Profit mapping as decision support tool for precision agriculture

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Introduction

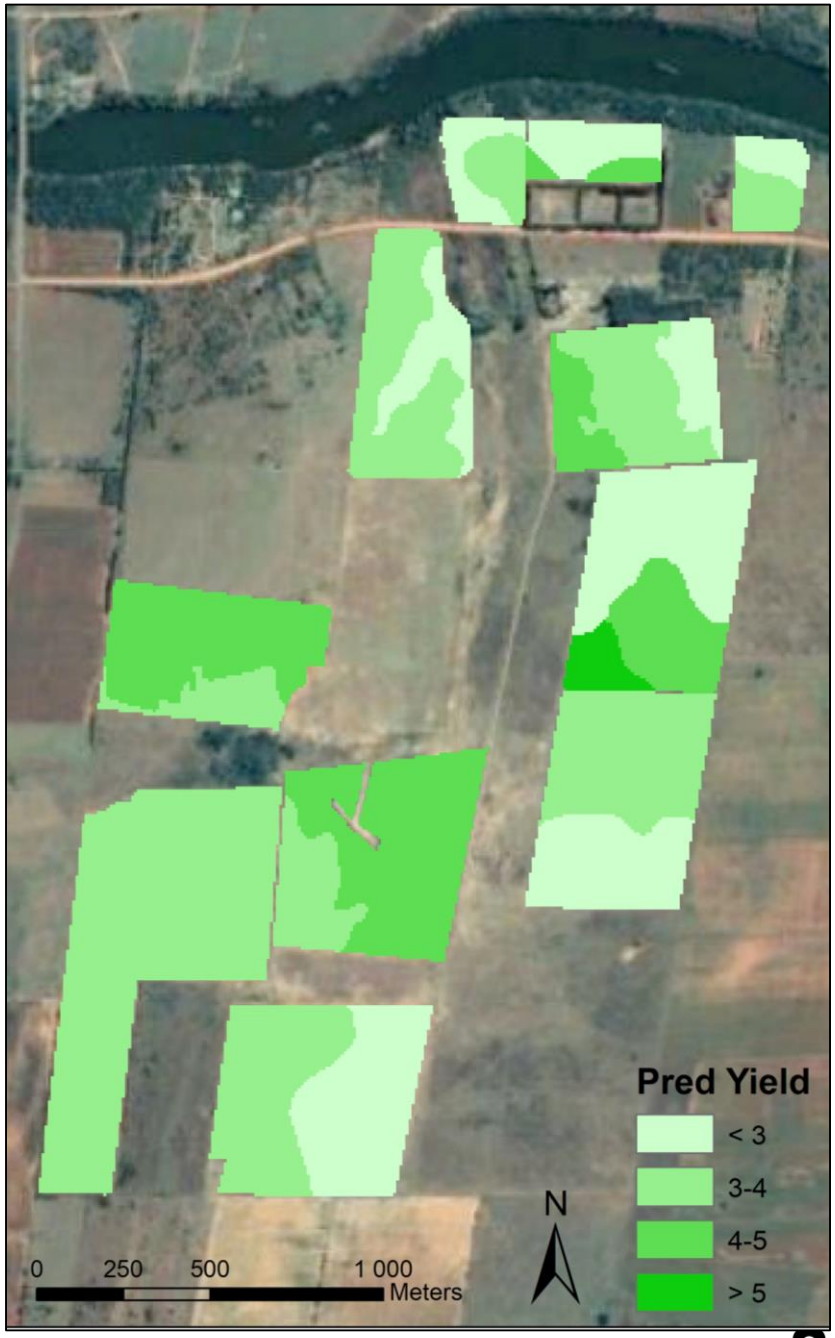
- Precision Agriculture allows for site specific agricultural management
- Optimizing agricultural inputs
- Ton/ha vs $/ha

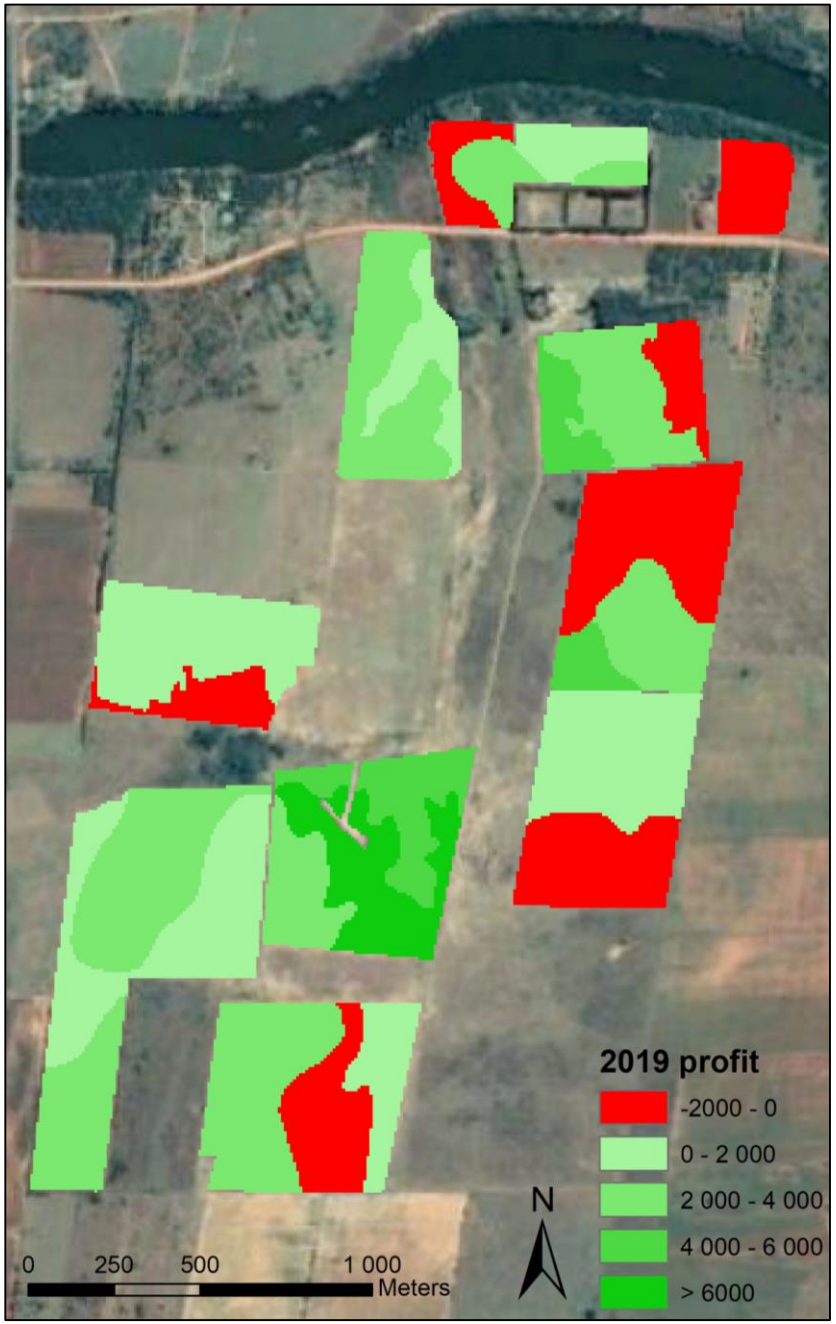
Site

243 ha
MAP = 600 mm
Crop = Maize
Dryland
POLOKWANE
MBOMBELA
MMABATHO
Farm
JOHANNESBURG
UPINGTON
BLOEMFONTEIN
PIETERMARITZBURG
BISHO
CAPE TOWN
Farm
SASOLBURG
BOTHAVILLE
VREDE
KROONSTAD
WELKOM
BETHLEHEM
BLOEMFONTEIN
LADYBRAND

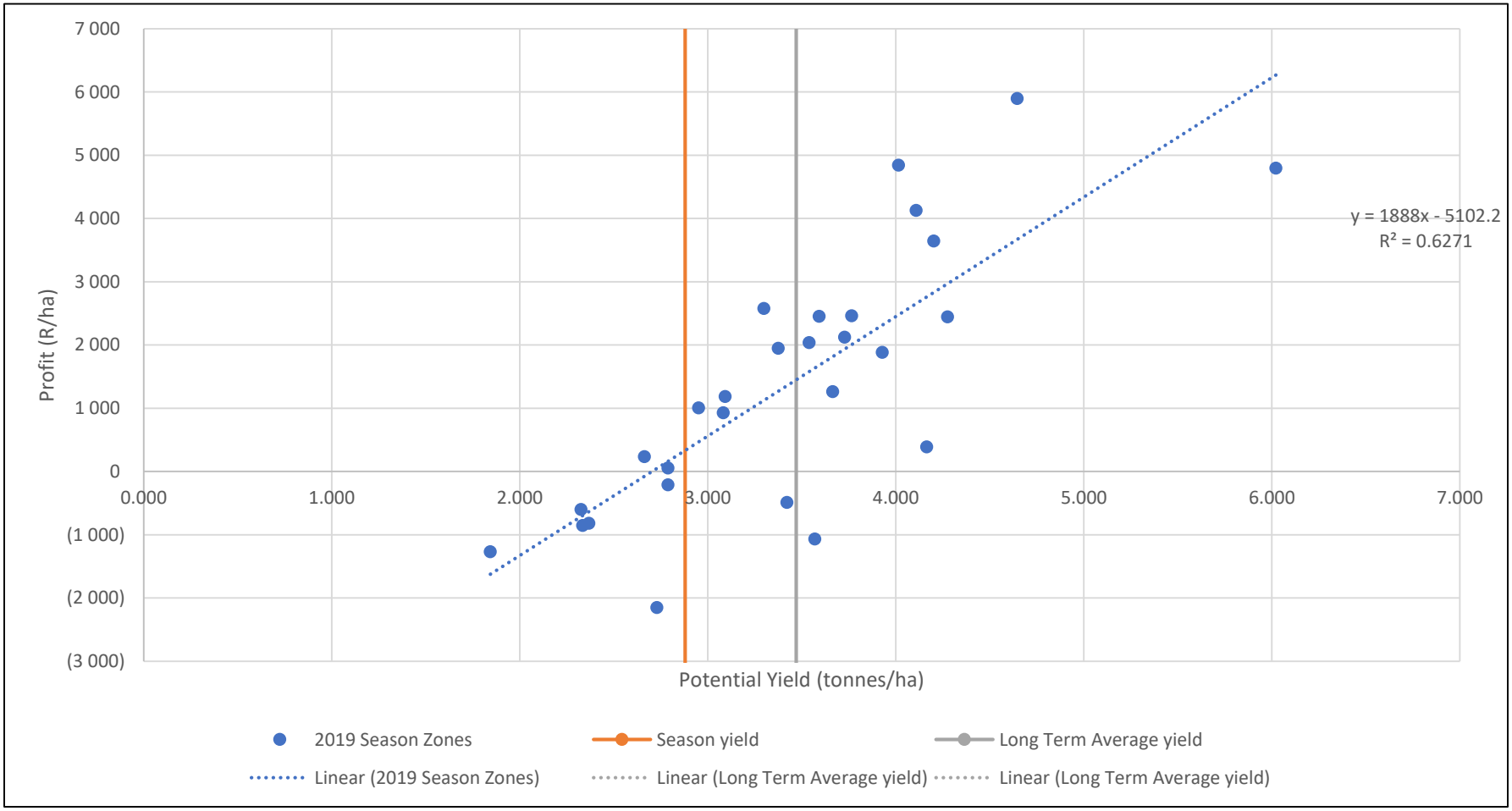
Methodology

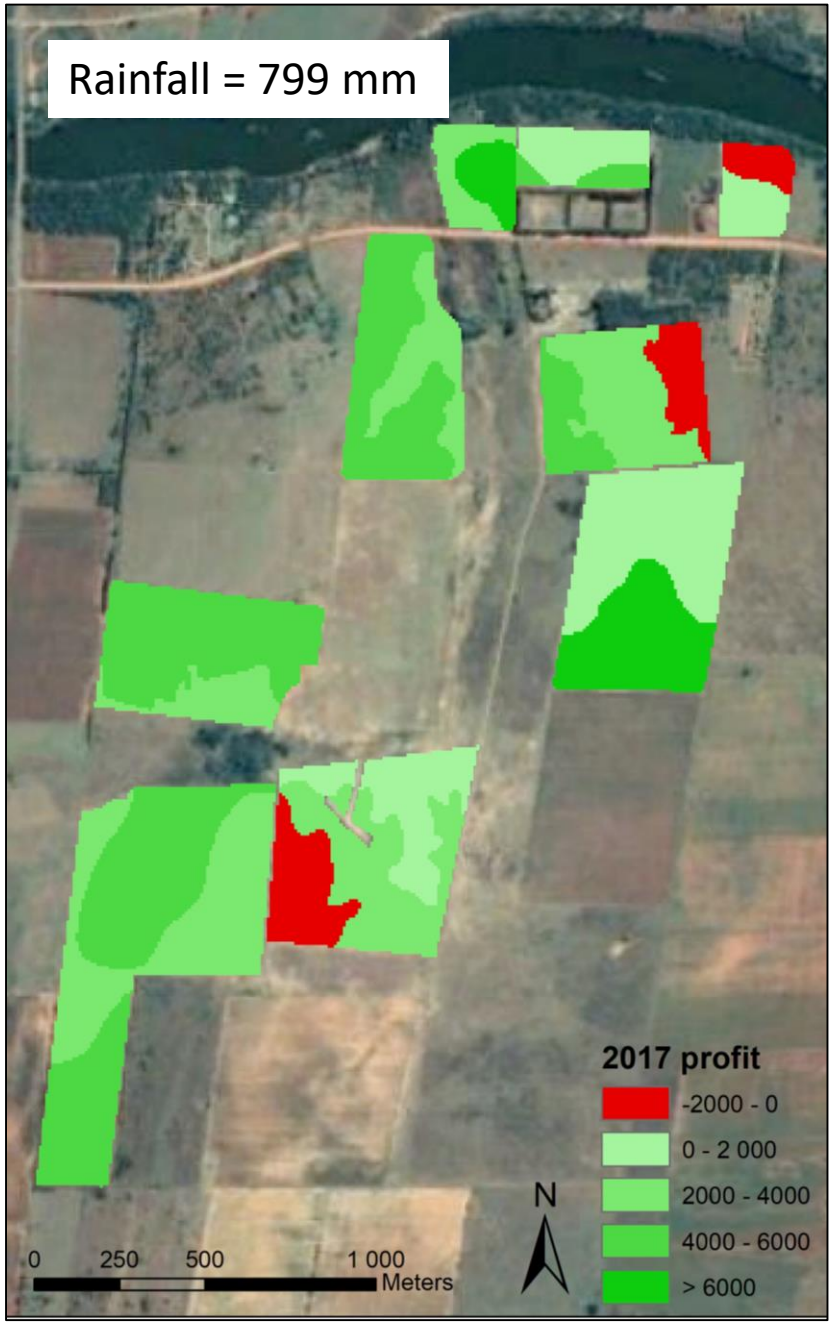
- Seed and Treatment
  - Seed, Trichoderma, Mice repellant
- Fertilizer
  - Products, Soil Sampling
- Herbicide
- Fuel
- Fixed Costs (R2500)
  - Labour, Mechanization, living expense
- Income, Yield per ha X Price
- 3 Maize seasons 2017, 2018, 2019

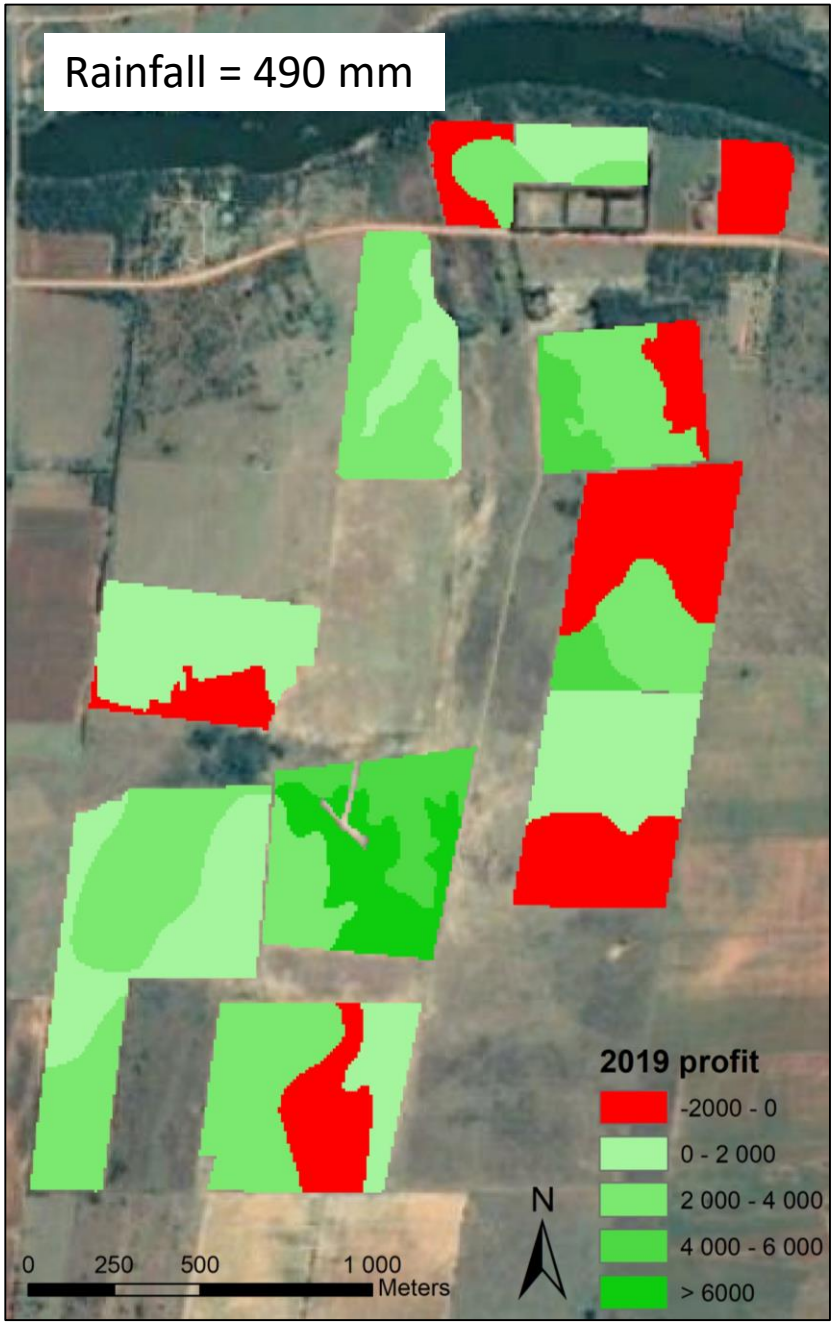

Pred Yield
< 3
3-4
4-5
> 5
N
0 250 500 1 000
Meters


2019 profit
-2000 - 0
0 - 2 000
2 000 - 4 000
4 000 - 6 000
> 6000
N
0 250 500 1 000
Meters

Potential yield vs Profit

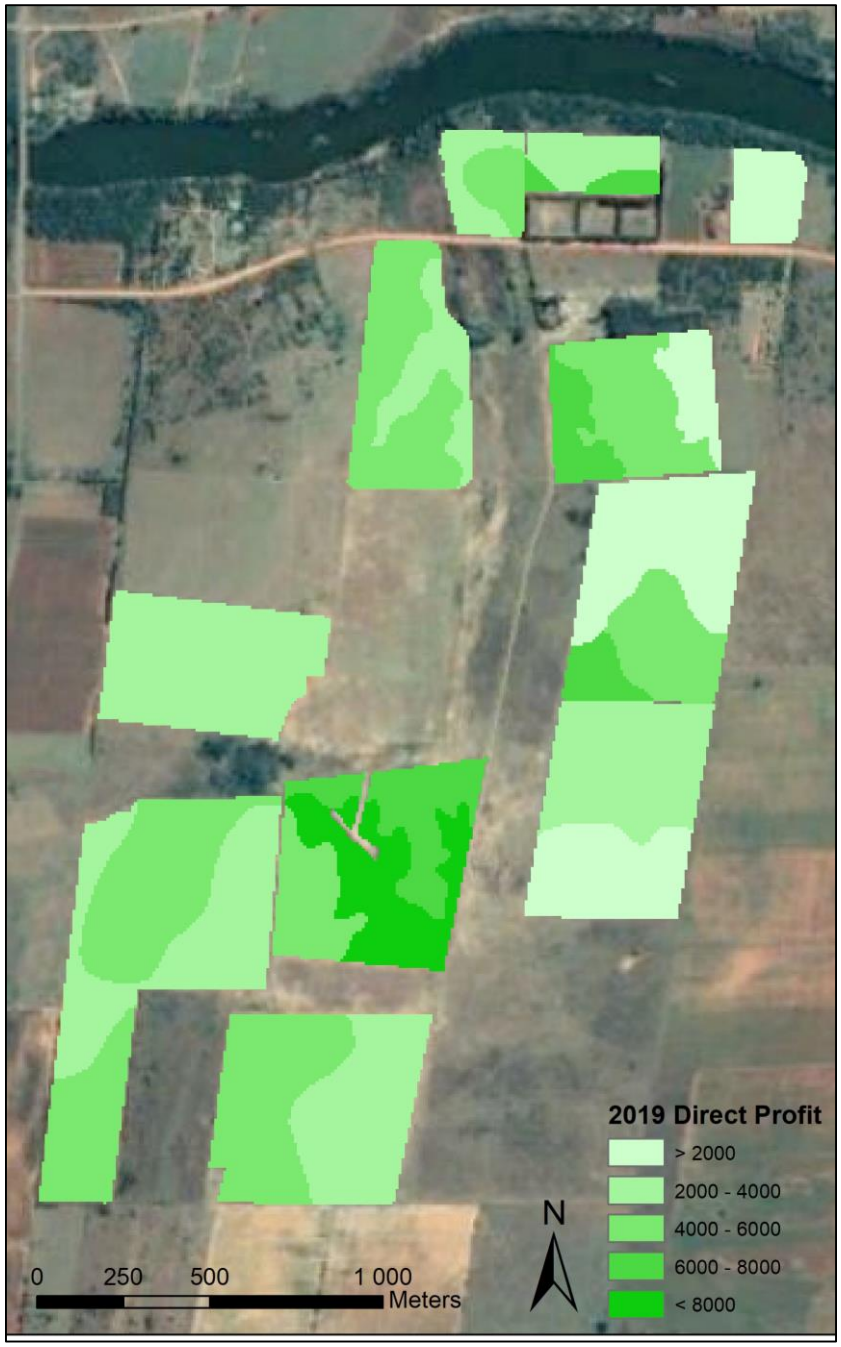



Rainfall = 799 mm
2017 profit
-2000 - 0
0 - 2 000
2000 - 4000
4000 - 6000
> 6000
N
0 250 500 1 000
Meters


Rainfall = 490 mm
2019 profit
-2000 - 0
0 - 2 000
2 000 - 4 000
4 000 - 6 000
> 6000
N
0 250 500 1 000
Meters

Decision support tool

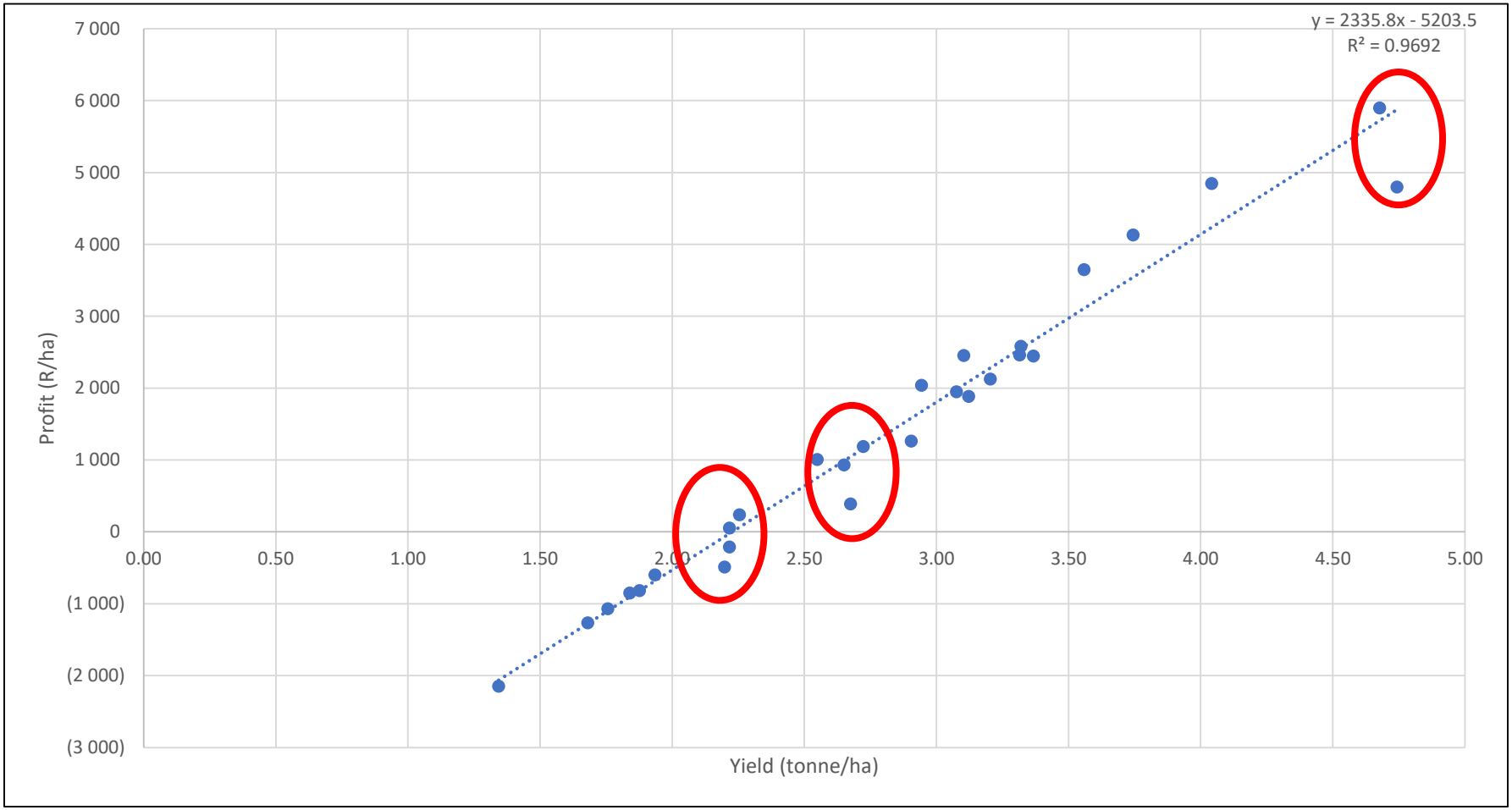
- Should this field be planted?
- Which management actions should be applied?


2019 Direct Profit
> 2000
2000 - 4000
4000 - 6000
6000 - 8000
< 8000
N
0
250
500
1 000
Meters

Should this field be planted?

- Highest loss = - R2147 / ha
- Fixed costs = R 2500/ha
- Therefore all fields should be planted
- Is farm correctly staffed/mechanized?
- Is farm size adequate?

Which management should be applied?

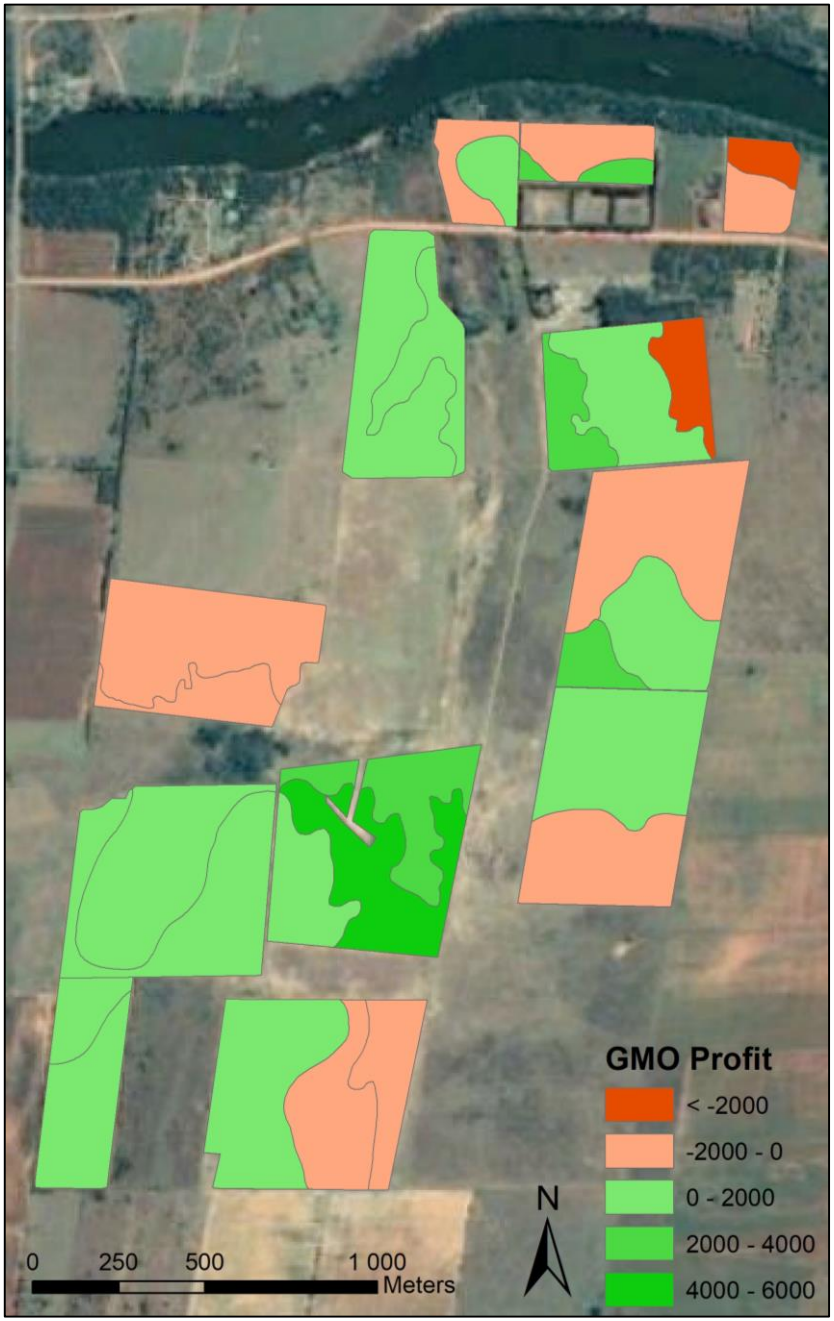


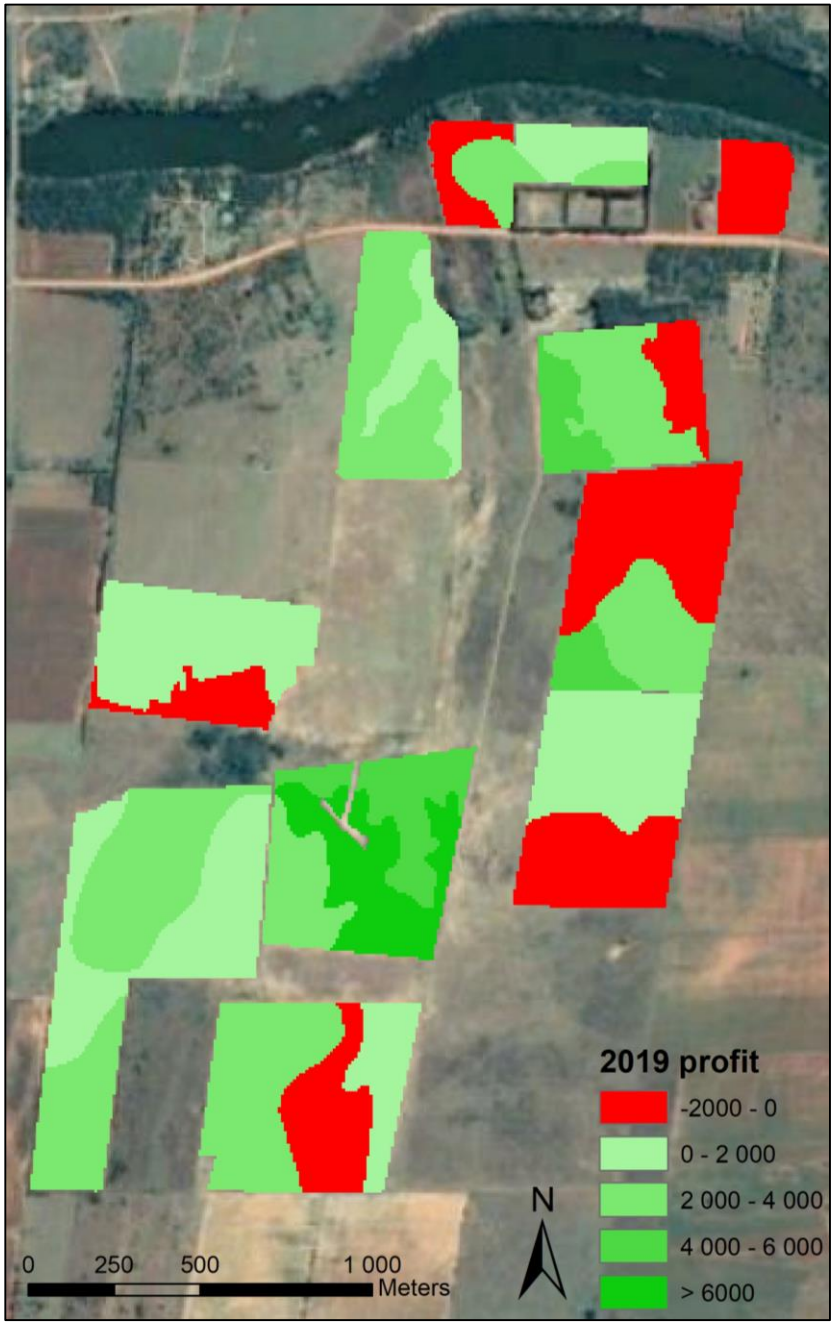
Which management should be applied

- Fields with low profit and equal yield = high amelioration cost
  - Lime/compost
- Amelioration short term uneconomical
  - Long term sustainability

GMO seed vs normal hybrid seed

- Roundup Ready
- Cost R500 per ha more
- Non-GMO R100 per ton premium


GMO Profit
< -2000
-2000 - 0
0 - 2000
2000 - 4000
4000 - 6000
N
0 250 500 1 000
Meters


2019 profit
-2000 - 0
0 - 2 000
2 000 - 4 000
4 000 - 6 000
> 6000
N
0 250 500 1 000
Meters

Conclusions

- Profit mapping is subtle focus change in precision agriculture
- High potential yield is not equal to high profit
- Profitable areas differ between seasons

Conclusions

- On this farm all fields should be planted, but farmer should reconsider labour/mechanization costs/ farm size
- Soil amelioration decreases short term profitability, required for long term sustainability
- Planting normal hybrid seed decomoditized the produce, giving better profitability