Way(s) ahead to make water footprint meaningful in water planning

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OUTLINE

- Considerations when using the Water Footprint in planning
- Moving beyond m^3 : The usefulness of the Extended Water Footprint
- Exploring the environmental dimension in EWF assessments

Using the Water Footprint (WF) in planning: considerations

It is an easy tool to understand and communicate how water is being consumed (green and blue water) and polluted (grey water) when producing/consuming different goods and services in a region/basin. However:

- Data demanding and sensitive to variations → Define data quality standards
- To make it meaningful for planning → Compare it to AWR
- m3 is not enough to establish water allocations → Inclusion of Economic, Social and Environmental goals
- In reallocating water → Consideration of the temporal and spatial patterns of AWR
- We need to be aware that by relying on imports of “green virtual water” we might generate large externalities because it can potentially increases land (ecological) footprint elsewhere.

Moving beyond m^3 : The Extended Water Footprint

- **What is it?**

  "An integrated analysis of water uses oriented to provide relevant information for policy analysis"

- **What dimensions have been assessed so far?**

  Economic (cash/m^3)
  Social (jobs/m^3)
  Environmental (Environmental Flow Requirements)

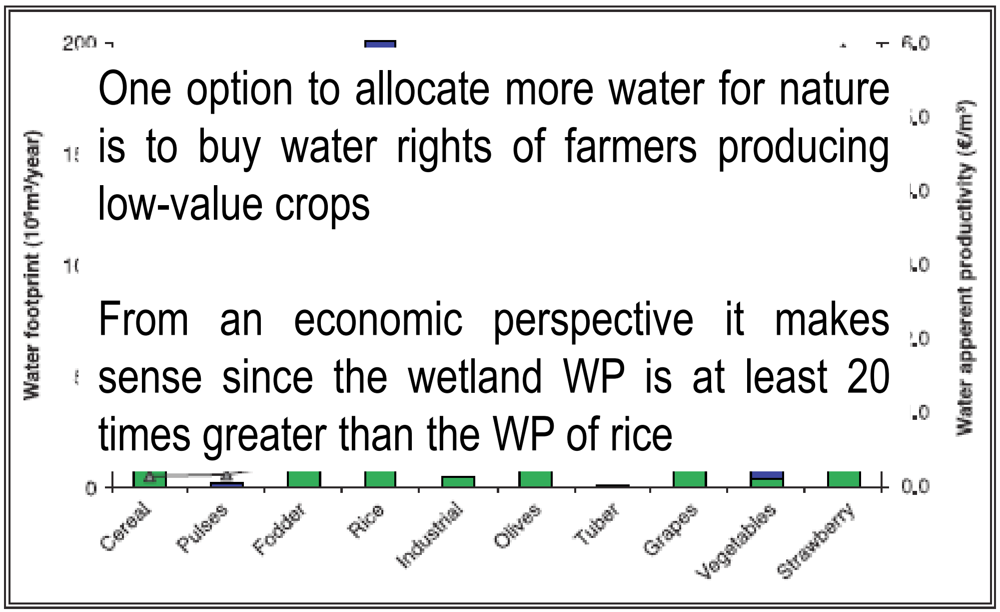
- **Tailor-made tool, depending on the policy goal**

  "more cash and care of nature per drop"
  "more jobs and care of nature per drop"
  "more crops and jobs per drop"

Moving beyond m³: The Extended Water Footprint

- **Where has been applied?**
  So far regionally in Spain but we aim to test it in Latin American countries

Doñana Wetland National Park



One option to allocate more water for nature is to buy water rights of farmers producing low-value crops

From an economic perspective it makes sense since the wetland WP is at least 20 times greater than the WP of rice

(Aldaya and Llamas, 2010)

Considerations on the Extended Water Footprint

- **Economic**
  How to value water resources? (opportunity cost, added value, market value)
  Different sources of water (green, blue, grey) will have different values

- **Social**
  How can we reflect the social impacts of water use? (direct jobs/m^3 ; direct plus indirect jobs/m^3)

- **Environmental**
  Aquatic water needs are being considered but what about terrestrial water needs?

In summary….we are still

Economic valuations vs. EFW

- **Economic valuation exercises are used to conduct** Cost-Benefit analyses of alternative policy actions (obtaining welfare gains is the goal)
    - It is a policy analysis

- **Extended Water Footprint analyses are not used to define any policy goal**.
    - It is a productivity analysis

EWF vs. Input-Output Table Models

- **Extended Water Footprint analyses permit a more dynamic picture, but it is less systematic.**
  - It is reduced-form model

- IOT is a systematic approach (all sectors), and permits answering what-if questions about water policies and the general economy, but
  - It is based on a fix economy structure

Policy relevance of WF and EWF

- Huge, unknown until now, a powerful education mechanism (change consumers' behaviour)

- A relevant stimuli for the private sector, and for methodological innovation (bechmaking)

- As another sustainability indicator, it does not provide bases for policy advise, but:
    - It is water-performing indicator
    - It permits expost analyses of trends
    - It dissociates the WF components, which shows complementarities and synergies

Environmental sustainability boundaries of water use

- **What does it means?**

  Quantifying the maximum amount of water available for different purposes taking into account the minimum water requirements needed by ecosystems

- **Why is it important?**

  Because aquatic and terrestrial ecosystems requires a certain amount of water to maintain its well functioning and to ensure the supply of ecosystem services. Water for nature is important for intrinsic and utilitarian reasons

- **How can we define blue and green boundaries (= achieve more care of nature per drop")?**

  Blue water boundaries = Total blue WATER resources- EFR
  Green water boudandaries = Total available LAND – Min. Area required to secure a representive fraction of terrestrial ecosystems

- **Minimum BLUE water requirements (= Environmental Flow requirements)**

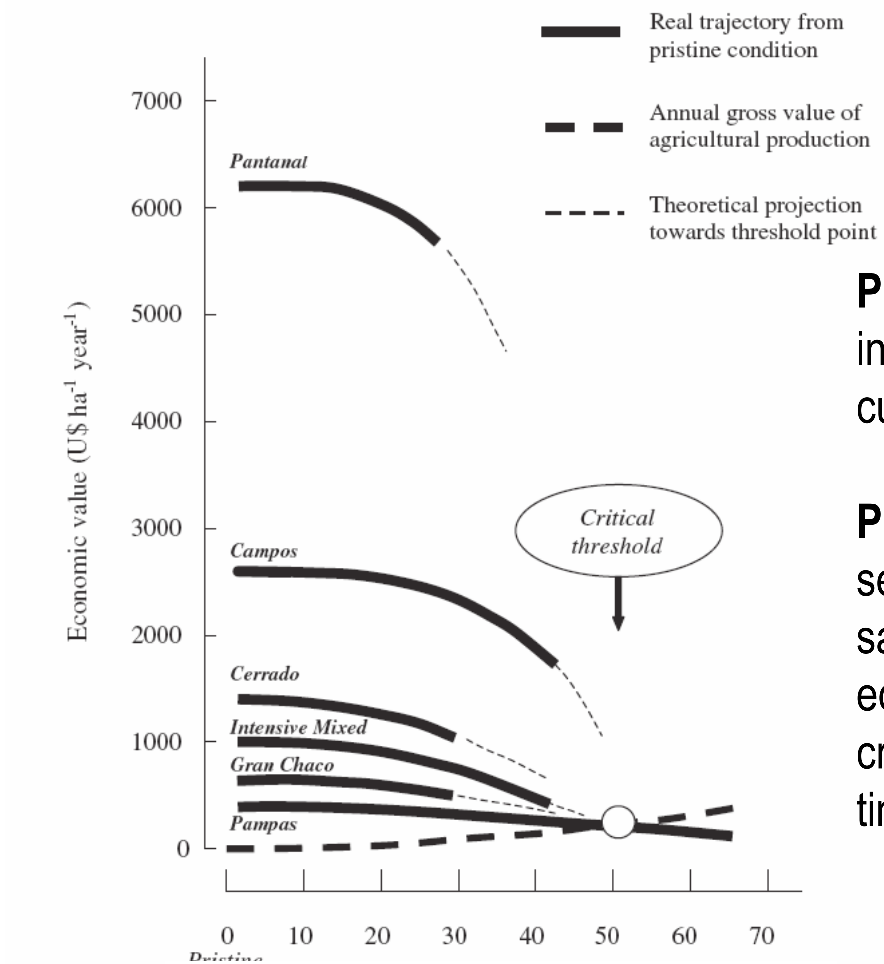
  - ✓ Its quantification ca be done through several approches
  - ✓ Smakhtin method poses important spatial and temporal scale problems
  - ✓ ELOHA approach is data intensive

- **Minimum GREEN water requirements (= Minimum amount of natural land that needs to be conserved)**

  - ✓ Available estimates range between 15-75%
  - ✓ We lack a real scientific criteria to define this limit
  - ✓ Even when using some of the estimates the applicability to regional scales is doubtful

- Minimum BLUE water requirements **can be quantified relative well**
- Minimum GREEN water requirements (GWR) **can t be set up yet.** Its determination is an issue of **LAND appropiation**. This issue is a key challenge specially in emerging economies (major agricultural exporters)
- While we try to define GWR, it is important to assess the **opportunity cost of green water** (natural land). Even though GW does not supply many market values, **it does have an economic value** due to the array of ecosystem services it supplies

De la Plata Basin study: agricultural gross value vs ES value



Rate of land conversion (% cropland)

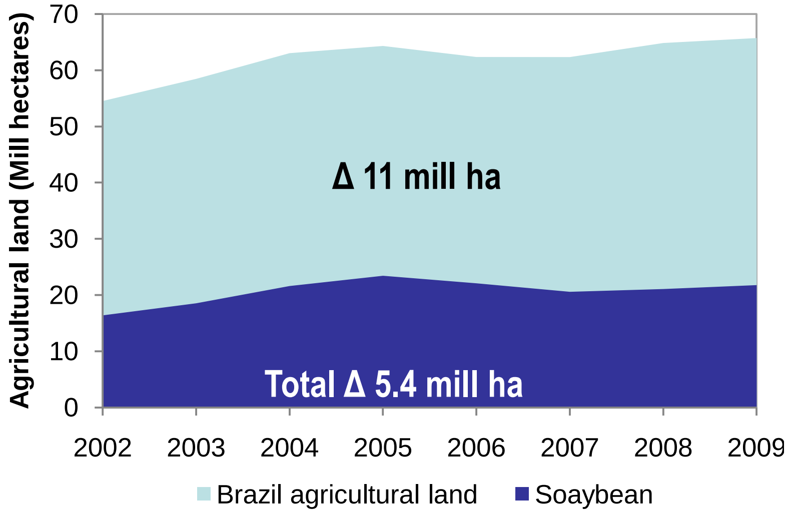
Pampa biome is rather insensitive to ↑ cultivation.

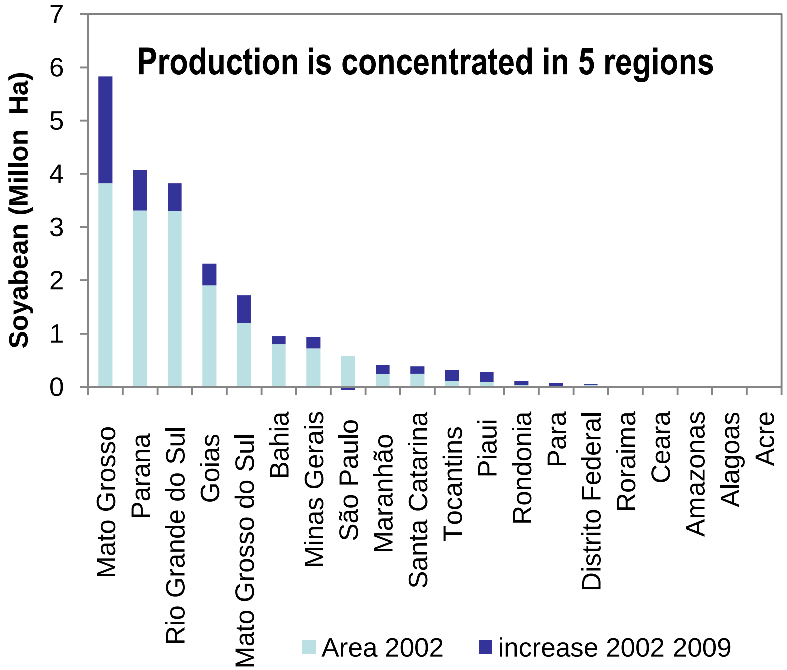
Pantanal is extremely sensitive. To reach same gross margin equivalent to Pampa s crops, it will loose 30 times its original value.

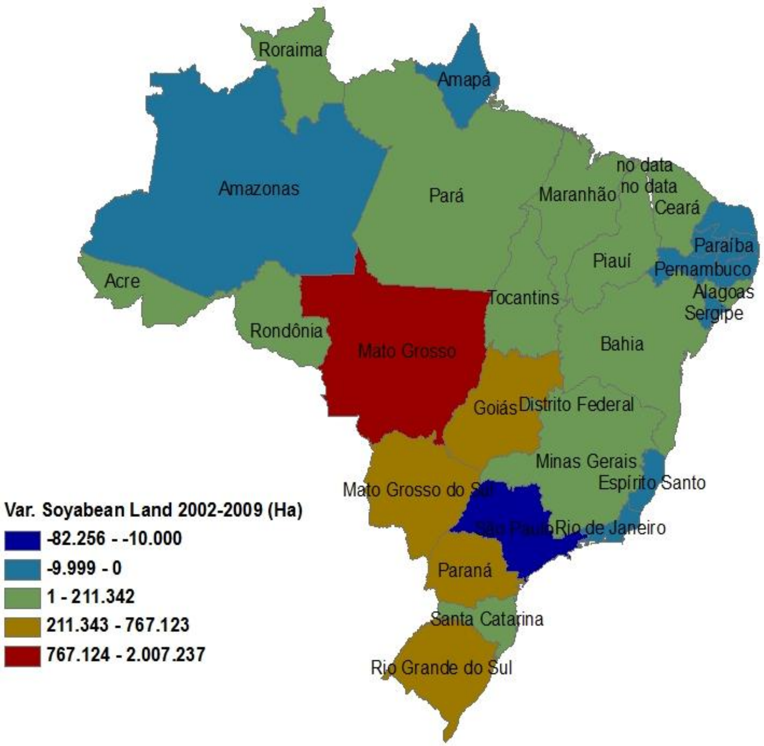
Environmental impacts of food exporting countries: Land and Water and requirements for soyabean production in Brazil

- Well endowed country in terms natural resources
- Key player for global food security
- Agriculture represents almost 35% of the GDP (when including agro-bussines)
- Land Conversion for agricultural purposes is expected to doubled (65 to 120 mill hectares, equiv. 14% Brasil land surface)

Temporal and spatial patterns of soybean land expansion 2002-2009



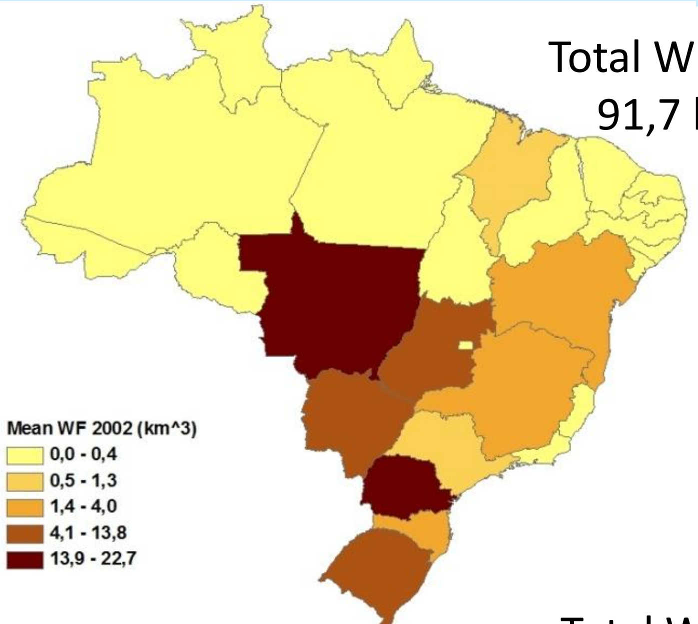




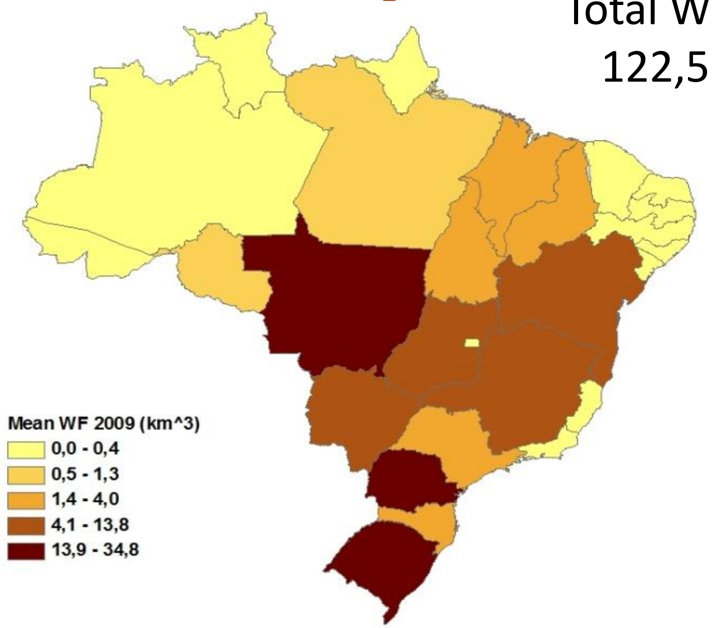
Most of the soybean land grew at the expenses of replacing natural “cerrados”

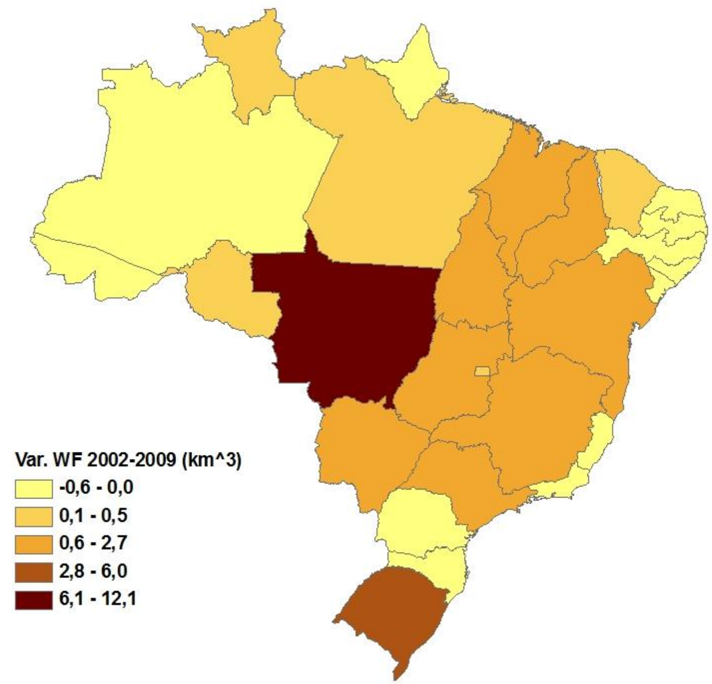
Temporal & Spatial variations of the Water Footprint for soybean (2002-2009)

Total WF 2002
91,7 km3



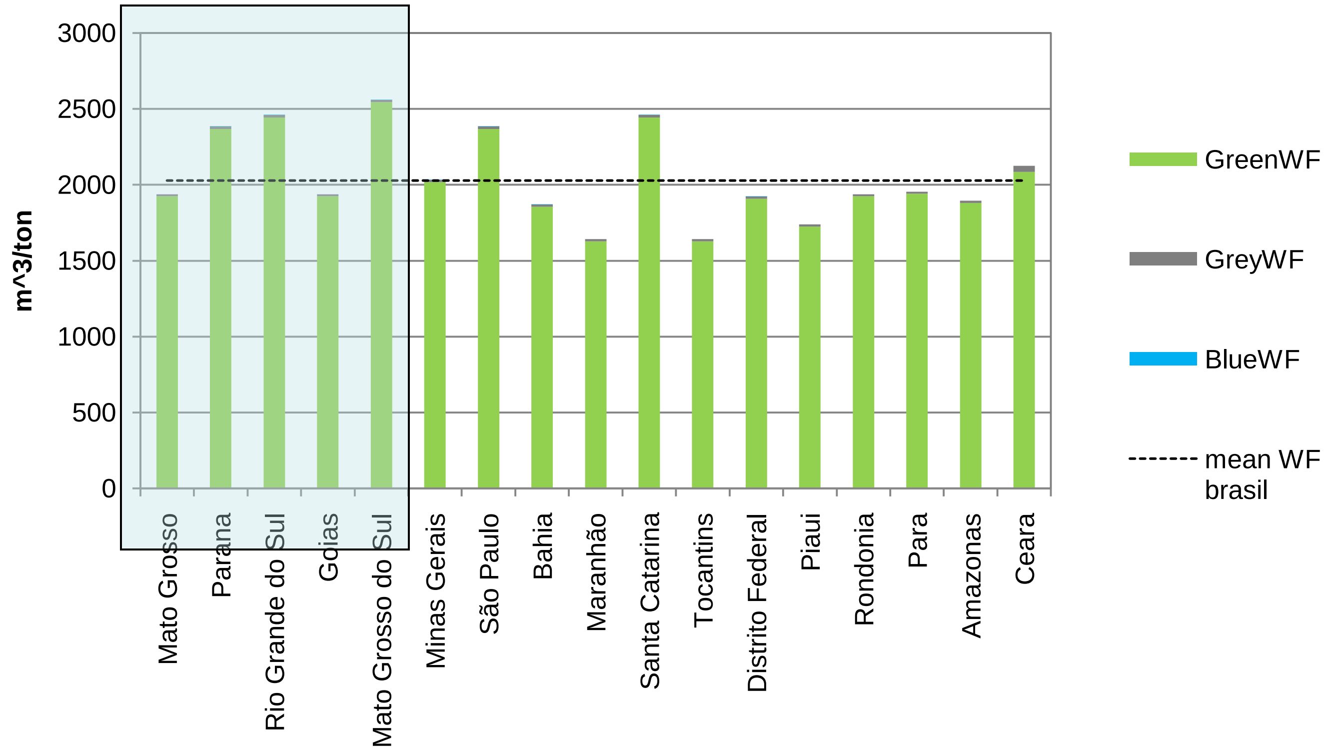
Total WF 2009
122,5 km3





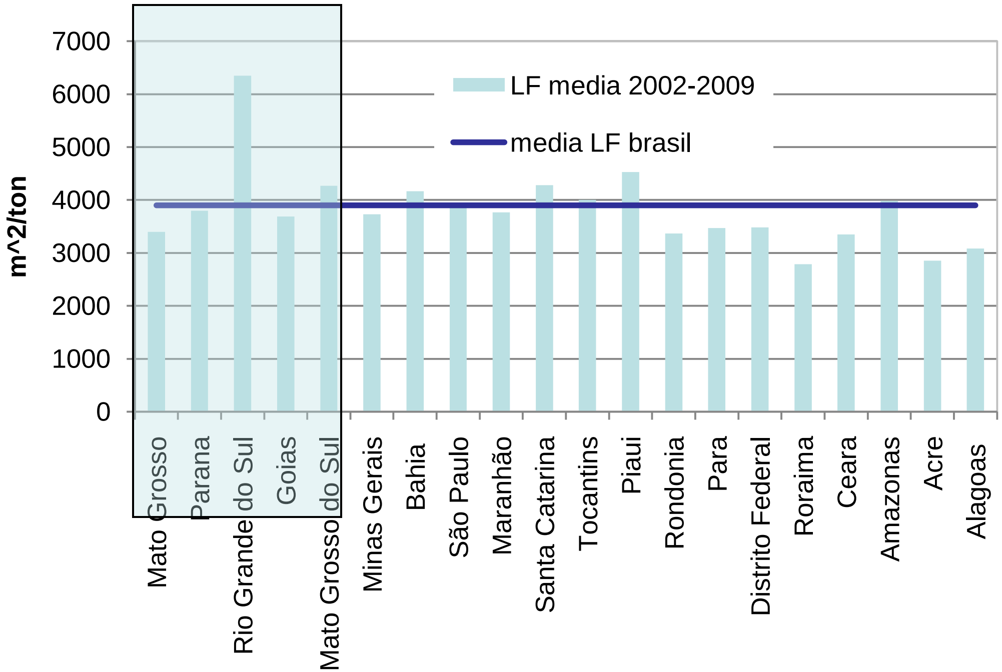
Between 2002 and 2009 the WF of soybean production has increased 30%

Water Footprint of soybean production (m3/ton)



- Soybean production generates the larger impacts on green water resources
- Greater soybean production areas hold the larger WF (m3/ton) within Brazil
- Larger WF are found in the Southern regions, where the climate is more arid
. (less AWR)

Land Footprint of soybean production (m2/ton)



Greater soybean production areas hold average LF (m2/ton) within Brazil, except for 1 region

	m2/ton
Argentina	3952
Brazil	3920
US	3679

LF of major production areas is close to LF of greater soybean producers ⟶ It seems that there is little options to improve yields

Land appropiation in the major production regions (year 2009)

Federal Unit (FU)	Cultivated Land (%FU)	Soybean Land (%FU)	WF (m3/ton)	LF (m2/ton)
Mato Grosso	10	6	1938	3401
Paraná	51	21	2385	3795
Río Grande do Sul	29	14	2463	6350
Goias	13	7	1938	3691
Mato Grosso do Sul	9	5	2562	4271
National Mean	**12**	**5**	**2280**	**3902**

Mato Grosso and **Goias** have potential to increase their production capacity. low WF & LF

Paraná has a low LF but it is rate of land appropiation is the highest

Mato Grosso do Sul and Rio Grande do Sul has the potential to increase yields

Next things to look at

To explore potential options to achieve "more care of nature per drop" we will look at:

1. Assess the opportunity cost of green water (= replacing natural land) for each region
2. Try to incorporate the concept of BIOCAPACITY ("bioproductive supply that is available within a certain area") to define sustainable boundaries of land or green water use

THANKS!