



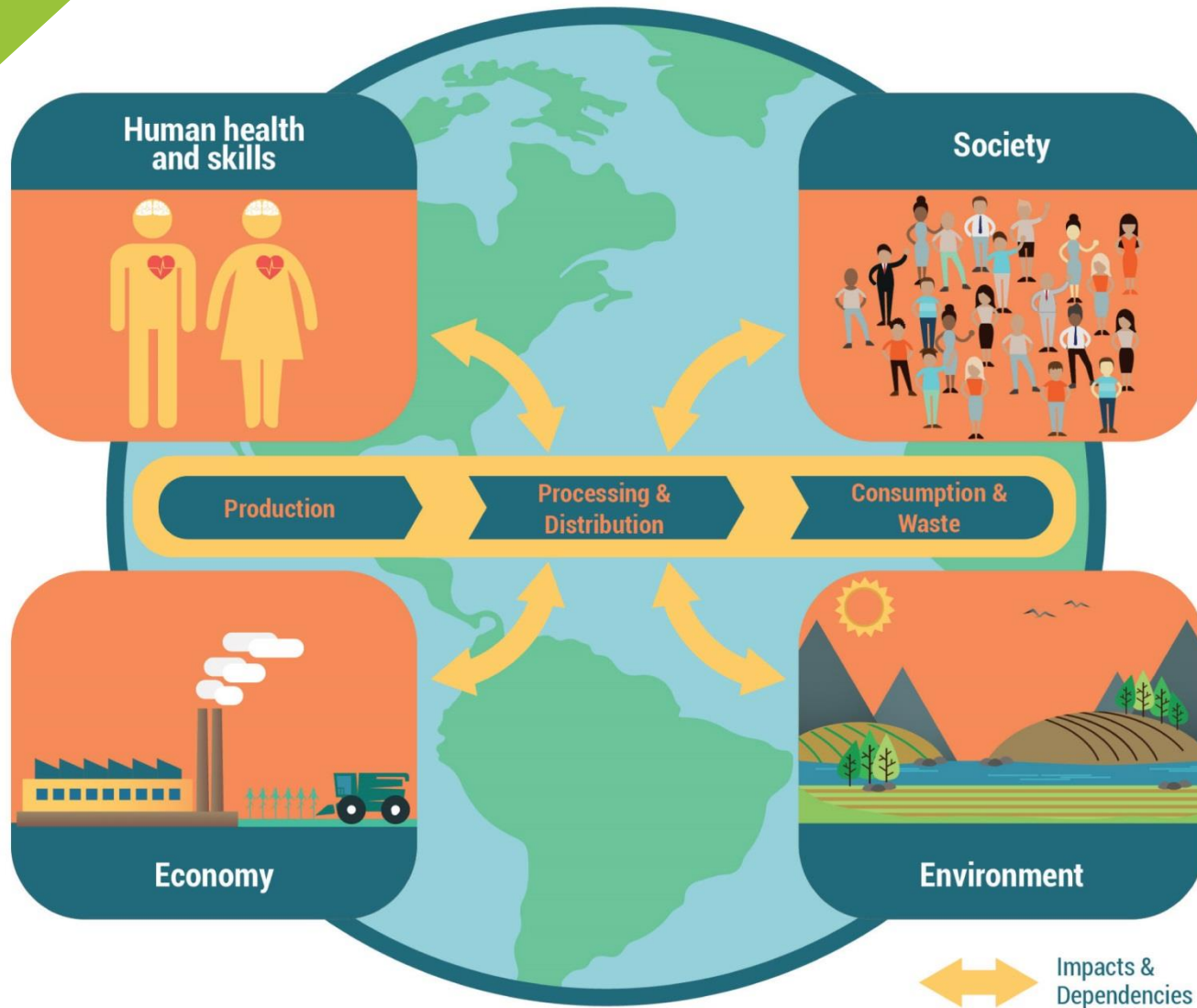
# **TEEBAgriFood**

## **The Economics of Ecosystems and Biodiversity for Food and Agriculture**

Nairobi, 15 February 2017

Alexander Müller

# Eco-agri-food systems complex – impacts and dependencies



# The visible and invisible flows of agricultural production

## AGRICULTURE & FOOD SYSTEMS



# The visible and invisible flows of agricultural production

## HUMAN SYSTEMS

## AGRICULTURE & FOOD SYSTEMS

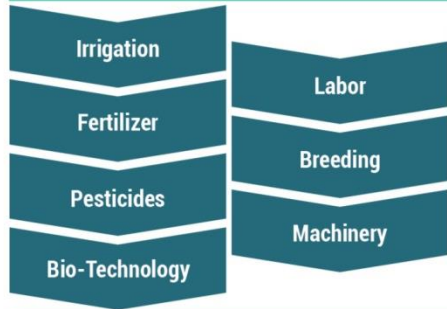


## BIODIVERSITY & ECOSYSTEMS

■ Inputs   ■ Outputs   ■ Invisible positive flows   ■ Invisible negative flows

# The visible and invisible flows of agricultural production

## HUMAN SYSTEMS



## AGRICULTURE & FOOD SYSTEMS



## BIODIVERSITY & ECOSYSTEMS



# The visible and invisible flows of agricultural production

## HUMAN SYSTEMS



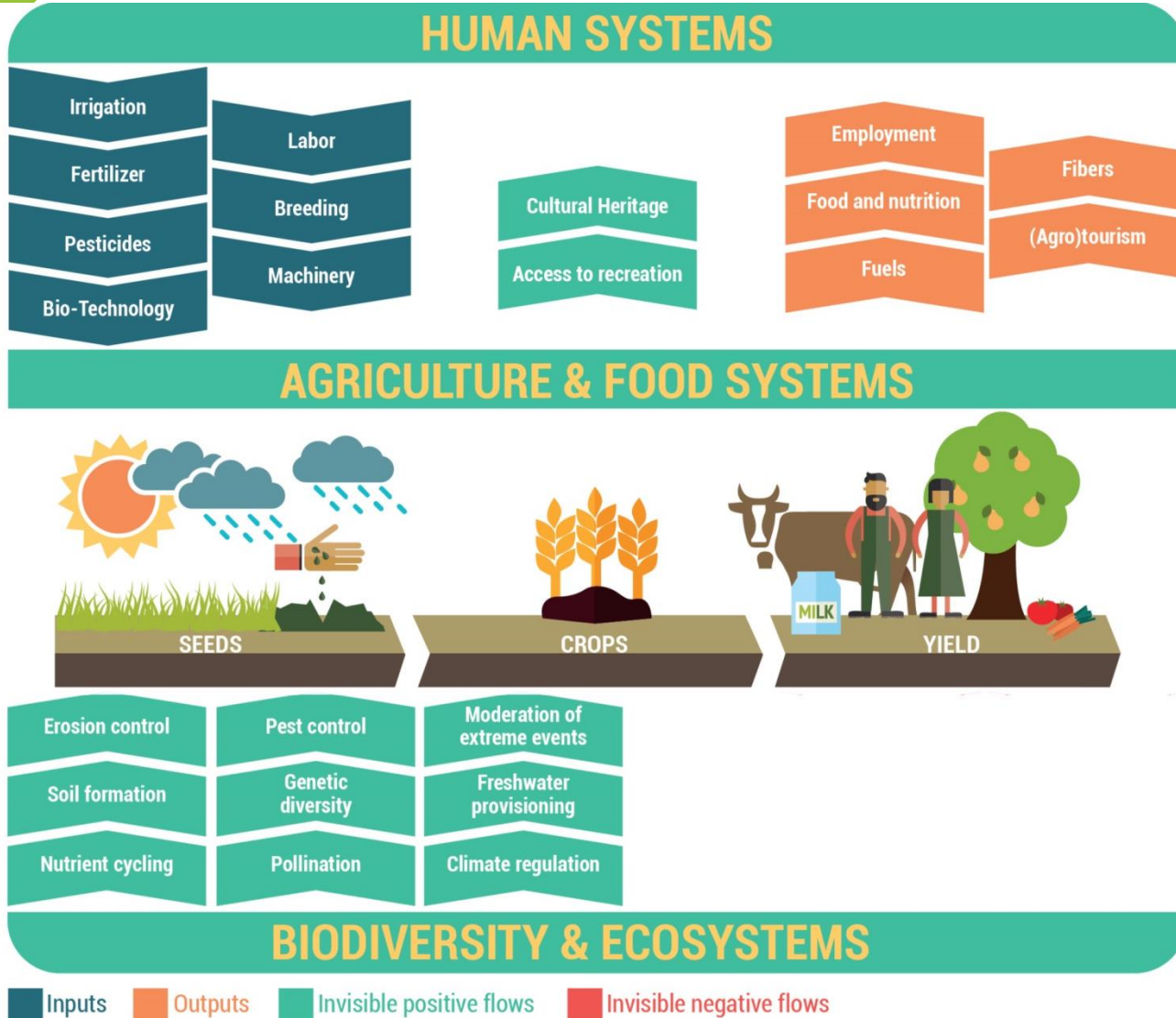
## AGRICULTURE & FOOD SYSTEMS



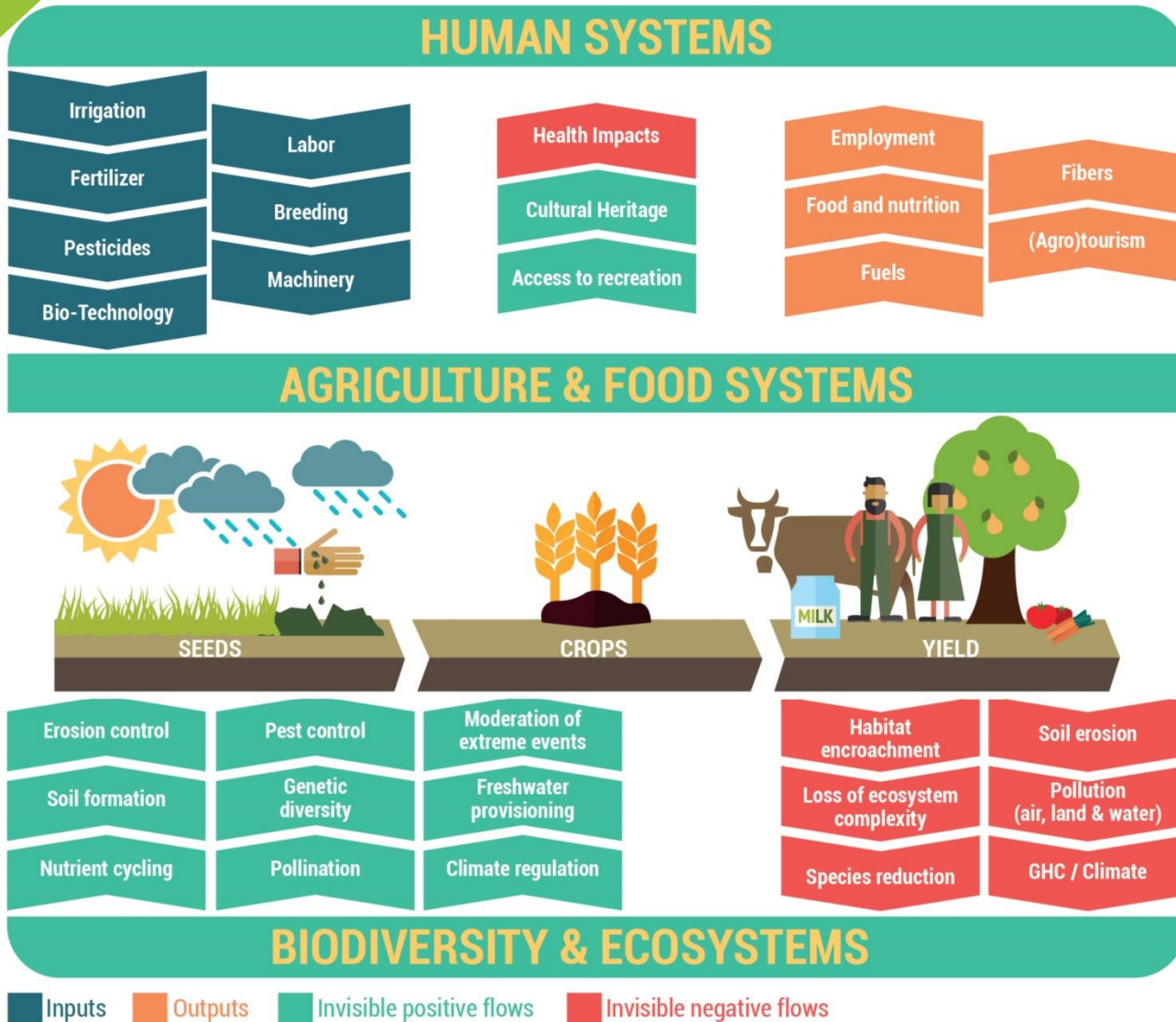
## BIODIVERSITY & ECOSYSTEMS



# The visible and invisible flows of agricultural production



# The visible and invisible flows of agricultural production







## Setting the Scene

- **There is not one single global food system – variety and complexity of different food systems in the world.  
TEEBAgriFood has to take different systems into account**
- **Production and consumption of food is based on culture, regional, socioeconomic and environmental conditions**
- **There is a trend towards globalization and western diets**
- **Growing consensus: Current ag. production is not sustainable**
- **Growing population will increase demand**
- **Climate change multiplies existing threats**



## **SDGs: How to manage complexity to achieve sustainability**

- **Eradication of hunger and poverty in the center of SDGs**
- **SDGs are designed to support transformation**
- **Are there different “models” of ag development?**
- **Demand for management systems for sustainable use of natural resources will grow**
- **Importance of biodiversity for human wellbeing is recognized – food production still responsible for 60% of biodiv. loss**
- **Role of technologies**

# 45 t/ha living material in temperate grassland soil



**Macrofauna family**

**Earthworm**

- Beetle larva
- Woodlouse
- Earthworm
- Ant
- Millipede
- Termite

© J.C. P. Schmidt

An earthworm contributes to soil fertility and improves the soil structure by digesting several tonnes of soil a year.

**Actual size 5-30 cm**



Photo credit Roger Klidd  
modified by Alan Belward  
stats Karl Ritz

45 tons living material = 900 sheep –  
all in the first meter



Photo credit Roger Klidd  
modified by Alan Belward  
stats Karl Ritz

## 5 t/ha living material in arable soil



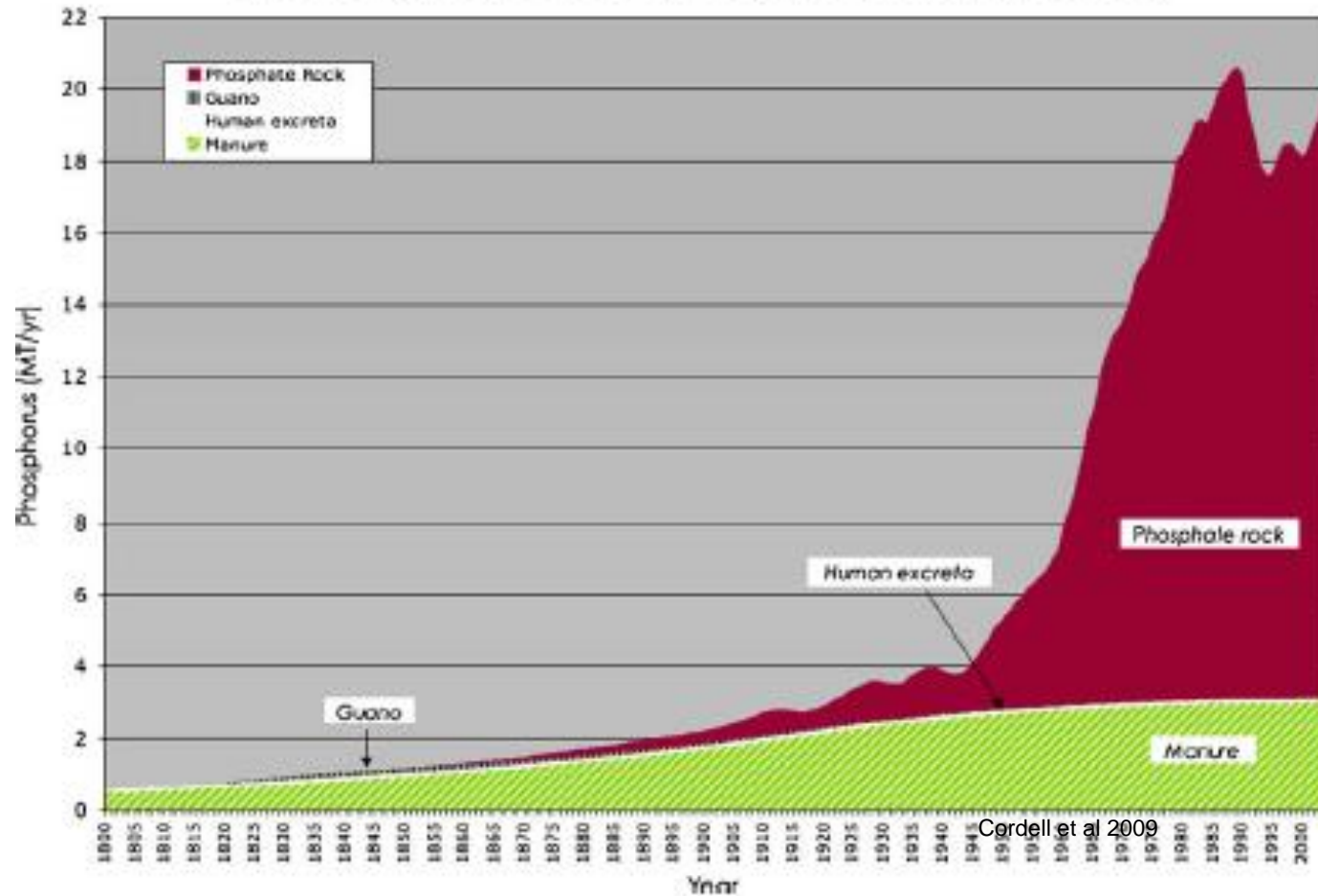
Photo credit Roger Klidd  
modified by Alan Belward  
stats Karl Ritz

5 tonnes = 100 sheep



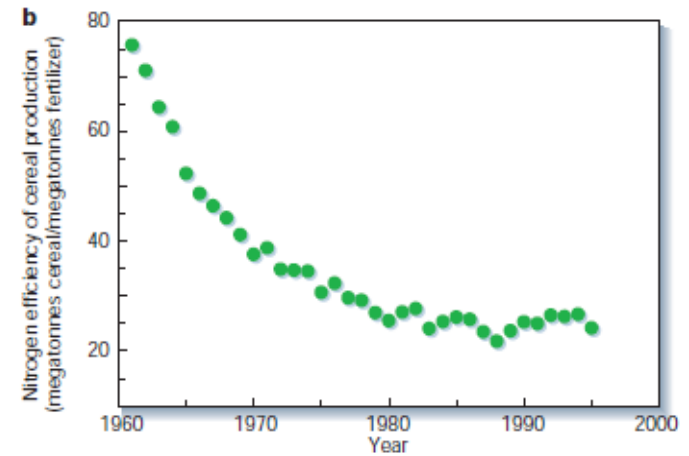
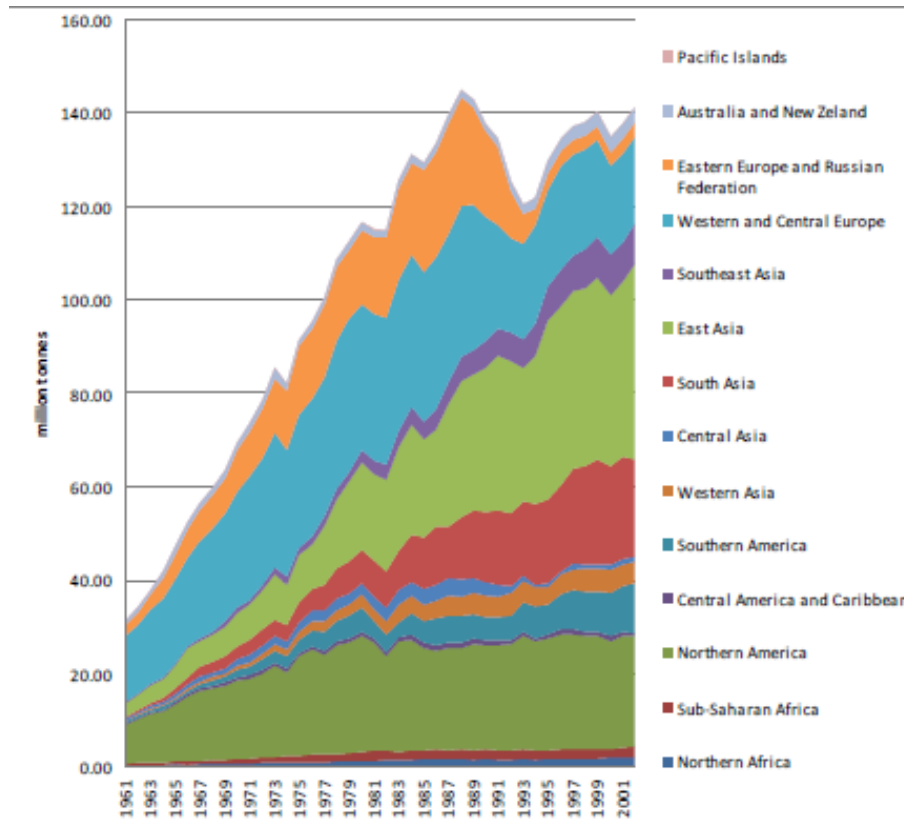
# Increased use of Phosphorus

Historical global sources of phosphorus fertilizers (1800-2000)



# Is Efficiency the Solution?

## Trends in Fertilizer use and nitrogen efficiency



Tilman et al., 2002

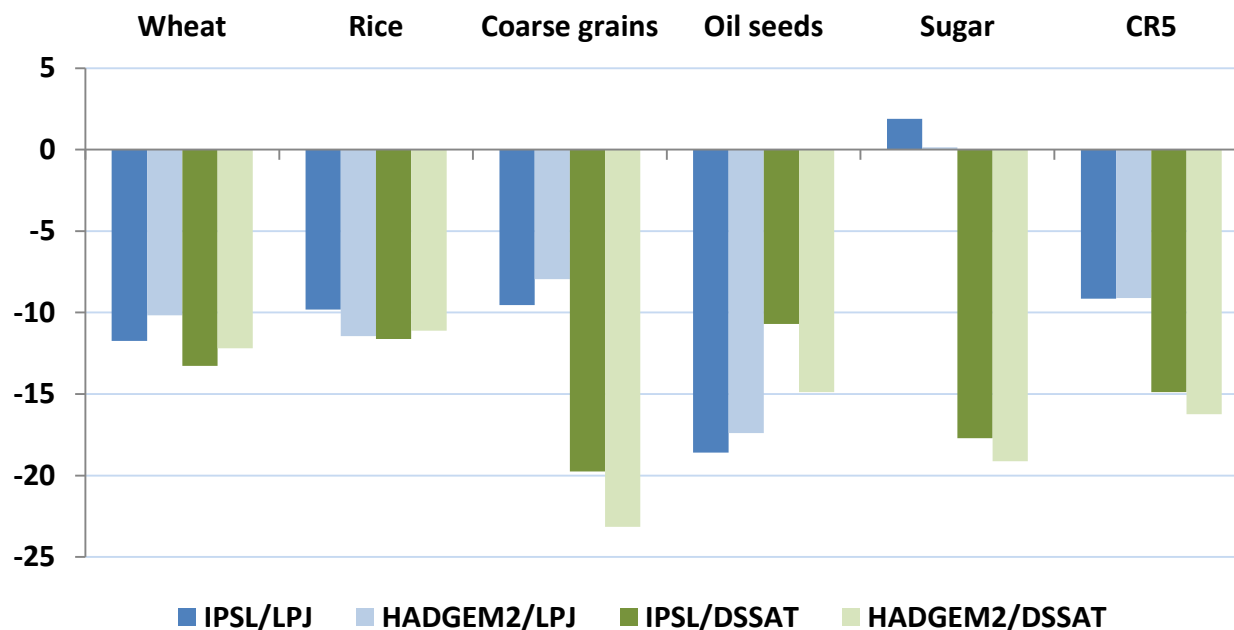
FAO SOLAW 2011



# AT2050/80: **provisional** nutritional outcomes (global averages/aggregates)

	undernourished		% of population with kcal/person/day		obese	
	%	million	>2700	>3000	%	million
2005/07	13	844	57	28	9	570
2050	4	330	91	52	15	1400
2080	2	150	98	66	21	2000

# Simulated impacts for the four **climate scenarios**: global average for major crops in 2050 with respect to reference



Source: Shocks from IFPRI as interpreted for use in the ENVISAGE model, Nelson et al. (2014).



**TEEBAgriFood sounds complex –  
and it is!**