

Climatic Risk Agricultural Zoning (ZARC)

*Agro-climatic Risk Zoning
for
Risk Management*

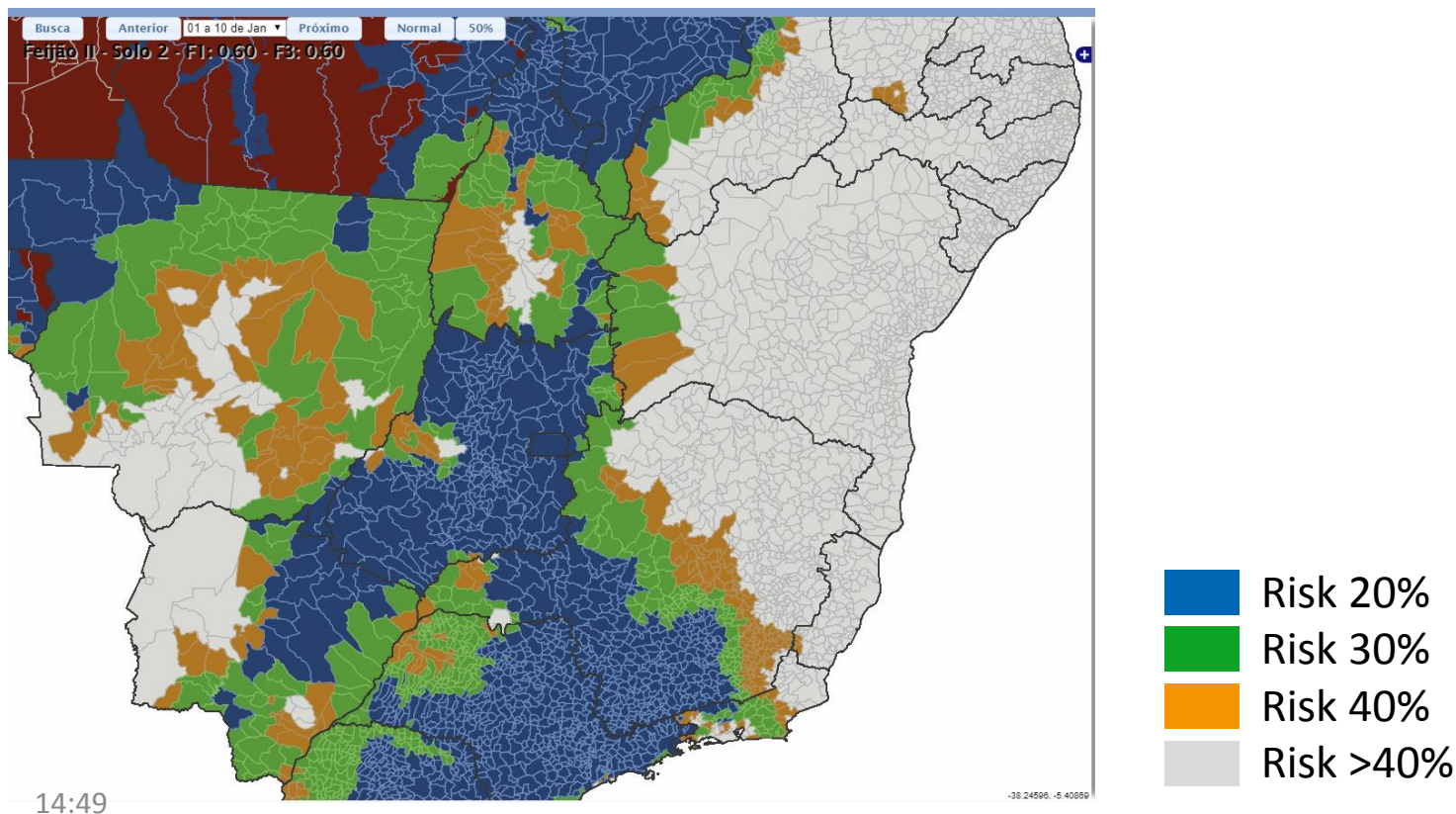
*Dr. Eduardo Monteiro
Researcher Scientist*

Commitee ZARC-Embrapa

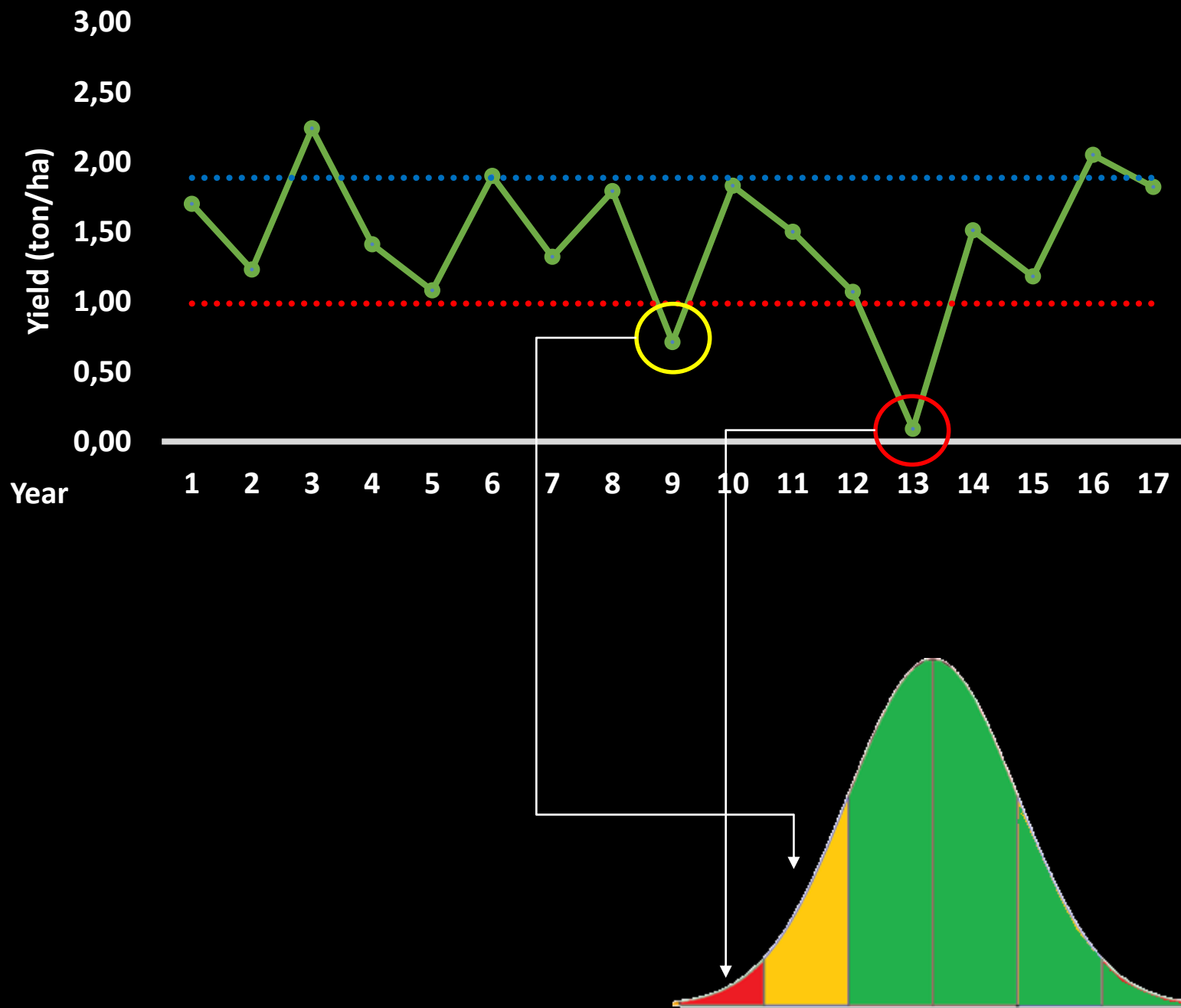


Agro-climatic Risk Zoning (ZARC)

- It is the delimitation of regions and sowing dates in classes according to their chances or probabilities of yield loss caused by adverse meteorological events;

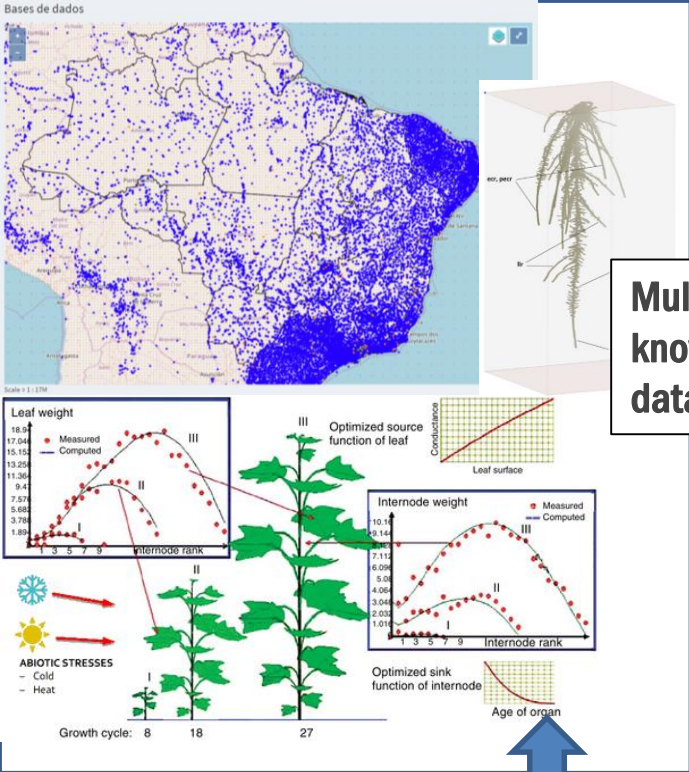




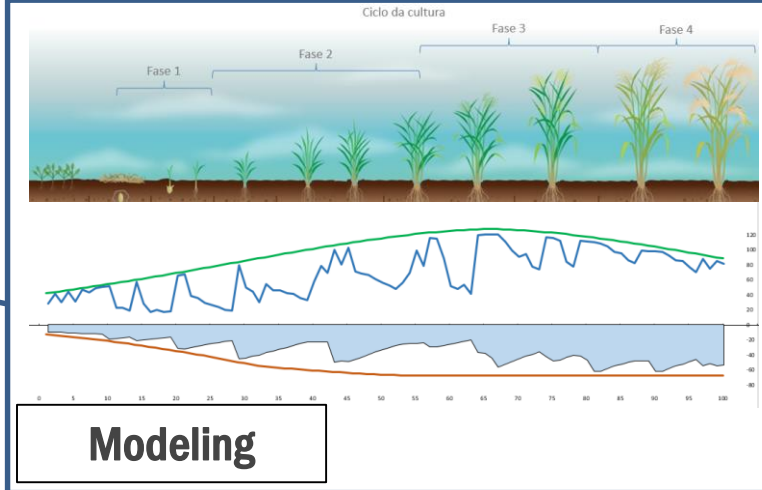




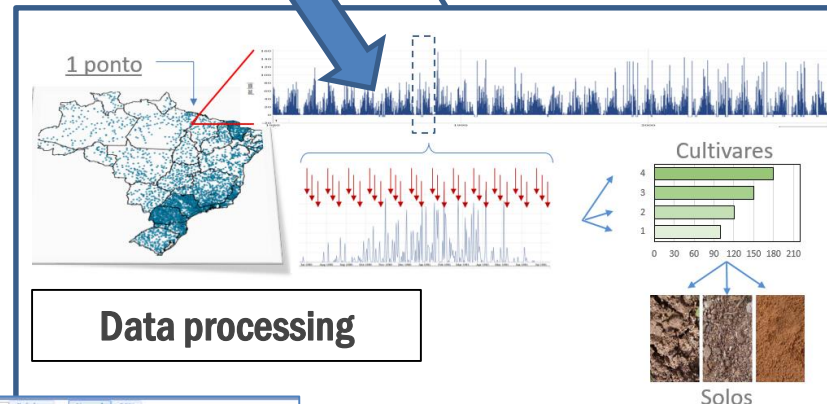
- Drought
- Excessive rain
- Rain in harvest time
- High or low temperatures
- Frost
- Storm or gale (wind)
- Hail



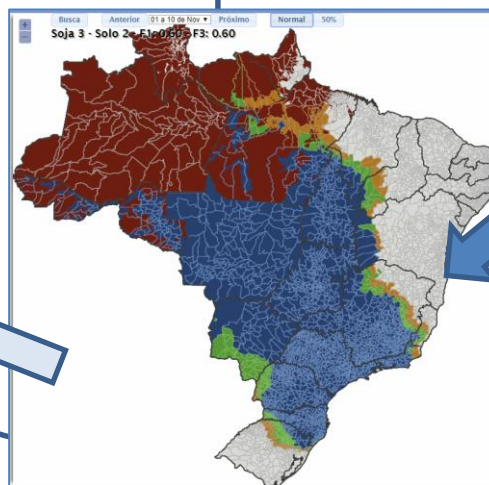
Multidisciplinary knowledge and data base



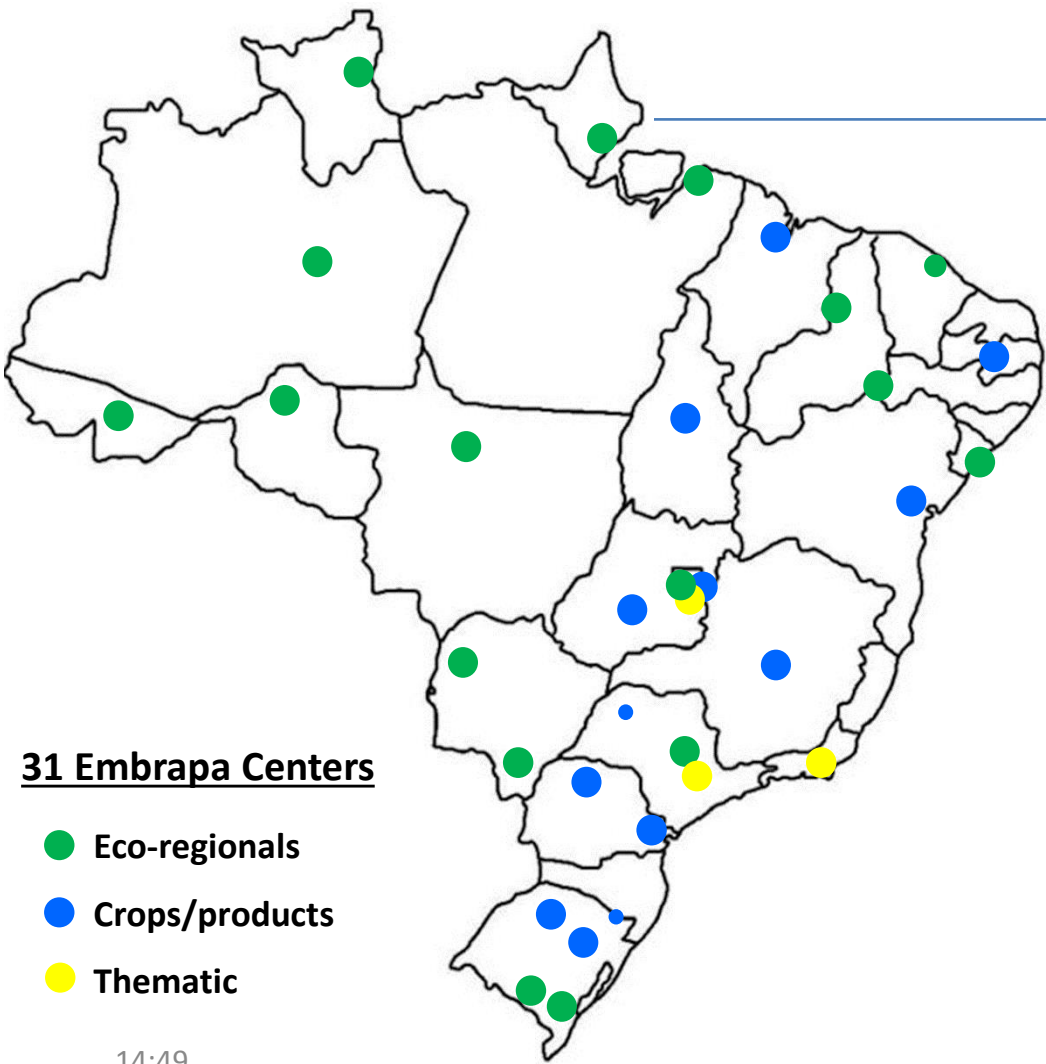
ZARC



Validation meetings



Network ZARC/Embrapa



14:49

Local teams



Crop leader



IT team - data
processing analysis



Crop modeling
team

Agro-climatic Risk Zoning (ZARC)

Depends on the crop species



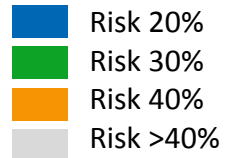
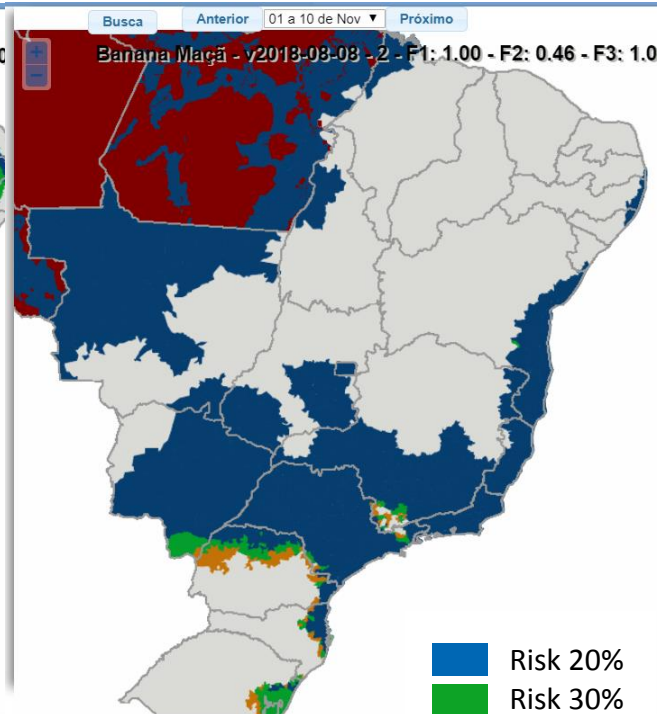
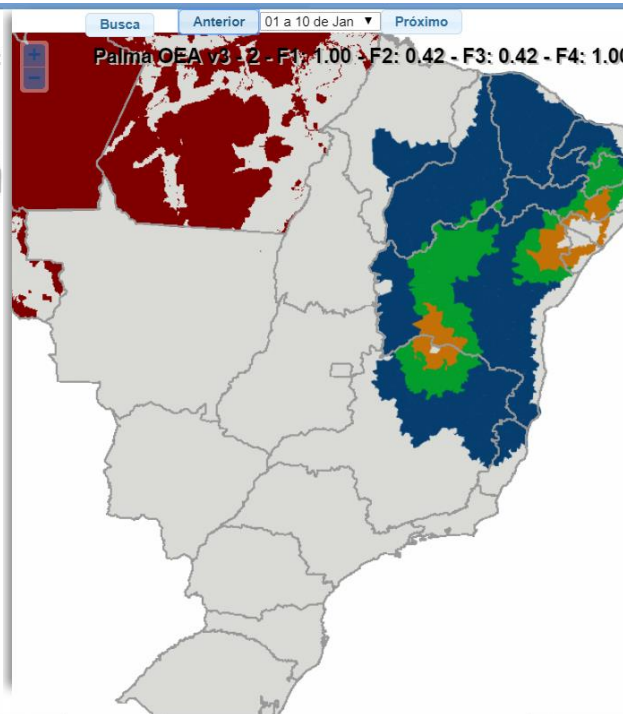
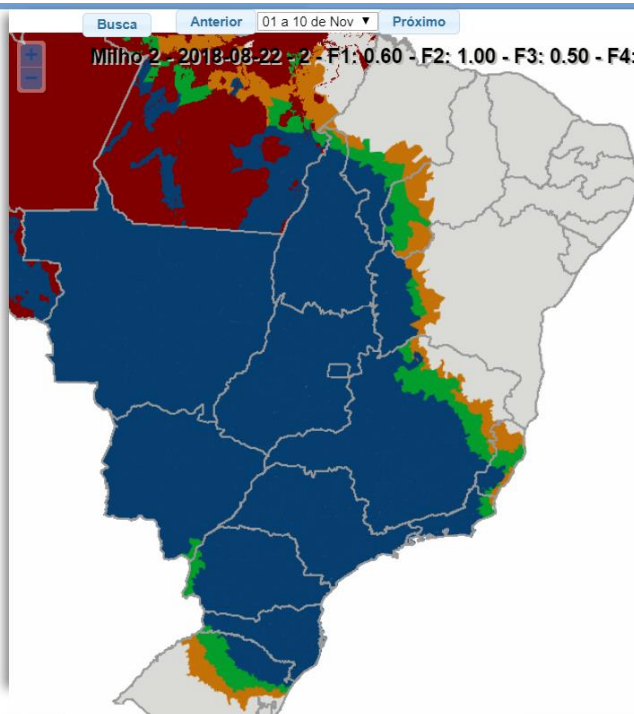
Corn



Forage Palm



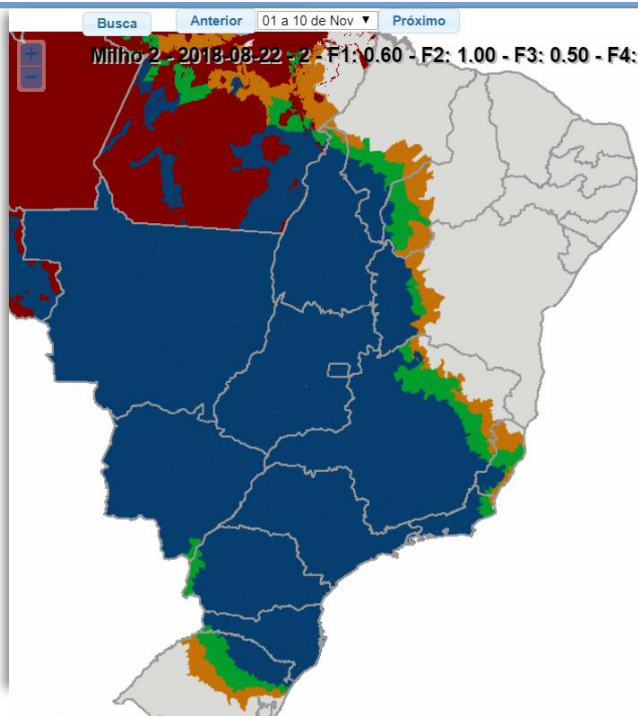
Banana



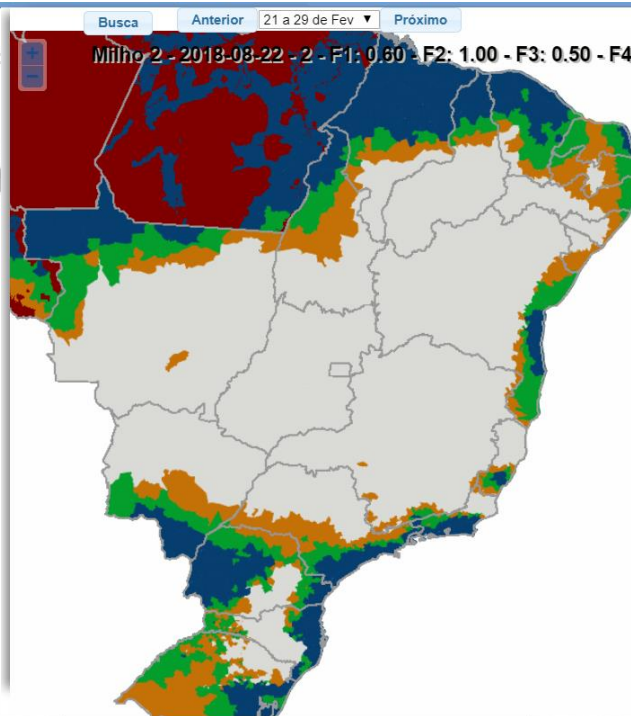
Agro-climatic Risk Zoning (ZARC)

Depends on the planting/sowing date

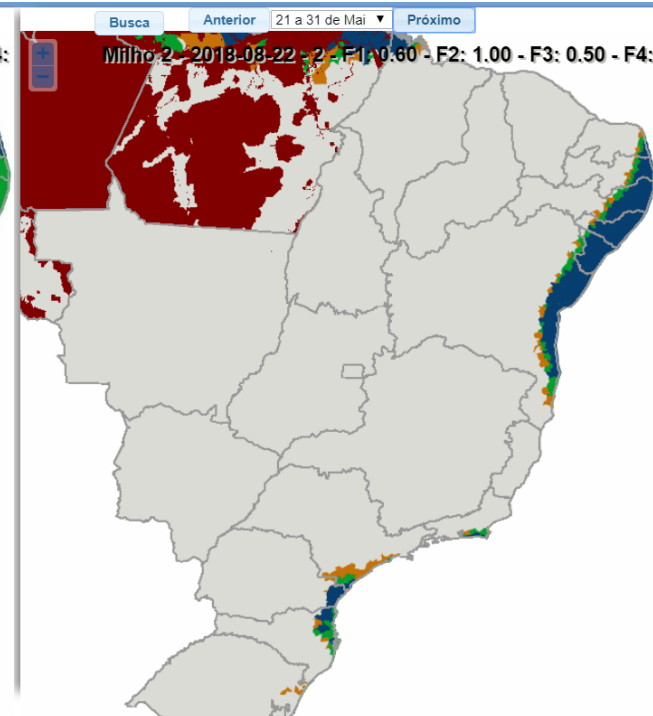
November



February



May



Agro-climatic Risk Zoning (ZARC)

Depends on the soil capacity to storage water



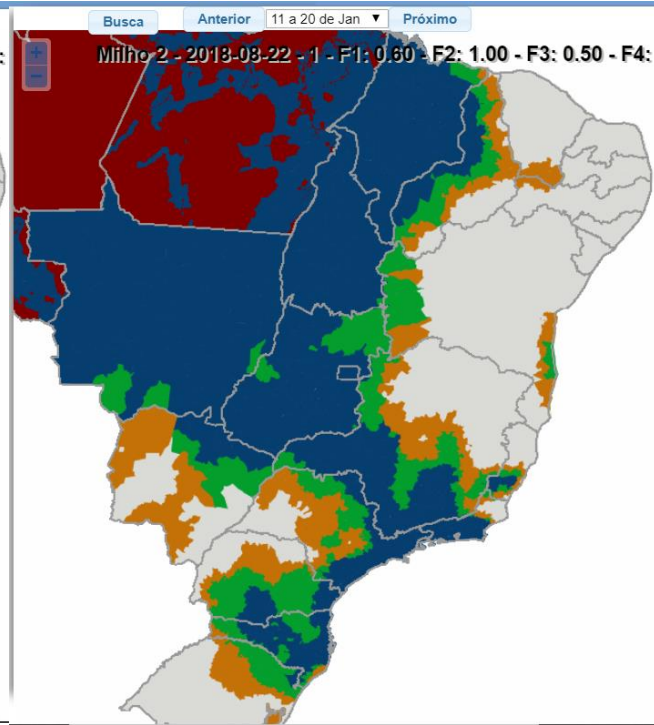
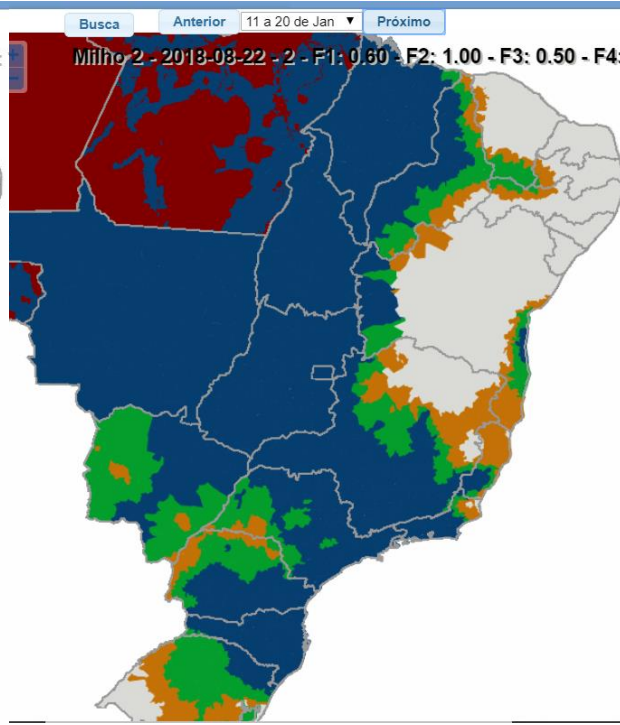
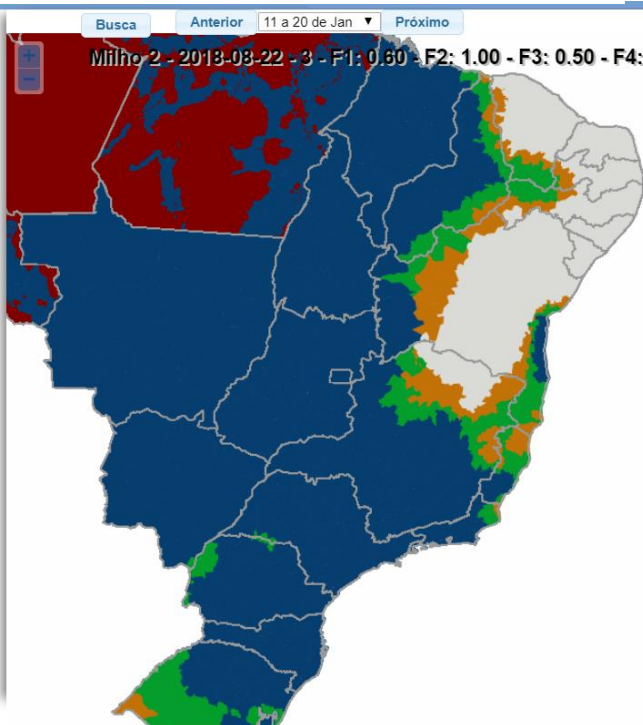
Clayey soil



Loamy soil



Sandy soil



Agricultural Risk Management in Brazil

- Production risks
- Market risks
- Business risks

Losses around **R\$ 11 billions / year**
R\$ 4,00 \approx US\$ 1,00

REVISÃO RÁPIDA E INTEGRADA DA GESTÃO DE RISCOS AGROPECUÁRIOS NO BRASIL

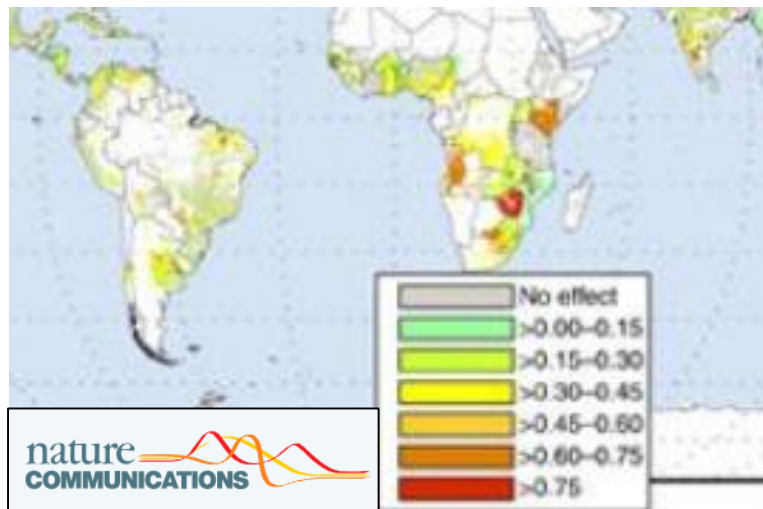
Caminhos para uma visão integrada

COORDENAÇÃO

Diego Arias (Banco Mundial)

Paulo Mendes (MAPA)

Pedro Abel (Embrapa)



“Substantial areas of the global breadbaskets, >60% of the yield variability can be explained by climate variability”

Brazil: up to 75%

Climate variation explains a third of global crop yield variability. RAY, D.K. et al. Nature Communications, v. 6, n. 5989, 2015.

PROAGRO

Agricultural Activities Guarantee Program - Proagro

Guarantees the exemption of financial obligations related to the operation of rural costing credit, whose settlement is hindered by the occurrence of natural phenomena (small and medium farmers).

1980	1990	2000
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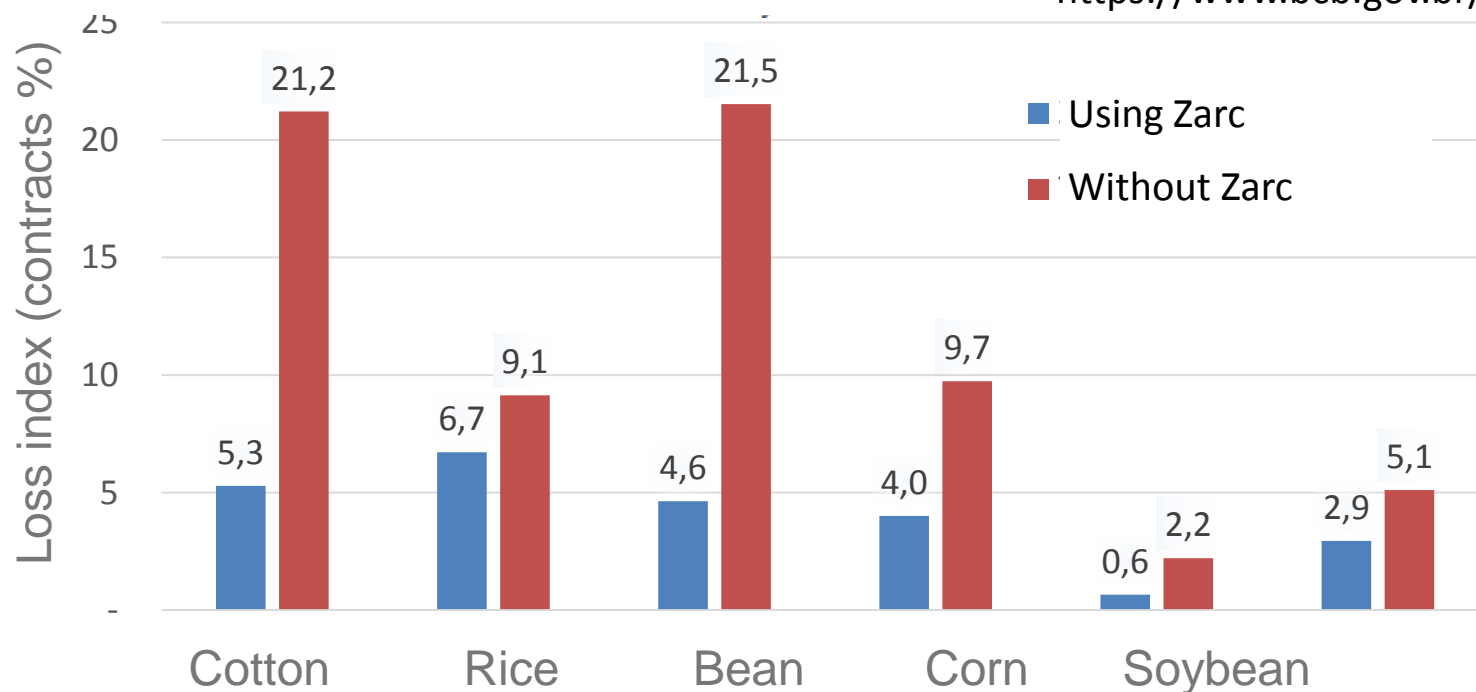
- High loss ratio;
- Deficit;
- Frauds;
- Drought and rain:
- 95% indemnities

The new
Proagro

ZARC

Agricultural activity guarantee program 1996-1998

<https://www.bcb.gov.br/>



Relatório circunstanciado

► 2014-2017 (dados revistos em Jan/2018)

► 2013-2016

► 2012-2015

► 2011-2014 (dados revistos em junho/2015)

► 2004-2012

► 2004-2011

► 1999-2010

► 1996-1998

► 1991-1996

**1998 - CMN:
ZARC mandatory**

Before 1998, optional:

Losses

With
ZARC

2,69%

Without
ZARC

11,5%

Proagro 2016:

Total indemnified: R\$ 1,08 bilhões

Lost contracts 5,8%

5,8% = R\$ 1,08 billion

11,5% = R\$ 2,14 billions

+ R\$ 1,06 billion

Similar gains in PSR?

Yield gains

Proagro RC 91-98

<https://www.bcb.gov.br/acessoinformacao/legado?url=https:%2F%2Fwww.bcb.gov.br%2Fhtms%2Fproagro%2F1998%2Frel01.asp>

[www.bcb.gov.br%2Fhtms%2Fproagro%2F1998%2Frel01.asp](https://www.bcb.gov.br/acessoinformacao/legado?url=https:%2F%2Fwww.bcb.gov.br%2Fhtms%2Fproagro%2F1998%2Frel01.asp)

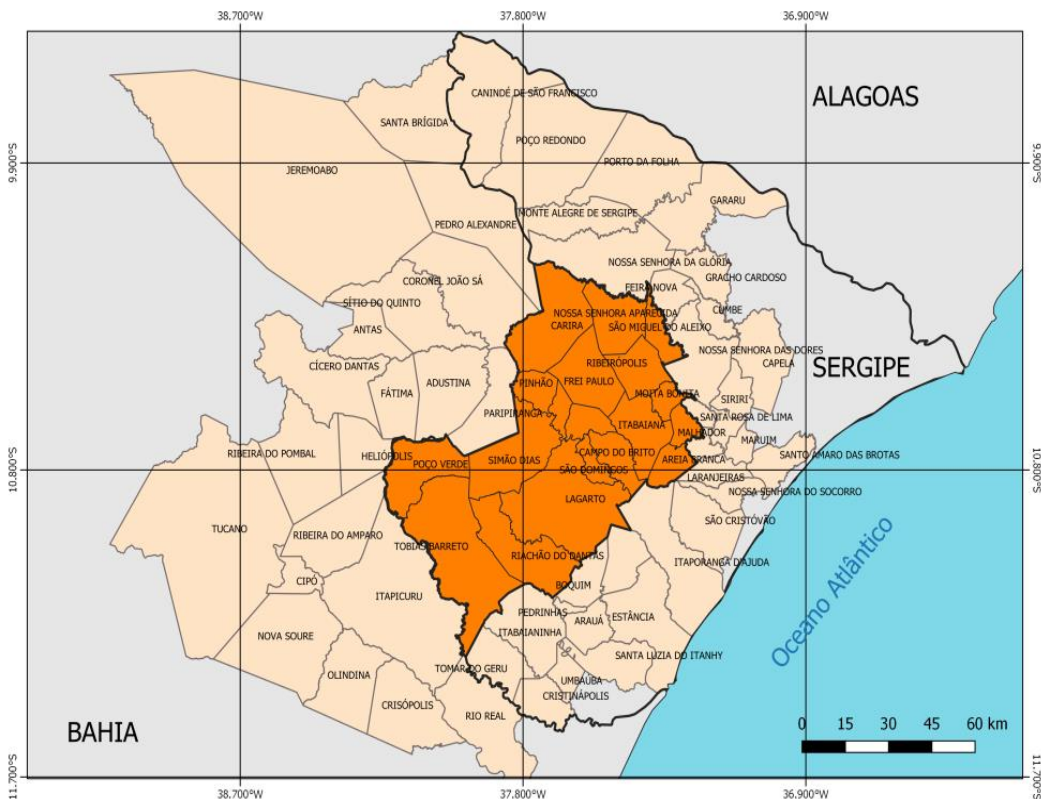
Indirect impacts

- Maize in Sergipe, before and after Zarc maize.



Processes of spatial influence on corn production in the western rural territory of Sergipe: an spatial econometric analysis

Damaris S. Silva; Fábio Moura; Marcos A. S. Silva; Ana A. Gama da Silva

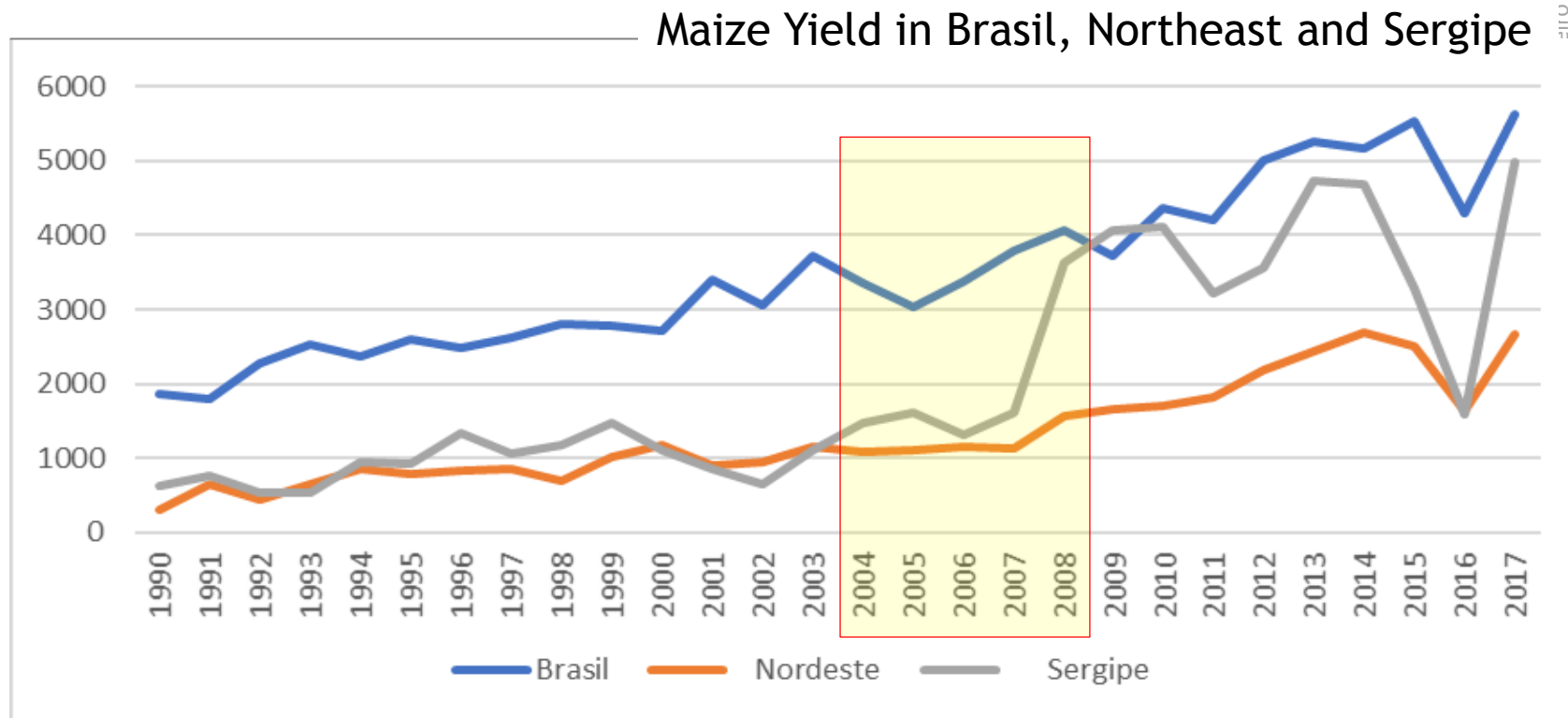


Spatial econometric analysis:

- Until 2004, subsistence crop, low technification, low yield;
- 2004: ZARC maize;
- 2008, agronomic improvements, expansion in area and yield gains;

Indirect impacts

- Maize in Sergipe State, before and after Zarc maize.



Processes identified:

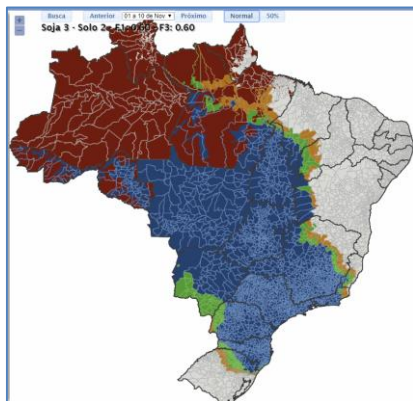
- 1) Dissemination of (basic) information after ZARC;
- 2) Qualification and Technification;
- 3) Space overflow (neighbor to neighbor);

PROAGRO, PSR, Rural Credit



+

ZARC



=

In policy programs:

- **Lower risk;**
- **Lower loss index;**
- **Cost reduction;**

To farmers:

- **Insurance and credit access;**
- **Farmers qualification;**
- **Crop management improvements;**
- **Yield gains;**

Some glaring opportunities for development-inducing agricultural policies

- Zarc AND selected Production Systems to guide Credit and Risk Management incentive programs to:



Special cases where Zarc should guide rural credit and insurance subsidies

a) New genotypes – model and estimate risks for drought tolerance;



Drought resistant genotype



Regular genotype

Special cases where Zarc should guide rural credit and insurance subsidies

b) Integrated Systems (crop – forest – livestock);



Synergies between crop species changing microclimate and soil fertility:

- Higher yields and Lower risk.

Frost (1°C)

Ponta Porã, MS, Brazil

28/jun/2011

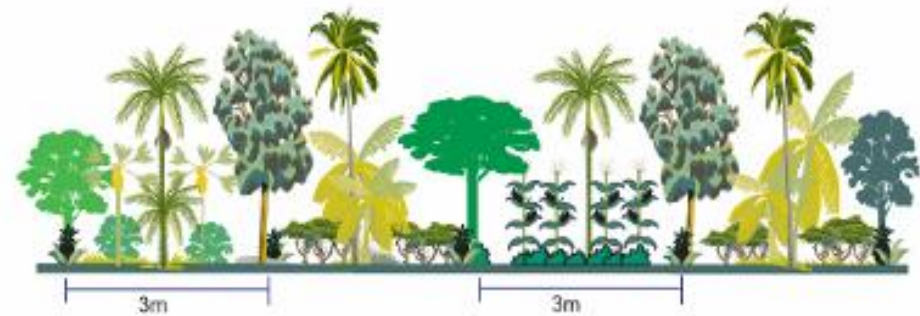
Forage alone (Brachiaria)
Loss: 100%

Forage under Corn
Loss: 9%



Special cases where Zarc should guide rural credit and insurance subsidies

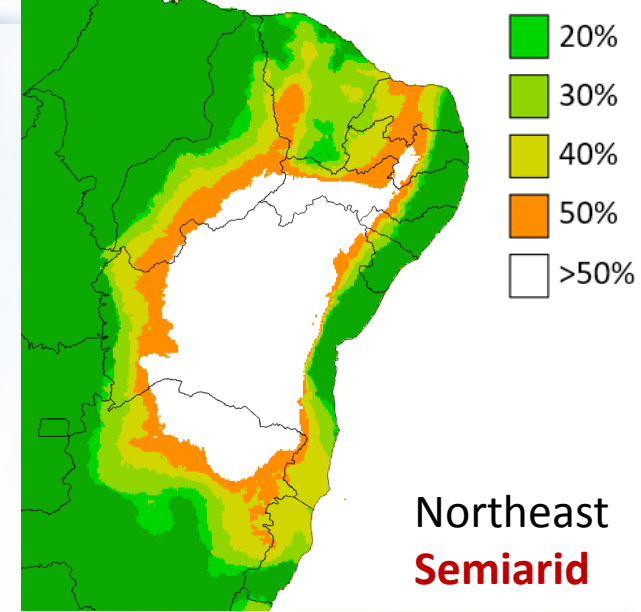
c) Agro-forestry Systems;



Cassava, banana, cocoa, coffee, açai,
Brazil nut, heart of palm, guarana,
cupuaçu, native honey bees,

Special cases where Zarc should guide rural credit and insurance subsidies

d) Production Systems for drought resilience;



Thank you!

Team ZARC/Embrapa:

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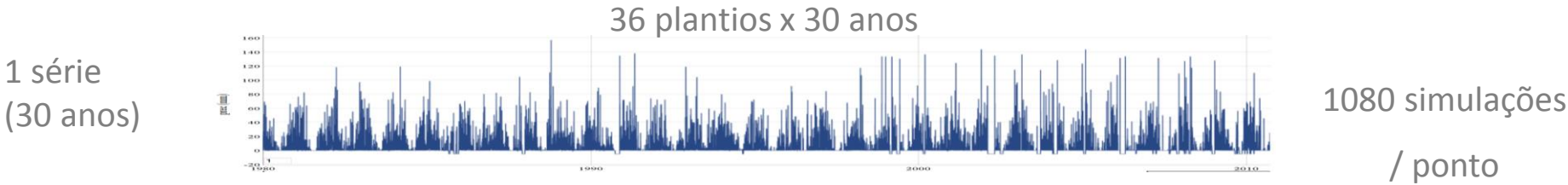
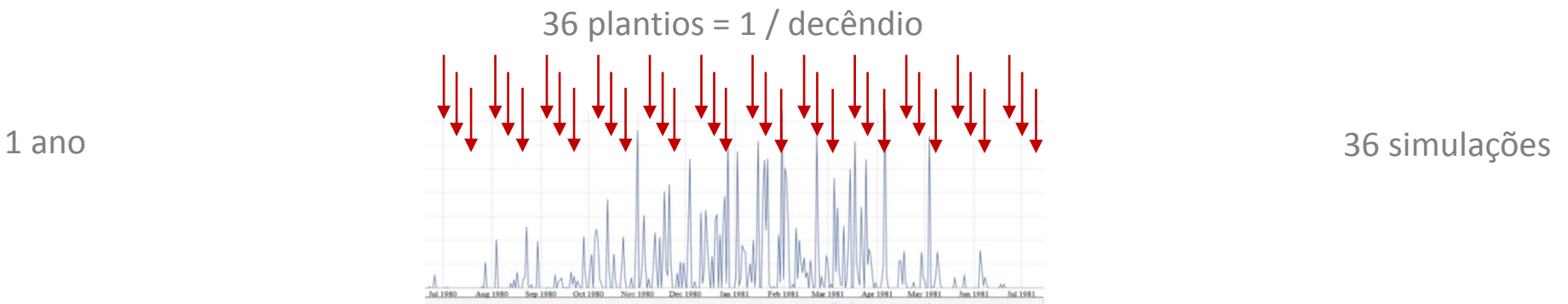
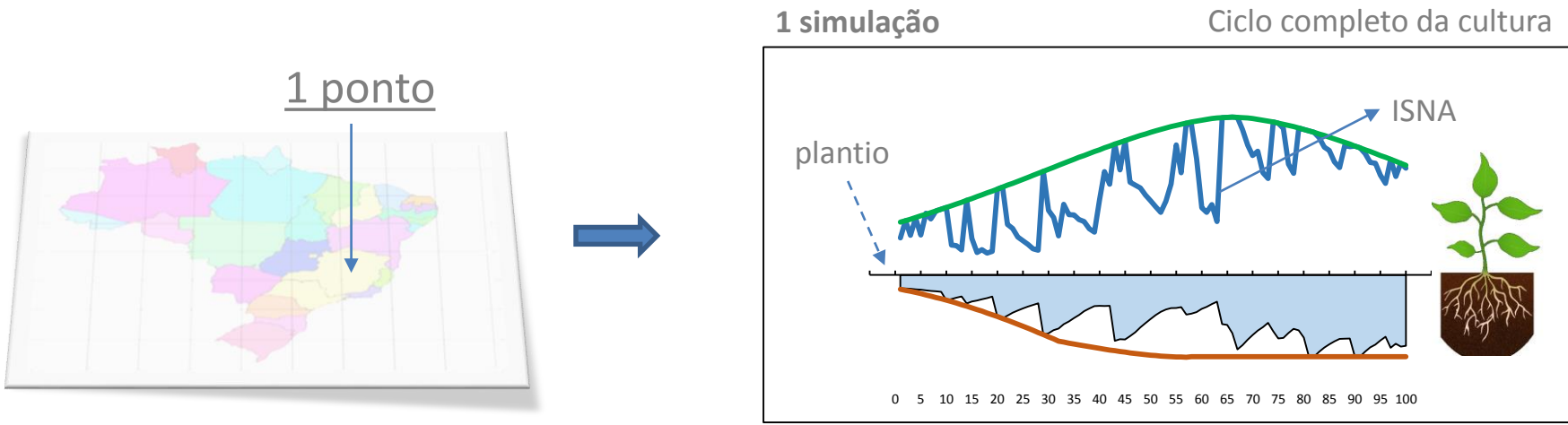
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Marco Antônio F. Conceição
Maria Emilia Borges Alves



Processo de simulação: Execução do modelo



Elevada demanda de processamento.

Culturas	Ciclos	Solos	Datas de plantio / brot.	Níveis de risco
Exemplo: Uva mesa Uva proc.	<ul style="list-style-type: none"> - 100; - 120; - ... - 210. 	<ul style="list-style-type: none"> - Arenoso; - Médio; - Argiloso. 	<ul style="list-style-type: none"> - Decêndio 1 - Decêndio 2; - ... - Decêndio 36 	<ul style="list-style-type: none"> - 20% - 30% - 40%
2 x	5 x	3 x	36 x	=

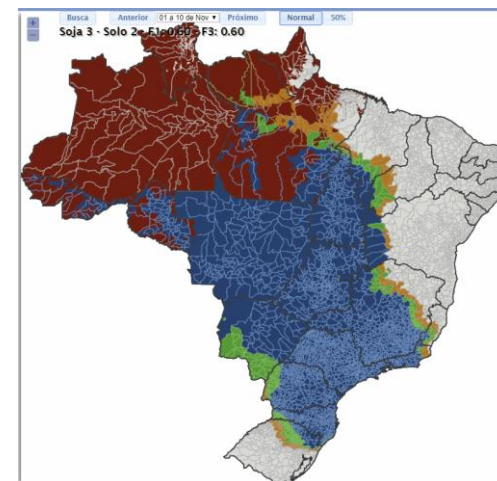
Mapas Brasil

3.240

ou

1.080

Sala de servidores:
Processamento em paralelo (≈40hrs)



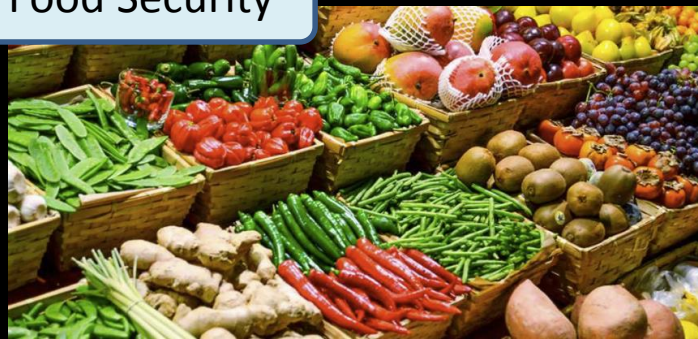
Economy



Livelihood



Food Security



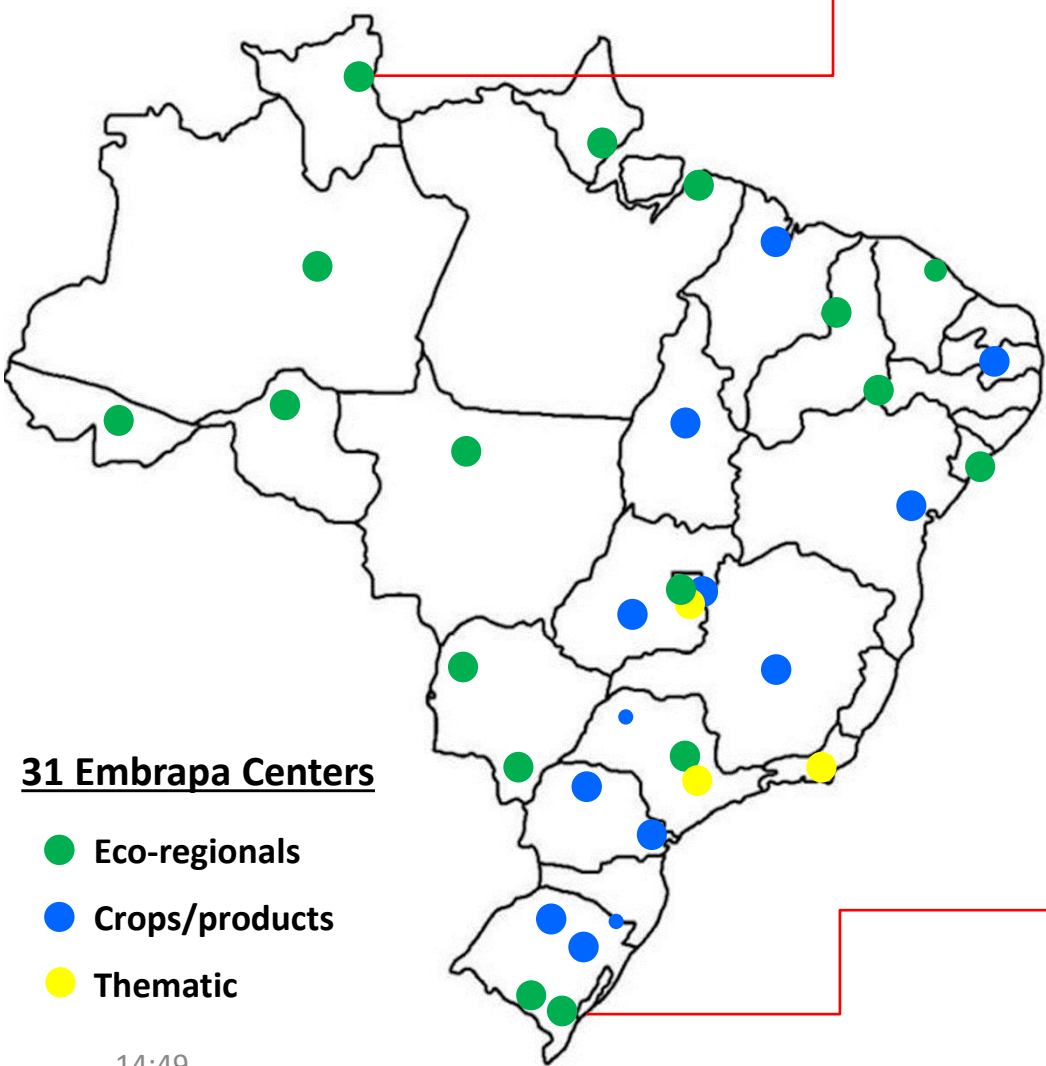
Availability

Stability

Access

Utilization

Network ZARC/Embrapa



Dr. Edu

