Oportunidades para as Engenharias – o Potencial Brasileiro para Atender a Demanda Mundial de Alimentos

***Alencar Junior Zanon*, Dr. Equipe SimulArroz – UFSM**

Santa Maria, 27 de setembro de 2018.

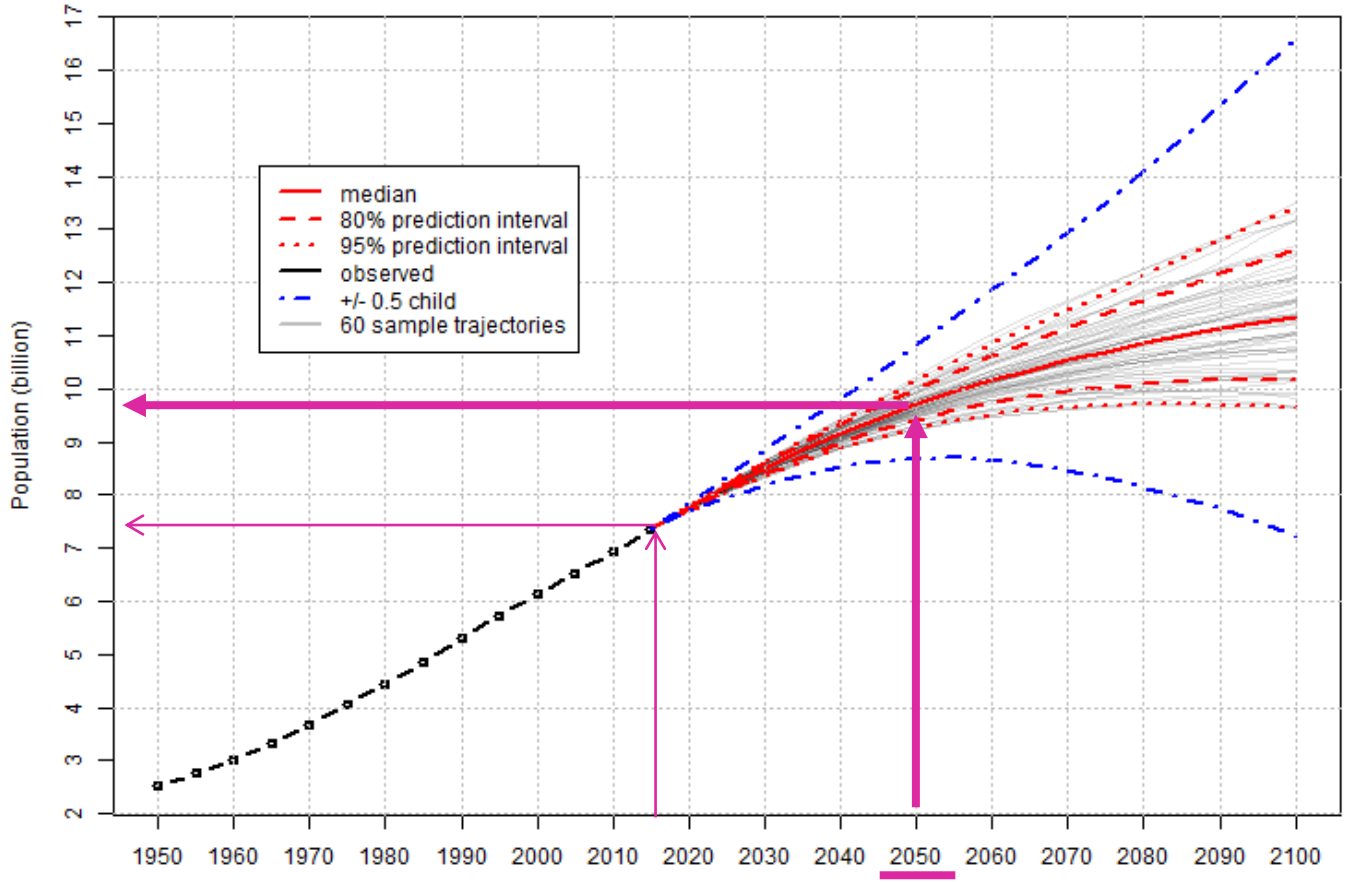
Roteiro:

- ✓Qual a demanda de alimentos?
- ✓Formas de suprir a demanda?
- ✓Lucro para todos !!!

Potencial brasileiro em produzir alimentos?

Global population trend

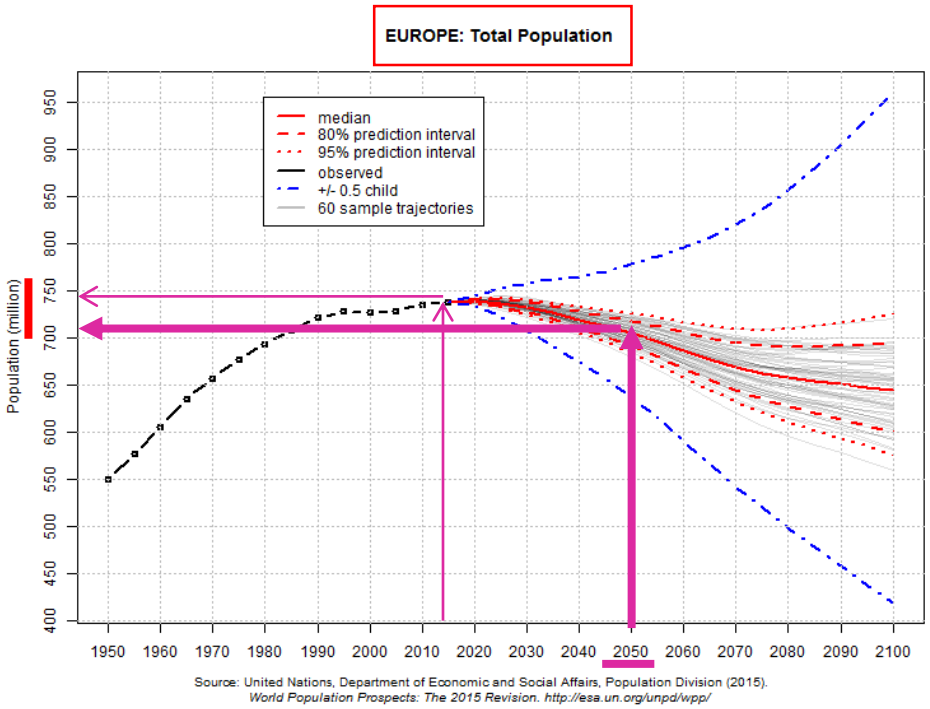
Global population around 9.7 billion by year 2050 (+30% increase relative to 2015)

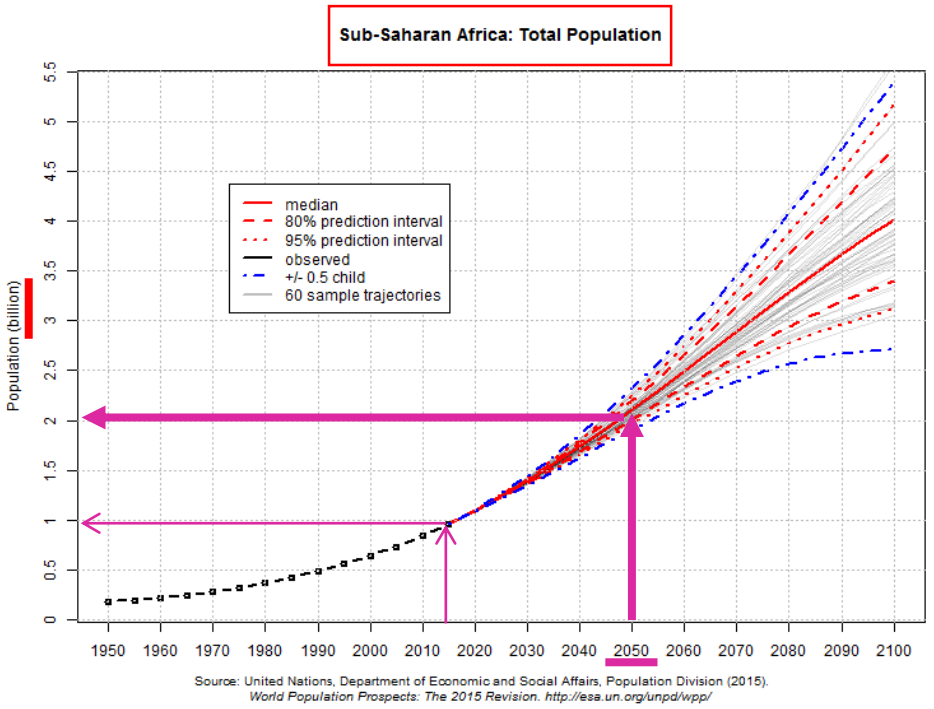


Source: United Nations, Department of Economic and Social Affairs, Population Division (2015).
World Population Prospects: The 2015 Revision. http://esa.un.org/unpd/wpp/

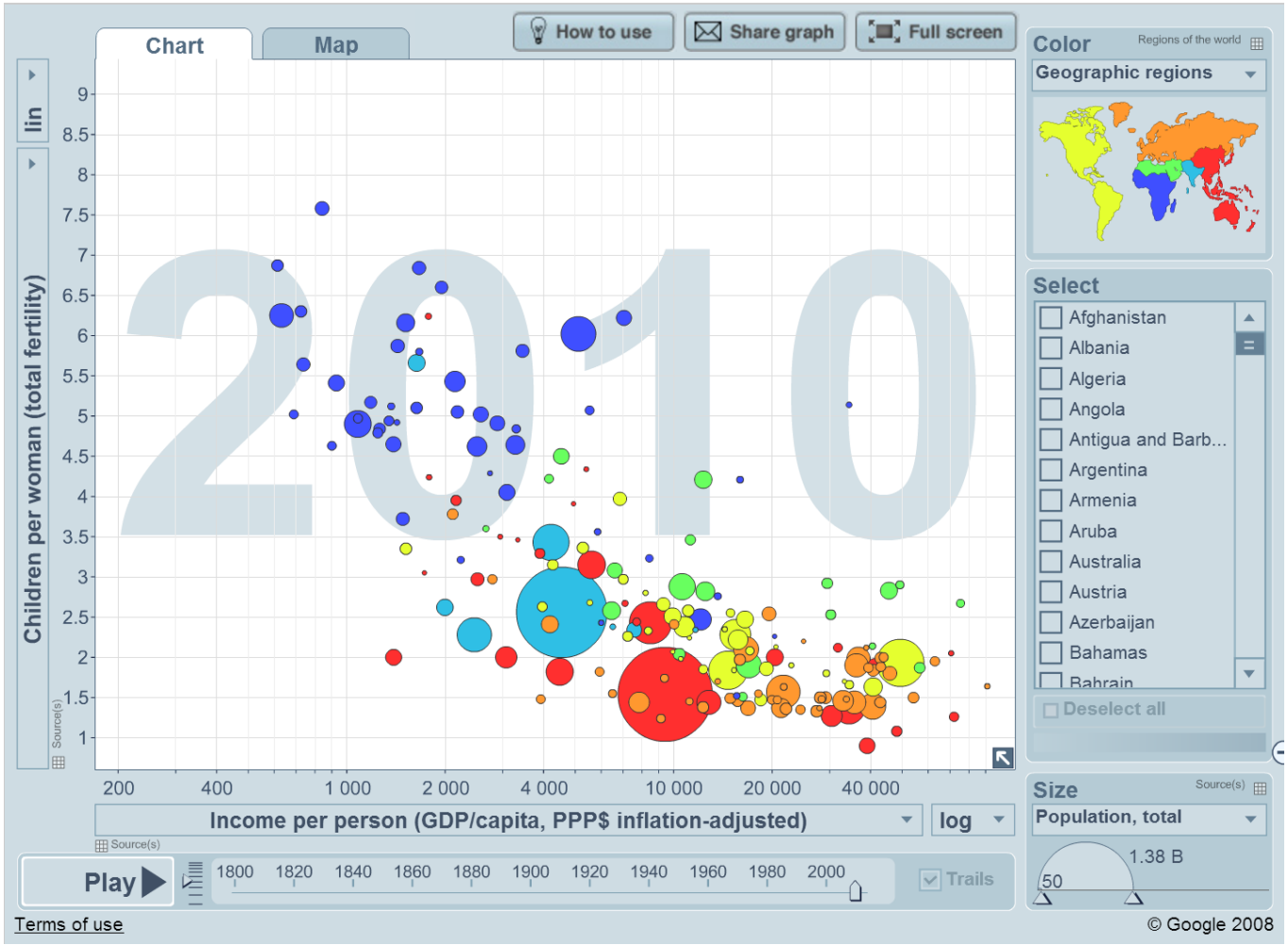
Zooming in specific regions…

Stabilization in high-income countries; population explosion in least developed countries





Fertility rates depend upon household income



Source: http://www.gapminder.org/

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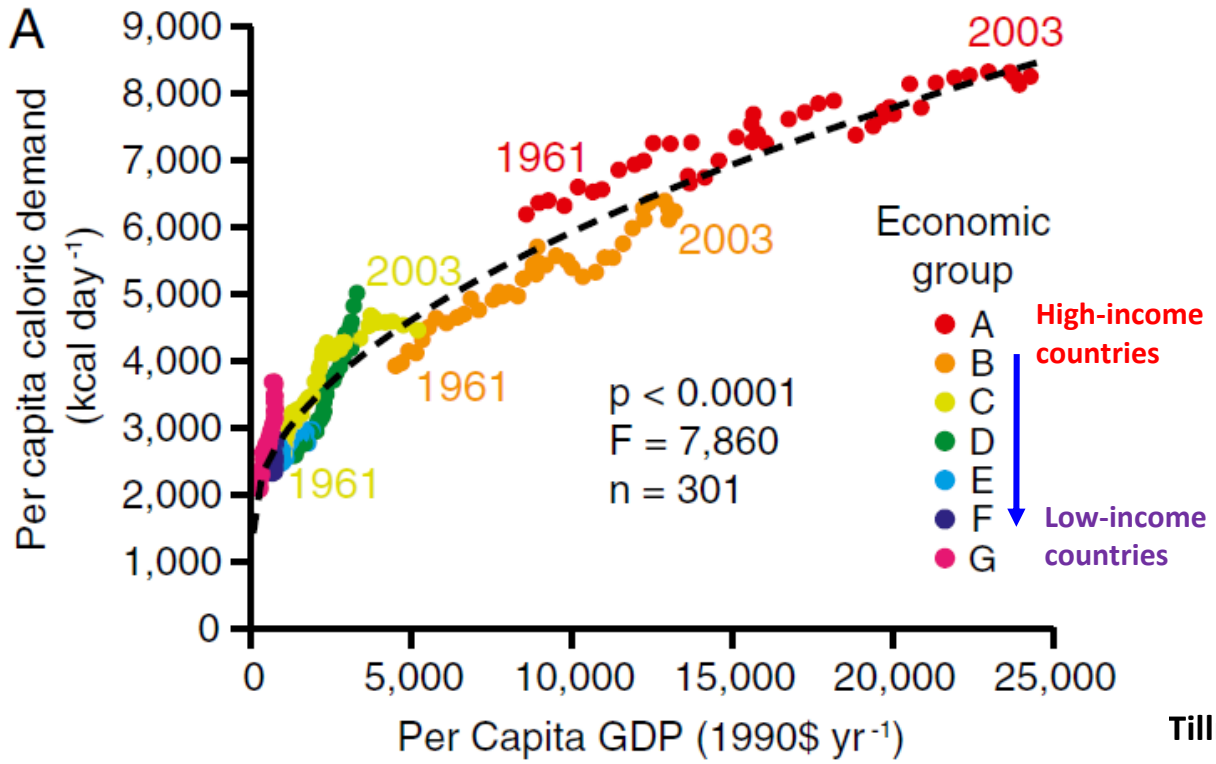
Higher caloric intake in developing countries will further increase food demand

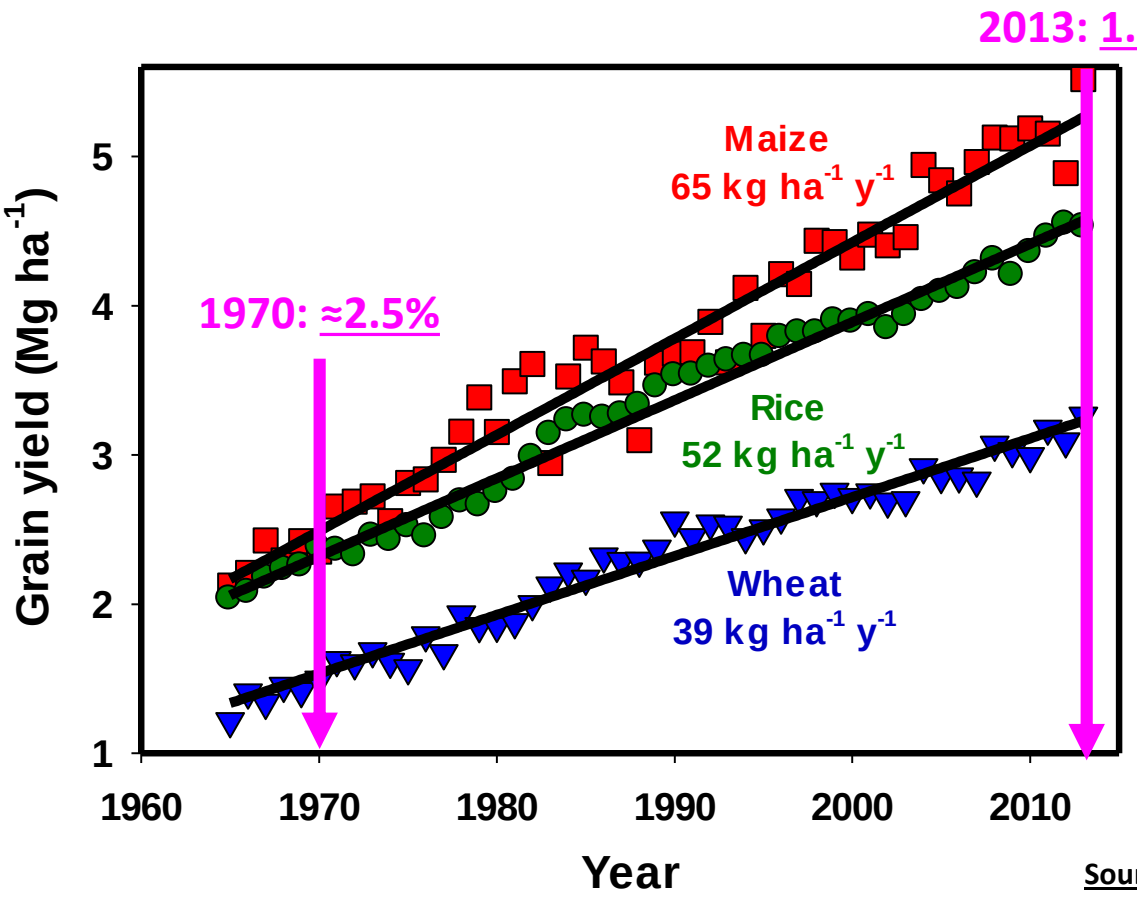
Não é só o "número de bocas..."



Tillman *et al.*, PNAS (2011)

Global trends in cereal crop yields

Best available data indicate that population increase plus diet changes will increase food demand by 50-70% in the next 35 years (Bruinsma, 2009; Fischer, 2009). This means that global crop yields needs to increase 1.2-1.3% annually from NOW until 2050 to meet food demand on existing cropland area

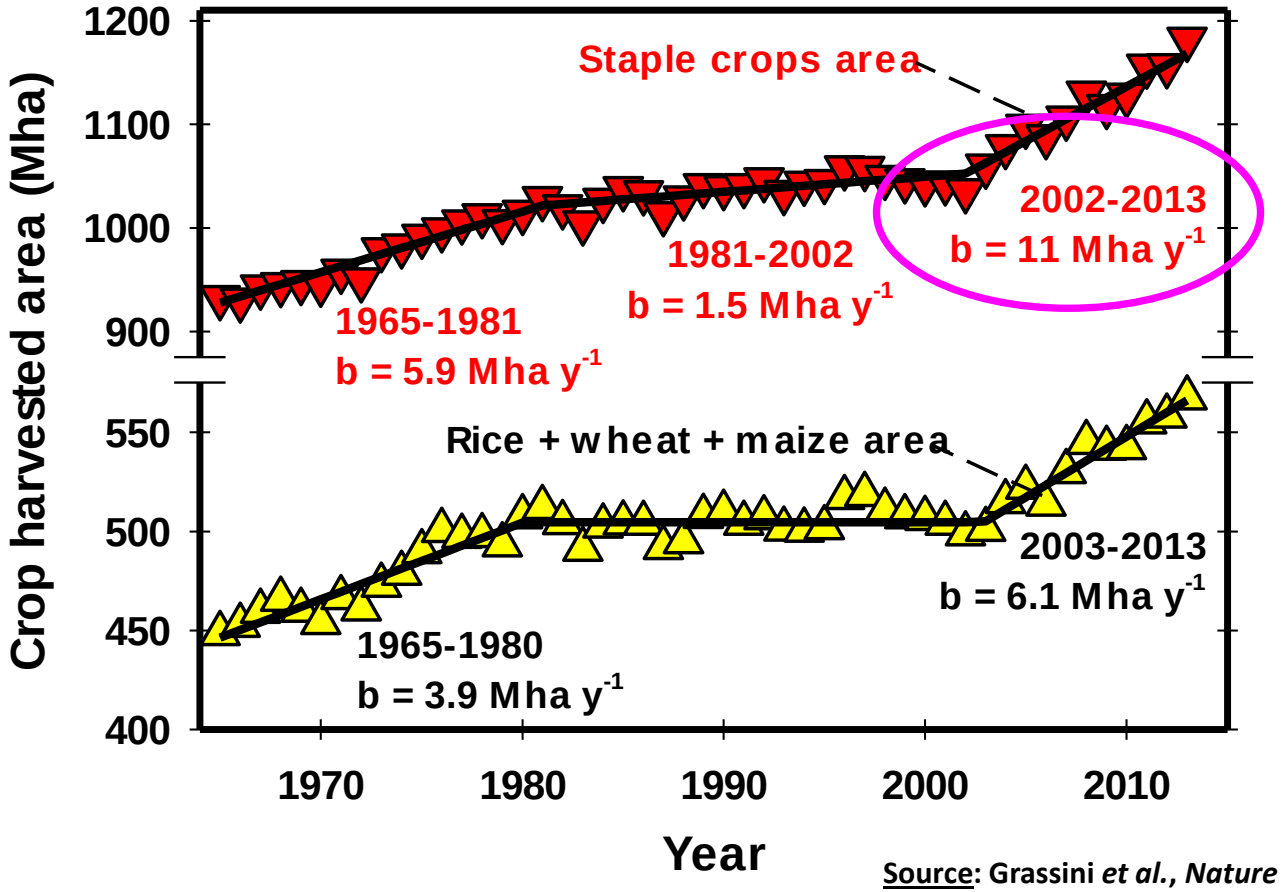


Source: FAOSTAT, 1965-2013

Aumento da Área ou Intensificação da Agricultura????

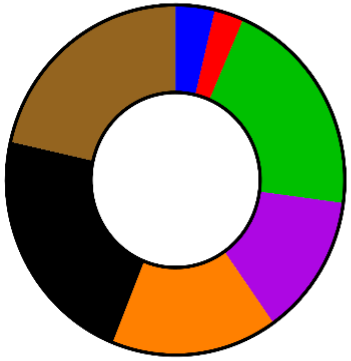
A time bomb in agriculture

Red symbols: staple-crop area, which includes cereals, oilseed, sugar, root, fiber, and tuber crops.
Yellow symbols: sum of rice (R), wheat (W), maize (M), and soybean (S) areas.



Source: Grassini *et al.*, *Nature Communications* (2014)

Where is cropland area expanding?

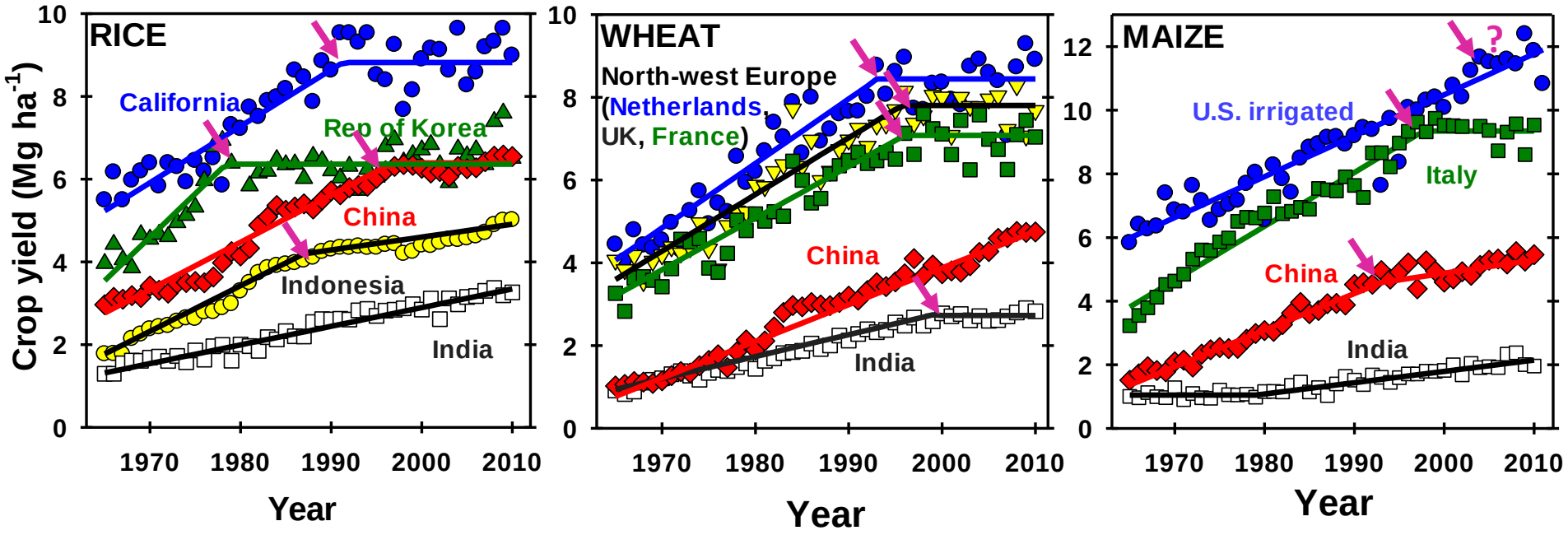


- Sub-Saharan Africa
- South America
- Southeast Asia
- South Asia
- Central Asia
- North America
- Rest of the world

Biodiversidade, Reserva de Carbono, Mudança Climática

Slowdown of yield gain rates in major crop systems

Evidence of yield plateaus or abrupt decreases in rate of yield gain, including rice in eastern Asia and wheat in northwest Europe, which account for a third of total global rice, wheat and maize production.



Source: Grassini *et al.*, *Nature Communications* (2014)

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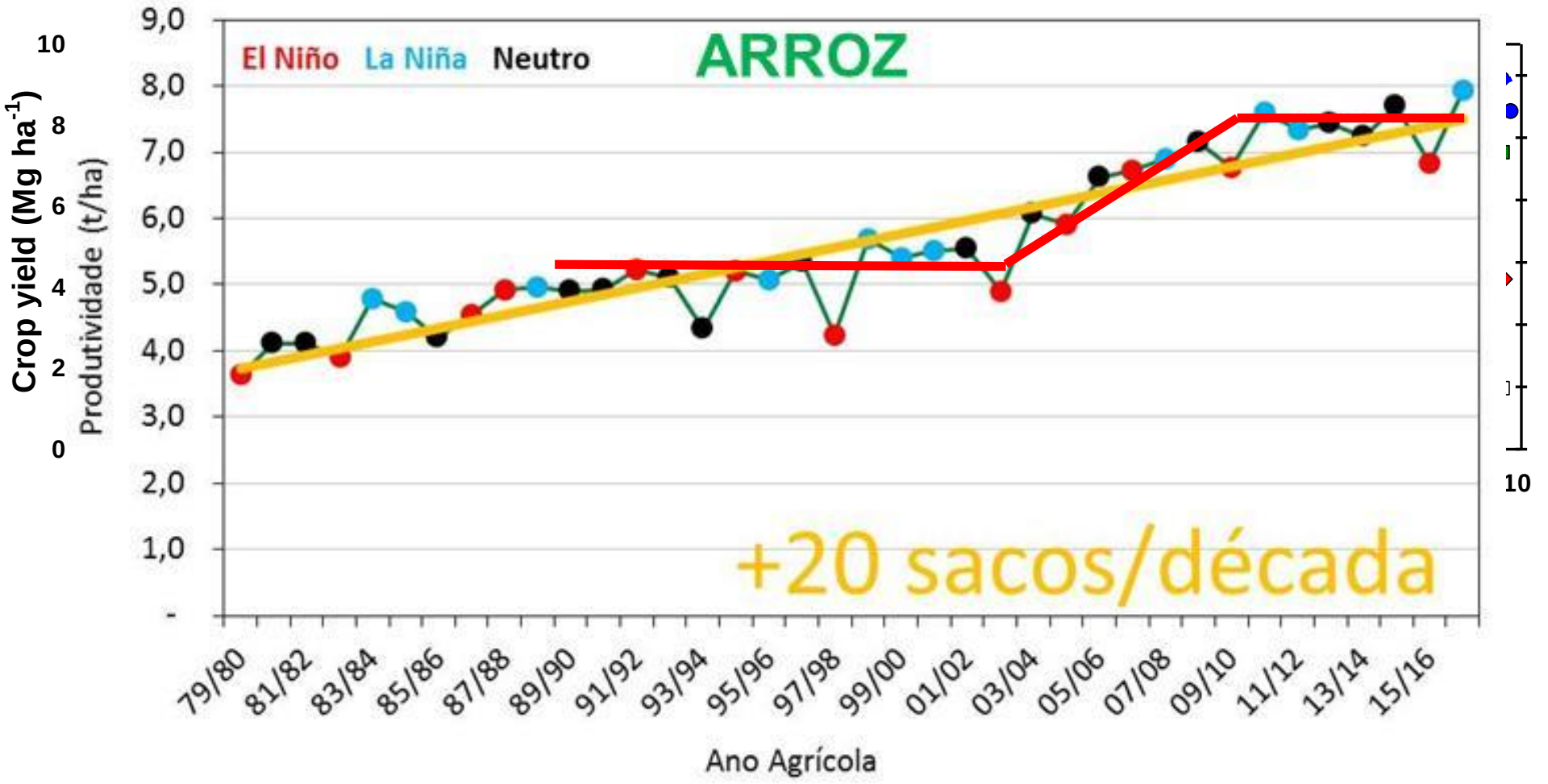
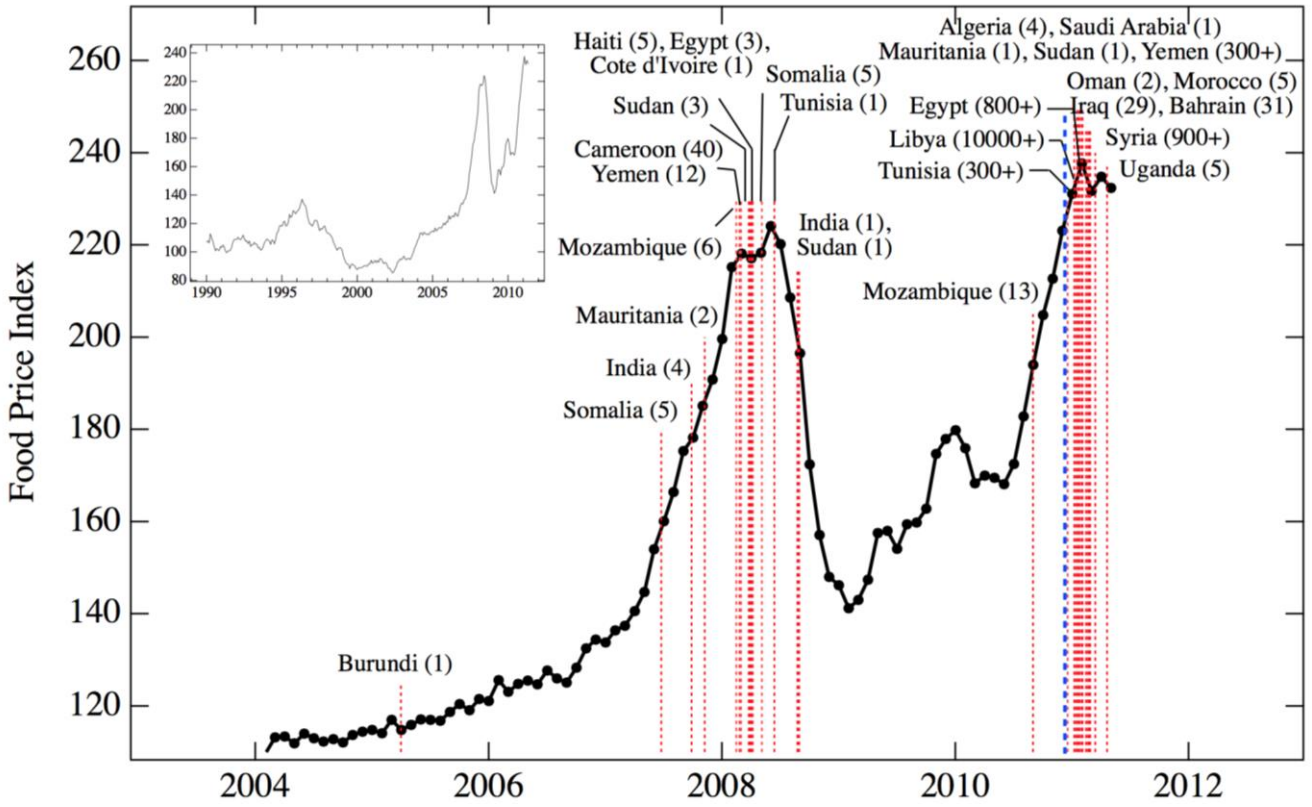


Food crises and political instability

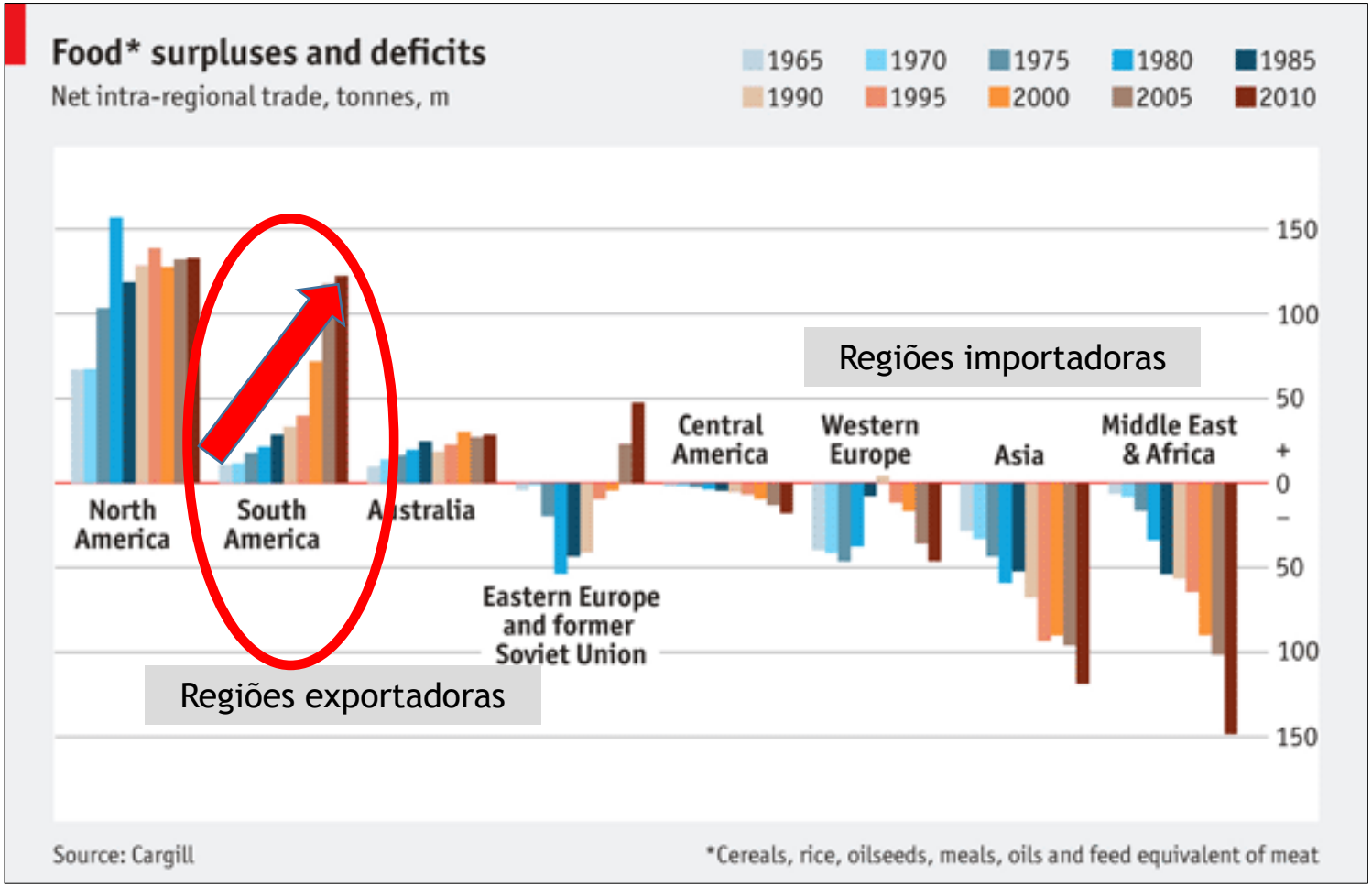
FAO food price index between 2004 and 2011. Red dashed vertical lines correspond to beginning dates of "food riots" and protests associated with major recent unrest in North Africa and Middle East (death toll is reported)



Source: Lagi *et al.*, 2011

Superávit e déficit alimentar entre 1965 - 2010

Como as importações ou exportações mudaram desde 1965



Regiões com variações positivas e negativas na produção de alimentos

Cortesia: Dr Jerson Guedes

http://www.economist.com/blogs/feastandfamine/2012/05/food

Summary on global trends

- **Increase in food production due to population increase and higher caloric intake in least developed countries**
- **Current yield trajectories are NOT sufficient to meet food demand increase on existing cropland area**
- **Massive cropland area expansion during last 10 years (11 million ha per year)**
- **Evidence of yield plateaus or slower yield gains in countries that account for *ca.* 1/3 of total maize, rice, and wheat production**

Não é somente alimentar bocas, mas....

Global Yield Gap Atlas (GYGA)

Precisamos fornecer respostas confiáveis sobre questões-chave sobre segurança alimentar:

1 - Qual é o potencial de produção de alimentos para uma região ou país, na área de cultivo atual e com recursos hídricos disponíveis, se os produtores adotarem as melhores práticas de gestão?

2 - Será possível que o país X seja auto-suficiente na produção de alimentos até 2030 ou 2050?

Em caso positivo, terá capacidade de exportar? Quanto?

Em caso negativo, Quanta terra está disponível e adequada para expandir a produção?

Se houver terra insuficiente disponível, quanto alimento precisará?

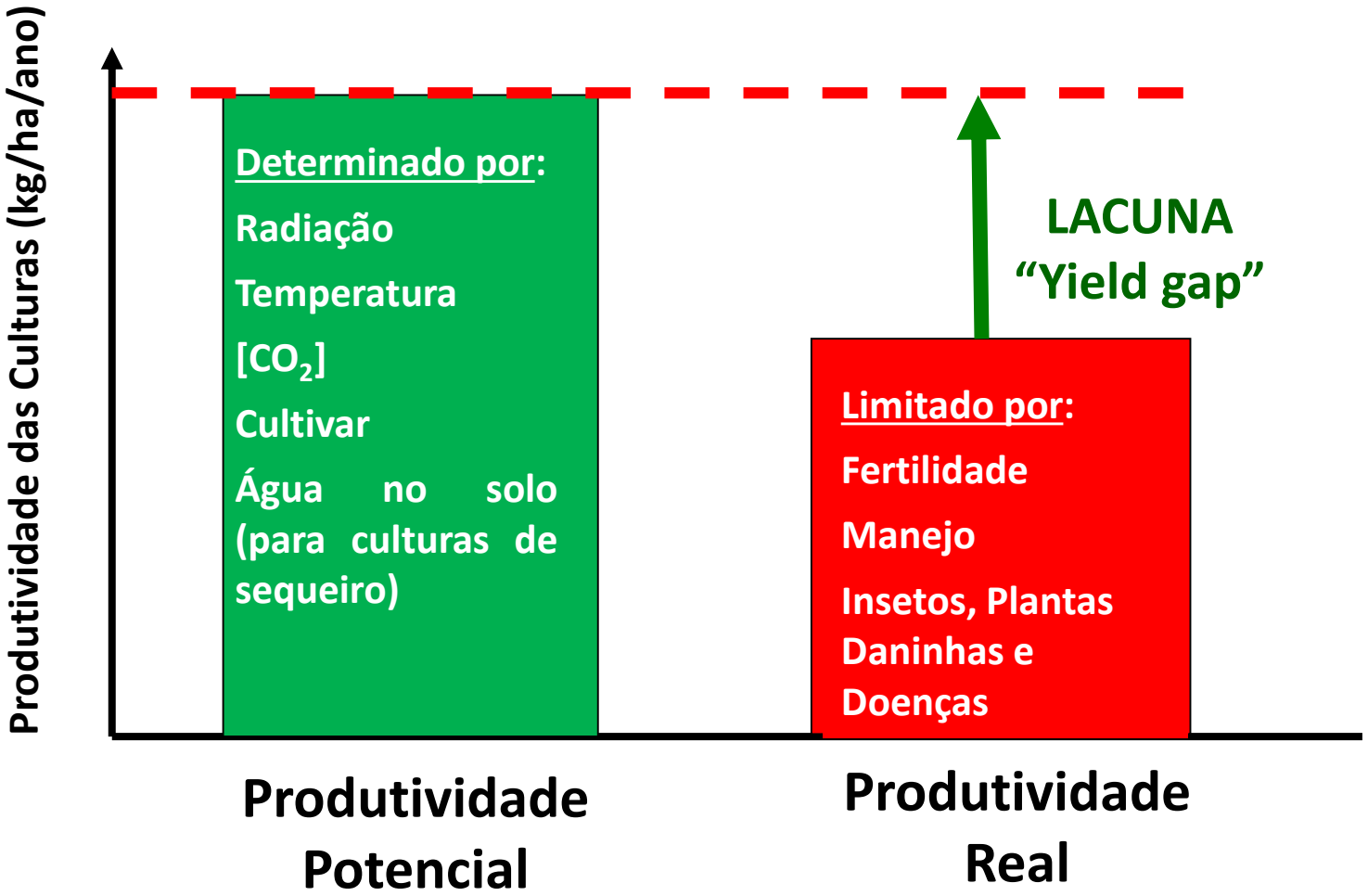
Global Yield Gap Atlas

Hypothesis

This challenge can only be met through sustainable intensification of agricultural systems so that every single hectare of cropland produces near its potential while minimizing the environmental impact

Maior desafio da humanidade!!!!

Produtividade Potencial, Real e Lacunas de Produtividade (yield gaps)



Modificado de: Grassini et al, 2015; Van Ittersum and Rabbinge, *Field Crops Research* (1997)

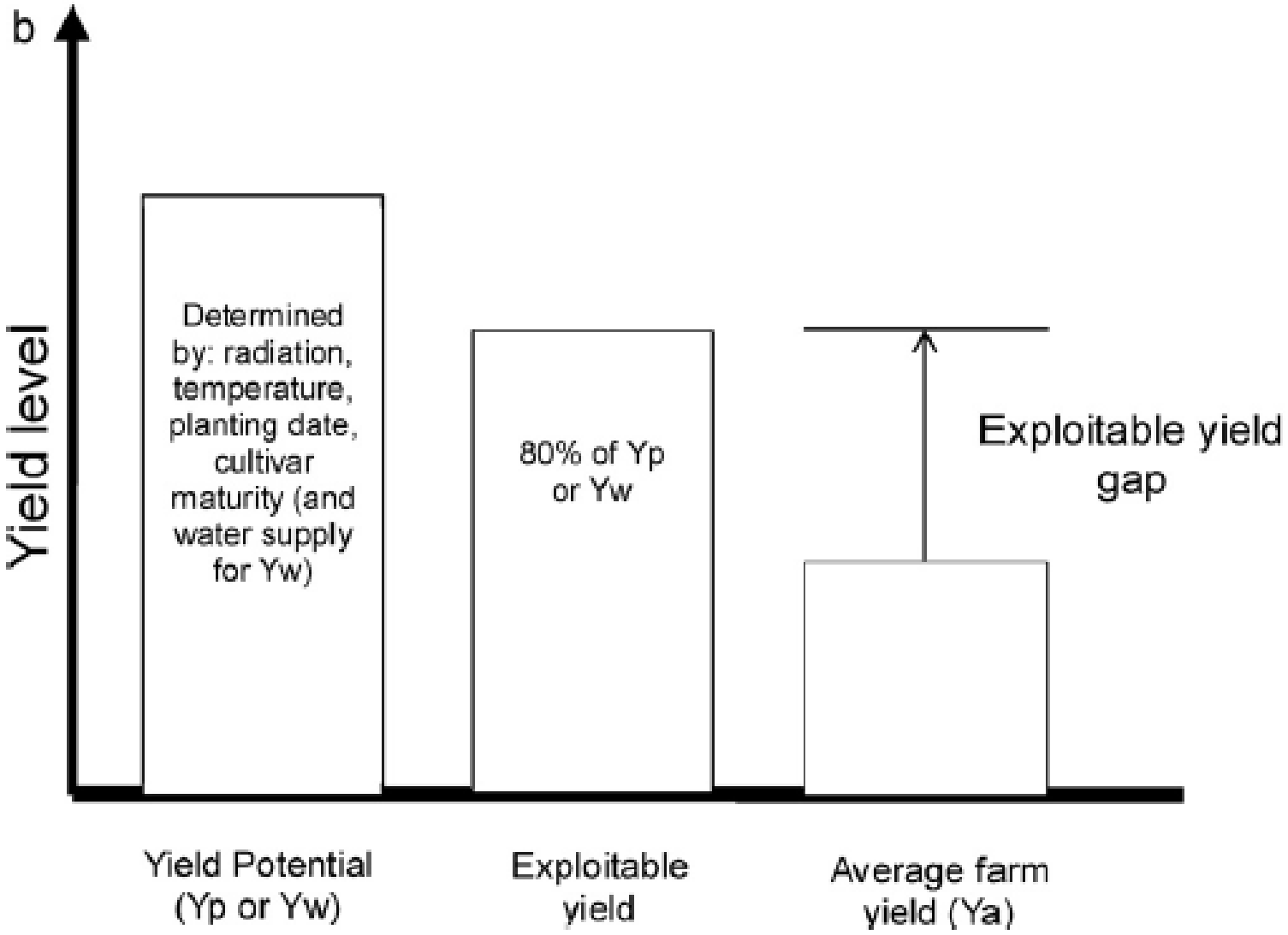
Global Yield Gap Atlas

How close to yield potential can ‘top farmers’ get?

Reaching 75-85% of yield potential is a reasonable target for farmers with access to inputs, markets, and extension services. Above this threshold, the degree of perfection in management and level of inputs that is needed for further yield increase becomes not cost-effective and/or environmental sound

Experiments that received optimal management
Rice yields: 13-14 t/ha

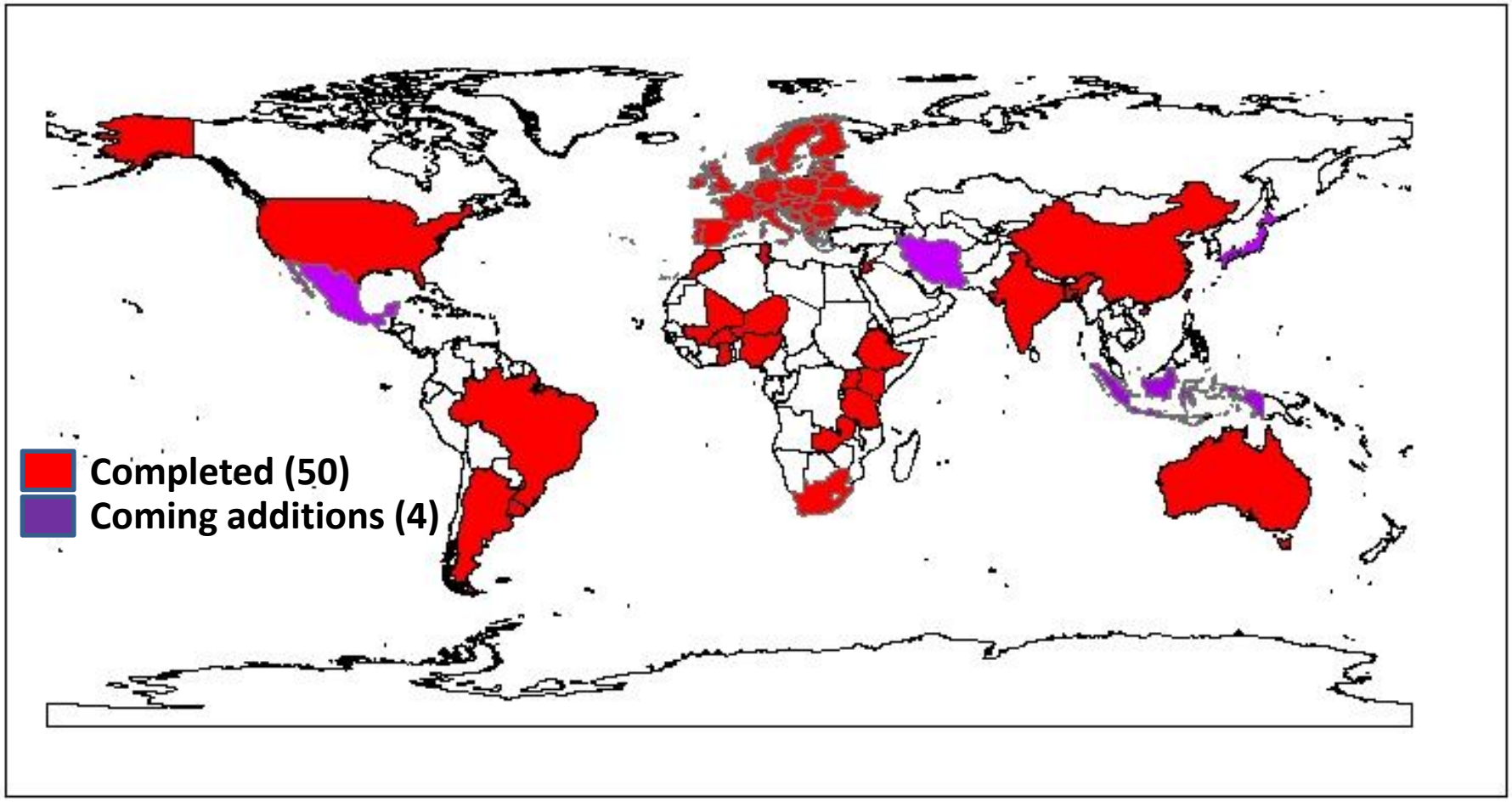
Best farmer fields
Rice yields: 10-12 t/ha



Global Yield Gap Atlas

Global coverage of cropland; currently >50 countries*

Include rice, maize, wheat, barley, sorghum, millet, sugarcane, potatoes, soybean, and other legume crops

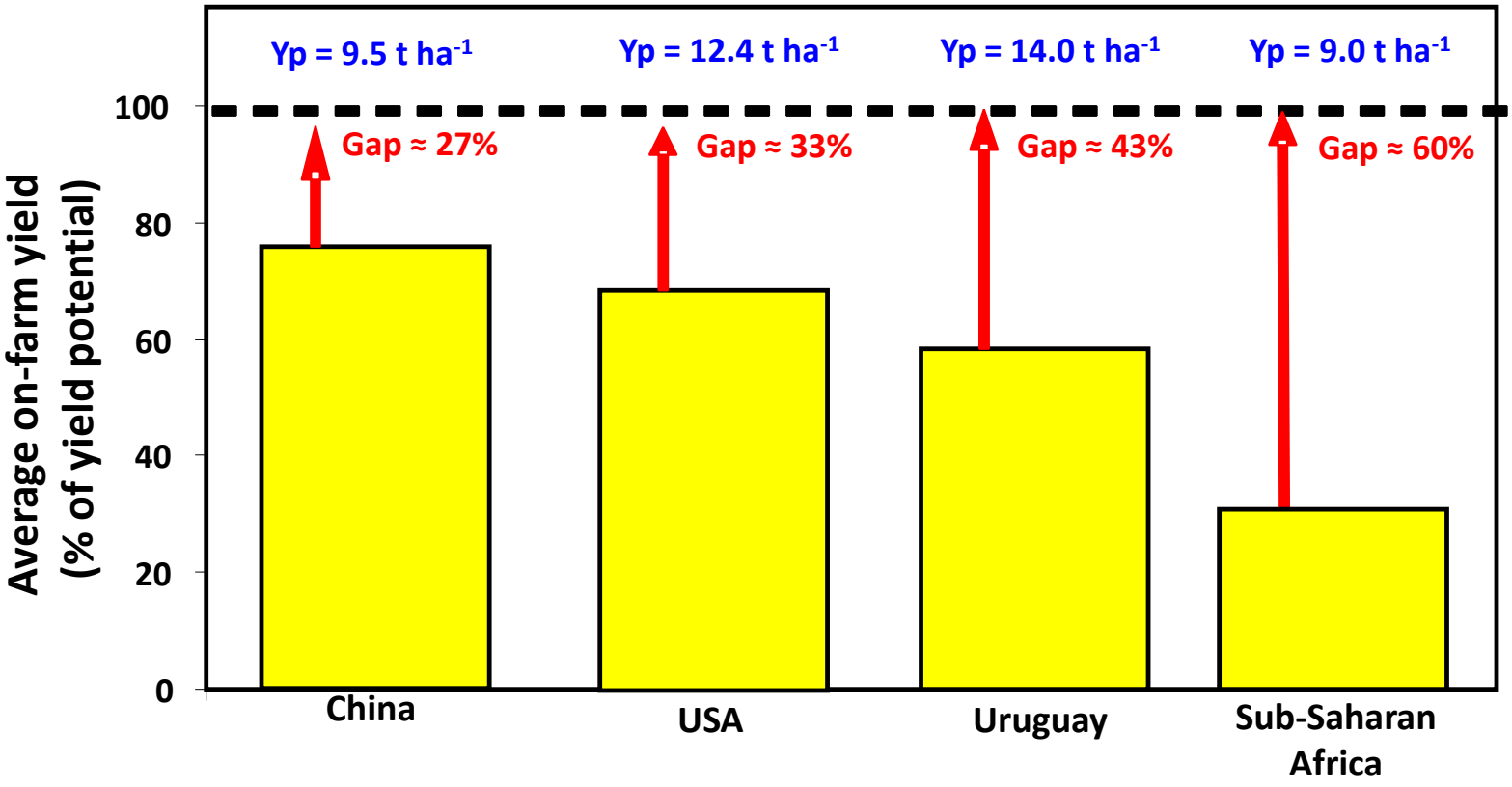


* Including countries completed and in progress

Global Yield Gap Atlas

Yield gaps for irrigated rice across crop systems

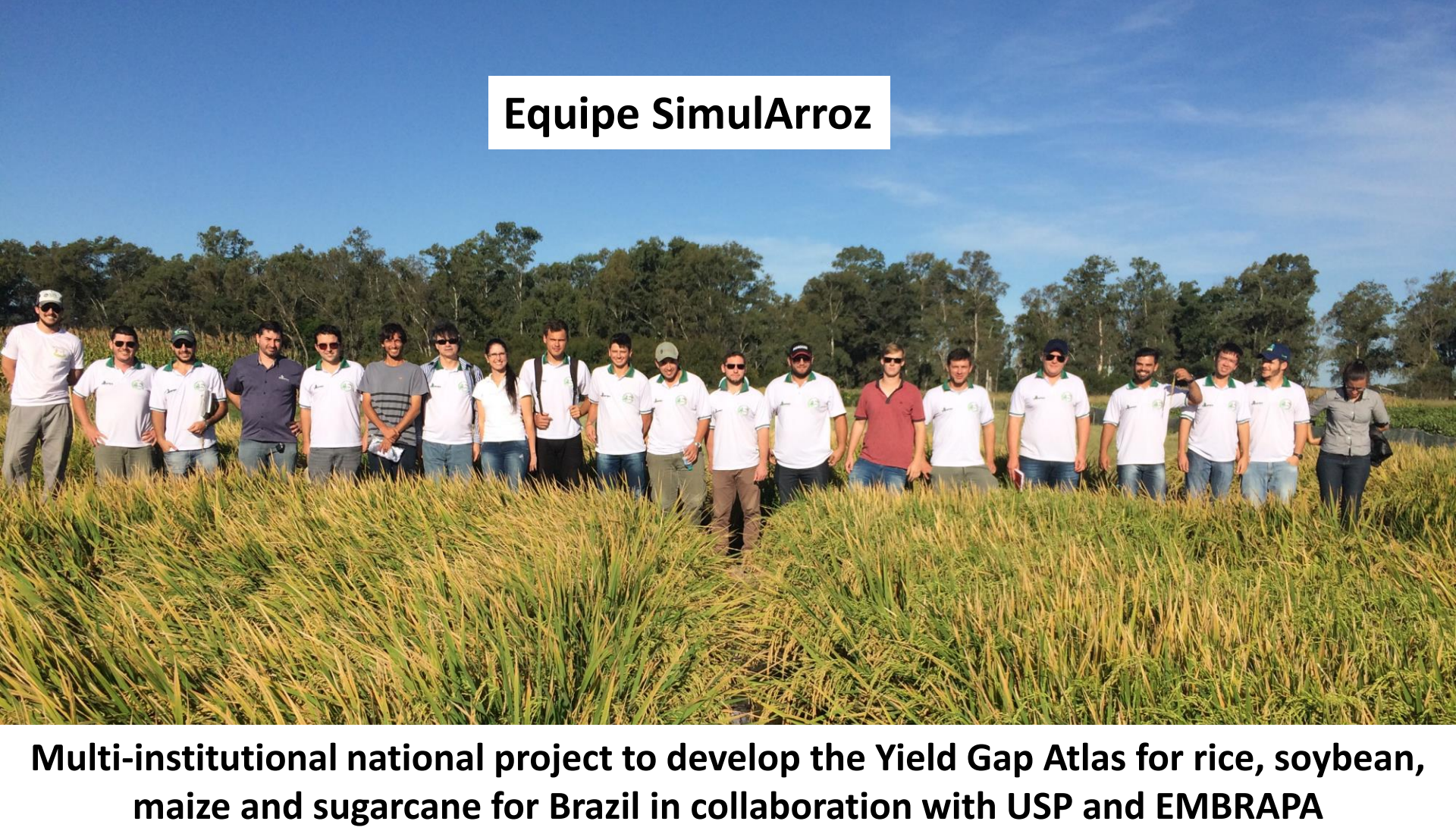
* Yield potential (Yp) estimated using well-validated crop simulation models and high-quality local weather, soil, and management data.



Source: Espe et al (2016), van Oort et al (2013), Carracelas et al (unpublished), Deng et al (unpublished) & Global Yield Gap Atlas (www.yieldgap.org)

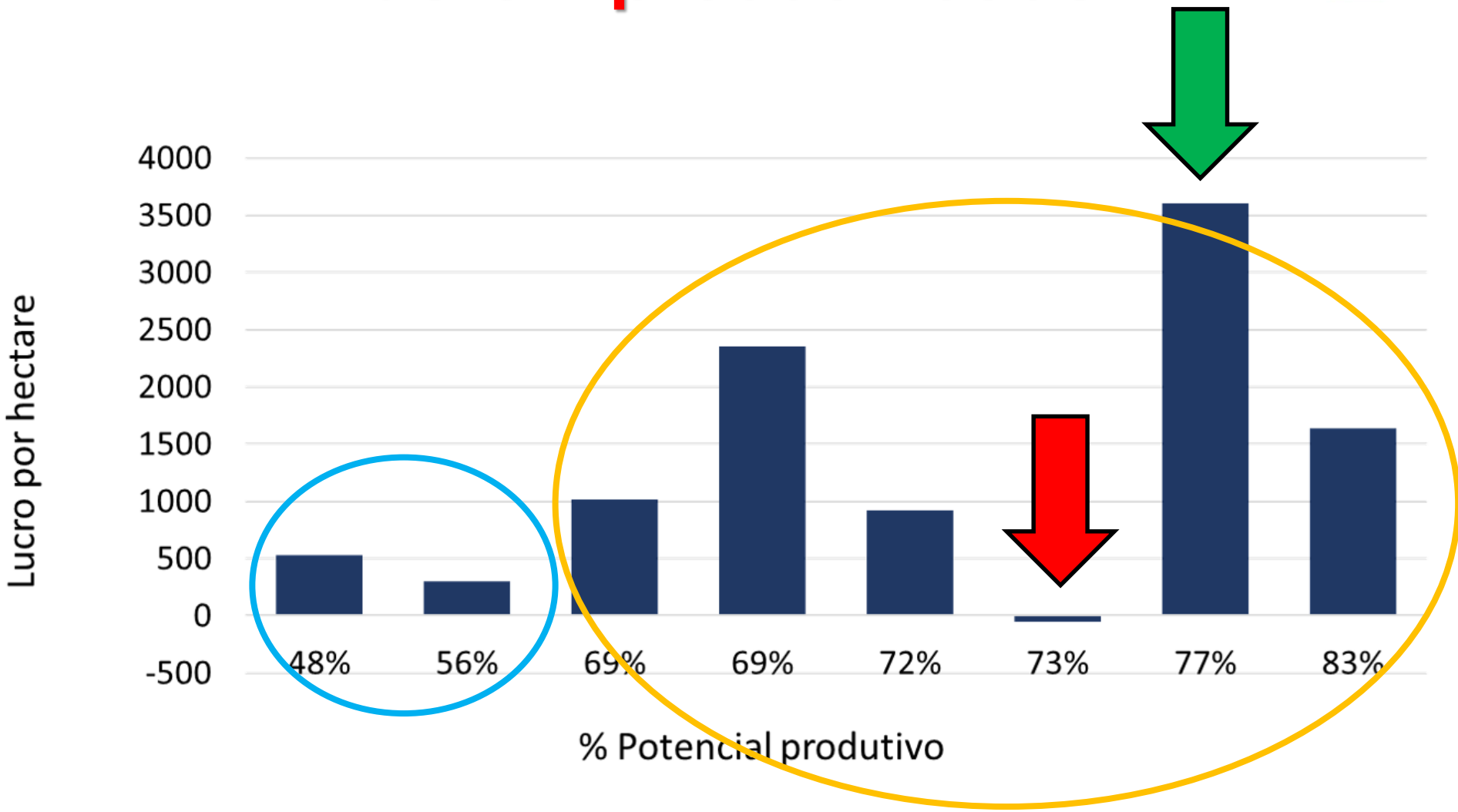
Global Yield Gap Atlas

África: 20% de importação de alimentos...

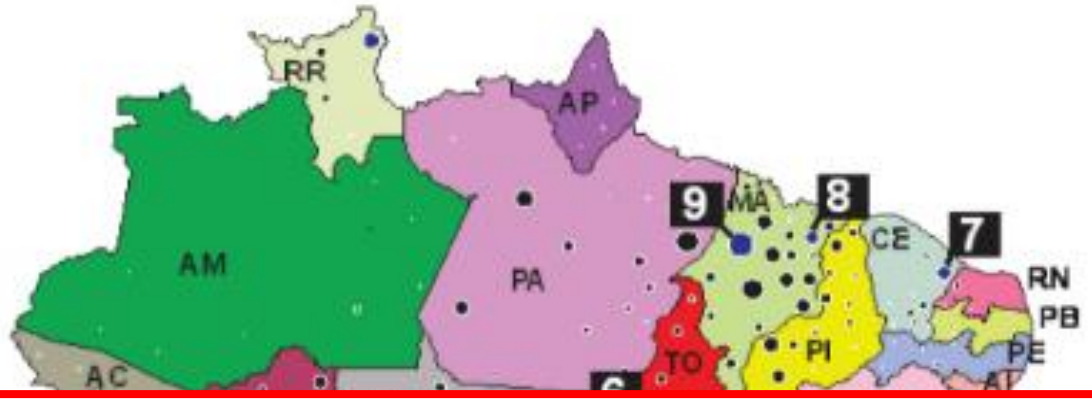


Multi-institutional national project to develop the Yield Gap Atlas for rice, soybean, maize and sugarcane for Brazil in collaboration with USP and EMBRAPA

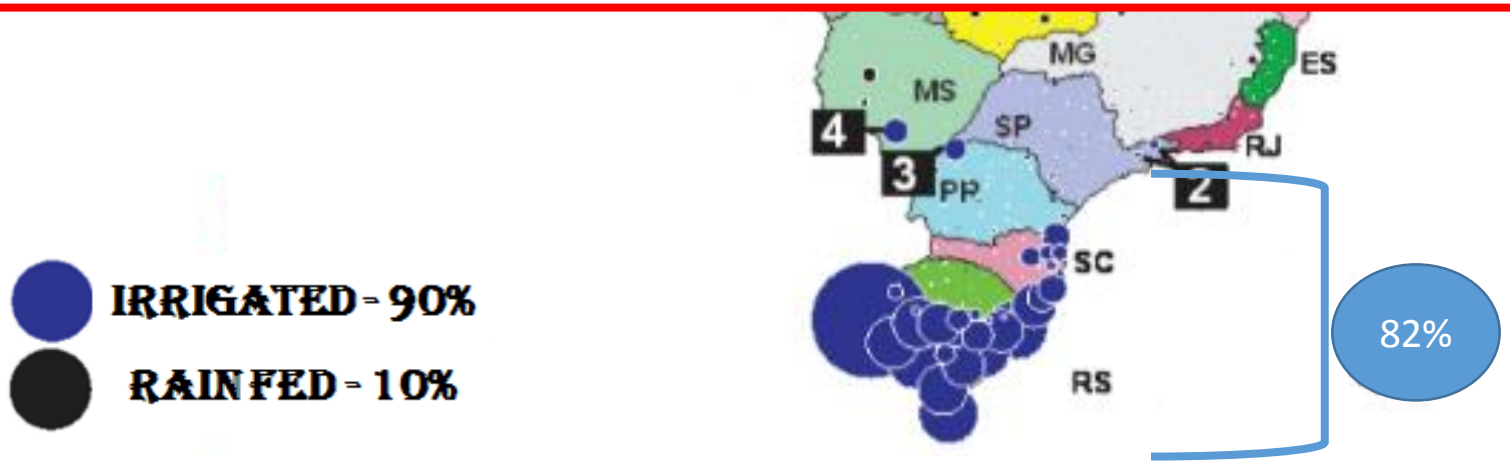
Lucro x produtividade



Arroz Irrigado

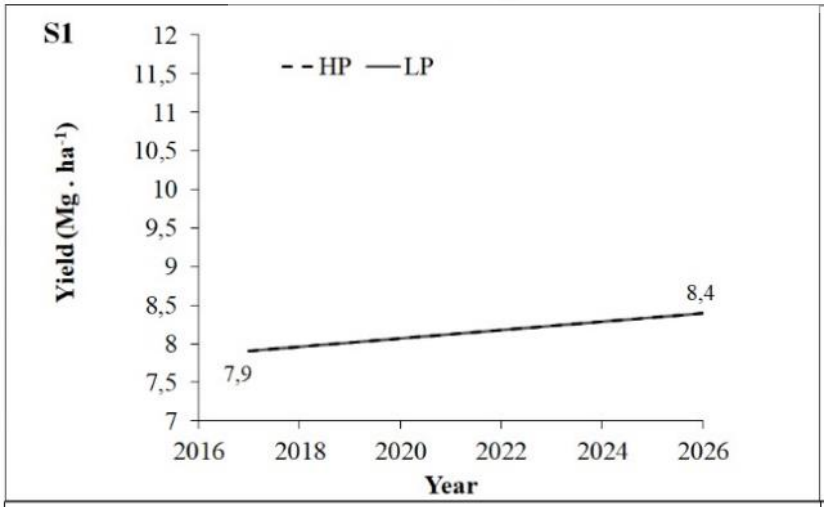


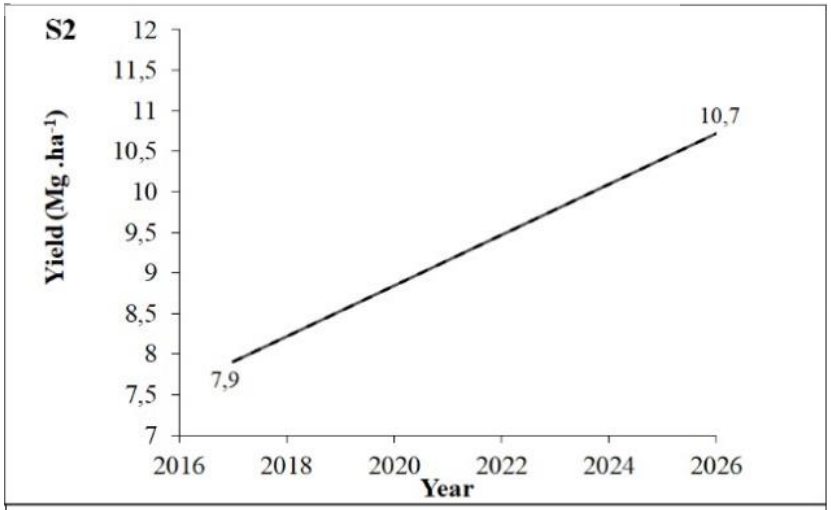
RIO GRANDE DO SUL - 70% BRAZILIAN RICE PRODUCTION

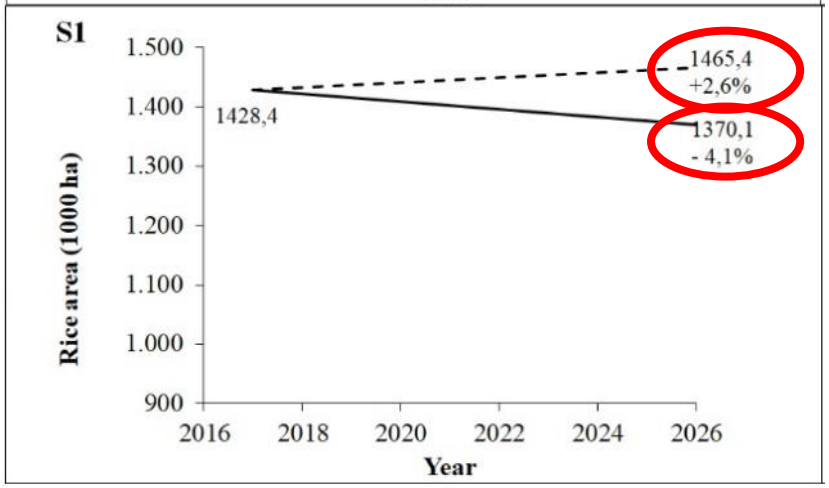


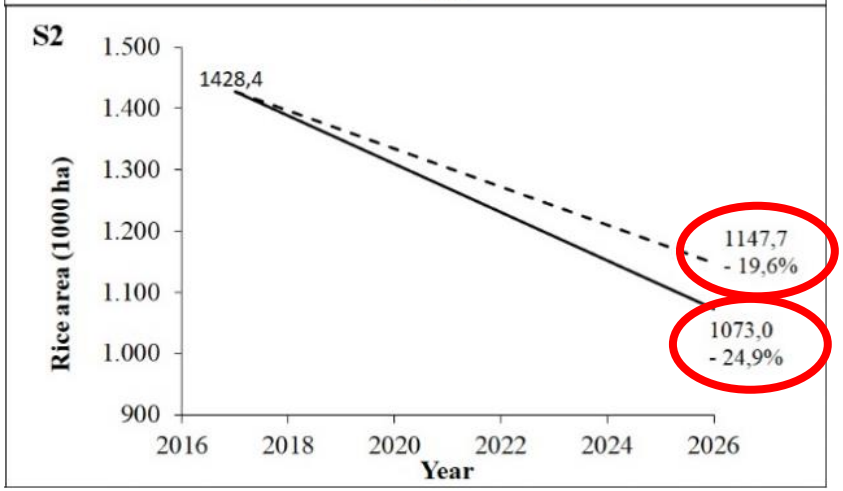
Source: CONAB, 2018

Scenarios of high and low demand for RICE to 2026 in Brazil









Cortesia: Isabela Pilecco – Equipe SimulArroz

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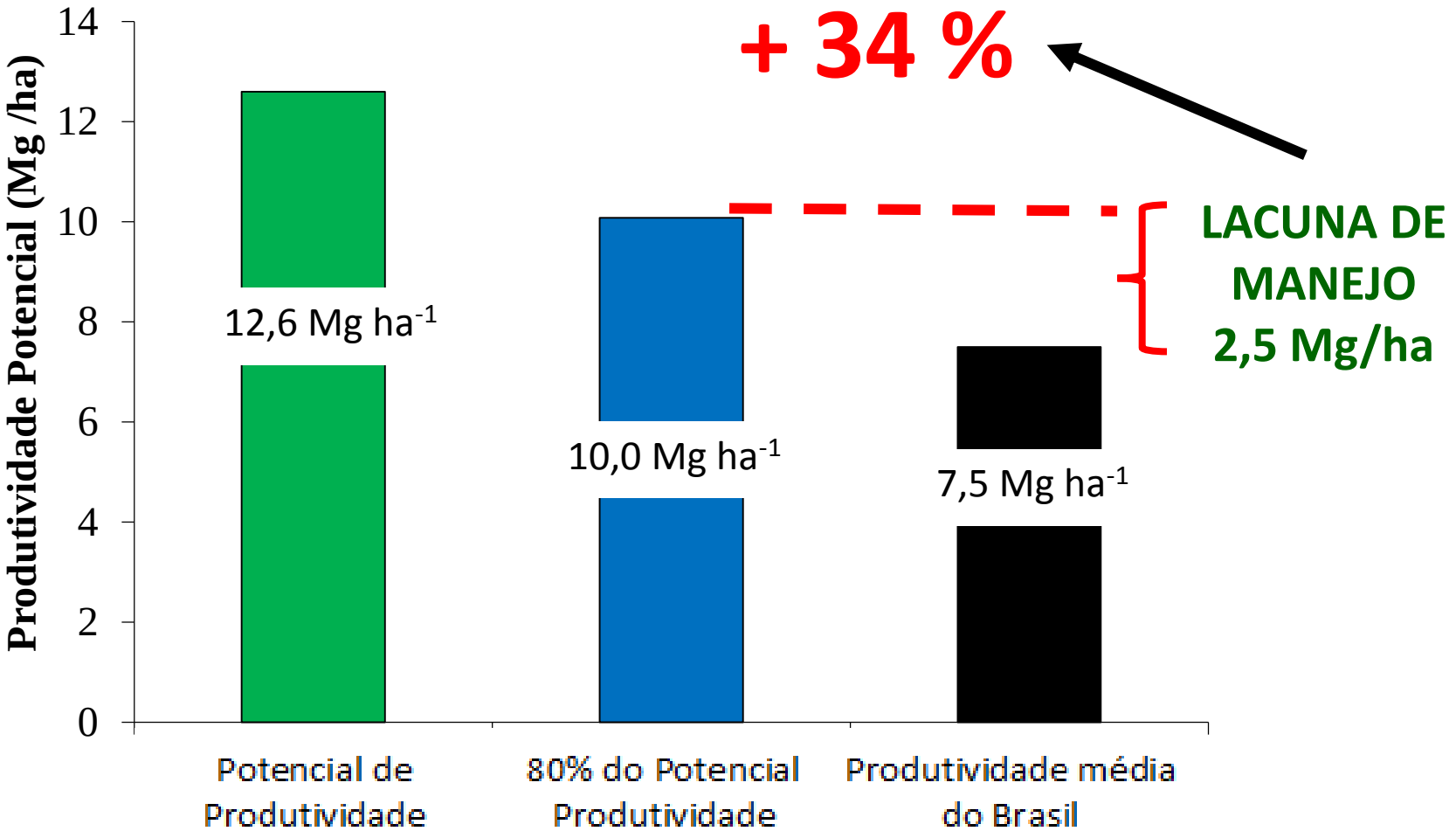
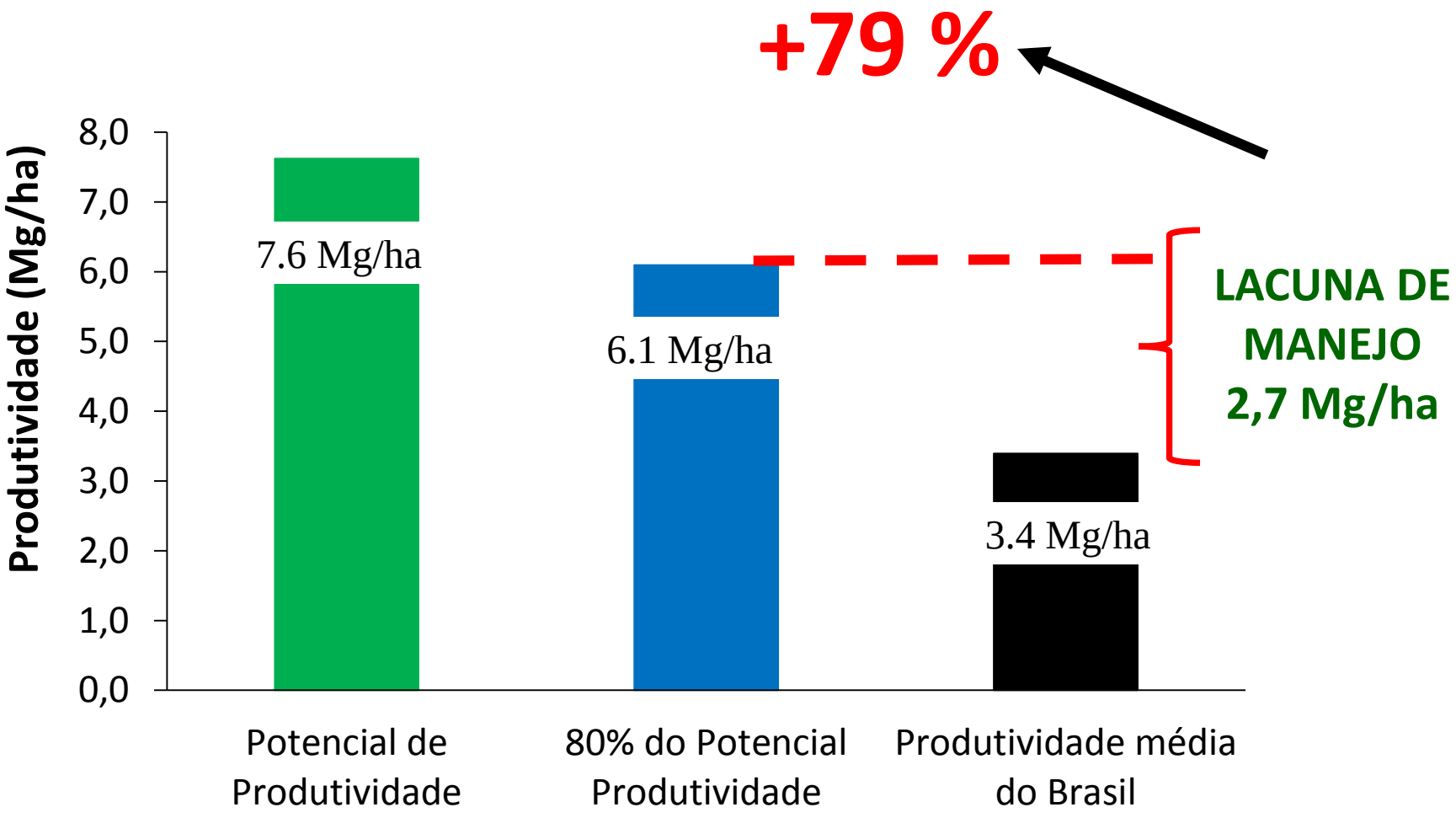


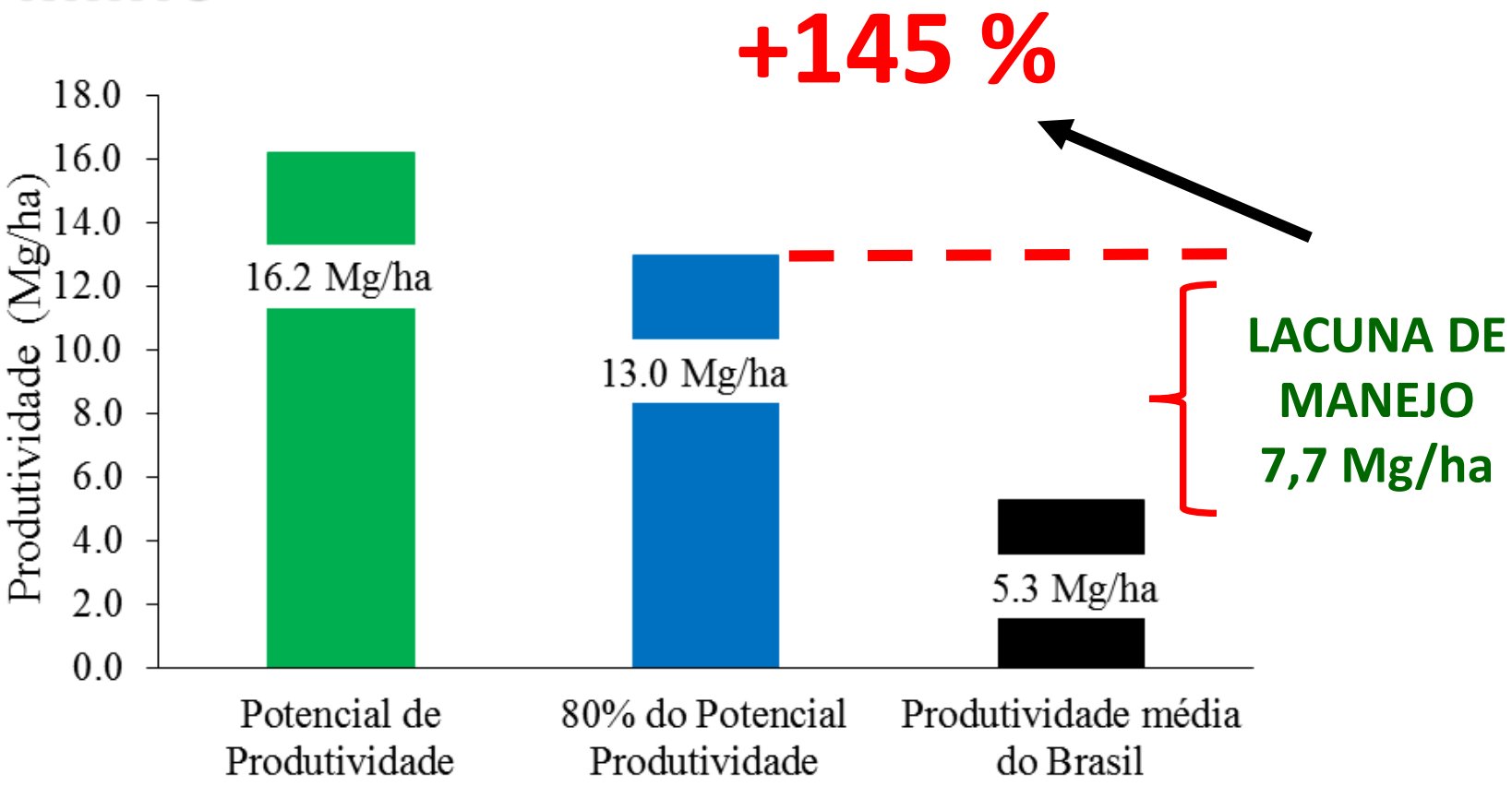
Área safra 2017/18 : 1.433.800 ha
Produção Safra 2017/18: 12.071.0 toneladas
Produção 80% do Potencial: 14.338.0 toneladas

Soja



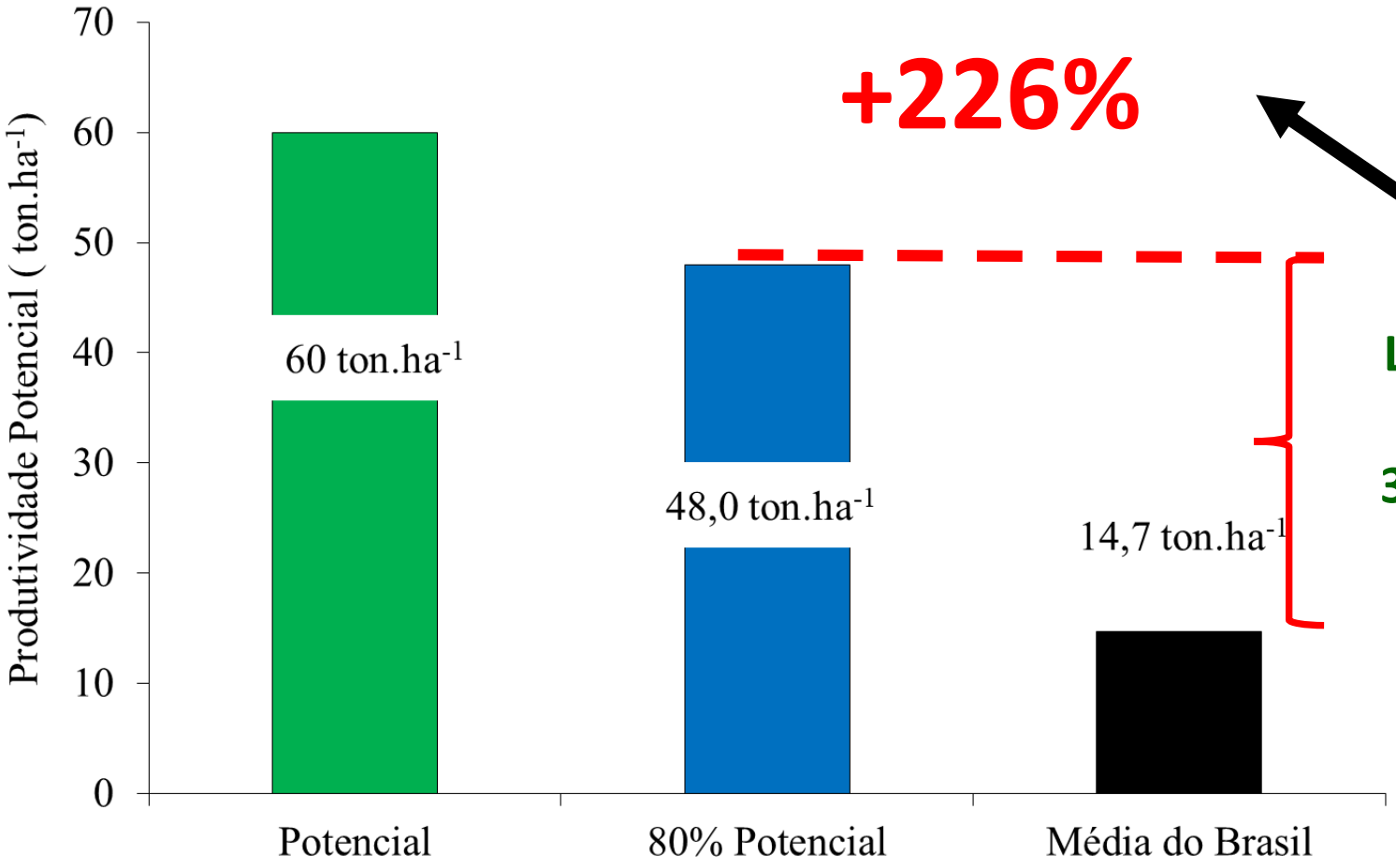
Área safra 17/18: 35149.3 mil ha
Produção Safra 17/18: 119,281.4 toneladas
Produção 80% do Potencial: 214270.1 toneladas

Milho



Área safra 17/18: 5084.0 mil ha
Produção Safra 17/18: 26810.7 toneladas
Produção 80% do Potencial: 65888.64 toneladas

Mandioca



Área safra 2017/18 : 2.149.409 ha
Produção Safra 2017/18: 20.704.182 toneladas
Produção 80% do Potencial: 103.171.632 toneladas

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Muito obrigado!!!

Agradecimentos

AEAA

Associação dos Engenheiros Agrônomos de Alegrete