name: Elmboog
Client Name: TSB
Total Hectares: 79.77
Field Boundary Start Location:
Latitude: -25.41179338
Longitude: 31.92548670

Application Estimates:	
Product: MAP	
Min. Rate:	50.0 Kg./ha.
Max. Rate:	200.0 Kg./ha.
Avg. Rate:	147.4 Kg./ha.
Total MAP:	11079.3 Kg.
Total N (11%):	1218.7 Kg.
Total P (22%):	2437.4 Kg.
Total K (0%):	0.0 Kg.
Total MAP (100%):	11079.3 Kg.
Product Price per kilogram:	R0.00
Product Cost:	R0.00
Number of Hectares to be Applied:	75.37 Hectares
Per Hectare Application Charge:	R0.00
Anticipated Application Charge:	R0.00
Total Cost:	R0.00
Cost per Applied Hectare:	R0.00
Total Hectare Cost:	R0.00

K Recommendation

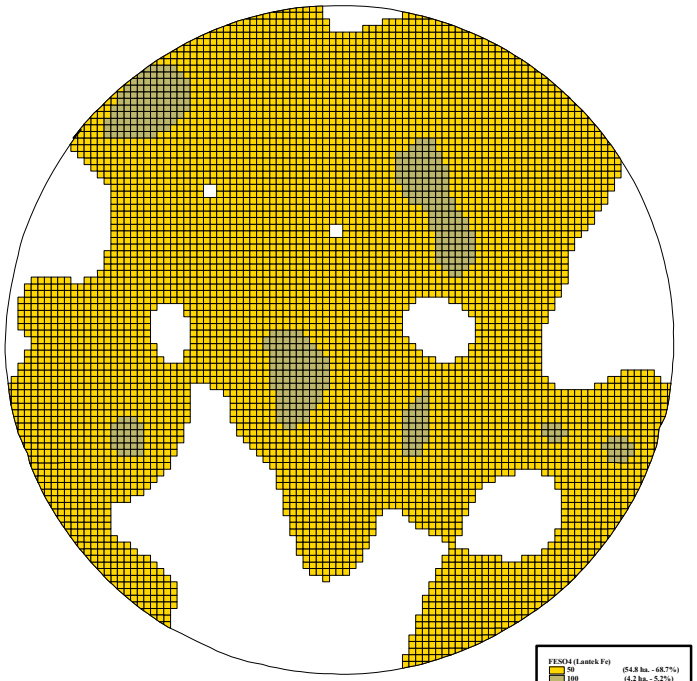


Zn Recommendation



Fe Recommendation

0EB6; 14 (79.77 ha.) - FESO4 Recommendation



Equation Used: Lantek Fe

Date: Aug 4, 2015
Field Name: 0EB6; 14
Farm Name: Elmboog
Client Name: TSB
Total Hectares: 79.77
Field Boundary Start Location:
Latitude: -25.41179338
Longitude: 31.92548670

Application Estimates:

Product: FESO4	
Min. Rate:	50.0 Kg./ha.
Max. Rate:	100.0 Kg./ha.
Avg. Rate:	53.5 Kg./ha.
Total FESO4:	3157.5 Kg.
Total Fe (15%):	473.6 Kg.
Total Fe1 (5%):	157.9 Kg.
Total Fe2 (2.9%):	91.6 Kg.
Total Fe3 (3.6%):	113.7 Kg.
Product Price per kilogram:	R0.00
Product Cost:	R0.00
Number of Hectares to be Applied:	58.99 Hectares
Per Hectare Application Charge:	R60.00
Anticipated Application Charge:	R3539.40
Total Cost:	R3539.40
Cost per Applied Hectare:	R60.00
Total Hectare Cost:	R44.37

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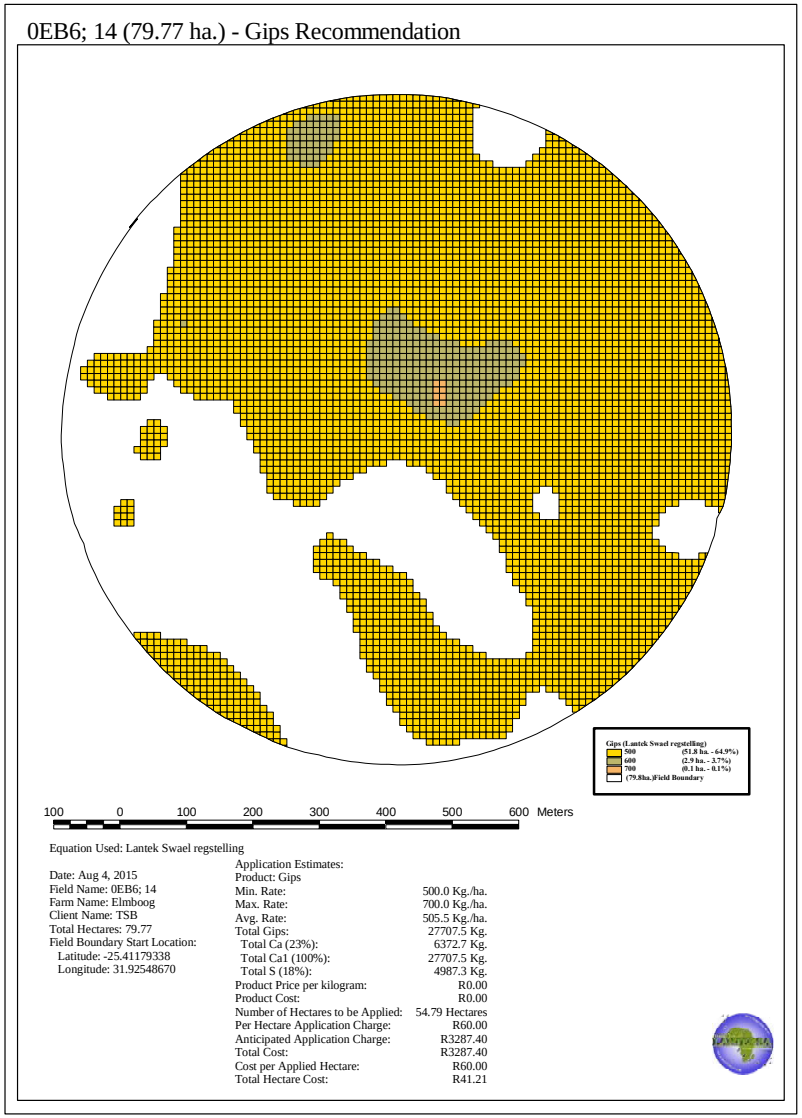
LANTEK SA Precision Farming/Pressie Boerdery

Gypsum Recommendation



8 Product VRA

5 Product VRA

1 Product VRA

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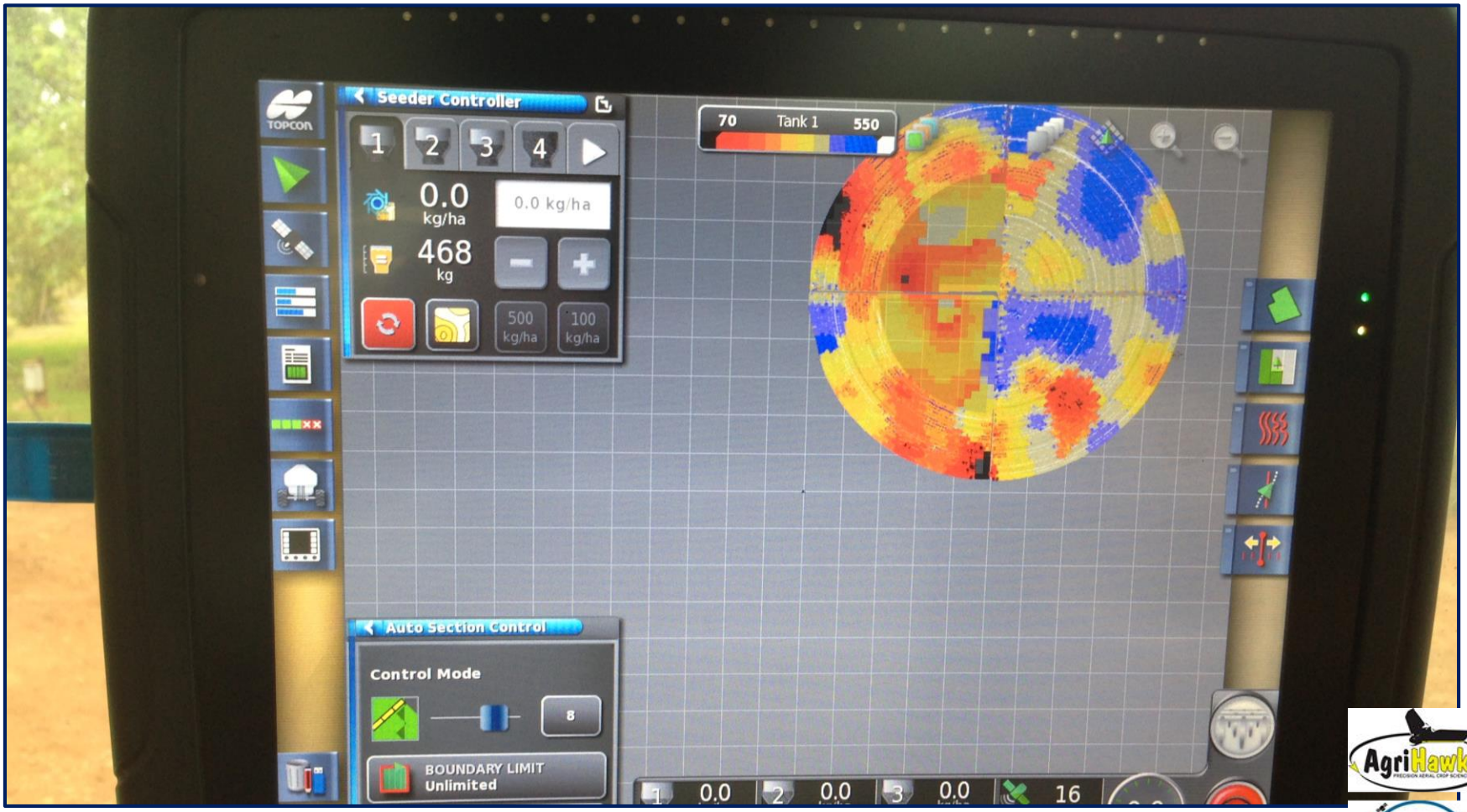
LANTEK SA
Precision Farming/Pressie Boerdery

Applied Data on Applicator Screen



Advantages of Precision Soil Data Management

- Accurate **soil nutrient management**
  - Less over-application of nutrients.
  - Less under-application
  - Lower cost to lift nutrient levels
- Better **ecological sustainability**
- **Traceability** of all **applications**
- Easier to **manage** your **budget**

Limitations of Precision Soil Data Management

- All decisions are based on data collected from the **soil**
- No input from the **plants**

Solution

UAV Monitoring of Plants

AgriHawk
PRECISION AERIAL CROP SCIENCE

LANTEK SA
Precision Farming / Pressie Boerdery

Use of UAV

- **Quick** and **easy**
- **Timely**, whenever it is needed
- **High definition**
  - From 5 – 15 cm pixel size
- **Lower cost** than aerial photography by plane
- **Not affected** by cloud cover
  - Satellite images are restricted by cloud cover, UAV can fly underneath the clouds

Modified Digital Cameras
3 Band Widths

- **RGB** Camera
  - Red
  - Green
  - Blue
- **NIR** Camera
  - Red
  - Green
  - NIR
- **“Red Edge”** Camera
  - “Red Edge”
  - Green
  - Blue

AgriHawk
PRECISION AERIAL CROP SCIENCE

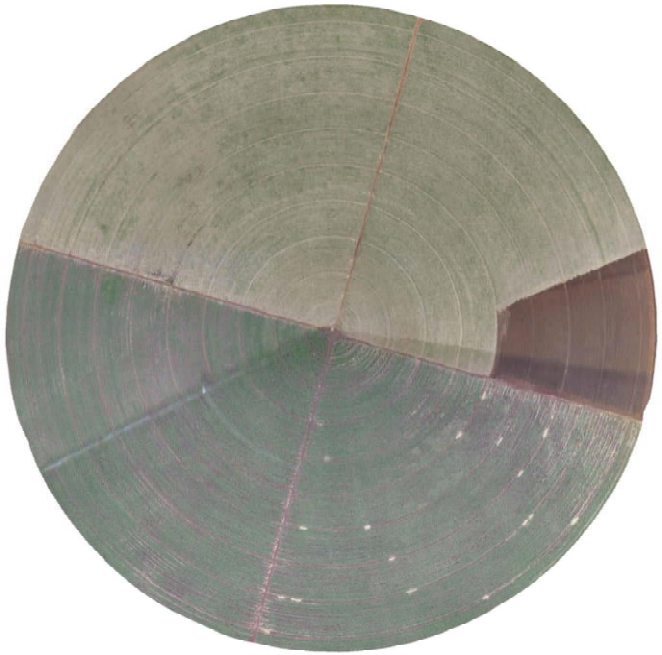
LANTEK SA
Precision Farming/Pressie Boerdery

RGB

- Normal colour photo
- Used to create NDVI
- Used for identification of physical problems on the field
  - Gaps
  - Lodging
  - Weeds
  - Low population
  - Waterlogged
  - Animal damage (Hippopotamus)

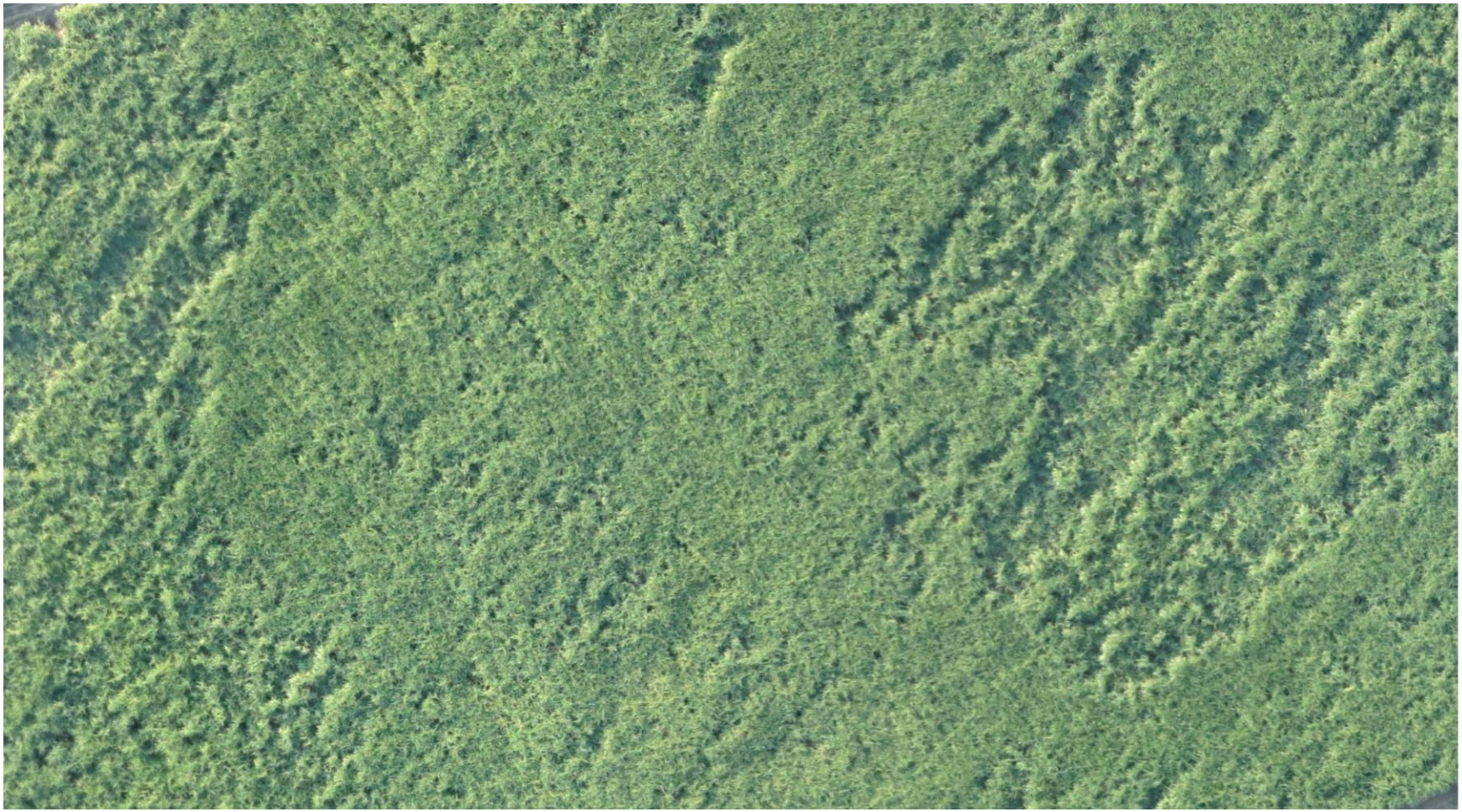
RGB Image

0EB6; 14 (79.77 ha.)



Date: Aug 4, 2015
Field Name: 0EB6; 14
Farm Name: Elmboog
Client Name: TSB
Total Hectares: 79.77
Field Boundary Start Location:
Latitude: -25.41179338
Longitude: 31.92548670

Cane Lodging



Water Logging

NIR

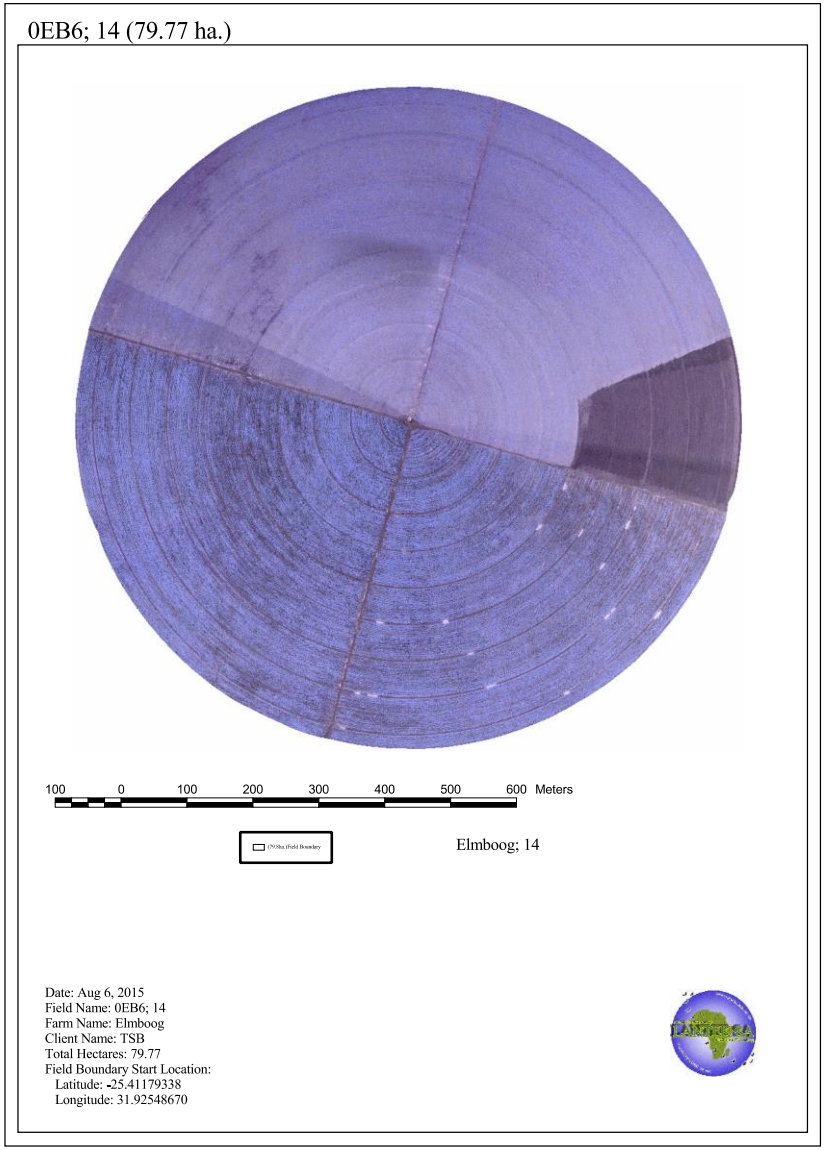
- Red, green and NIR bands
- NDVI (**Normalized Difference Vegetation Index**)

The **Normalized Difference Vegetation Index** (**NDVI**) is an index of plant “greenness” or photosynthetic activity, and is one of the most commonly used vegetation indices

Vegetation indices are based on the observation that different surfaces reflect different types of light differently

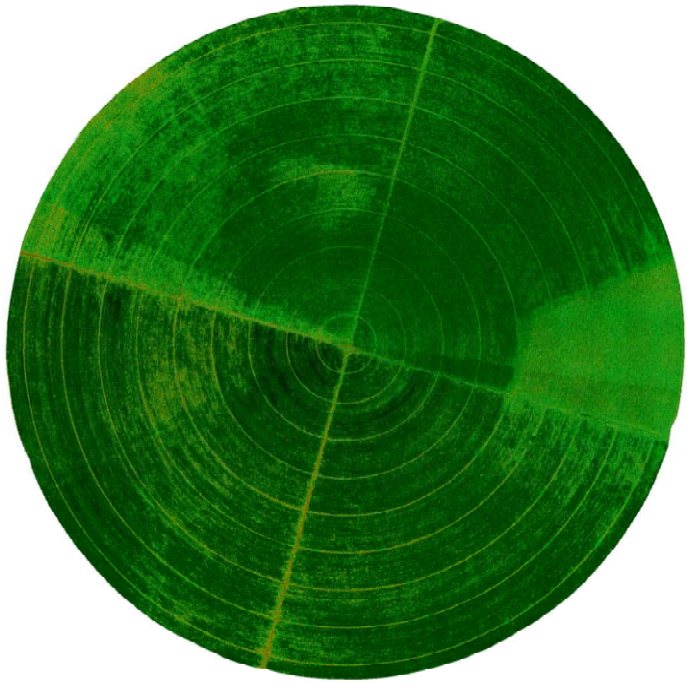
Use it to see **differences** in **plants**

NIR Image


0EB6; 14 (79.77 ha.)
100 0 100 200 300 400 500 600 Meters
Elmboog; 14
Date: Aug 6, 2015
Field Name: 0EB6; 14
Farm Name: Elmboog
Client Name: TSB
Total Hectares: 79.77
Field Boundary Start Location:
Latitude: -25.41179338
Longitude: 31.92548670

NDVI Image

0EB6; 14 (79.77 ha.) NDVI raster image



Date: Aug 5, 2015
Field Name: 0EB6; 14
Farm Name: Elmboog
Client Name: TSB
Total Hectares: 79.77
Field Boundary Start Location:
Latitude: -25.41179338
Longitude: 31.92548670

Decision Making Tools

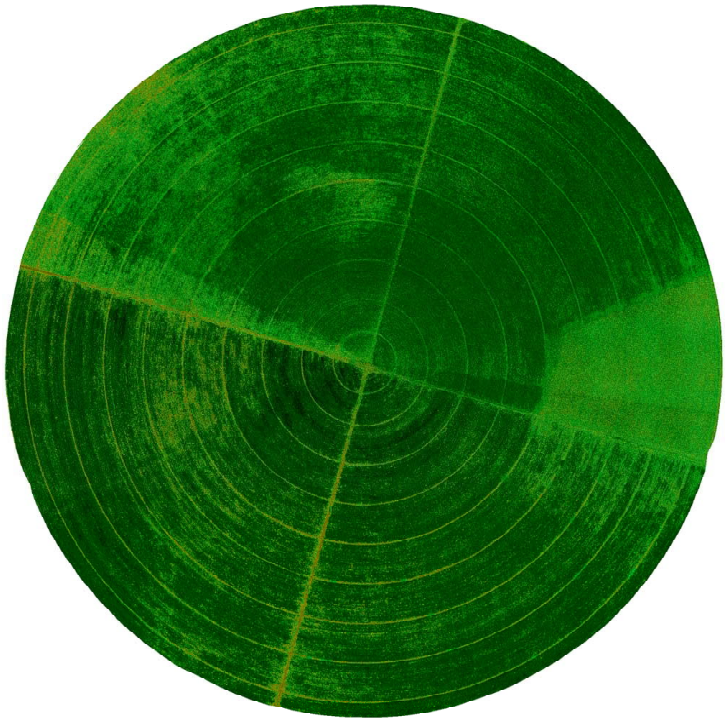
- **Visual** identification
  - Visually compare different variable layers

- **Statistical** evaluation
  - A **correlation matrix** is used to investigate the dependence between multiple variables at the same time. The result is a table containing the **correlation coefficients** between each variable and the others

- **Ground truthing**
  - Use NDVI images to identify the problem areas on the field and then physically investigate the areas on the field itself

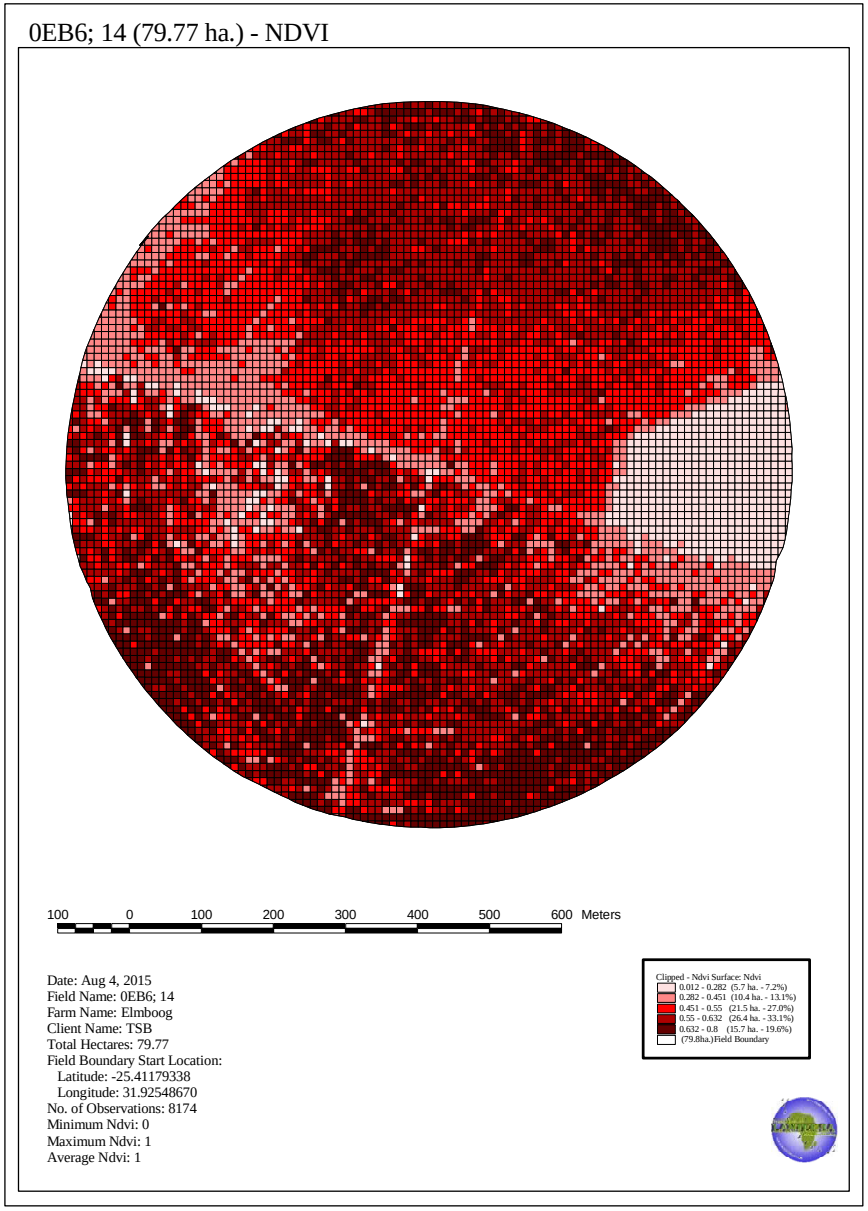
NDVI Raster Image

0EB6; 14 (79.77 ha.) NDVI raster image



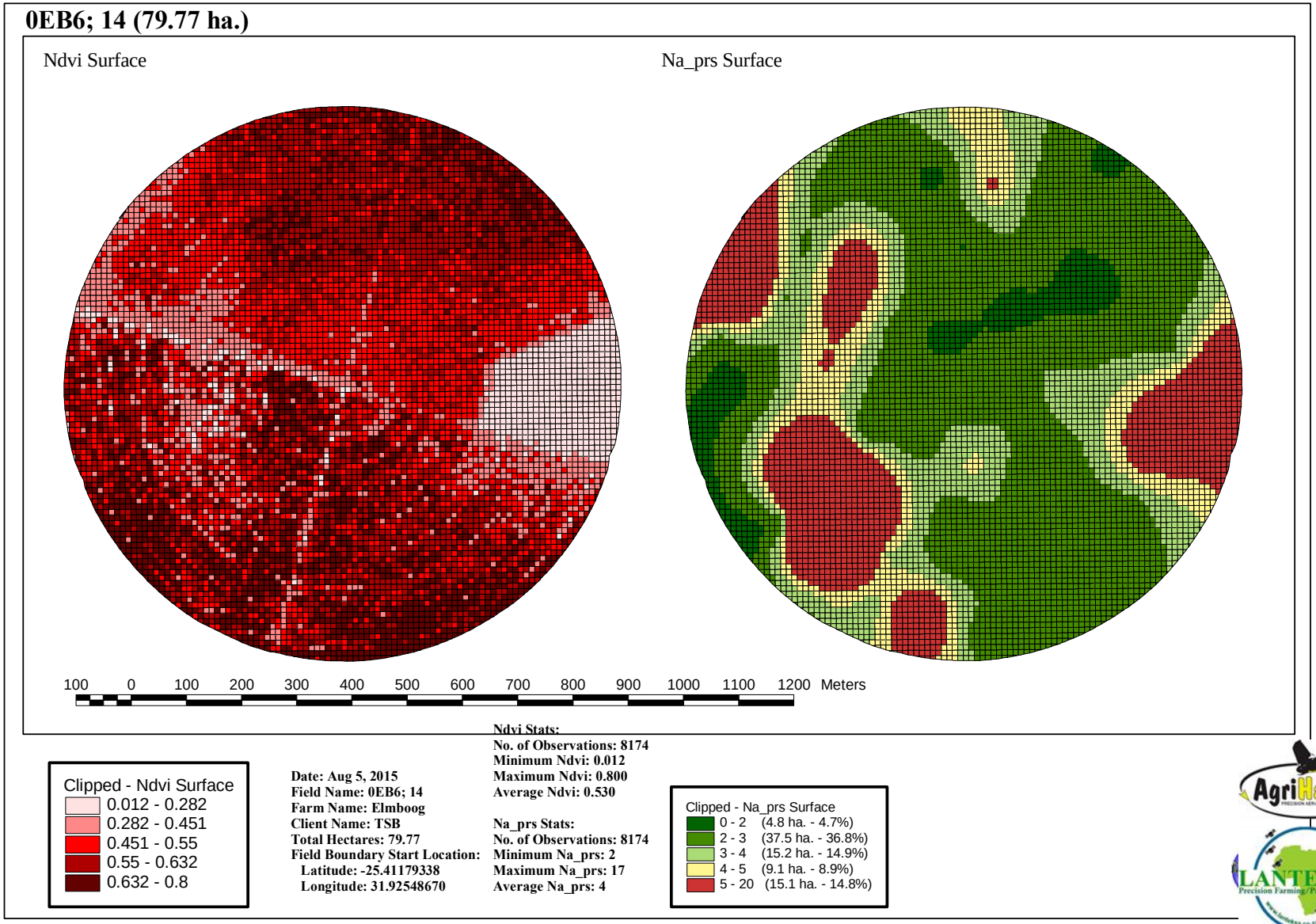
Date: Aug 5, 2015
Field Name: 0EB6; 14
Farm Name: Elmboog
Client Name: TSB
Total Hectares: 79.77
Field Boundary Start Location:
Latitude: -25.41179338
Longitude: 31.92548670

NDVI Raster Surface

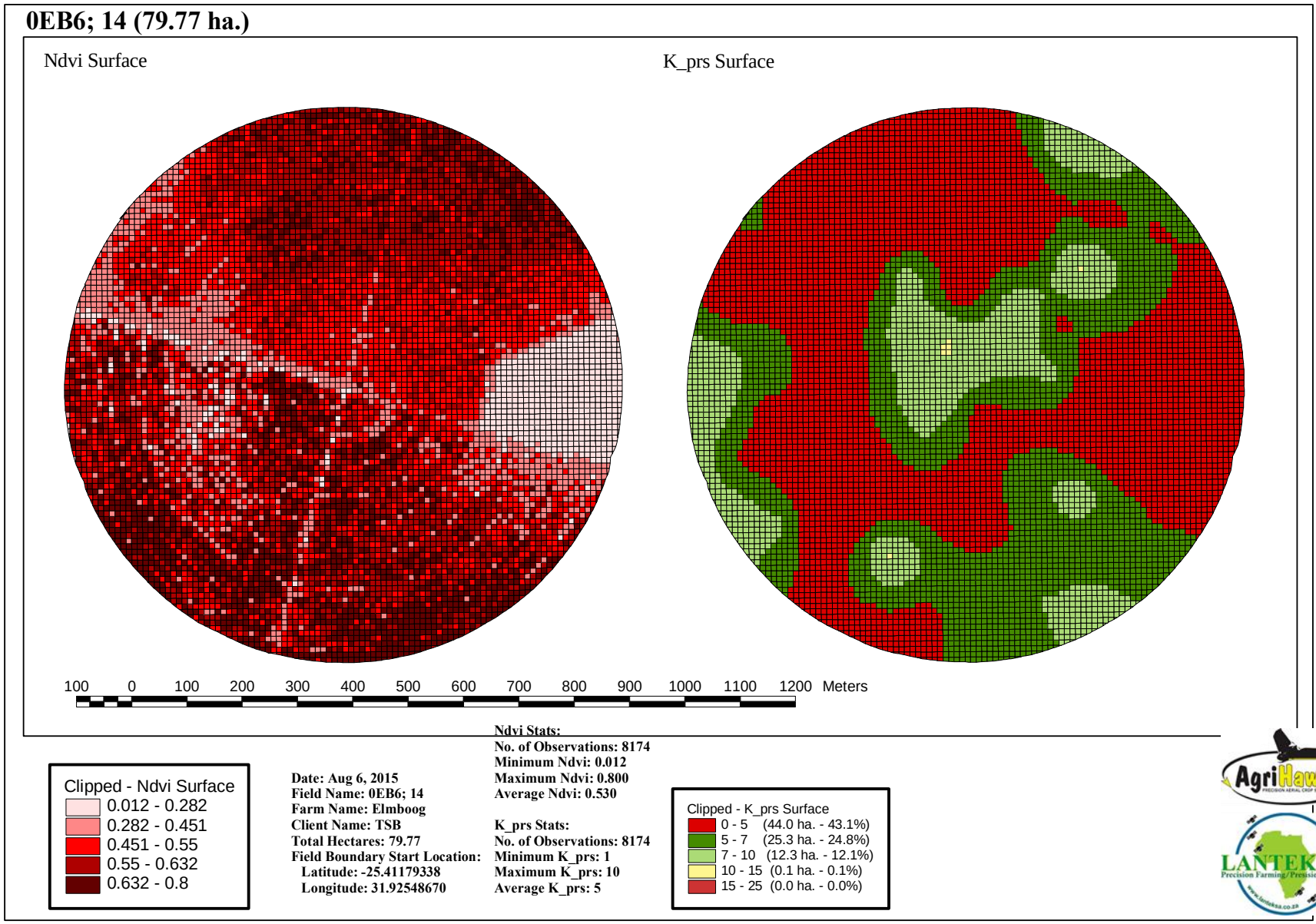


Visual Comparison Between Different Variable Layers and NDVI

Visual Identification



Visual Identification



Statistical Evaluation

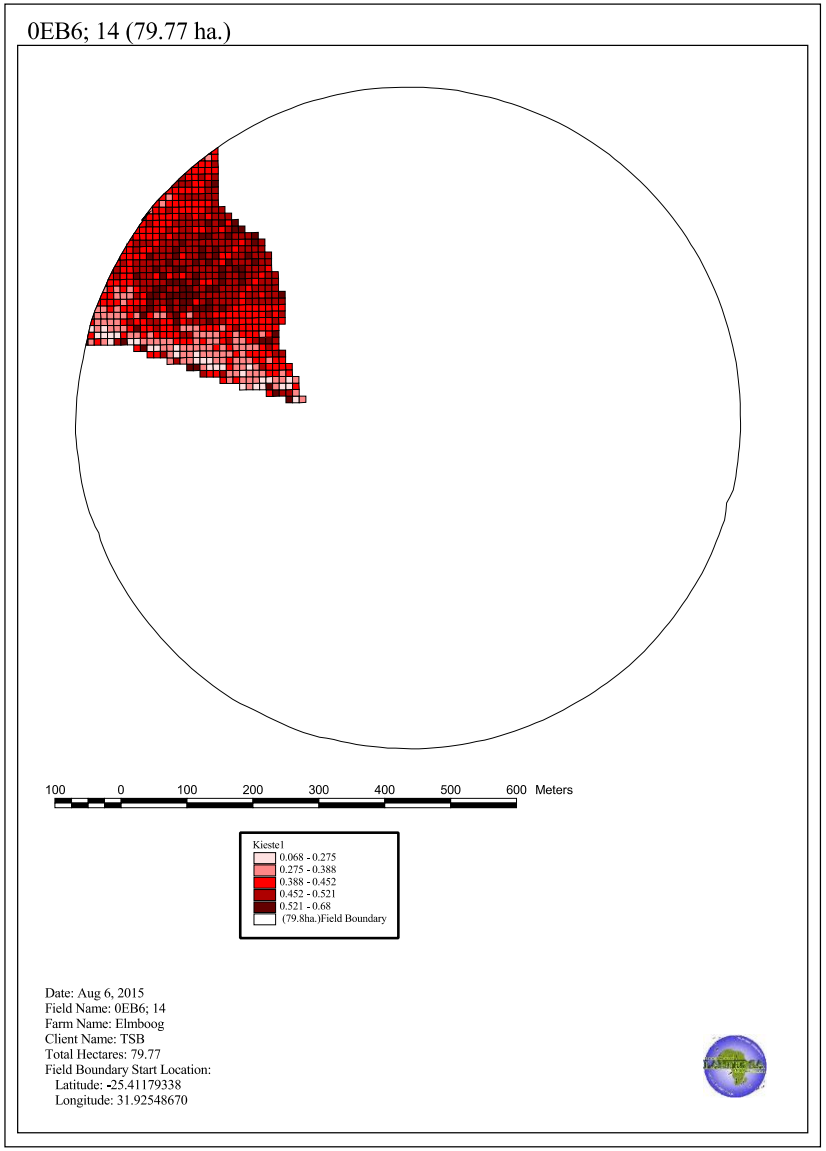
Correlation Matrix on all Variables

Variables	Capmg	B	S	Fe	Mn	Zn	Cu	Na_prs	K_prs	Mg_prs	Ca_prs	Camgk	Mgk	Camg	Cec	Mg	Ca	K	Na	P_bray1	Ph_kcl	Density	Raw	Aw	Shc	Sat	Pwp	Fc	Sand	Slik	Clay	C	Elevation	Ndvi
Capmg	1	-0.04	0.02	-0.25	0.06	0.32	-0.55	0.09	-0.32	-0.5	0.58	0.19	0.13	0.64	0.97	0.81	0.98	-0.05	0.32	0.27	0.66	0.35	0.57	0.57	0.44	-0.37	-0.52	-0.46	0.19	0.44	-0.52	0.27	0	-0.15
B	-0.04	1	-0.11	-0.12	-0.07	-0.11	-0.19	-0.18	0.29	-0.09	0.02	-0.33	-0.34	0.06	-0.04	-0.09	-0.02	0.27	-0.15	-0.06	0.06	0.07	-0.05	-0.05	-0.04	-0.08	0	-0.05	0.03	-0.02	0	-0.17	0.17	0.13
S	0.02	-0.11	1	0.29	0.65	0.16	-0.08	0.62	0.02	-0.21	-0.37	0	0.02	0.01	0.16	-0.02	0.03	0.06	0.62	-0.16	0.13	-0.03	0.08	0.08	0.01	0.04	0.02	-0.03	0.03	-0.04	0.02	0.14	0.01	0.07
Fe	-0.25	-0.12	0.29	1	0.35	0.16	0.22	0.45	-0.03	0.01	-0.38	0	0.03	-0.23	-0.16	-0.15	-0.26	-0.06	0.32	-0.05	0	-0.2	-0.11	-0.11	-0.21	0.22	0.22	0.19	-0.24	-0.06	0.23	-0.14	-0.11	-0.19
Mn	0.06	-0.07	0.65	0.35	1	0.52	0.05	0.27	0.22	0.04	-0.44	-0.23	-0.2	-0.2	0.19	0.22	0	0.28	0.31	-0.08	0.1	-0.04	0.02	0.02	-0.12	0.04	0.09	0.05	0.01	-0.11	0.08	0.05	-0.3	0.09
Zn	0.32	-0.11	0.16	0.16	0.52	1	-0.01	-0.07	0.29	-0.09	-0.09	-0.39	-0.39	0.04	0.38	0.39	0.27	0.43	0.02	0.51	0.22	0.1	0.1	0.1	-0.13	-0.12	-0.01	-0.06	-0.04	0.03	0	-0.2	-0.34	-0.01
Cu	-0.55	-0.19	-0.08	0.22	0.05	-0.01	1	-0.29	0.24	0.36	-0.24	-0.2	-0.16	-0.39	-0.57	-0.44	-0.54	0.08	-0.38	-0.02	-0.53	-0.28	-0.39	-0.39	-0.41	0.3	0.42	0.43	-0.31	-0.22	0.43	-0.41	-0.34	0.22
Na_prs	0.09	-0.18	0.62	0.45	0.27	-0.07	-0.29	1	-0.47	-0.32	-0.24	0.45	0.47	0.12	0.22	0.02	0.11	-0.42	0.96	-0.19	0.41	-0.1	0.2	0.2	0.15	0.08	-0.09	-0.08	-0.08	0.17	-0.09	0.27	0.11	-0.33
K_prs	-0.32	0.29	0.02	-0.03	0.22	0.29	0.24	-0.47	1	0.03	-0.37	-0.87	-0.86	-0.23	-0.24	-0.24	-0.32	0.95	-0.45	0.34	-0.23	-0.16	-0.26	-0.26	-0.38	0.18	0.32	0.31	-0.2	-0.21	0.33	-0.37	-0.15	0.33
Mg_prs	-0.5	-0.09	-0.21	0.01	0.04	-0.09	0.36	-0.32	0.03	1	-0.59	-0.03	0.06	-0.88	-0.51	0.05	-0.62	-0.1	-0.45	-0.27	-0.46	0.01	-0.43	-0.43	-0.28	0	0.27	0.13	0.23	-0.5	0.26	-0.16	-0.15	0.01
Ca_prs	0.58	0.02	-0.37	-0.38	-0.44	-0.09	-0.24	-0.24	-0.37	-0.59	1	0.29	0.18	0.82	0.42	0.12	0.68	-0.27	-0.11	0.14	0.21	0.2	0.39	0.39	0.39	-0.21	-0.4	-0.28	0.02	0.43	-0.39	0.17	0.15	0.03
Camgk	0.19	-0.33	0	0	-0.23	-0.39	-0.2	0.45	-0.87	-0.03	0.29	1	0.99	0.17	0.13	0.13	0.2	-0.84	0.41	-0.26	0.09	0.16	0.21	0.21	0.39	-0.18	-0.32	-0.3	0.25	0.16	-0.33	0.42	0.24	-0.28
Mgk	0.13	-0.34	0.02	0.03	-0.2	-0.39	-0.16	0.47	-0.86	0.06	0.18	0.99	1	0.07	0.08	0.12	0.12	-0.84	0.41	-0.28	0.05	0.15	0.17	0.17	0.36	-0.17	-0.29	-0.29	0.26	0.11	-0.29	0.4	0.22	-0.29
Camg	0.64	0.06	0.01	-0.23	-0.2	0.04	-0.39	0.12	-0.23	-0.88	0.82	0.17	0.07	1	0.57	0.08	0.76	-0.09	0.28	0.24	0.45	0.12	0.49	0.49	0.38	-0.13	-0.38	-0.23	-0.09	0.5	-0.37	0.19	0.18	0
Cec	0.97	-0.04	0.16	-0.16	0.19	0.38	-0.57	0.22	-0.24	-0.51	0.42	0.13	0.08	0.57	1	0.82	0.95	0.04	0.45	0.29	0.72	0.32	0.57	0.57	0.41	-0.34	-0.49	-0.44	0.16	0.42	-0.49	0.27	-0.04	-0.17
Mg	0.81	-0.09	-0.02	-0.15	0.22	0.39	-0.44	0.02	-0.24	0.05	0.12	0.13	0.12	0.08	0.82	1	0.69	0	0.19	0.18	0.52	0.37	0.37	0.37	0.3	-0.39	-0.4	-0.42	0.33	0.18	-0.4	0.22	-0.15	-0.2
Ca	0.98	-0.02	0.03	-0.26	0	0.27	-0.54	0.11	-0.32	-0.62	0.68	0.2	0.12	0.76	0.95	0.69	1	-0.06	0.34	0.27	0.65	0.32	0.59	0.59	0.46	-0.33	-0.52	-0.44	0.13	0.48	-0.52	0.27	0.04	-0.12
K	-0.05	0.27	0.06	-0.06	0.28	0.43	0.08	-0.42	0.95	-0.1	-0.27	-0.84	-0.84	-0.09	0.04	0	-0.06	1	-0.34	0.46	-0.02	-0.06	-0.1	-0.1	-0.27	0.07	0.18	0.18	-0.15	-0.08	0.18	-0.3	-0.18	0.31
Na	0.32	-0.15	0.62	0.32	0.31	0.02	-0.38	0.96	-0.45	-0.45	-0.11	0.41	0.41	0.28	0.45	0.19	0.34	-0.34	1	-0.11	0.56	0	0.35	0.35	0.24	-0.01	-0.21	-0.18	-0.05	0.28	-0.21	0.3	0.07	-0.31
P_bray1	0.27	-0.06	-0.16	-0.05	-0.08	0.51	-0.02	-0.19	0.34	-0.27	0.14	-0.26	-0.28	0.24	0.29	0.18	0.27	0.46	-0.11	1	0.08	-0.05	-0.04	-0.04	-0.15	0.03	0.09	0.15	-0.16	0.01	0.1	-0.3	-0.03	0.02
Ph_kcl	0.66	0.06	0.13	0	0.1	0.22	-0.53	0.41	-0.23	-0.46	0.21	0.09	0.05	0.45	0.72	0.52	0.65	-0.02	0.56	0.08	1	0.25	0.49	0.49	0.23	-0.26	-0.37	-0.32	0.04	0.38	-0.36	0.13	-0.24	-0.27
Density	0.35	0.07	-0.03	-0.2	-0.04	0.1	-0.28	-0.1	-0.16	0.01	0.2	0.16	0.15	0.12	0.32	0.37	0.32	-0.06	0	-0.05	0.25	1	0.52	0.52	0.46	-0.98	-0.75	-0.75	0.81	0.18	-0.75	0.13	-0.08	0.07
Raw	0.57	-0.05	0.08	-0.11	0.02	0.1	-0.39	0.2	-0.26	-0.43	0.39	0.21	0.17	0.49	0.57	0.37	0.59	-0.1	0.35	-0.04	0.49	0.52	1	1	0.79	-0.52	-0.88	-0.7	0.2	0.84	-0.88	0.51	0.01	0.02
Aw	0.57	-0.05	0.08	-0.11	0.02	0.1	-0.39	0.2	-0.26	-0.43	0.39	0.21	0.17	0.49	0.57	0.37	0.59	-0.1	0.35	-0.04	0.49	0.52	1	1	0.79	-0.52	-0.88	-0.7	0.2	0.84	-0.88	0.51	0.01	0.02
Shc	0.44	-0.04	0.01	-0.21	-0.12	-0.13	-0.41	0.15	-0.38	-0.28	0.39	0.39	0.36	0.38	0.41	0.3	0.46	-0.27	0.24	-0.15	0.23	0.46	0.79	0.79	1	-0.45	-0.88	-0.73	0.37	0.7	-0.89	0.72	0.25	0.09
Sat	-0.37	-0.08	0.04	0.22	0.04	-0.12	0.3	0.08	0.18	0	-0.21	-0.18	-0.17	-0.13	-0.34	-0.39	-0.33	0.07	-0.01	0.03	-0.26	-0.98	-0.52	-0.52	-0.45	1	0.76	0.76	-0.82	-0.18	0.76	-0.12	0.07	-0.05
Pwp	-0.52	0	0.02	0.22	0.09	-0.01	0.42	-0.09	0.32	0.27	-0.4	-0.32	-0.29	-0.38	-0.49	-0.4	-0.52	0.18	-0.21	0.09	-0.37	-0.75	-0.88	-0.88	-0.88	0.76	1	0.87	-0.52	-0.71	1	-0.55	-0.04	-0.09
Fc	-0.46	-0.05	-0.03	0.19	0.05	-0.06	0.43	-0.08	0.31	0.13	-0.28	-0.3	-0.29	-0.23	-0.44	-0.42	-0.44	0.18	-0.18	0.15	-0.32	-0.75	-0.7	-0.7	-0.73	0.76	0.87	1	-0.61	-0.48	0.87	-0.5	-0.04	-0.04
Sand	0.19	0.03	0.03	-0.24	0.01	-0.04	-0.31	-0.08	-0.2	0.23	0.02	0.25	0.26	-0.09	0.16	0.33	0.13	-0.15	-0.05	-0.16	0.04	0.81	0.2	0.2	0.37	-0.82	-0.52	-0.61	1	-0.23	-0.53	0.3		0.06
Slik	0.44	-0.02	-0.04	-0.06	-0.11	0.03	-0.22	0.17	-0.21	-0.5	0.43	0.16	0.11	0.5	0.42	0.18	0.48	-0.08	0.28	0.01	0.38	0.18	0.84	0.84	0.7	-0.18	-0.71	-0.48	-0.23	1	-0.7	0.4	-0.08	0.05
Kleipslik	-0.52	0	0.02	0.23	0.08	0	0.43	-0.09	0.33	0.26	-0.39	-0.33	-0.29	-0.37	-0.49	-0.4	-0.52	0.18	-0.21	0.1	-0.36	-0.75	-0.88	-0.88	-0.89	0.76	1	0.87	-0.53	-0.7	1	-0.57	-0.05	-0.09
C	0.27	-0.17	0.14	-0.14	0.05	-0.2	-0.41	0.27	-0.37	-0.16	0.17	0.42	0.4	0.19	0.27	0.22	0.27	-0.3	0.3	-0.3	0.13	0.13	0.51	0.51	0.72	-0.12	-0.55	-0.5	0.3	0.4	-0.57	1	0.32	0.09
Elevation	0	0.17	0.01	-0.11	-0.3	-0.34	-0.34	0.11	-0.15	-0.15	0.15	0.24	0.22	0.18	-0.04	-0.15	0.04	-0.18	0.07	-0.03	-0.24	-0.08	0.01	0.01	0.25	0.07	-0.04	-0.04	0.15	-0.08	-0.05	0.32	1	0.02
Ndvi	-0.15	0.13	0.07	-0.19	0.09	-0.01	0.22	-0.33	0.33	0.01	0.03	-0.28	-0.29	0	-0.17	-0.2	-0.12	0.31	-0.31	0.02	-0.27	0.07	0.02	0.02	0.09	-0.05	-0.09	-0.04	0.06	0.05	-0.09	0.09	0.02	1

Highest Values on Correlation Matrix on whole field

Variables	Fe	Cu	Na %	K %	Ca+Mg/k	Mg/k	K	Na
Ndvi	-0.19	0.22	-0.33	0.33	-0.28	-0.29	0.31	-0.31

Area of Interest



Correlation Matrix on Area of Interest

Variables	Capmg	B	S	Fe	Mn	Zn	Cu	Na_prs	K_prs	Mg_prs	Ca_prs	Camgk	Mgk	Camg	Cec	Mg	Ca	K	Na	P_bray1	Ph_kcl	Density	Raw	Aw	Shc	Sat	Pwp	Fc	Sand	Slik	Clay	C	Elevation	Ndvi
Capmg	1	0.21	-0.63	-0.53	0.04	0.05	-0.89	-0.38	-0.4	-0.38	0.74	0.31	0.24	0.69	0.99	0.96	1	-0.09	0.07	0.22	0.76	0.52	0.77	0.77	0.59	-0.56	-0.78	-0.73	0.43	0.8	-0.78	0.63	-0.45	0
B	0.21	1	-0.41	-0.23	0.19	-0.16	-0.22	-0.43	0.16	-0.42	0.46	-0.16	-0.24	0.42	0.17	0.07	0.25	0.22	-0.32	-0.28	0.22	0.2	0.3	0.3	-0.12	-0.22	-0.14	-0.11	-0.12	0.27	-0.14	0.07	-0.23	0.04
S	-0.63	-0.41	1	0.85	0.15	0.28	0.58	0.85	0.04	0.08	-0.74	-0.15	-0.08	-0.56	-0.55	-0.58	-0.63	-0.13	0.6	0.16	-0.5	-0.43	-0.62	-0.62	-0.47	0.48	0.62	0.57	-0.35	-0.63	0.62	-0.45	0.41	-0.28
Fe	-0.53	-0.23	0.85	1	0.27	0.36	0.56	0.79	-0.04	-0.15	-0.53	0	0.06	-0.36	-0.47	-0.54	-0.51	-0.18	0.57	0.04	-0.32	-0.31	-0.38	-0.38	-0.4	0.35	0.47	0.45	-0.32	-0.45	0.47	-0.39	0.51	-0.25
Mn	0.04	0.19	0.15	0.27	1	0.72	0.15	0.01	0.35	-0.38	-0.04	-0.34	-0.36	0.02	0.08	-0.02	0.06	0.35	0.1	-0.21	-0.04	0.15	0.03	0.03	-0.26	-0.16	0.1	0.12	-0.15	-0.04	0.1	-0.43	0.04	-0.16
Zn	0.05	-0.16	0.28	0.36	0.72	1	0.18	0.04	0.24	0.05	-0.21	-0.34	-0.32	-0.25	0.1	0.12	0.03	0.28	0.08	0.23	-0.2	0.32	-0.12	-0.12	-0.27	-0.32	0.11	0.08	0.05	-0.2	0.12	-0.56	0.15	-0.2
Cu	-0.89	-0.22	0.58	0.56	0.15	0.18	1	0.29	0.22	0.35	-0.55	-0.12	-0.05	-0.55	-0.91	-0.88	-0.87	-0.09	-0.13	-0.22	-0.86	-0.47	-0.76	-0.76	-0.57	0.51	0.74	0.71	-0.43	-0.75	0.74	-0.71	0.69	0.04
Na_prs	-0.38	-0.43	0.85	0.79	0.01	0.04	0.29	1	-0.2	-0.23	-0.55	0.08	0.13	-0.27	-0.29	-0.37	-0.37	-0.29	0.89	0.21	-0.09	-0.58	-0.32	-0.32	-0.26	0.62	0.44	0.45	-0.45	-0.31	0.44	-0.09	0.36	-0.45
K_prs	-0.4	0.16	0.04	-0.04	0.35	0.24	0.22	-0.2	1	0.16	-0.55	-0.92	-0.91	-0.52	-0.33	-0.32	-0.42	0.94	-0.32	-0.21	-0.14	0.09	-0.24	-0.24	-0.5	-0.08	0.34	0.32	-0.16	-0.36	0.34	-0.57	-0.32	0
Mg_prs	-0.38	-0.42	0.08	-0.15	-0.38	0.05	0.35	-0.23	0.16	1	-0.43	-0.1	0	-0.68	-0.4	-0.16	-0.45	0.05	-0.46	0.02	-0.53	0.15	-0.32	-0.32	0.09	-0.12	0.07	-0.01	0.35	-0.31	0.06	-0.21	0.27	0.12
Ca_prs	0.74	0.46	-0.74	-0.53	-0.04	-0.21	-0.55	-0.55	-0.55	-0.43	1	0.55	0.46	0.89	0.64	0.58	0.79	-0.38	-0.27	-0.05	0.43	0.32	0.57	0.57	0.47	-0.38	-0.59	-0.55	0.28	0.63	-0.59	0.53	-0.22	0.18
Camgk	0.31	-0.16	-0.15	0	-0.34	-0.34	-0.12	0.08	-0.92	-0.1	0.55	1	0.99	0.48	0.23	0.23	0.33	-0.89	0.16	-0.05	0.11	-0.08	0.3	0.3	0.56	0.07	-0.38	-0.36	0.18	0.42	-0.39	0.61	0.37	0.16
Mgk	0.24	-0.24	-0.08	0.06	-0.36	-0.32	-0.05	0.13	-0.91	0	0.46	0.99	1	0.38	0.15	0.17	0.25	-0.9	0.17	-0.04	0.04	-0.1	0.24	0.24	0.55	0.09	-0.34	-0.33	0.2	0.36	-0.35	0.57	0.43	0.14
Camg	0.69	0.42	-0.56	-0.36	0.02	-0.25	-0.55	-0.27	-0.52	-0.68	0.89	0.48	0.38	1	0.62	0.49	0.75	-0.36	0.02	0.02	0.54	0.12	0.53	0.53	0.37	-0.17	-0.47	-0.4	0.07	0.6	-0.46	0.53	-0.23	0.08
Cec	0.99	0.17	-0.55	-0.47	0.08	0.1	-0.91	-0.29	-0.33	-0.4	0.64	0.23	0.15	0.62	1	0.97	0.98	-0.01	0.17	0.25	0.8	0.51	0.77	0.77	0.56	-0.54	-0.75	-0.71	0.39	0.78	-0.75	0.61	-0.48	-0.05
Mg	0.96	0.07	-0.58	-0.54	-0.02	0.12	-0.88	-0.37	-0.32	-0.16	0.58	0.23	0.17	0.49	0.97	1	0.93	0	0.06	0.27	0.72	0.59	0.75	0.75	0.64	-0.62	-0.8	-0.77	0.53	0.76	-0.8	0.6	-0.44	-0.02
Ca	1	0.25	-0.63	-0.51	0.06	0.03	-0.87	-0.37	-0.42	-0.45	0.79	0.33	0.25	0.75	0.98	0.93	1	-0.12	0.08	0.2	0.76	0.49	0.76	0.76	0.57	-0.53	-0.76	-0.71	0.39	0.8	-0.76	0.63	-0.45	0.01
K	-0.09	0.22	-0.13	-0.18	0.35	0.28	-0.09	-0.29	0.94	0.05	-0.38	-0.89	-0.9	-0.36	-0.01	0	-0.12	1	-0.26	-0.11	0.15	0.27	0.03	0.03	-0.33	-0.27	0.09	0.09	-0.04	-0.11	0.09	-0.37	-0.51	-0.01
Na	0.07	-0.32	0.6	0.57	0.1	0.08	-0.13	0.89	-0.32	-0.46	-0.27	0.16	0.17	0.02	0.17	0.06	0.08	-0.26	1	0.29	0.3	-0.38	0.04	0.04	-0.02	0.41	0.11	0.15	-0.32	0.06	0.11	0.19	0.12	-0.34
P_bray1	0.22	-0.28	0.16	0.04	-0.21	0.23	-0.22	0.21	-0.21	0.02	-0.05	-0.05	-0.04	0.02	0.25	0.27	0.2	-0.11	0.29	1	0.07	-0.18	-0.21	-0.21	-0.18	0.16	0.18	0.2	-0.14	-0.16	0.18	-0.07	-0.12	-0.22
Ph_kcl	0.76	0.22	-0.5	-0.32	-0.04	-0.2	-0.86	-0.09	-0.14	-0.53	0.43	0.11	0.04	0.54	0.8	0.72	0.76	0.15	0.3	0.07	1	0.3	0.85	0.85	0.56	-0.32	-0.7	-0.62	0.22	0.82	-0.7	0.71	-0.5	-0.03
Density	0.52	0.2	-0.43	-0.31	0.15	0.32	-0.47	-0.58	0.09	0.15	0.32	-0.08	-0.1	0.12	0.51	0.59	0.49	0.27	-0.38	-0.18	0.3	1	0.55	0.55	0.45	-0.98	-0.71	-0.77	0.82	0.44	-0.7	0.19	-0.38	0.03
Raw	0.77	0.3	-0.62	-0.38	0.03	-0.12	-0.76	-0.32	-0.24	-0.32	0.57	0.3	0.24	0.53	0.77	0.75	0.76	0.03	0.04	-0.21	0.85	0.55	1	1	0.78	-0.57	-0.92	-0.86	0.47	0.97	-0.92	0.78	-0.31	0.07
Aw	0.77	0.3	-0.62	-0.38	0.03	-0.12	-0.76	-0.32	-0.24	-0.32	0.57	0.3	0.24	0.53	0.77	0.75	0.76	0.03	0.04	-0.21	0.85	0.55	1	1	0.78	-0.57	-0.92	-0.86	0.47	0.97	-0.92	0.78	-0.31	0.07
Shc	0.59	-0.12	-0.47	-0.4	-0.26	-0.27	-0.57	-0.26	-0.5	0.09	0.47	0.56	0.55	0.37	0.56	0.64	0.57	-0.33	-0.02	-0.18	0.56	0.45	0.78	0.78	1	-0.46	-0.9	-0.88	0.7	0.8	-0.91	0.84	-0.05	0.09
Sat	-0.56	-0.22	0.48	0.35	-0.16	-0.32	0.51	0.62	-0.08	-0.12	-0.38	0.07	0.09	-0.17	-0.54	-0.62	-0.53	-0.27	0.41	0.16	-0.32	-0.98	-0.57	-0.57	-0.46	1	0.73	0.78	-0.83	-0.46	0.72	-0.2	0.43	-0.04
Pwp	-0.78	-0.14	0.62	0.47	0.1	0.11	0.74	0.44	0.34	0.07	-0.59	-0.38	-0.34	-0.47	-0.75	-0.8	-0.76	0.09	0.11	0.18	-0.7	-0.71	-0.92	-0.92	-0.9	0.73	1	0.98	-0.74	-0.9	1	-0.78	0.3	-0.09
Fc	-0.73	-0.11	0.57	0.45	0.12	0.08	0.71	0.45	0.32	-0.01	-0.55	-0.36	-0.33	-0.4	-0.71	-0.77	-0.71	0.09	0.15	0.2	-0.62	-0.77	-0.86	-0.86	-0.88	0.78	0.98	1	-0.83	-0.82	0.98	-0.73	0.32	-0.1
Sand	0.43	-0.12	-0.35	-0.32	-0.15	0.05	-0.43	-0.45	-0.16	0.35	0.28	0.18	0.2	0.07	0.39	0.53	0.39	-0.04	-0.32	-0.14	0.22	0.82	0.47	0.47	0.7	-0.83	-0.74	-0.83	1	0.39	-0.75	0.39	-0.28	0.06
Slik	0.8	0.27	-0.63	-0.45	-0.04	-0.2	-0.75	-0.31	-0.36	-0.31	0.63	0.42	0.36	0.6	0.78	0.76	0.8	-0.11	0.06	-0.16	0.82	0.44	0.97	0.97	0.8	-0.46	-0.9	-0.82	0.39	1	-0.9	0.83	-0.23	0.1
Kleipslik	-0.78	-0.14	0.62	0.47	0.1	0.12	0.74	0.44	0.34	0.06	-0.59	-0.39	-0.35	-0.46	-0.75	-0.8	-0.76	0.09	0.11	0.18	-0.7	-0.7	-0.92	-0.92	-0.91	0.72	1	0.98	-0.75	-0.9	1	-0.79	0.29	-0.1
C	0.63	0.07	-0.45	-0.39	-0.43	-0.56	-0.71	-0.09	-0.57	-0.21	0.53	0.61	0.57	0.53	0.61	0.6	0.63	-0.37	0.19	-0.07	0.71	0.19	0.78	0.78	0.84	-0.2	-0.78	-0.73	0.39	0.83	-0.79	1	-0.23	0.14
Elevation	-0.45	-0.23	0.41	0.51	0.04	0.15	0.69	0.36	-0.32	0.27	-0.22	0.37	0.43	-0.23	-0.48	-0.44	-0.45	-0.51	0.12	-0.12	-0.5	-0.38	-0.31	-0.31	-0.05	0.43	0.3	0.32	-0.28	-0.23	0.29	-0.23	1	-0.05
Ndvi	0	0.04	-0.28	-0.25	-0.16	-0.2	0.04	-0.45	0	0.12	0.18	0.16	0.14	0.08	-0.05	-0.02	0.01	-0.01	-0.34	-0.22	-0.03	0.03	0.07	0.07	0.09	-0.04	-0.09	-0.1	0.06	0.1	-0.1	0.14	-0.05	1

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PRECISION AERIAL CROP SCIENCE

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Precision Farming/Presisie Boerdery

Highest value in Correlation Matrix on Area of interest

Variables	Fe	Na_prs	Na
Ndvi	-0.25	-0.45	-0.34

Statistically Na% has the biggest influence on the NDVI value on the area of interest

Ground Truthing

Tools needed for Ground Truthing

- Geo-referenced NDVI image on a mobile device
- Reference data and image layers
- Ability to save observations on the field to a database
- Database should be available to all role players to give input

Mobile Device Supported Geo-referenced Data Management

iCropTrak App

- ❑ Management Data
- ❑ GIS reference data
- ❑ Scouting data

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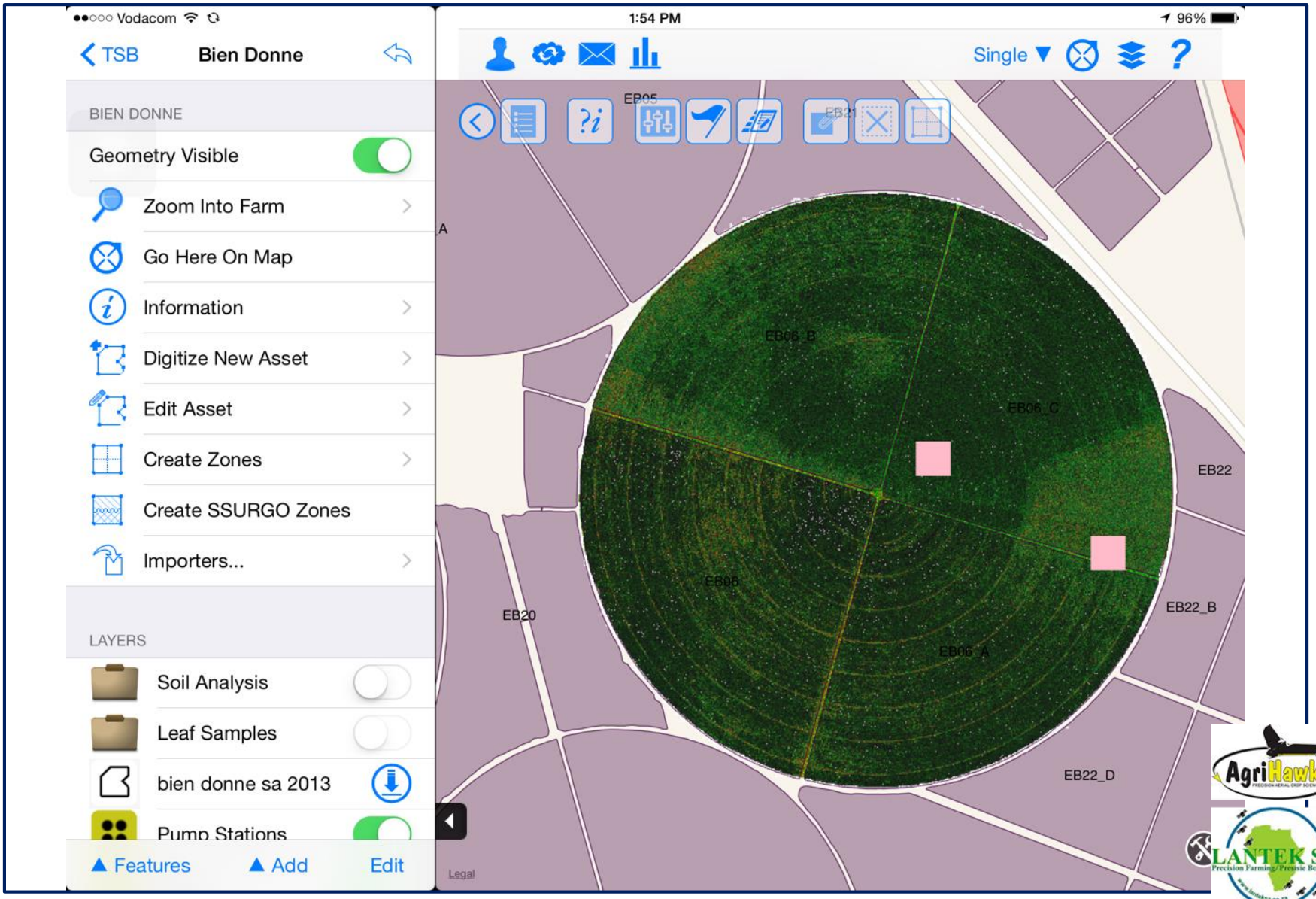
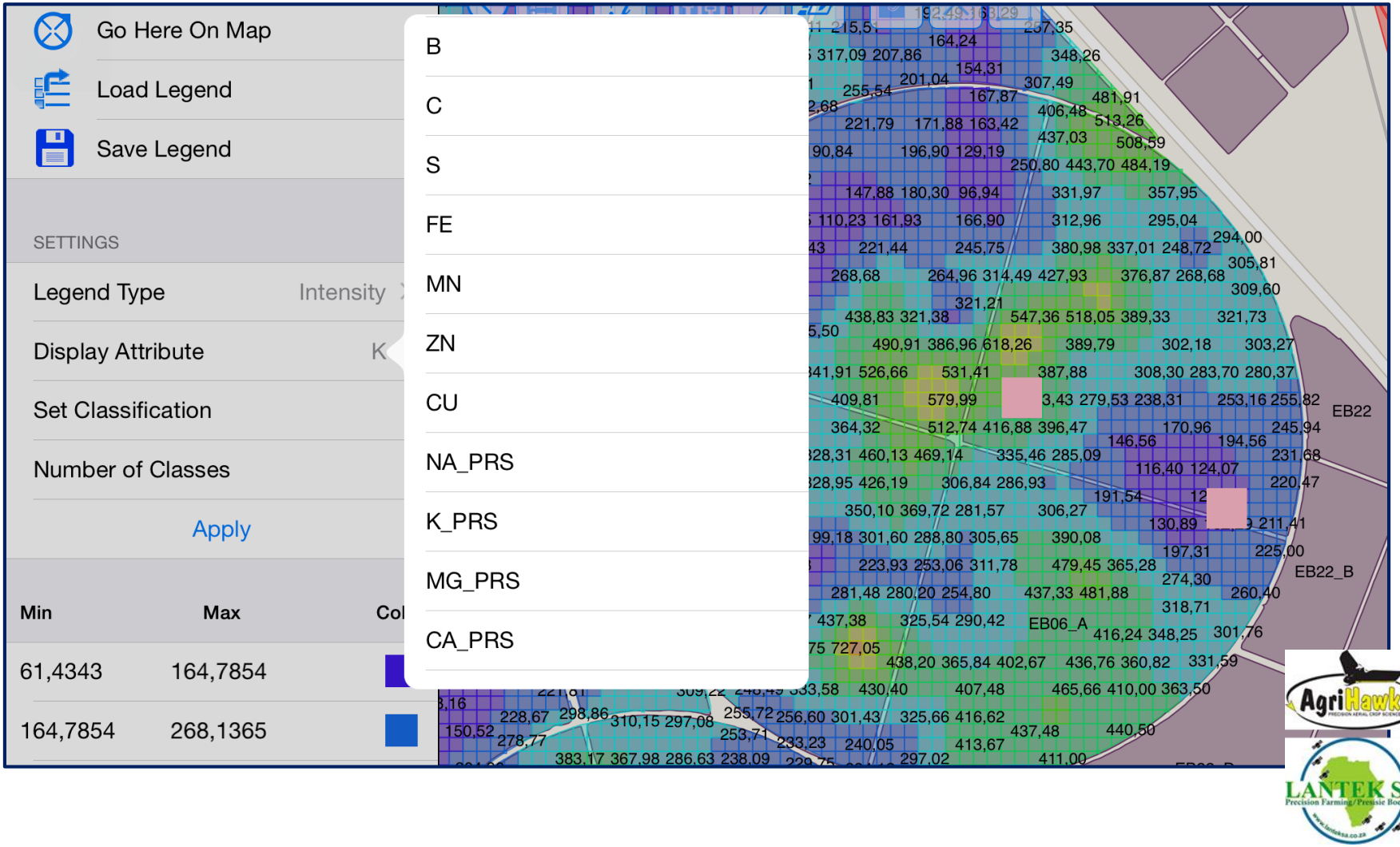
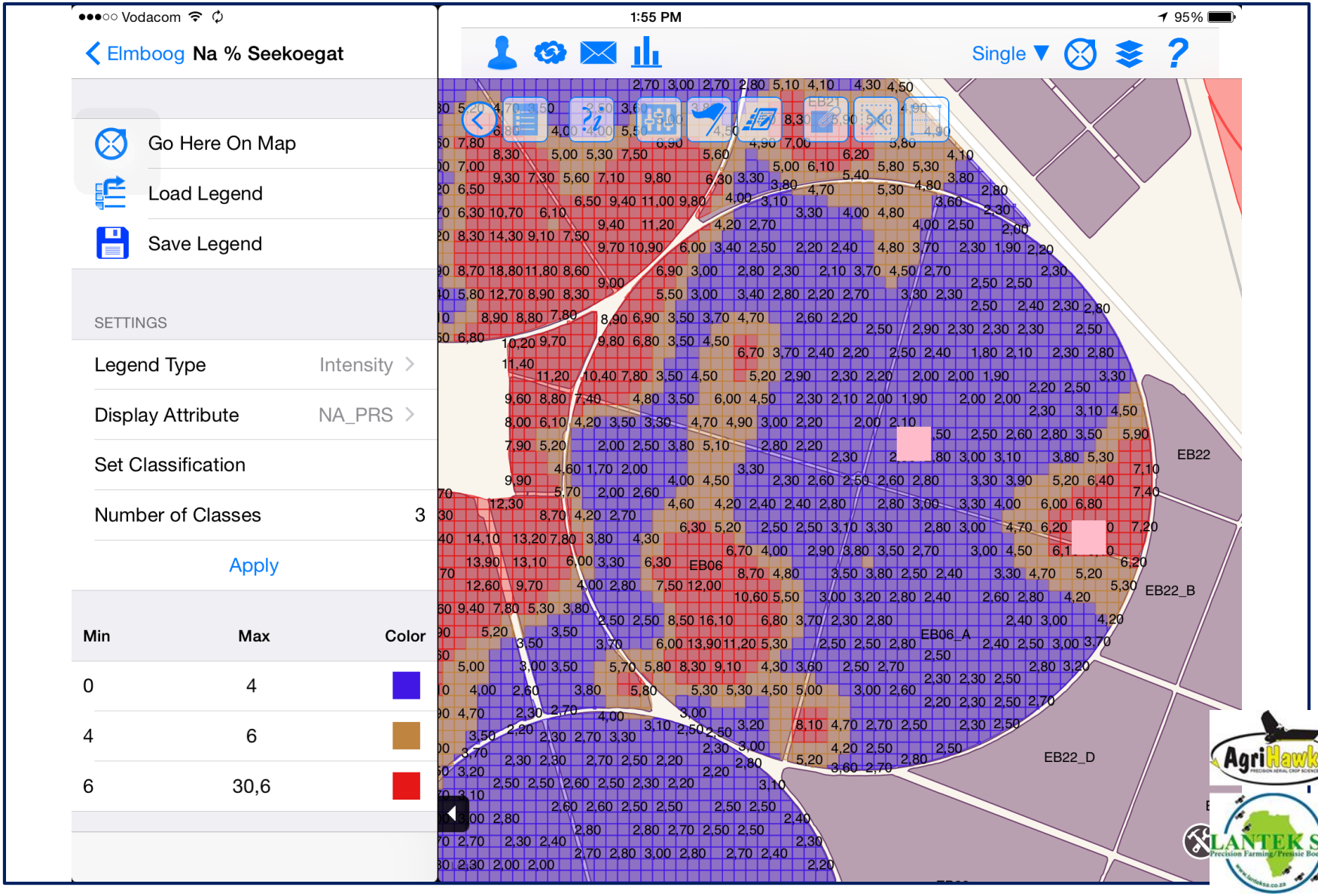
NDVI on Mobile Device



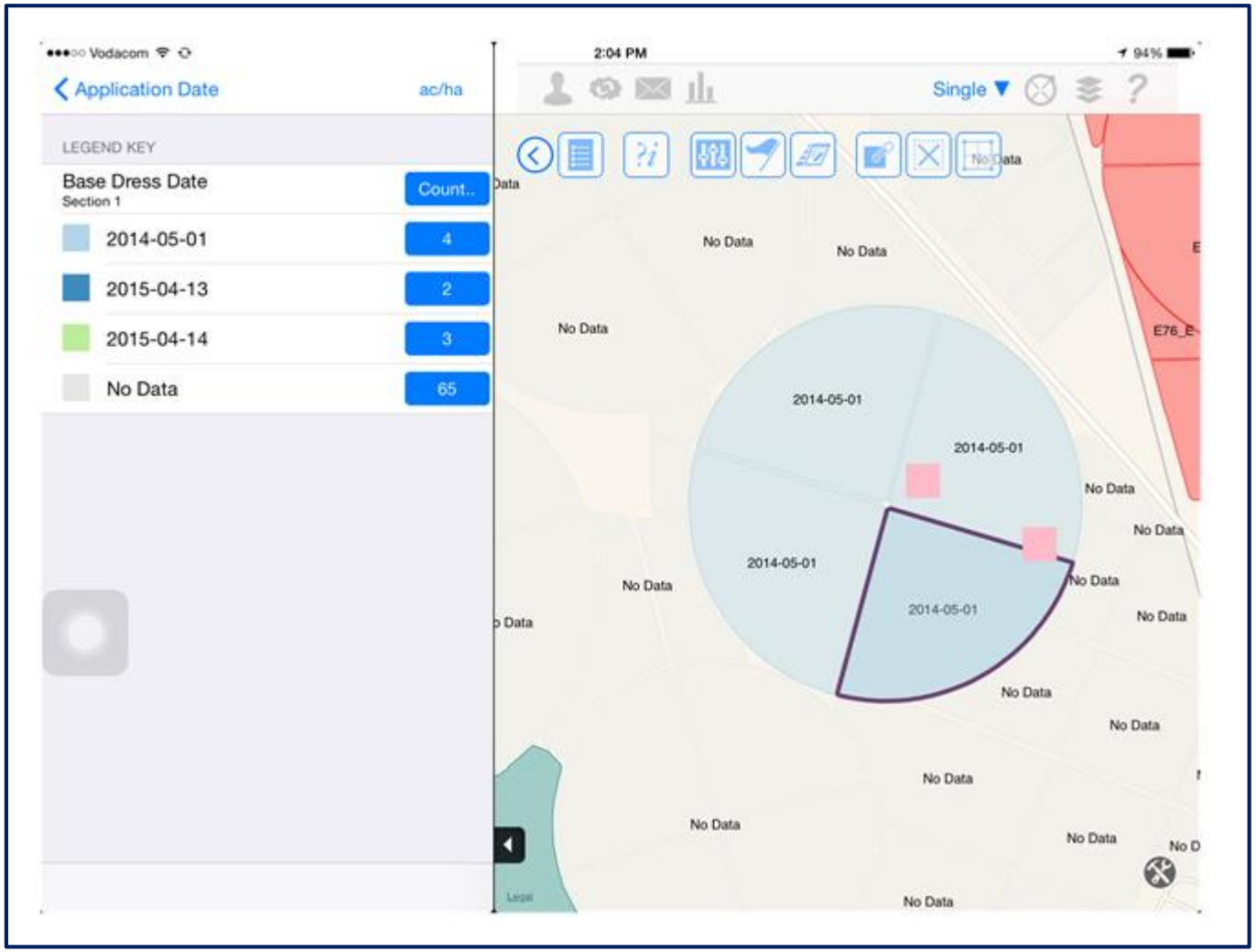
Different Nutrient Layers on Mobile Device



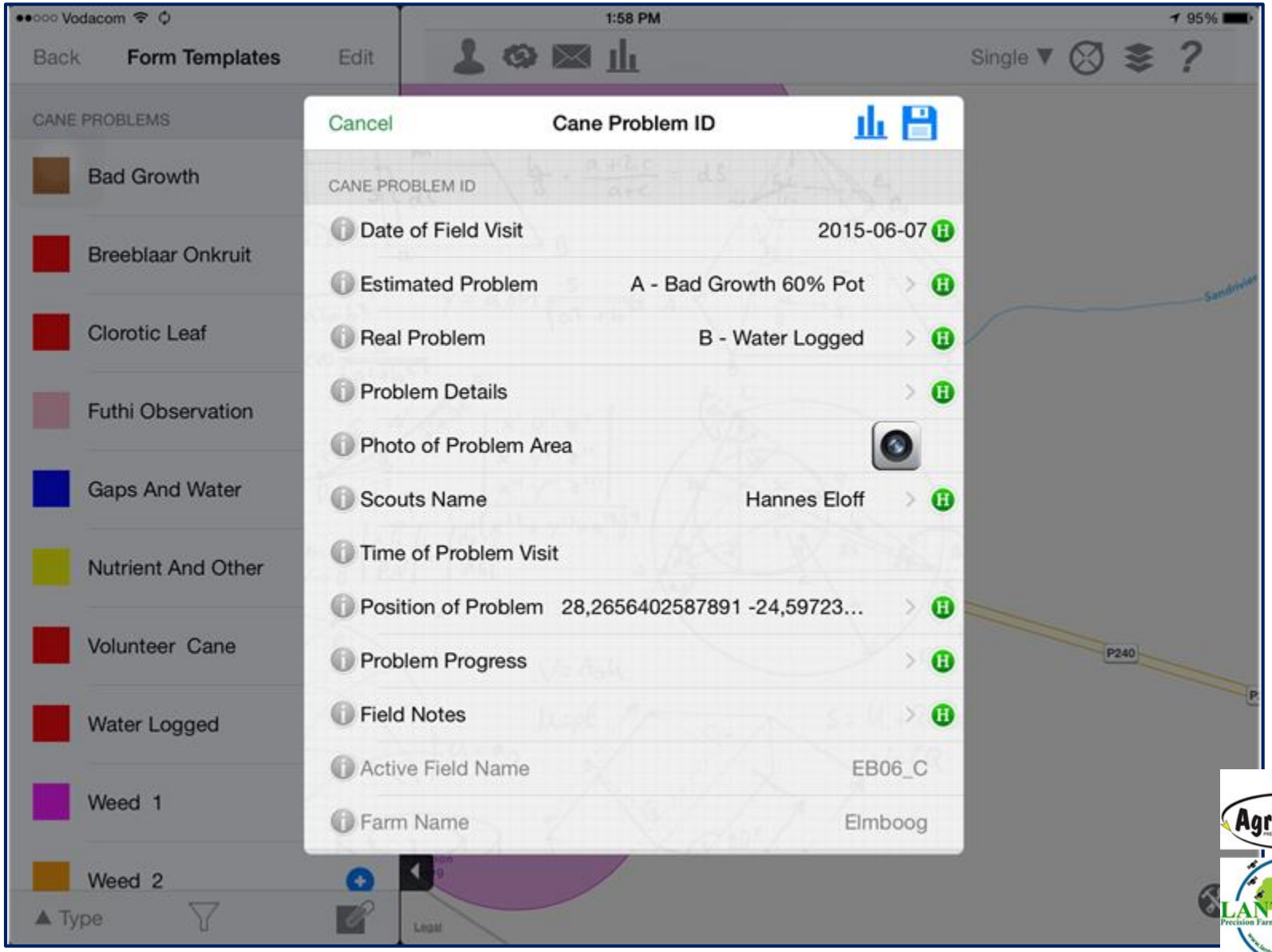
Na% Layer on Mobile Device



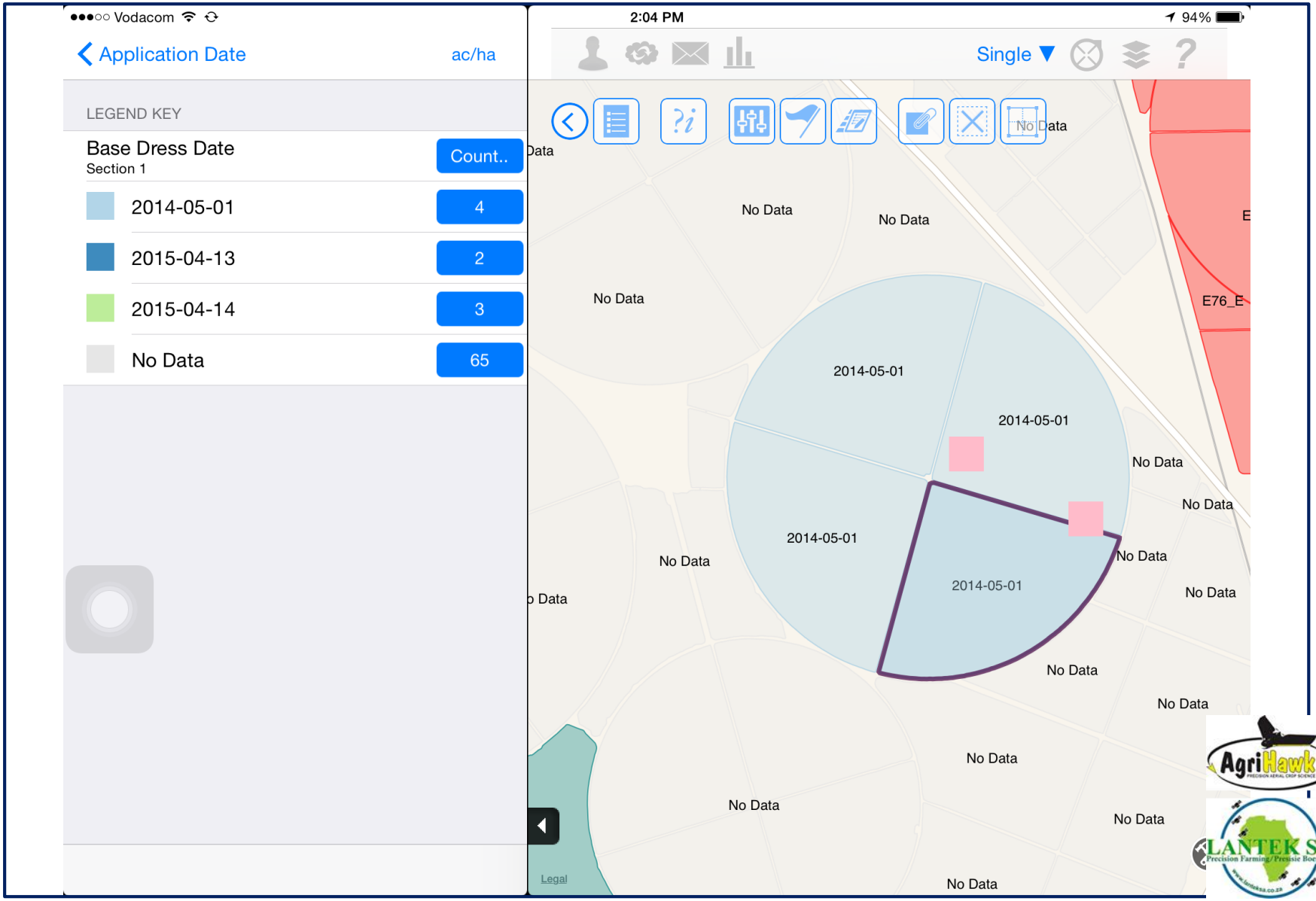
Check Application Date



Scouting Form on the Field



Shows Scouting Icon on the Field



Outcome

The problem was identified using

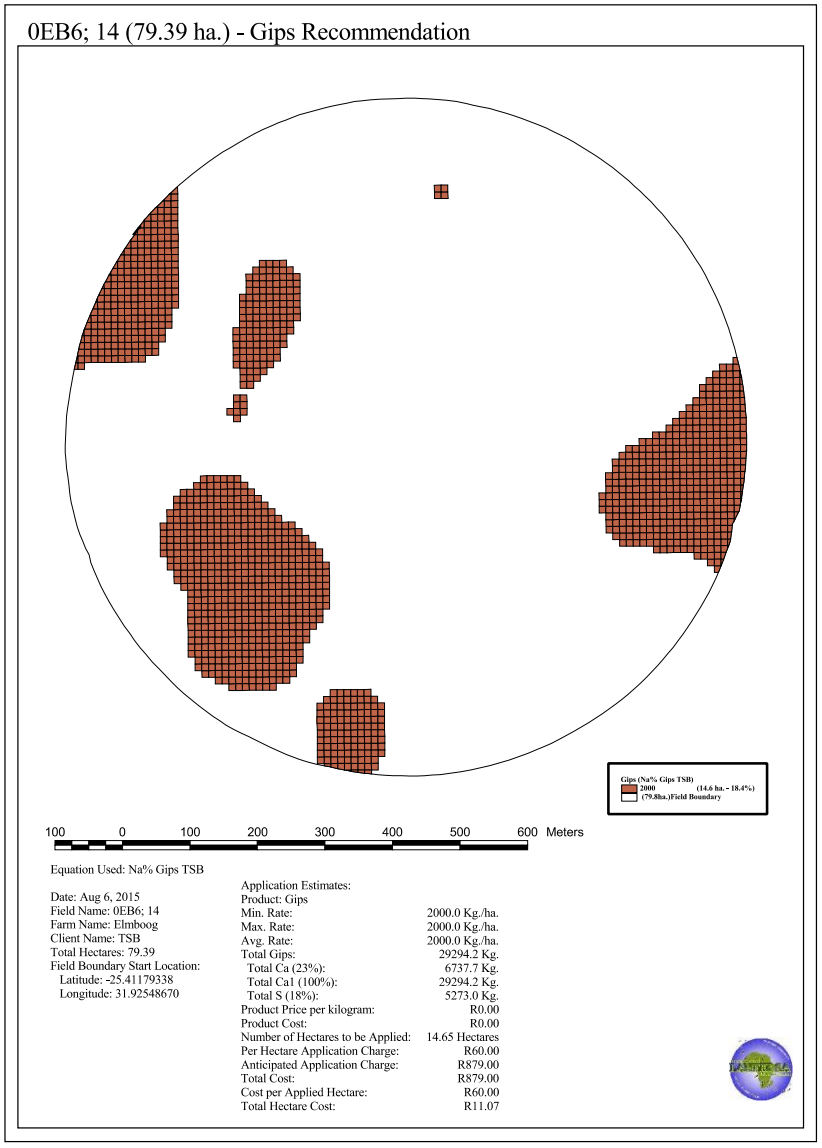
- ❑ Visual identification
- ❑ Statistical evaluation
- ❑ Ground truthing

Soil salinity

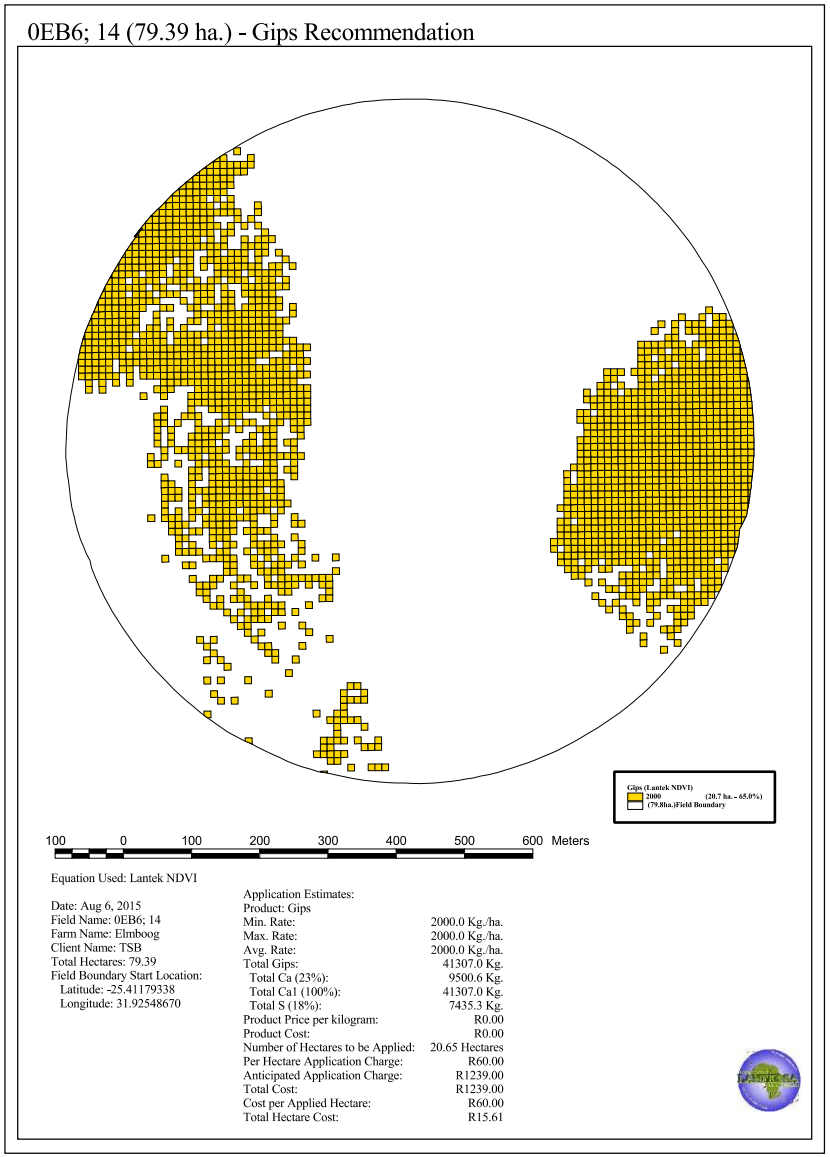
Practical Usage of Information

- Subsurface drainage
- Variable rate application of Gypsum
- Variable rate irrigation
- Variable rate application of nutrients such as N

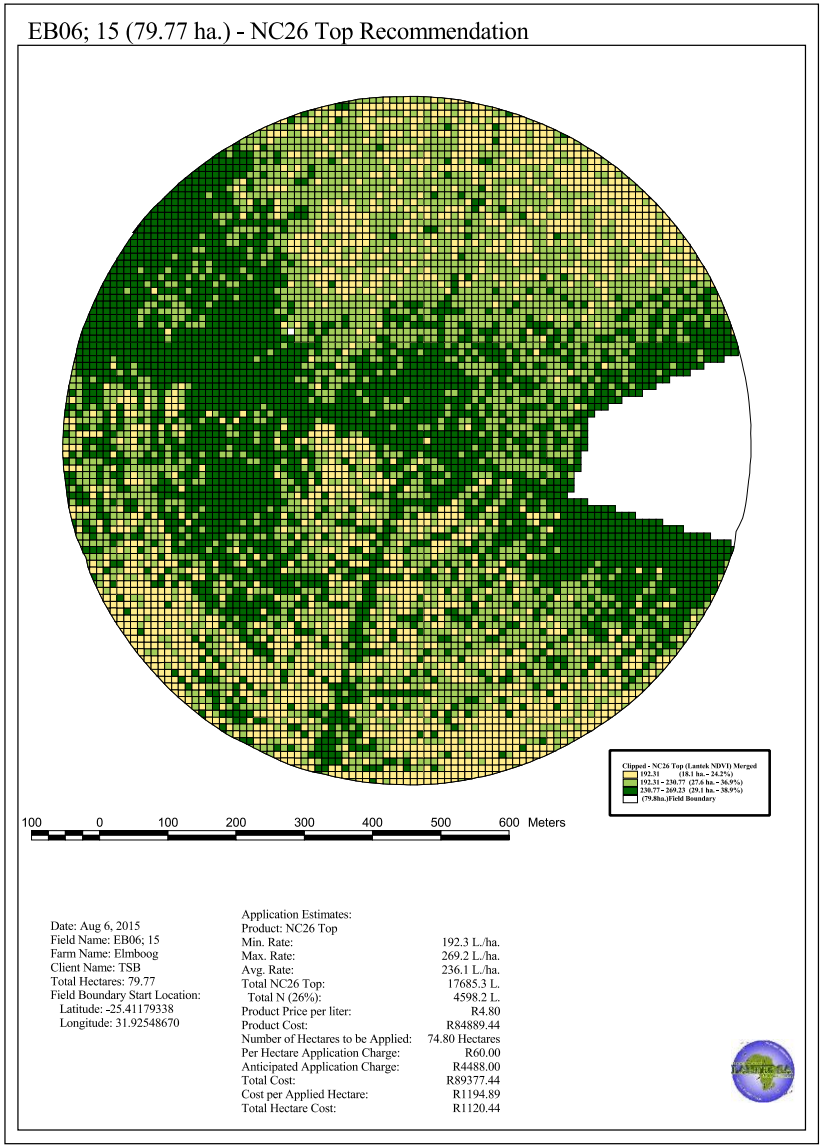
VRA of Gypsum from Soil Data

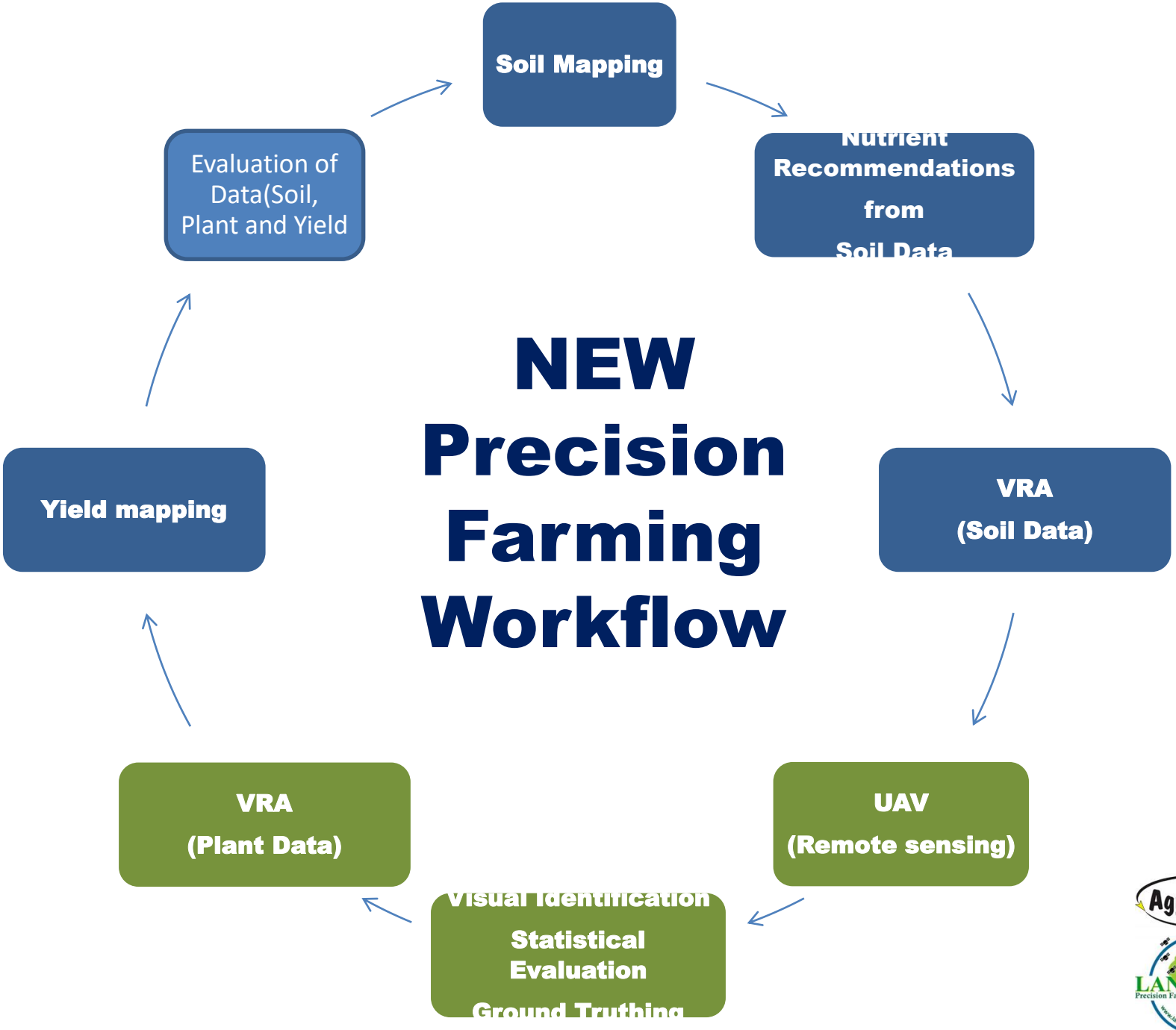


VRA of Gypsum from NDVI Data



VRA of N from NDVI data




Soil Mapping
Nutrient Recommendations from Soil Data
VRA (Soil Data)
UAV (Remote sensing)
Visual Identification
Statistical Evaluation
Ground Truthing
VRA (Plant Data)
Yield mapping
Evaluation of Data(Soil, Plant and Yield
NEW Precision Farming Workflow

Conclusion

Advantages of the use of UAV's in Precision Farming

- Provides in season information about plant growth and health
- Substantiates soil data
- Helps to identify physical problems in fields
- Delineates different plant growth boundaries
- Gives validated data to use in statistical analysis
- Gives a geo-referenced base from which to do variable rate recommendations and applications


Questions
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PRECISION AERIAL CROP SCIENCE
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