

Unidades de Gestão Diferenciada

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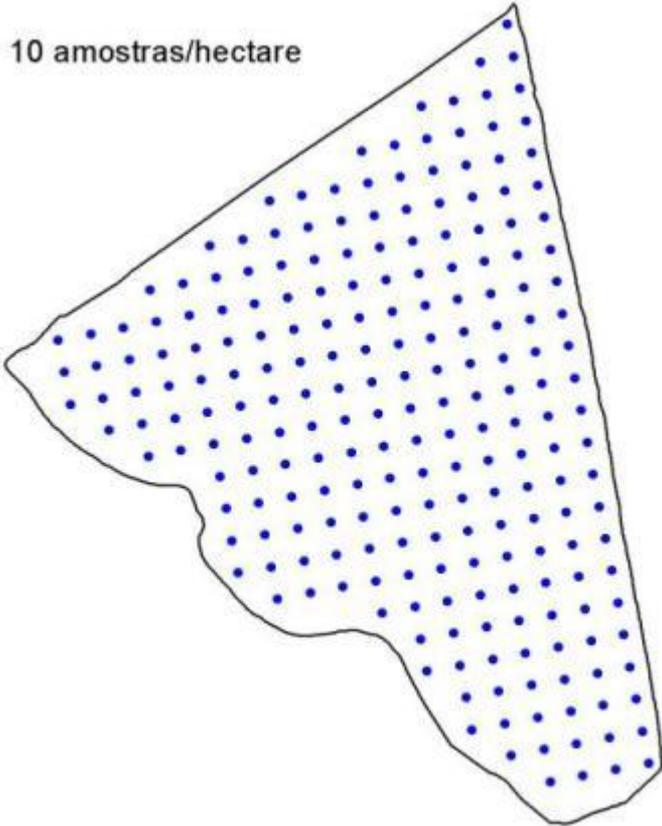
www.agriculturadeprecisao.org.br

Objetivo

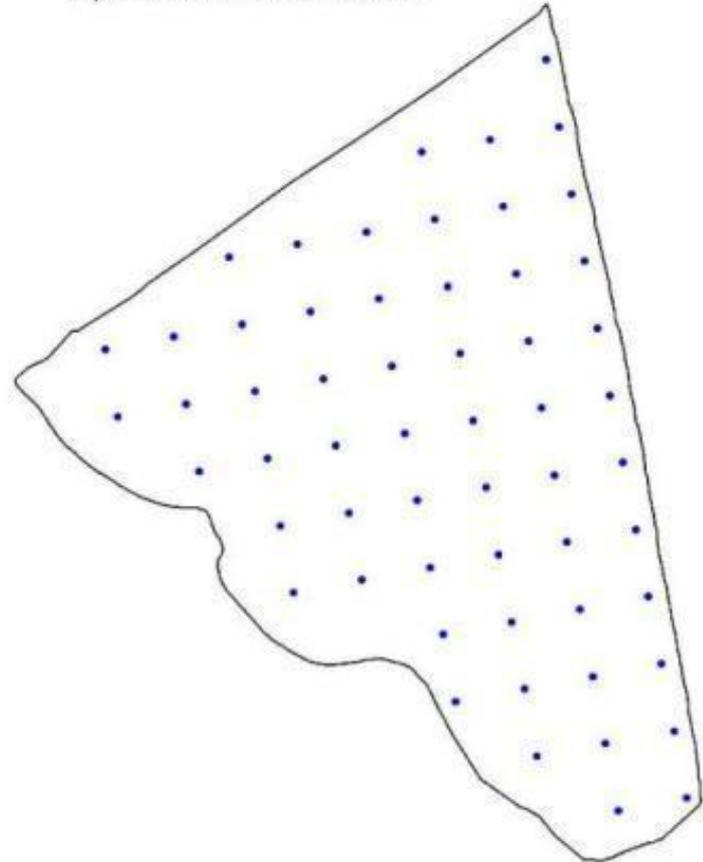
Conceituar unidades de gestão diferenciada e abordar formas de delimitá-las e gerenciá-las a partir dos desempenhos distintos que manifestam.

Densidade amostral

10 amostras/hectare

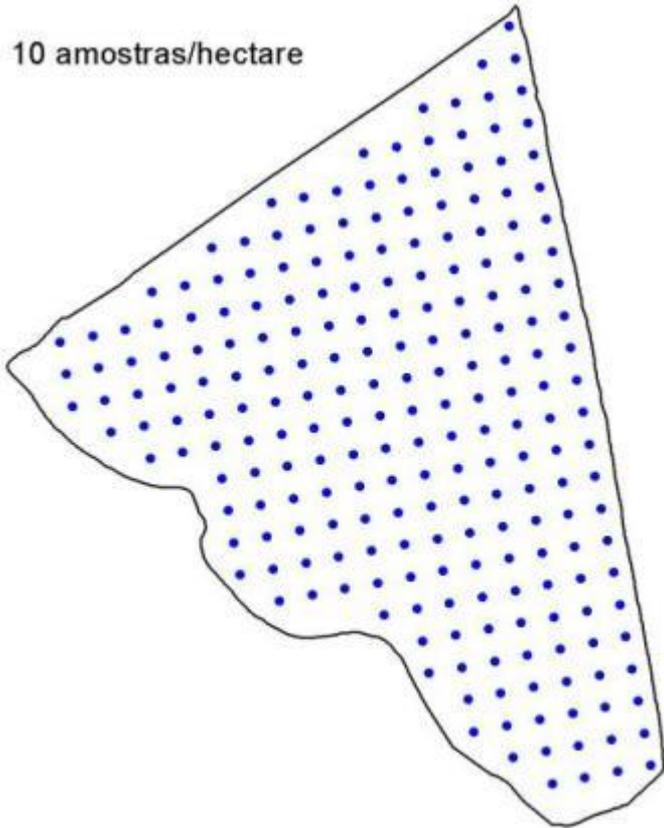


2,5 amostras/hectare

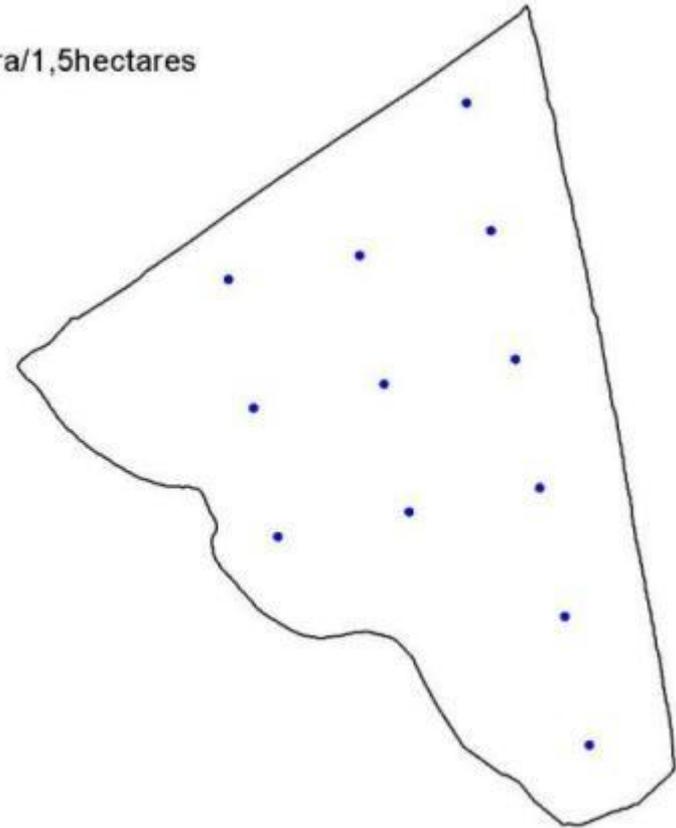


Densidade amostral

10 amostras/hectare

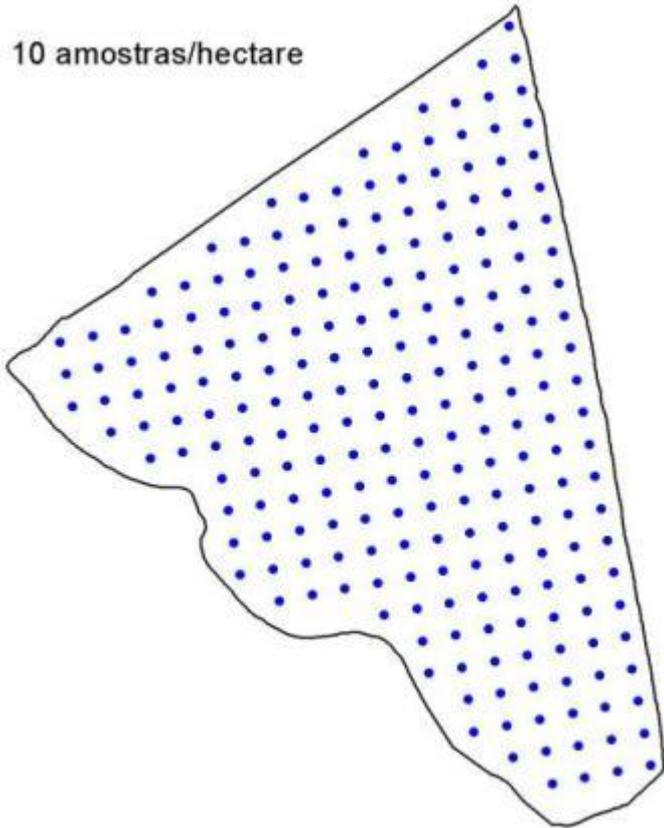


1 amostra/1,5hectares

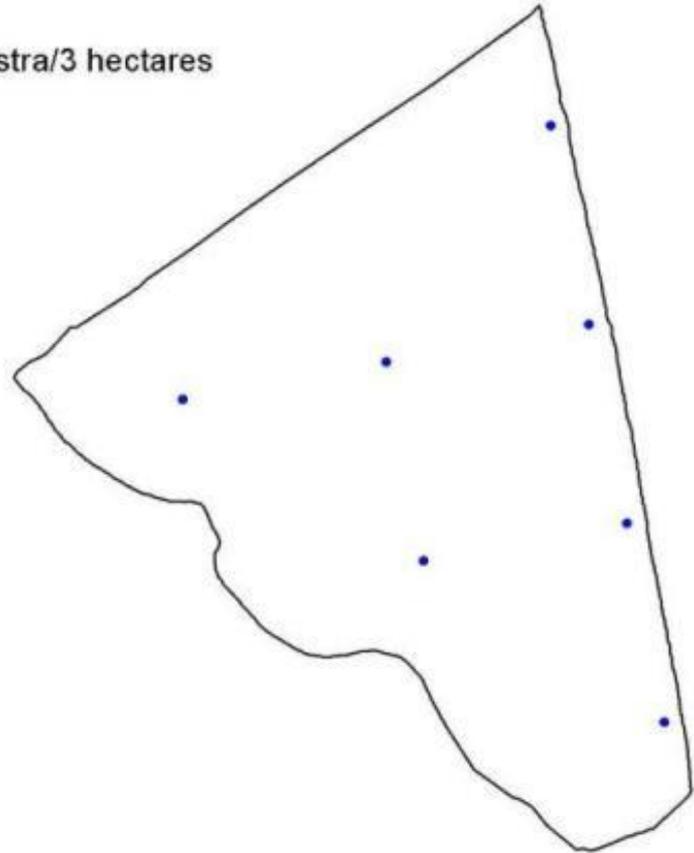


Densidade amostral

10 amostras/hectare



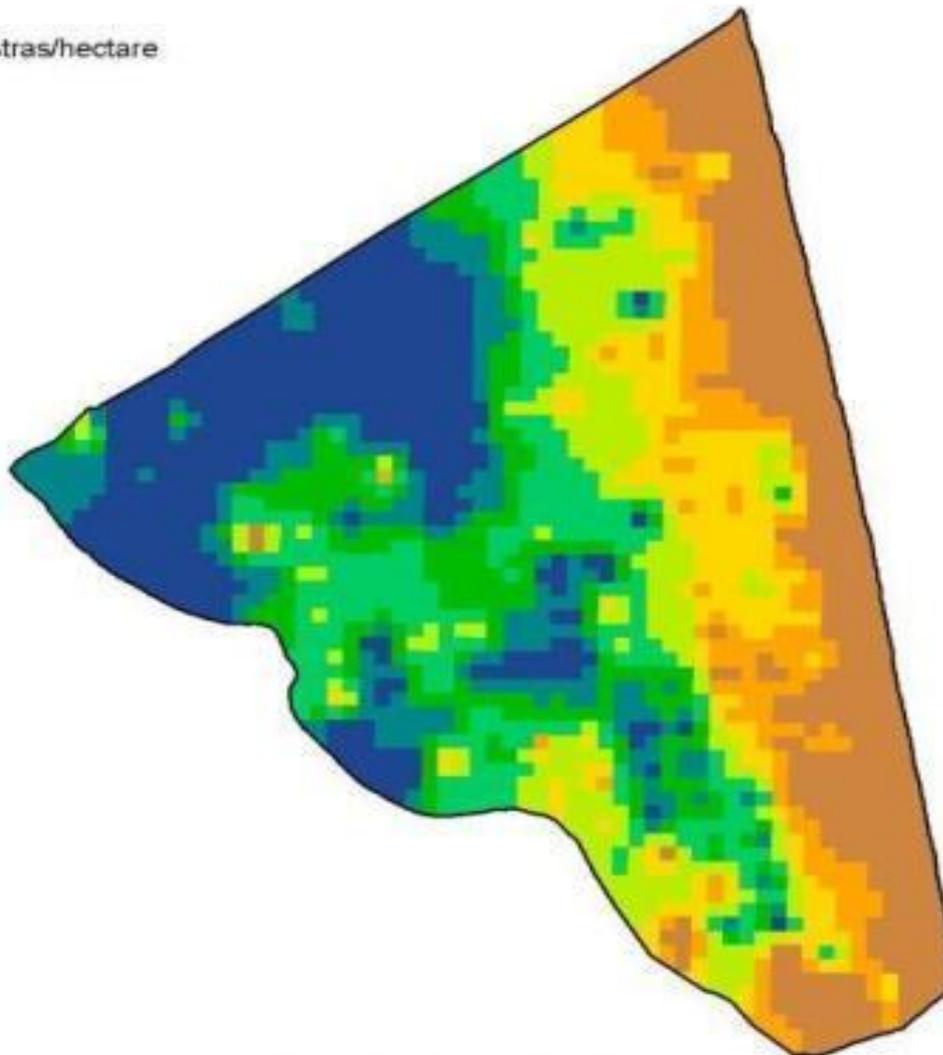
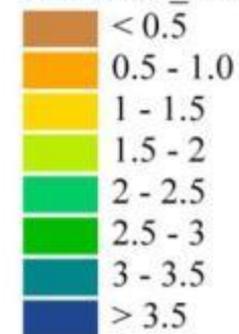
1 amostra/3 hectares



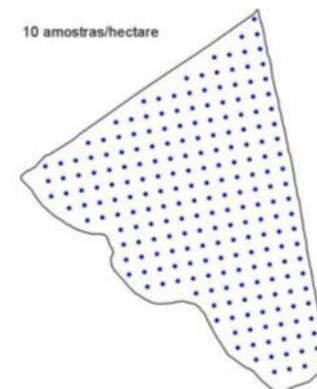
Aplicação de Calcário

10 amostras/hectare

Toneladas Hectare



10 amostras/hectare

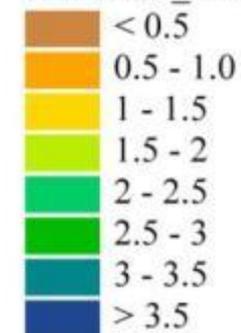


80 0 80 160 240 320 Meters

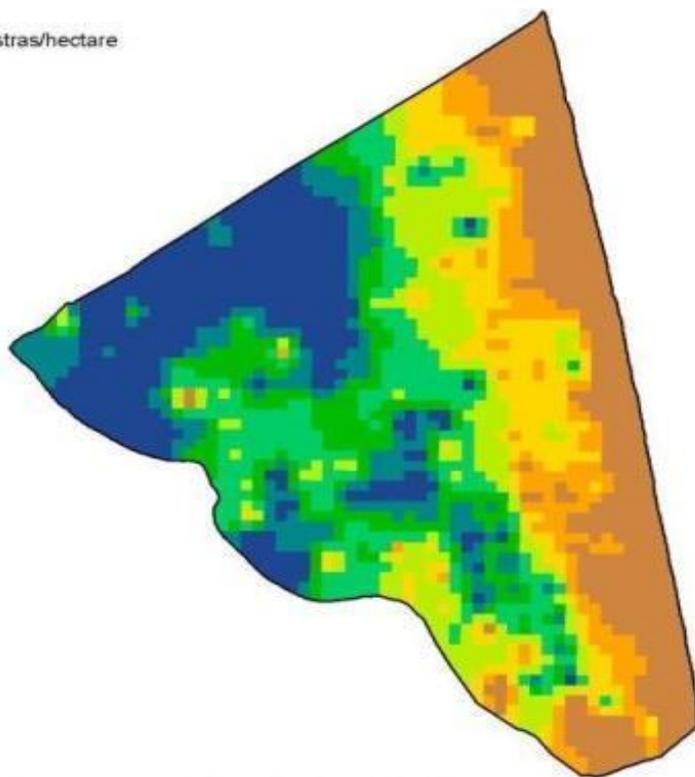


Aplicação de Calcário

Toneladas Hectare

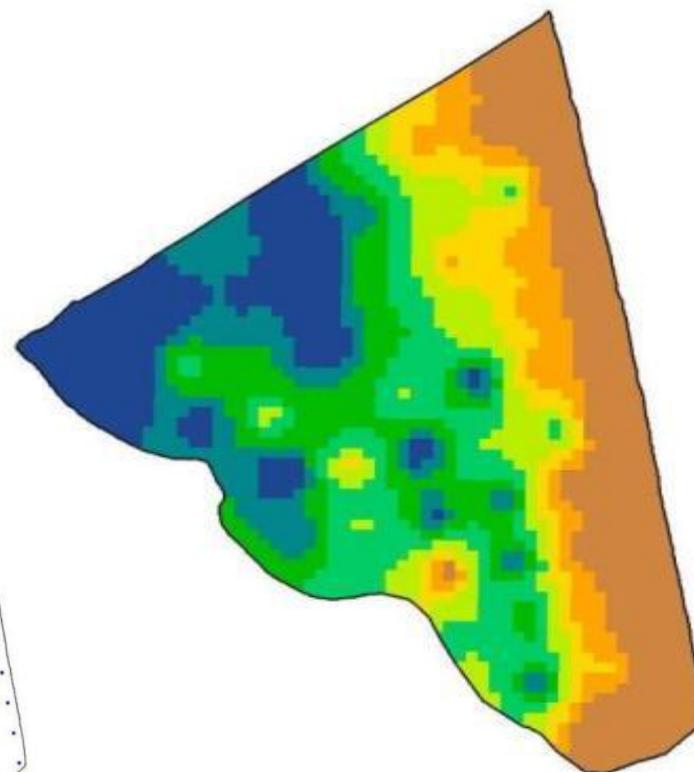
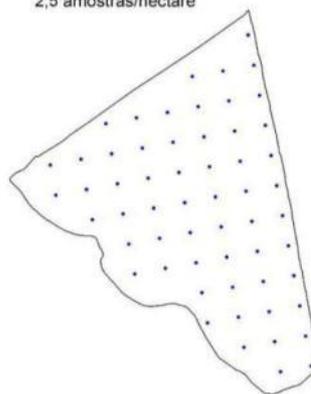


10 amostras/hectare



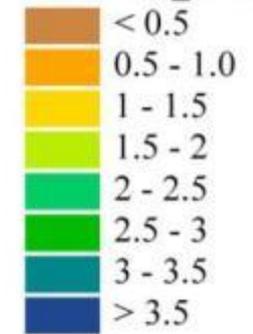
2,5 amostras/ha

2,5 amostras/hectare

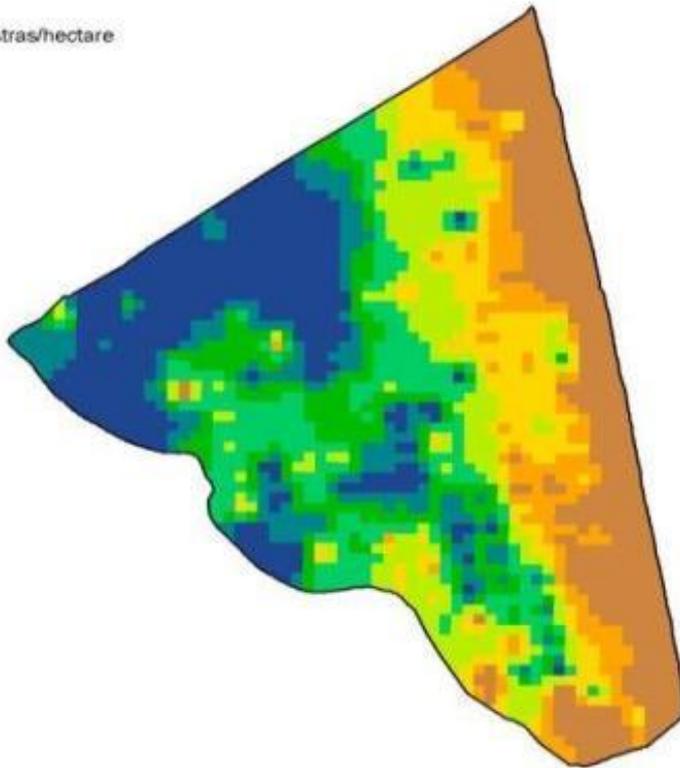


Aplicação de Calcário

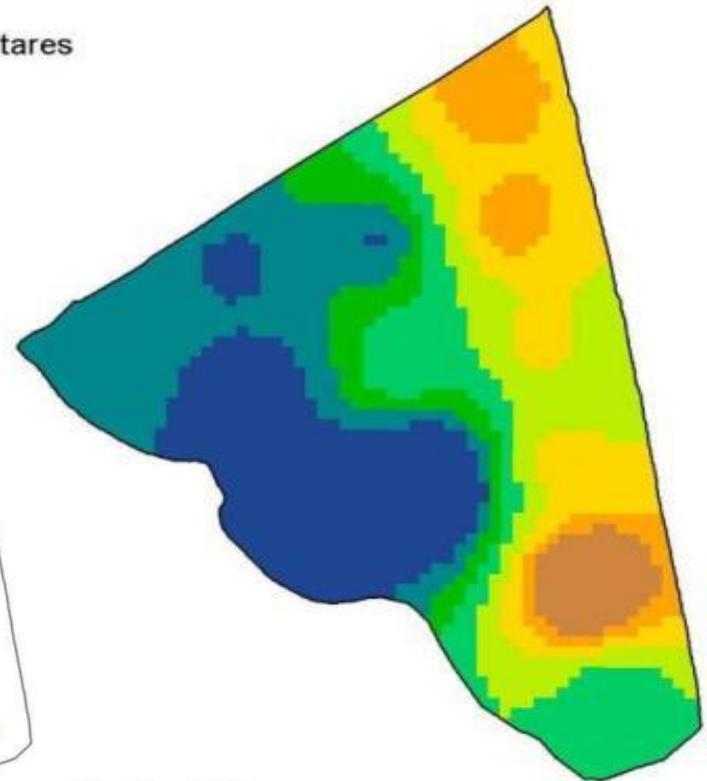
Toneladas Hectare



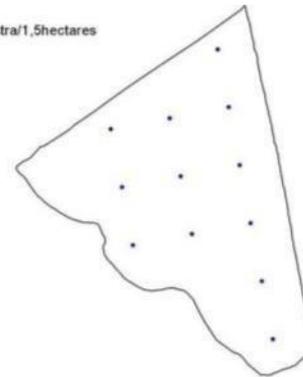
10 amostras/hectare



1 amostra/1,5hectares

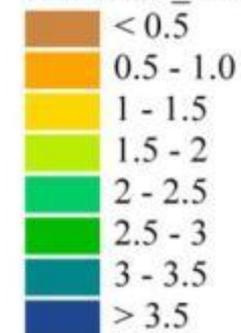


1 amostra/1,5hectares

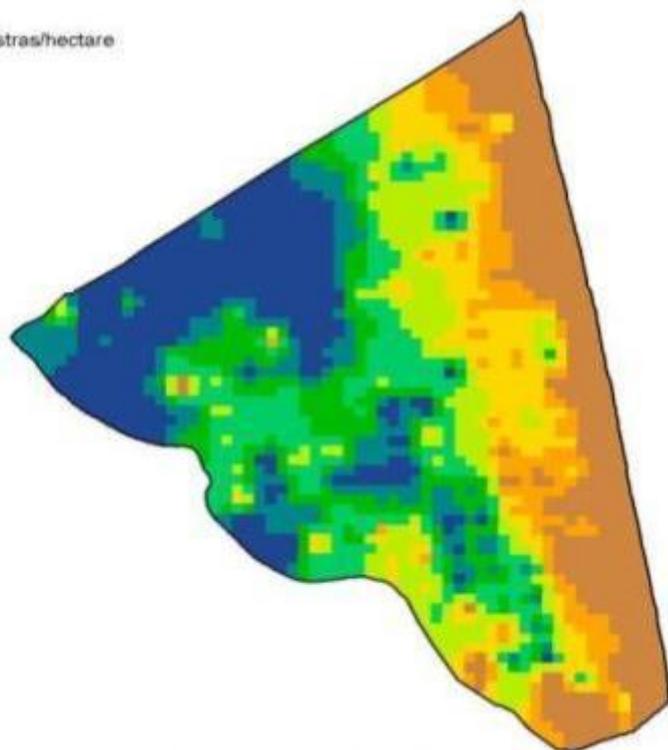


Aplicação de Calcário

Toneladas Hectare

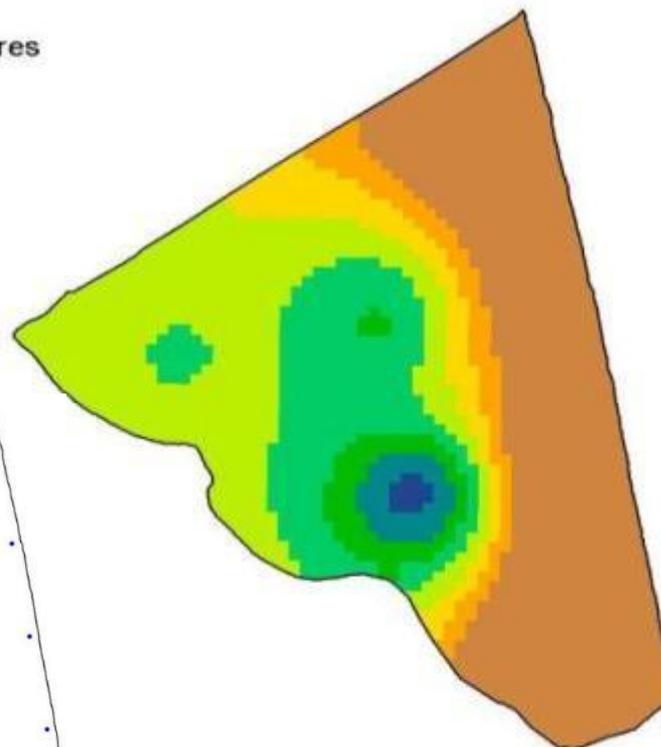
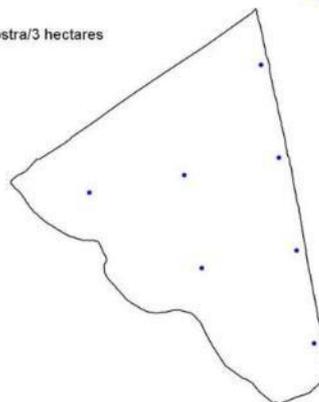


10 amostras/hectare



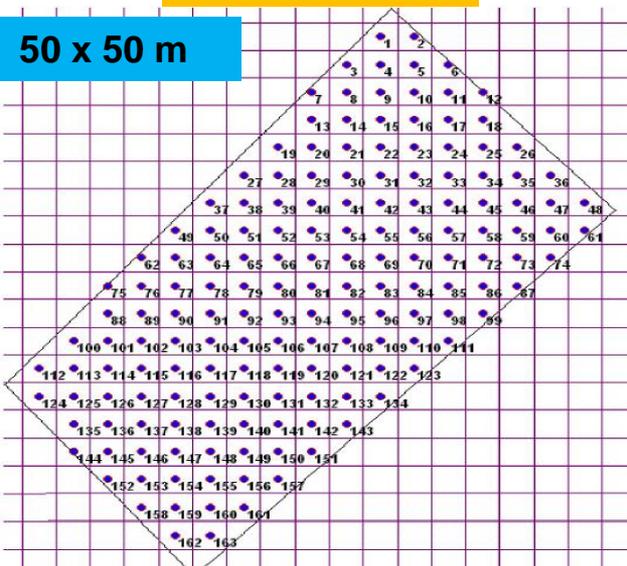
1 amostra/3hectares

1 amostra/3 hectares

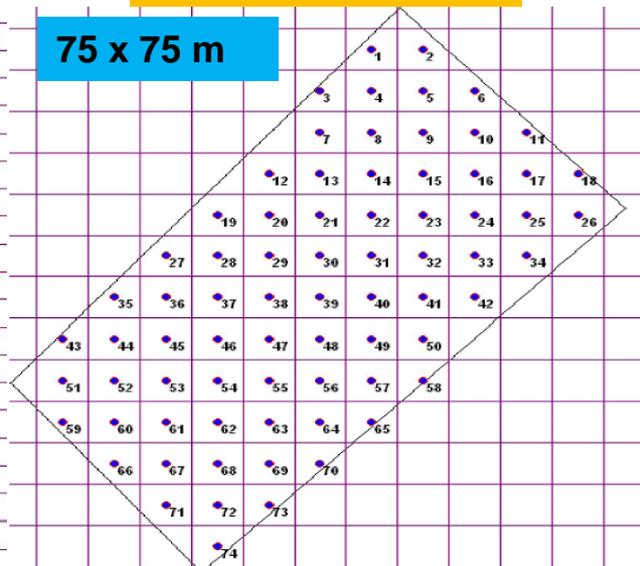


Qual a dimensão ideal da grade amostral?

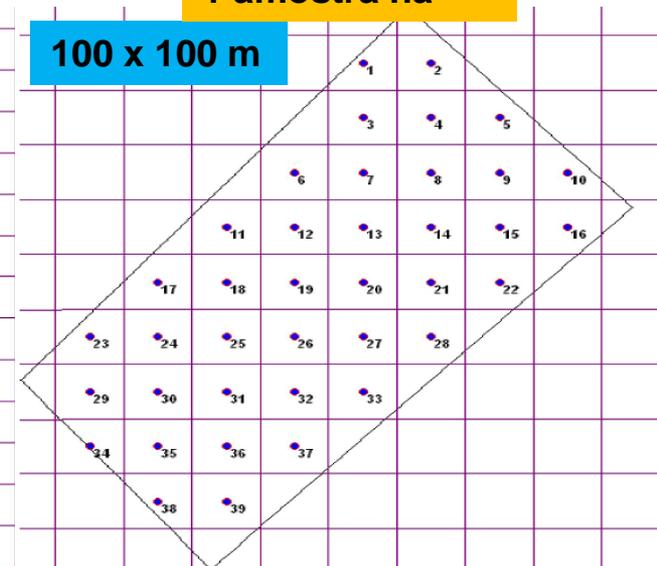
4 amostras ha⁻¹



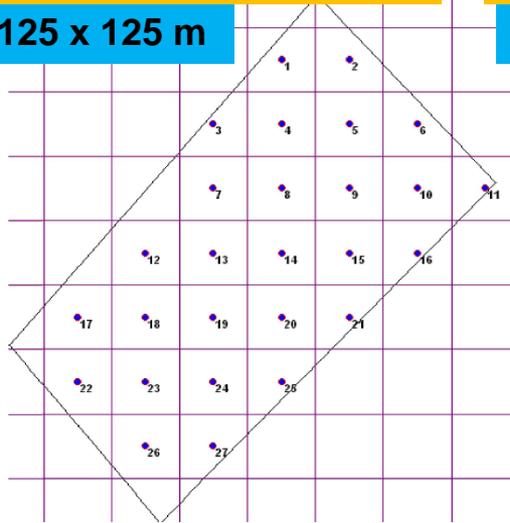
1,77 amostras ha⁻¹



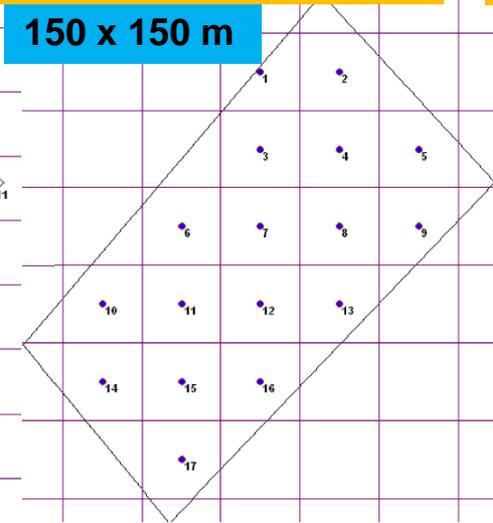
1 amostra ha⁻¹



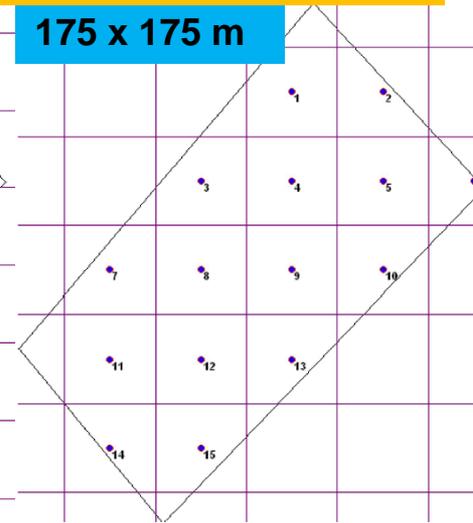
1 amostra cada 1,56 ha



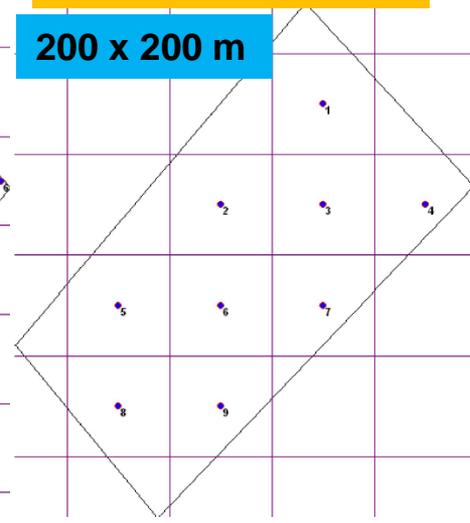
1 amostra cada 2,25 ha



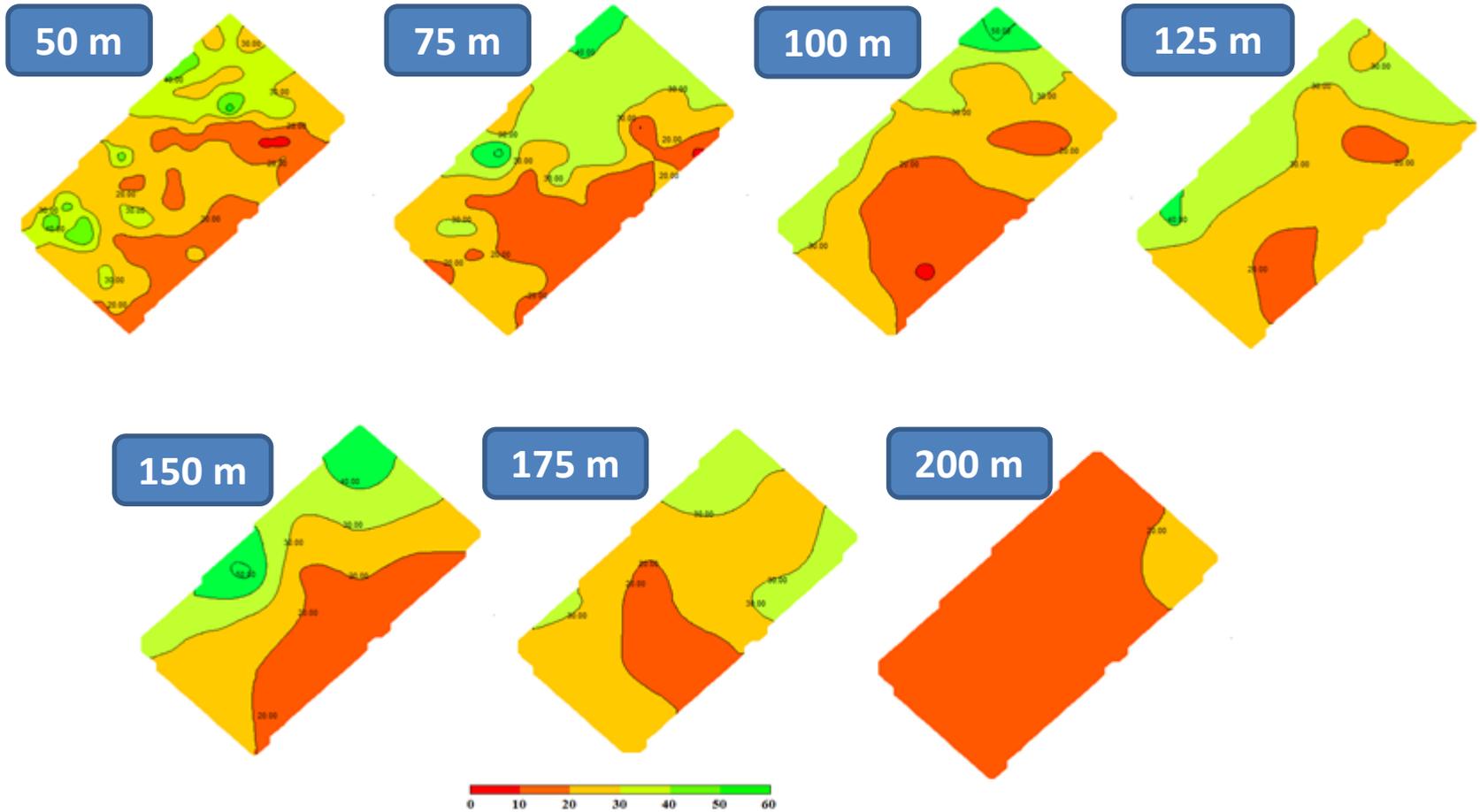
1 amostra cada 3,06 ha



1 amostra cada 4 ha

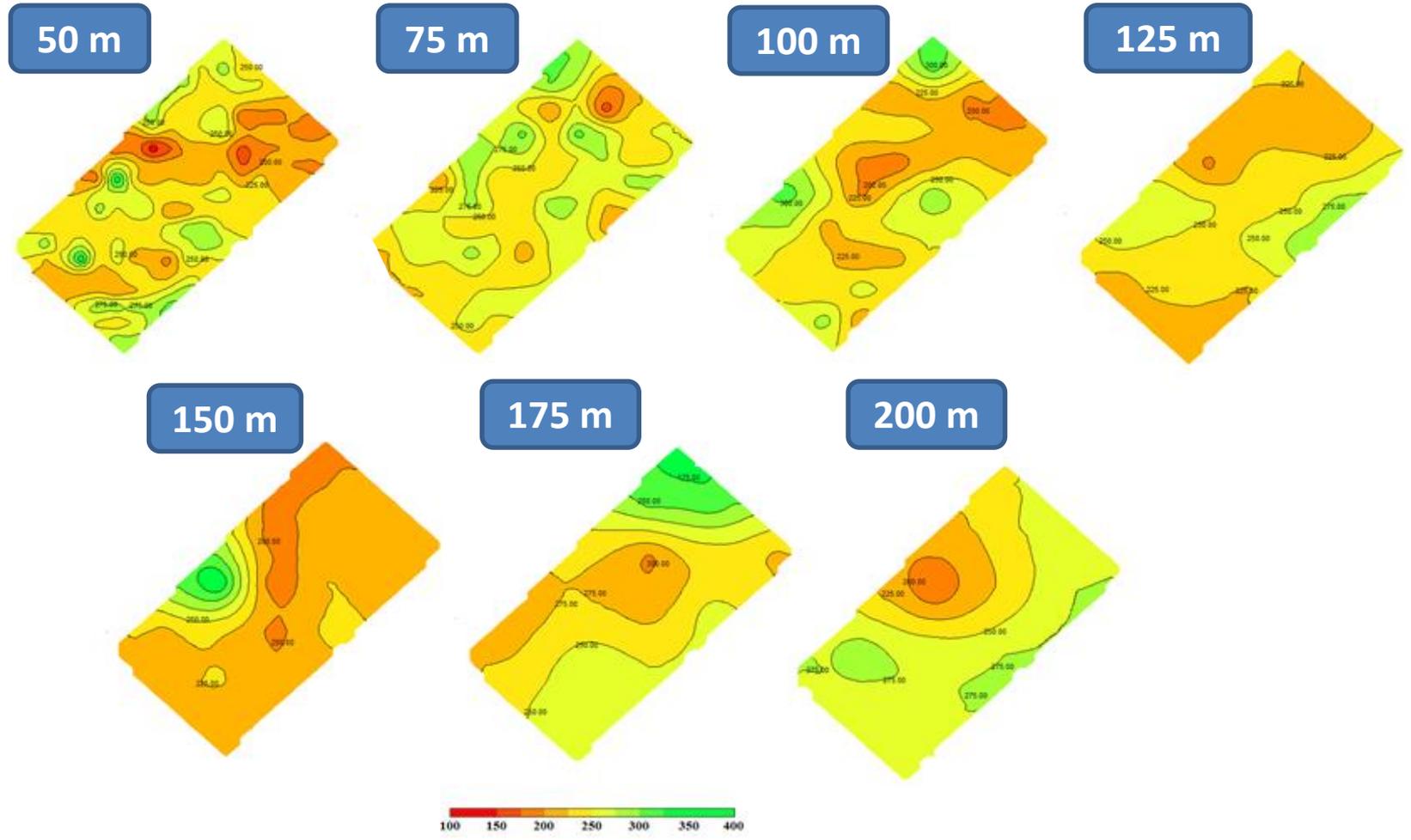


Fósforo



Cherubin et al. (2015)

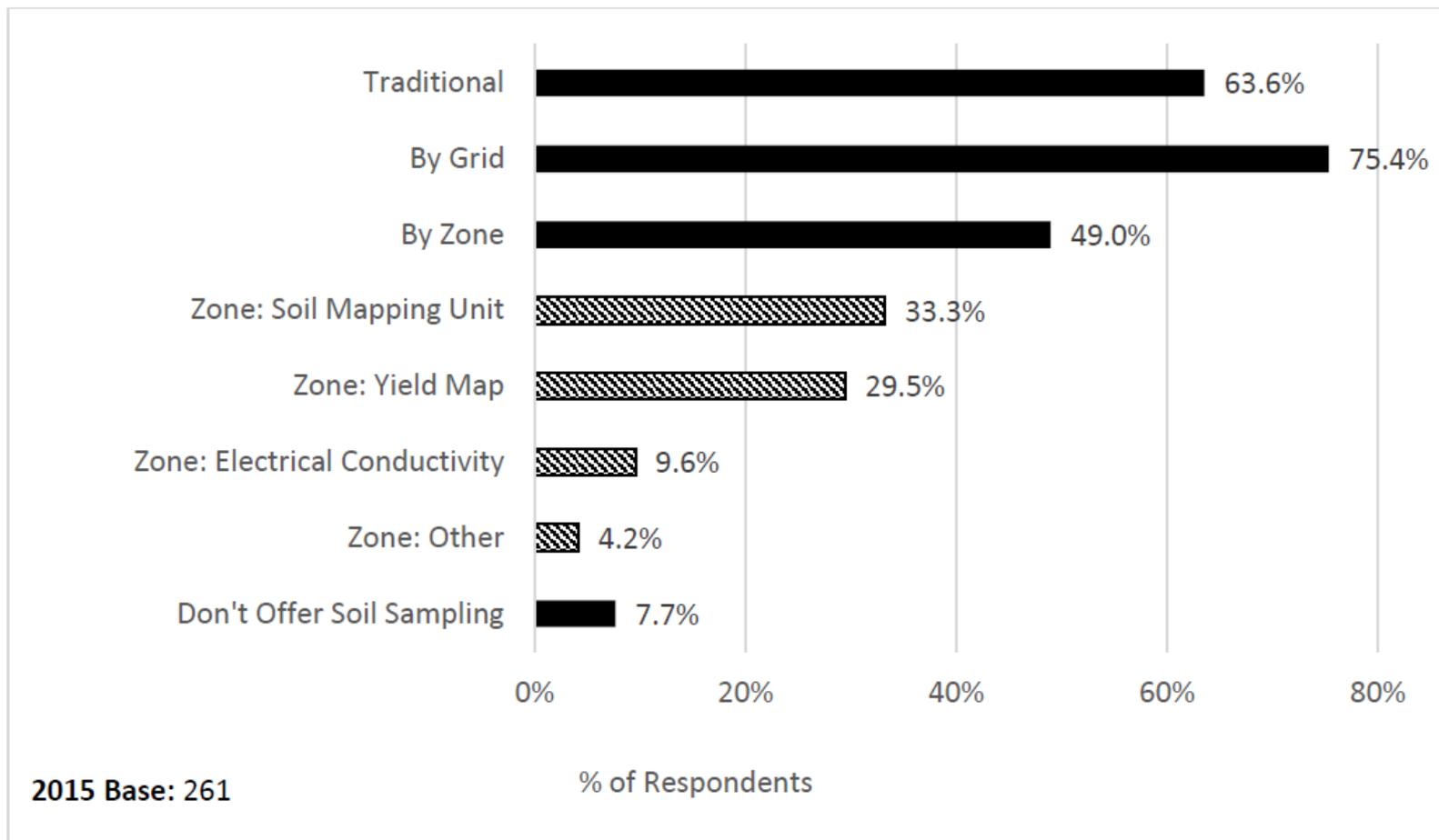
Potassio



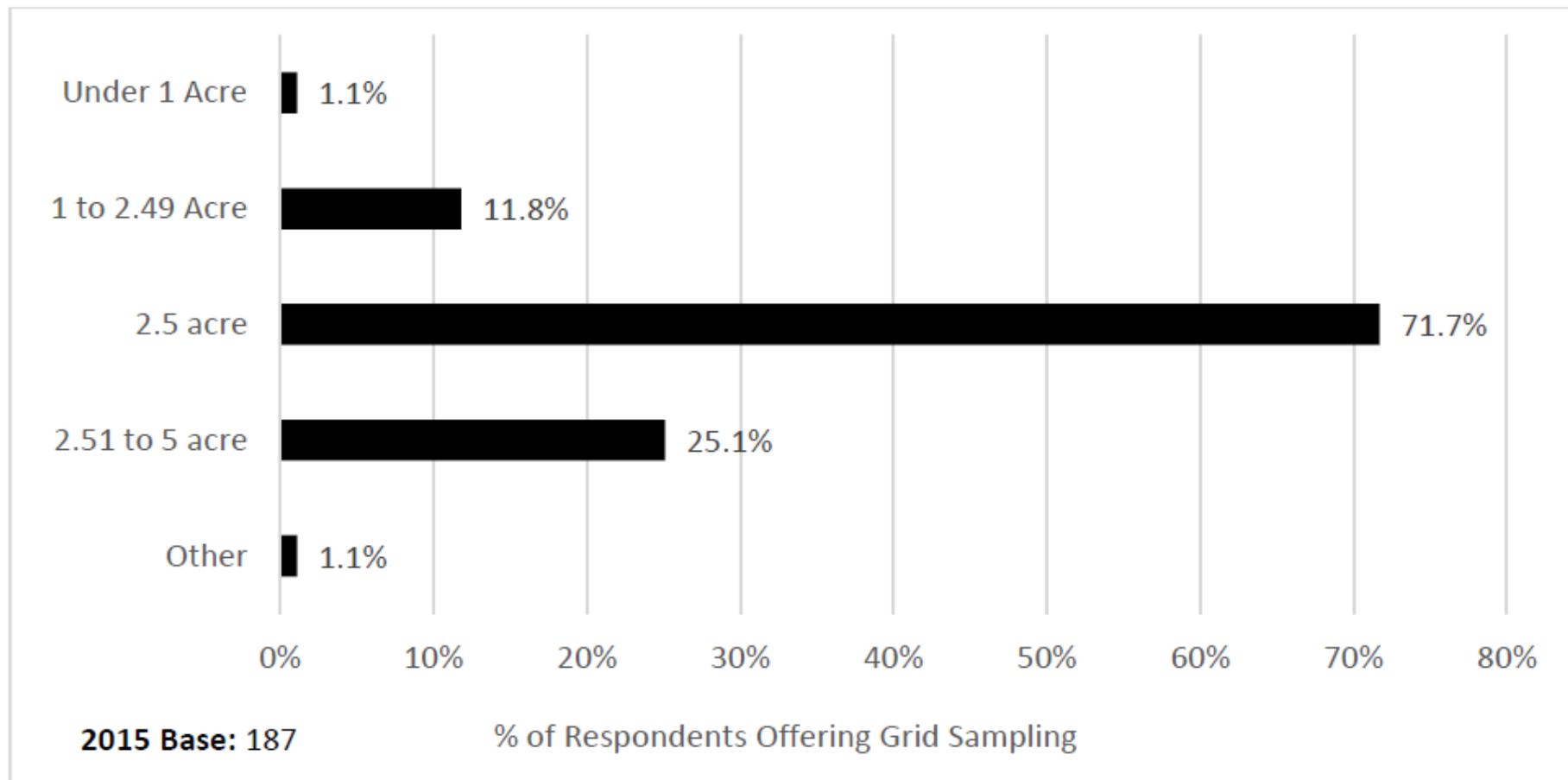
Cherubin et al. (2015)

Prof. J. P. Moñin¹²

Tipos de amostragem de solo oferecida



Tamanho das grades amostrais, em acres, praticadas nos EUA

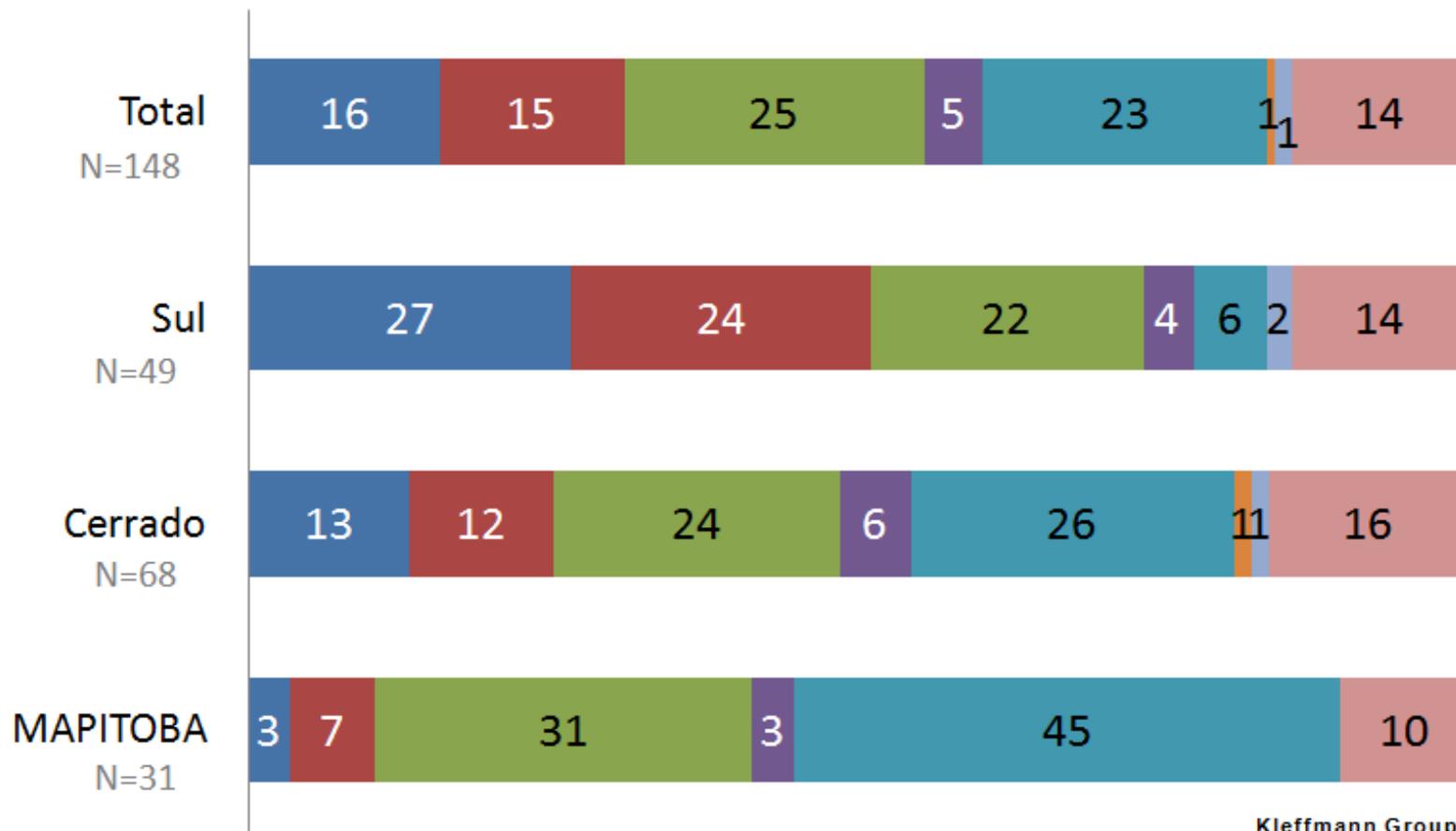


B.Erickson & D. A. Widmar (2015)

Tamanho das grades amostrais, em hectares, praticadas em cada região do Brasil

Todas as indicações em %. Base: Entrevistados que realizam o mapeamento da fertilidade do solo por grades N = 148

■ Até 1 ■ 1,1 - 2 ■ 2,1 - 3 ■ 3,1 - 4 ■ 4,1 - 5 ■ 6,1 - 7 ■ 7,1 - 9 ■ Maior que 9,1

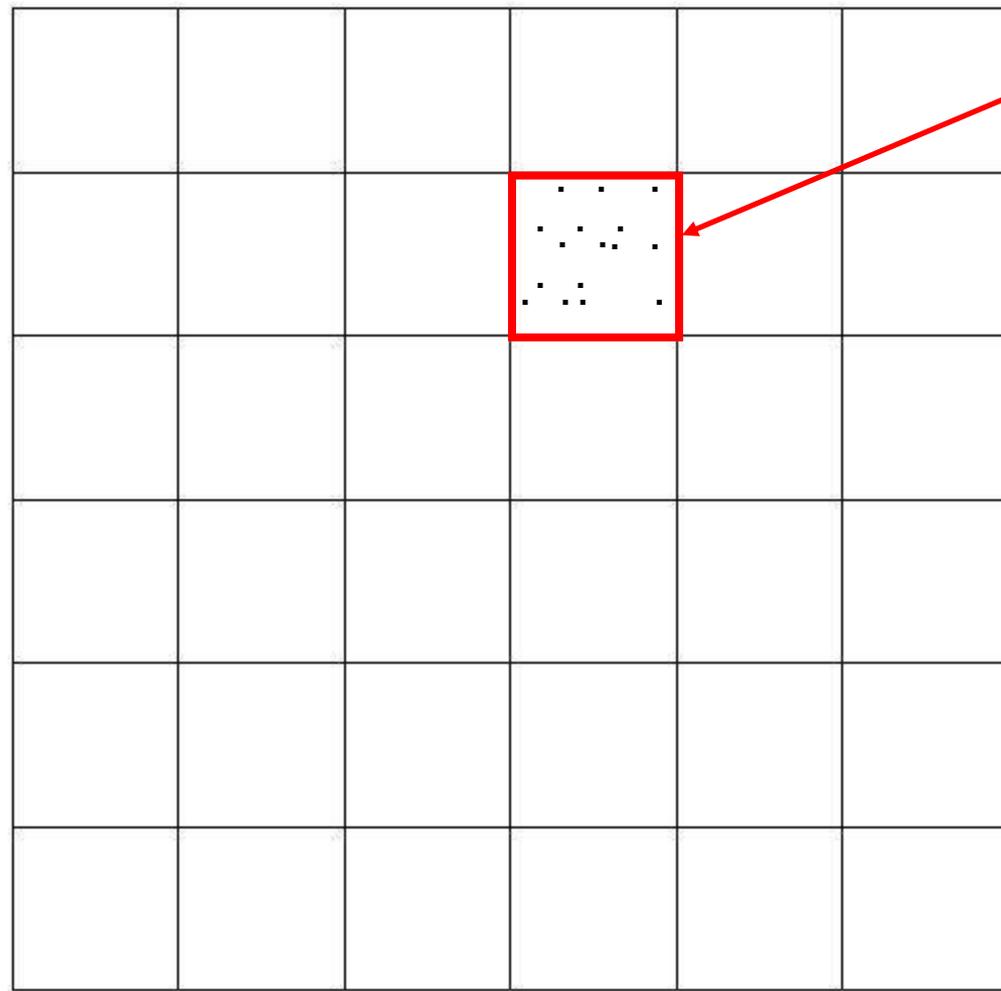


Kleffmann Group ®

J. P. Molin (2017)



Prof. J. P. Molin

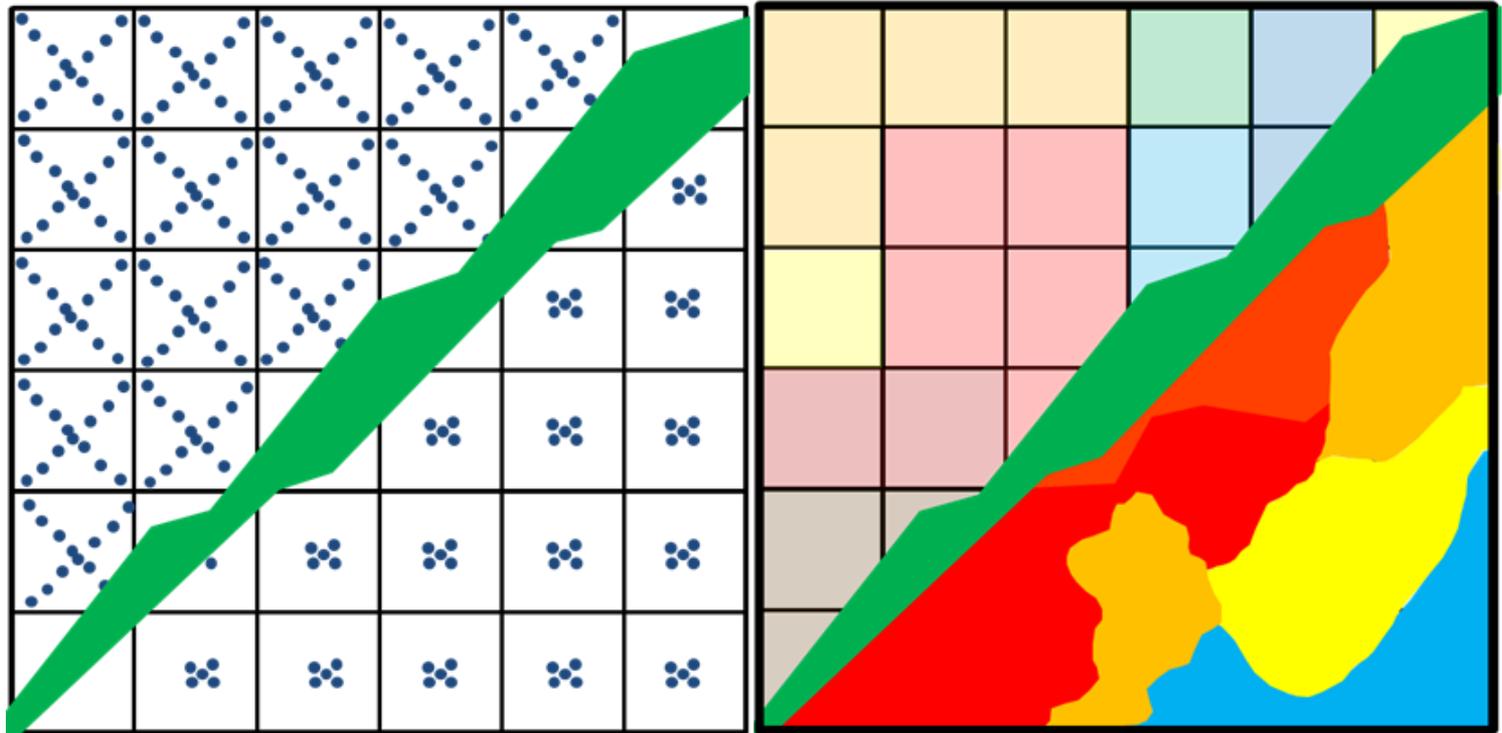


Célula amostral

Amostragem por célula

Amostragem em células

Mapa = valor da amostra

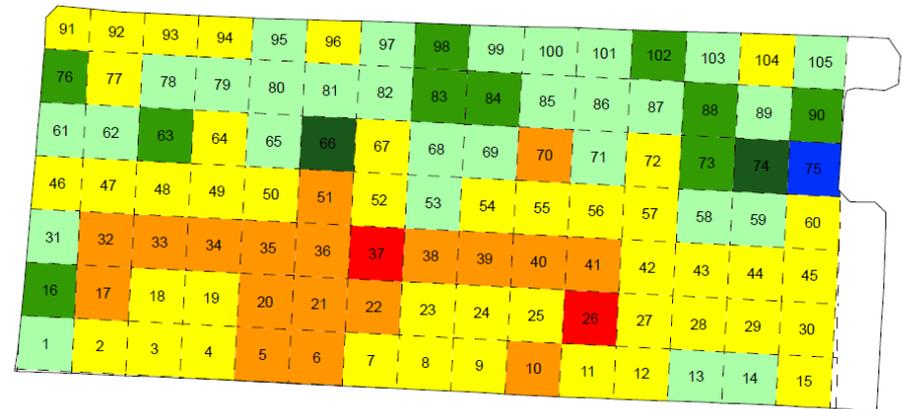
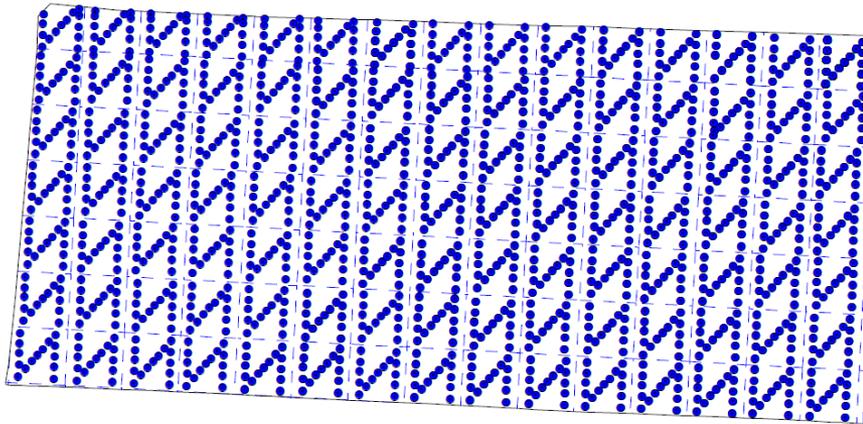
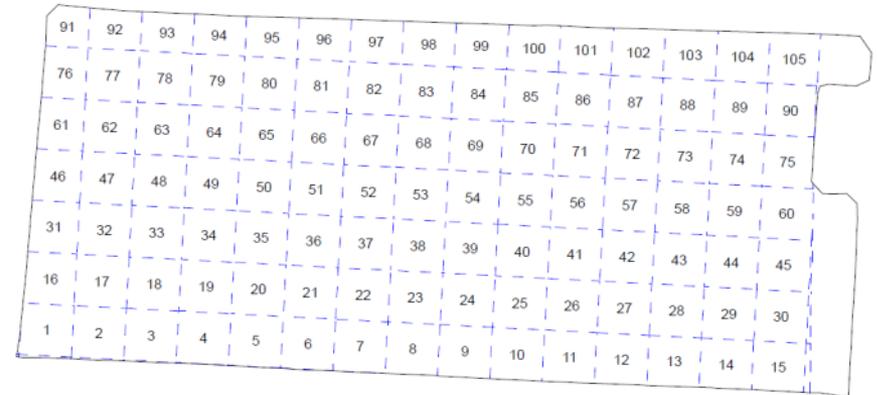


Amostragem em pontos

Mapa = estimativa

Amostragem em célula

- Maior número de subamostras
- Maior tempo de coleta
- Menor densidade
- Menor frequência



Métodos de Amostragem

Sem conhecimento prévio da área

- Amostragem em grade
 - por ponto
 - por célula

Com conhecimento pleno da área

- Amostragem por unidades de gestão (UGD)

Unidades de gestão diferenciada (UGD) ou “zonas de manejo”

São áreas delimitadas, dentro de um talhão, com mínima variabilidade interna.

Mínima variabilidade dentro das UGDs

Diferenças (variabilidade) entre UGDs

Unidades de gestão diferenciada (UGD) ou “zonas de manejo”

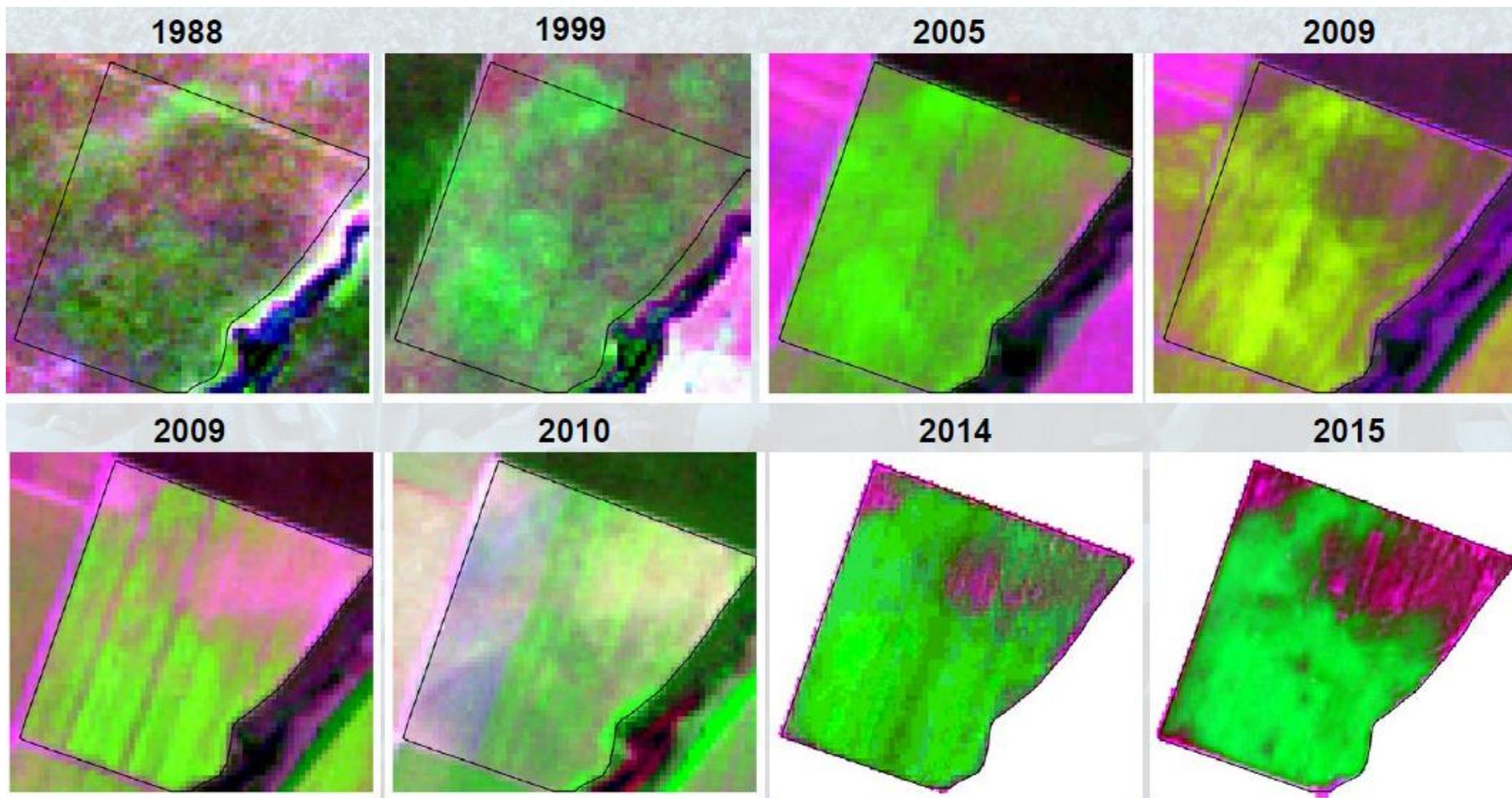
Os indicadores podem ser únicos ou, preferencialmente, compostos:

- produtividades
- vigor das culturas (biomassa) a partir de IV
- condutividade elétrica do solo
- relevo
- pedologia
- conhecimento do agricultor

Plantas

Solo

Estabilidade temporal

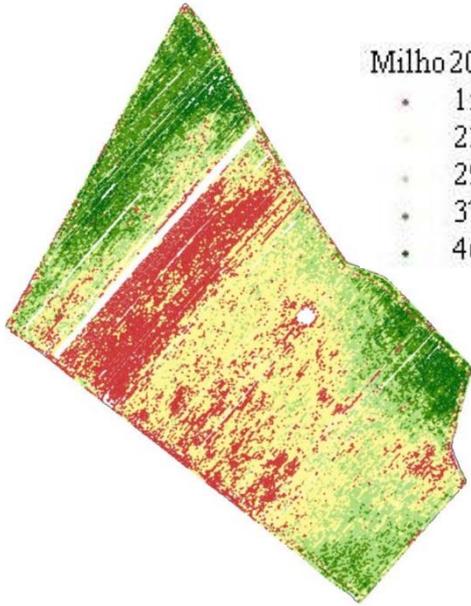


Trevisan, R. (2018)

Unidades de Gestão Diferenciada (UGD)

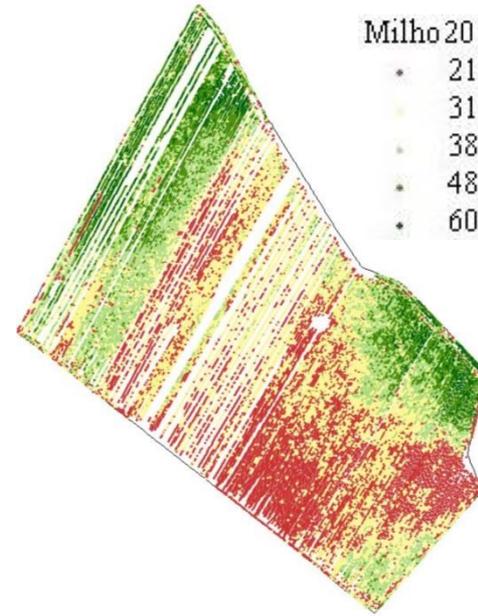
Milho2002b

- 1500.17 - 2369.13
- 2369.13 - 2970.62
- 2970.62 - 3728.42
- 3728.42 - 4692.63
- 4692.63 - 6794.93



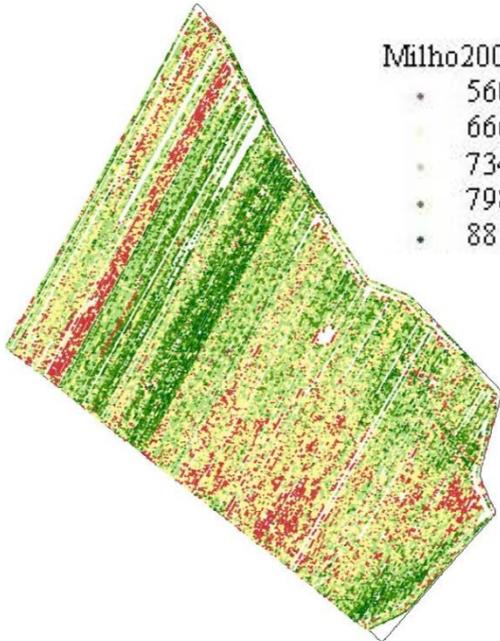
Milho2003b

- 2101.13 - 3108.84
- 3108.84 - 3874.79
- 3874.79 - 4879.6
- 4879.6 - 6072.77
- 6072.77 - 8493.56



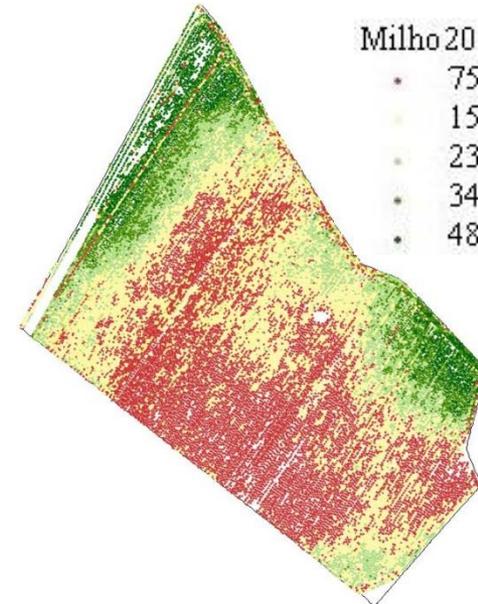
Milho2005a

- 5600.24 - 6669.72
- 6669.72 - 7343.13
- 7343.13 - 7989.91
- 7989.91 - 8812.51
- 8812.51 - 10496.52



Milho2006b

- 750.23 - 1521.29
- 1521.29 - 2305.03
- 2305.03 - 3444.3
- 3444.3 - 4837.29
- 4837.29 - 6699.78



Safrinha 2002

Safrinha 2003

Produtividades Normalizadas

- 0 a 40% da média
- 40 a 85% da média
- 85 a 105% da média
- 105 a 150% da média
- + 150% da média

Safrinha 2005

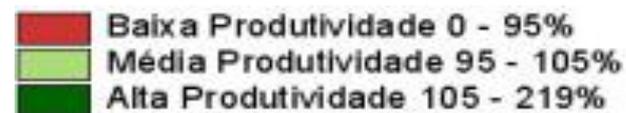
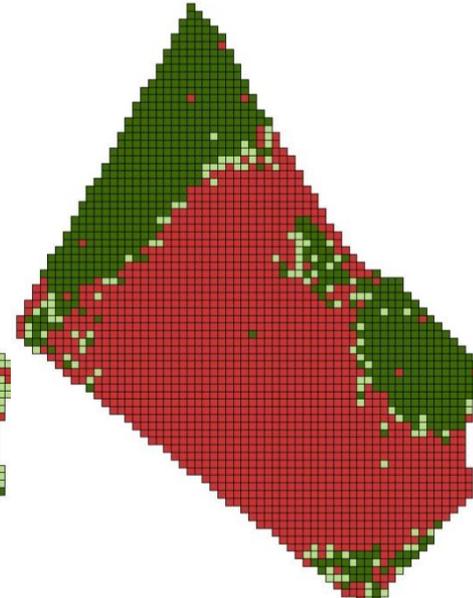
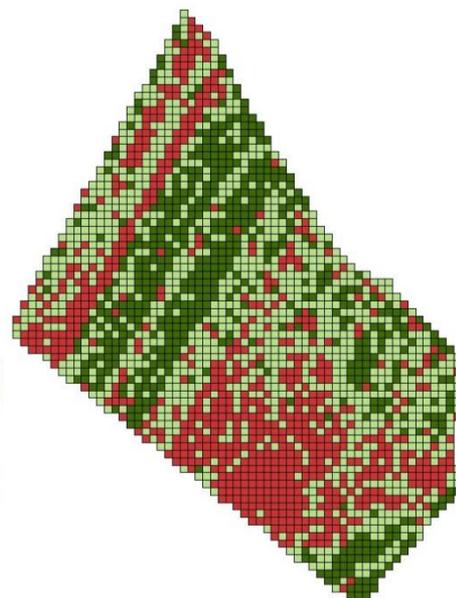
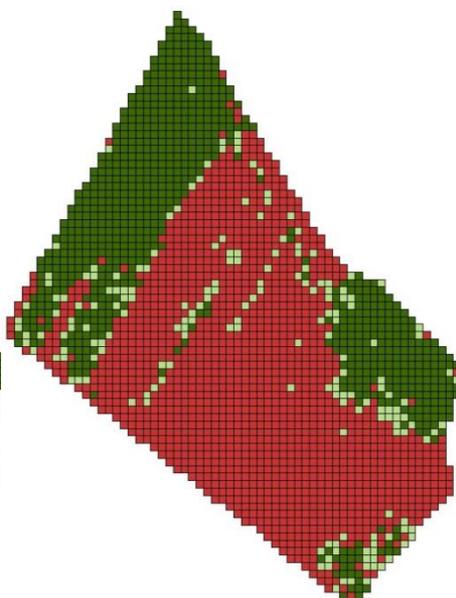
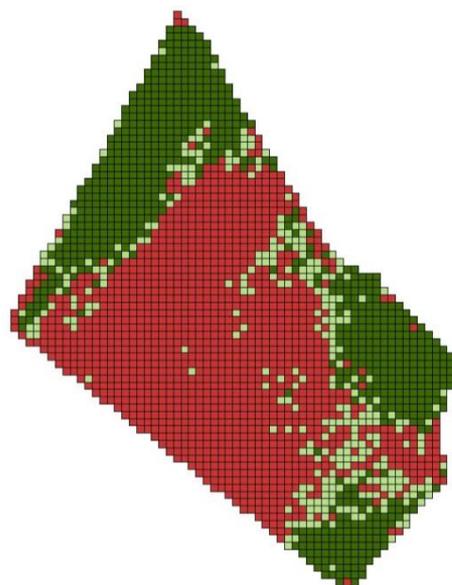
Safrinha 2006

Safrinha 2002

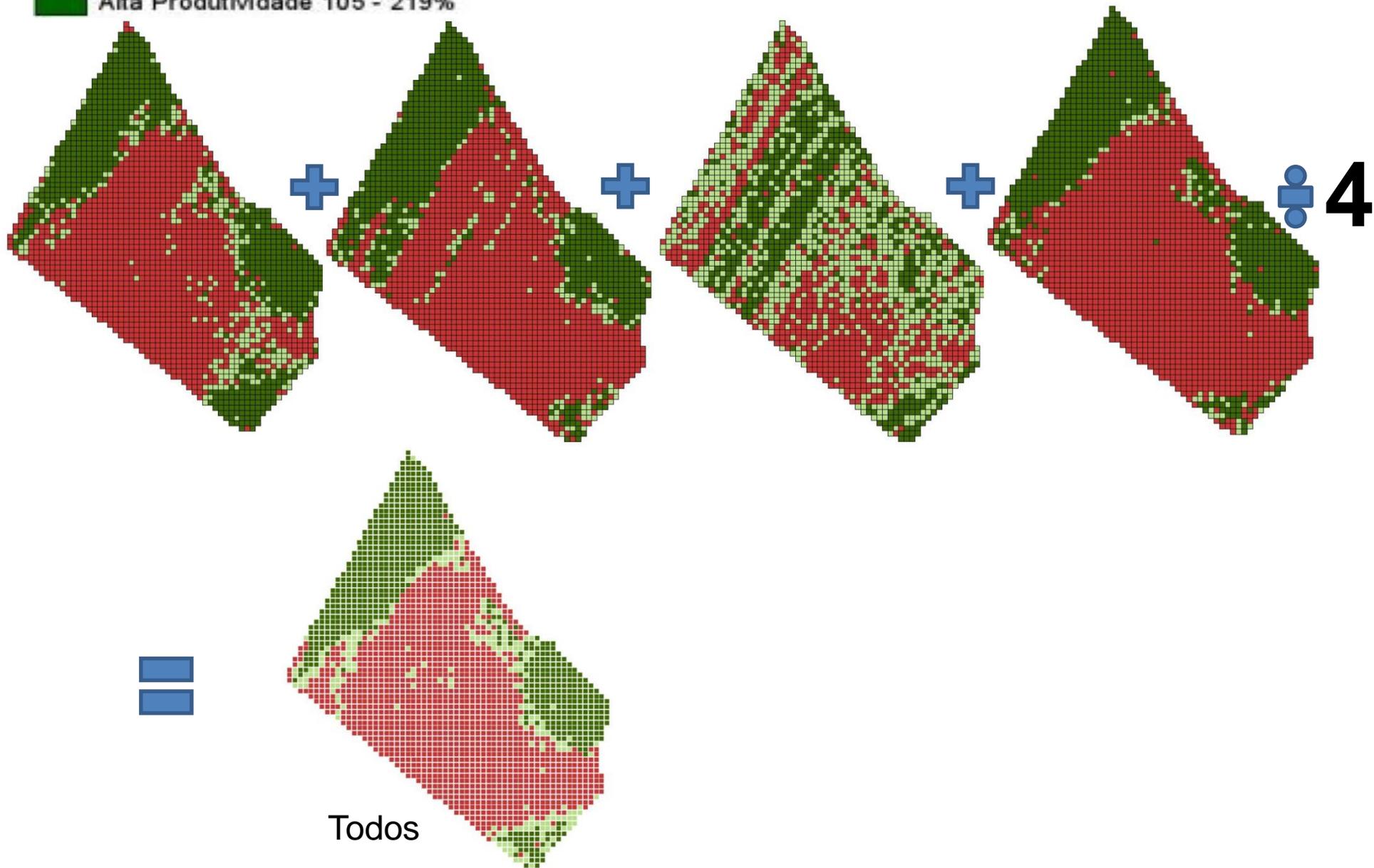
Safrinha 2003

Safra 2005

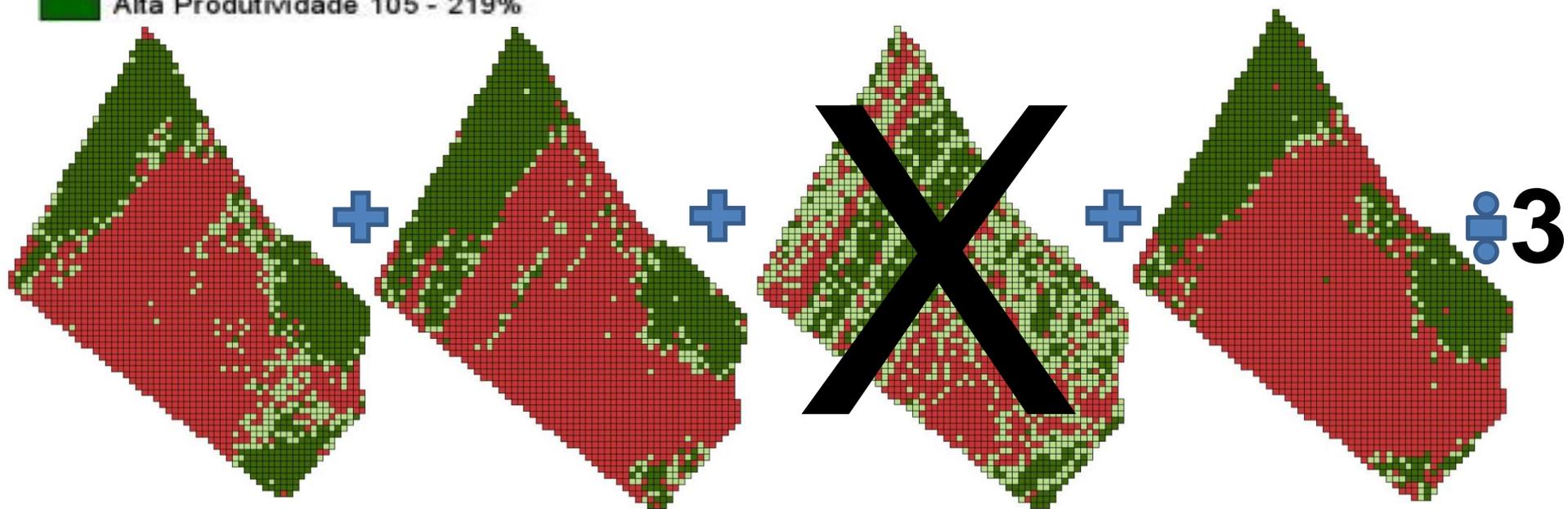
Safrinha 2006



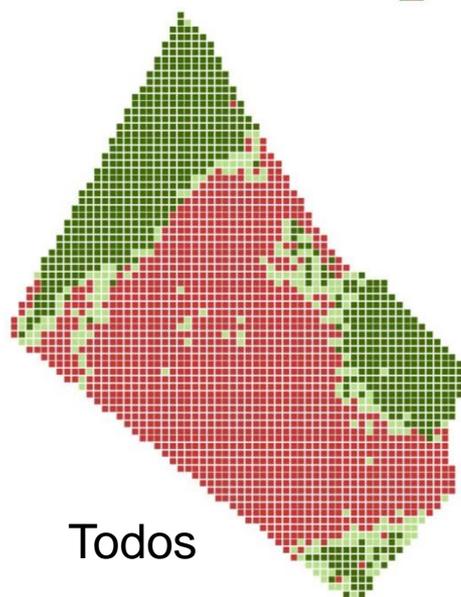
- Baixa Produtividade 0 - 95%
- Média Produtividade 95 - 105%
- Alta Produtividade 105 - 219%



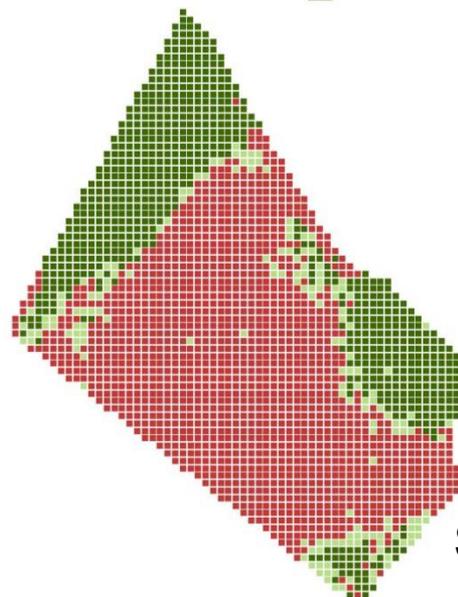
■ Baixa Produtividade 0 - 95%
■ Média Produtividade 95 - 105%
■ Alta Produtividade 105 - 219%



=

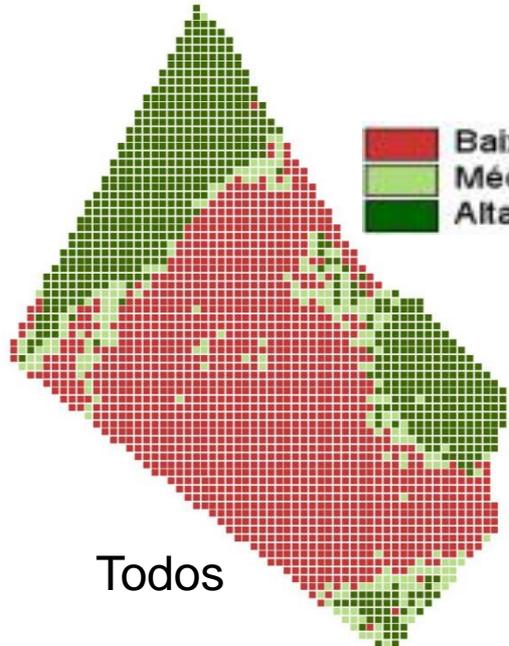


Todos

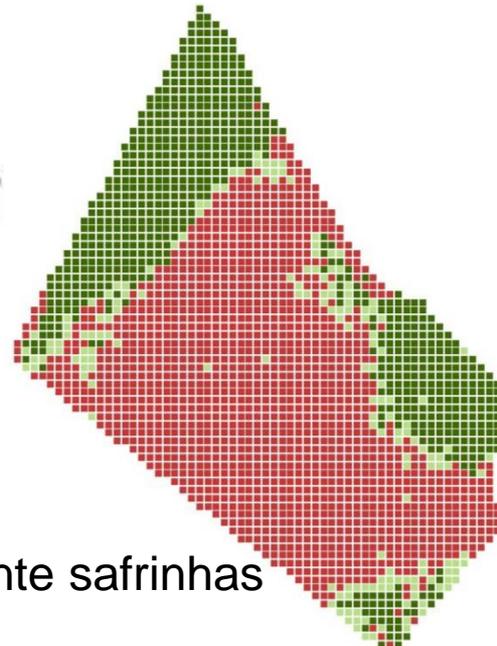


Somente safrinhas

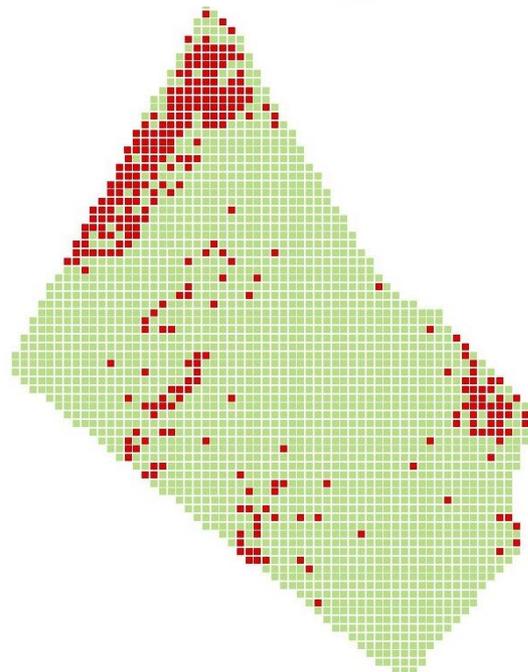
■ Baixa Produtividade 0 - 95%
■ Média Produtividade 95 - 105%
■ Alta Produtividade 105 - 219%



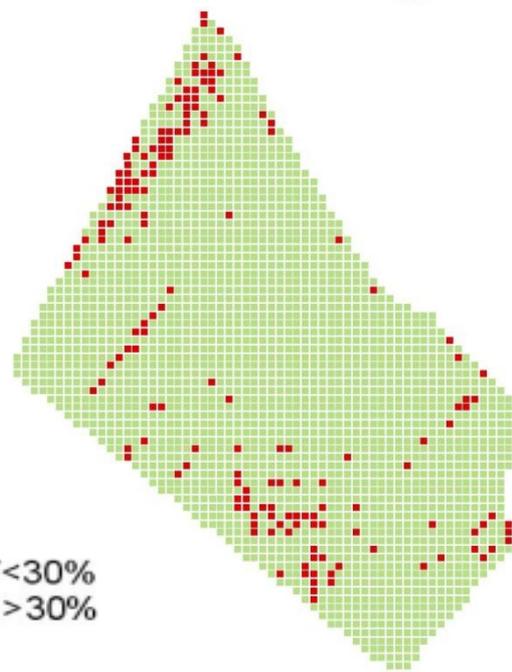
Todos



Somente safrinhas



■ Consistente - CV < 30%
■ Inconsistente - CV > 30%



Unidades de gestão diferenciada em função das produtividades médias normalizadas:



1, 2 e 3 – alta produtividade
4 – baixa produtividade

Formas de demarcar UGD

Análise de Agrupamento (“Clustering”; “Fuzzy Clustering”); algoritmos para classificação, supervisionada ou não, de um conjunto de dados.

Usam como técnica a redução da variabilidade dentro da classe e maximização das diferenças entre as classes.

Análise de Agrupamento

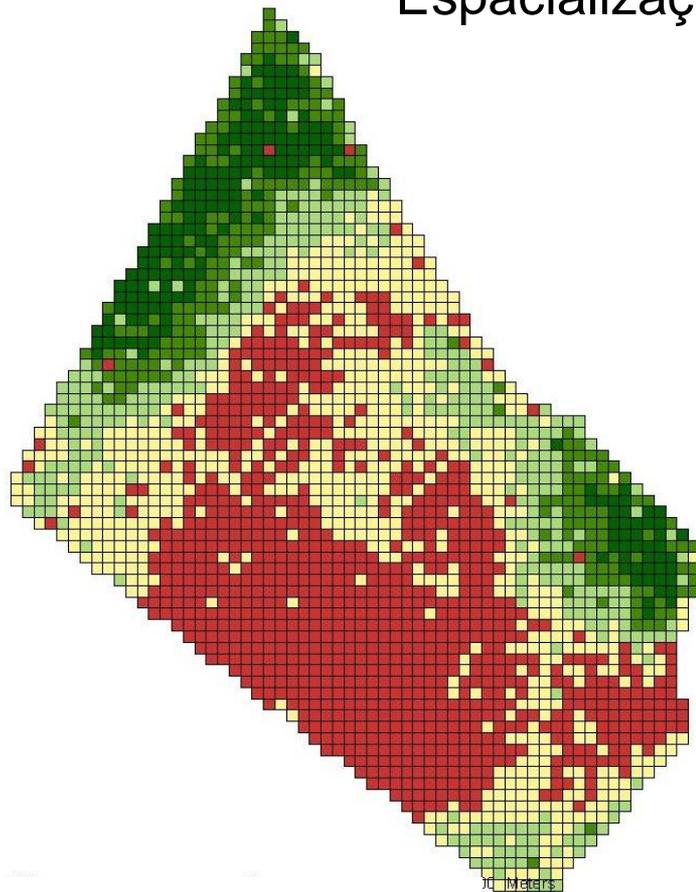
FuzME - Australian Centre for Precision Agriculture (ACPA)

<http://sydney.edu.au/agriculture/pal/software/fuzme.shtml>

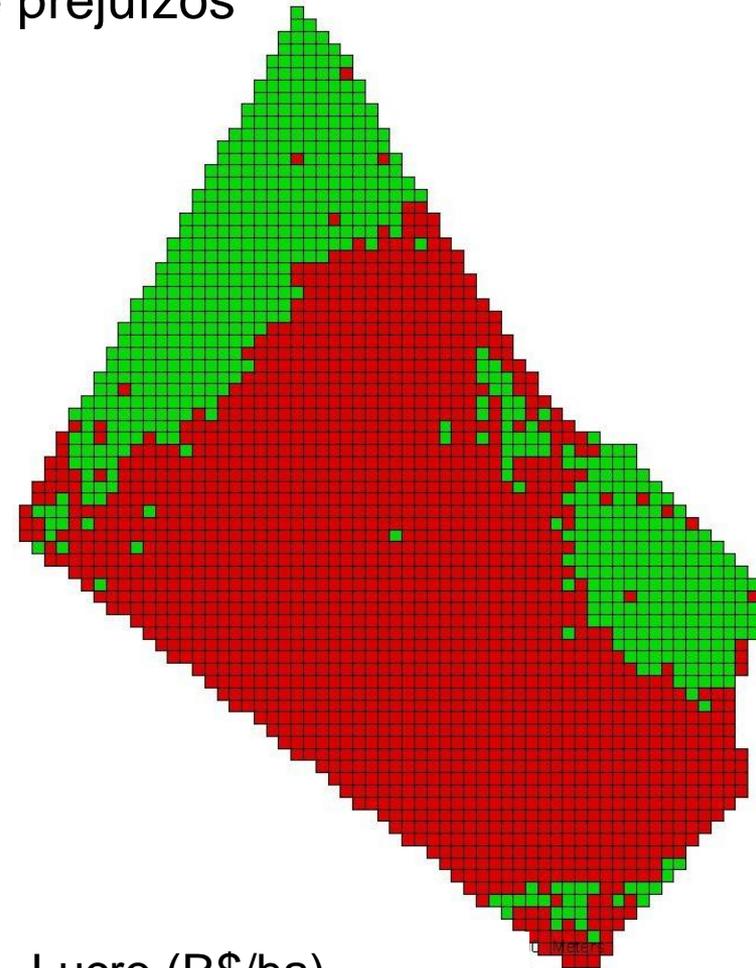
MZA - USDA

<http://www.ars.usda.gov/services/software/download.htm?softwareid=24>

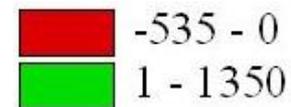
Espacialização dos lucros e prejuízos



Milho Safrinha 2006 (kg/ha)

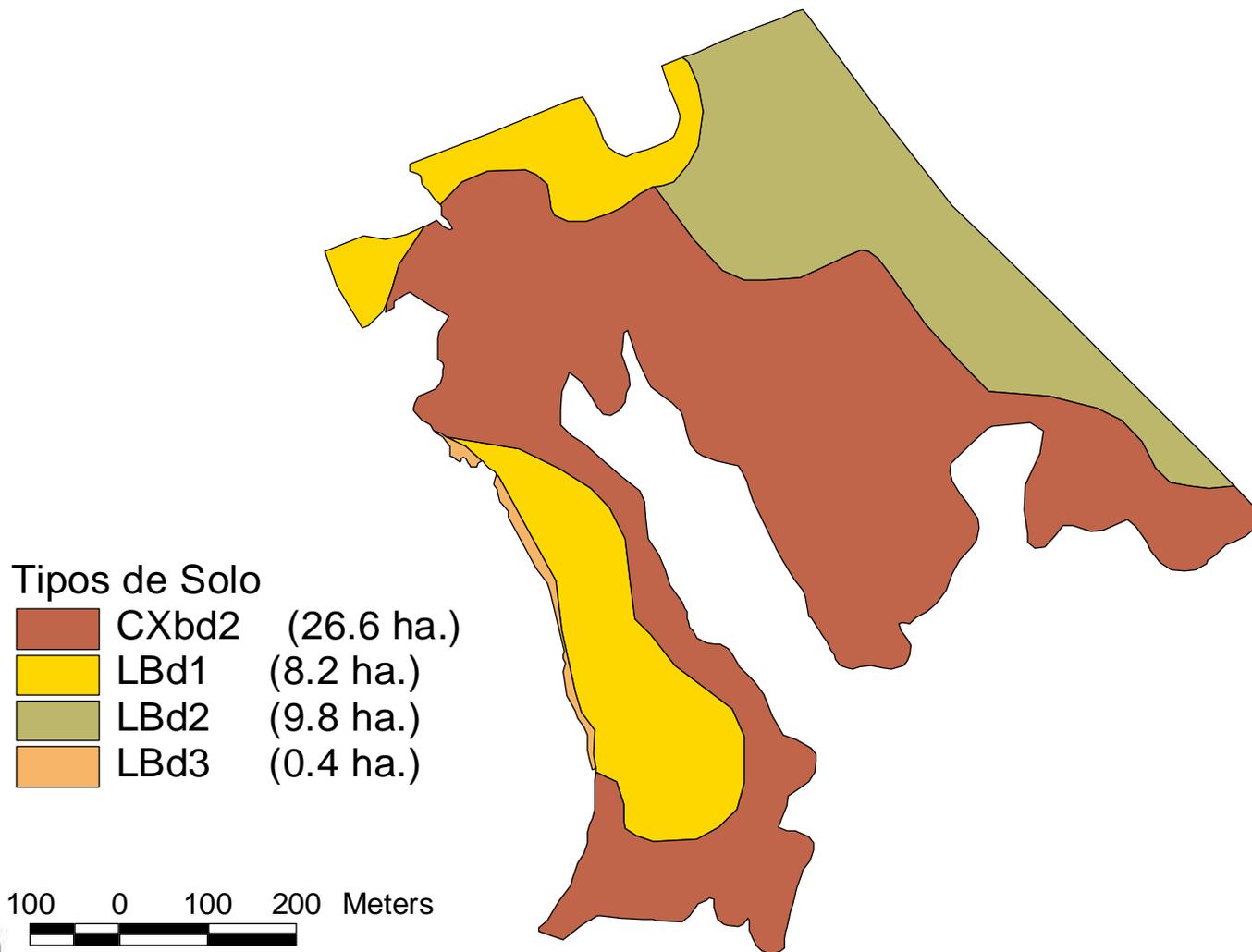


Lucro (R\$/ha)

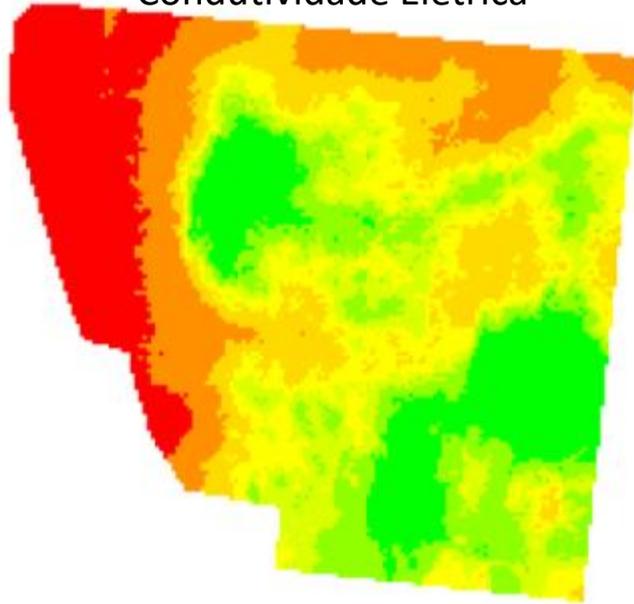


Valores atualizados para 2014:
R\$ 20,00/saco
Custo: R\$ 750,00/ha

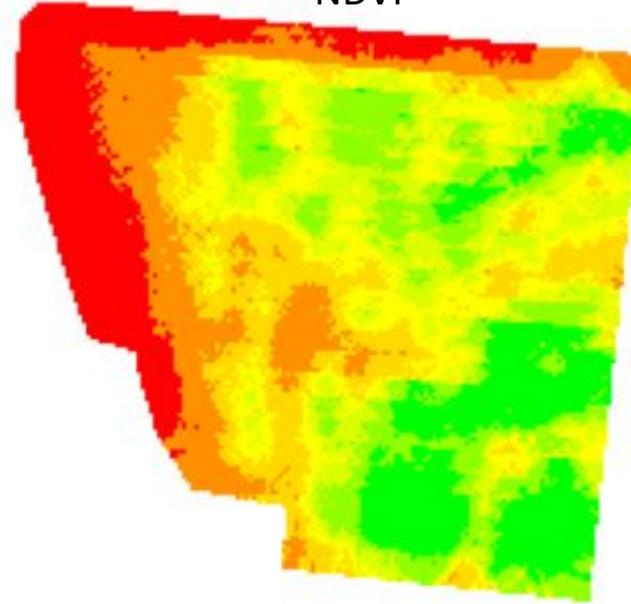
Mapa de Classificação do Solo



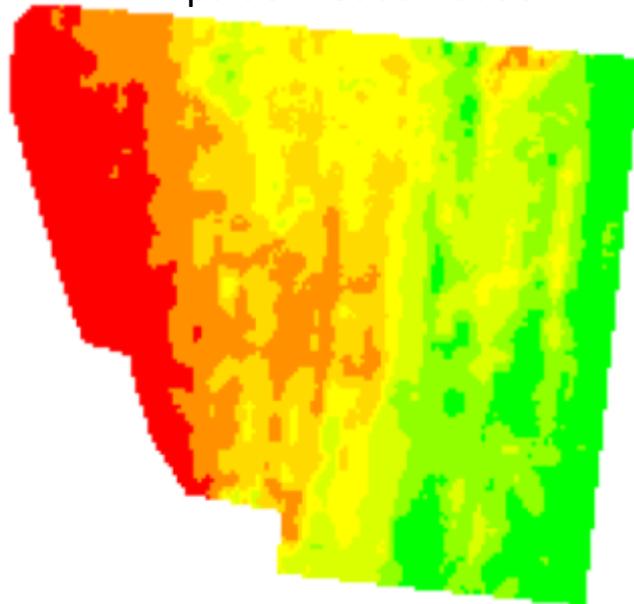
Condutividade Elétrica



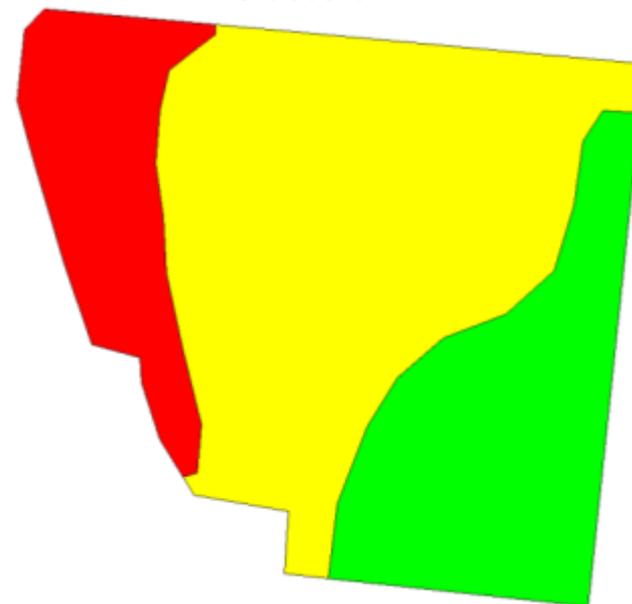
NDVI



Mapa de Produtividade



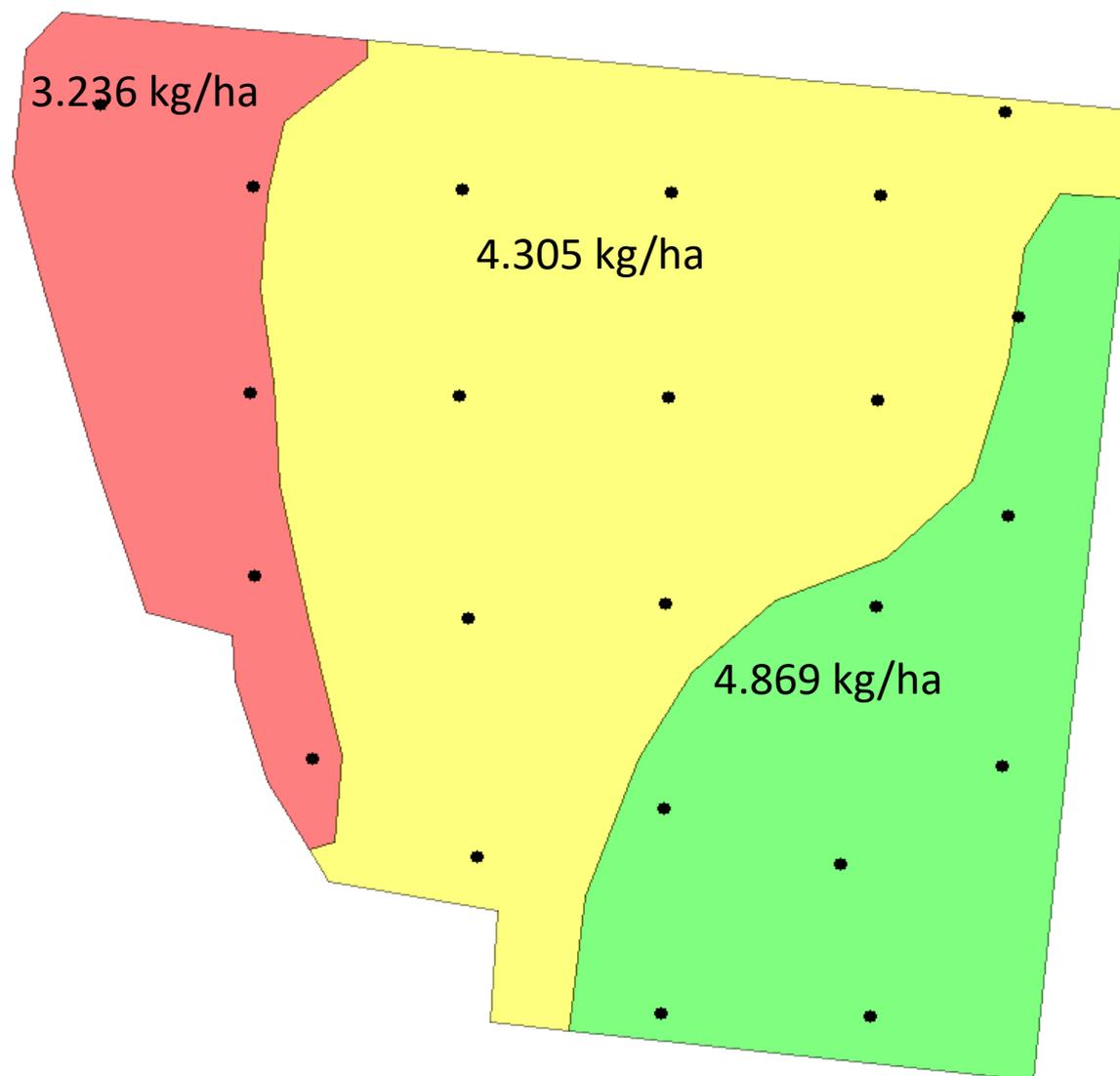
Clusters



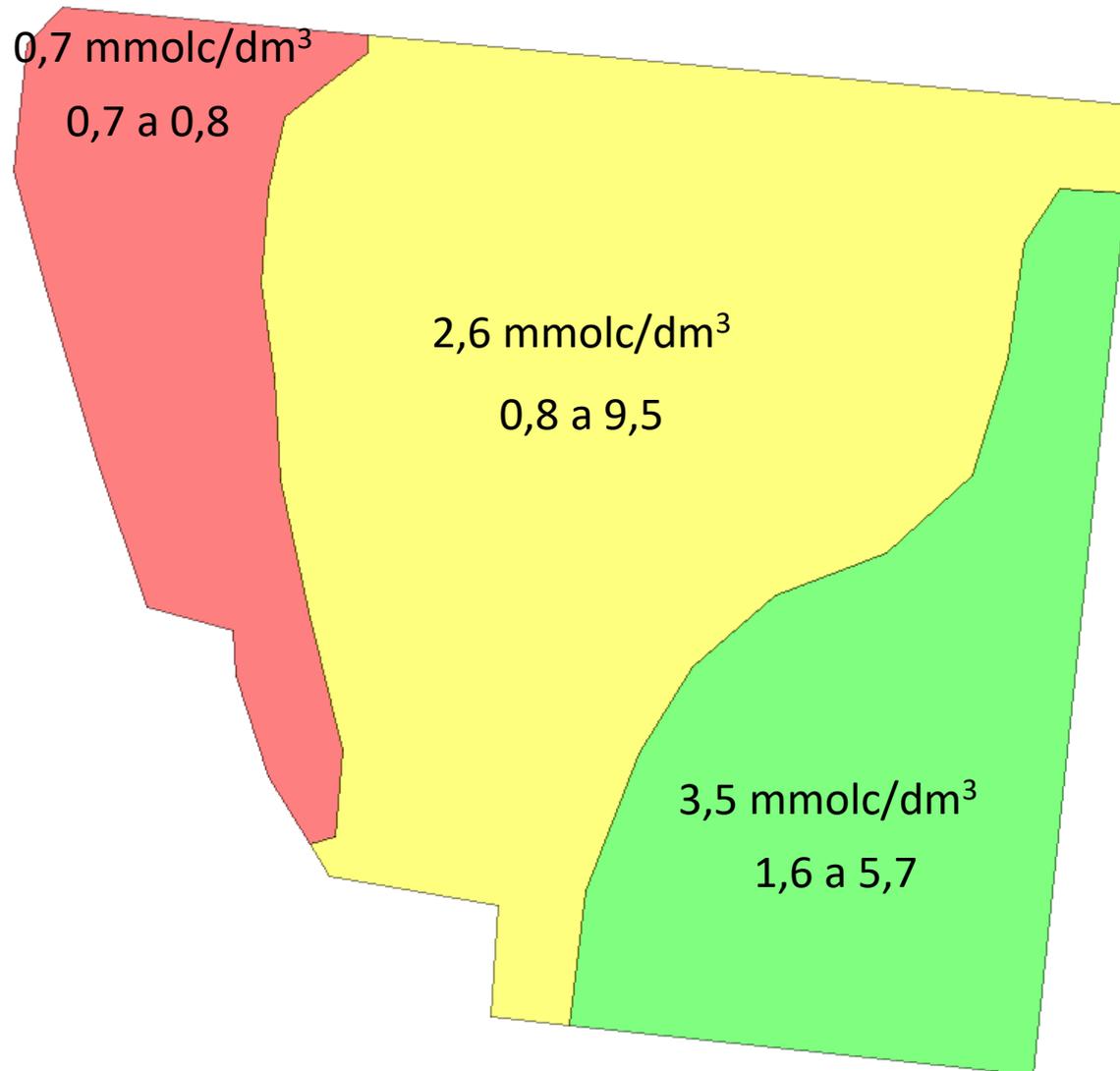
POVH, 2011



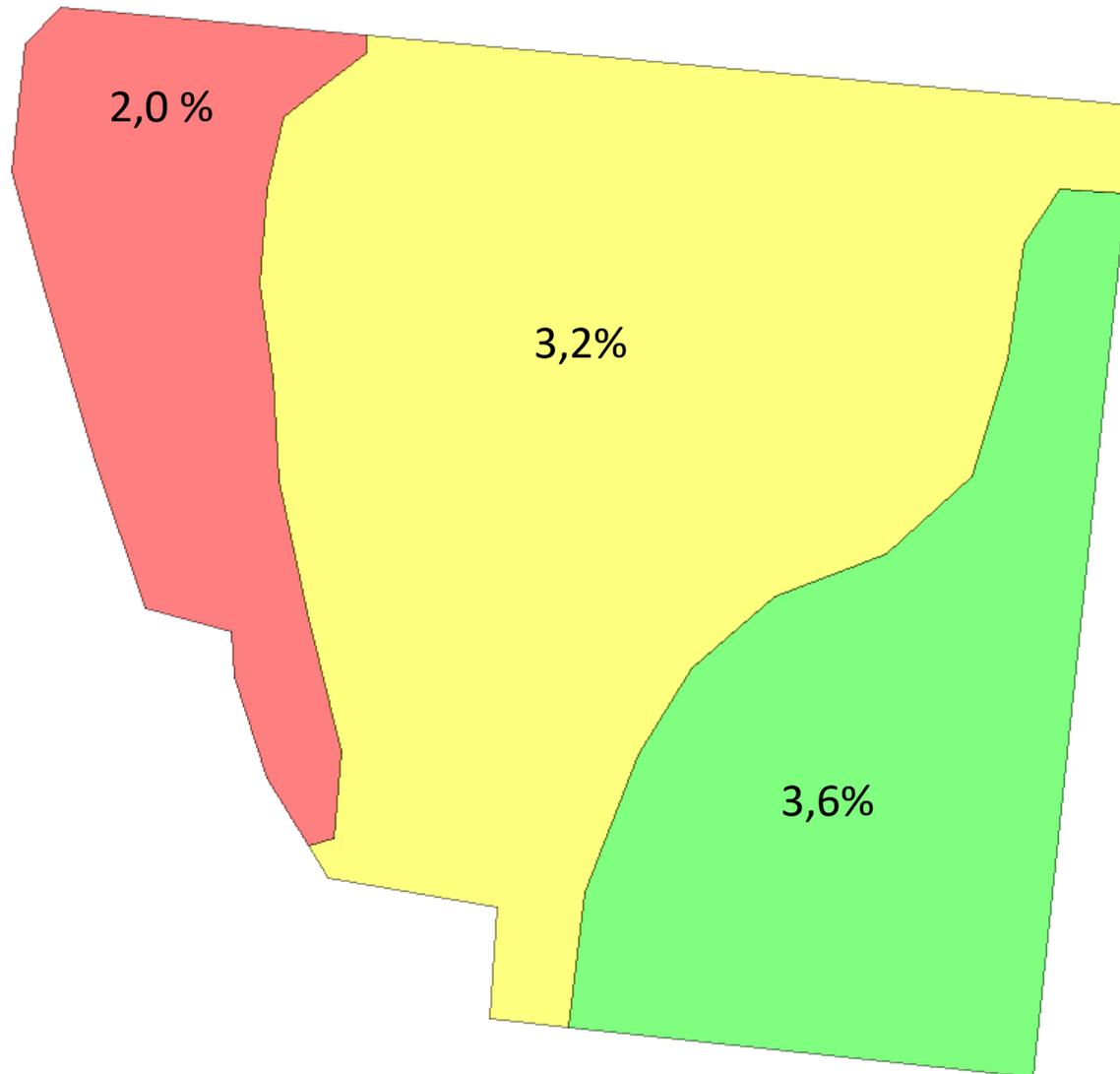
Produtividade de Trigo (safra 10/10) – 41,36 ha



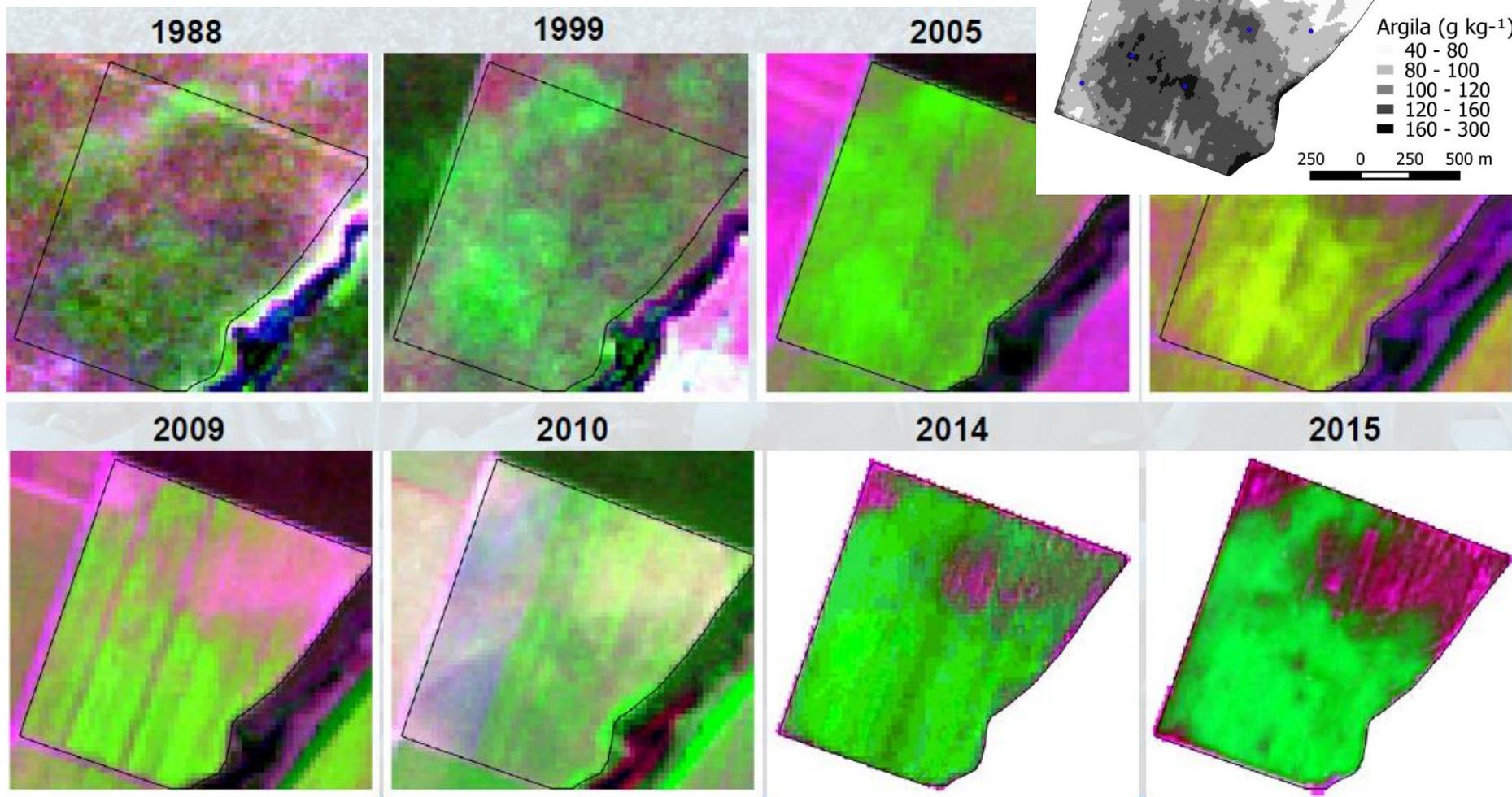
Potássio (0 – 20 cm)



Matéria Orgânica (0 – 20 cm)



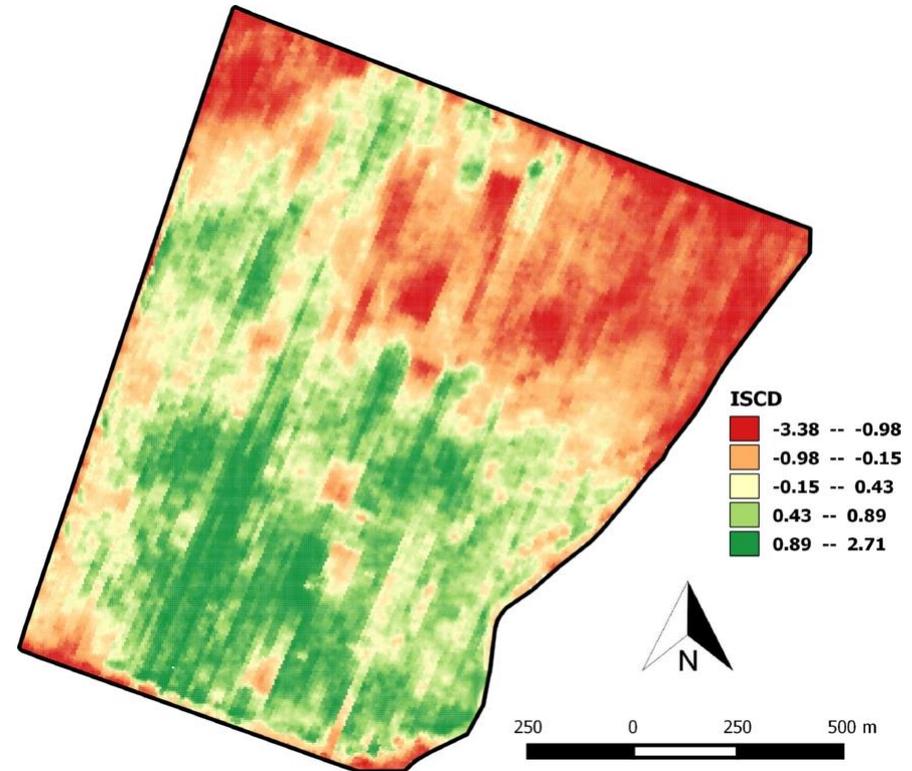
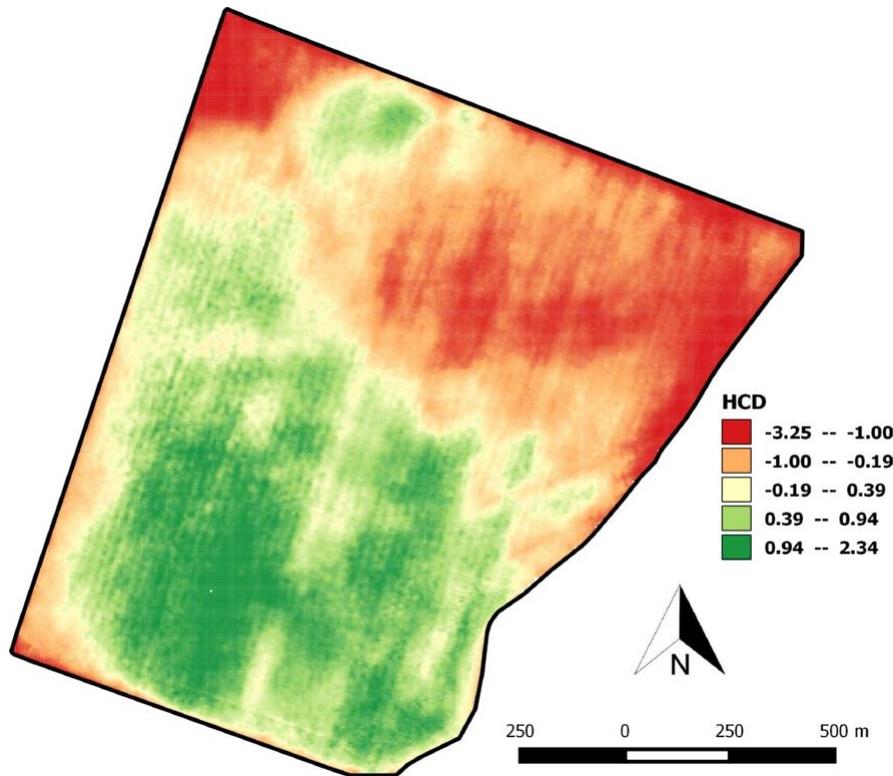
Estabilidade temporal



Trevisan, R. (2018)

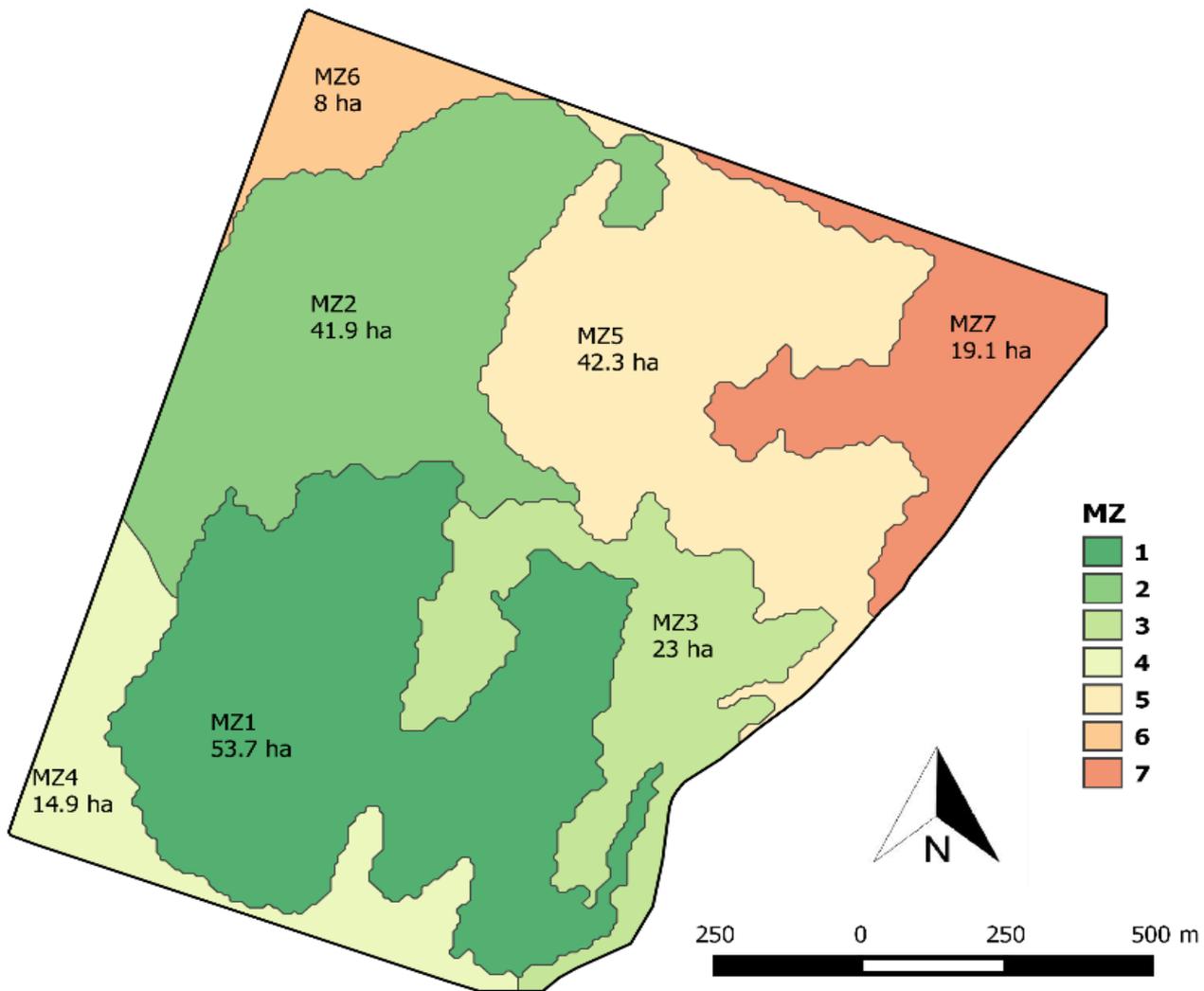
12 historical NDVI maps

N-Sensor, satellite derived NDVI and ultrasonic measured crop height at mid-season and pre-harvest



Maps of the first pair of latent variables from the canonical correlation analysis, representing historical crop development (HCD) and in season crop development (ISCD) for a cotton field in Campo Verde – Mato Grosso – Brazil

Trevisam, R. (2016)



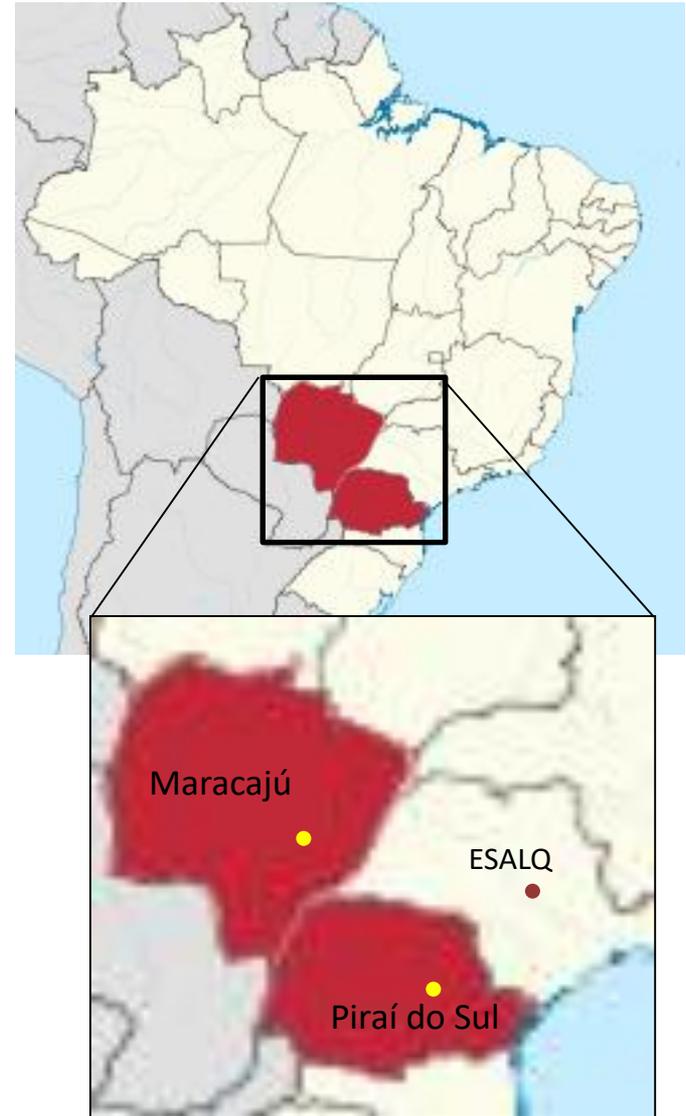
Map of the management zones delineated for a cotton field in Campo Verde – Mato Grosso – Brazil

Trevisan, R. (2016)

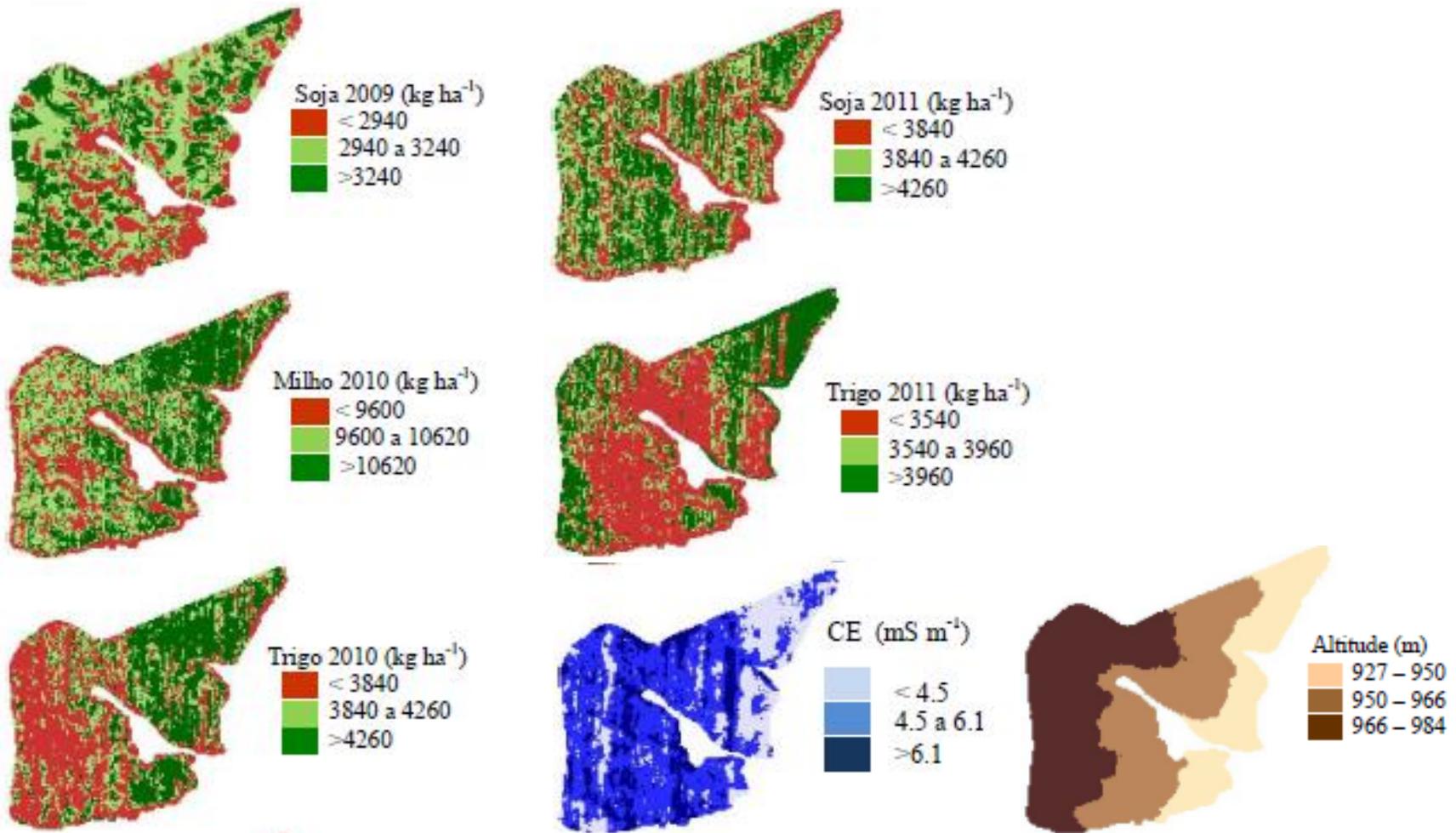
- **Duas regiões geográficas diferentes**

- Duas épocas de semeadura:
Primeira safra (PR)
Segunda safra (MS)

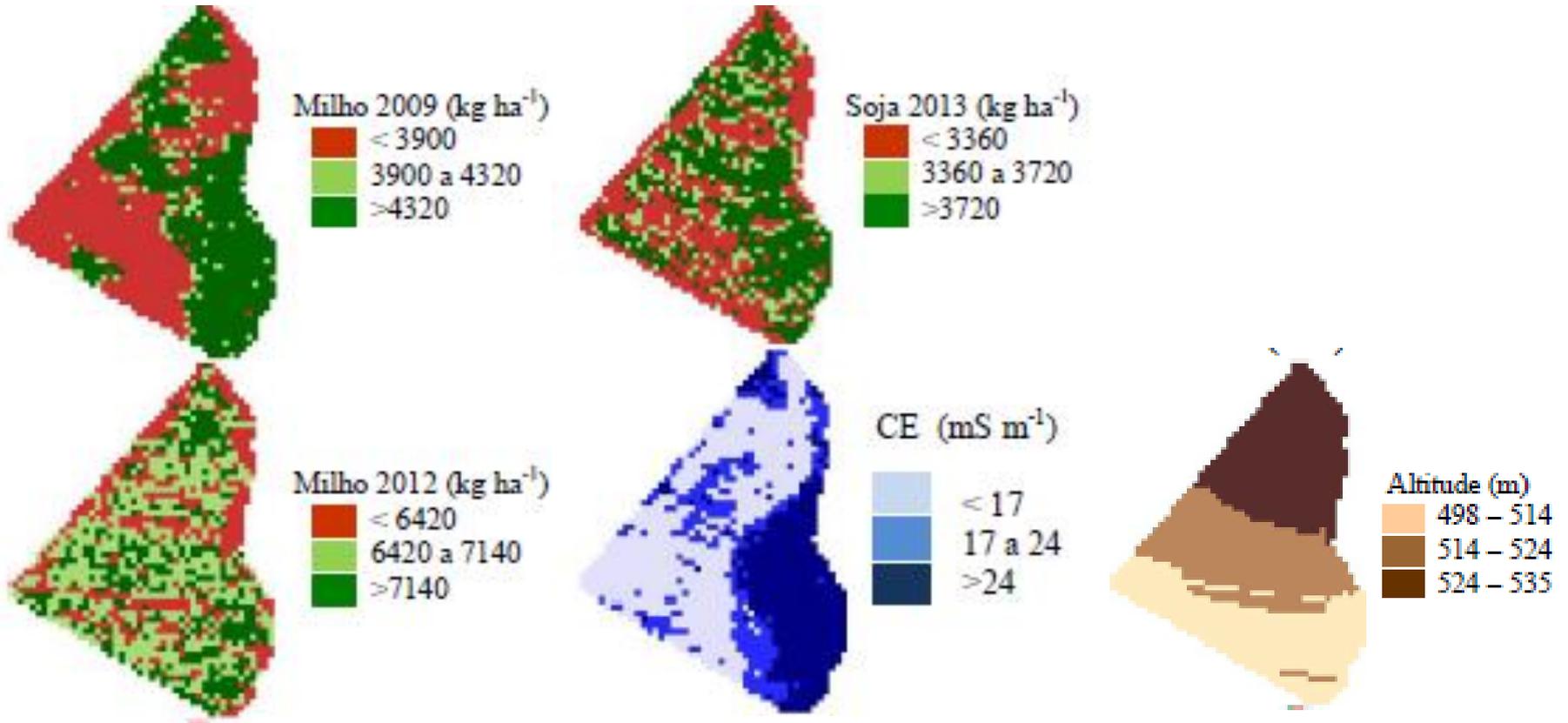
- Fatores sendo testados:
População de plantas
Híbridos de milho
Áreas com diferentes potenciais produtivos



Base de dados para delimitar as UGD: Sequência de mapas normalizados Área 1

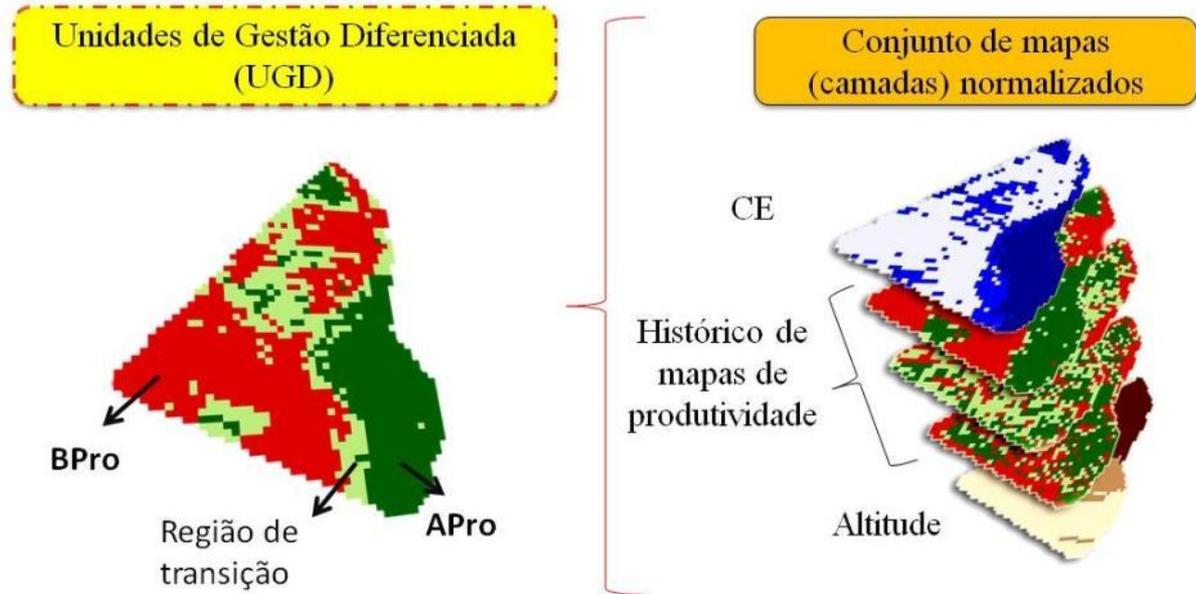


Área 2



DEFINIÇÃO DAS UGD

Abordagem com foco no histórico de mapas de produtividade e fatores perenes relacionado ao solo que possibilitem mensuração rápida e prática.



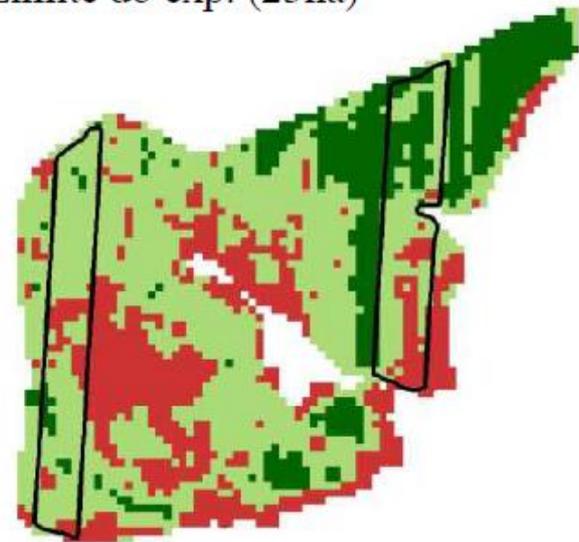
BPro < 95% da média,

Região de transição, valores de 95% a 105% da média

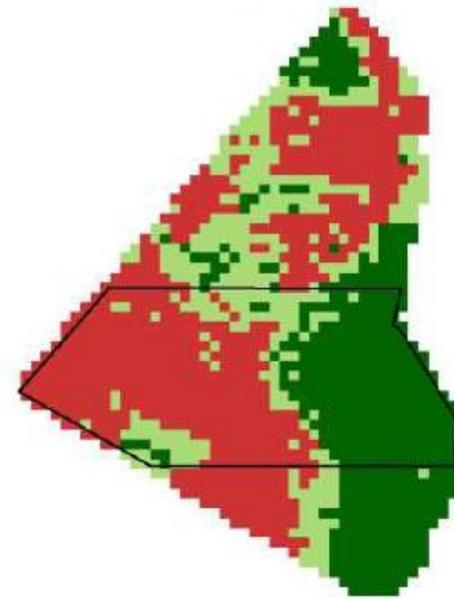
APro > 105% da média

Delimitação das UGDs

UGD exp. 1
— Limite do exp. (23ha)



UGD exp. 2
— Limite do exp. (26ha)



-  Baixo potencial Produtivo (BPro).
-  Região de Transição
-  Alto potencial Produtivo (APro)

Unidades com média superior a 105% foram definidas como APro, unidades entre 95% -105% foram definidas com região de transição e unidades com média inferior a 105% foram definidas com Bpro.

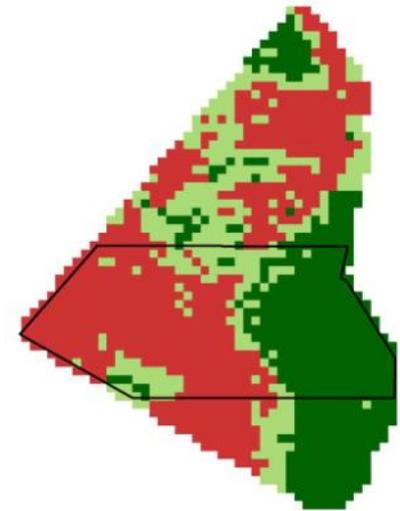
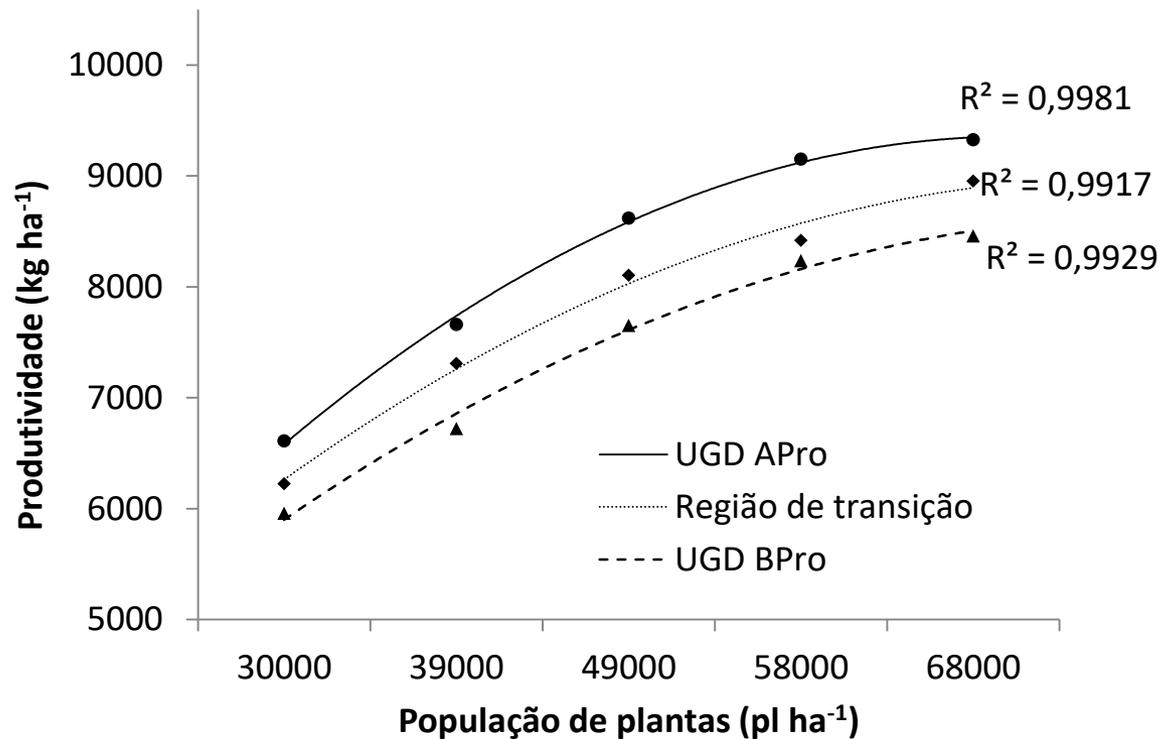
Área total d

N da pas Híbr

1
2
3
4
5
6
7
8

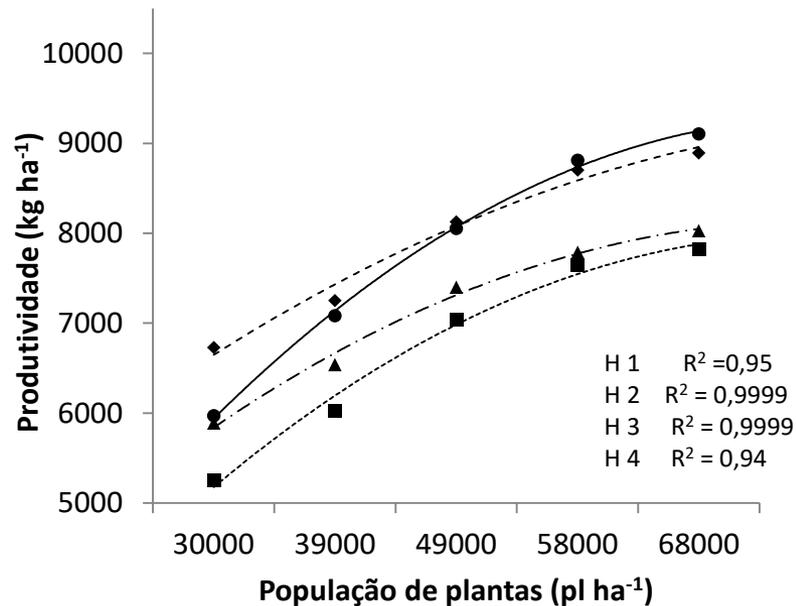


12 m
2Hb em cada passada da
semeadora

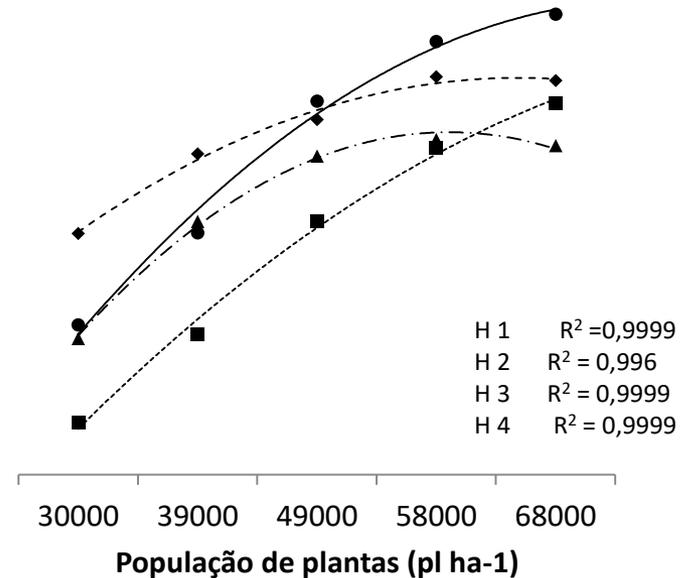


Efeito da população de plantas na produtividade de milho em diferentes UGD.
Média de quatro híbridos. Exp2 MS.

UGD de BPro



UGD de APro



Efeito da população de plantas na produtividade de milho para diferentes híbridos cultivados em unidade de gestão diferenciada. Exp2, MS.

