

The importance of dietary change and waste reduction to deliver food security and to combat climate change

Pete Smith

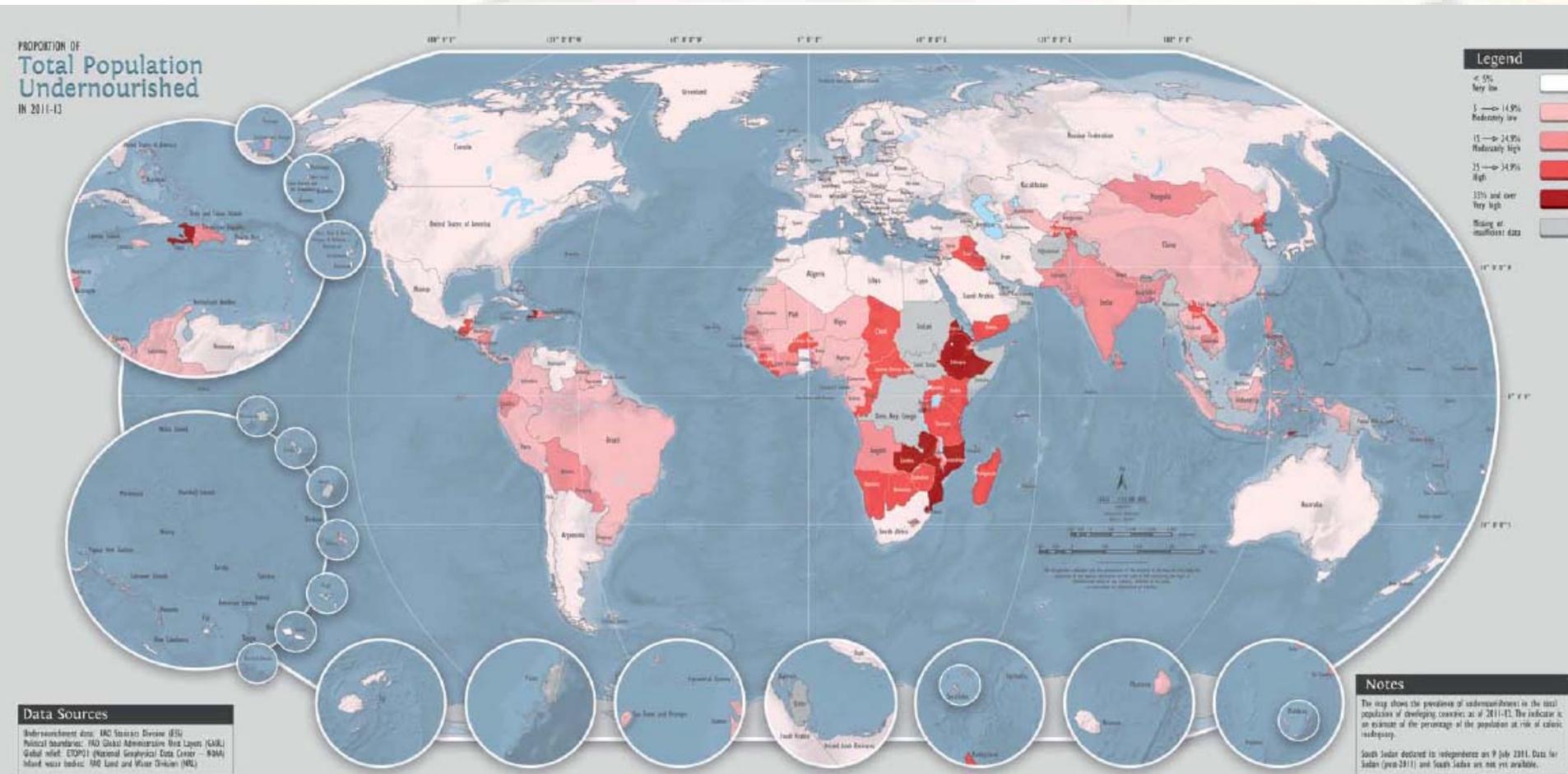
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World hunger



842 million people will go to bed hungry and undernourished tonight

FAO (2014)



10000 réfugiés de guerre soudanais vivent dans les camps de l'Onu. Chacun a droit à 2100 C

Source: © 2005 PETER MENZ
PHOTOGRAPHY



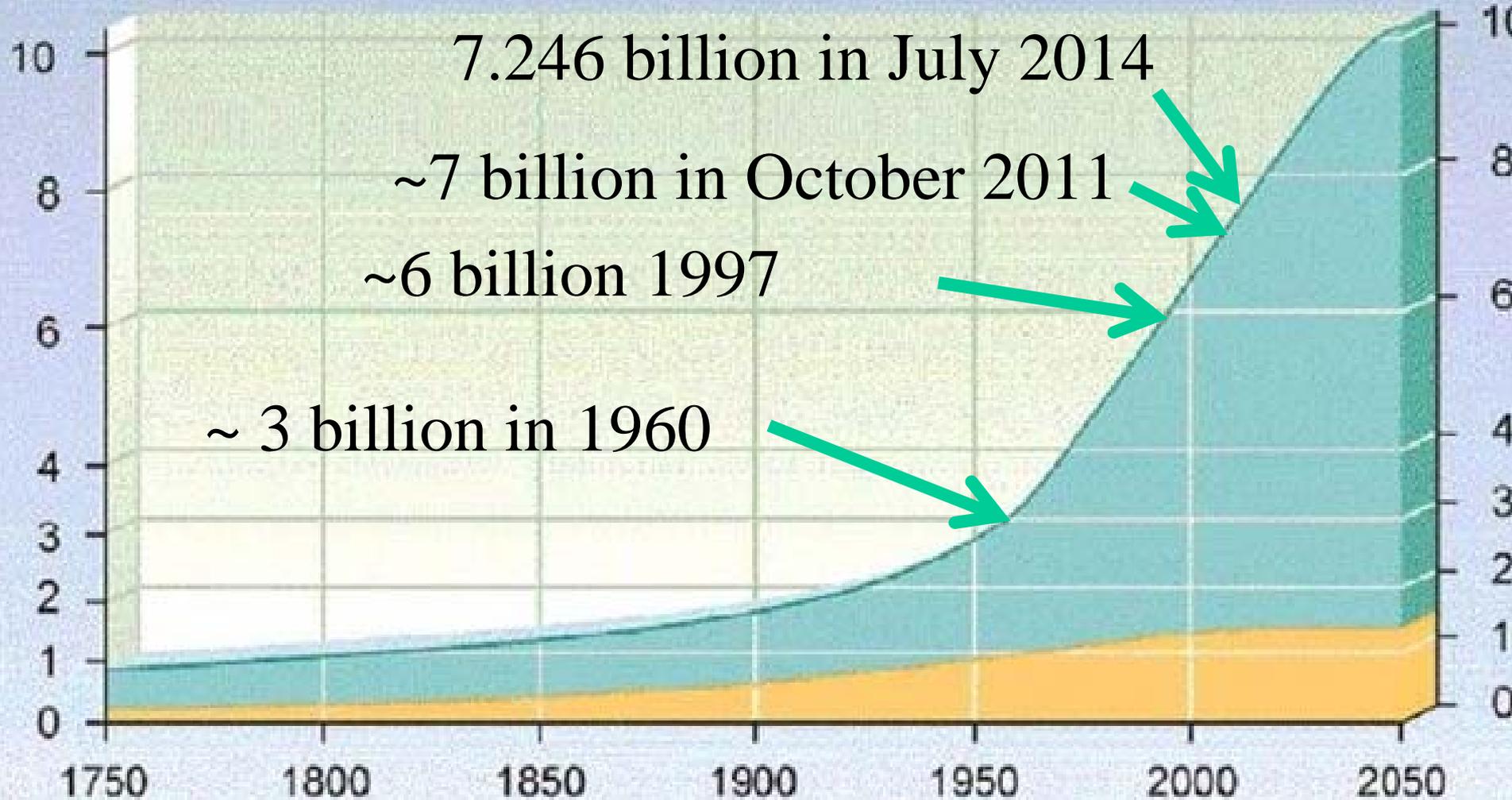
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avalés chaque année... Plus de la moitié des Allemands sont en surpoids ou obèses.

World population development

Billions

Billions



7.246 billion in July 2014

~7 billion in October 2011

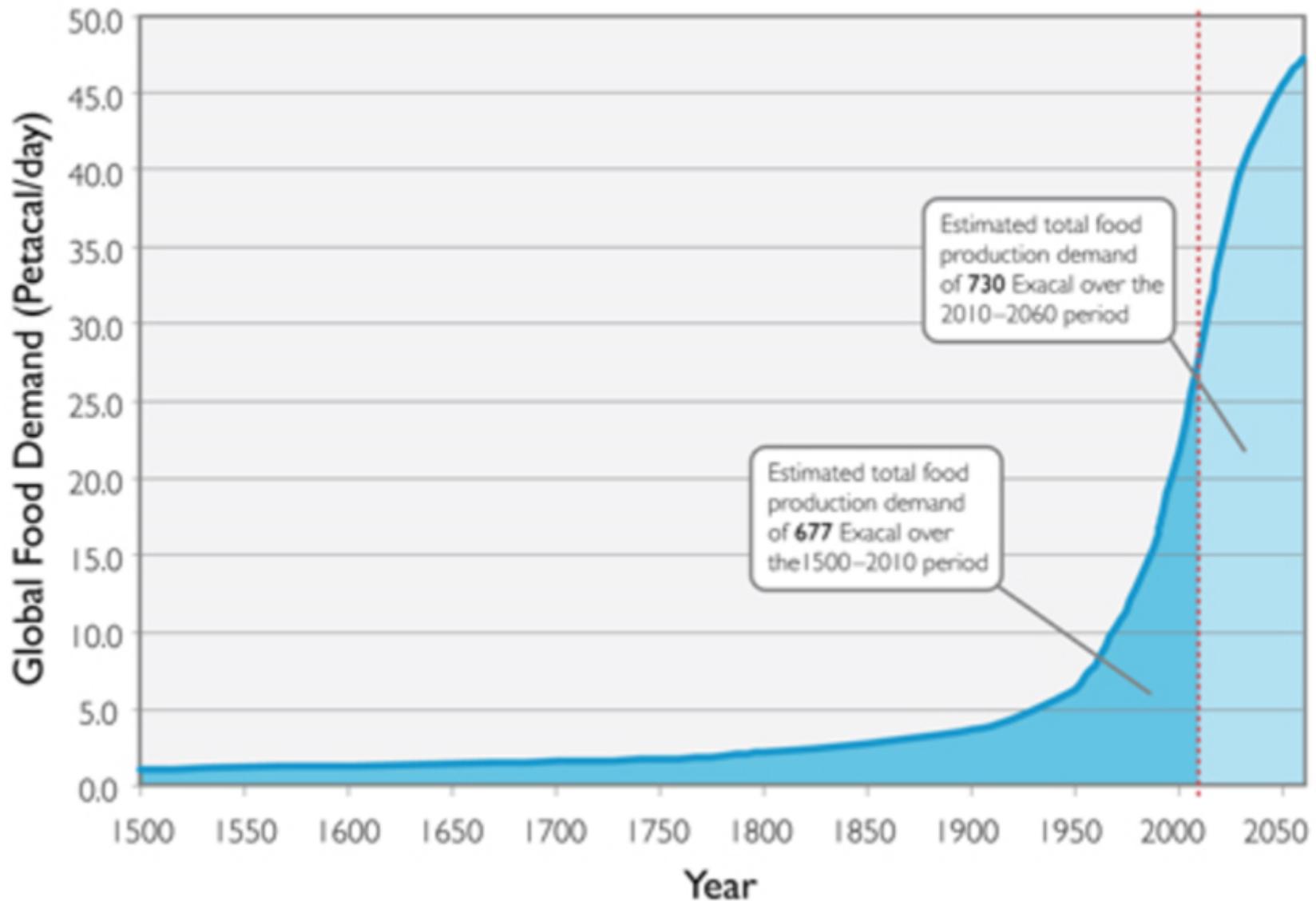
~6 billion 1997

~ 3 billion in 1960

Developing countries
Industrialized countries



The challenge to produce enough food will be greater over the next 50 years than in all human history

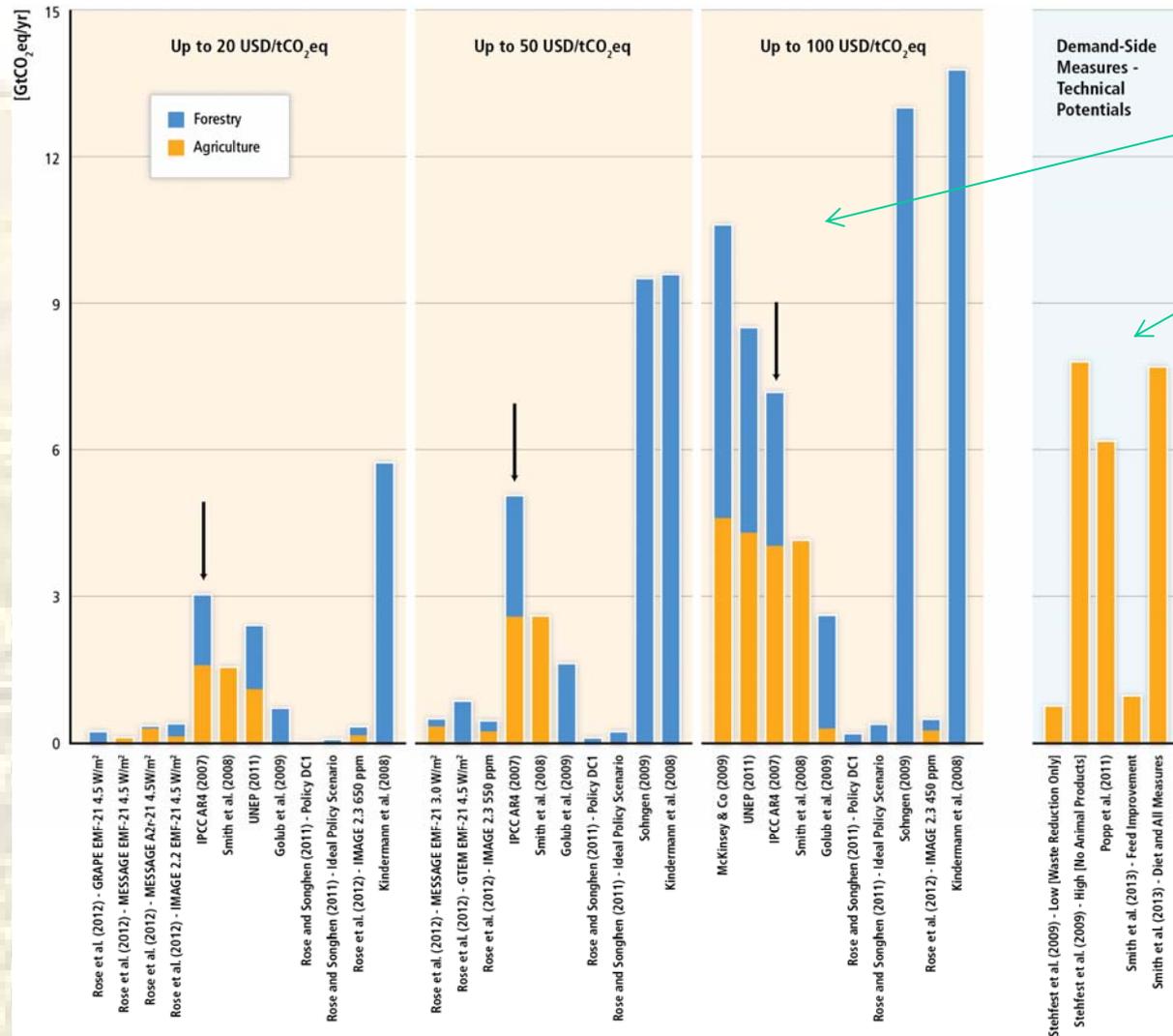




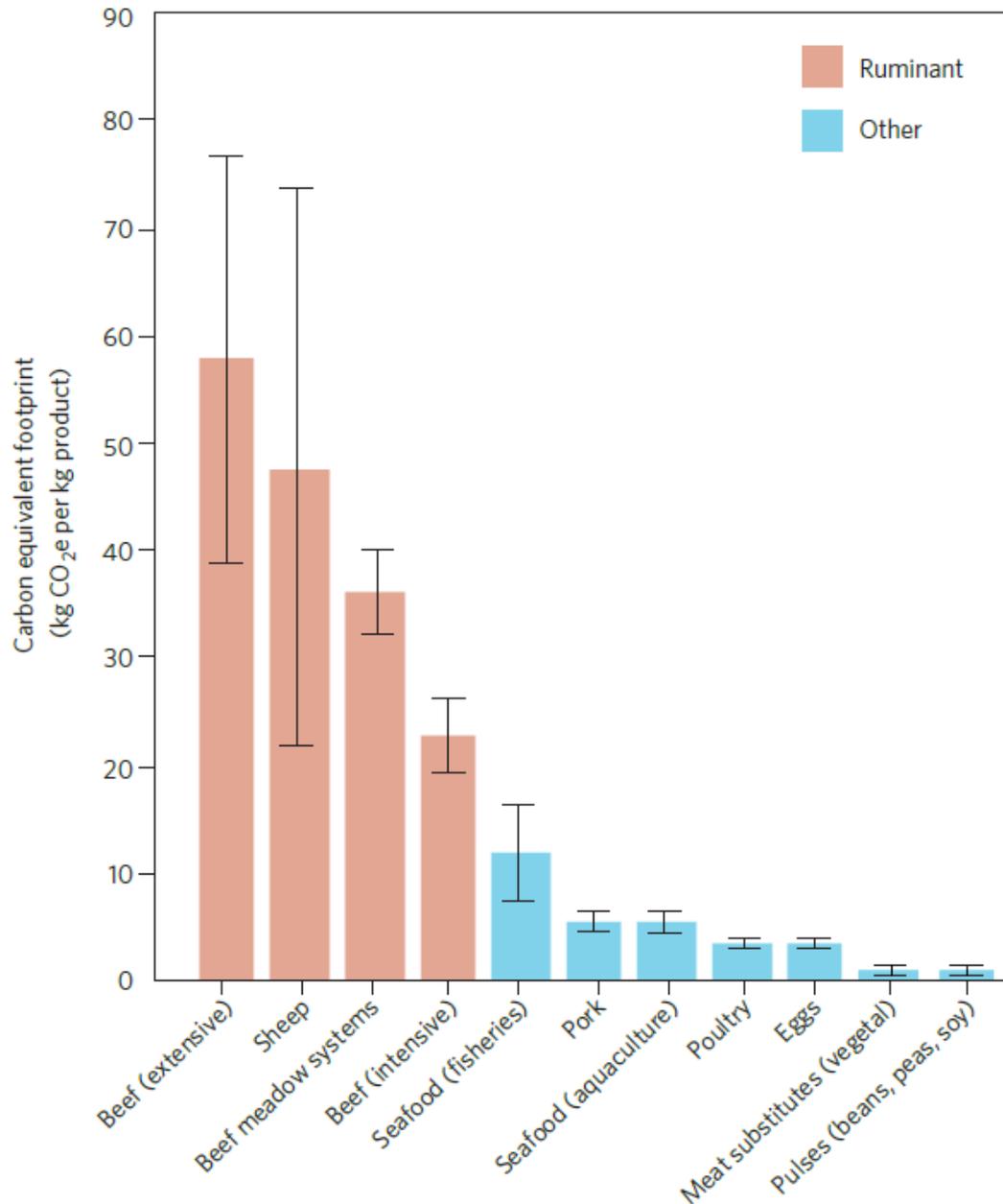
Reducing the climate impact of food production



Demand- and supply-side measures need to be considered



- Supply-side measures in the AFOLU sector are large & cost-competitive
- Demand-side measures such as dietary change and waste reduction also have large, but uncertain, mitigation
- Demand-side measures may be difficult to implement, but are worthy of further research
- Other options in the AFOLU sector include bioenergy



Direct GHG emissions per unit of food product – if indirect emissions are included, non-ruminant meat emissions also increase

Changed consumption patterns

Table 3 Description of the reference scenario and the four dietary variants

Variant	Description
Reference	Agricultural production for 2000–2030 (Bruinsma 2003) and 2030–2050 (FAO 2006). The 2000–2030 projections are country-scale and aggregated to the 24 world regions of the IMAGE model. The projections for 2030–2050 have a continental scale
No Ruminant Meat (NoRM)	As reference, but with complete substitution of proteins from ruminant meat (cattle, buffaloes, sheep and goats) by plant-proteins, starting in 2010 and completed by 2030. By-products such as wool and leather are also assumed to be substituted by other materials
No Meat (NoM)	As NoRM, with additional substitution of white meat (pork, poultry) by plant proteins, starting in 2010 and completed by 2030
No Animal Products (NoAP)	As NoM, with additional substitution of milk and eggs by plant proteins, starting in 2010 and completed by 2030
Healthy Diet (HDiet)	“Healthy Eating” recommendations from the Harvard Medical School (Willett 2001) implemented globally for meat and eggs, starting in 2010 and completed by 2030. See also Table 4

Fewer animal products in global diet allows everyone to be fed, and land is available for energy and nature conservation

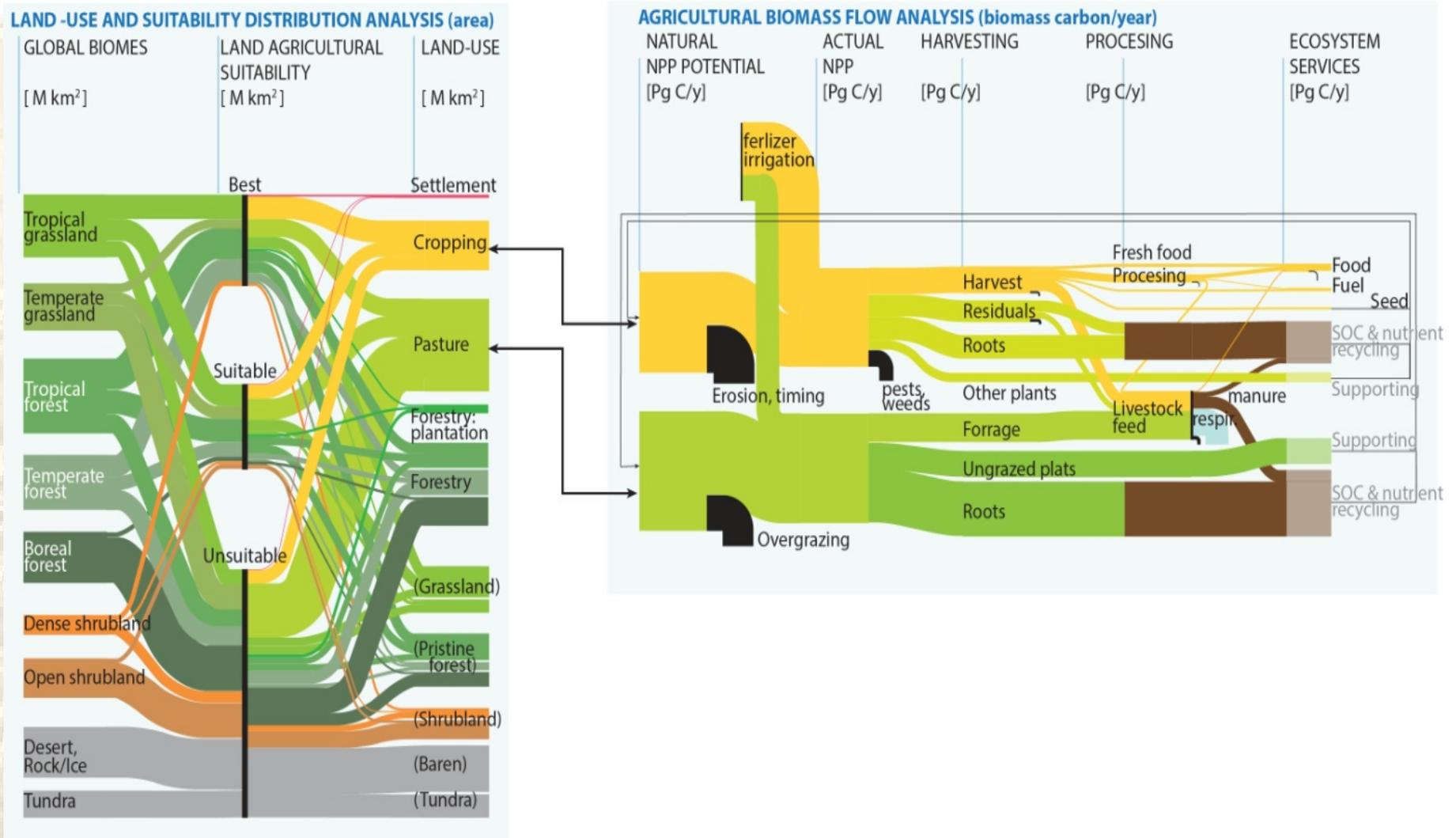
Land based GHG emissions:

	GtC eq.
2000	3.0
2050-Reference	3.3
2050-NoRM	1.7
2050-NoM	1.5
2050-NoAP	1.1
2050-HDiet	2.1

Food demand must be managed because sustainable intensification alone will not suffice

Scenarios	Yields		Demand side reduction measures:	
	Current trends in yields	Yield gap closures (sustainable intensification)	50% Food waste reduction	Healthy diets
CT1	X			
CT2	X		X	
CT3	X		X	X
YG1		X		
YG2		X	X	
YG3		X	X	X

Food demand must be managed because sustainable intensification alone will not suffice



Food demand must be managed because sustainable intensification alone will not suffice

Current yield trend



Yield gap closure only

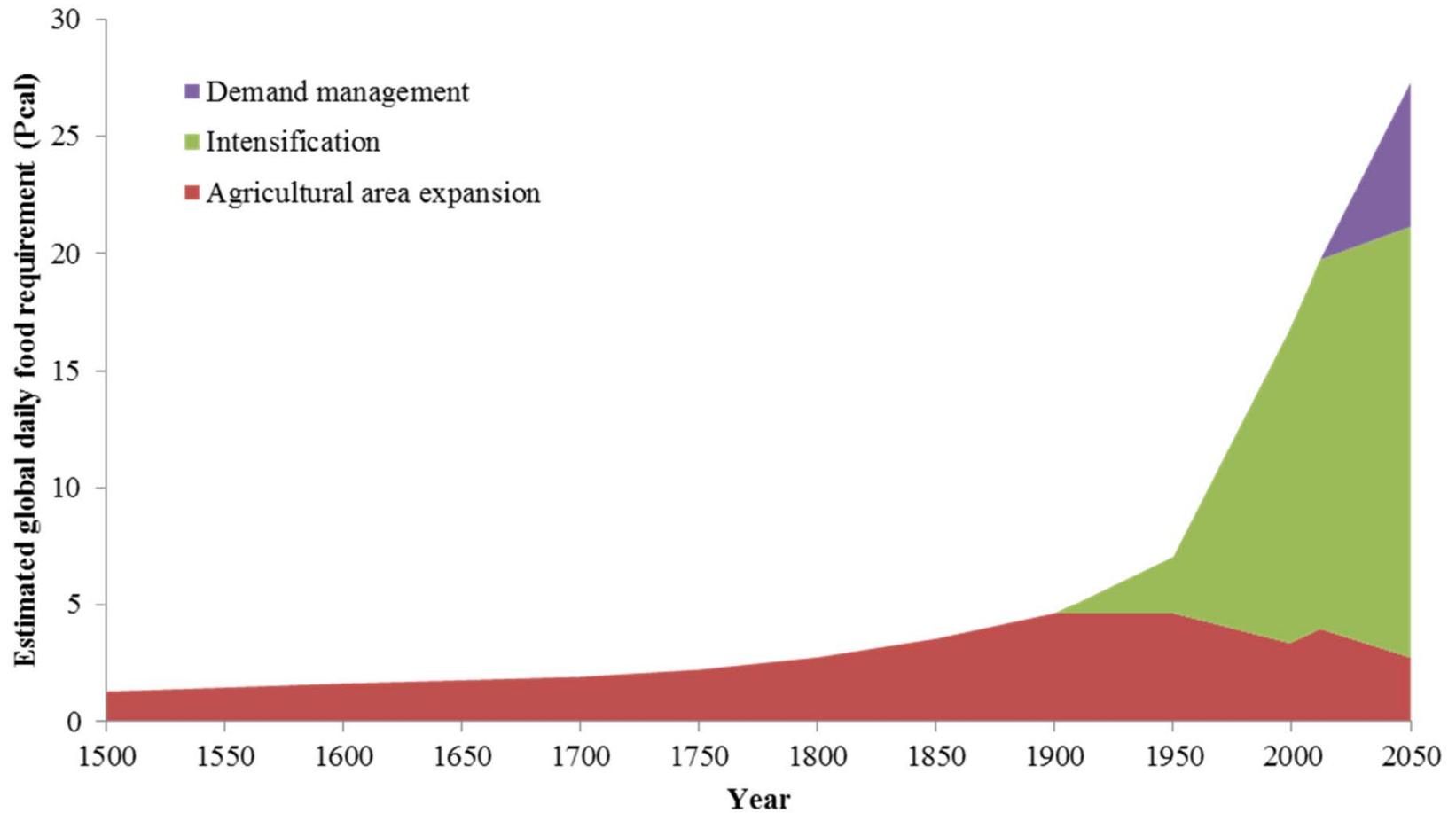


Yield gap closure + demand options



	units	2009*	CT1	CT2	CT3	YG1	YG2	YG3
Cropland	Mkm ²	15.6	22.5 (+44%)	18.7 (+20%)	17.6 (+12%)	18.2 (+16%)	16.0 (+2%)	14.6 (-6%)
Pasture	Mkm ²	32.8	35.2 (+7%)	32.6 (-1%)	26.8 (-18%)	36.0 (+10%)	33.1 (+1%)	27.1 (-17%)
Net Forest cover	Mkm ²	26.1	23.1 (-12%)	24.7 (-6%)	26.1 (+0%)	24.2 (-7%)	25.6 (-2%)	27.1 (+4%)
Tropical Pristine Forests	Mkm ²	7.9	7.2 (-9%)	7.4 (-7%)	7.4 (-6%)	7.4 (-6%)	7.6 (-4%)	7.6 (-4%)
Total GHG emissions	GtCO ₂ /y	13.5	22.2 (+64%)	16.1 (+20%)	11.7 (-13%)	19.2 (+42%)	15.0 (+11%)	10.2 (-25%)
Carbon sink potential	GtCO ₂ /y	14.7	14.5 (-1%)	14.6 (-0%)	14.8 (+0%)	14.6 (-1%)	14.7 (+0%)	14.7 (+0%)
Fertiliser use	Mt/y	103	166 (+61%)	136 (+32%)	125 (+22%)	226 (+120%)	196 (+90%)	175 (+70%)
Irrigation water use	km ³ /y	2889	6496 (+125%)	5328 (+84%)	5075 (+76%)	5051 (+75%)	4413 (+53%)	4157 (+44%)

How will food demand be met in future?



Smith (2014b)

Conclusions

- We can feed 9-10 billion people
- Food supply needs to be increased whilst reducing environmental impact of agriculture
- Need to find options and policies that co-deliver improved food security and improved environmental outcomes
- Some promising supply-side measures (e.g. efficiency improvements) improve food security and reduce environmental impact
- Demand-side measures (e.g. changing diets, waste reduction) are under-researched, for food security and for potential to reduce environmental impact
- We need to change consumption patterns (demand-side measures) – techno-fixes are not enough to make the necessary changes



Thank you for your attention

