

Beijing, GLP 3rd Open Science Meeting, 25th October 2016

*Contribution to the session “Local-global interactions in
global land use change”*

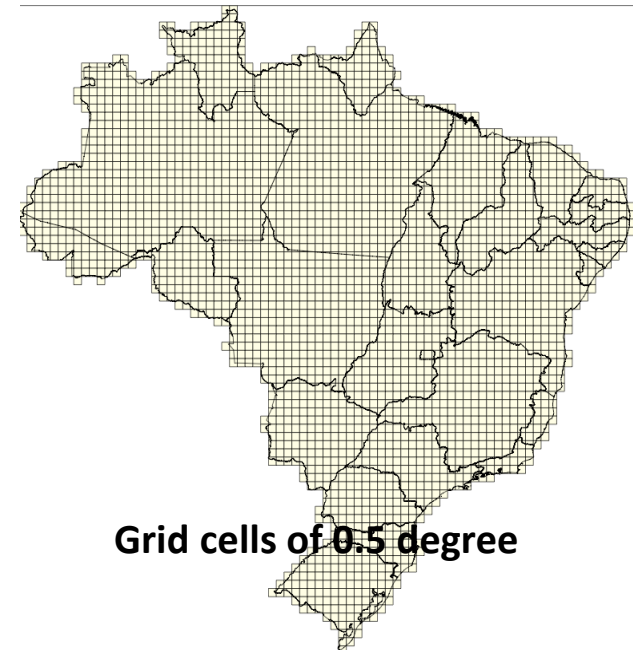
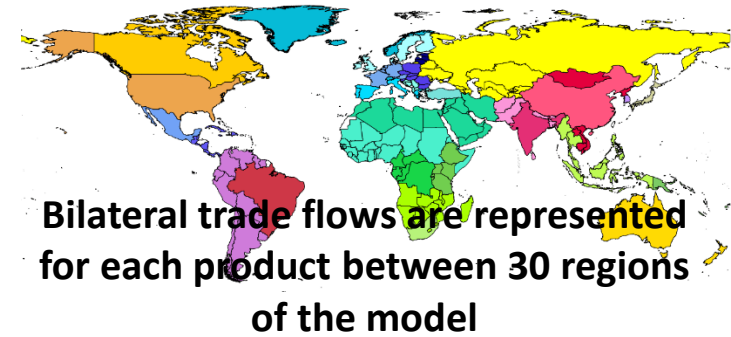
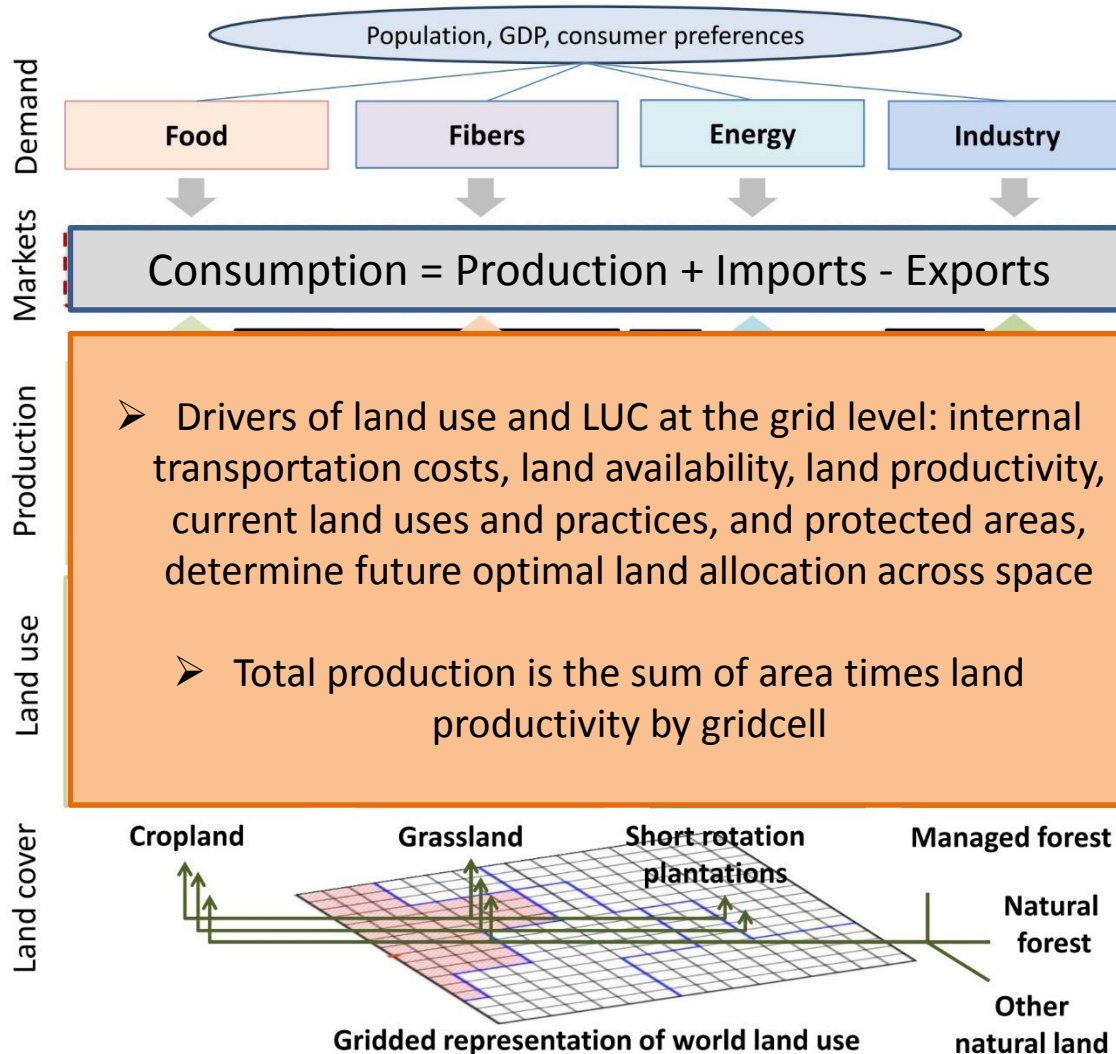
Disentangling the effects of local and global drivers of deforestation with the GLOBIOM model

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IIASA, INPE

COMIFAC, UNEP-WCMC

GLOBIOM computes future global land use and LUC



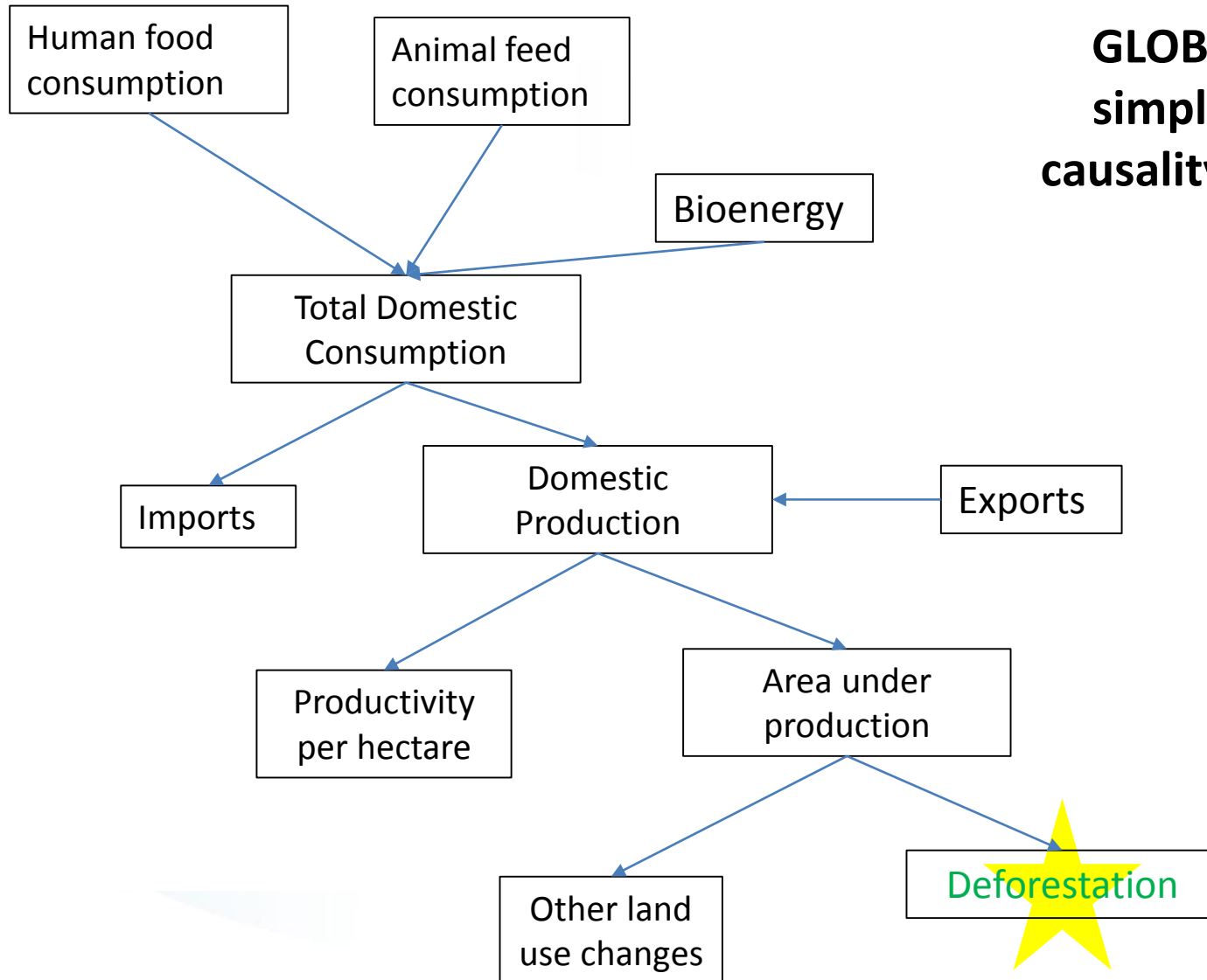
Could a forward-looking model like GLOBIOM be a useful tool to better understand the past?

- ▶ Main purpose of GLOBIOM is to provide quantitative analysis for the future or under scenarios which did not yet happen
- ▶ Base year in GLOBIOM is 2000 and first year of simulation 2010
 - ▶ The availability of data for this period allows confronting modelling results with observations
- ▶ For reference level in REDD+/ INDC framework, important to start from historical emissions
- ▶ Increasing demand for model validation

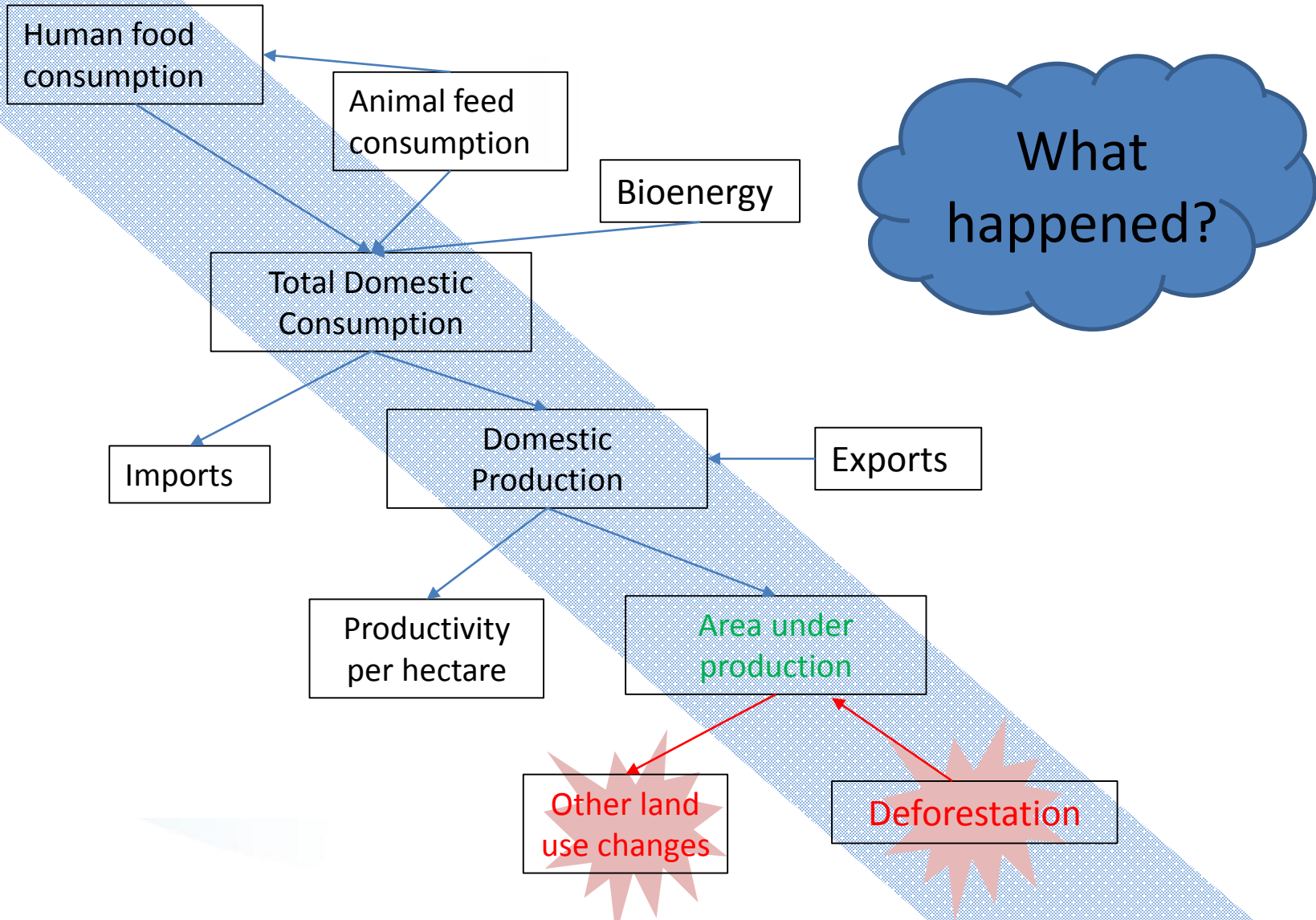


Can the model reproduce historical deforestation?

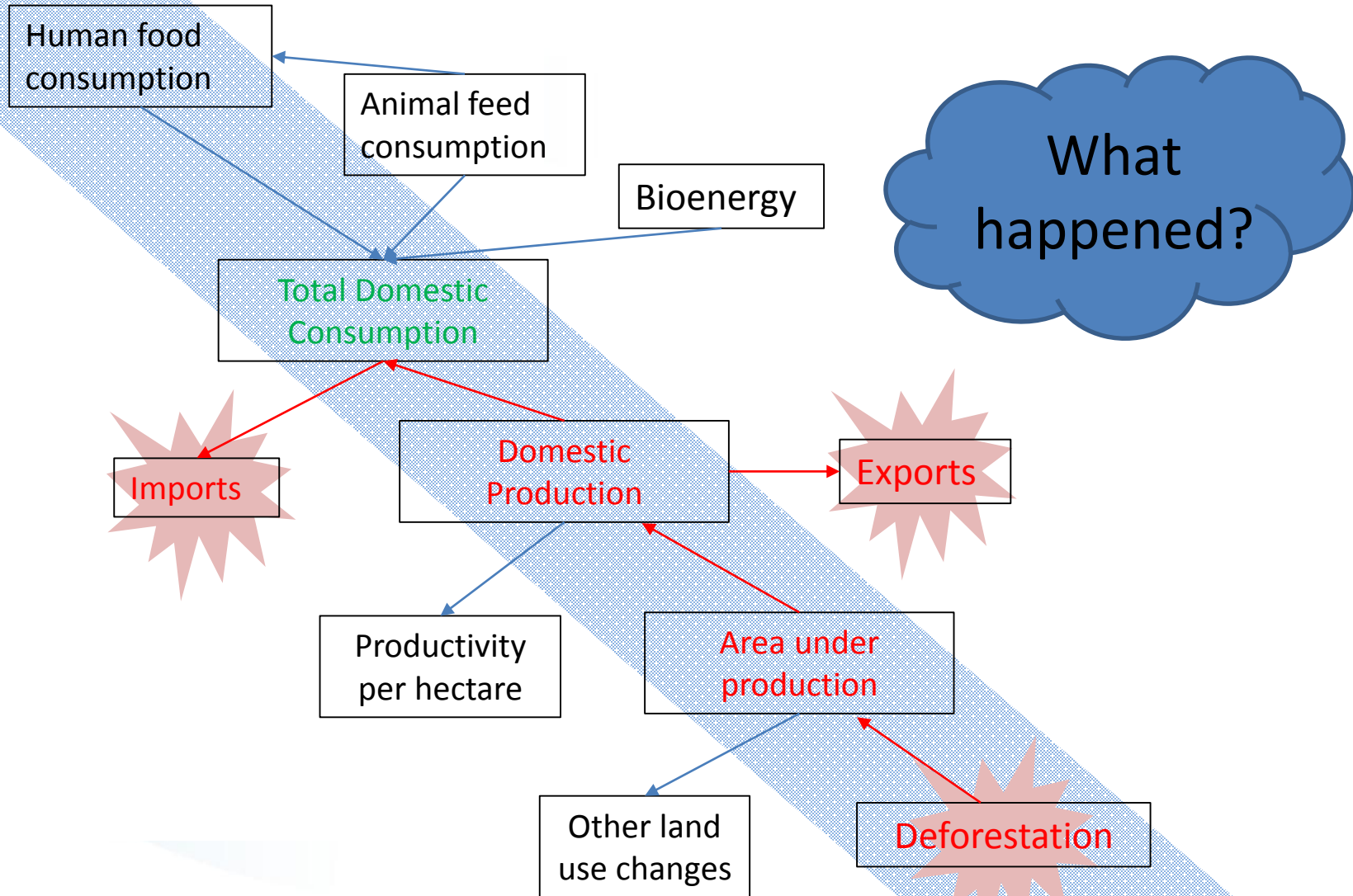
GLOBIOM simplified causality chain



When the model does not reproduce historical deforestation over 2000-2010...



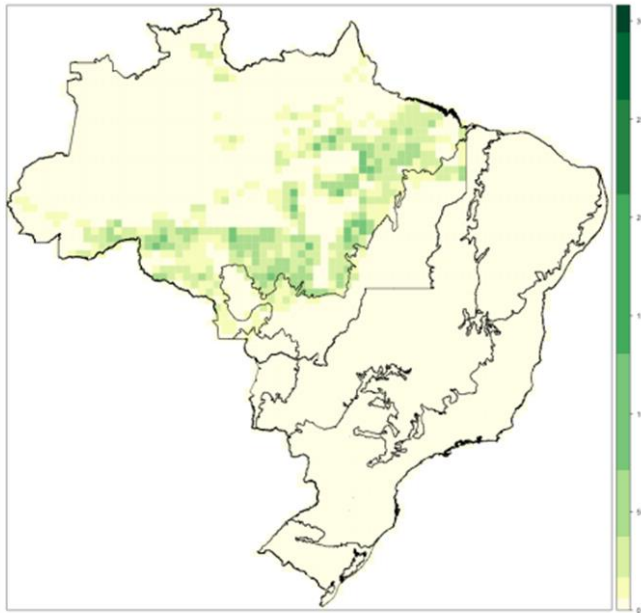
When the model does not reproduce historical deforestation over 2000-2010...



Example of GLOBIOM- Brazil

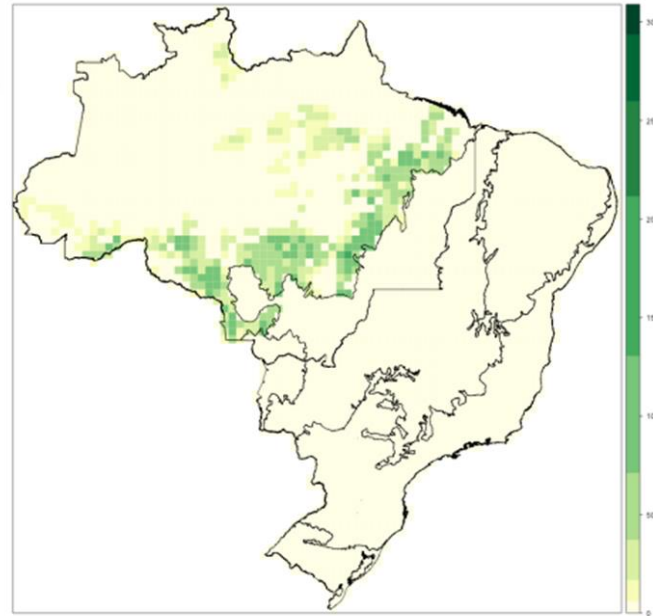
Validation of the model in Brazil

PRODES/INPE



16.53 Mha

GLOBIOM-Brazil projection

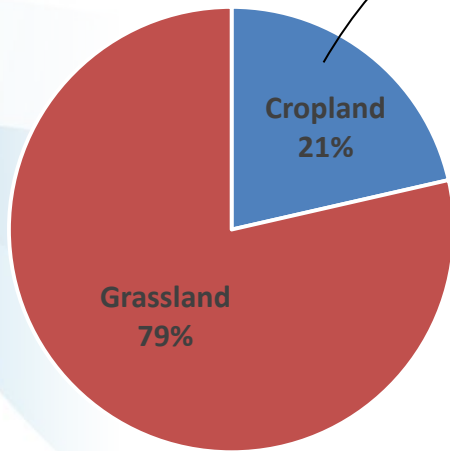


16.93 Mha

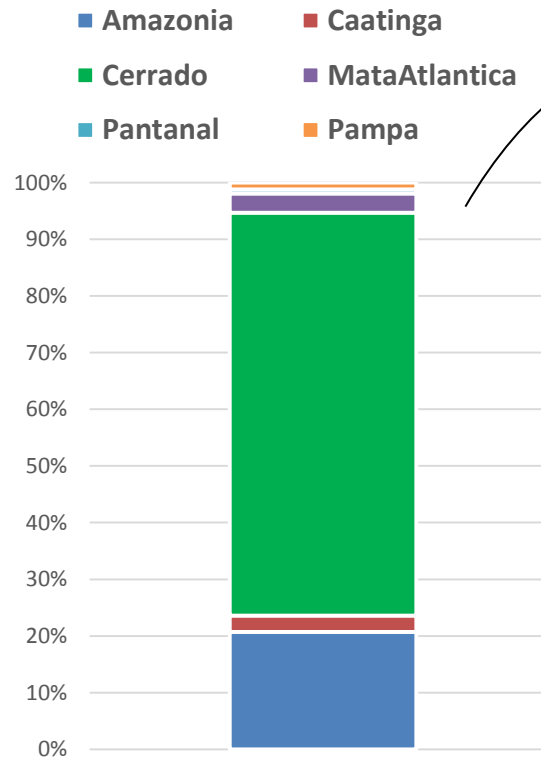
model produces consistent estimate of deforestation (2000-2010)

What caused deforestation over 2000-2010 in Brazil?

► The direct land use change



Direct causes of deforestation



Share of each biome in total deforestation due to cropland

In Amazonia and Cerrado biome, 70% of cropland expansion is caused by soybean.

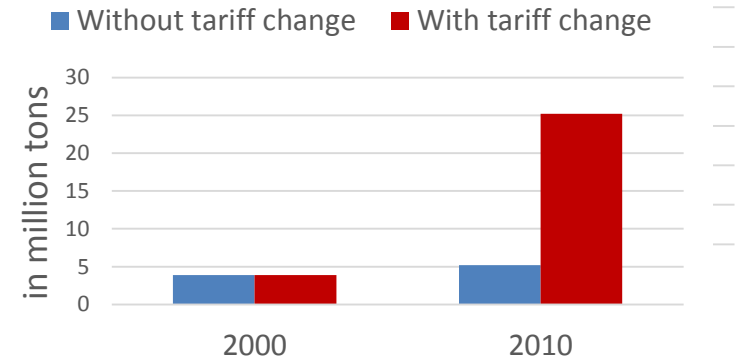


Mainly driven by international demand: **78% of the increase in soybean production is for exports.**

What caused deforestation over 2000-2010 in Brazil?

- ▶ But at the beginning we did not get historical deforestation numbers right...
- ▶ In our results, soybean exports did not increase as much as observed over 2000-2010...
- ▶ A major change happened during this period which had big impacts on Brazil...
- ▶ China joined WTO and decreased its tariffs !

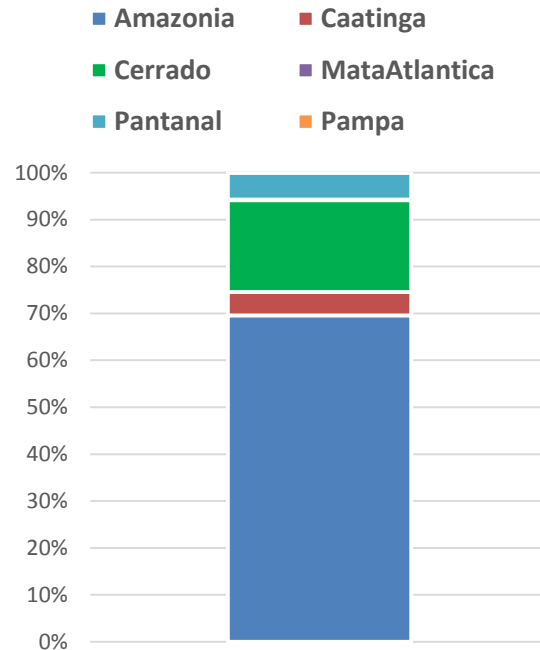
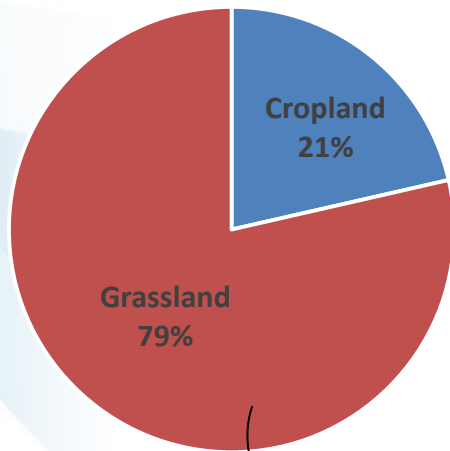
Brazilian soya exports to China



What caused deforestation over 2000-2010 in Brazil?

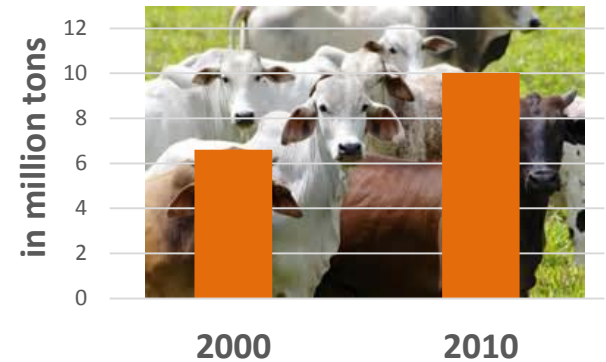
► The direct land use change

Direct causes of deforestation



Share of each biome in total deforestation due to grassland

Total beef production in Brazil



But only 5% of the increase in beef production over 2000-2010 was due to exports vs **50%** in reality

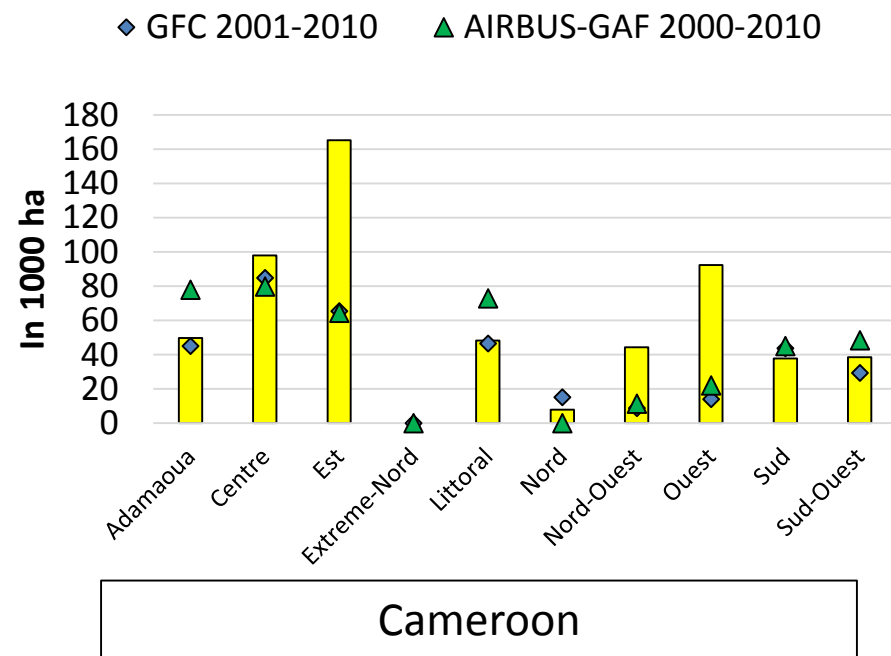
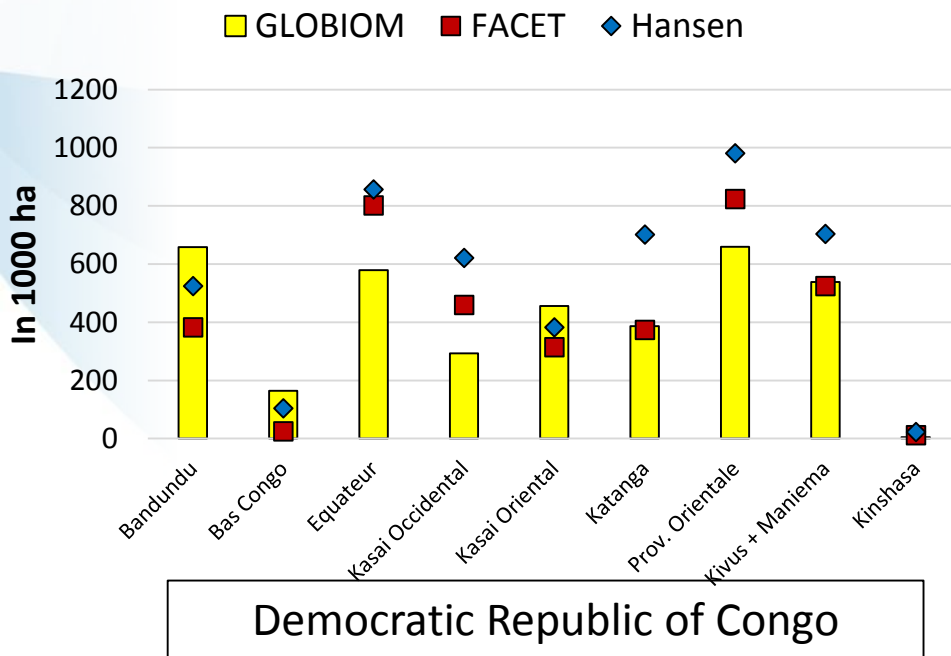
Review demand projections of beef by region

Example of GLOBIOM- Congo Basin

Validation of the model in the Congo Basin

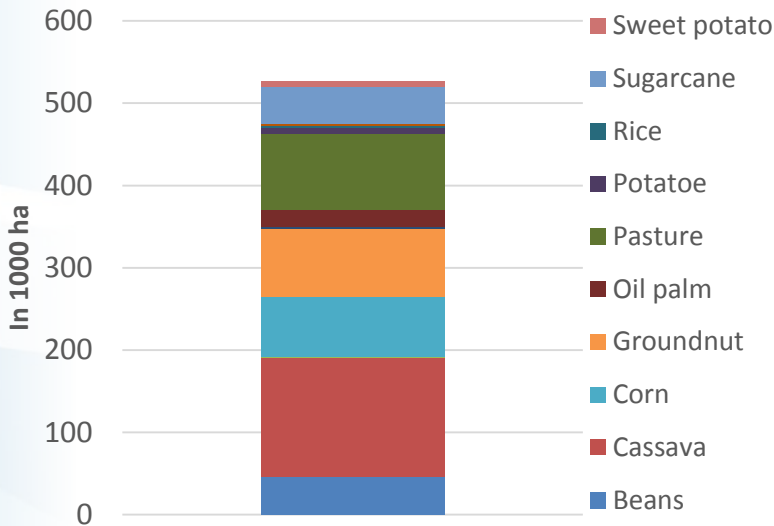
- Cumulated deforestation over 2001-2010 in the Congo Basin (in 1000 hectares)

	GLOBIOM	GFC	FACET	GAF
Cameroon	582	352		422
DRC	3723	4873	3642	
Congo	160	340	164	184



What caused deforestation over 2001-2010 in the Congo Basin?

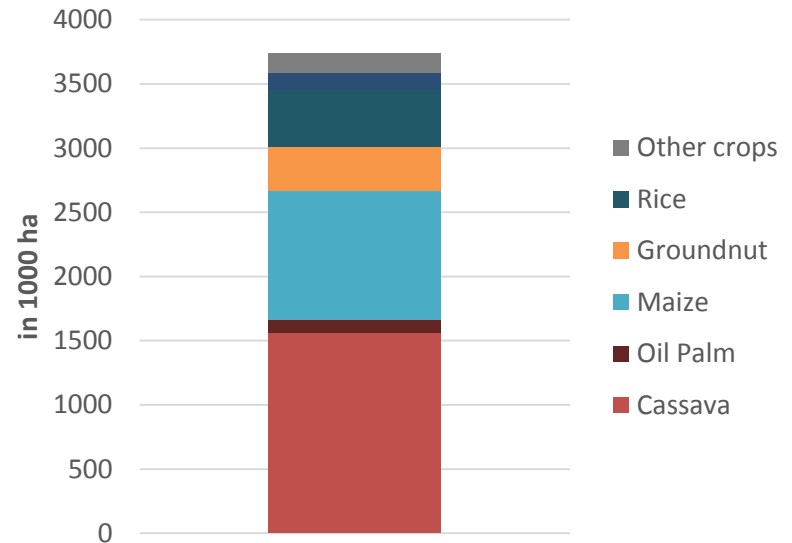
▶ Cameroon



Increase due to higher population (+ 25%) and higher GDP p.c. (+11%)

But >50% also due to neighboring countries' increasing demand for cassava, groundnut and palm oil (Gabon and Congo Rep.)

▶ DRC



Increase due to higher population (+ 33%) and higher GDP p.c. (+17%) + stabilization after civil conflict

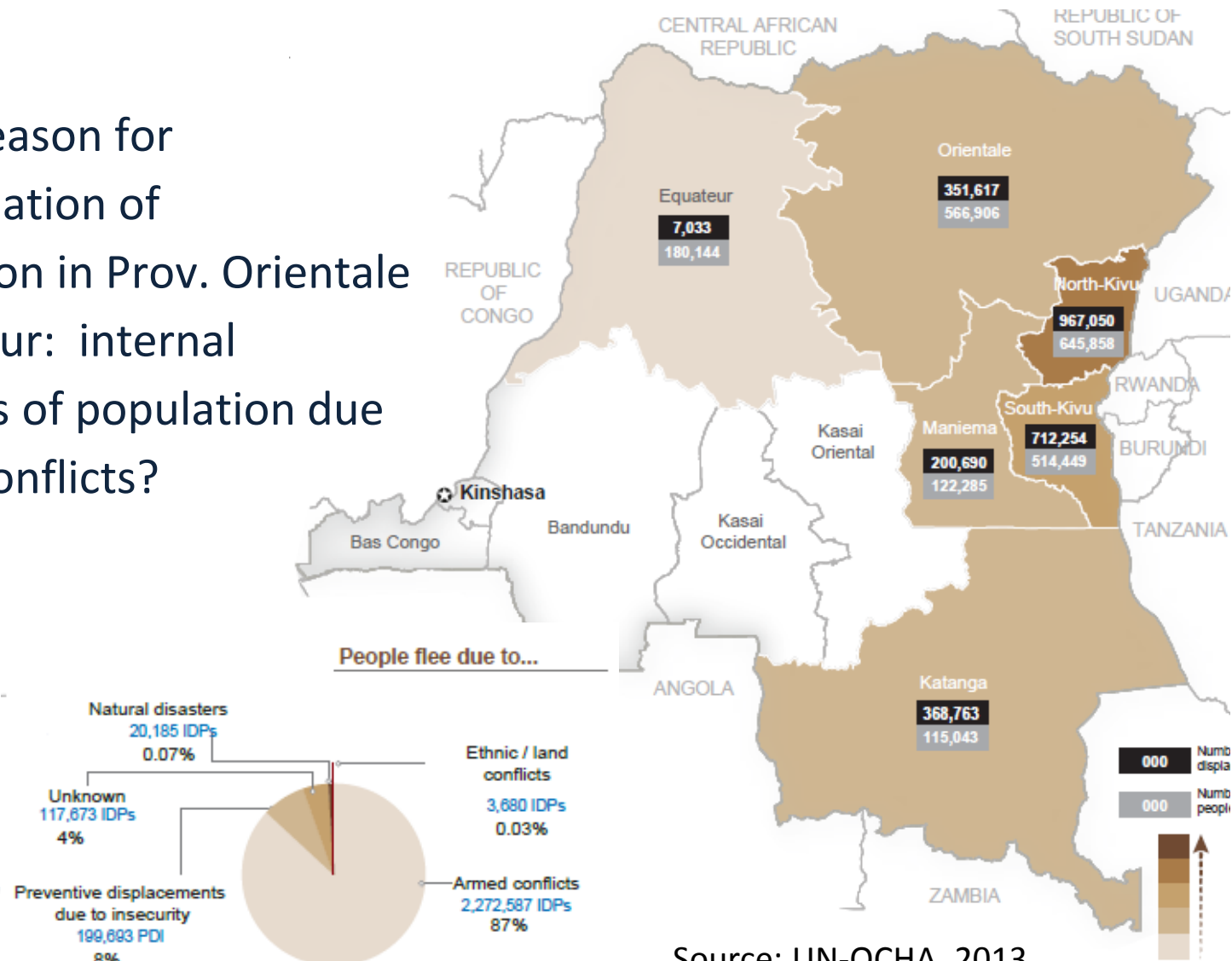


What caused deforestation over 2001-2010 in the Congo Basin?

- ▶ At the beginning, the model tended to underestimate deforestation in the Congo Basin. We got closer to historical deforestation by:
 - ▶ Including fallows in shifting agriculture system
 - ▶ Introducing an auto-consumption constraint in subsistence system depending on local diets and rural population
 - ▶ Increasing the level of food consumption per capita in DRC
- ▶ Overestimation of deforestation in Cameroon: still investigating the reasons why... In fact from FAO cultivated areas have increased even more than in our model
 - ▶ Expansion in other natural land rather than in forests?
 - ▶ Problem of definition of forests?

What caused deforestation over 2001-2010 in the DRC?

- ▶ Potential reason for underestimation of deforestation in Prov. Orientale and Equateur: internal movements of population due to armed conflicts?



Conclusion

Conclusion

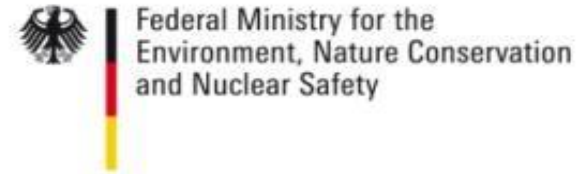
- ▶ More and more data being available from remote-sensing will allow better validation of our models
- ▶ Comparison of model results with past observations is a lengthy process: investigation type of work to identify the reasons for difference but it has many benefits...
- ▶ Helps understanding the underlying complex mechanisms behind past land use change: indirect land use change, trade...
- ▶ ... and improving future projections through a better representation of drivers of land use change rather than ad-hoc calibration



Thank you!



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