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

- 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.

Declining Supply of Arable Land from Top 3 Agricultural Producers

- 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

Source: World Bank, United Nations FAO

Source: World Bank
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'

- Human well-being
- Economic activity (GDP)
- Resource use
- Environmental impact

Resource decoupling
Impact decoupling

Time
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
<table>
<thead>
<tr>
<th>Production/consumption externality</th>
<th>Valuation/ internalisation/ PES progress</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon/emissions</td>
<td>√√√</td>
</tr>
<tr>
<td>Water</td>
<td>√√√√</td>
</tr>
<tr>
<td>Biodiversity</td>
<td>√</td>
</tr>
<tr>
<td>Animal Health</td>
<td>√√√</td>
</tr>
<tr>
<td>Animal welfare</td>
<td>√</td>
</tr>
</tbody>
</table>
Carbon as an aggregated indicator:

- Increase Soil Carbon
- Improved Soil Structure
- Better Water Use
- Reduced Salination
- Soil Fertility
- Biodiversity
- Healthy Profit
- Healthy ecology
- Healthy Farm Families
- Stronger Rural Communities
- Healthy ecology
- Biodiversity
- Soil Fertility
- Reduced Salination
- Better Water Use
- Improved Soil Structure
- Less Erosion
- Increase Soil Carbon

The Widely Cumulative Benefits of Soil Carbon

source: Australian farmers carbon group
Emissions trading

Global carbon trading schemes

North America

- Canada
- US

EU

- European Union emissions trading scheme (EU ETS)

Asia

- China: pilot carbon trading schemes* in: Beijing, Tianjin, Shanghai, Hubei, Guangdong, Shenzhen, Chongqing
- Japan: Tokyo cap-and-trade programme
- India: Perform, Achieve and Trade scheme*
- South Korea: emissions trading scheme*

Kyoto protocol

International agreement with binding targets for 37 industrialised countries

Annual carbon dioxide emissions, 2009

<table>
<thead>
<tr>
<th>Country</th>
<th>Emissions (Million tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taiwan</td>
<td>279</td>
</tr>
<tr>
<td>Japan</td>
<td>1,098</td>
</tr>
<tr>
<td>South Korea</td>
<td>528</td>
</tr>
<tr>
<td>China</td>
<td>7,707</td>
</tr>
<tr>
<td>India</td>
<td>1,591</td>
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<tr>
<td>Canada</td>
<td>541</td>
</tr>
<tr>
<td>United States</td>
<td>5,425</td>
</tr>
<tr>
<td>European Union</td>
<td>3,896</td>
</tr>
</tbody>
</table>

Sources: Stockholm Environment Institute; US Energy Information Administration

* Proposed schemes

FT Graphic
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:
  – 4 companies account for 75-90% of the global grain trade
  – 10 companies are responsible for >40% of the global retail market
  – 7 companies control virtually all fertiliser supply
  – 5 companies share 68% of the world's agrochemical market
  – 3 companies control almost 50% of the proprietary 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

\[
\frac{\text{Unit output}}{\text{Unit input}}
\]
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

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