

A map of the state of Mato Grosso, Brazil, showing major cities and rivers. The map is partially obscured by a green title box and an orange text box. The title box contains the text 'ANÁLISE DA DISTRIBUIÇÃO ESPACIAL DA CULTURA DA SOJA NO ESTADO DO MATO GROSSO'. The orange box contains the text 'SER-301 Análise Espacial de Dados Geográficos Moisés Pereira Galvão Salgado salgado@dsr.inpe.br'. The map shows cities such as Cuiabá, Caceres, Poconé, and Barão de Melgaço, and rivers such as the Rio Juruá and Rio Paraguai. The state of Mato Grosso is labeled at the bottom, and the state of Mato Grosso do Sul is labeled at the top. The country of Bolivia is labeled to the west.

# ANÁLISE DA DISTRIBUIÇÃO ESPACIAL DA CULTURA DA SOJA NO ESTADO DO MATO GROSSO

SER-301 Análise Espacial de Dados Geográficos  
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salgado@dsr.inpe.br

A map of the state of Mato Grosso, Brazil, showing major cities and rivers. The map is overlaid with text. The text is in green and black. The green text asks 'Como se distribui a cultura da soja no MT?' and 'Quais as regiões de concentração da cultura?'. The black text lists 'Planejamento das atividades do setor agrícola', 'Estabelecer prioridades na alocação de recursos', and 'Estratégias de promoções industriais'.

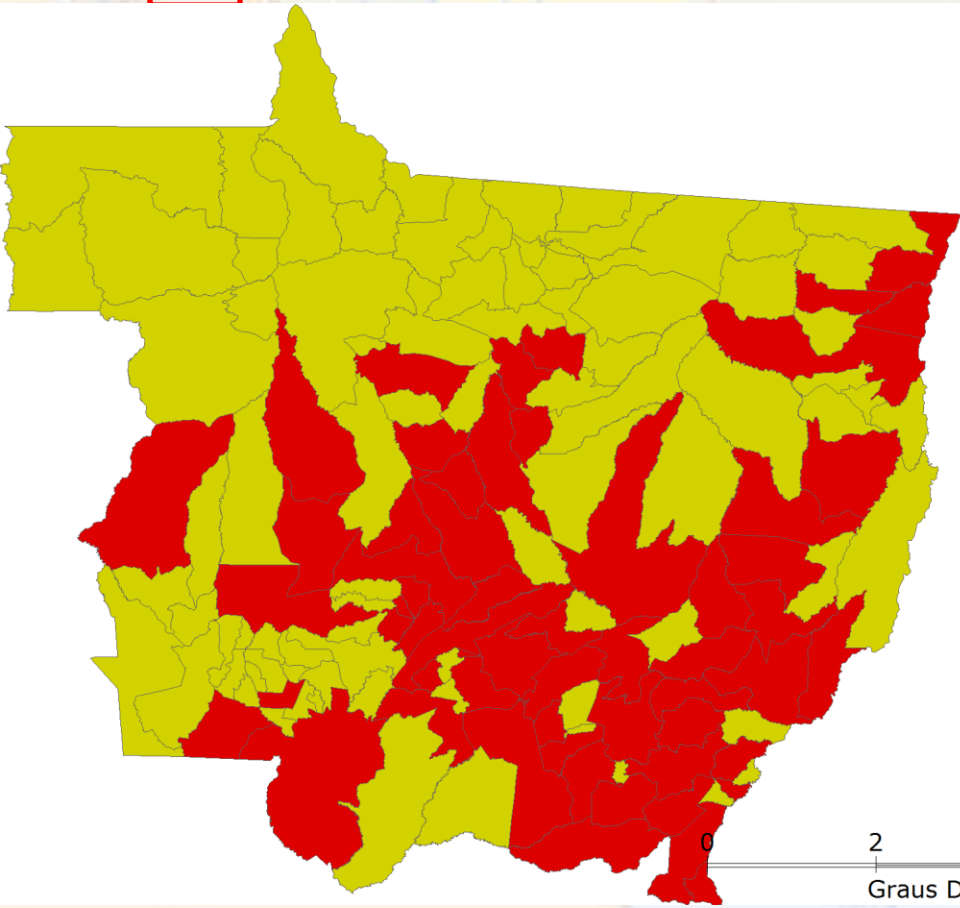
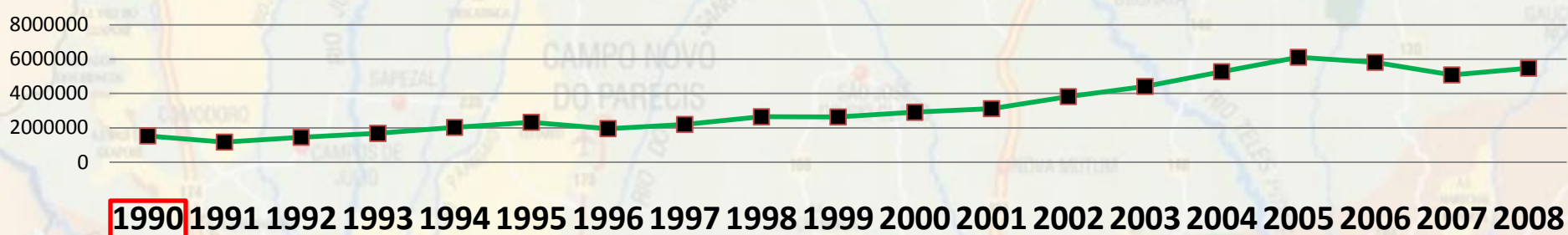
**Como se distribui a cultura da soja no MT?**

**Quais as regiões de concentração da cultura?**

**Planejamento das atividades do setor agrícola**

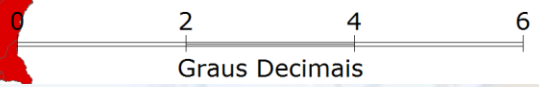
**Estabelecer prioridades na alocação de recursos**

**Estratégias de promoções industriais**

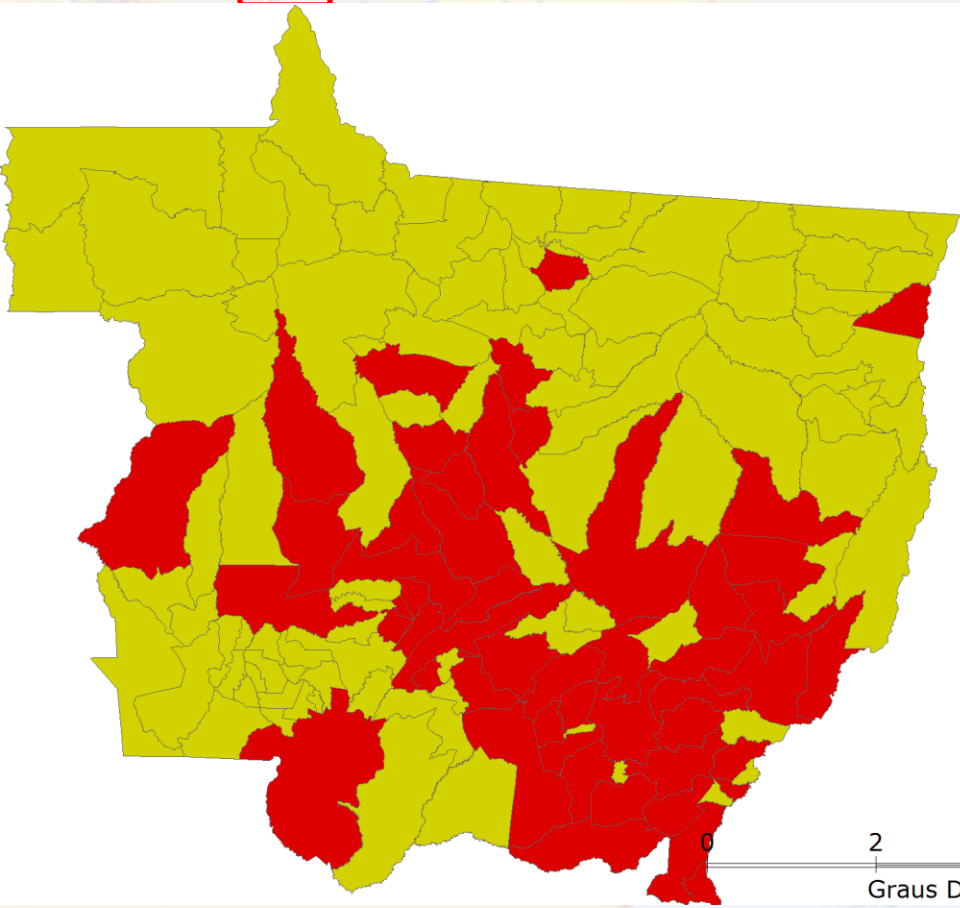
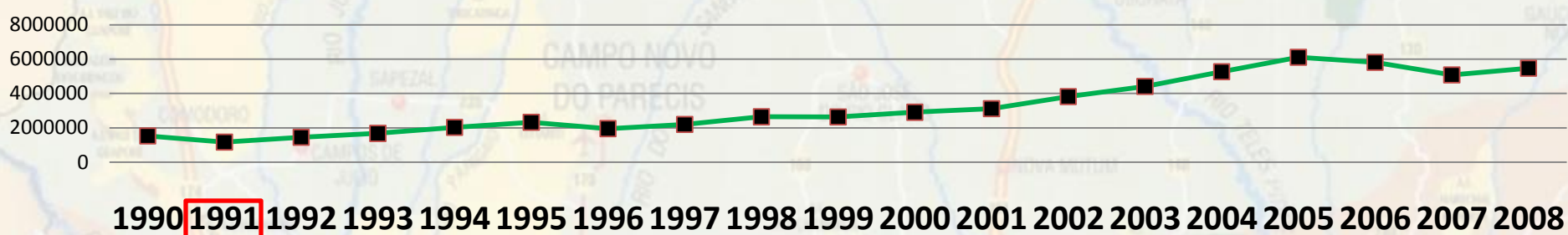


### Legenda

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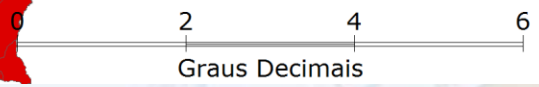


Área colhida (hectares) de soja. Dados da Produção Agrícola Municipal – IBGE (1990)

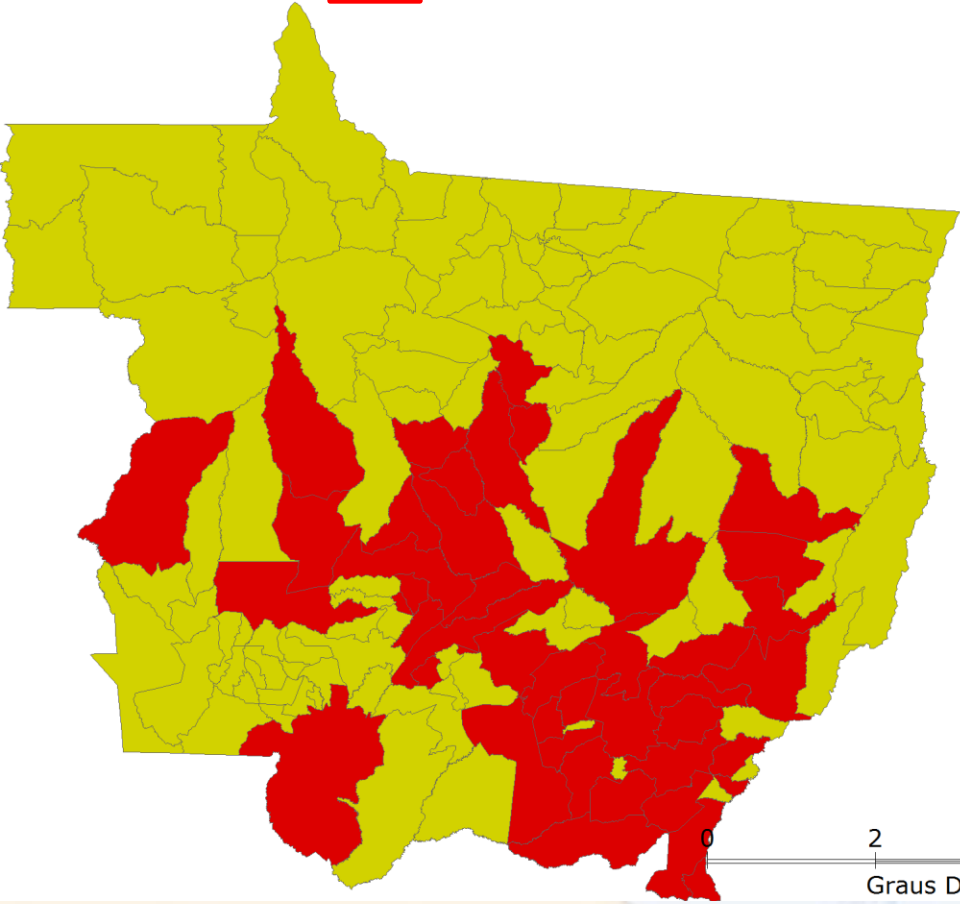
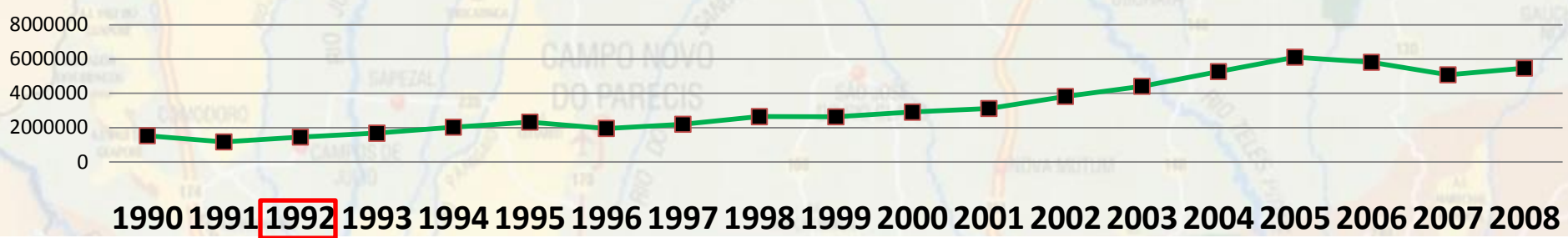


### Legenda

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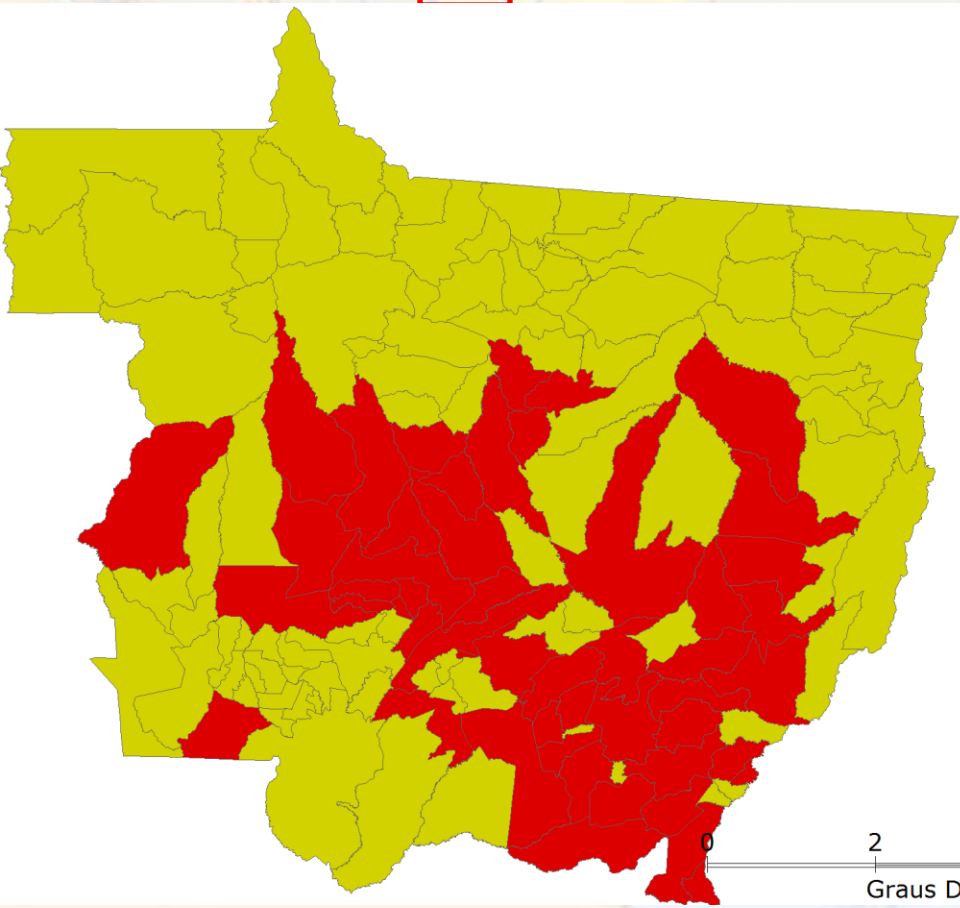
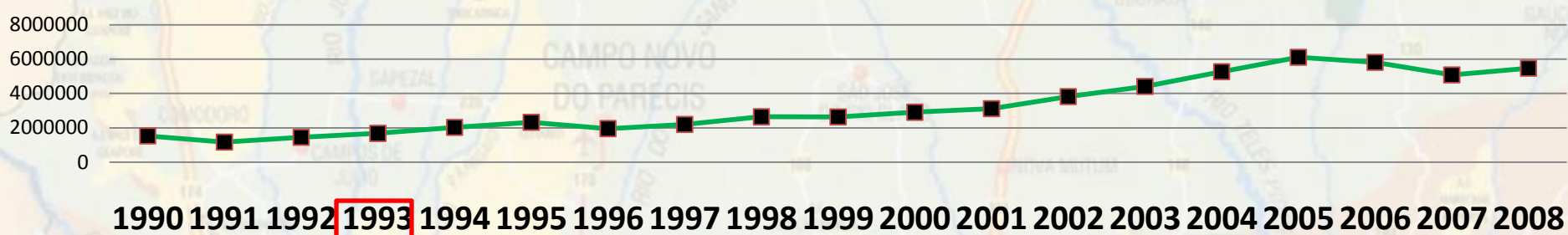
Área colhida (hectares) de soja. Dados da Produção Agrícola Municipal – IBGE (1991)



### Legenda

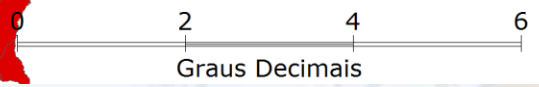
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Área colhida (hectares) de soja. Dados da Produção Agrícola Municipal – IBGE (1992)

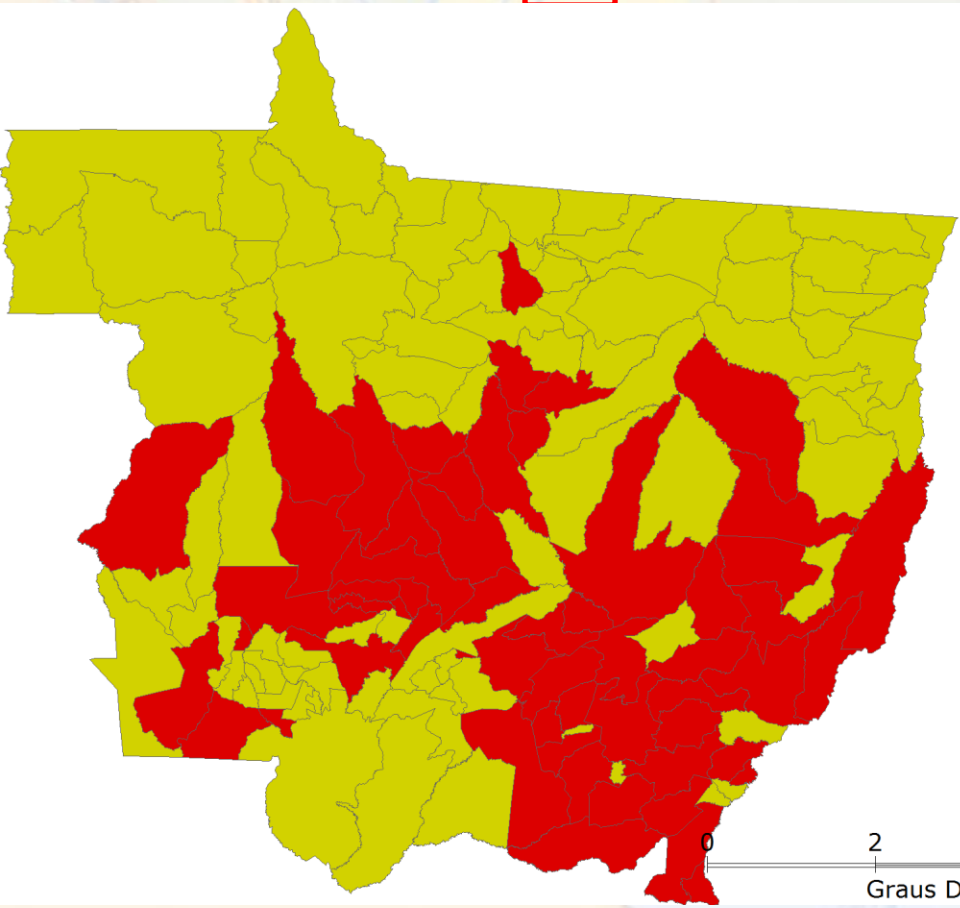
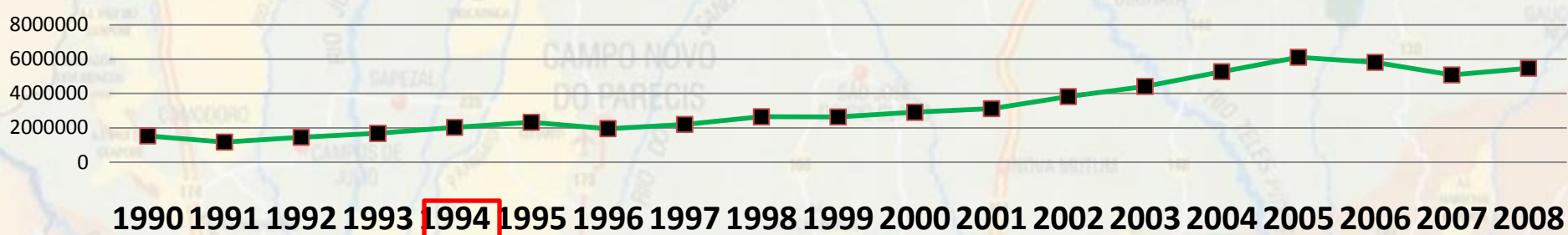


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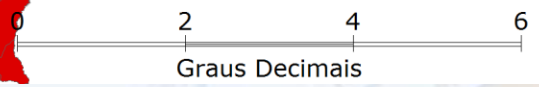


Área colhida (hectares) de soja. Dados da Produção Agrícola Municipal – IBGE (1993)

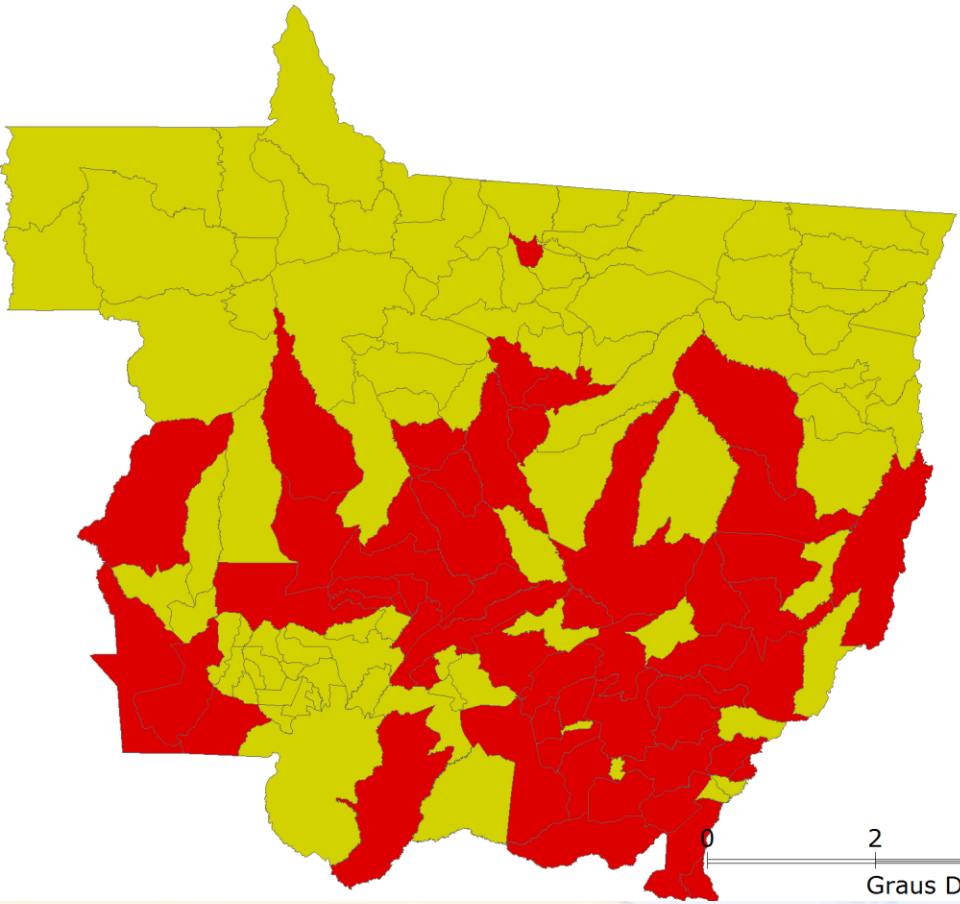
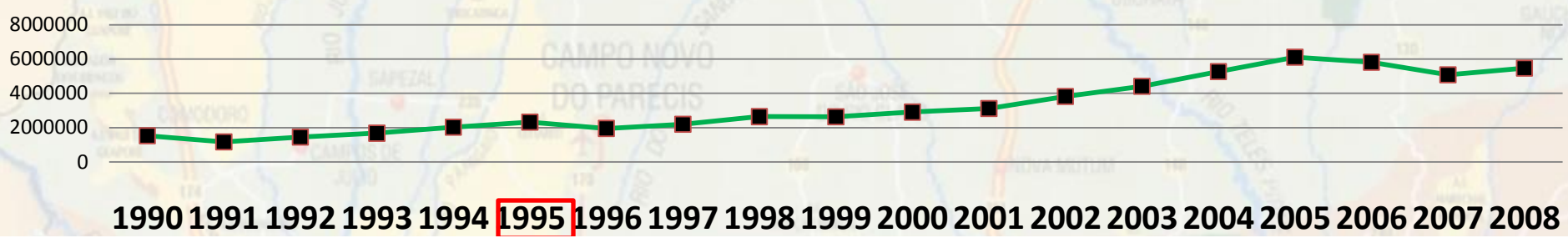


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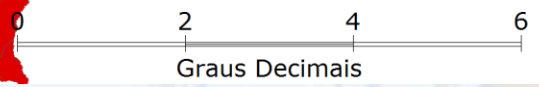


Área colhida (hectares) de soja. Dados da Produção Agrícola Municipal – IBGE (1994)



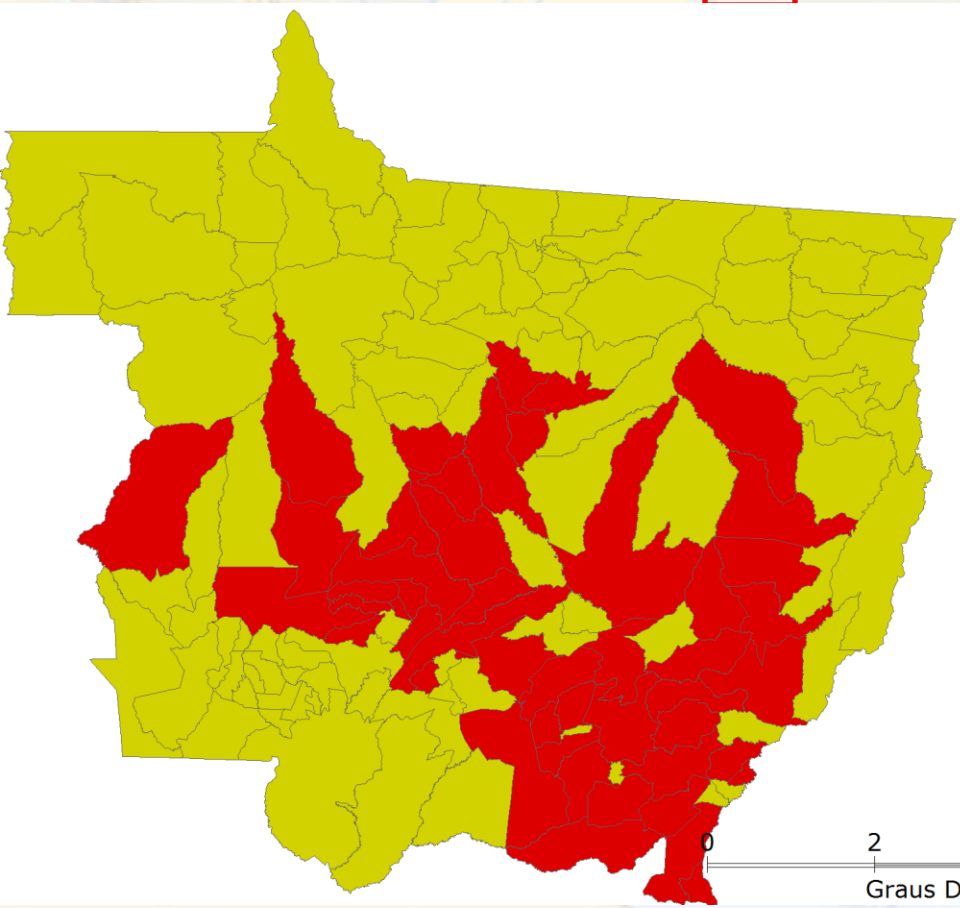
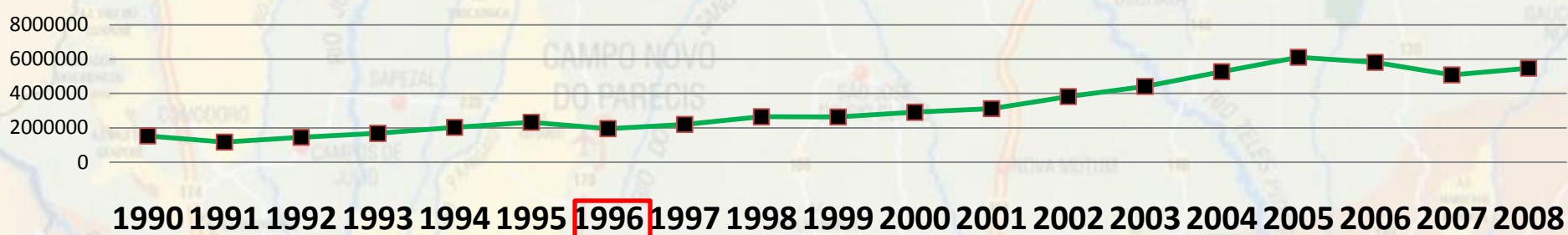
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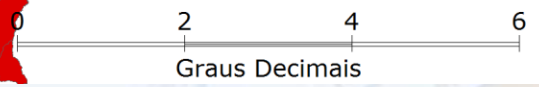
Área colhida (hectares) de soja. Dados da Produção Agrícola Municipal – IBGE (1995)



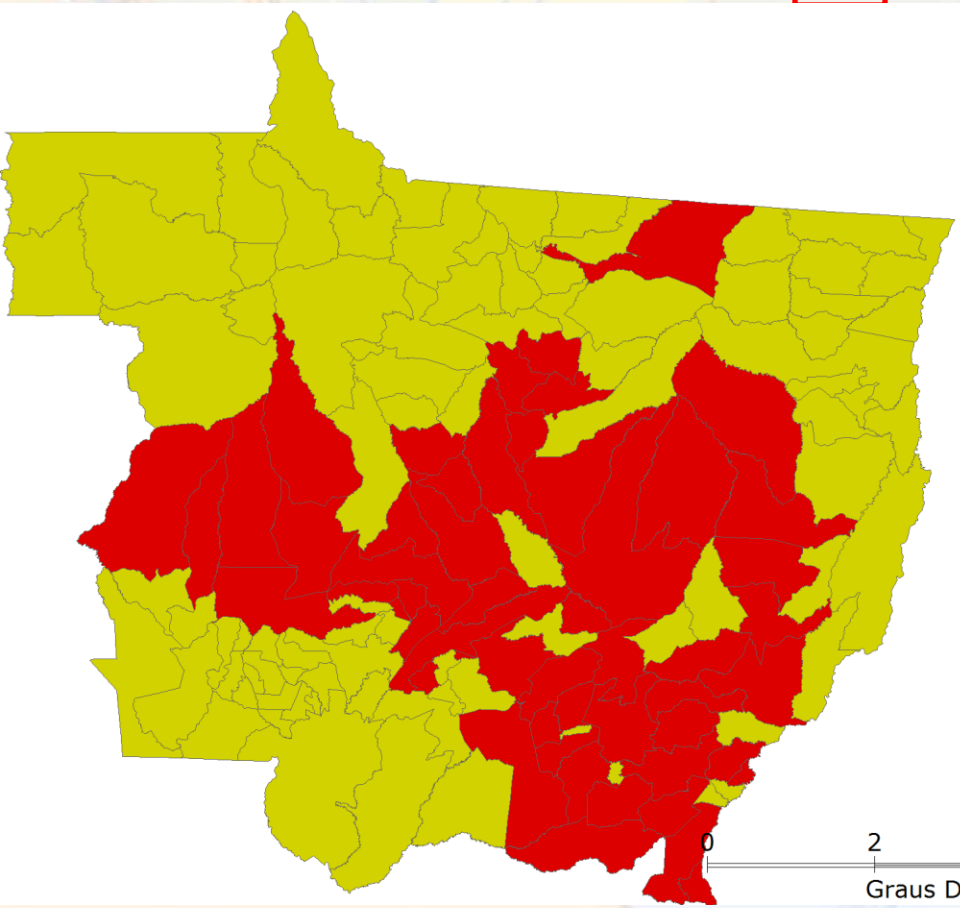


### Legenda

- Área colhida = 0
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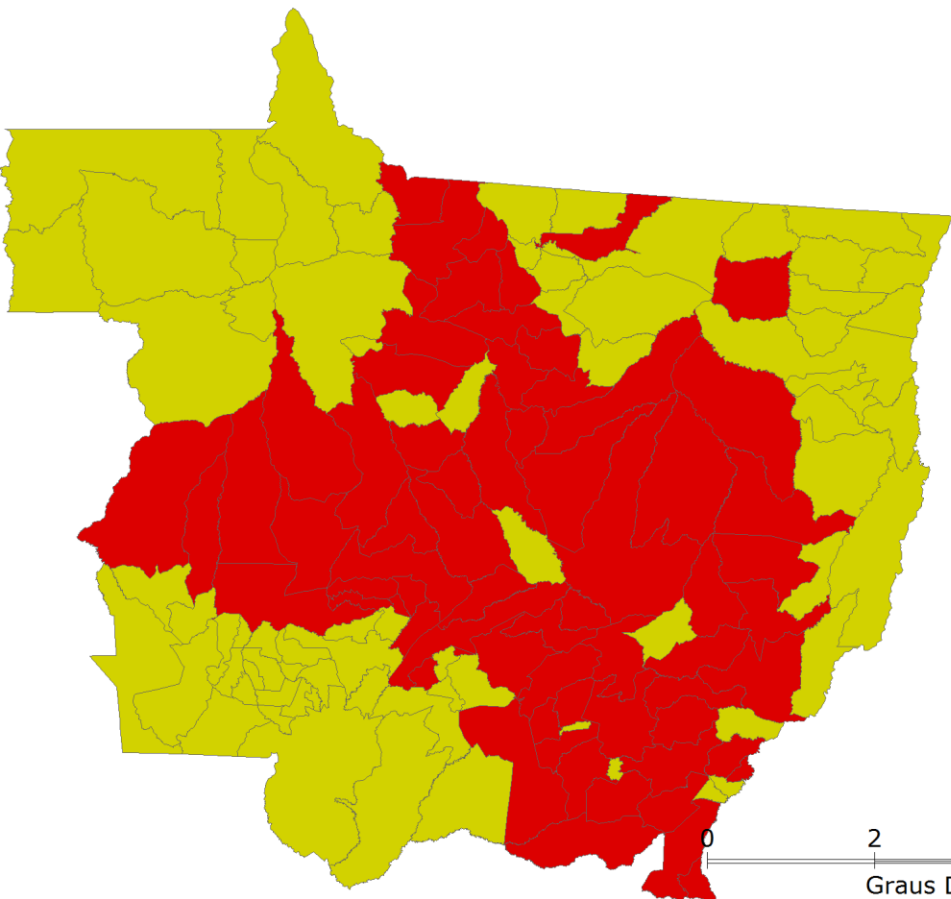
Área colhida (hectares) de soja. Dados da Produção Agrícola Municipal – IBGE (1996)



### Legenda

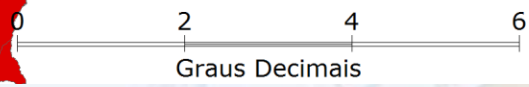
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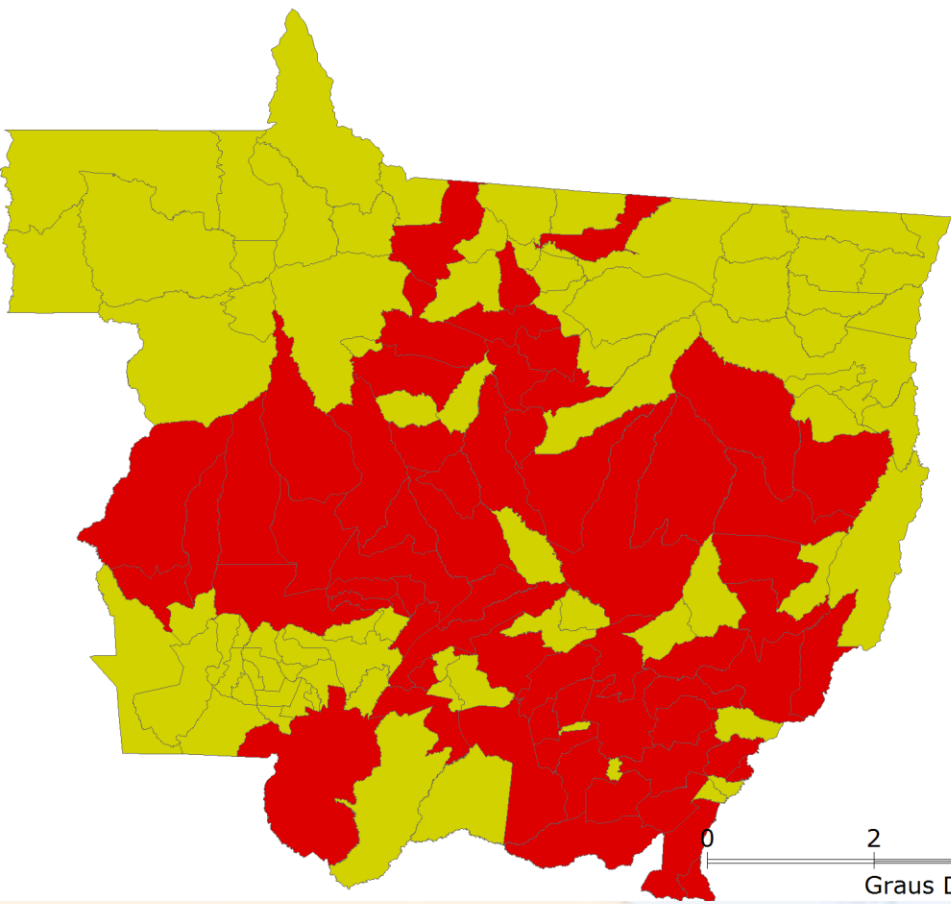
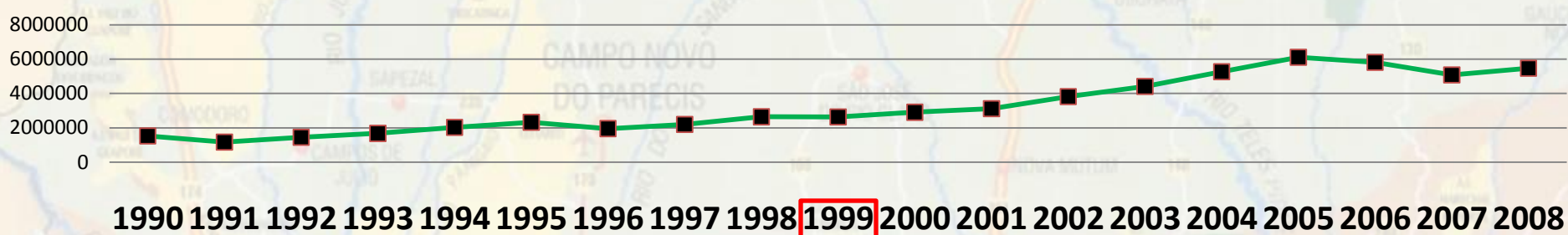


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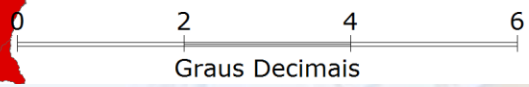


Área colhida (hectares) de soja. Dados da Produção Agrícola Municipal – IBGE (1998)

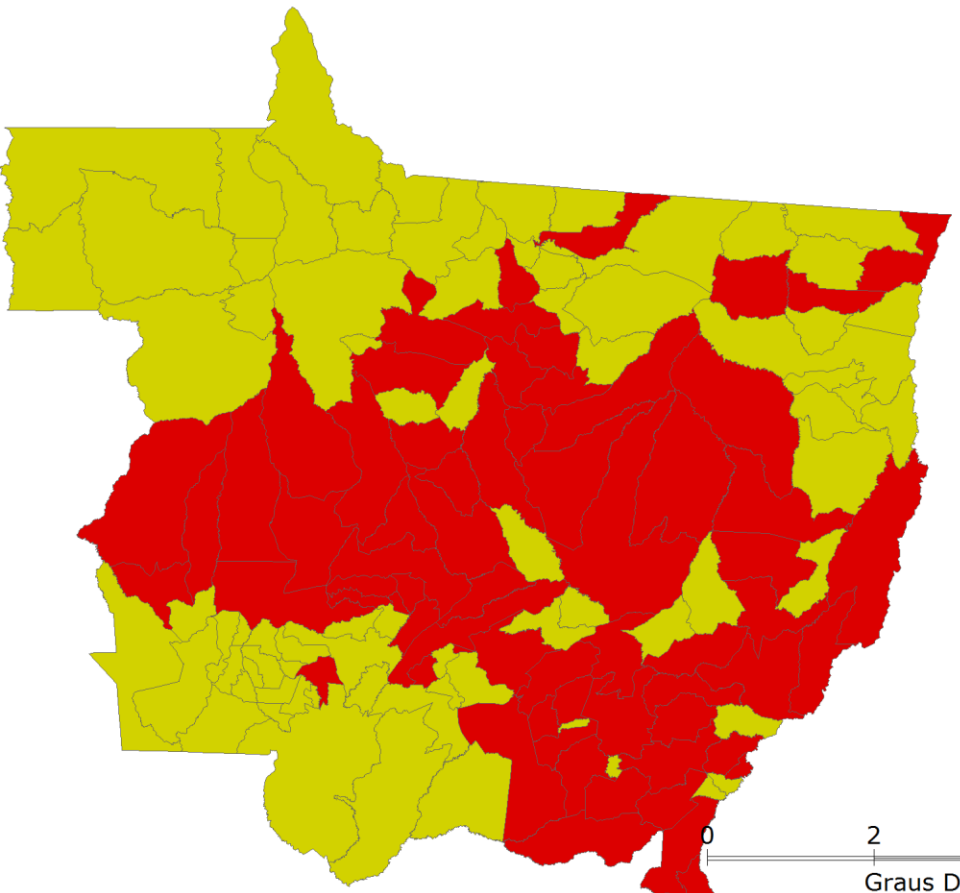
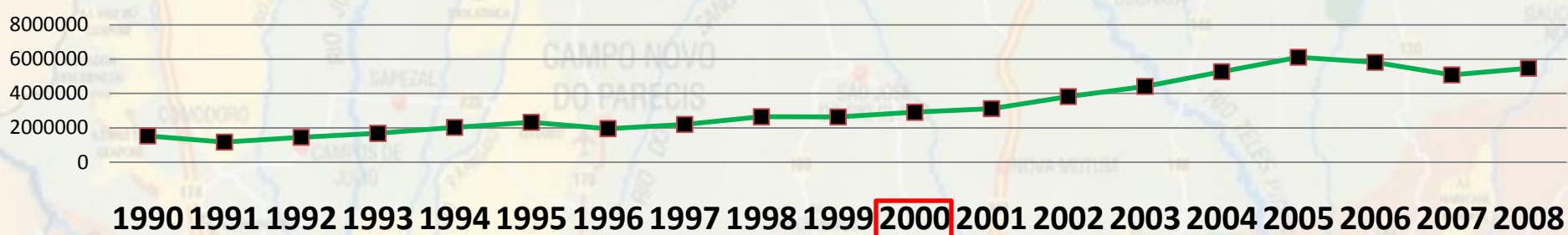


### Legenda

- Área colhida = 0
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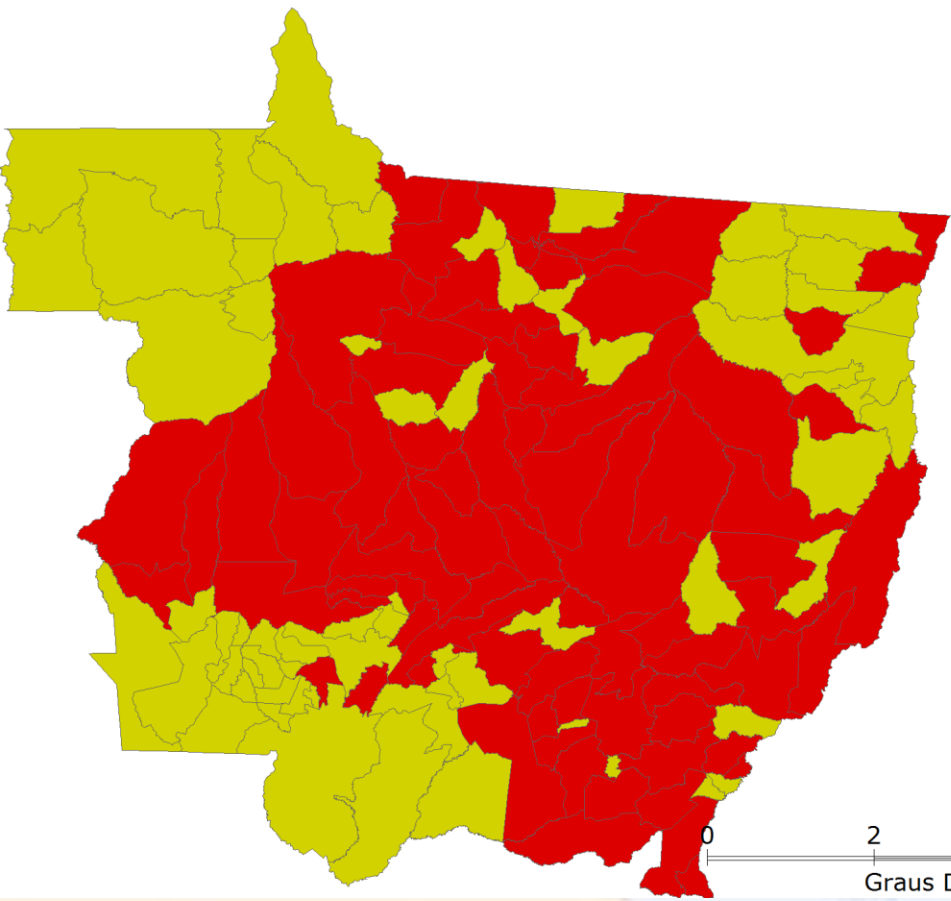
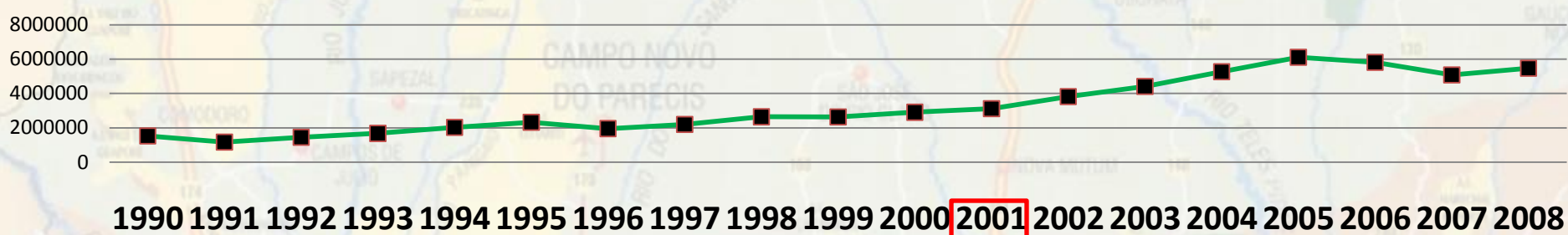
Área colhida (hectares) de soja. Dados da Produção Agrícola Municipal – IBGE (1999)



### Legenda

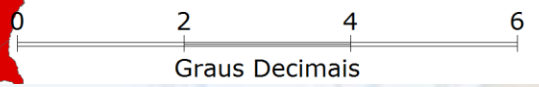
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Área colhida (hectares) de soja. Dados da Produção Agrícola Municipal – IBGE (2000)

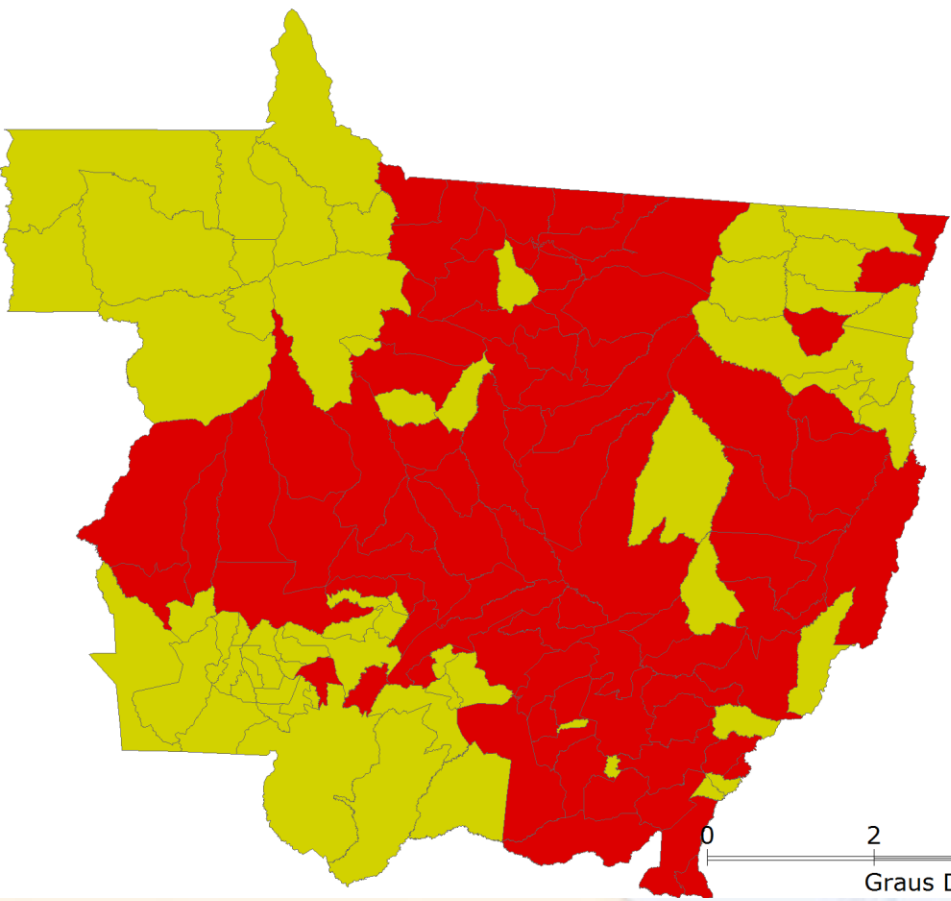
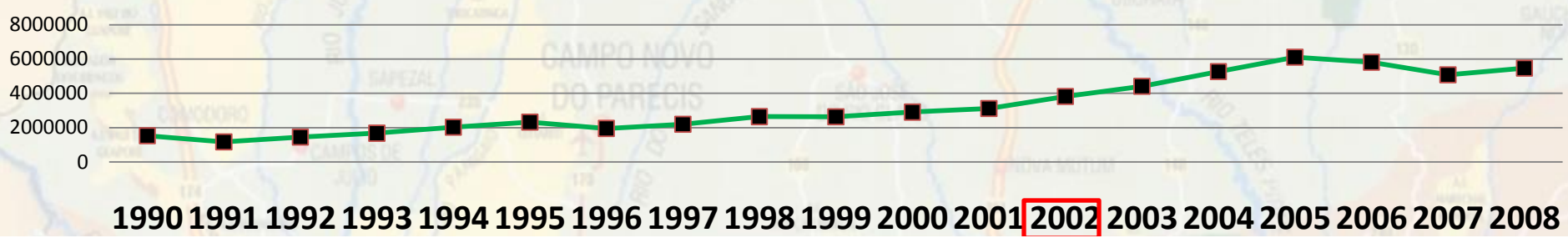


### Legenda

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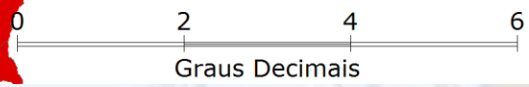


Área colhida (hectares) de soja. Dados da Produção Agrícola Municipal – IBGE (2001)

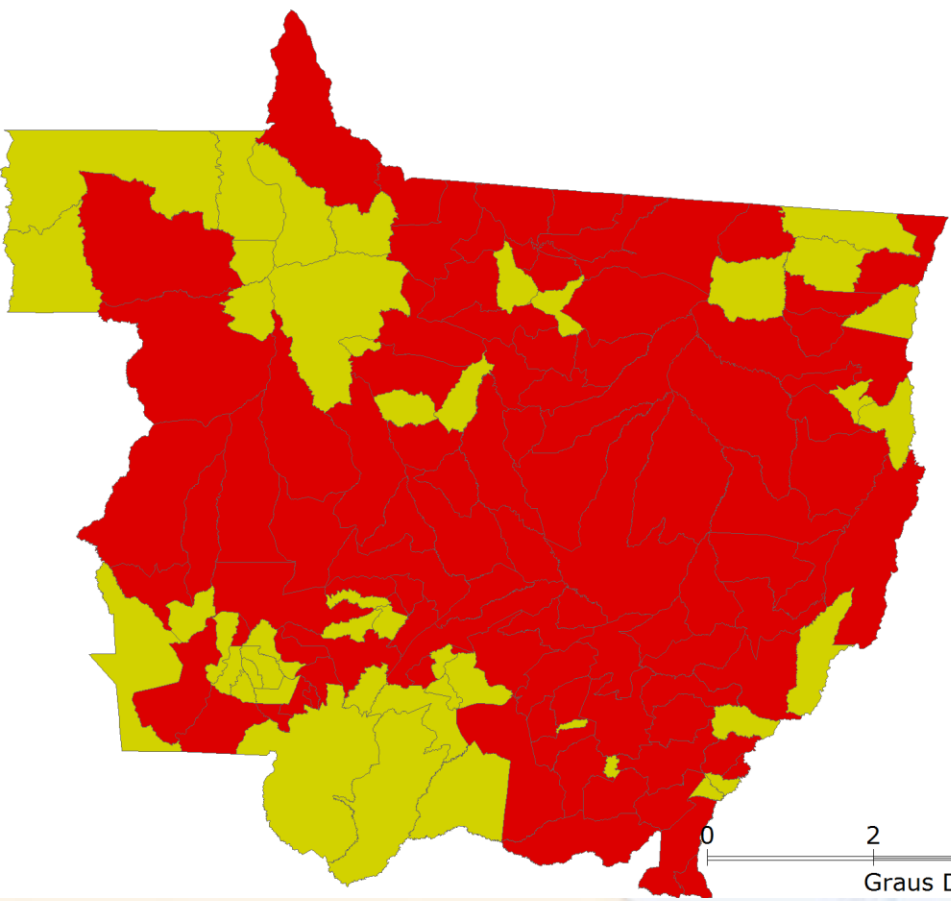
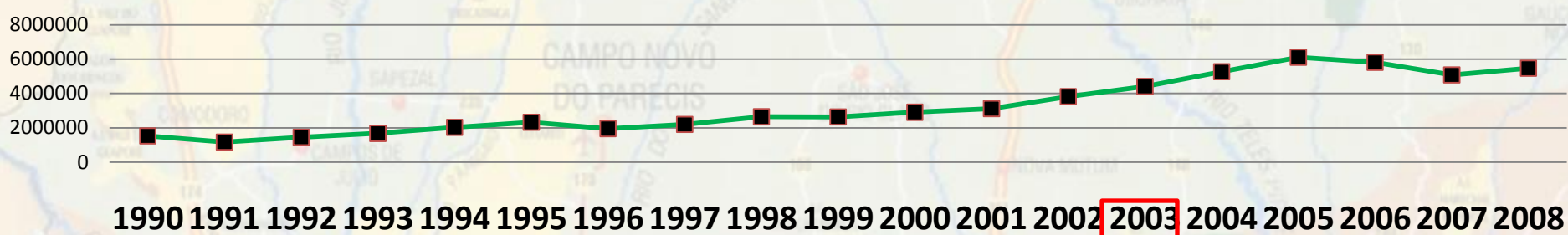


### Legenda

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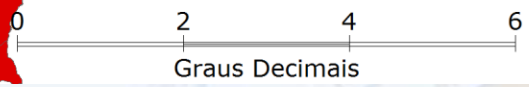


Área colhida (hectares) de soja. Dados da Produção Agrícola Municipal – IBGE (2002)



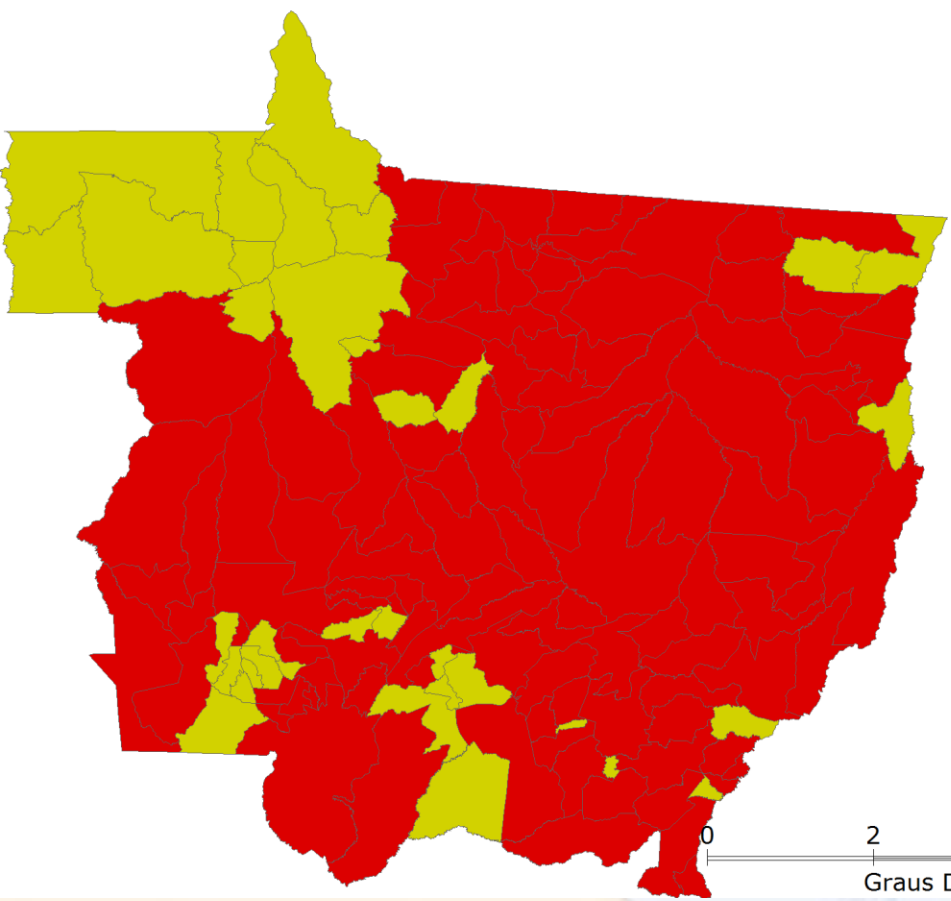
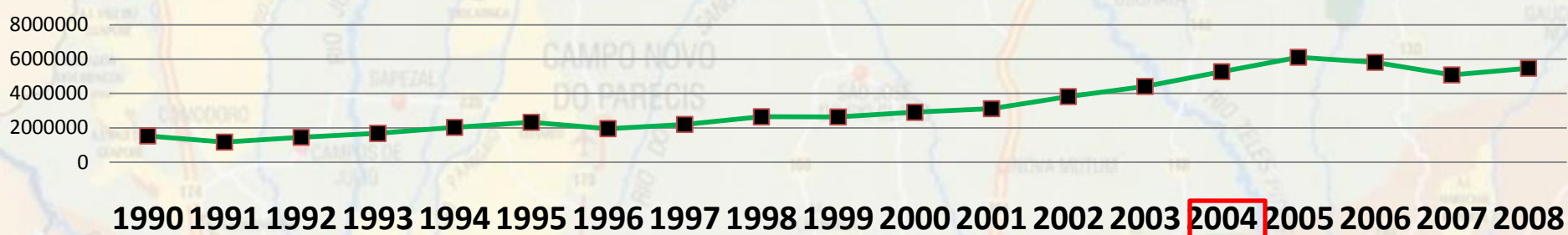
### Legenda

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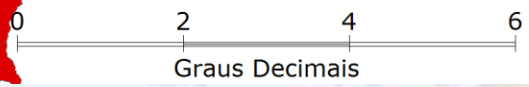
Área colhida (hectares) de soja. Dados da Produção Agrícola Municipal – IBGE (2003)



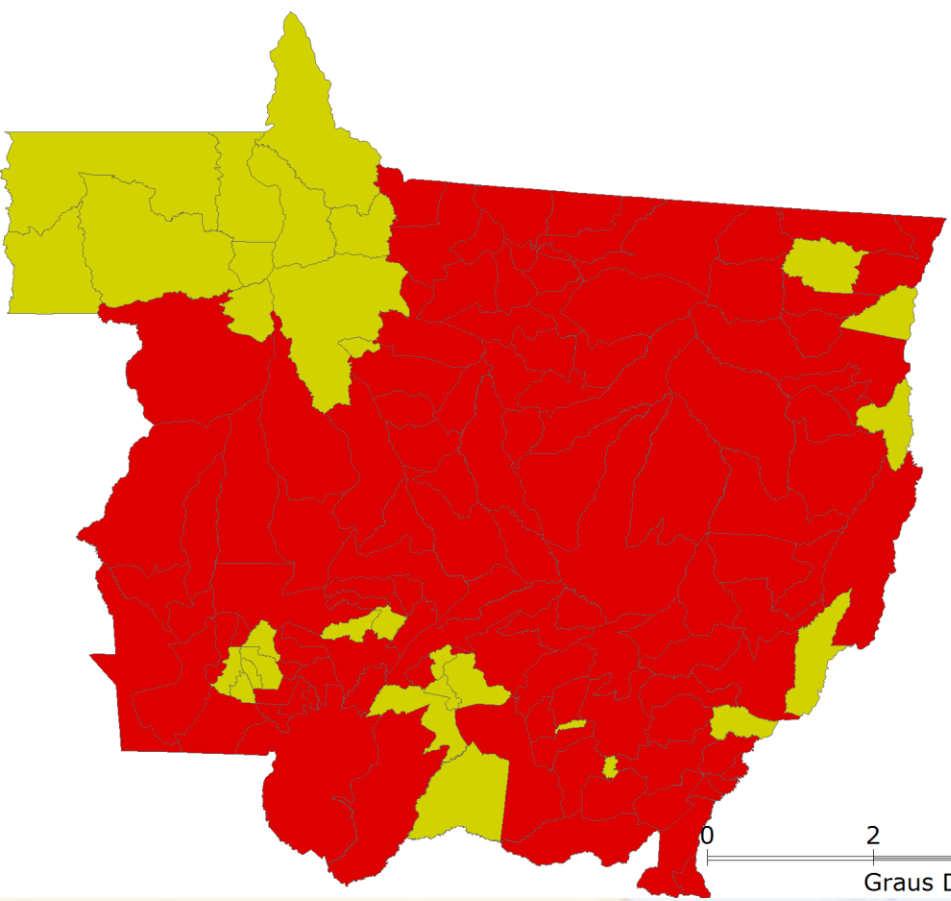
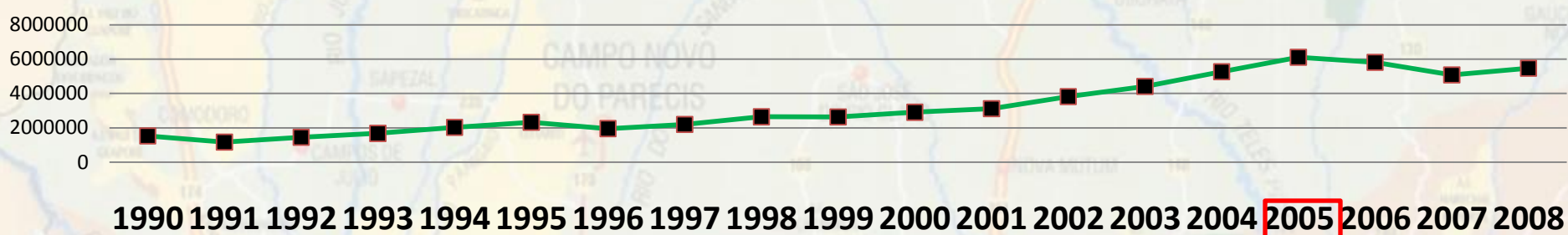


### Legenda

- Área colhida = 0
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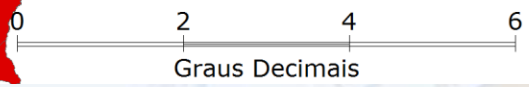


Área colhida (hectares) de soja. Dados da Produção Agrícola Municipal – IBGE (2004)

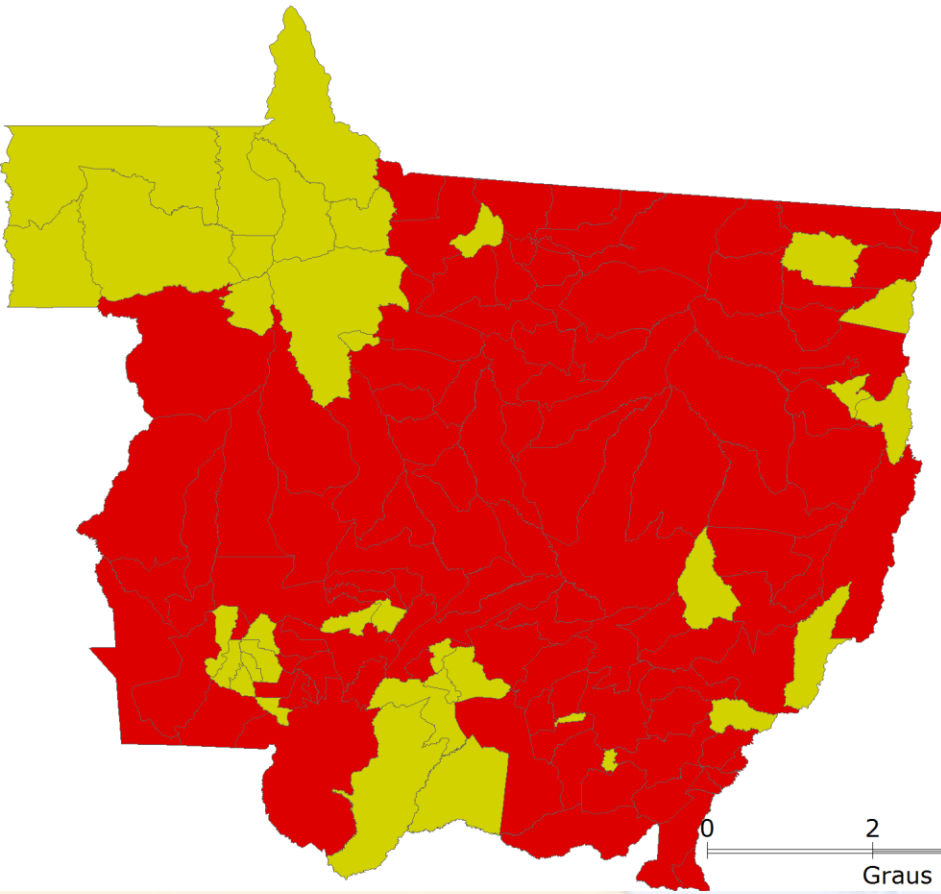
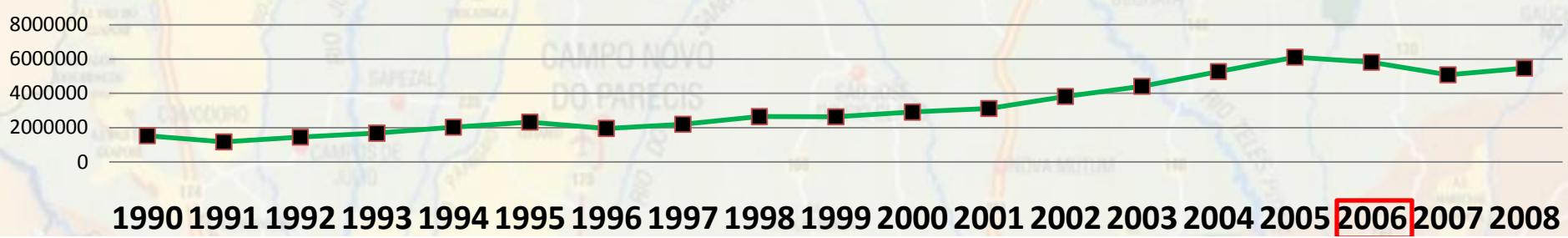


### Legenda

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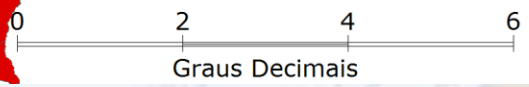


Área colhida (hectares) de soja. Dados da Produção Agrícola Municipal – IBGE (2005)

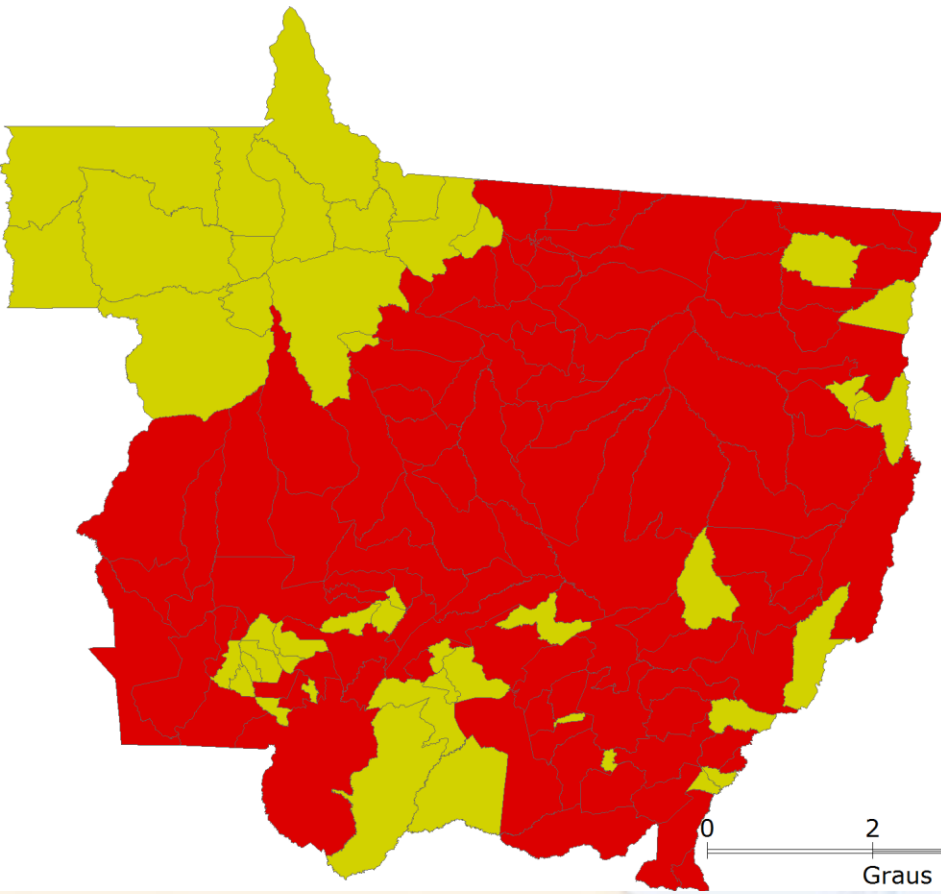
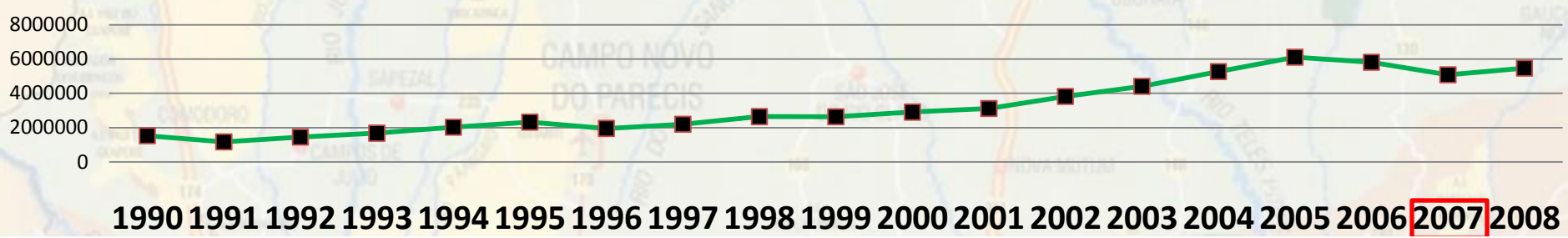


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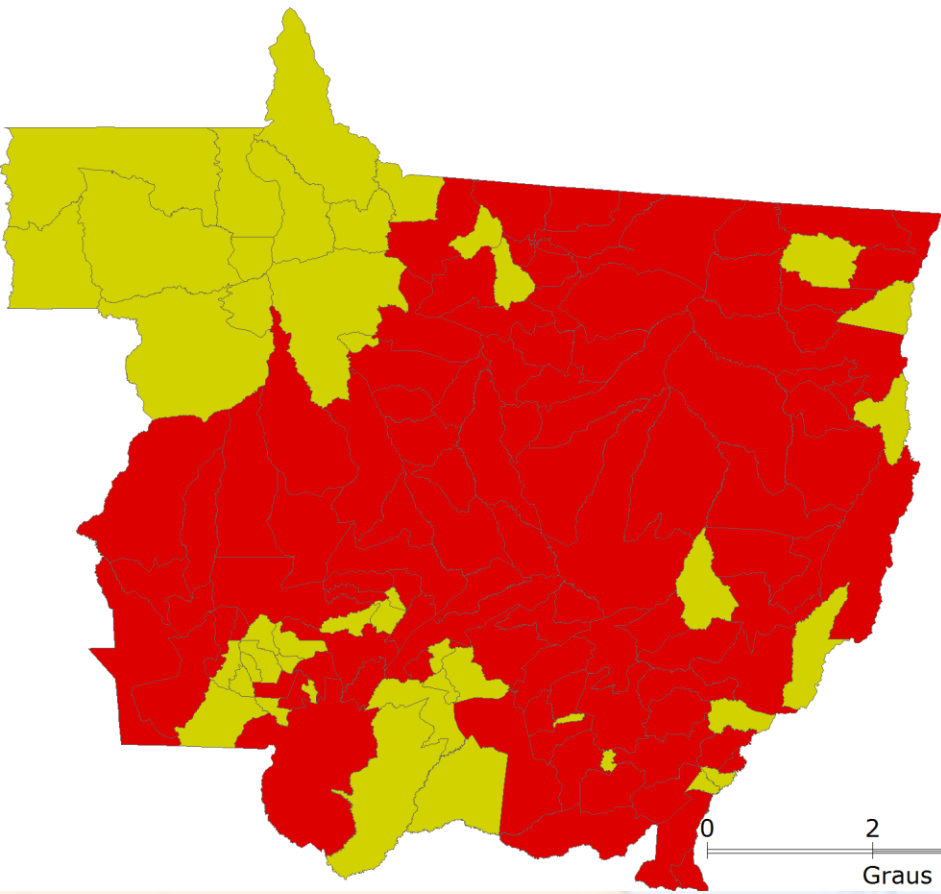
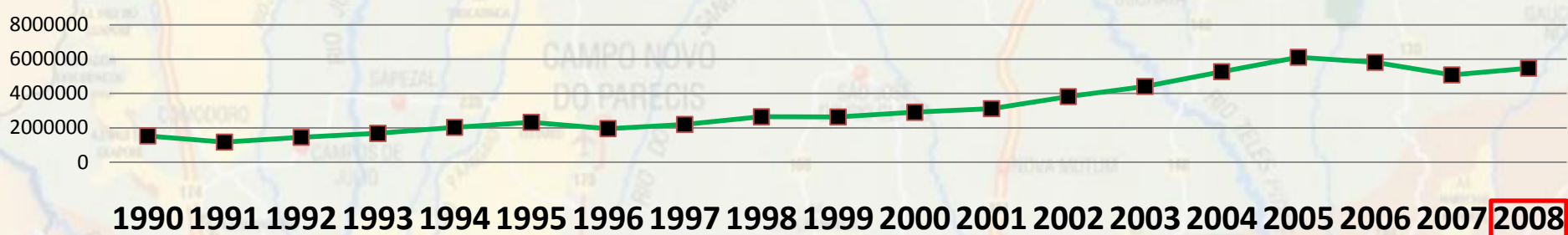
Área colhida (hectares) de soja. Dados da Produção Agrícola Municipal – IBGE (2006)



### Legenda

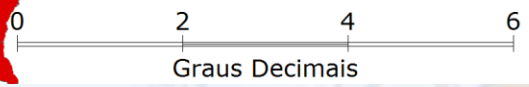
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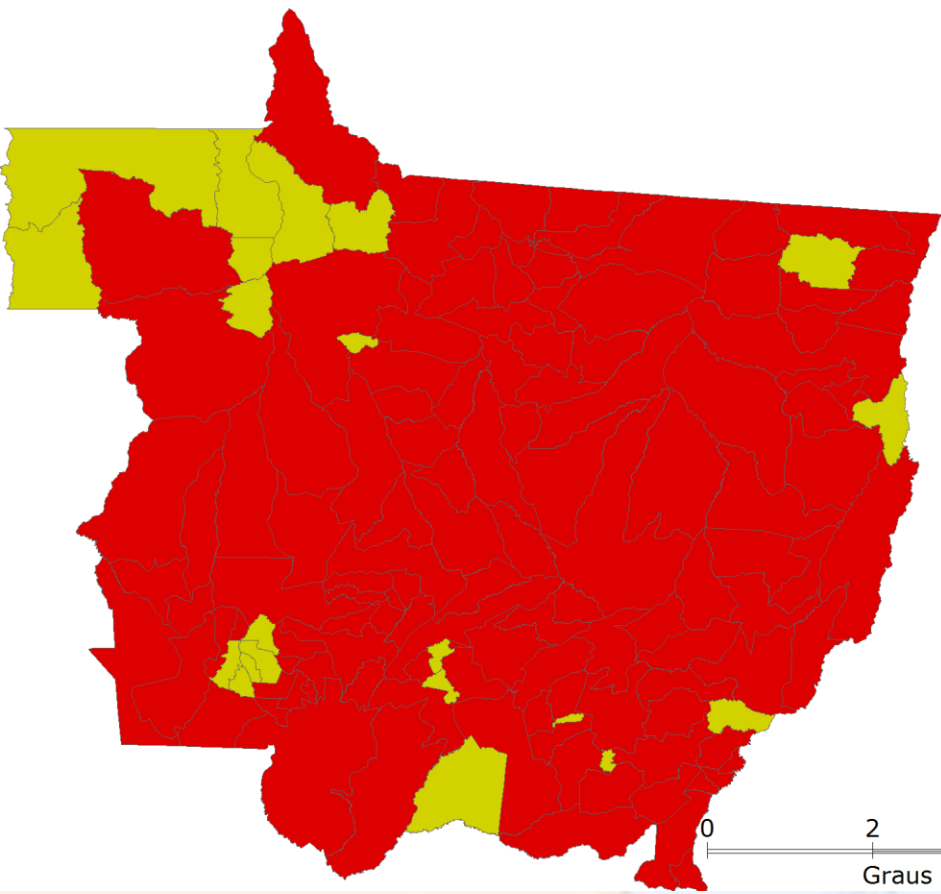


### Legenda

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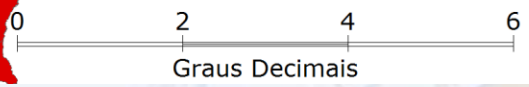


Área colhida (hectares) de soja. Dados da Produção Agrícola Municipal – IBGE (2008)



### Legenda

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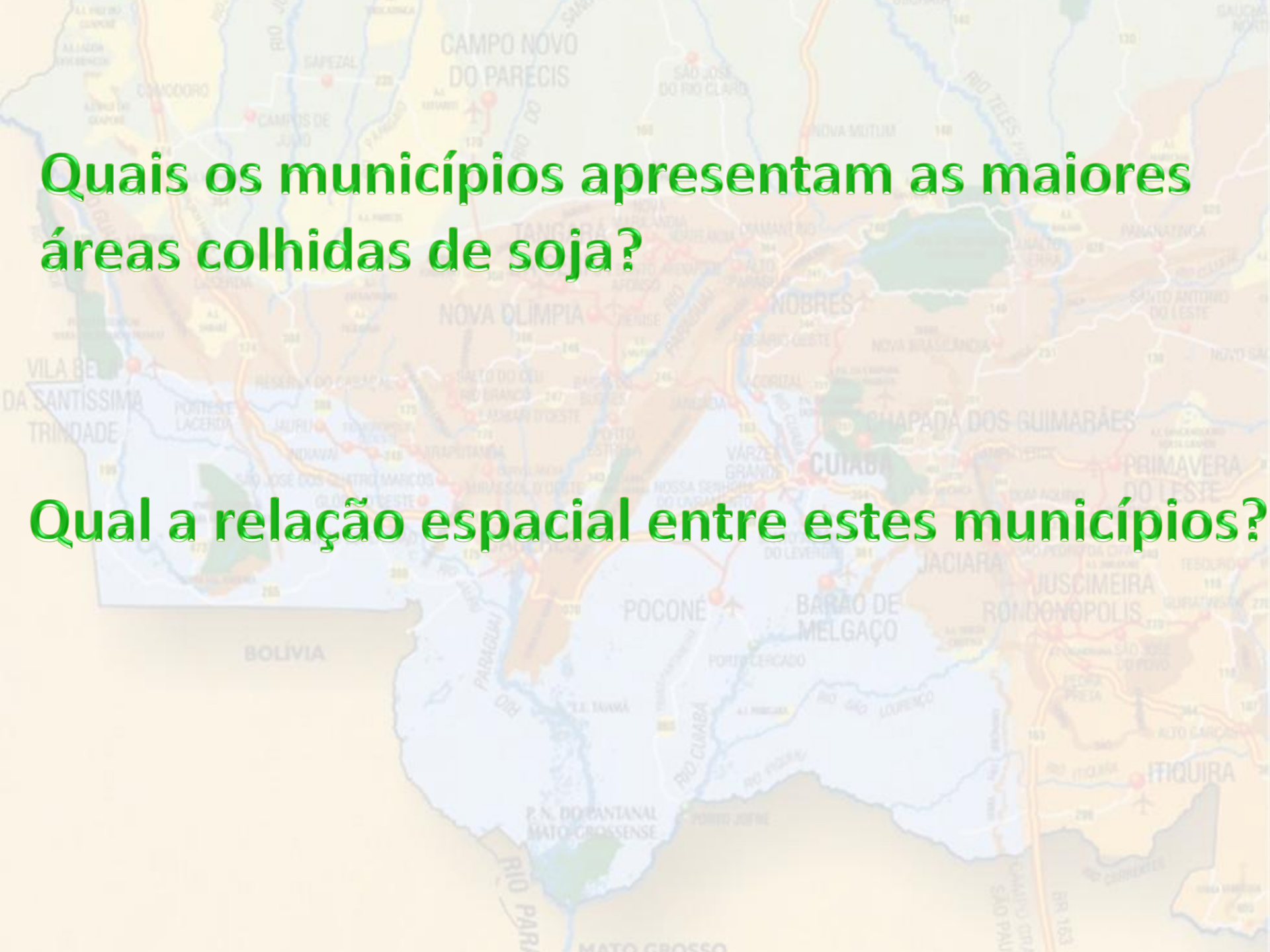


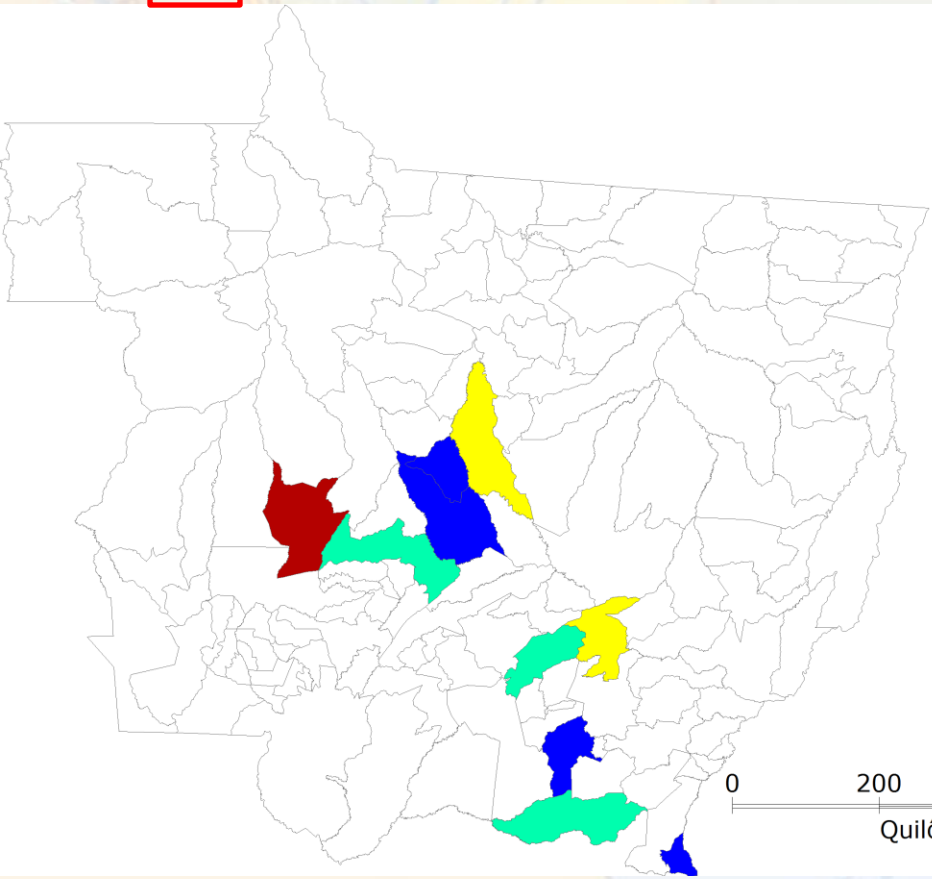
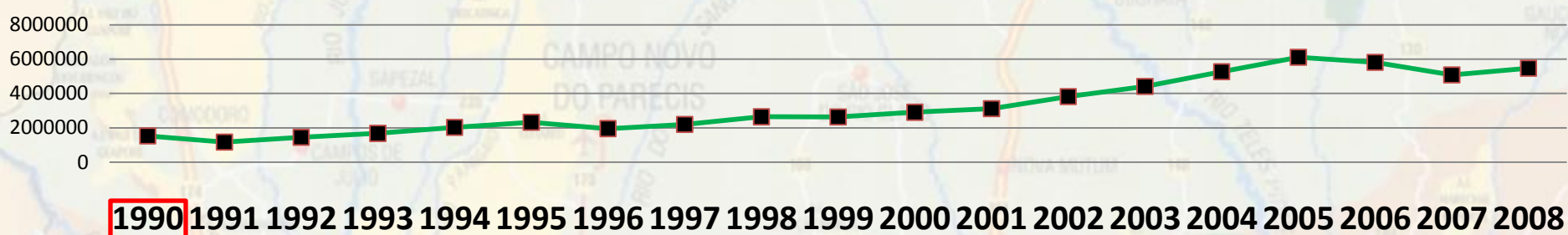
Área colhida (hectares) de soja. Produção Agrícola Municipal – IBGE (média 1990 a 2008)








**Quais os municípios apresentam as maiores áreas colhidas de soja?**

**Qual a relação espacial entre estes municípios?**





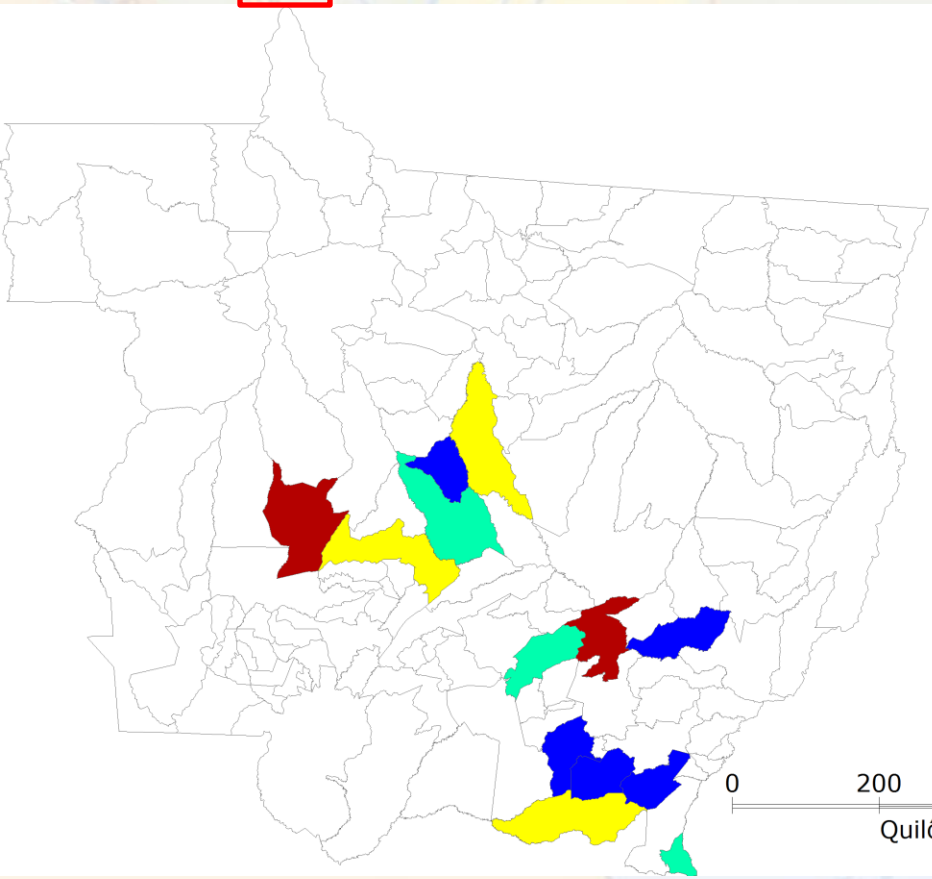
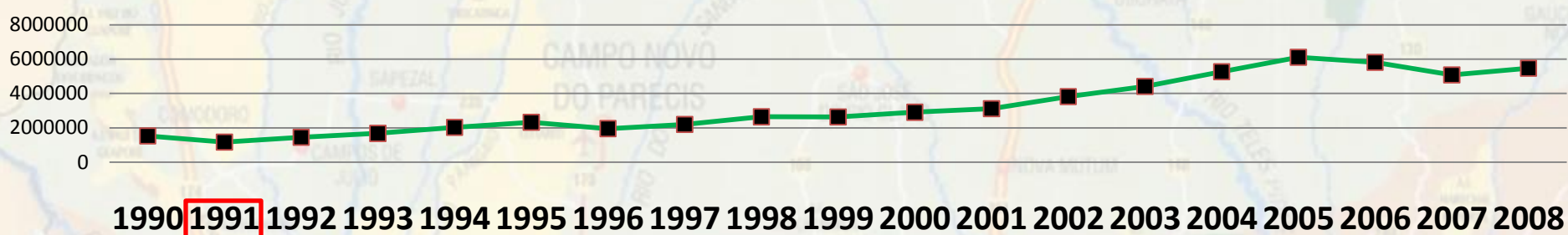
### Passos iguais

-  0 a 1/5 do VM
-  1/5 a 2/5 do VM
-  2/5 a 3/5 do VM
-  3/5 a 4/5 do VM
-  4/5 ao VM

valor máximo (VM) = 200800 ha

Área colhida (hectares) de soja. Dados da Produção Agrícola Municipal – IBGE (1990)

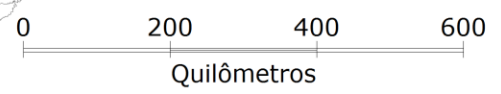




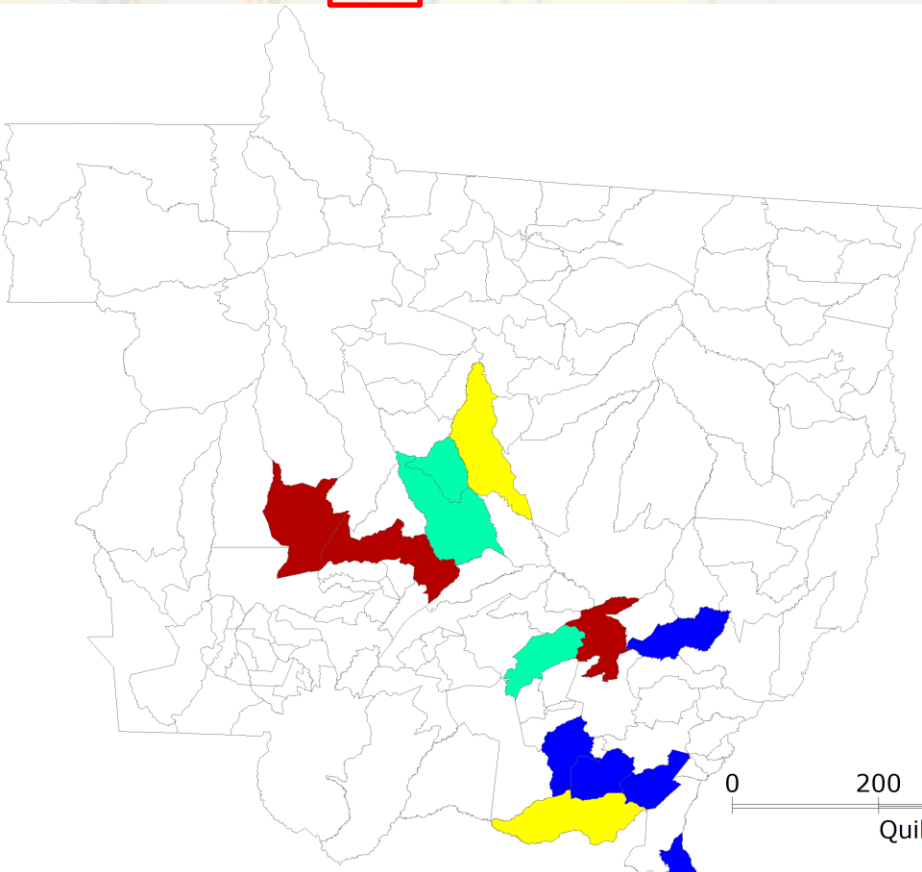
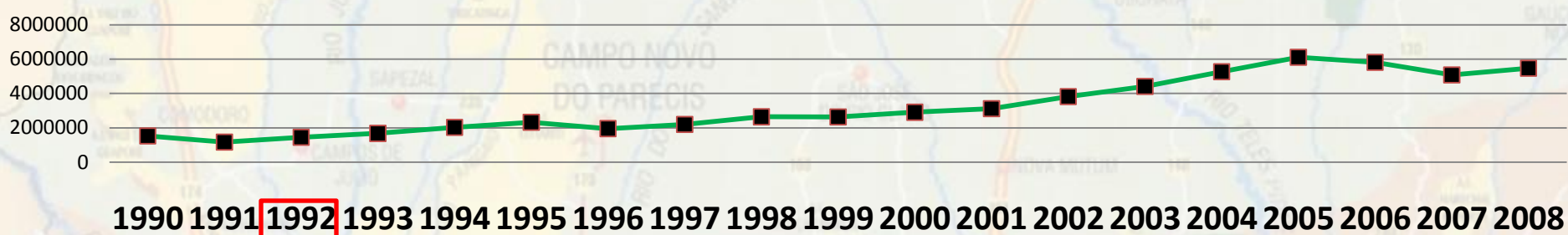
### Passos iguais

- 0 a 1/5 do VM
- 1/5 a 2/5 do VM
- 2/5 a 3/5 do VM
- 3/5 a 4/5 do VM
- 4/5 ao VM





valor máximo (VM) = 130660 ha



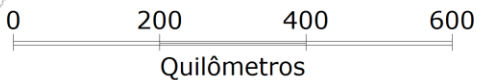
Área colhida (hectares) de soja. Dados da Produção Agrícola Municipal – IBGE (1991)



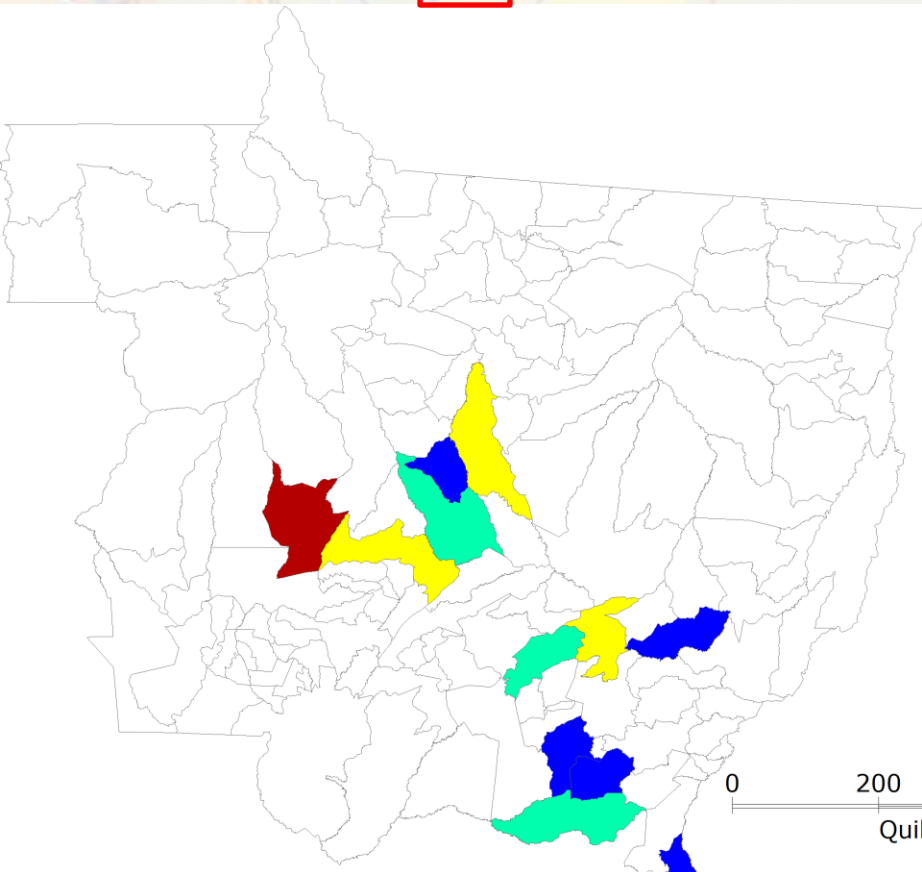
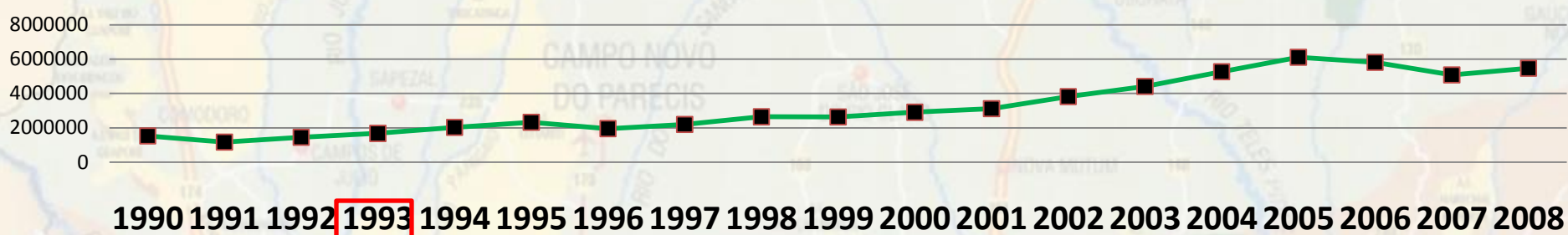
### Passos iguais

-  0 a 1/5 do VM
-  1/5 a 2/5 do VM
-  2/5 a 3/5 do VM
-  3/5 a 4/5 do VM
-  4/5 ao VM






valor máximo (VM) = 162000 ha



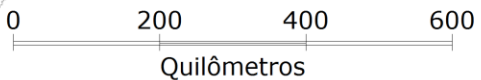
Área colhida (hectares) de soja. Dados da Produção Agrícola Municipal – IBGE (1992)



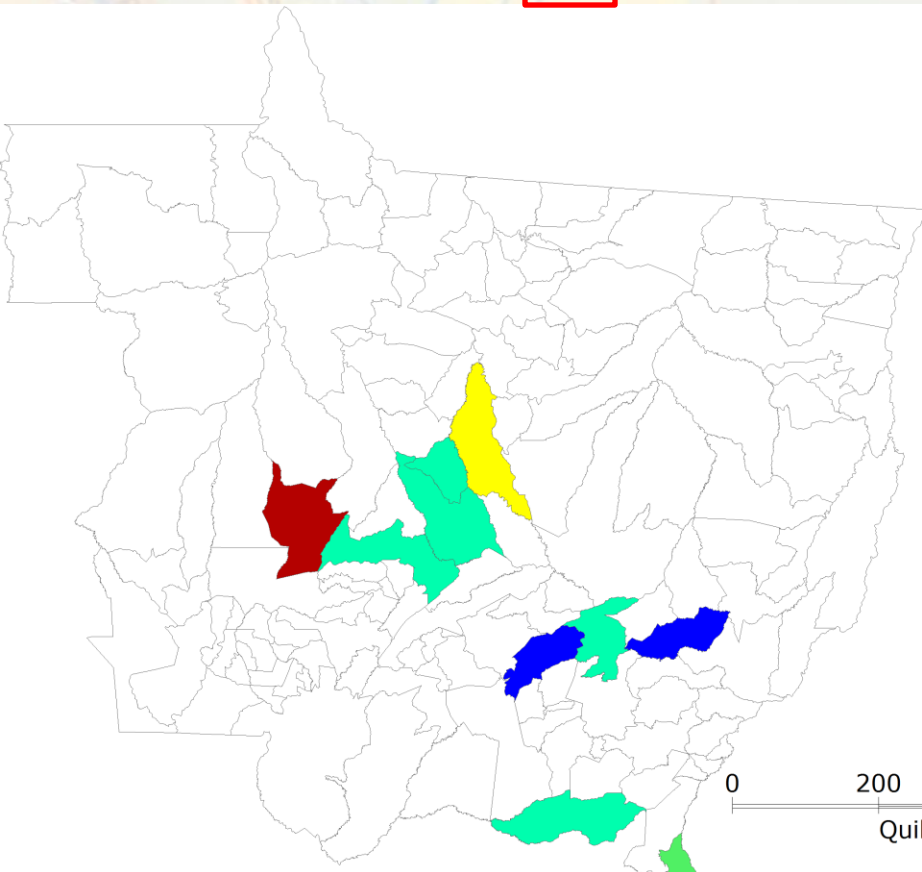
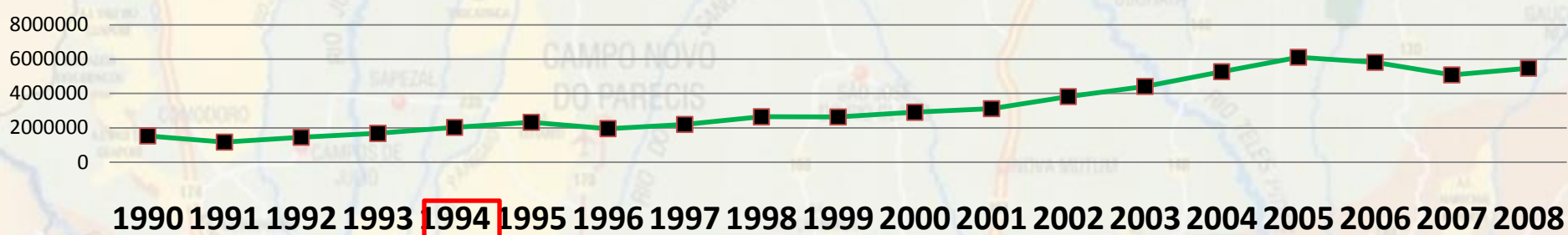
### Passos iguais

-  0 a 1/5 do VM
-  1/5 a 2/5 do VM
-  2/5 a 3/5 do VM
-  3/5 a 4/5 do VM
-  4/5 ao VM






valor máximo (VM) = 225910 ha



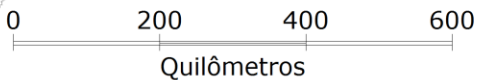
Área colhida (hectares) de soja. Dados da Produção Agrícola Municipal – IBGE (1993)



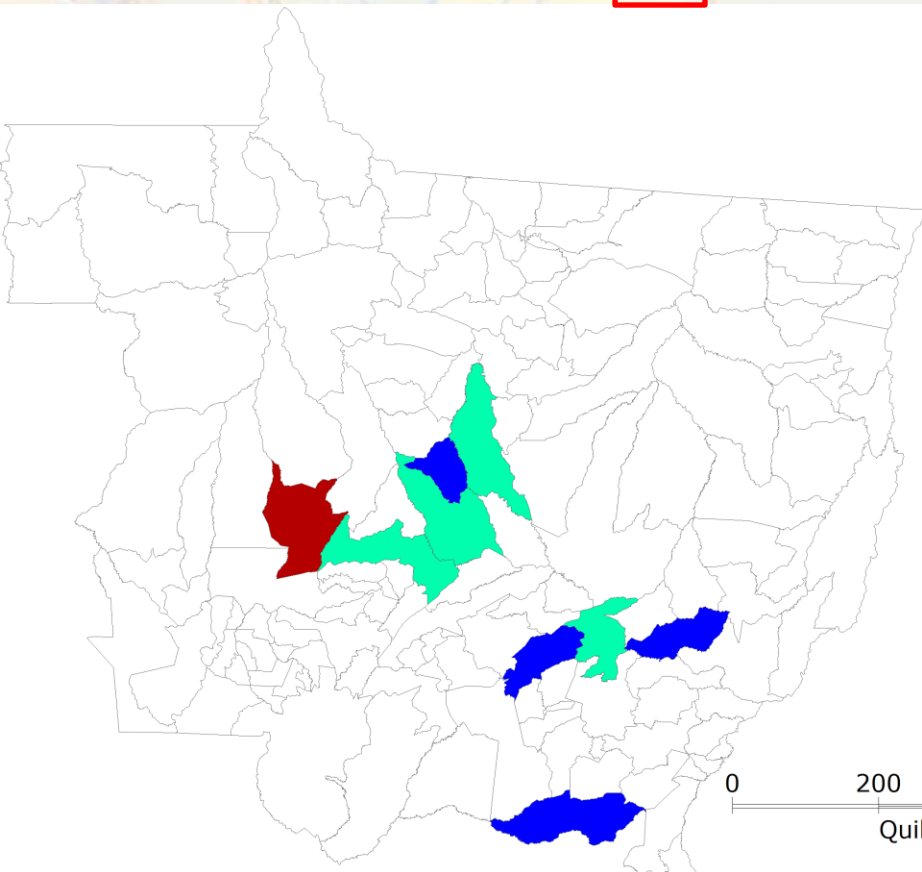
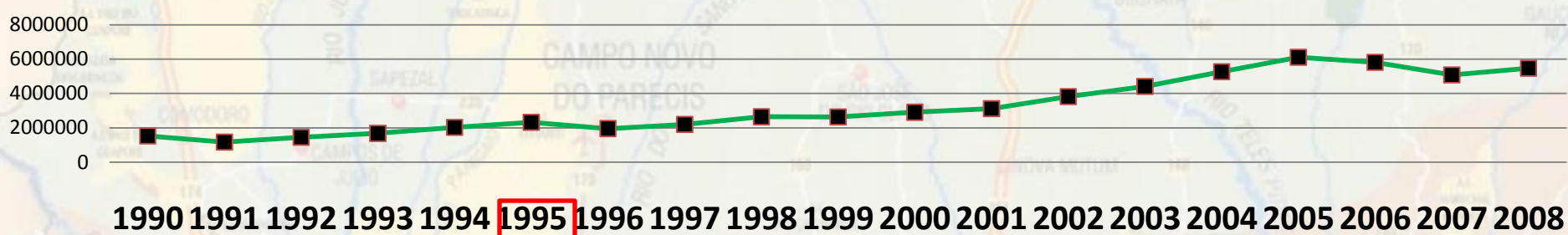
### Passos iguais

-  0 a 1/5 do VM
-  1/5 a 2/5 do VM
-  2/5 a 3/5 do VM
-  3/5 a 4/5 do VM
-  4/5 ao VM






valor máximo (VM) = 287829 ha



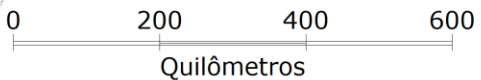
Área colhida (hectares) de soja. Dados da Produção Agrícola Municipal – IBGE (1994)



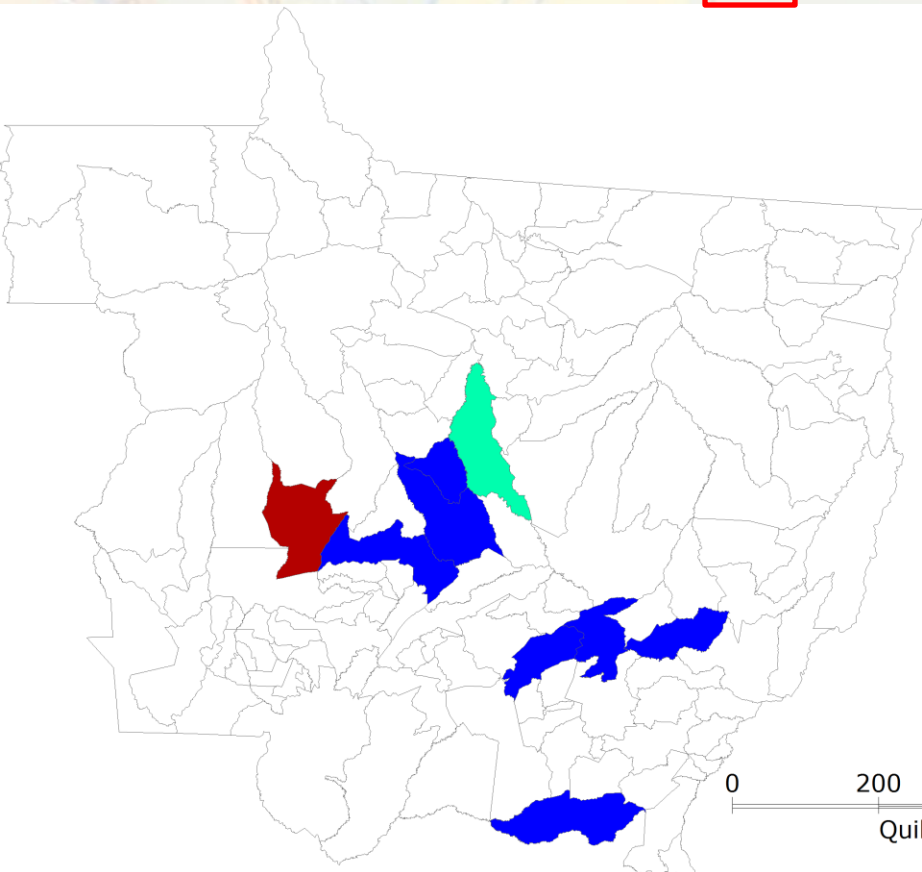
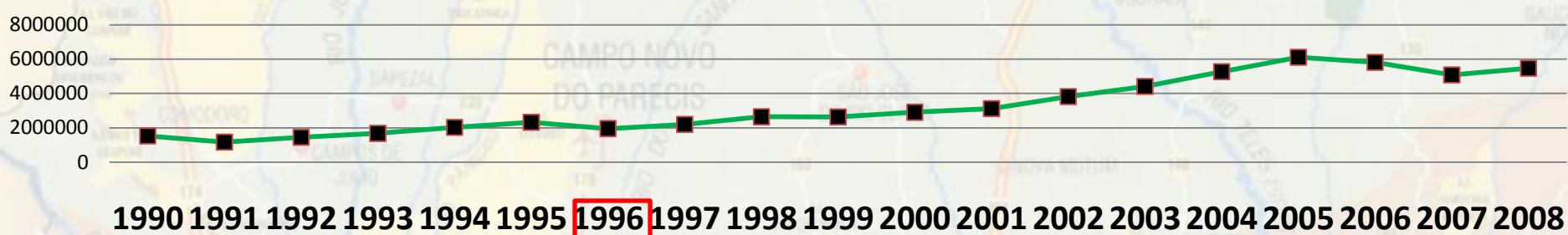
### Passos iguais

-  0 a 1/5 do VM
-  1/5 a 2/5 do VM
-  2/5 a 3/5 do VM
-  3/5 a 4/5 do VM
-  4/5 ao VM






valor máximo (VM) = 391580 ha



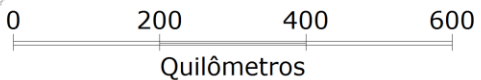
Área colhida (hectares) de soja. Dados da Produção Agrícola Municipal – IBGE (1995)



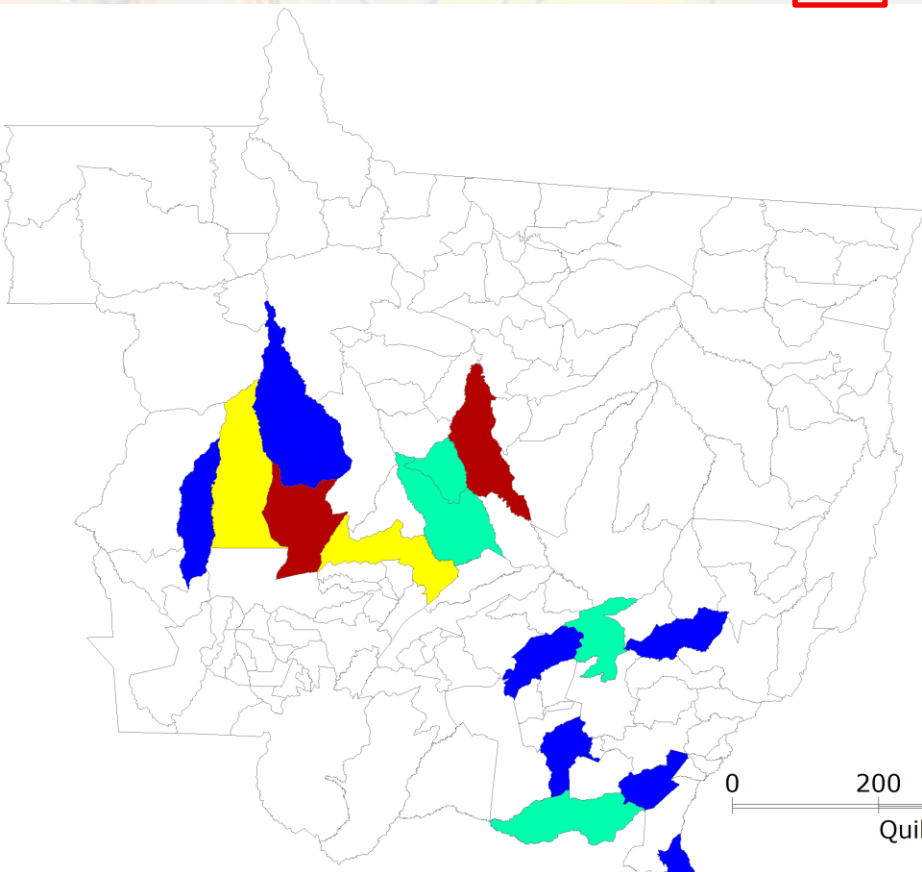
### Passos iguais

-  0 a 1/5 do VM
-  1/5 a 2/5 do VM
-  2/5 a 3/5 do VM
-  3/5 a 4/5 do VM
-  4/5 ao VM

valor máximo (VM) = 375046 ha



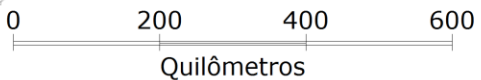
Área colhida (hectares) de soja. Dados da Produção Agrícola Municipal – IBGE (1996)



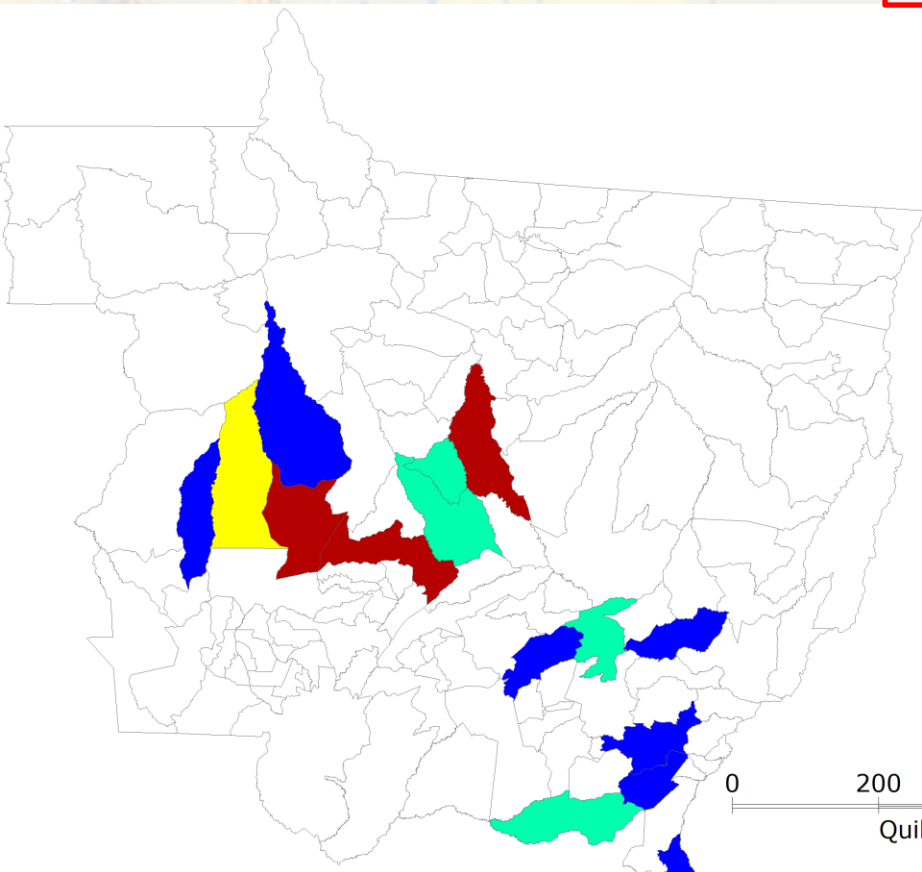
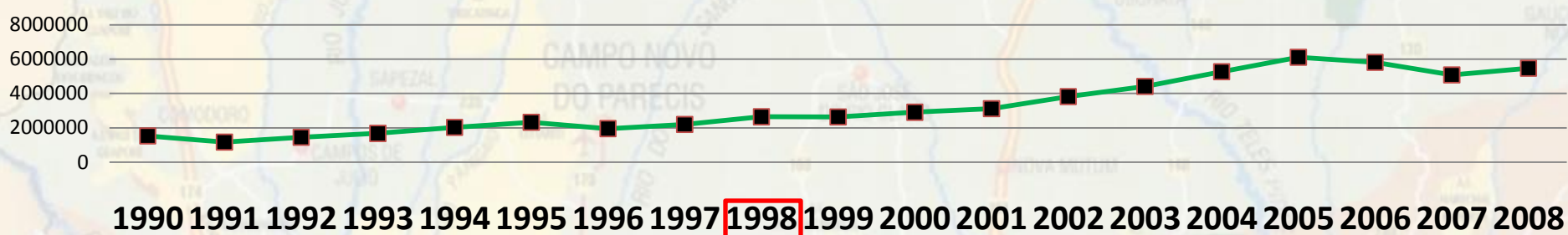
### Passos iguais

- 0 a 1/5 do VM
- 1/5 a 2/5 do VM
- 2/5 a 3/5 do VM
- 3/5 a 4/5 do VM
- 4/5 ao VM






valor máximo (VM) = 246281 ha



Área colhida (hectares) de soja. Dados da Produção Agrícola Municipal – IBGE (1997)



### Passos iguais

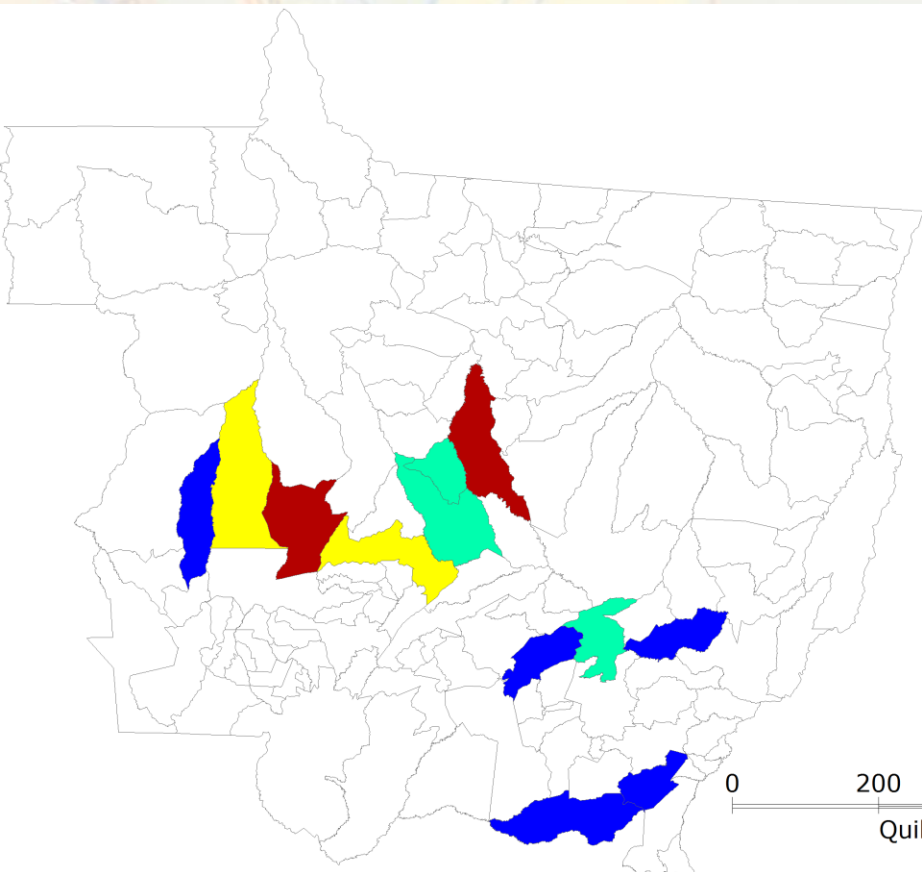
-  0 a 1/5 do VM
-  1/5 a 2/5 do VM
-  2/5 a 3/5 do VM
-  3/5 a 4/5 do VM
-  4/5 ao VM

valor máximo (VM) = 275000 ha








Área colhida (hectares) de soja. Dados da Produção Agrícola Municipal – IBGE (1998)

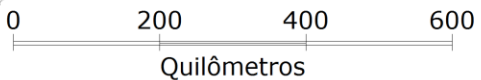




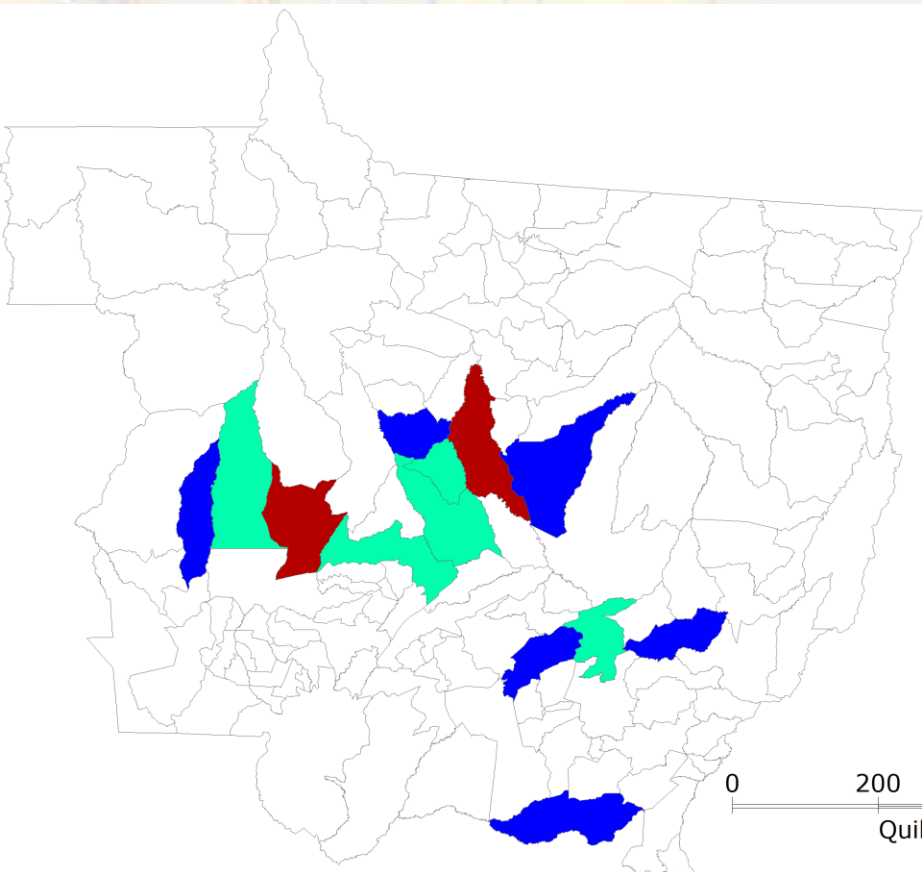
### Passos iguais

-  0 a 1/5 do VM
-  1/5 a 2/5 do VM
-  2/5 a 3/5 do VM
-  3/5 a 4/5 do VM
-  4/5 ao VM





valor máximo (VM) = 305000 ha



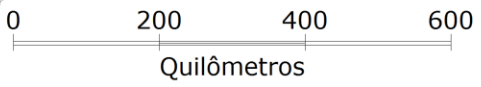
Área colhida (hectares) de soja. Dados da Produção Agrícola Municipal – IBGE (1999)



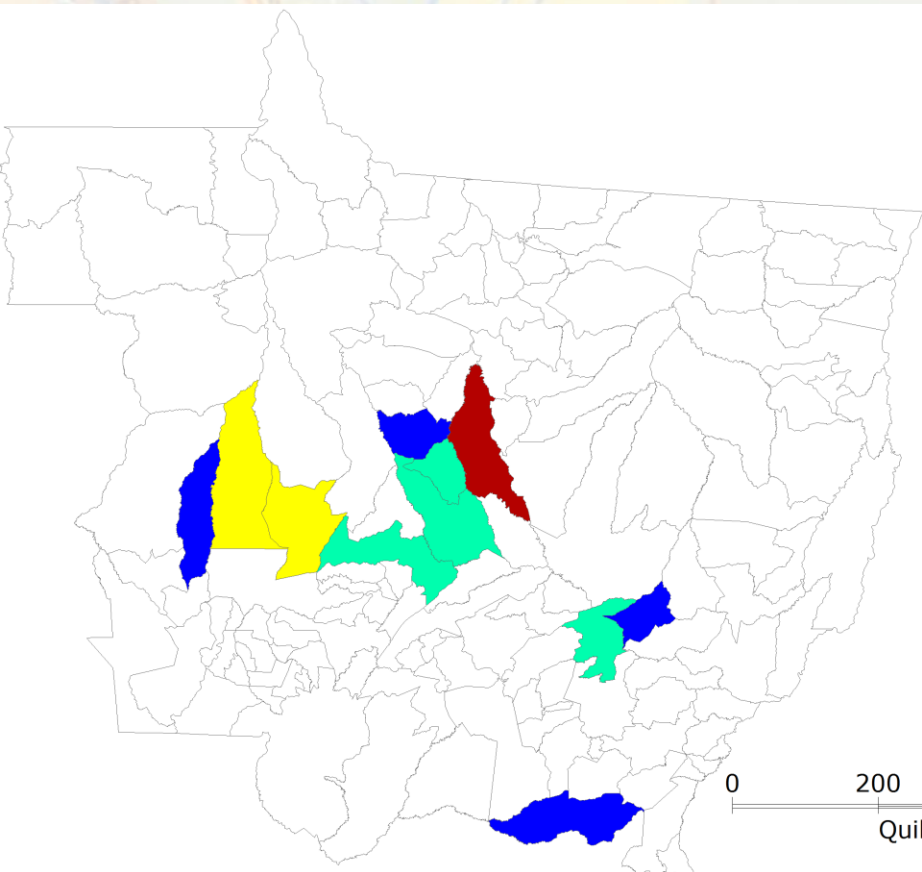
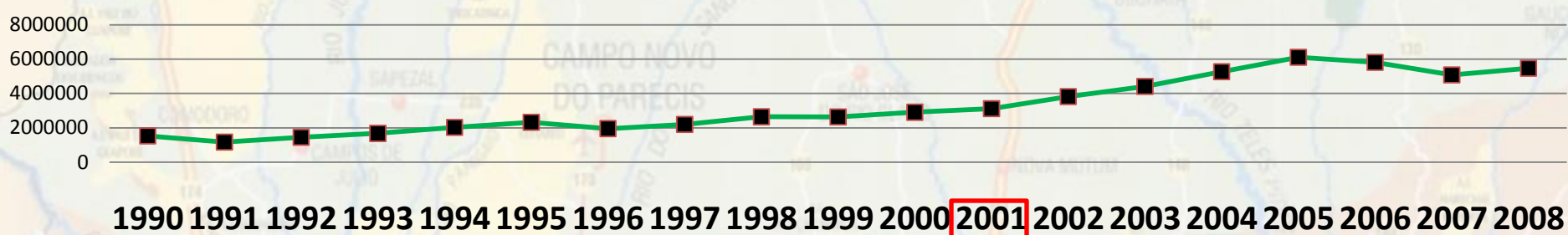
### Passos iguais

-  0 a 1/5 do VM
-  1/5 a 2/5 do VM
-  2/5 a 3/5 do VM
-  3/5 a 4/5 do VM
-  4/5 ao VM

valor máximo (VM) = 360000 ha



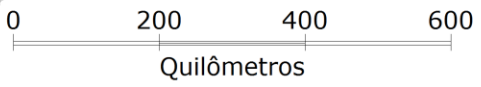
Área colhida (hectares) de soja. Dados da Produção Agrícola Municipal – IBGE (2000)



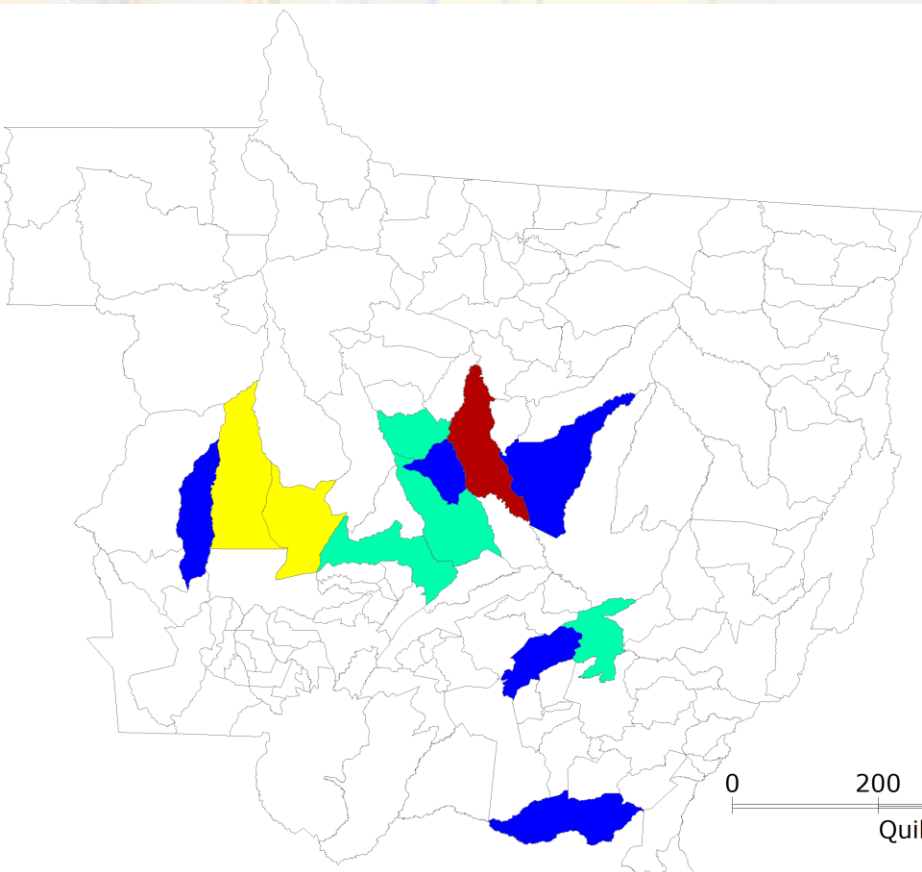
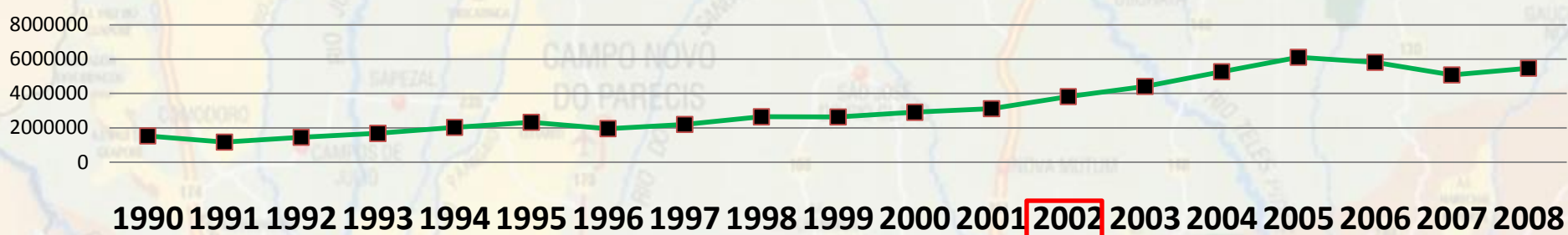
### Passos iguais

- 0 a 1/5 do VM
- 1/5 a 2/5 do VM
- 2/5 a 3/5 do VM
- 3/5 a 4/5 do VM
- 4/5 ao VM

valor máximo (VM) = 390000 ha



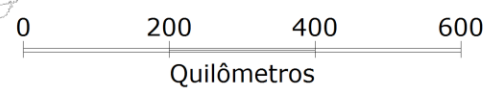
Área colhida (hectares) de soja. Dados da Produção Agrícola Municipal – IBGE (2001)



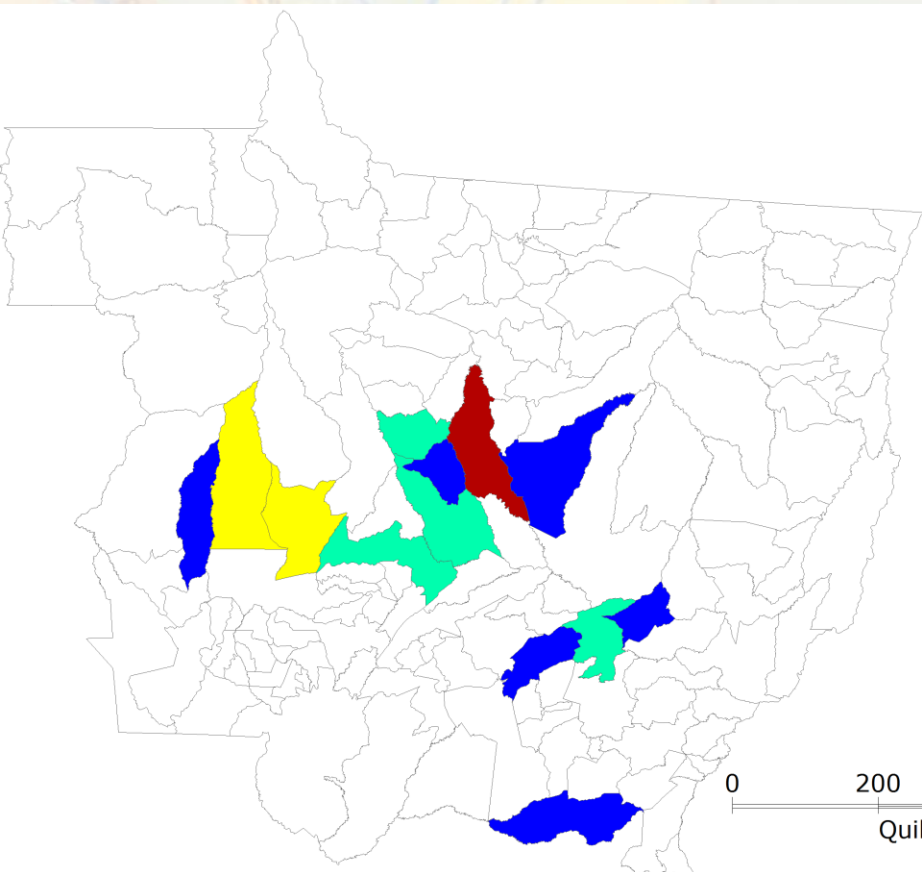
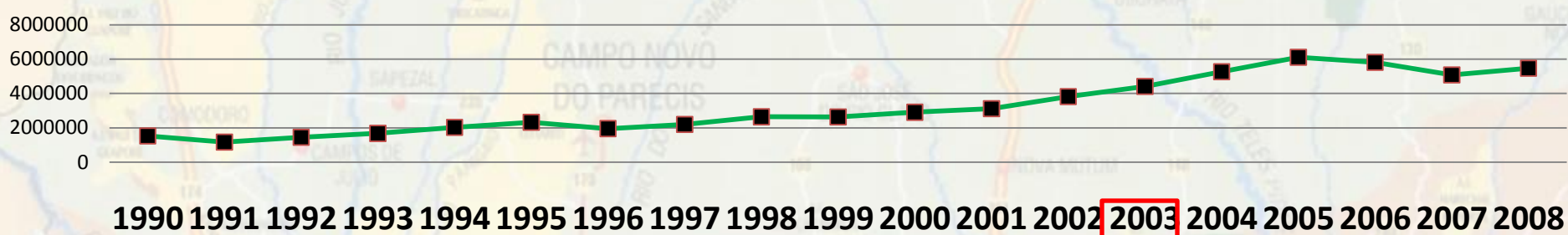
### Passos iguais

- 0 a 1/5 do VM
- 1/5 a 2/5 do VM
- 2/5 a 3/5 do VM
- 3/5 a 4/5 do VM
- 4/5 ao VM

valor máximo (VM) = 475000 ha



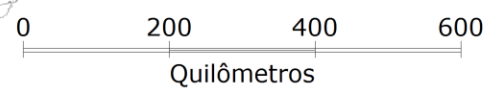
Área colhida (hectares) de soja. Dados da Produção Agrícola Municipal – IBGE (2002)



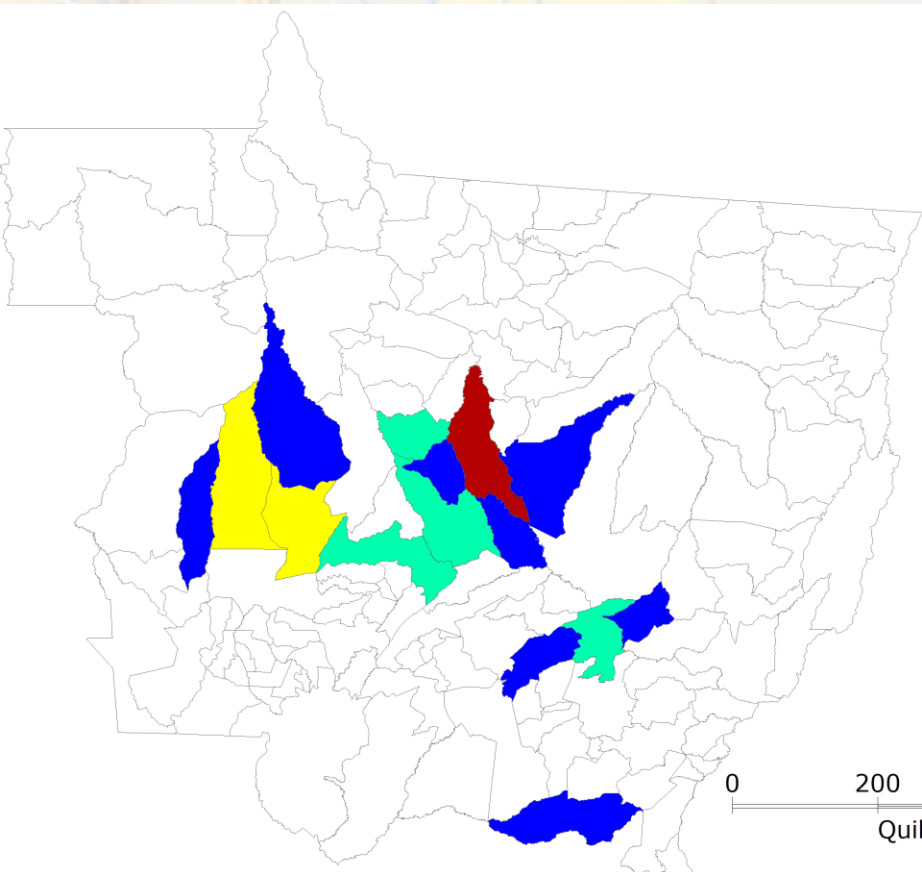
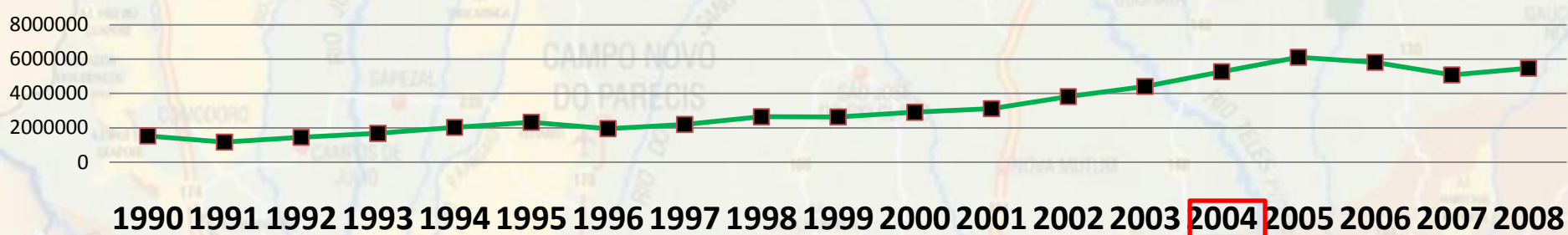
### Passos iguais

- 0 a 1/5 do VM
- 1/5 a 2/5 do VM
- 2/5 a 3/5 do VM
- 3/5 a 4/5 do VM
- 4/5 ao VM

valor máximo (VM) = 523000 ha



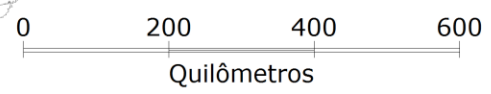
Área colhida (hectares) de soja. Dados da Produção Agrícola Municipal – IBGE (2003)



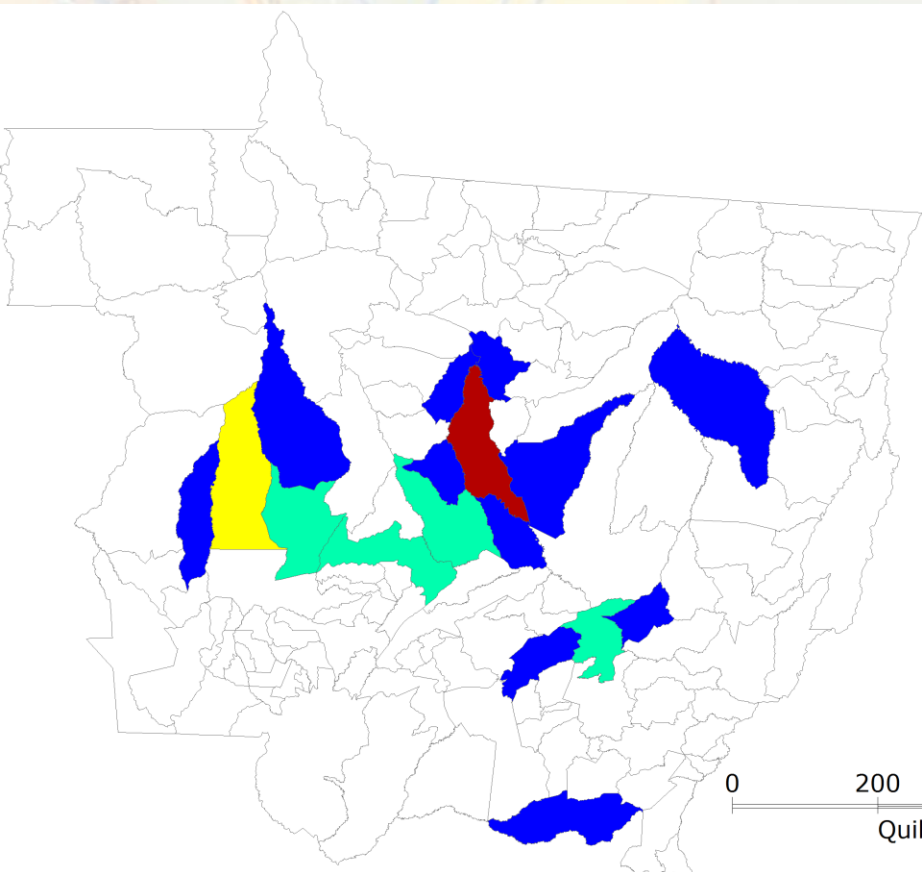
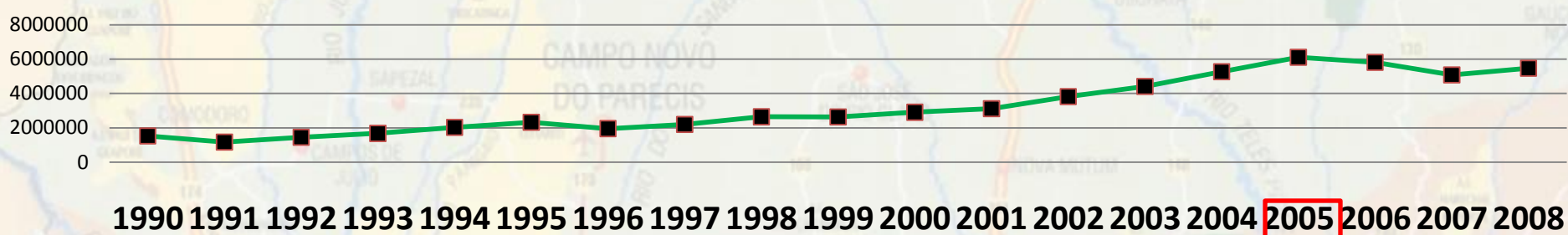
### Passos iguais

- 0 a 1/5 do VM
- 1/5 a 2/5 do VM
- 2/5 a 3/5 do VM
- 3/5 a 4/5 do VM
- 4/5 ao VM

valor máximo (VM) = 540867 ha



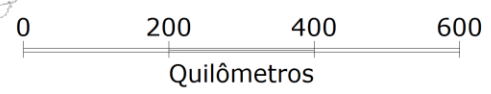
Área colhida (hectares) de soja. Dados da Produção Agrícola Municipal – IBGE (2004)



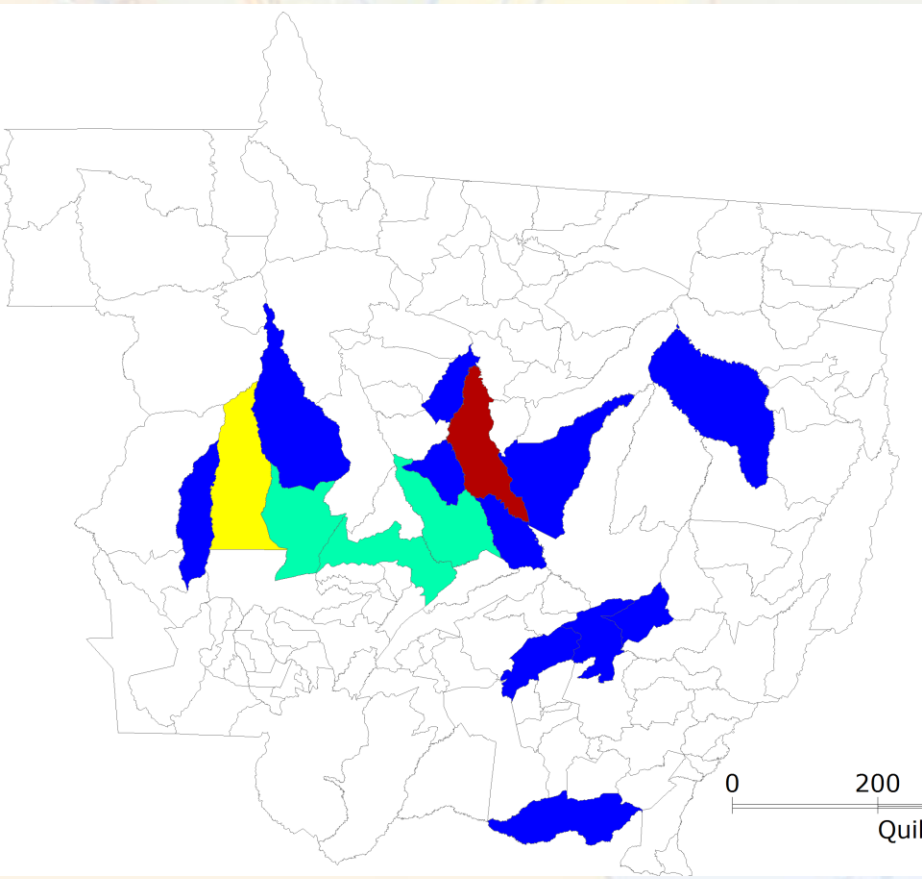
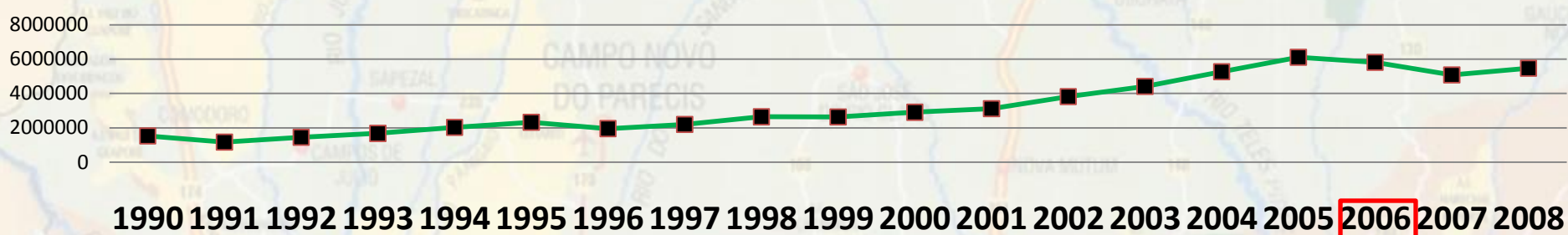
### Passos iguais

- 0 a 1/5 do VM
- 1/5 a 2/5 do VM
- 2/5 a 3/5 do VM
- 3/5 a 4/5 do VM
- 4/5 ao VM

valor máximo (VM) = 578356 ha



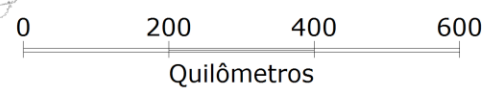
Área colhida (hectares) de soja. Dados da Produção Agrícola Municipal – IBGE (2005)



### Passos iguais

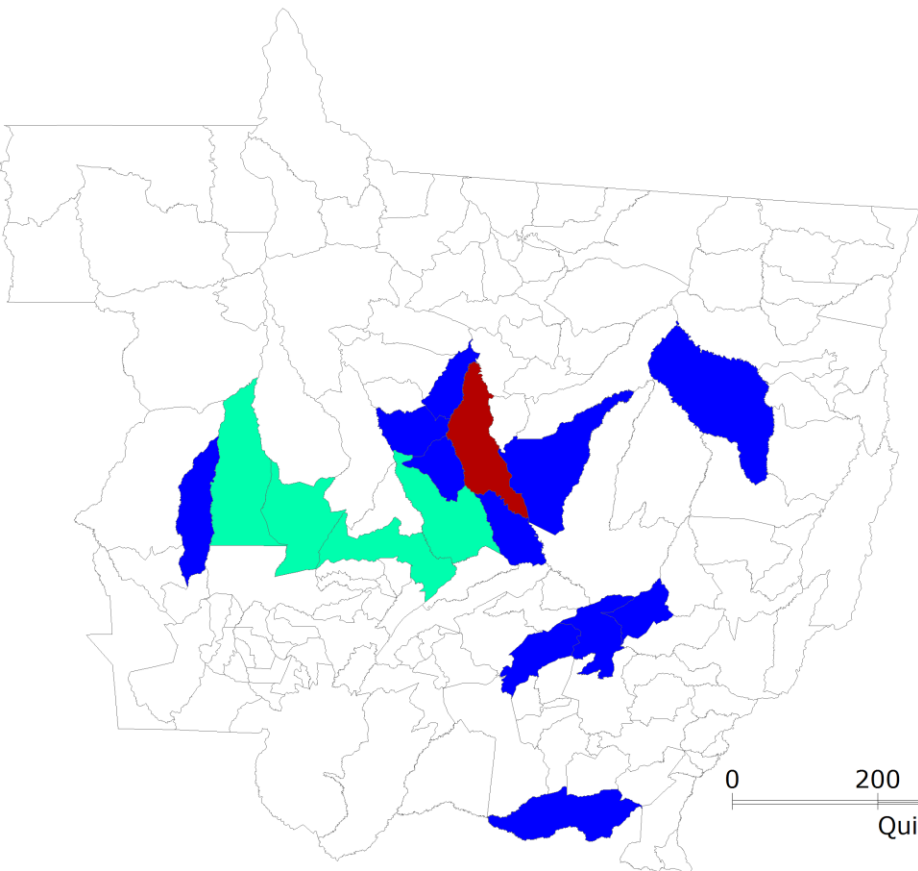
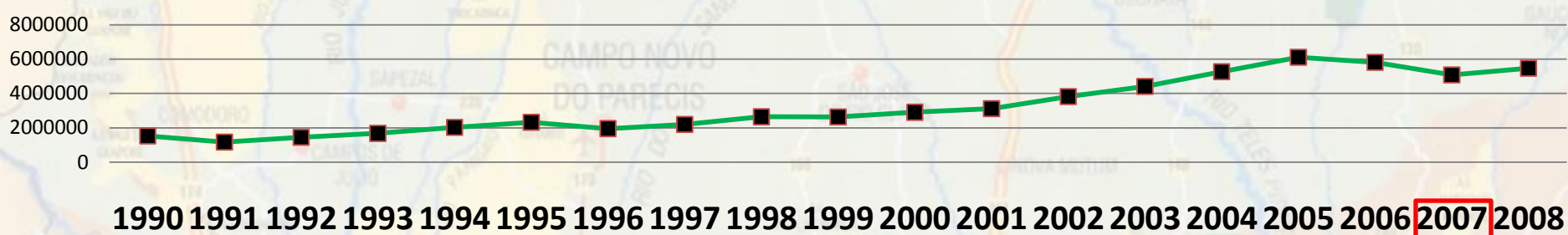
- 0 a 1/5 do VM
- 1/5 a 2/5 do VM
- 2/5 a 3/5 do VM
- 3/5 a 4/5 do VM
- 4/5 ao VM

valor máximo (VM) = 596658 ha



Área colhida (hectares) de soja. Dados da Produção Agrícola Municipal – IBGE (2006)

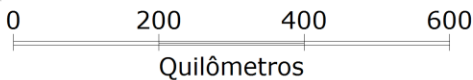




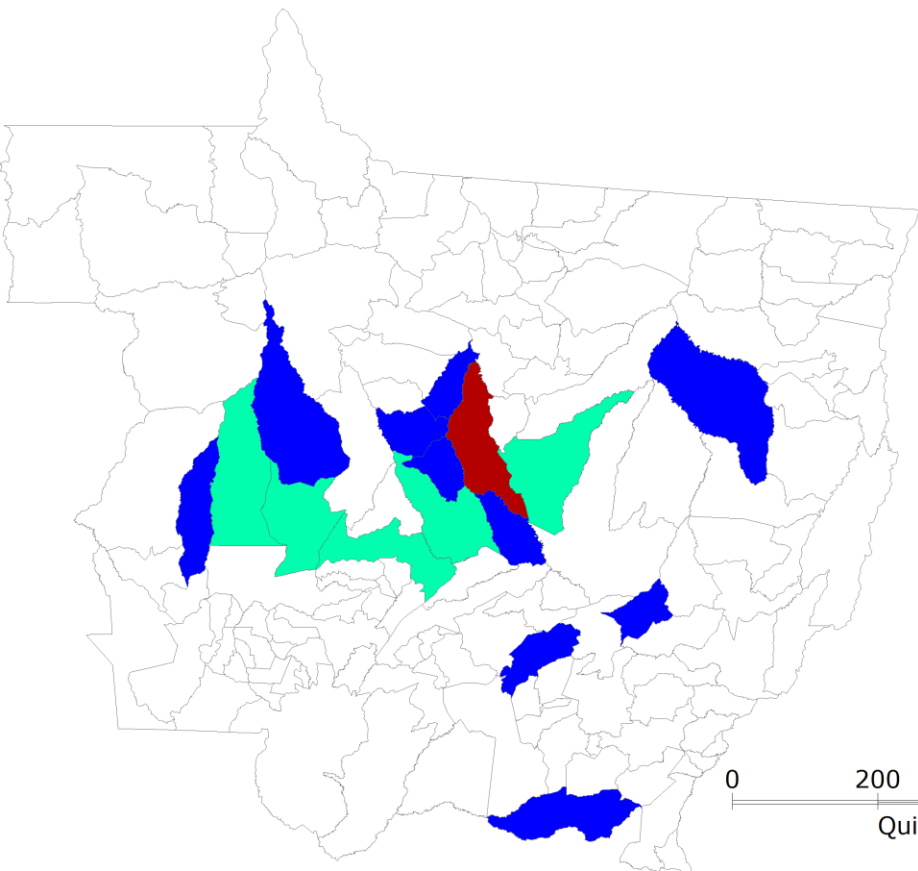
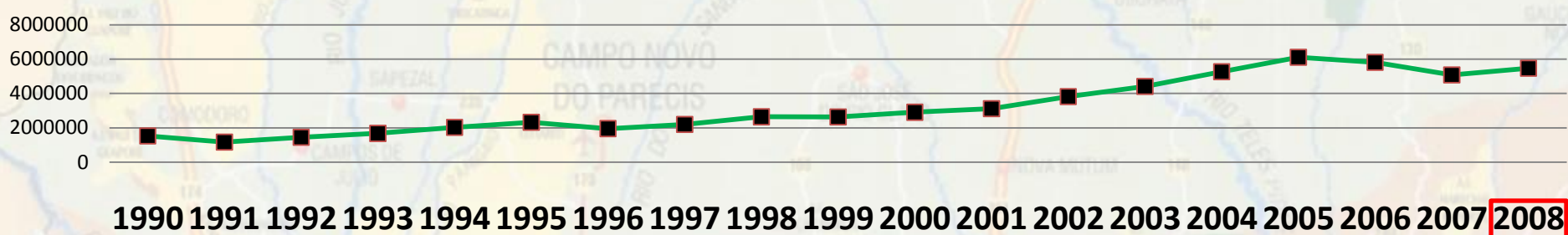
### Passos iguais

- 0 a 1/5 do VM
- 1/5 a 2/5 do VM
- 2/5 a 3/5 do VM
- 3/5 a 4/5 do VM
- 4/5 ao VM

valor máximo (VM) = 543000 ha



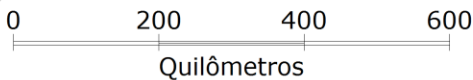
Área colhida (hectares) de soja. Dados da Produção Agrícola Municipal – IBGE (2007)



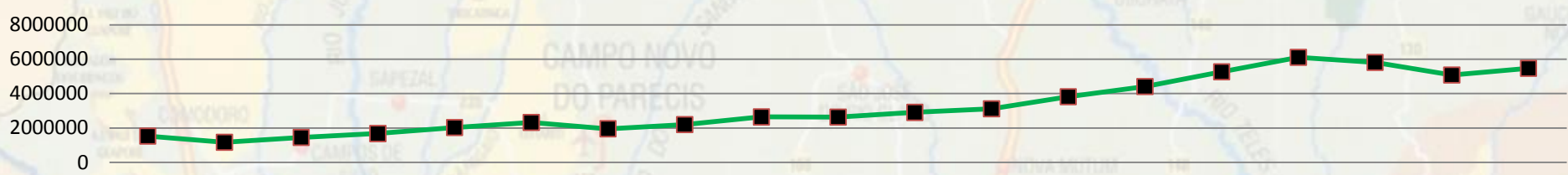
### Passos iguais

- 0 a 1/5 do VM
- 1/5 a 2/5 do VM
- 2/5 a 3/5 do VM
- 3/5 a 4/5 do VM
- 4/5 ao VM

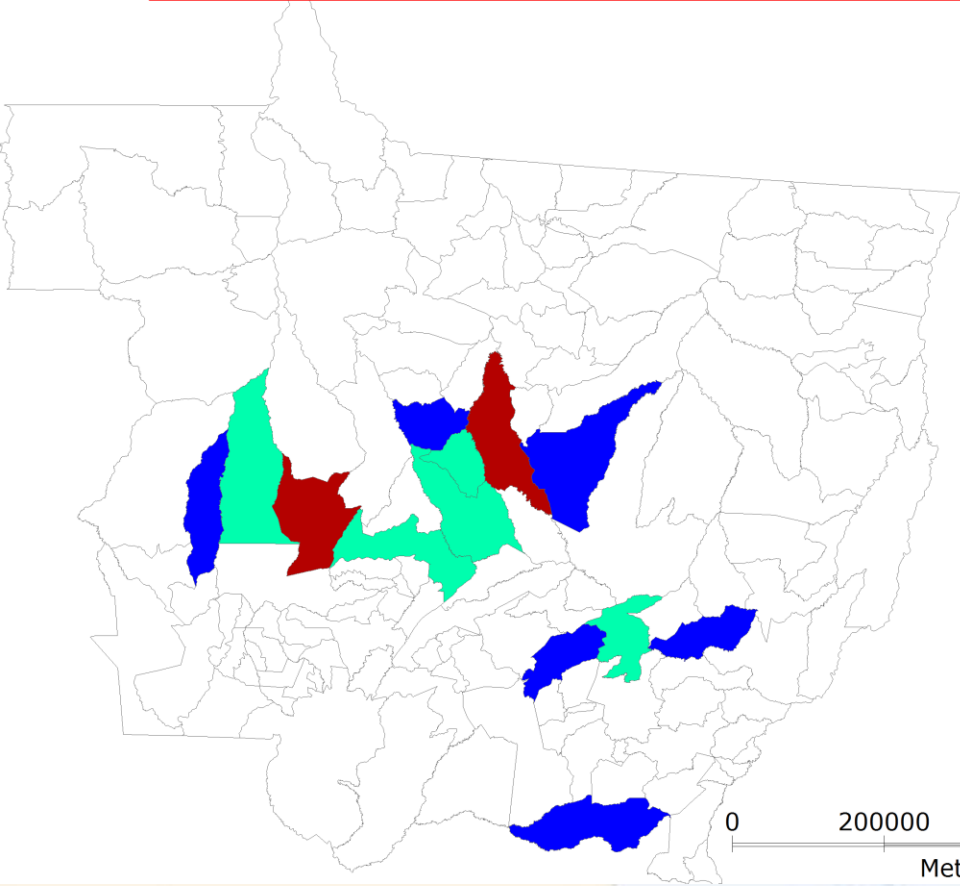
valor máximo (VM) = 575000 ha



Área colhida (hectares) de soja. Dados da Produção Agrícola Municipal – IBGE (2008)

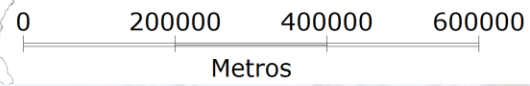


**1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008**



### Passos iguais

- 0 a 68.700 hectares
- 68.700 a 137.420 hectares
- 137.420 a 206.129 hectares
- 206.129 a 274.838 hectares
- 274.838 a 343.548 hectares



Área colhida (hectares) de soja. Produção Agrícola Municipal – IBGE (média 1990 a 2008)



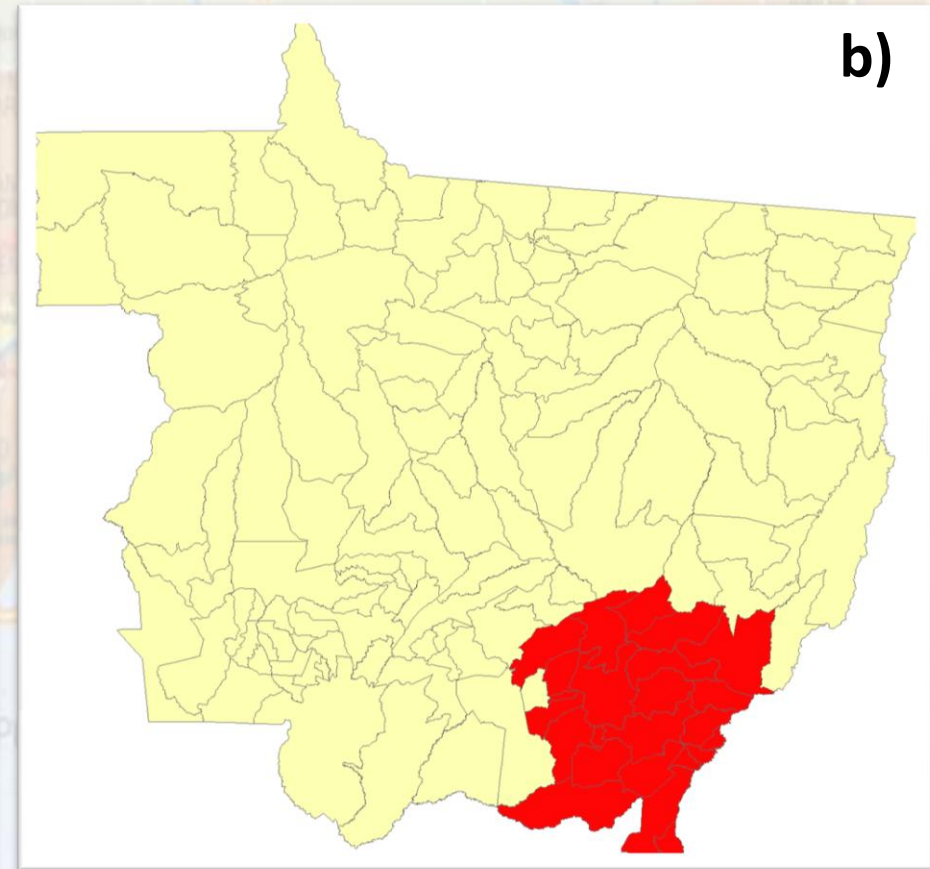
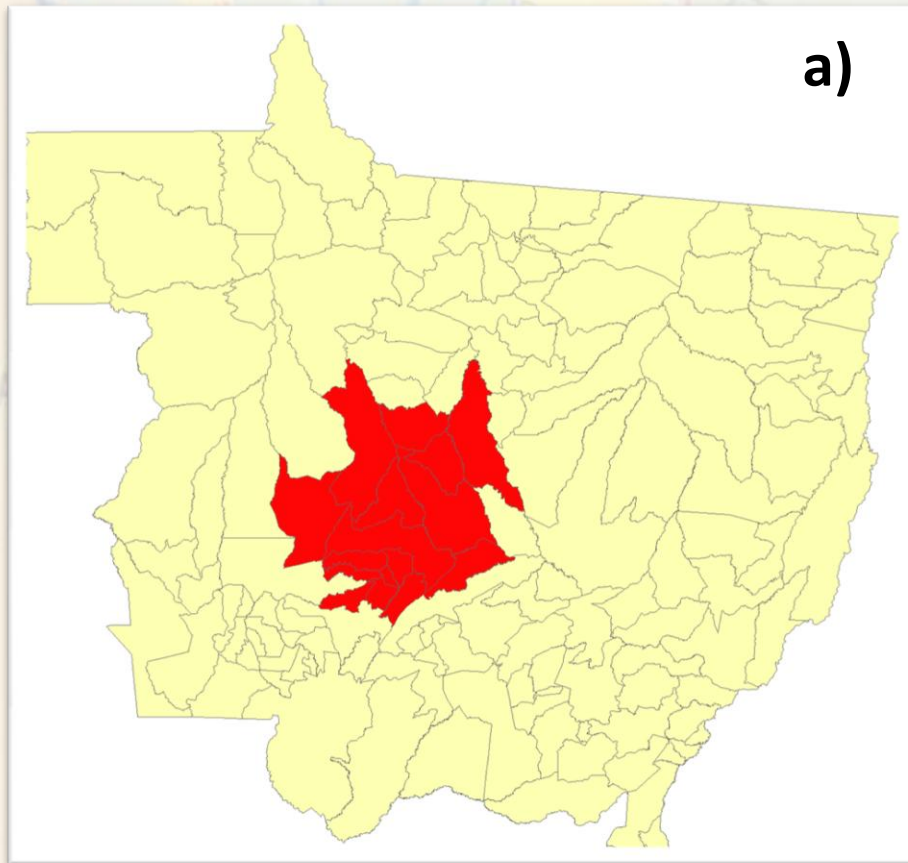
# Método de Grimson

$H_0$ : não há relação de adjacência entre os municípios.

$H_1$ : distribuição espacial destes municípios não é aleatória.

<b>Número de Objetos Indexados:</b>	24
<b>Média de Vizinhos por Objeto:</b>	5.46099
<b>Var(y):</b>	3.46834
<b>Componente de Regularidade:</b>	7.3202
<b>Componente de Variação:</b>	1.83505
<b>Estatística A:</b>	31
<b>E(A):</b>	10.766
<b>Var(A):</b>	9.15524
<b>z-score:</b>	6.68725
<b>P-valor</b>	0.0000000000114324

# Método Spatial Scan

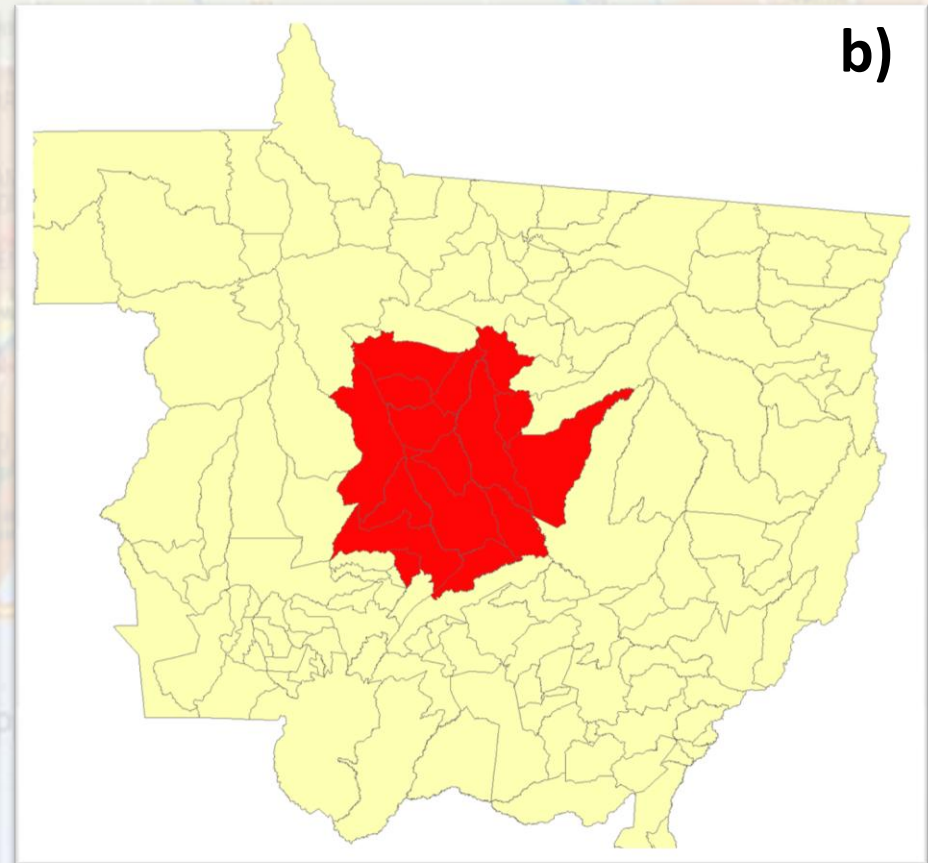
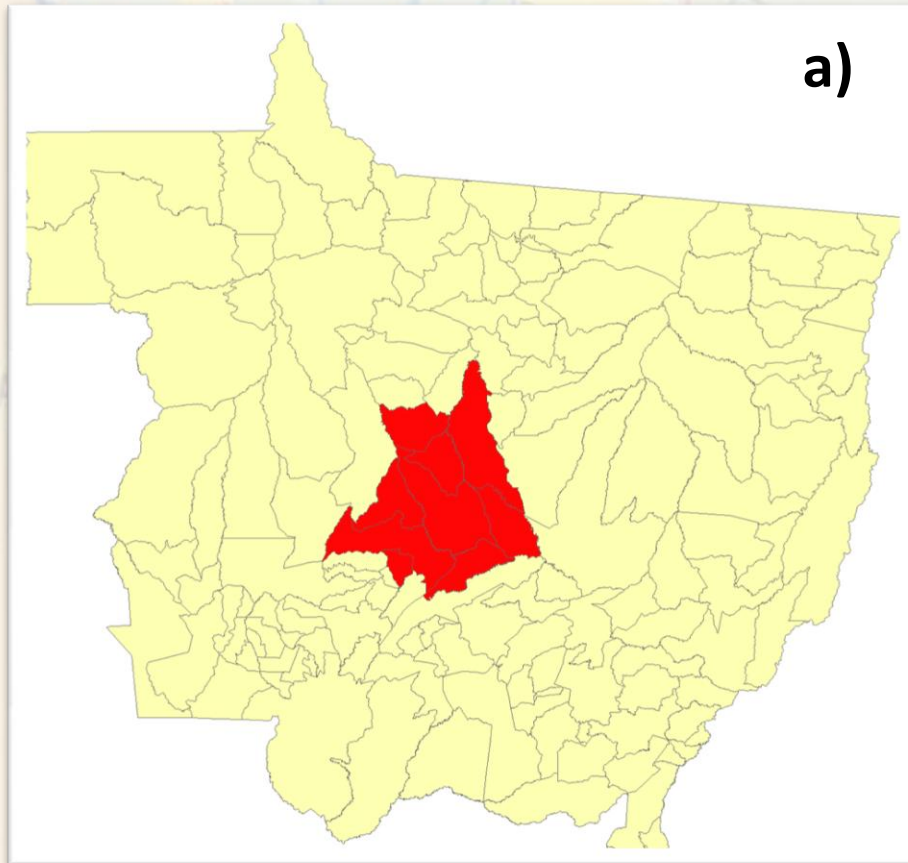


Padrões de aglomeração espacial (vermelho) detectados pelo método *Spatial Scan* para a década de 90, sendo:

a) em 1990 e de 1992 a 2001

b) apenas em 1991.

# Método Spatial Scan



Padrões de aglomeração espacial (vermelho) detectados pelo método *Spatial Scan* para a o período de 2002 a 2005, sendo:

a) de 2002 a 2004

b) apenas em 2005

# Método Spatial Scan

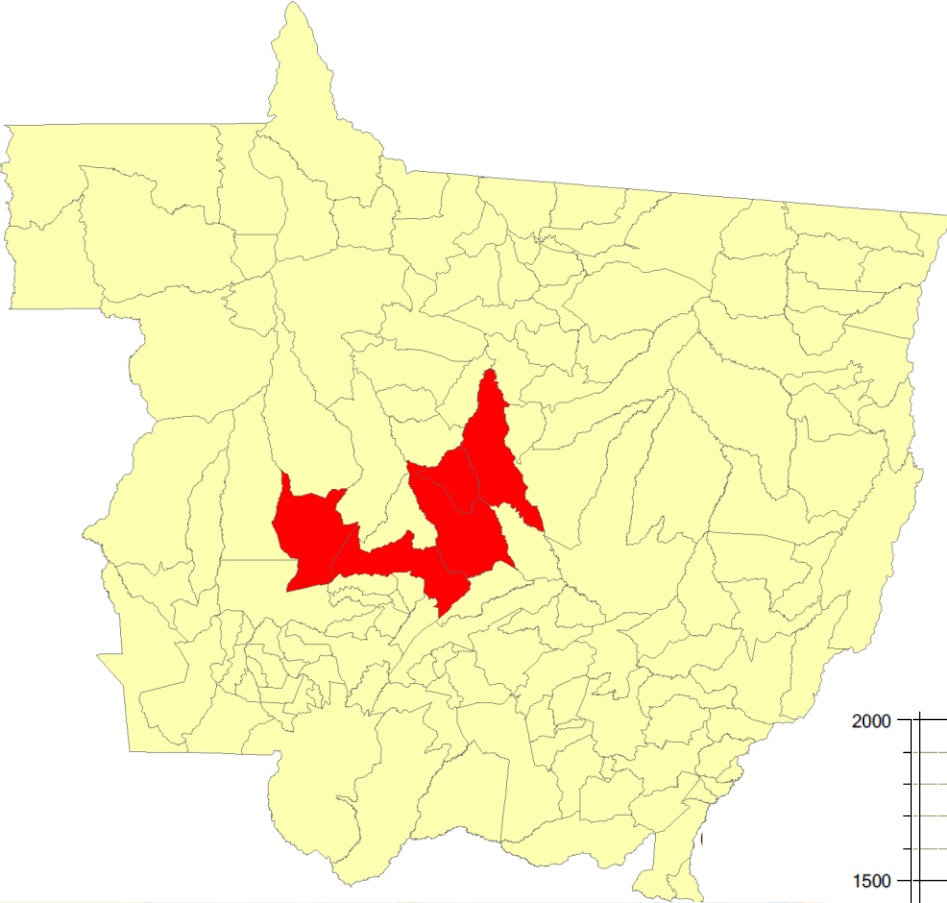


Padrão de aglomeração espacial (vermelho) detectados pelo método *Spatial Scan* para o período de 2006 a 2008

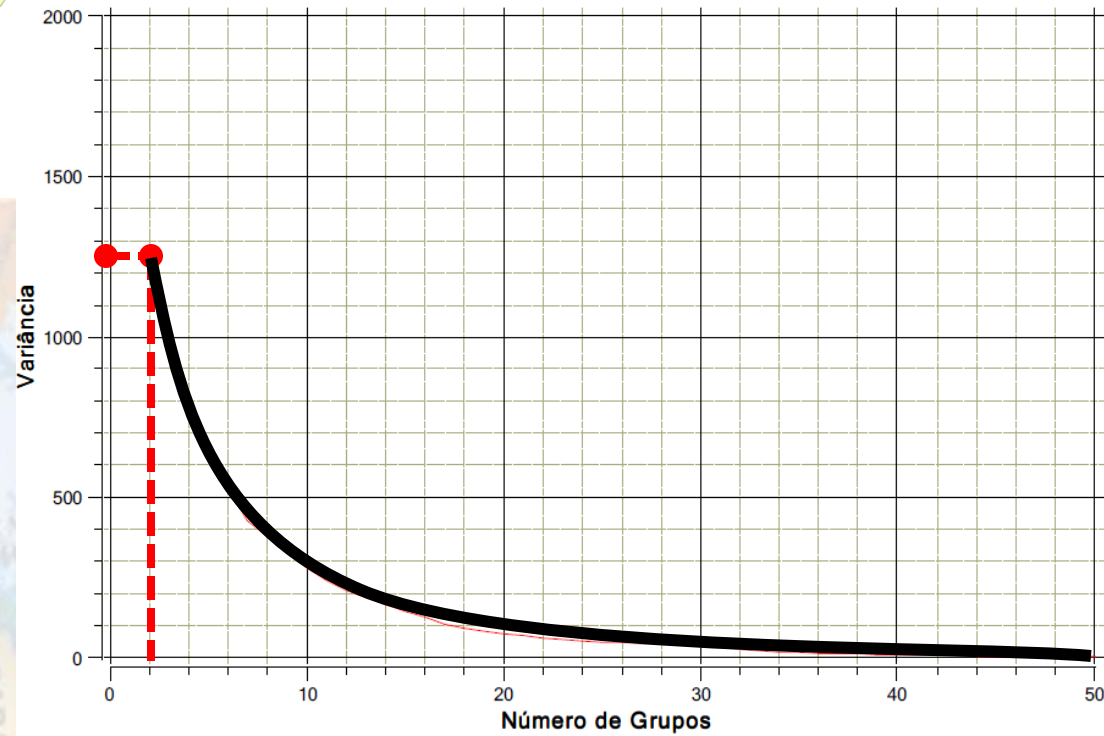
# SKATER

MÉTODO DE AGREGAÇÃO

2 Grupos



Diminuição da Variância

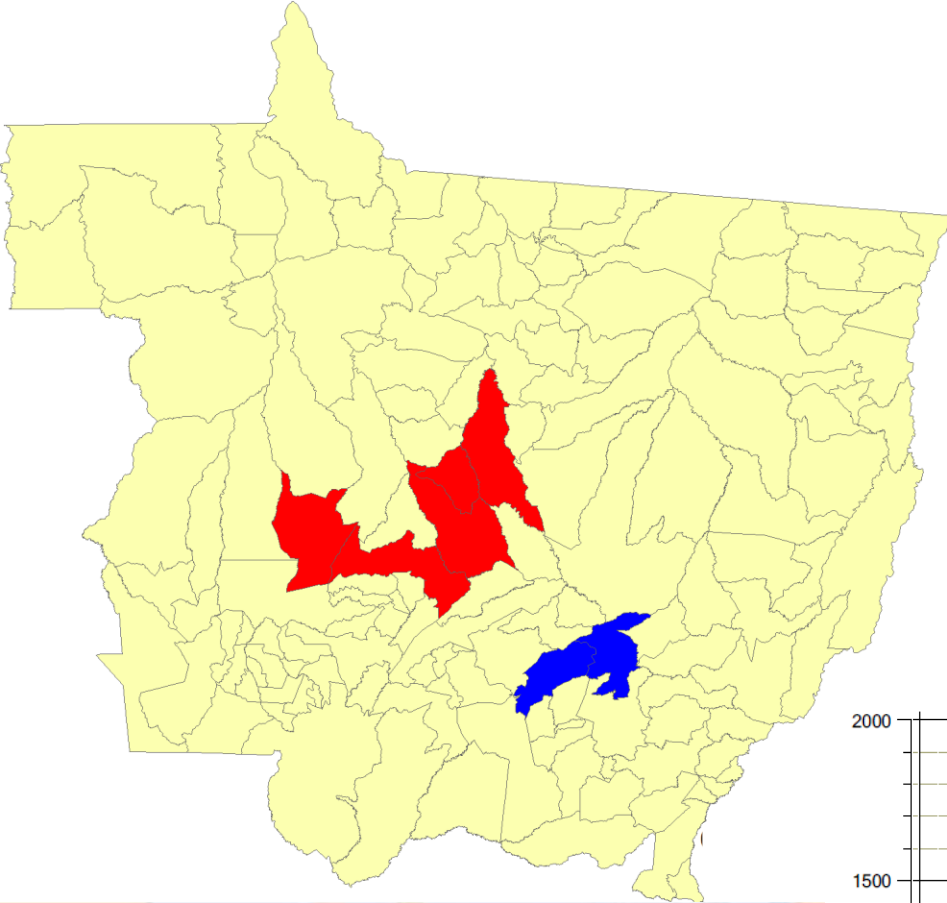




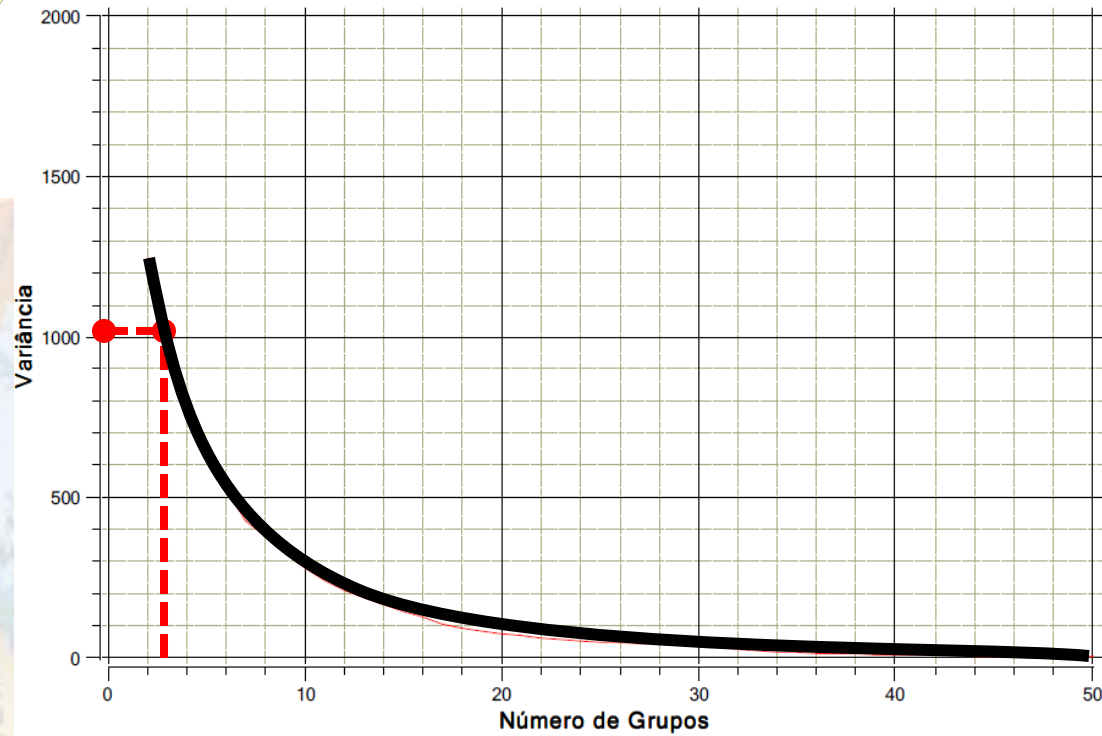
# SKATER

MÉTODO DE AGREGAÇÃO

3 Grupos



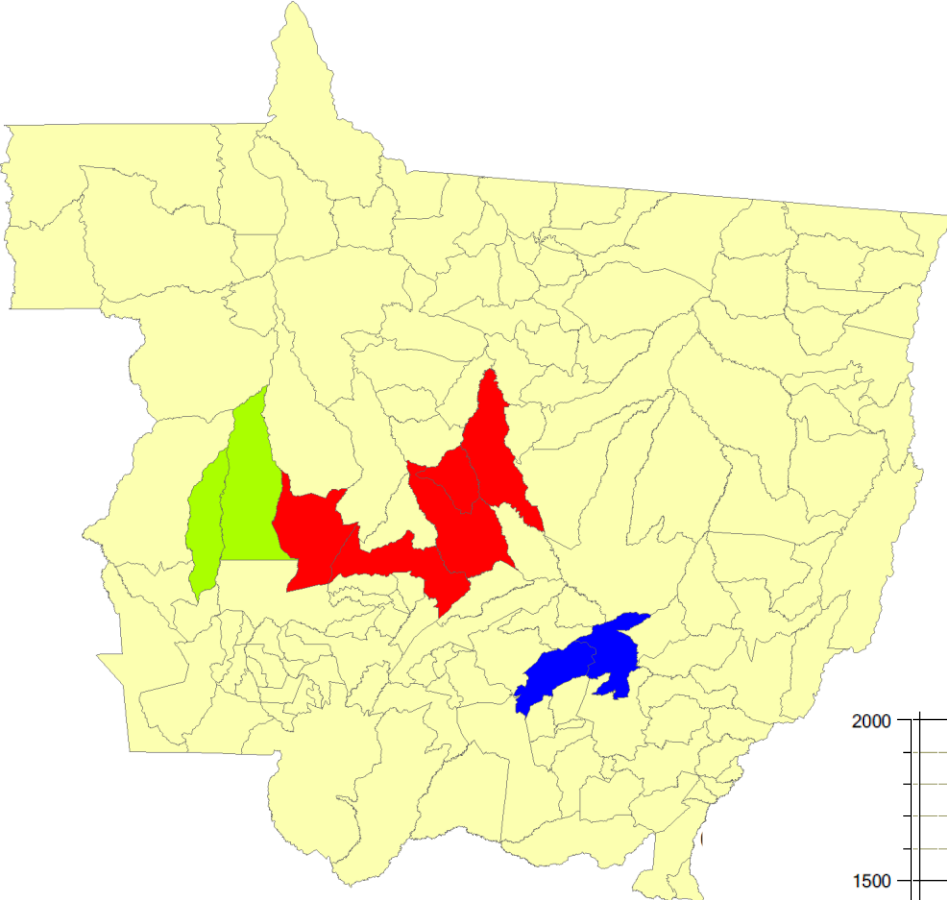
Diminuição da Variância



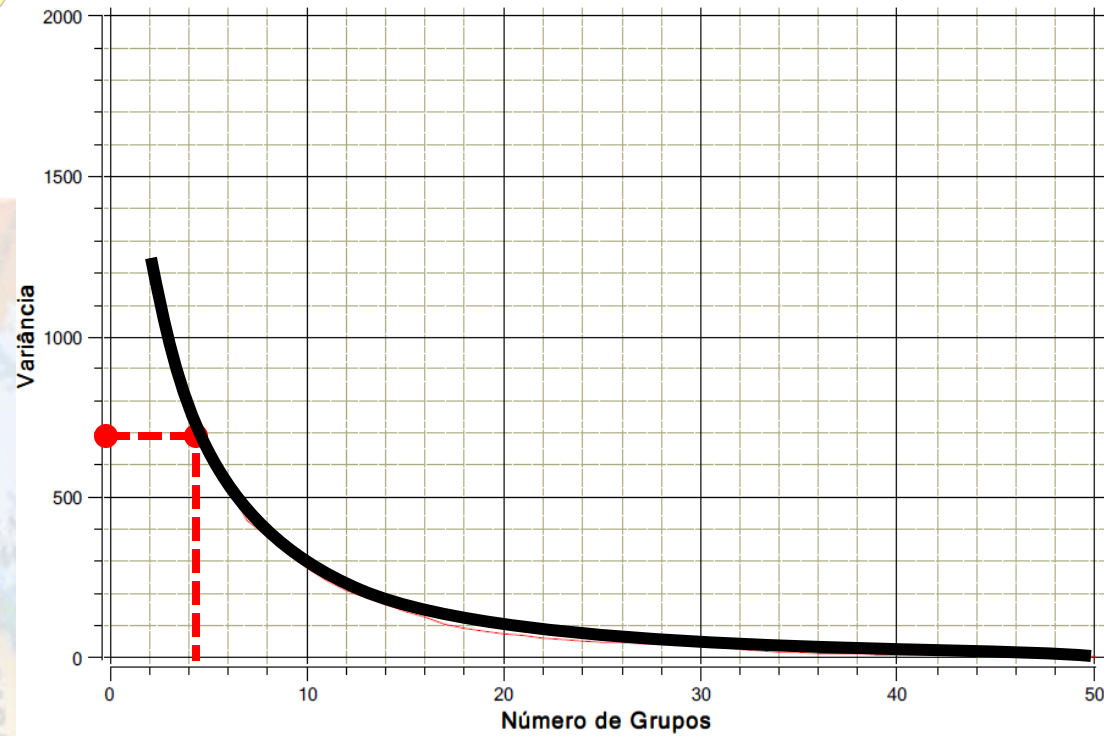
# SKATER

MÉTODO DE AGREGAÇÃO

4 Grupos



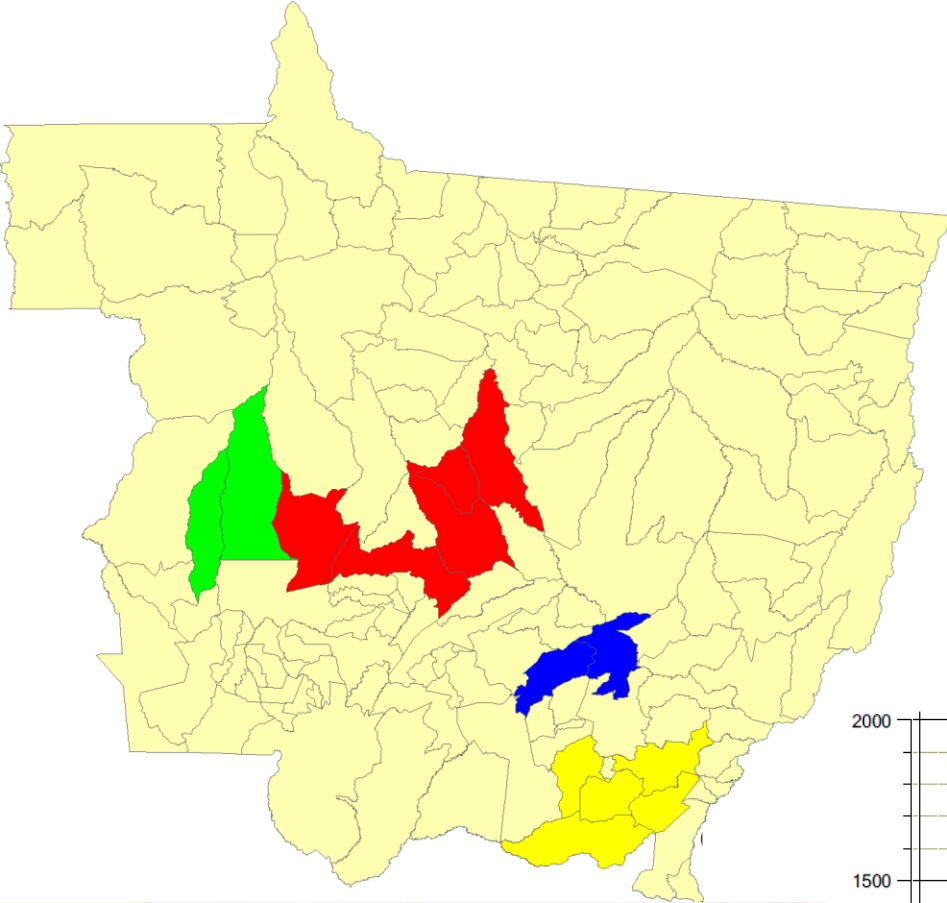
Diminuição da Variância



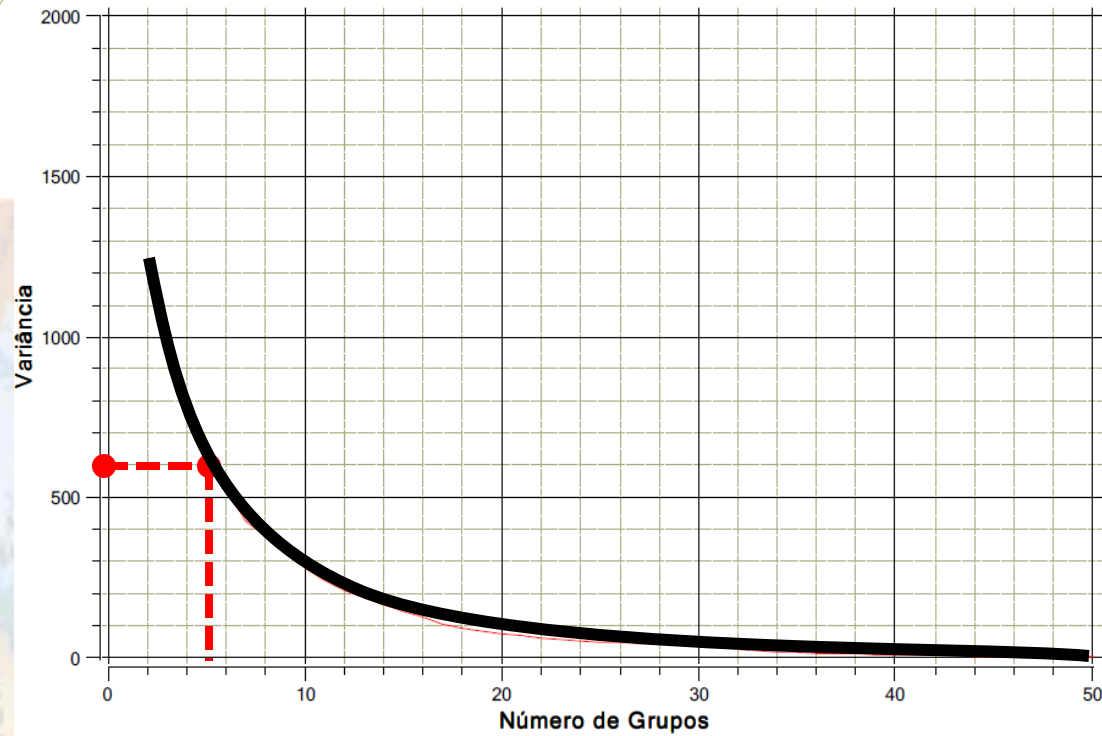
# SKATER

MÉTODO DE AGREGAÇÃO

5 Grupos



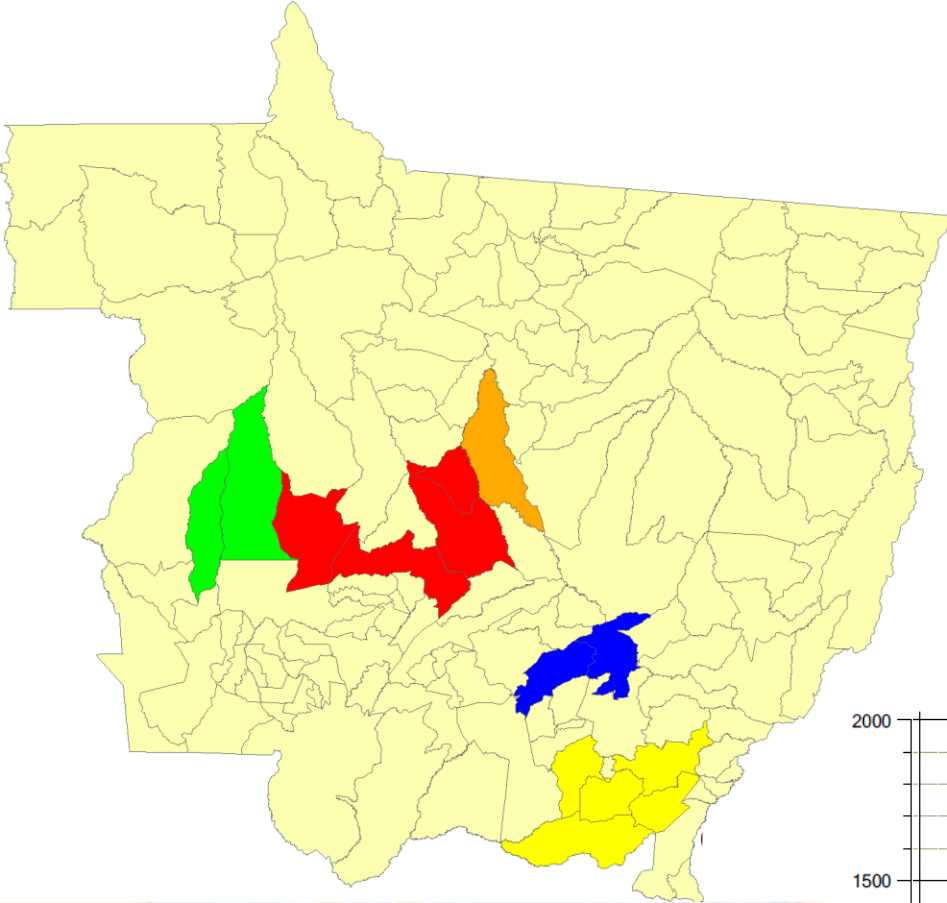
Diminuição da Variância



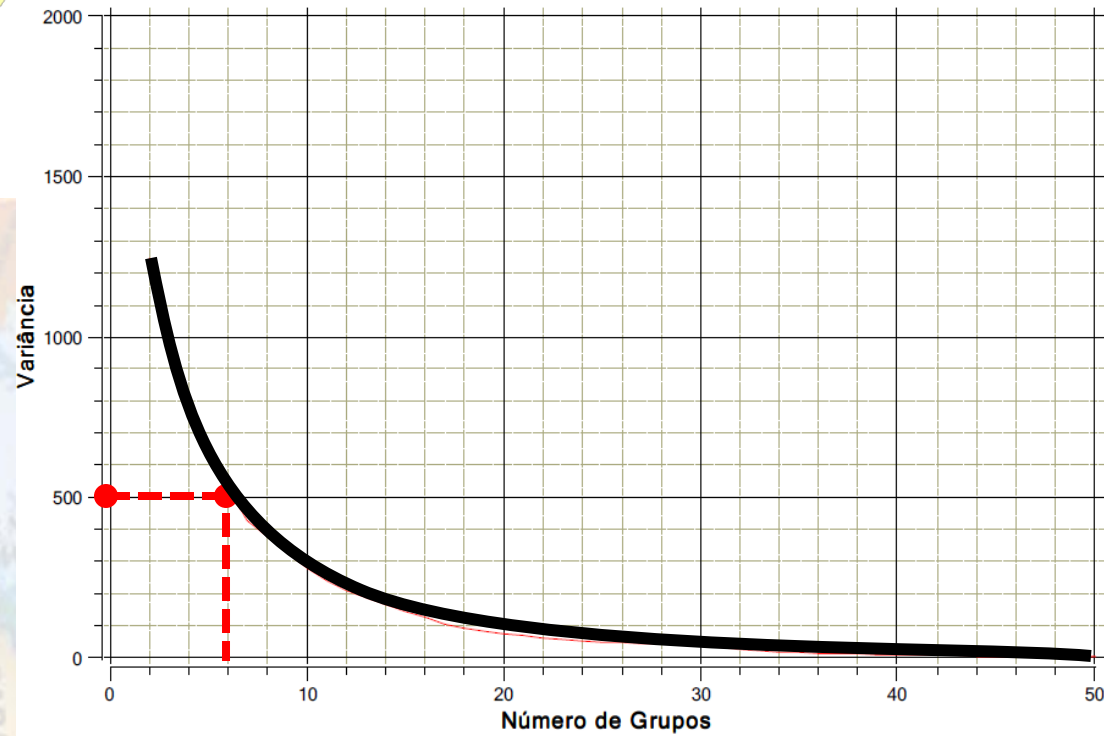
# SKATER

MÉTODO DE AGREGAÇÃO

6 Grupos



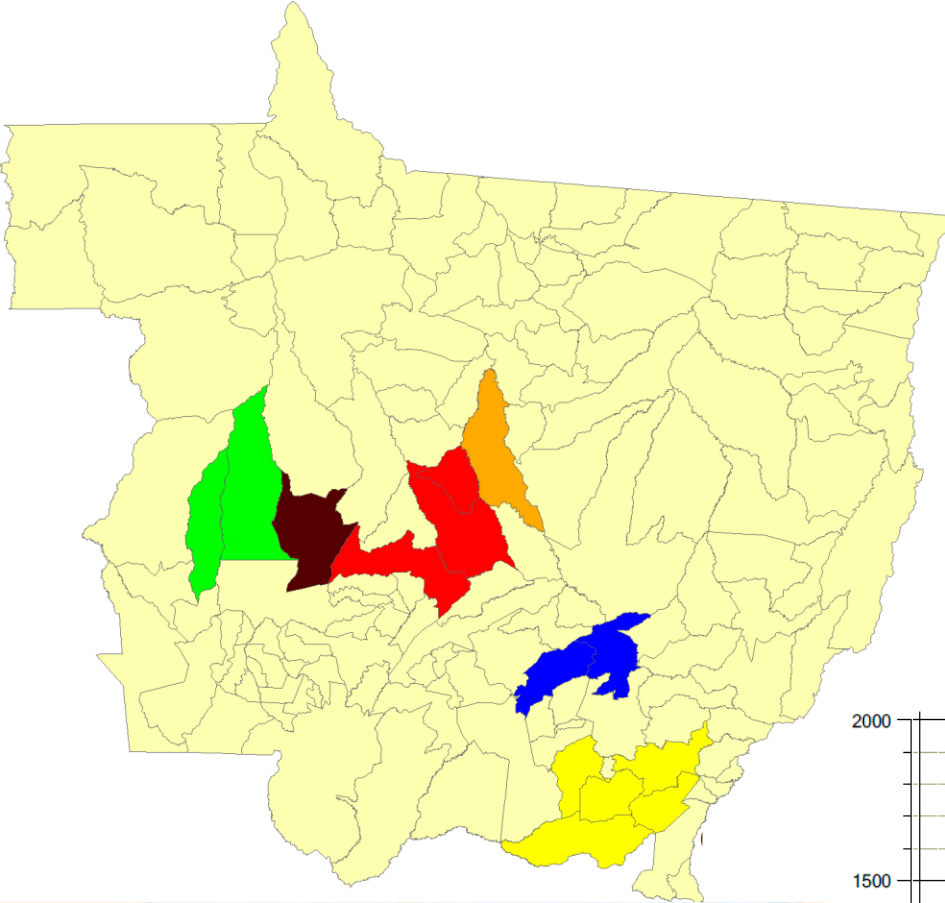
Diminuição da Variância



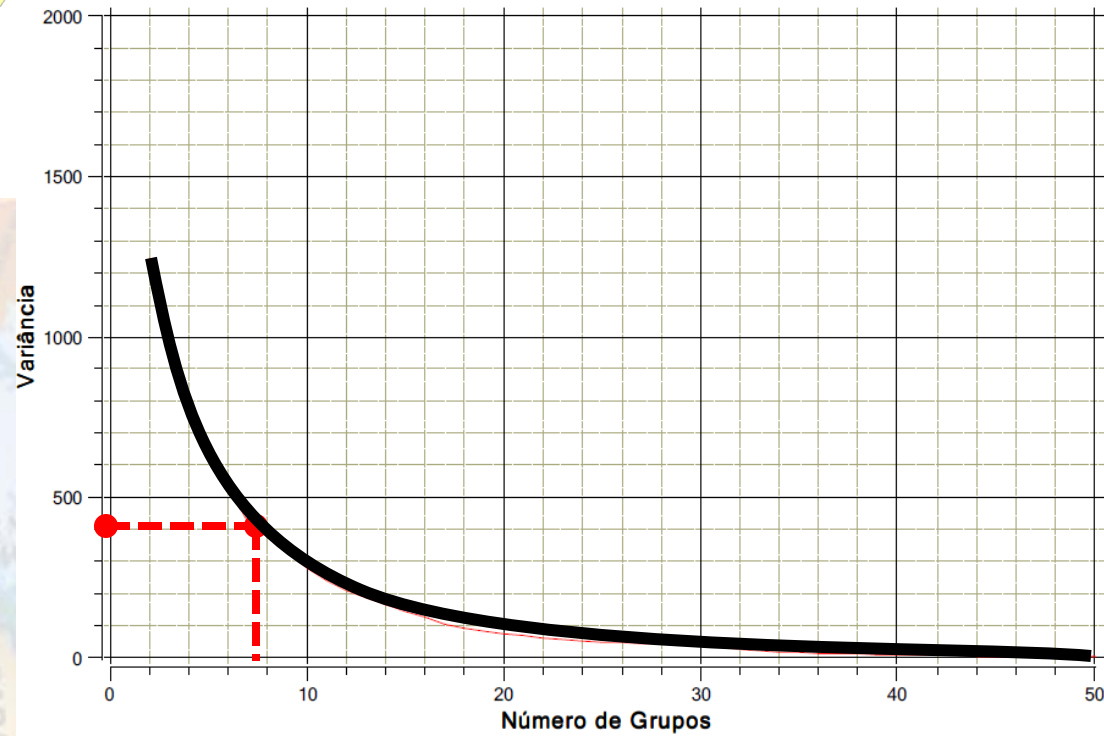
# SKATER

MÉTODO DE AGREGAÇÃO

7 Grupos



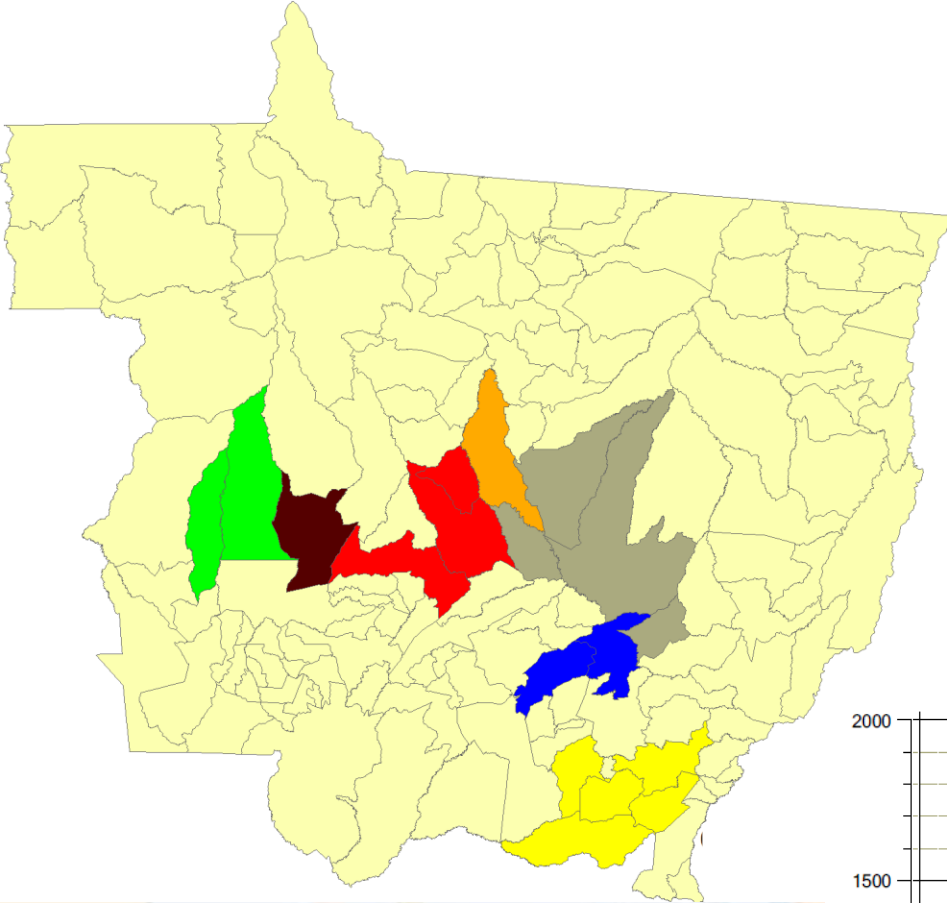
Diminuição da Variância



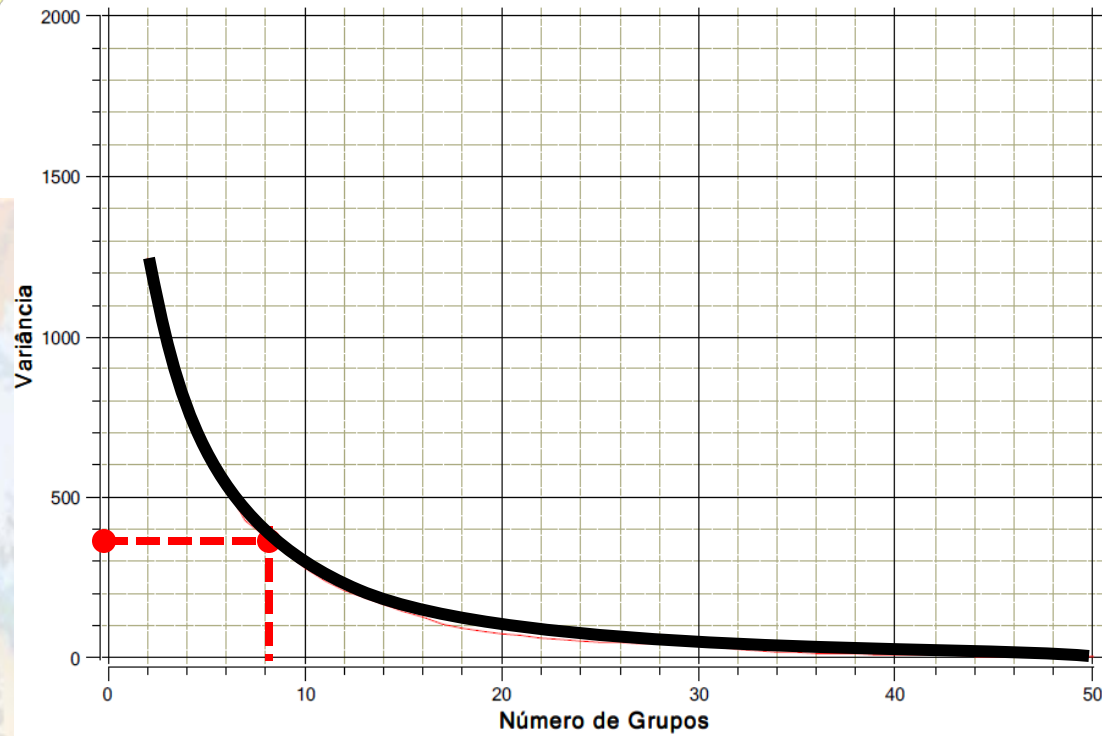
# SKATER

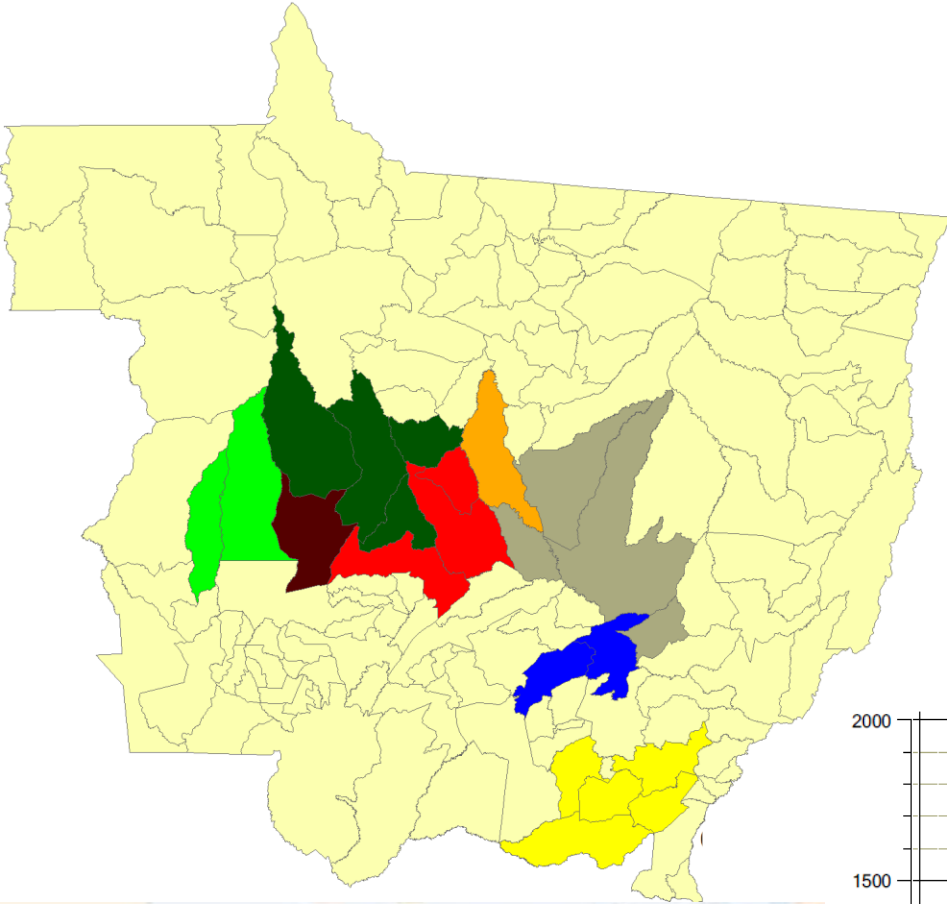
MÉTODO DE AGREGAÇÃO

8 Grupos



Diminuição da Variância

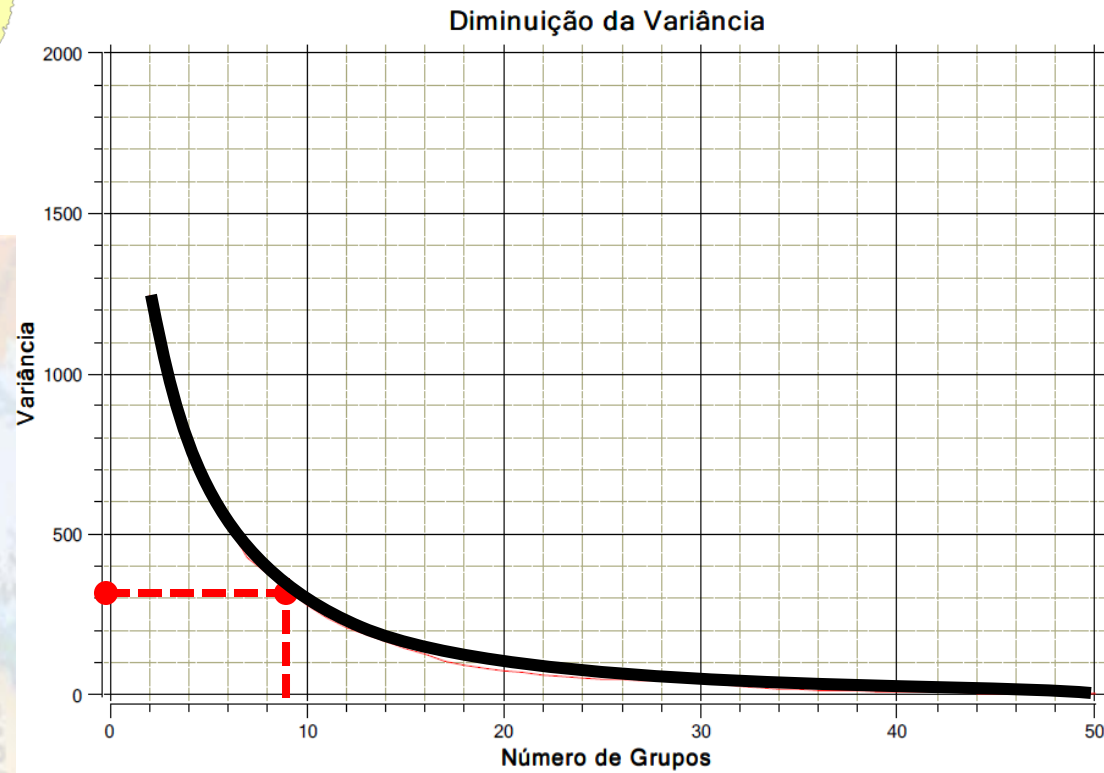


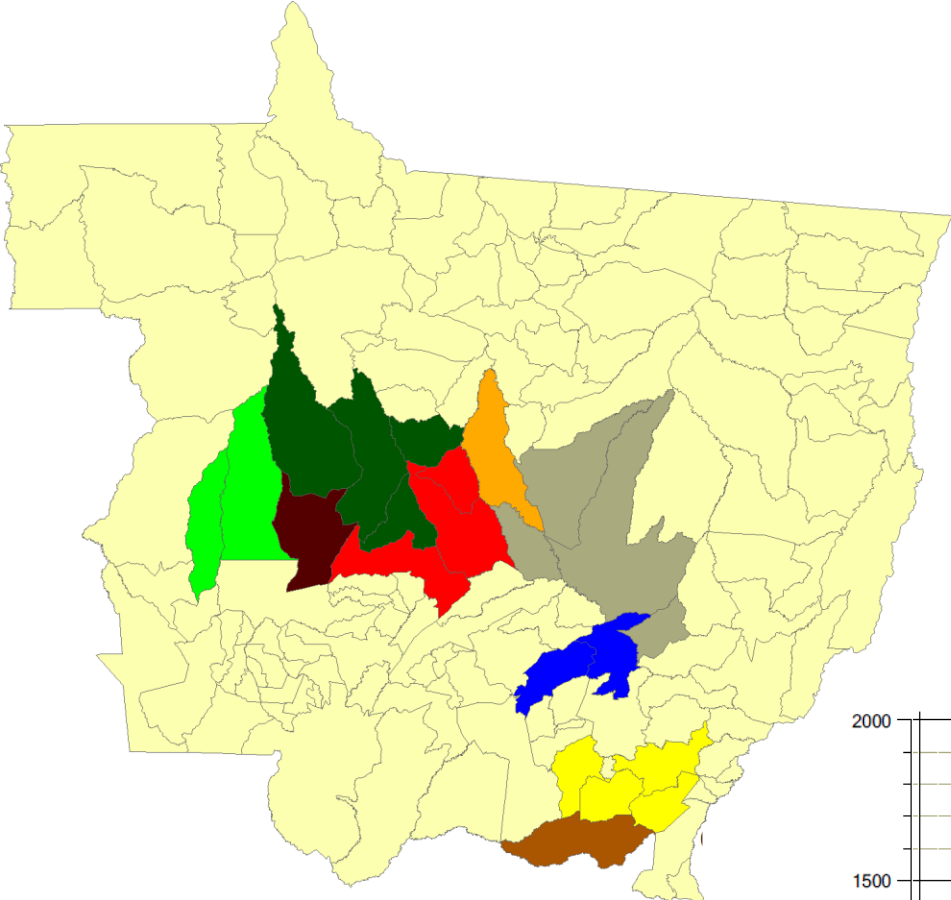


# SKATER

## MÉTODO DE AGREGAÇÃO

# 9 Grupos

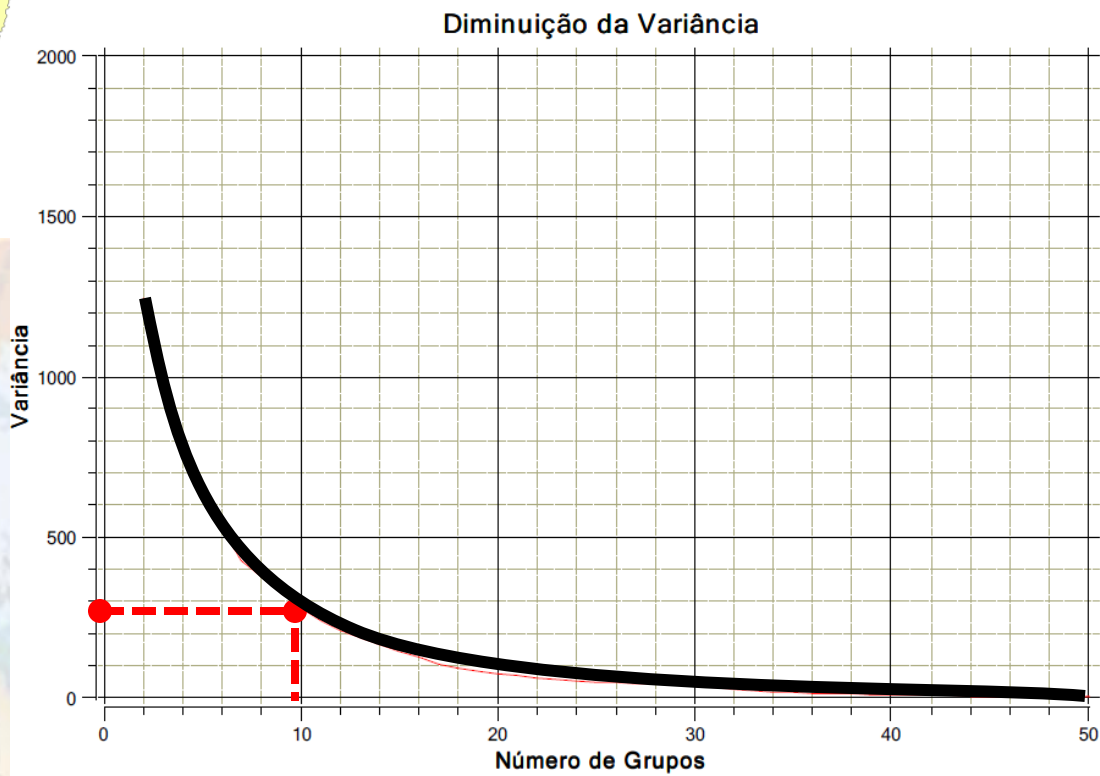




# SKATER

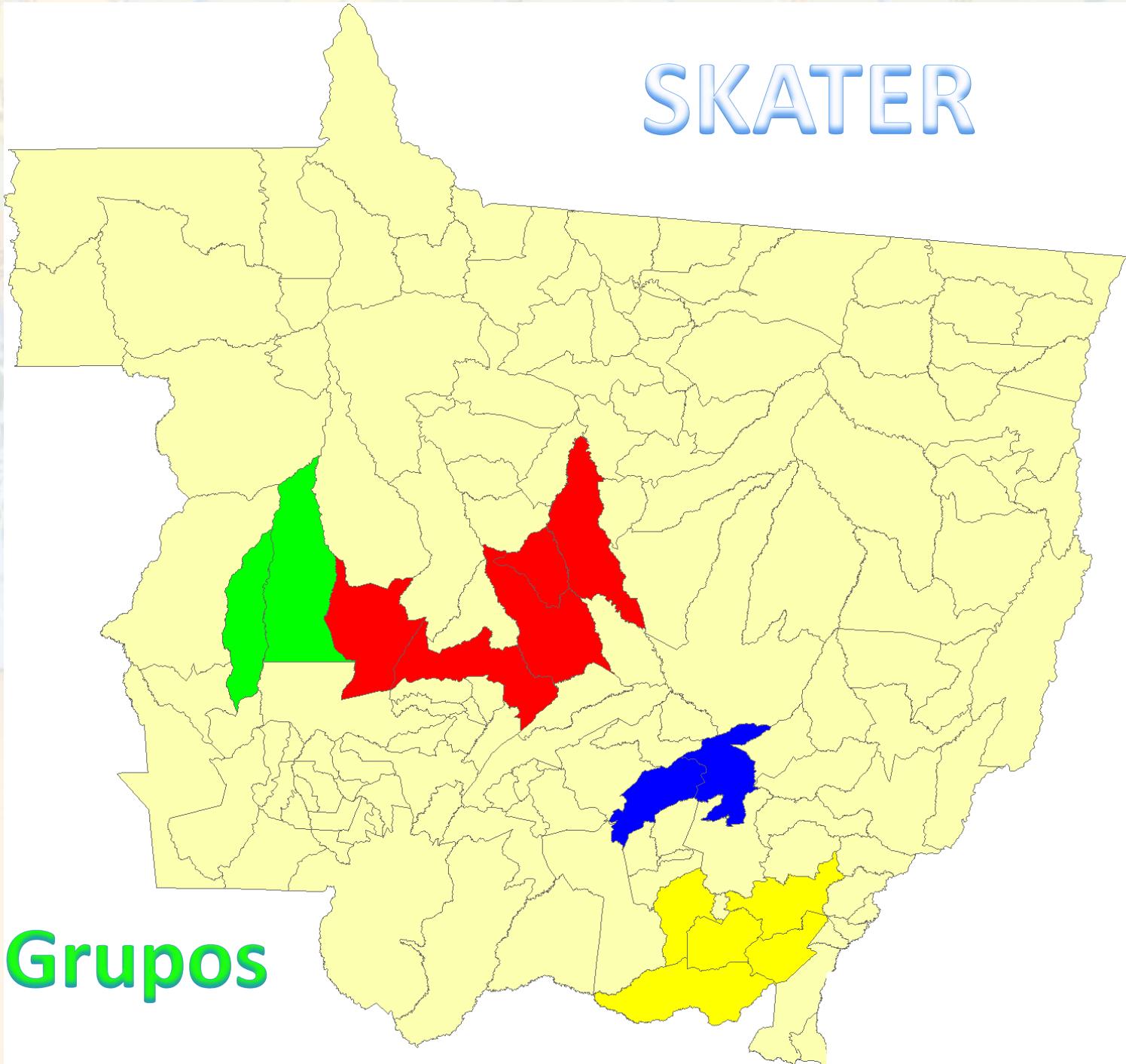
## MÉTODO DE AGREGAÇÃO

# 10 Grupos





# SKATER



**5 Grupos**

# Conclusões

Conclui-se que há relação espacial de adjacência, com nível de significância de 5%, entre os municípios que apresentam as maiores áreas colhidas de soja.

Durante a década de 90, os municípios: Sorriso, Primavera do Leste, Novo São Joaquim e Campo Novo do Parecis, apresentaram autocorrelação espacial com significância acima de 5%.

Para o período de 2000 a 2008, os municípios de maior autocorrelação espacial foram: Campos de Julio, Primavera do Leste e Santo Antônio do Leste.

As regiões que apresentam aglomeração espacial estão presentes na região central do estado do Mato Grosso.

A map of the state of Mato Grosso in Brazil, showing various cities and geographical features. The word "FIM" is written in large, bold, green letters across the center of the map. The map includes labels for cities like Cuiabá, Tangará da Serra, Nobres, and Jaciara, as well as rivers like Rio Teles Pires and Rio Cuiabá. The word "BOLÍVIA" is visible in the bottom left corner, and "MATO GROSSO" is at the bottom center.

**FIM**

**Obrigado**