

“Biodiversity as the key to food and nutrition security ”

13th Dialogue on Science - Stiftung Academia Engelberg

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Overview

- 1. Food and nutrition : the changing environment (WSSD 1992 to 2012)**
- 2. The connection between diet and sustainable agriculture and food systems?**
- 3. Challenges and solutions for transformation of global agriculture and food systems**

The IAASTD (International assessment of Agricultural Knowledge, Science and Technology for Development)

.....development and sustainability goals 4 main areas where agriculture needs to transition):

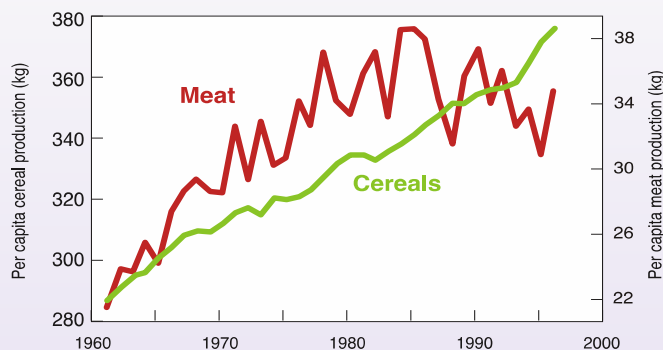
- Eradicating of Hunger and Poverty
- Improving Rural Livelihoods
- **Improving Nutrition and Human Health**
- Facilitating Environmentally, Socially, Equitable and Economically Sustainable Development

...under the challenges of:

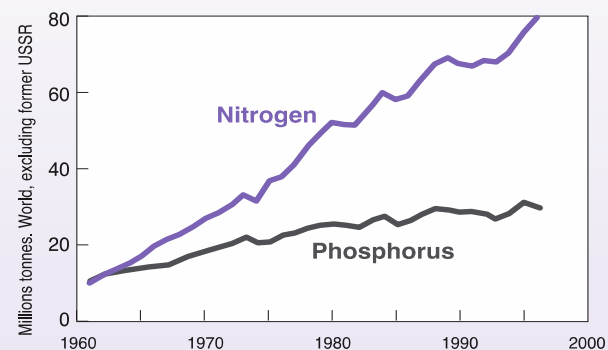
- **Climate Change**
- **Population and Demand Growth**
- **Growing inequity**
- **Shrinking Natural Resources / Energy**

The main problems (too much external / non renewable inputs)

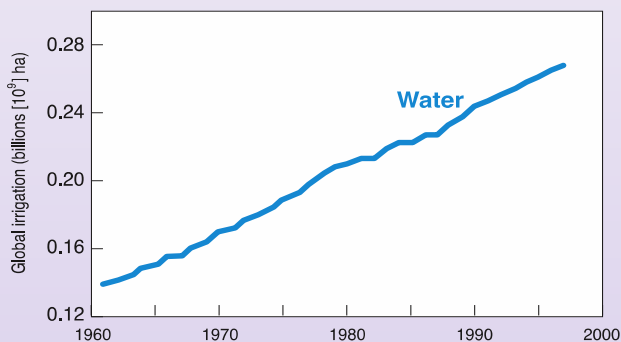
Global trends in cereal and meat production



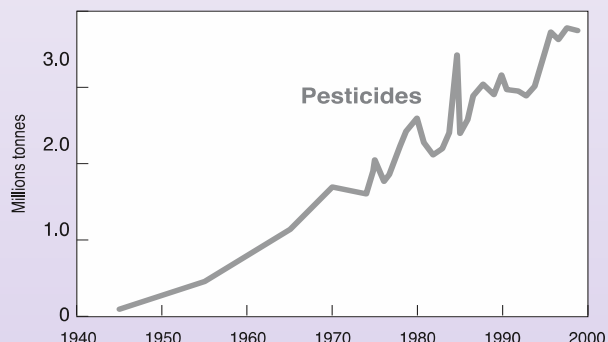
Global total use of nitrogen and phosphorus fertilizers.



Increased use of irrigation



Total global pesticides production



SOURCE: Tilman et al., 2002

IAASTD/Ketil Berger, UNEP/GRID-Arendal

David Tilman et al. Science 2001

The main problems (too little diversity, too many external inputs)

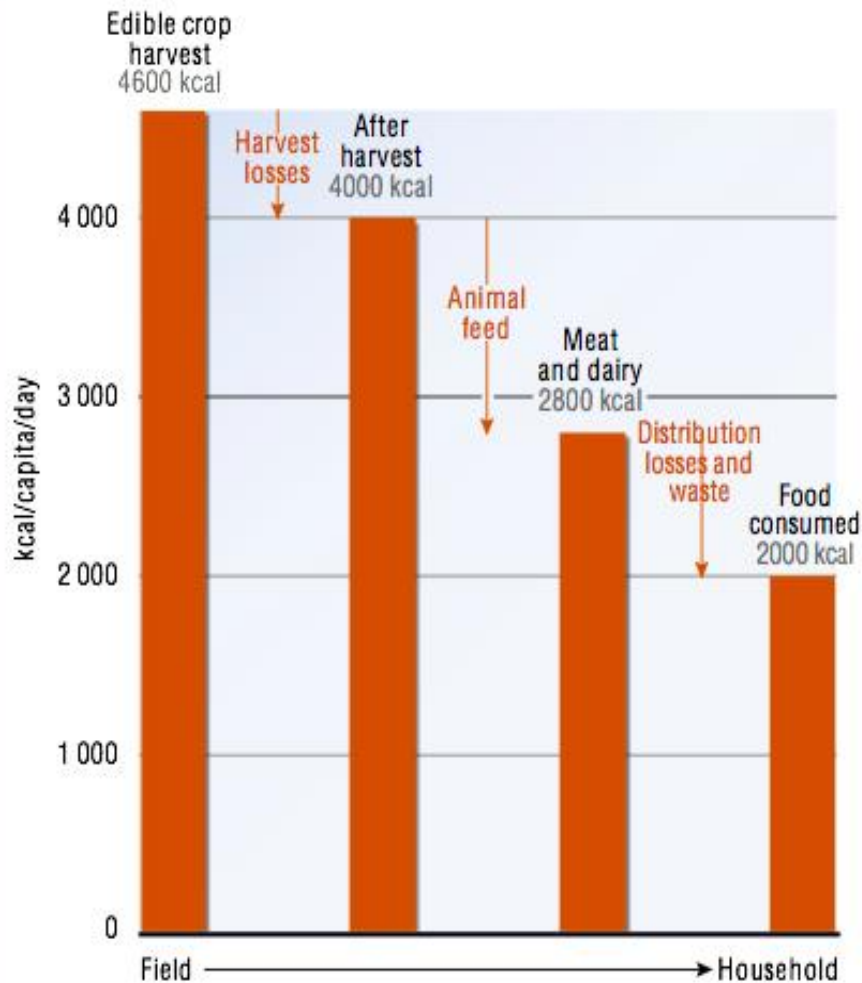


Brown



Green

...overproduction and waste



Tonnes de bouffe jetées à la poubelle

CONSOMMATION. Deux millions de tonnes par an. C'est le poids des aliments qui finissent chaque année à la poubelle en Suisse. Un phénomène inacceptable, selon le WWF. A l'occasion de la Journée mondiale de l'alimentation, l'ONG lance une pétition pour réduire ce gaspillage de moitié d'ici à 2025. Par habitant, le gaspillage atteint près de 250 kg par année. En fait, un tiers des aliments produits n'est jamais consommé, a déploré hier l'organisation environnementale. Ce gâchis a un coût financier: en moyenne, chaque foyer dilapide de 500 à 1000 francs

de denrées alimentaires. Un chiffre qui s'élève à 2,5 milliards de francs au total, à l'échelle mondiale. -ATS

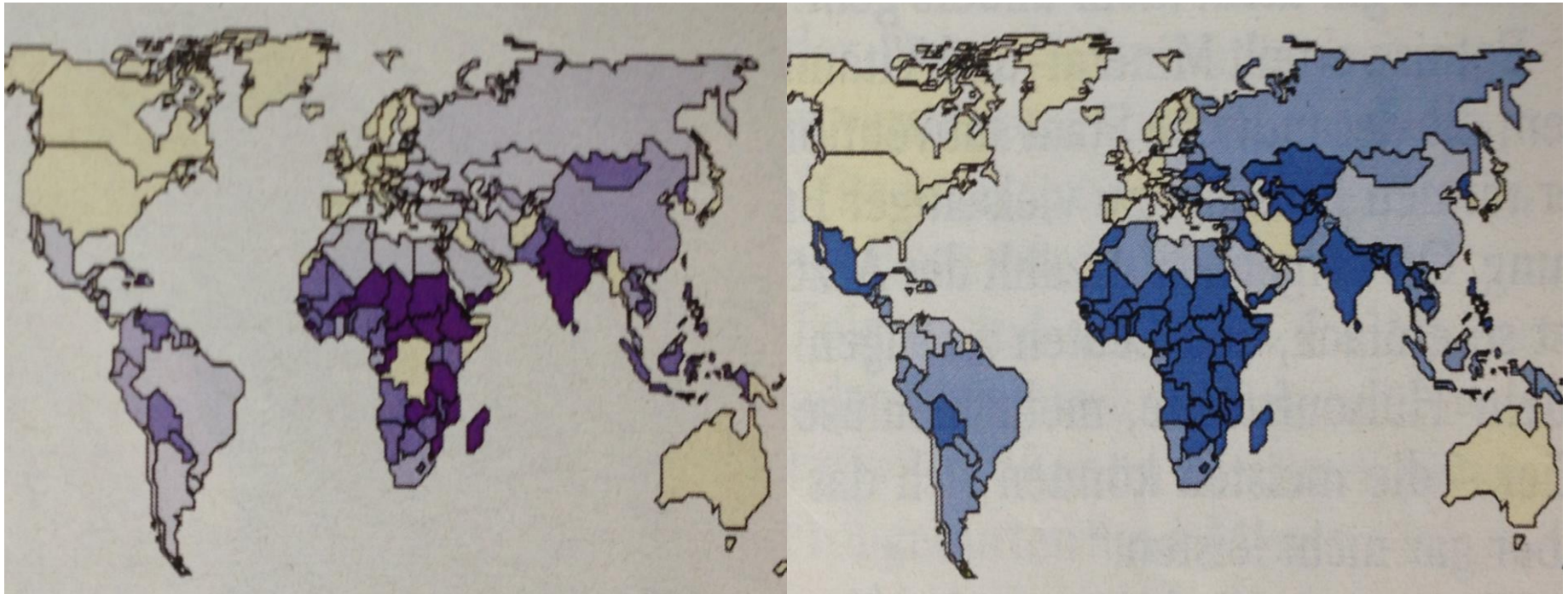


Un tiers des aliments produits n'est jamais consommé. -AFP

Figure 9a-b: The makeup of total food waste¹¹

Source: Lundqvist et al., Godfray

Under nutrition and nutritional deficiencies in a world of plenty.....an inequity issue



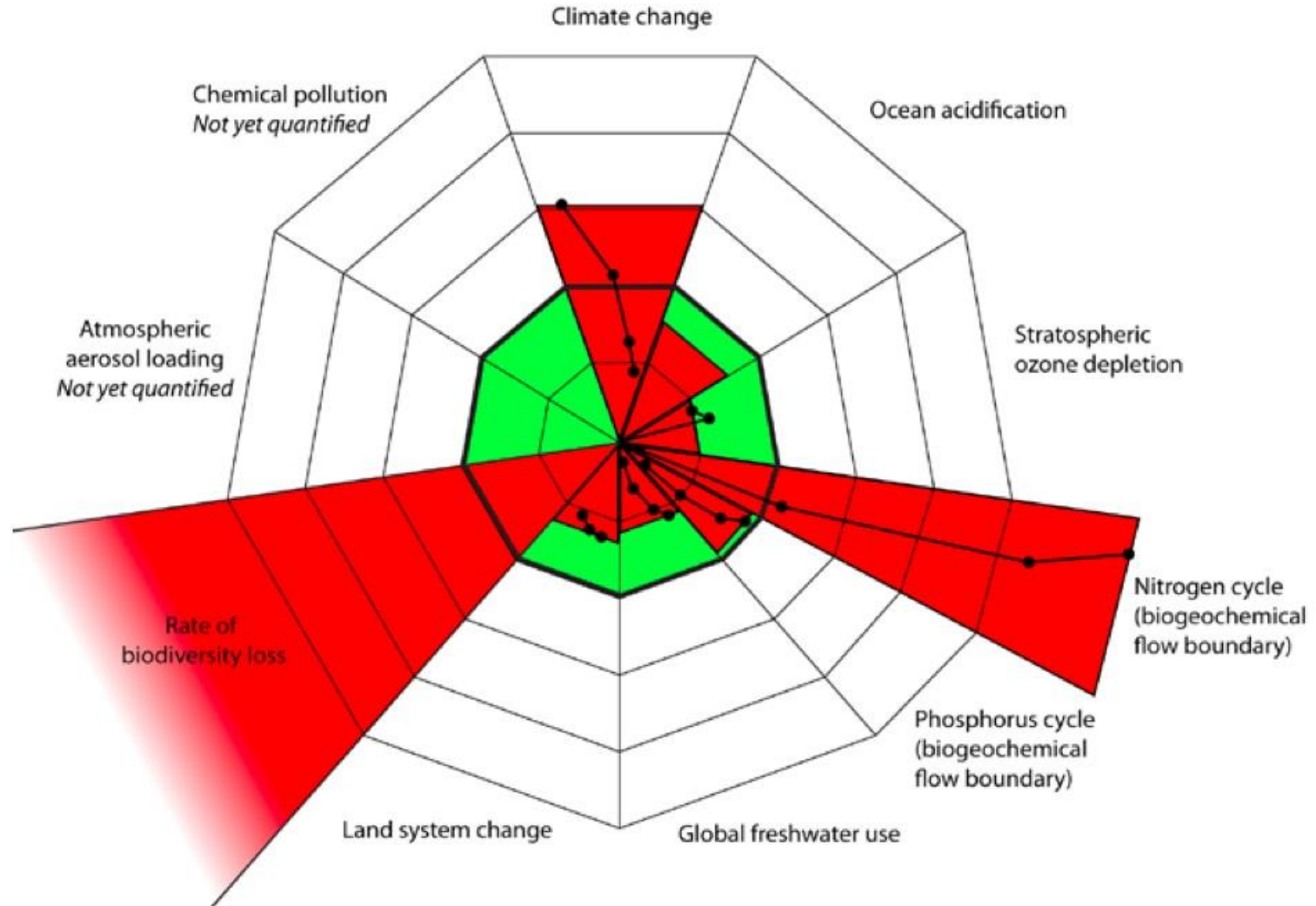
Undernutrition

Vitamin A deficiency

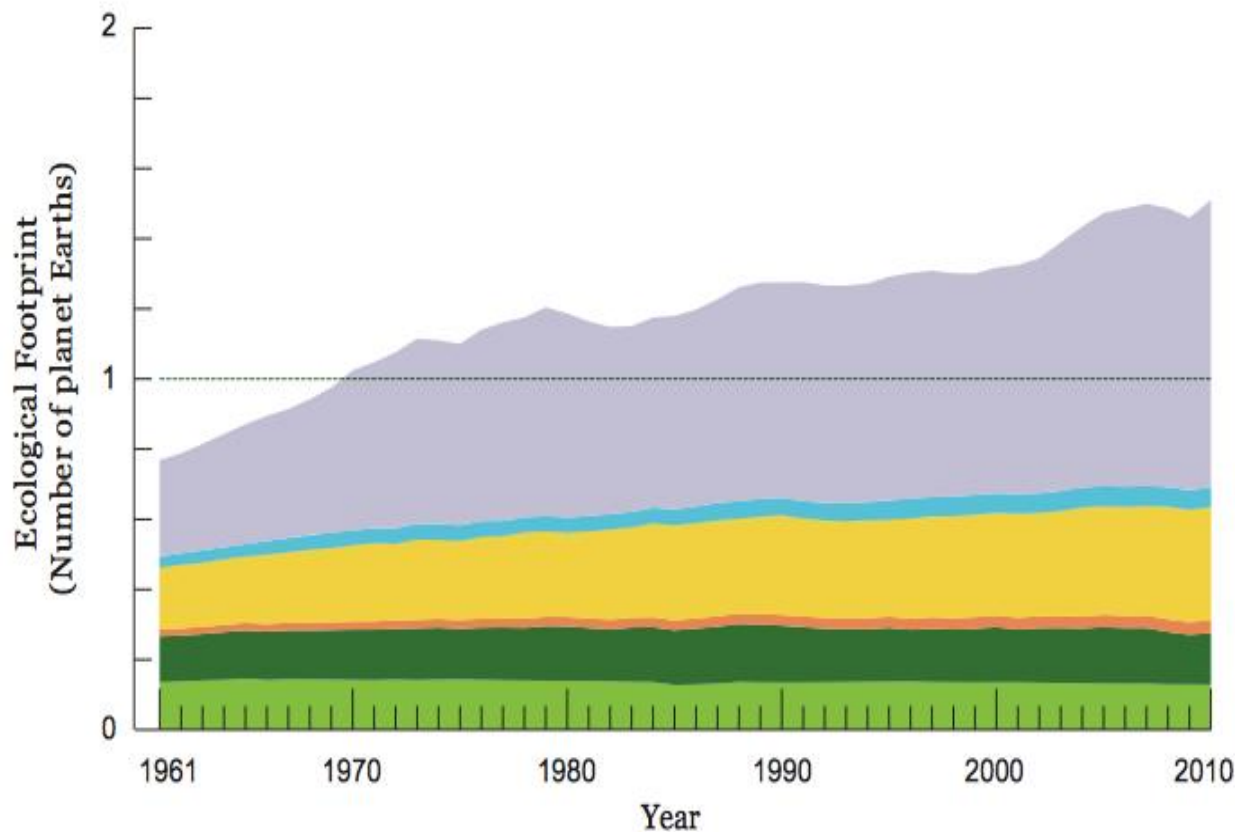
Why sustainable and bio-diverse food systems?

- 800 million undernourished – 1.5 billion obese – 300 million diabetes type 2 cases, etc. => **health problem**
- The industrial food system uses 10 kcal to produce 1 => **energy problem**
- The conventional food system is a major part of the **climate change problem**
- Soil degradation, water shortages, **biodiversity loss underlie food insecurity** => **natural resource problem**
- Industrial agriculture has emptied the rural areas instead of providing quality jobs => **social problem**

Understanding the consequences: (too much damages) Agriculture and the food system as example



Understanding the consequences (too much GHG)



Ecological Footprint components: the carbon component makes up more than half of the total global Ecological Footprint. (Global Footprint Network, 2014).

Key

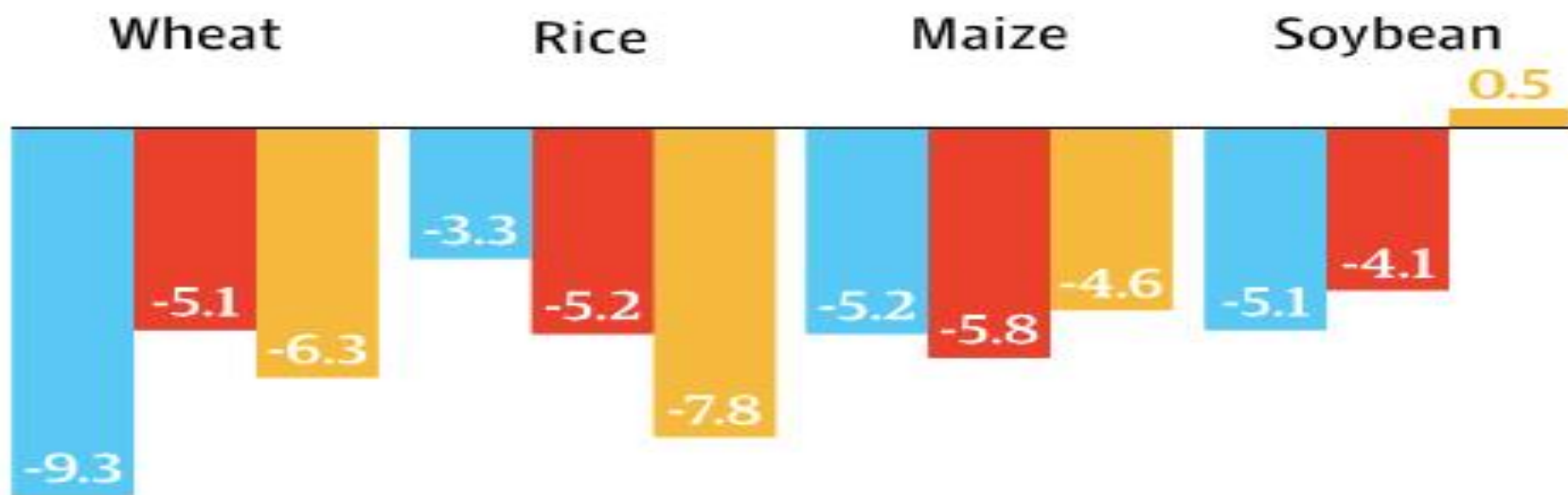
- Carbon
- Fishing grounds
- Cropland
- Built-up land
- Forest products
- Grazing products

Understanding the consequences (too much GHG, less nutrients)

High CO2 cuts crop nutrients

Percentage under co2 levels expected in 2050,

■ Zinc ■ Iron ■ Protein



SOURCE: NATURE

Rio+20: The Future we want

Food security and nutrition and sustainable agriculture

- We acknowledge that **food security and nutrition has become a pressing global challenge**..... addressed through, national, regional and global food security and nutrition strategies.
- We reiterate the importance of empowering rural women as critical agents for enhancing agricultural and rural development and food security and nutrition.
-address the root causes of **excessive food price volatility** and their consequences for global food security and nutrition

Rio+20: The Future we want

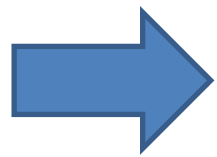
Biodiversity

- **We recognize the severity of global biodiversity loss ... degradation of ecosystems ... these undermine global development, affecting food security and nutrition.....**



Challenges and solutions for transformation of global agriculture and food systems

- «Business as usual is not an option»
- Agriculture is the world's largest user of land
- Predominant smallholder farmers
- Sustainable agriculture incorporates:
 - Economic dimension (e.g. jobs, sustainable production)
 - Social dimension (e.g. health, empowerment of women)
 - Environmental dimension (e.g. **biodiversity**, climate change, energy)



Sustainable, bio-diverse agriculture and food systems are key for sustainable development

...shift the thinking

From

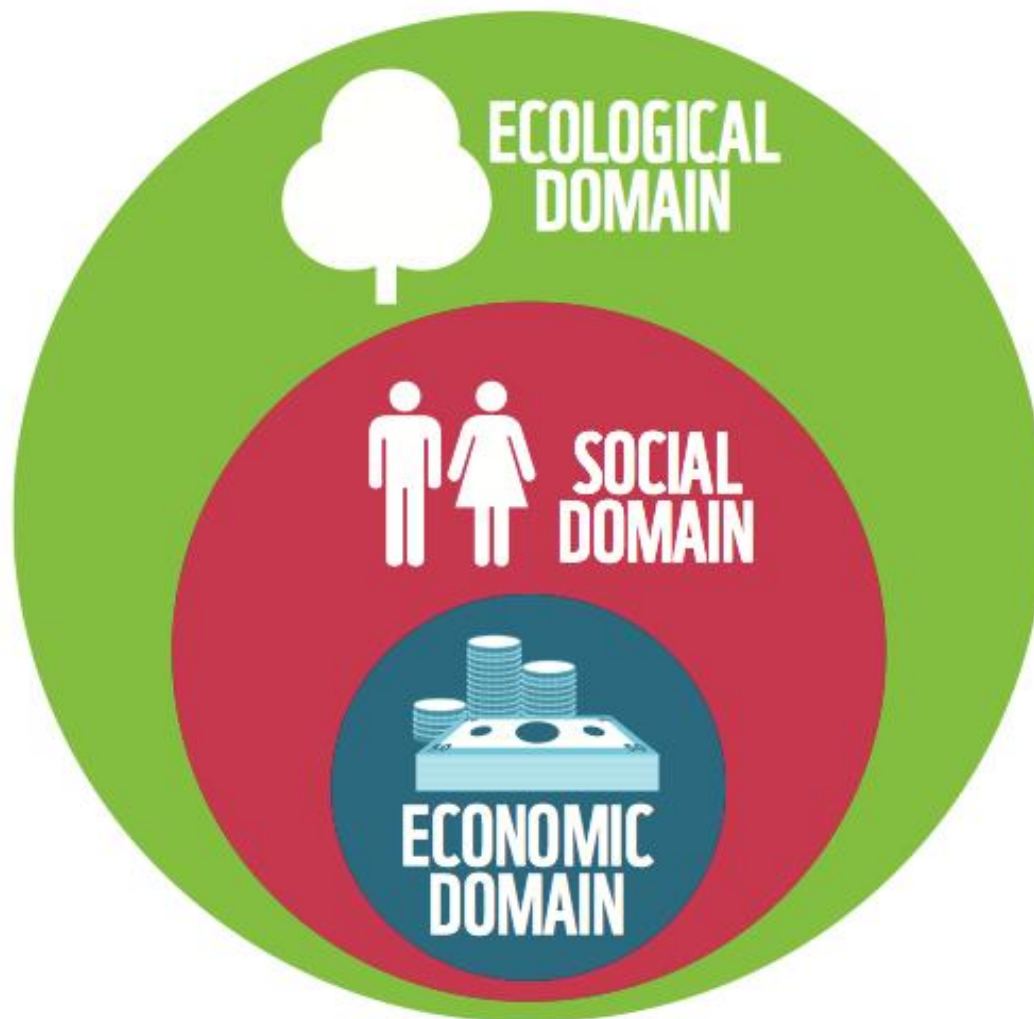


To



A Jones et al, 2011. *Virtuous Circles: Values, Systems, Sustainability*

Multifunctionality: the 3 dimensions

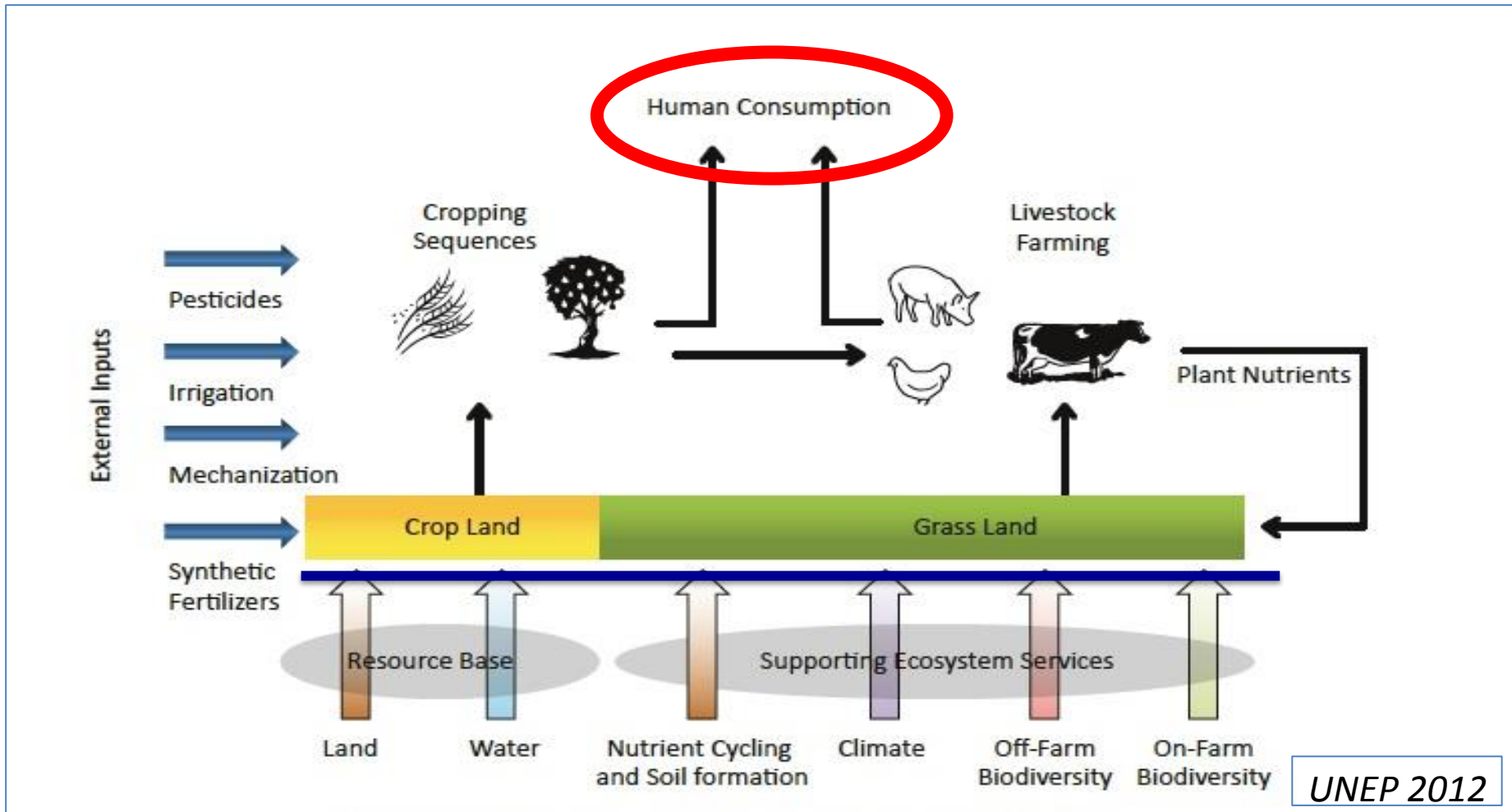


Multifunctionality: the 3 dimensions

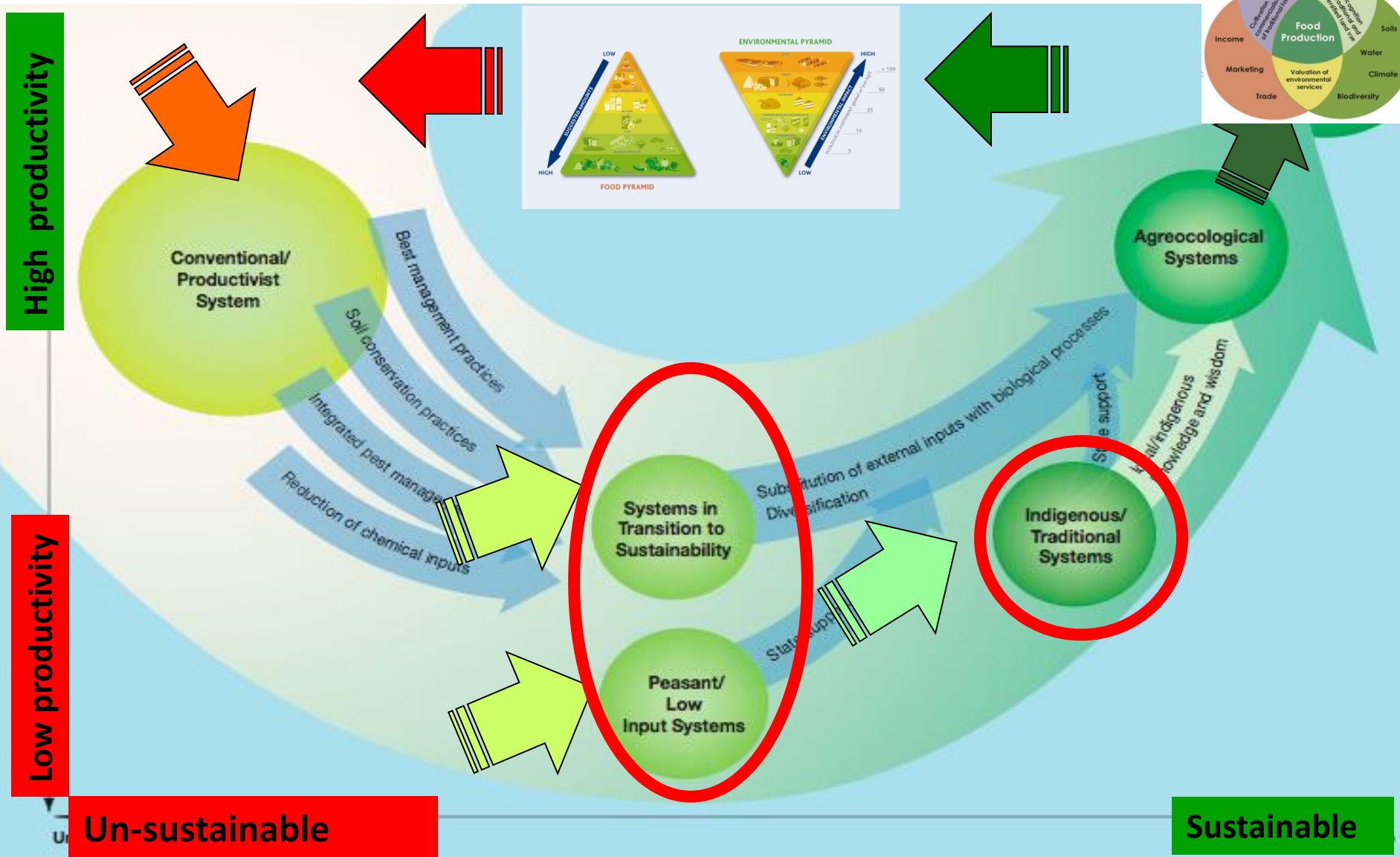


Thinking in system: what is connect to what?

Ecosystem services and true costs.....



...transformation path of agriculture and food systems: the consumer feed back loop



.....challenges and solutions

...it matters what and how we eat

The Changing Face of American Grocery Stores

<http://www.fool.com/investing/general/2013/10/27/the-changing-face-of-american-grocery-stores.aspx>

Brian Stoffel
October 27, 2013



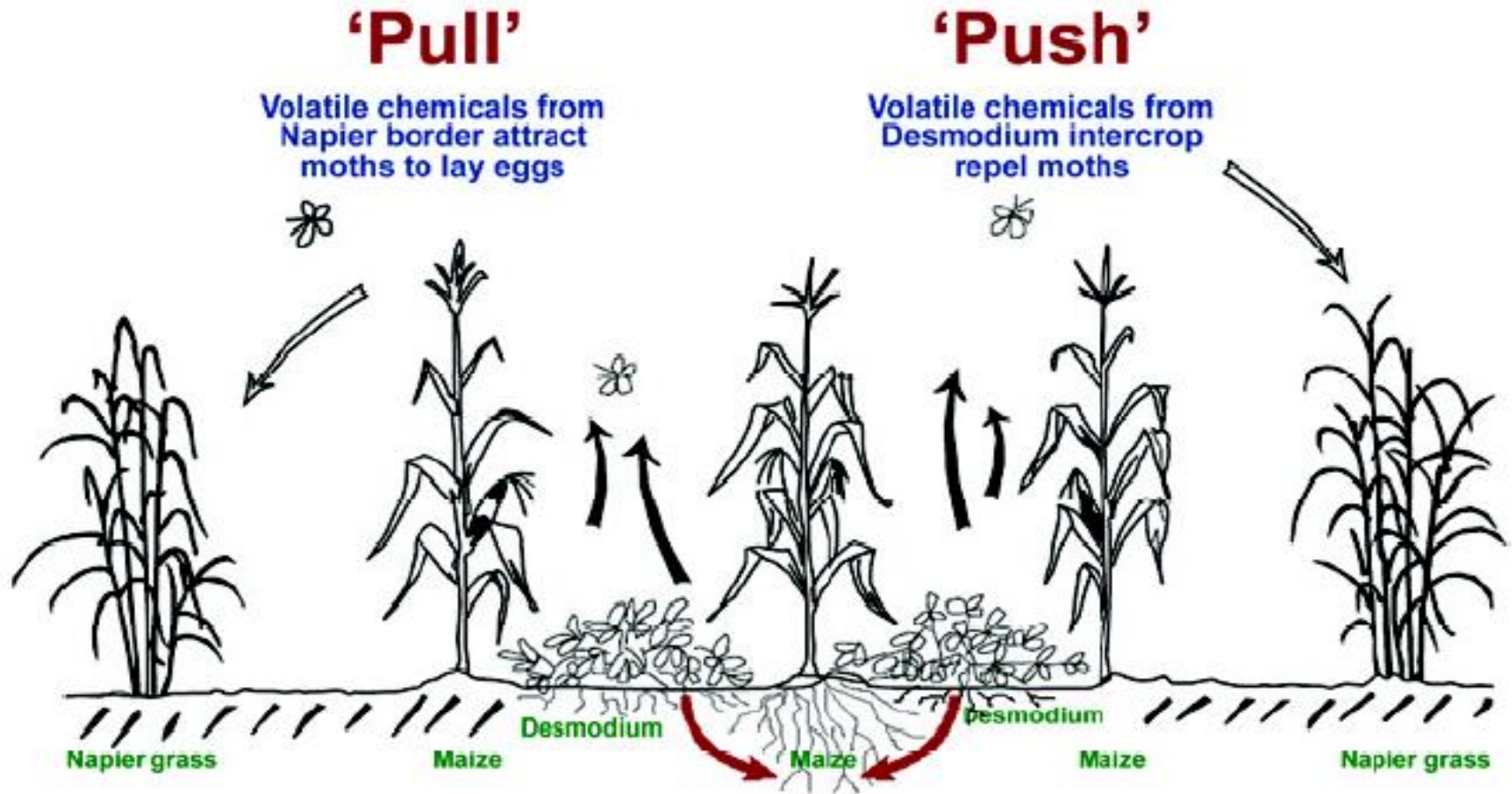
.....challenges and solutions

...it matters what and how we eat

Fair prices / true prices are needed, as well as a stop to the dumping of cheap food (subsidized) from developed to developing countries.



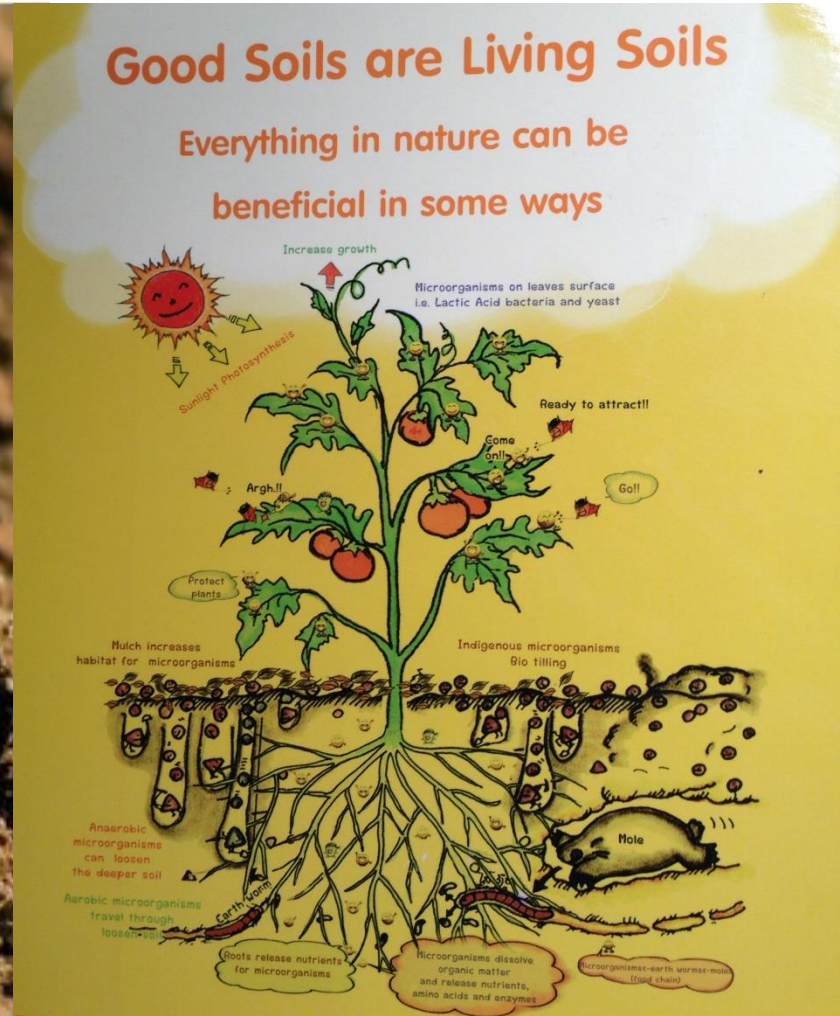
The main solutions: agroecological practices (Push-Pull to manage pests, weeds and soil fertility)



The main solutions: Healthy animals (on farm)



The main solutions: “biodiversity underground”



The main solutions: “biodiversity underground”



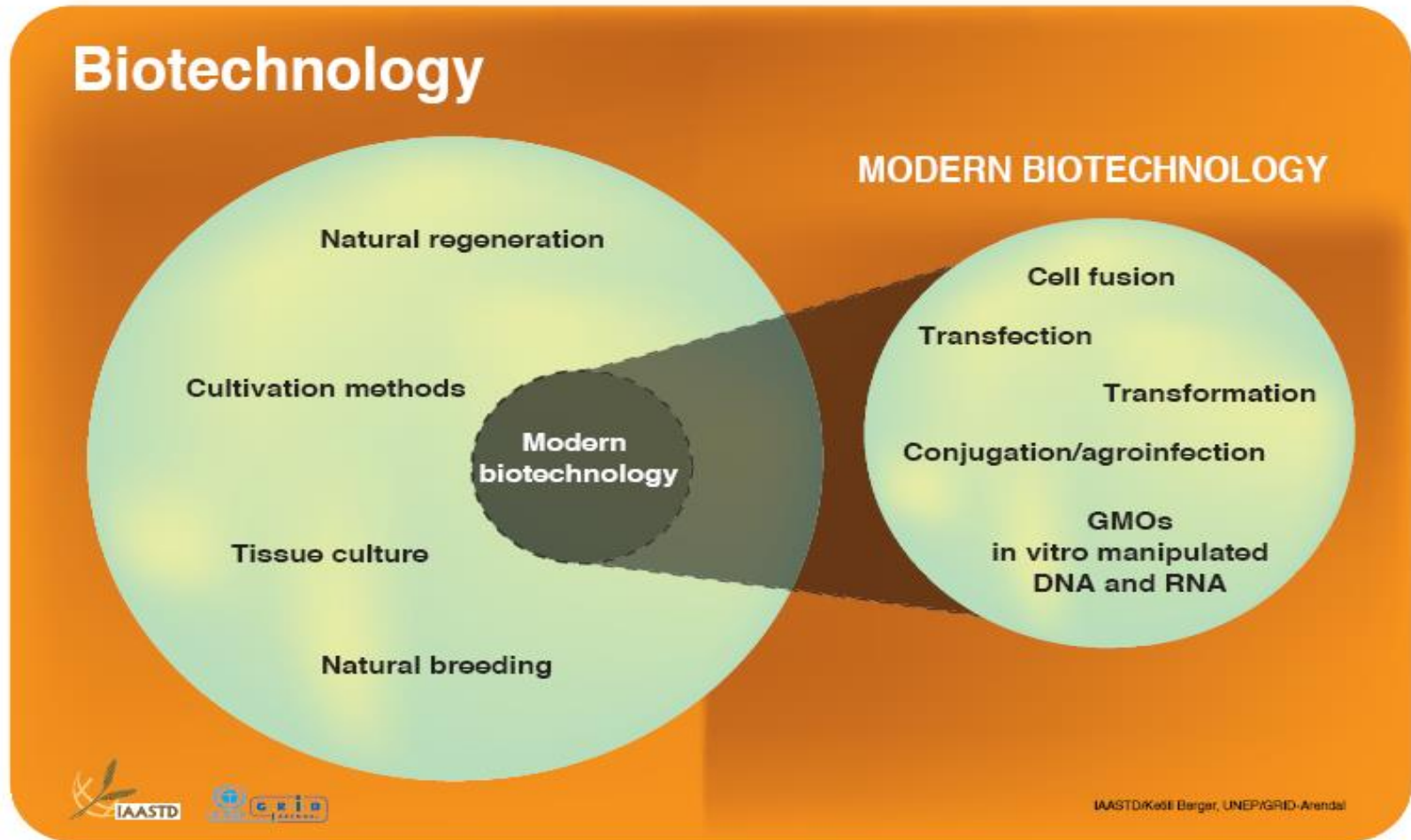
The main solutions: biological / natural pest and disease control (biodiversity above ground)



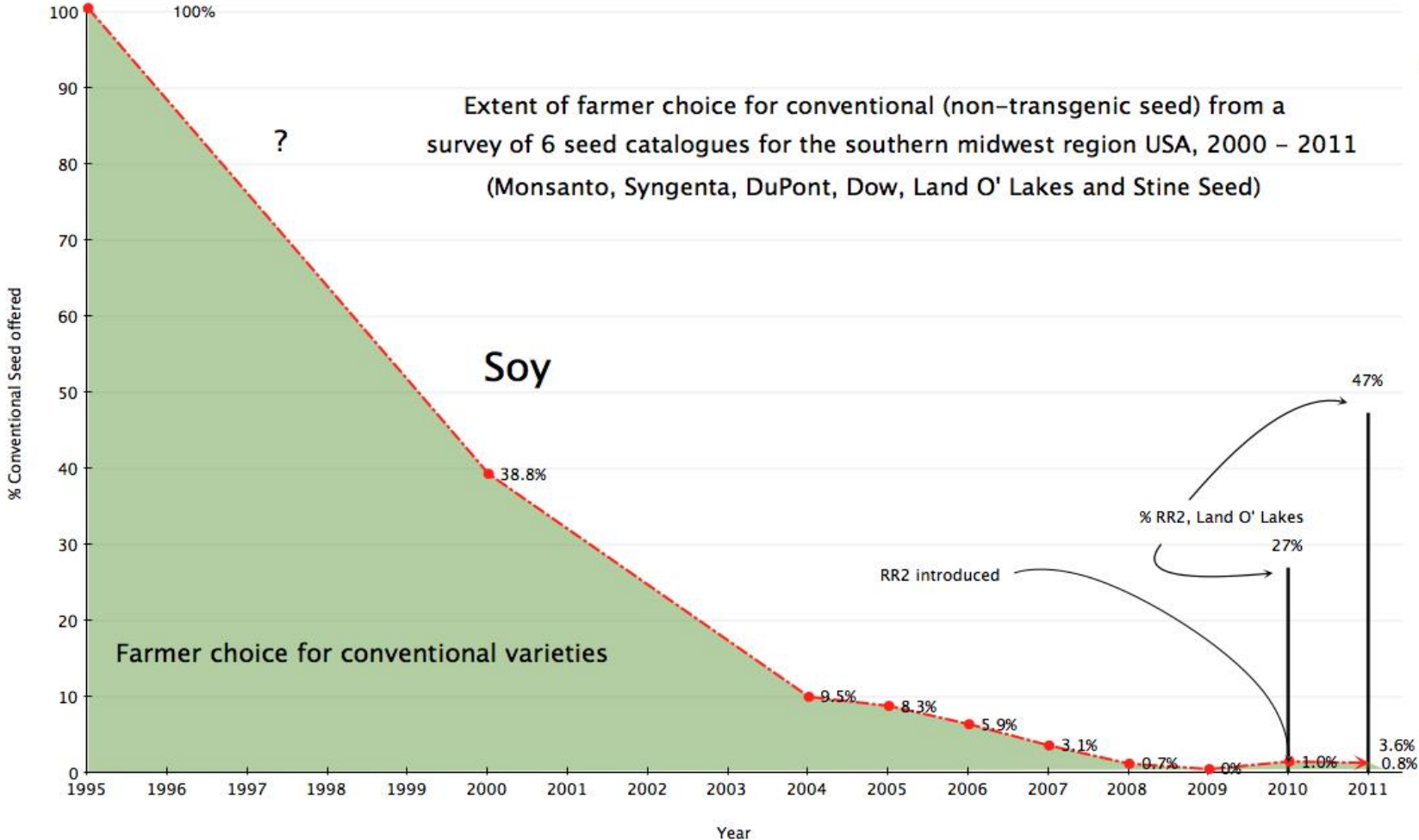
The main solutions: promotion of pollinators (biodiversity above ground)



The main solutions: Quick fix i.e., GMOs (less biodiversity)



The main solutions: Quick fix less genetic diversity?



David Quist, 2010 pers com

The main solutions: less genetic diversity?

The numbers.....

Industrial agriculture based on:

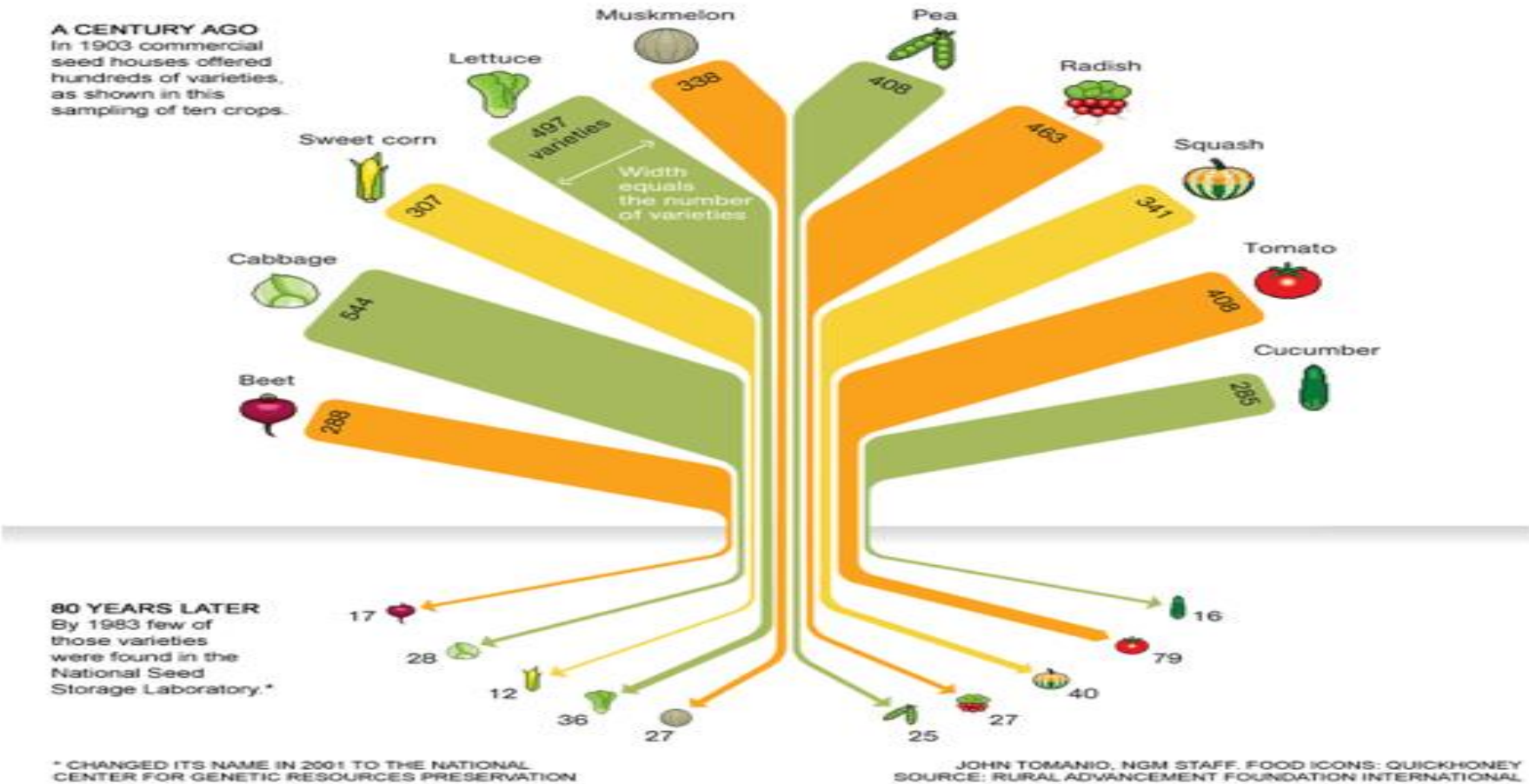
- 12 crops and about 80'000 varieties
- 5 animals species and some 100 races

Small holder Farmers work with:

- 7'000 different crops and over 2 million varieties.
- 40 animal species and over 7000 races

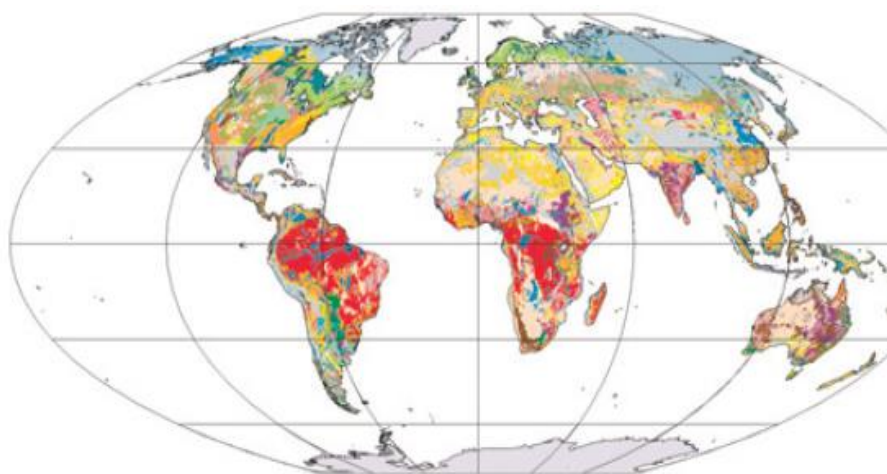
(source: Goethe, T. (2013))

The main solutions: (less genetic diversity?)



The main Solutions: R&D & Edu

- Improve, expand extension services and capacity bldg
- Strengthen Institutions
- Emphasize local solutions



Albituvisols	Chernozems	Durisols	Gypsisols	Luvvisols	Phaeozems	Solonchaks	Glaciers
Acrisols	Calcisols	Fluvisols	Histosols	Lixisols	Planosols	Solonetz	No data
Andosols	Cambisols	Ferralsols	Kastanozems	Nitisols	Plinthosols	Umbrisols	Water b.
Arenosols	Cryosols	Gleysols	Leptosols	Podzols	Regosols	Vertisols	



Is such a transition possible and how?

A systems model for the transition: scenarios from the UNEP GER ag chapter 2011

Global investments across sectors (2% of GDP, Stern report);
0.16% of GDP (141 Bn \$/year) invested in agriculture for:

- **Pre harvest losses** (training activities and effective pest management with bio-products, IPM)
- **Ag management practices** (cover transition costs from till to no till, organic, agroecological and **biodiverse** agriculture, training, access to small scale mechanization and irrigation)
- **R&D** (research in soil biology and agronomy, crop improvement (**orphan crops**), appropriate mechanization, irrigation, and more)
- **Food processing** (better storage and processing in rural areas, efficient processing, marketing, less waste)

... the numbers: we can win-win-win by 2050

Investing 0.2% of total GDP (\$141 Billion) / year

Indicator	Unit	Baseline	Green	BAU
Agricultural production	Bn US\$/year	1'921	2'852	2'559
Crops	Bn US\$/year	629	996	913
Employment	M people	1'075	1'703	1'656
Soil quality	Dmnl	0.92	1.03	0.73
Water use	Km ³ / year	3'389	3'207	4'878
Land	Bn ha	1.2	1.26	1.31
Deforestation	M ha/ year	16	7	15
Calories for consumption	Kcal/person/d ay	2'081	2'524	2'476

Source: UNEP Green Economy Report (2011)

Conclusions

There are many innovative solutions to the challenges facing long term food and nutrition security

- **promote sustainable bio-diverse agriculture methods**
- **assist family farmers in adapting to climate change and short-term climate variability (risks)**
- **promote policies to provide smallholder farmers with legal rights to land, facilitating access to markets and infrastructure**
- **providing women farmers with access to edu, info and inputs equal to those of their male counterparts**
- **Introduce full cost accounting to promote change in diets**
- **Change the policy environment and develop new policies (from MDGs to SDGs) and use national assessments**
- **Substantial public investment for R&D, the re-orientation of research, education and development institutions**

An aerial photograph of a vast, rolling landscape of green hills and valleys. The terrain is divided into numerous fields by stone walls and hedgerows. The hills are covered in lush green grass, and there are scattered trees and small buildings throughout the scene. The sky is filled with soft, white clouds. The text 'Thank you' is written in a large, bold, yellow font across the center of the image.

Thank you