Approaches to defining sustainable intensification

Dominic Moran

EAAP
Copenhagen 25th August 2014

Leading the way in Agriculture and Rural Research, Education and Consulting

Defining sustainable intensification

- Clarifying concepts /perspectives
- What's new?
- Locating the science
- Institutional challenges (market failures)

Sustainable intensification

- Clearly articulated?
- Food insecurity/shortage –weak institutions -price volatility
- Limits to growth - resource thresholds and ecosystem tipping points, of which the most important…
- Climate change (but could equally focus on water and biodiversity)
- Demographic change (population – migration)
- Economic convergence in consumption patterns –esp. diets
- Resource inter-linkages: the scarcity or WEL "nexus"
- No global ag-food governance architecture
- Concentration of supply-chain power

- Meta questions: ethics, justice and non-human wellbeing
- Been here before?

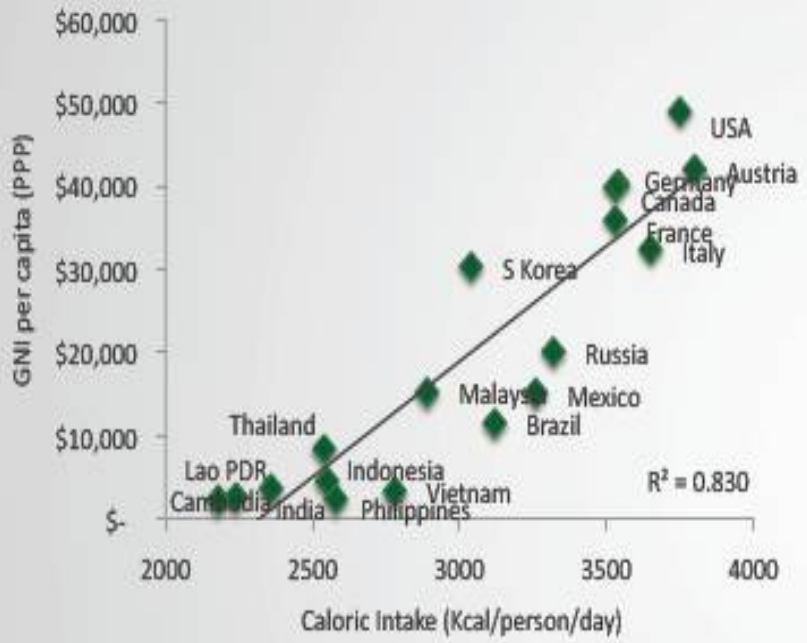
Sustainable intensification

- Been here before?

- Climate change (but could equally focus on water and biodiversity)
- Demographic change (population – migration)
- Economic convergence in consumption patterns
- Resource inter-linkages; the scarcity “nexus”
- Concentration of power along food chain

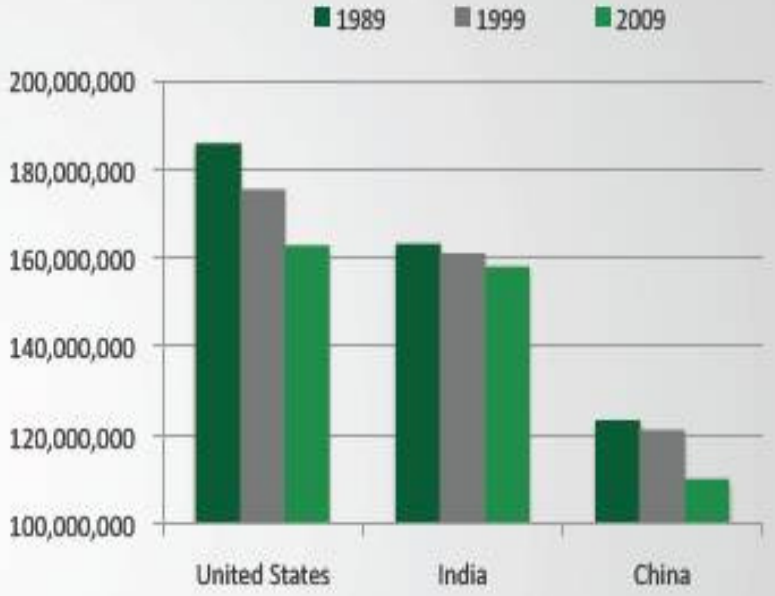
Food & Agriculture: Rising Demand & Declining Supply

Strong Correlation Between Income and Food Consumption



Source: World Bank, United Nations FAO

Declining Supply of Arable Land from Top 3 Agricultural Producers



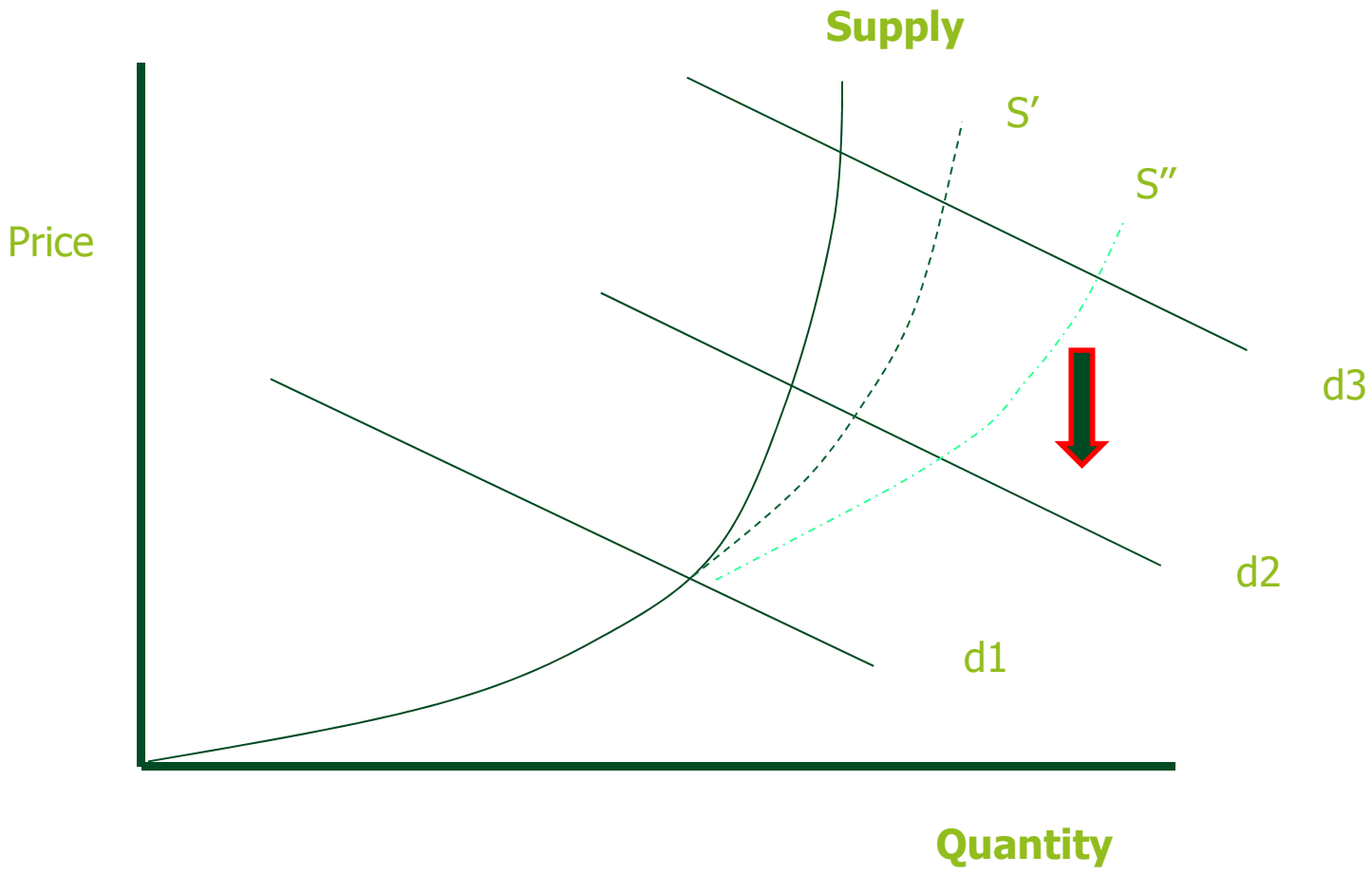
Source: World Bank

Key Takeaways:

- Global middle class will grow by 3bn people over the next 20 years.
- Rising incomes in Asia will drive food consumption.
- Investments in agricultural commodities serve as inflation hedge.

Key Takeaways:

- World population projected to reach 9bn by 2050. Experts say global food production will need to increase by as much as 70%
- China, India & US alone comprise > 40% of the global population and arable land is decreasing in all three countries


Supply
S′
S″
Price
d3
d2
d1
Quantity

Supply side (production)

The Science

- Biotechnology (feed-energy conversion trajectory)
- Pasture restoration
- Low input systems
- Low carbon farming
- Land sparing / sharing
- Innovation
- Supply response

Barriers

- R&D spending and its governance
- Public acceptability
- Institutions and incentives (market structure)

Demand side (consumption)

- Consumption choices
- Waste management

Barriers:

- Institutions and incentives (market structure)
- Public acceptability – equity & justice

- Is growth the answer? Maybe...

Green growth rhetoric

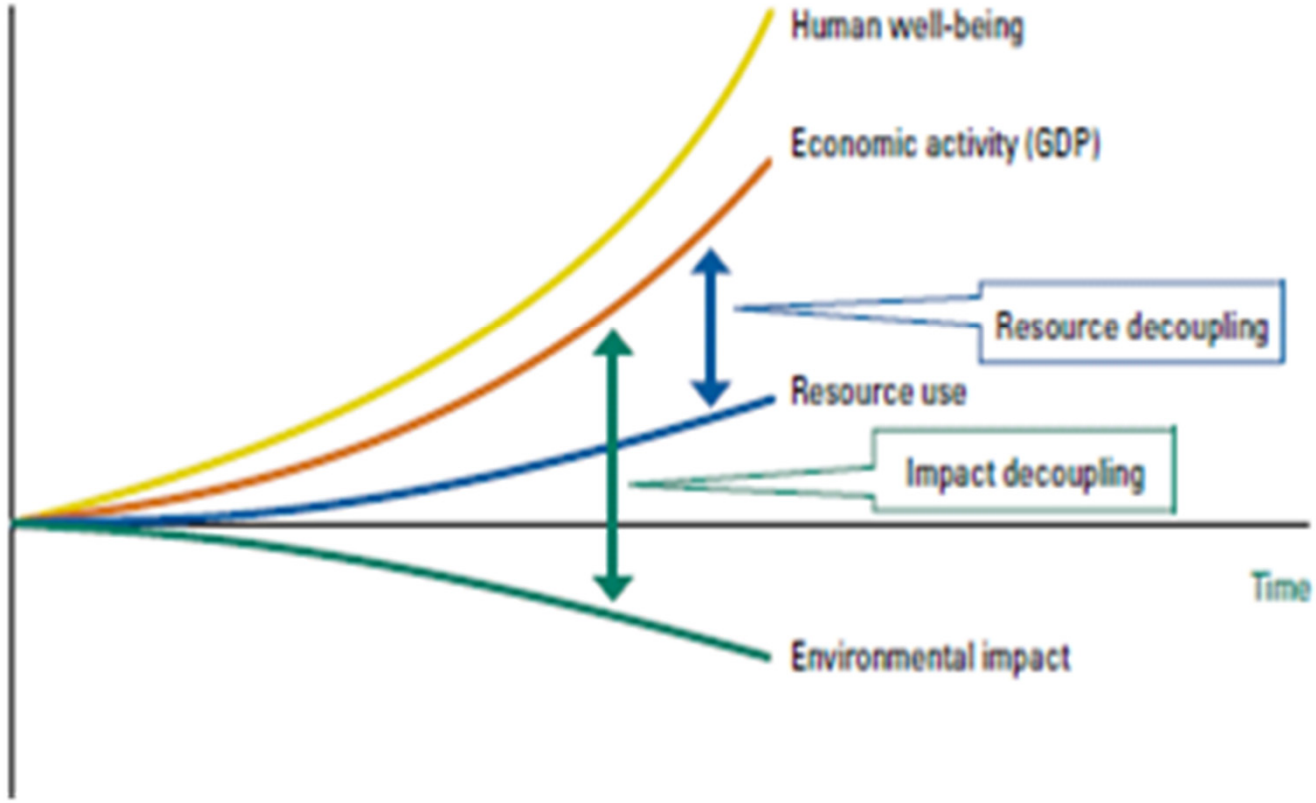
- Decoupling and leapfrogging

- Decoupling - de linking growth from external costs
- Leapfrogging - Step changes in new technologies

- How to do this ? Institutions and externality pricing

Decoupling and leapfrogging

Figure 1. Two aspects of 'decoupling'



Decoupling production & consumption from external costs

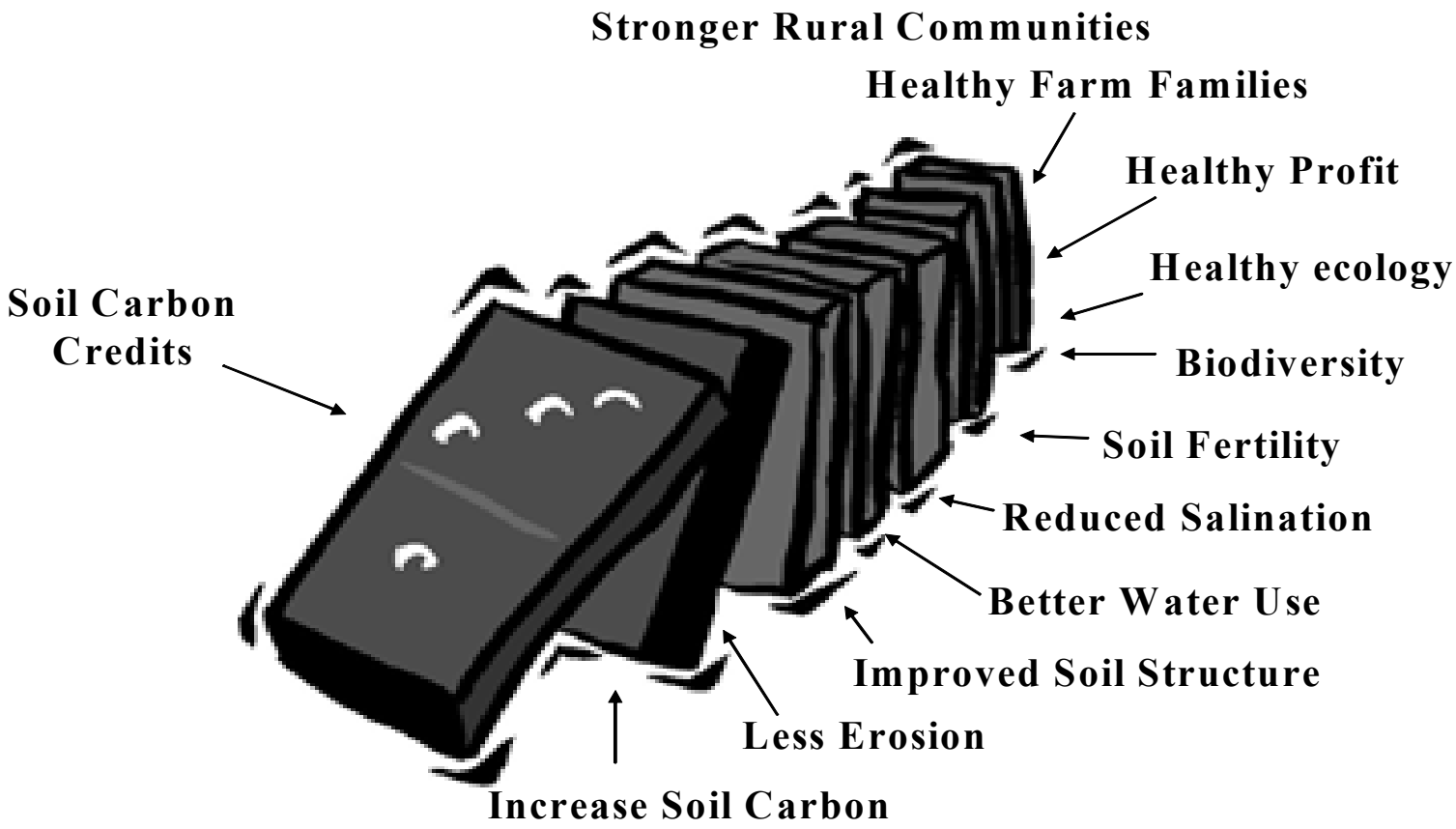
- Identifying external impacts (production and consumption)
- Valuing impacts using a recognizable metric
- Making producers and consumers face costs (internalising)

- How to affect desirable production choices and farmer behaviours?
- Voluntary or mandatory (regulatory) approaches
- Role of the market and market-based instruments?


Payments for Environmental Services
Provider gets and polluter pays principles

Production/consumption externality	Valuation/ internalisation/ PES progress
Carbon/emissions	√√√
Water	√√√√
Biodiversity	√
Animal Health	√√√
Animal welfare	√

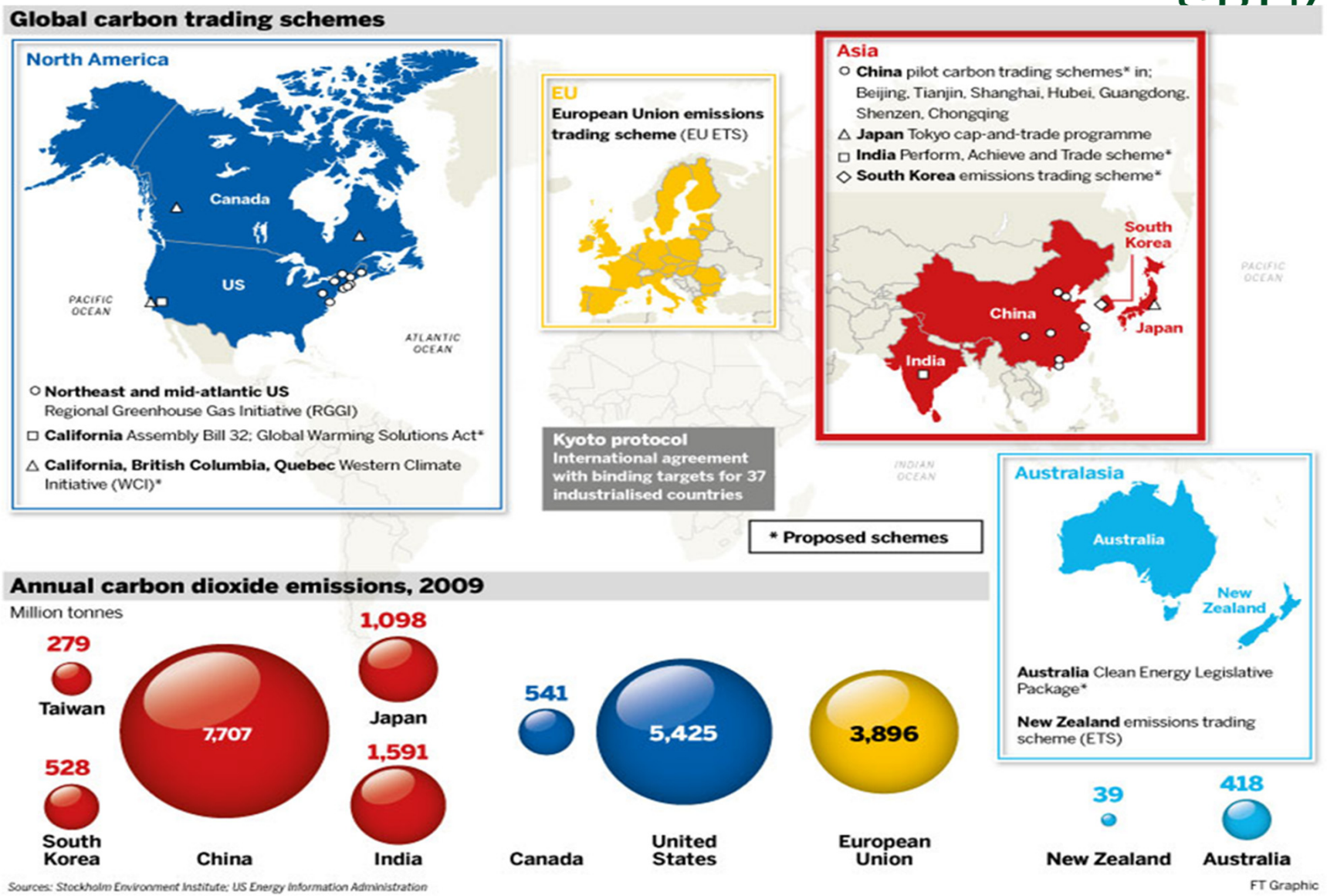
Carbon as an aggregated indicator?:



The Widely Cumulative Benefits of Soil Carbon

source: Australian famers carbon group

Emissions trading



So indicators matter: but at which levels do we measure?

Natural capital

- Biodiversity and habitat in landscape
- Quality of water through watershed
- No damage from toxics
- Low carbon footprint from economic activities
- High organic matter content in soil

Farm-level indicators

- # ha under active conservation management (natural habitat)
- # ha arable land under sustainable practices
- # m3 of water not affected
- # kg of N not wasted
- # kg of chemicals not used
- GHG emission trend
- Percentage of organic matter in the soil

Landscape-level indicators

- High conservation value areas in the landscape
- Levels of flow in rivers
- Reduced deforestation and land erosion (% of area)

Institutions also matter: corporate Power

- State intervention in agriculture and trade has been diminishing.
- TNCs have become increasingly dominant in all aspects of the agricultural supply chain.
- Statistics tell the story:

Input supply	Seed propagation	Production (farming)	Basic processing	Trading and logistics	Proces
• Seed companies • Fertiliser producers • Feed companies • Agro-chemical producers	• Farm equipment • Irrigation equipment	• Plantation companies • Grower shippers	• Wholesalers • Specialist traders • Transportation companies	• Food manufacturers • Textile producers • Biofuel producers	• Supermarkets • Fastfood chains • Coffee and tea houses

grain trade

seeds market

R&D Cartels?

- Six multinational corporations — BASF, Bayer, Dow, DuPont, Monsanto and Syngenta — control 75 per cent of all private-sector plant breeding research, 60 per cent of the commercial seed market and 76 per cent of global pesticide and fertiliser sales.

- Livestock genetics; estimated that four firms control 97 per cent of research on poultry and two thirds of swine and cattle research.

Resource use efficiency

$$\frac{Unit\ output}{Unit\ \ input}$$

Resource productivity based on money values:

£Q £e(Q) £e(M,E)

£M + £E

Output:

£Q = money value of output Q

£e(Q) = money value of emissions, waste, etc. from output e(Q)

£e(M.E) = inputs not included in e(Q) i.e. e(M,E)

Input:

£M = money value of materials

£E = money value of energy

SI: in summary

- Production + consumption
- Indicators
- ‘Internalisation’ of external costs
- Market and institutional failures

  Market failure and imperfection

- Global governance structures

Take homes

- The SI debate adds a consumption dimension to resource use efficiency
- Biotechnology is likely to be crucial on production and consumption sides
- Remaining challenge of measuring and internalising production and consumption impacts

- A global initiative for accelerated agriculture productivity is necessary now; such an initiative makes economic sense, is pro-poor

- However, global agriculture issues currently have only a limited decision making architecture relating to public goods such as water, climate, and food safety.
- What is missing is a recognized governance platform that addresses the growth opportunities and sustainability threats on a global scale

Acknowledgements

Funded by the Scottish Government Rural and Environmental Science and Analytical Services division (RESAS) DEFRA ,and the EU