Sustainable Food Consumption and Production in a Resource-Contrained World

Agriculture and Rural Convention

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Foresight Expert Group 3

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“Business as usual is not an option.” (R. Watson - Director IAASTD & Chief Scientist DEFRA)

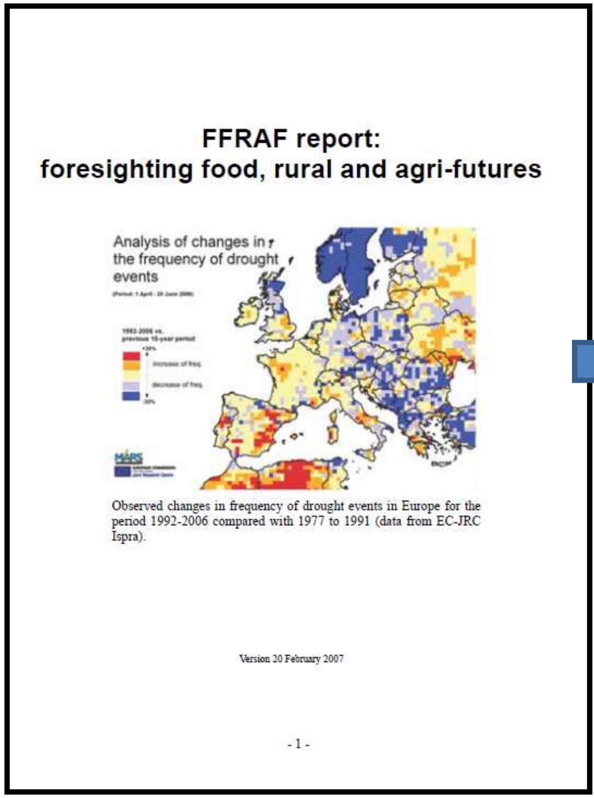
“The new challenges require changes in the way food is produced, stored, processed, distributed, and accessed that are as radical as those that occurred during the 18th, 19th, and 20th-century agricultural revolutions“ (Godfray et al., Science 2010)

Background

- Standing Committee on Agricultural Research (SCAR), est. 1974, renewed in 2005
- Formed by MS representatives, presided by EC representative
- Advise EC and MS on the coordination of agricultural research in Europe
- Initiatives:
  - Common research agendas (collobarative working groups, JPI)
  - Mapping capacities
  - Foresight monitoring mechanism

Background

- Scanning and monitoring exercise of recent relevant national, regional or international foresight activities



FFRAF report:
foresighting food, rural and agri-futures

Observed changes in frequency of drought events in Europe for the period 1992-2006 compared with 1977 to 1991 (data from EC-JRC Ispra).

Version 20 February 2007

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EU Commission - Standing Committee on Agricultural Research (SCAR)

The 2nd SCAR Foresight Exercise

New challenges for agricultural research: climate change, food security, rural development, agricultural knowledge systems

December 2008

Gianluca Brunori (chair), *Janice Jiggins* (rapporteur), *Rosa Gallardo* (expert), *Otto Schmidt* (expert)

With the collaboration of
Thierry Gaudin (expert, chair of the 1st Foresight Exercise)
Frank Dreger (expert), *Marta Pérez-Soba* (expert)

European Commission – Standing Committee on Agricultural Research (SCAR)

The 3rd SCAR Foresight Exercise

Sustainable food consumption and production in a resource-constrained world

February 2011

Annette Freibauer (chair), Erik Mathijs (rapporteur), Gianluca Brunori, Zoya Damianova, Elie Faroult, Joan Girona i Gomis, Lance O´Brien, Sébastien Treyer

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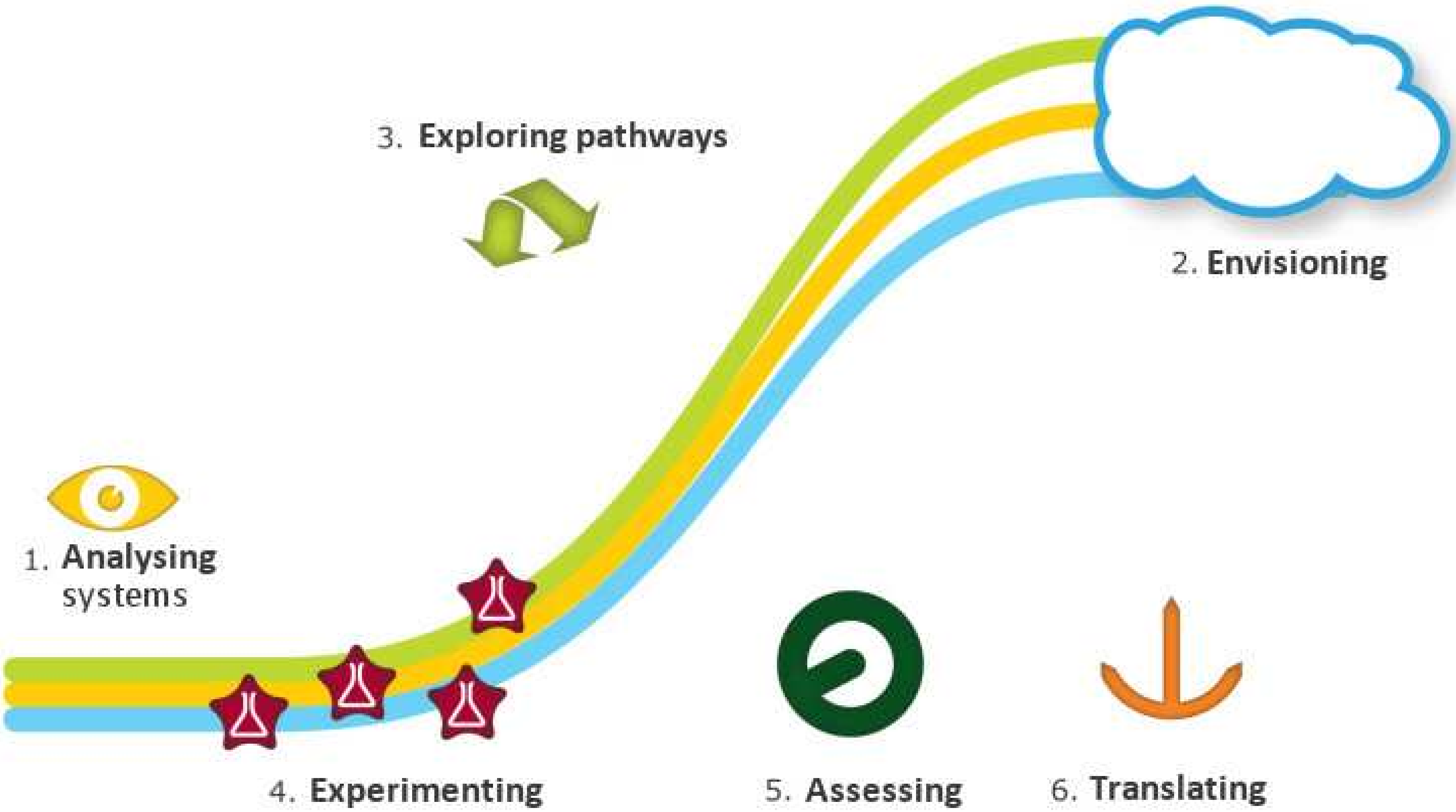
Purpose

- **Purpose**: scanning and monitoring exercise of recent relevant national, regional or international foresight activities and science papers (2009 / 2010)
- **Emphasis**:
  - Resource scarcities and adverse environmental impacts
  - Role of the Knowledge-Based Bio-Economy
  - Balance between food, fibre, feed and fuel + new technologies towards sustainable, green bio-economy
- **Final aim**: building blocks for longer-term perspective to prepare a smooth **transition** towards a world with resource constraints and environmental limits

Transition as frame



Main messages

1. Sense of urgency due to resource scarcities **accelerates** (due to interactions)
2. Way we look at problems and solutions **differs fundamentally** between productivity-oriented and sufficiency-oriented thinking
3. Productivity-oriented thinking still **dominates**, but technological solutions alone are inadequate
4. **Concerted** efforts are needed to enable the transition to a truly efficient and resilient agrofood system (policy at all levels, R&D, business)

Main messages

5. Main leverage points:
   - Radically increase resource use efficiency (eliminate waste at all levels)
   - New business models (organizational innovation)
   - Healthy consumer diet, worldwide
6. Not productivity **or** sufficiency, but productivity **and** sufficiency – **all approaches are necessary, no silver bullet**
7. Research: more coordination, more true transdisciplinarity, more room for (system) experimentation

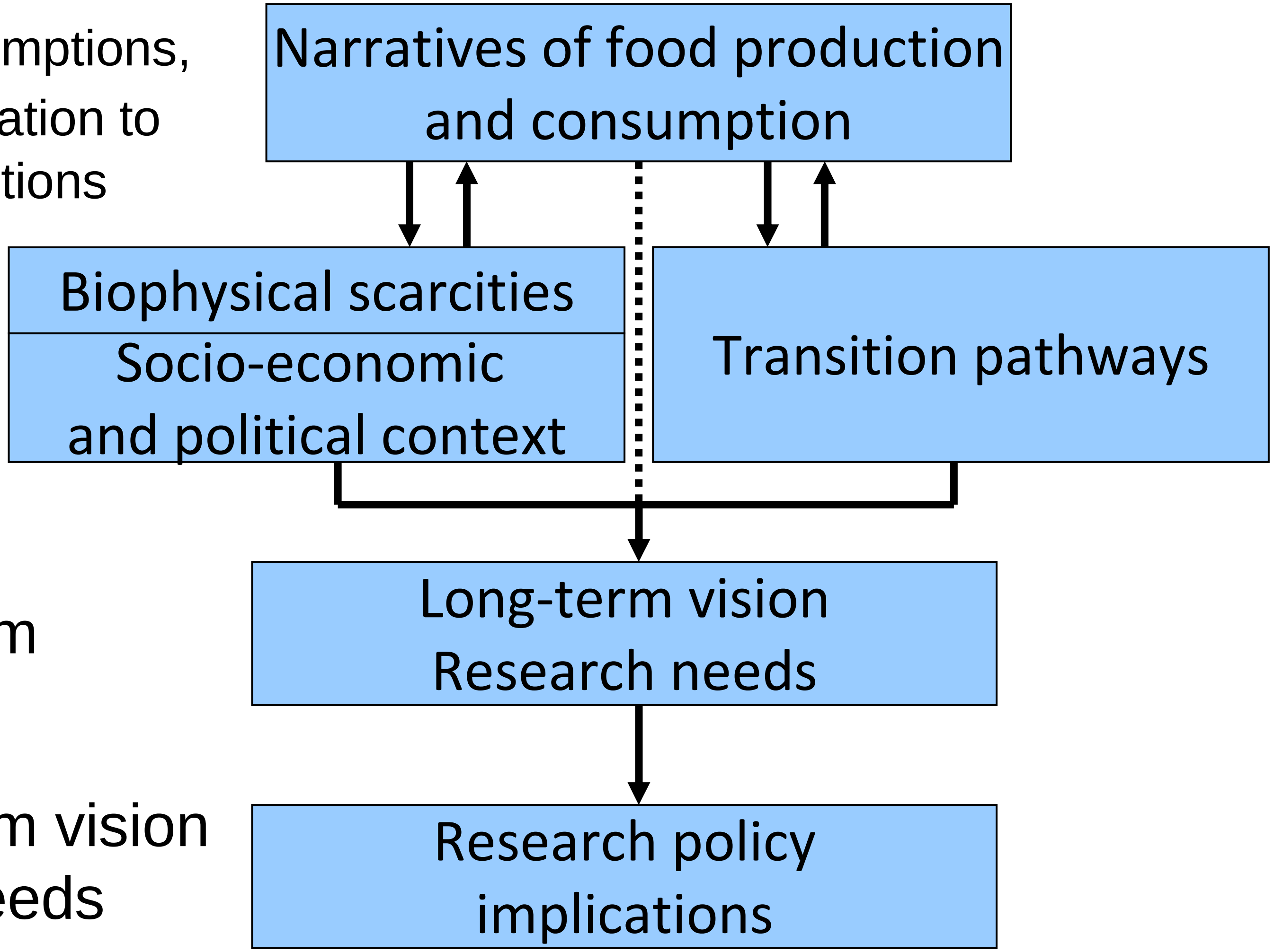
The approach

Starting point:
Extreme ends, assumptions, simplifications in relation to scarcities and transitions

New insights since FEG2

Conclusions from insights

Conclusions from vision and research needs



We show directions for solutions but even more, how research can direct us towards them

Two Narratives

- **Narrative**: discourse based on a coherent set of assumptions and principles underpinning and communicating a certain worldview
- Levidow (2008):
  - descriptive accounts: claims about objective reality as threats, opportunities and imperatives
  - normative accounts: claims about necessary or desirable responses to that objective reality
  - policy instruments for carrying out those responses

    “Regardless of its stated aims, a dominant narrative succeeds in the normative sense of gaining resources and power, while pre-empting alternative futures”

The Productivity Narrative

- *The problem -* World population 9.2 billion in 2050 - agricultural productivity slowing down - rising income levels shift diets to more protein rich food and will increase energy demand - serious threat that food demand will not be met - hunger and political instability - resource constraints and climate change limit the world's capacity to expand food production.

- *The solution -* Scientific advances have the potential to bring forward varieties, breeds and technologies that boost productivity and take into account resource scarcities and environmental problems - massive investments into R&D -removal of barriers to adoption by farmers, such as infrastructure, trade barriers and access to markets.

MORE WITH LESS

The Sufficiency Narrative

- *The problem* - World population 9.2 billion people in 2050 - dramatic environmental problems - no Earth capacity to support consumption - current food systems produce waste and overconsumption - mass health problems - destruction of important ecosystems will have dramatic feedback effects that undermine the foundations of our food systems - more poverty and conflict.

- *The solution* - Scientific advances have the potential to bring forward agro-ecosystems that are both productive, respectful for ecosystems and resource saving - demand increases need to be mitigated through behavioural change - environmental externalities need to be internalized in markets -appropriate governance structures that address disruptive effect of trade.

LESS IS MORE

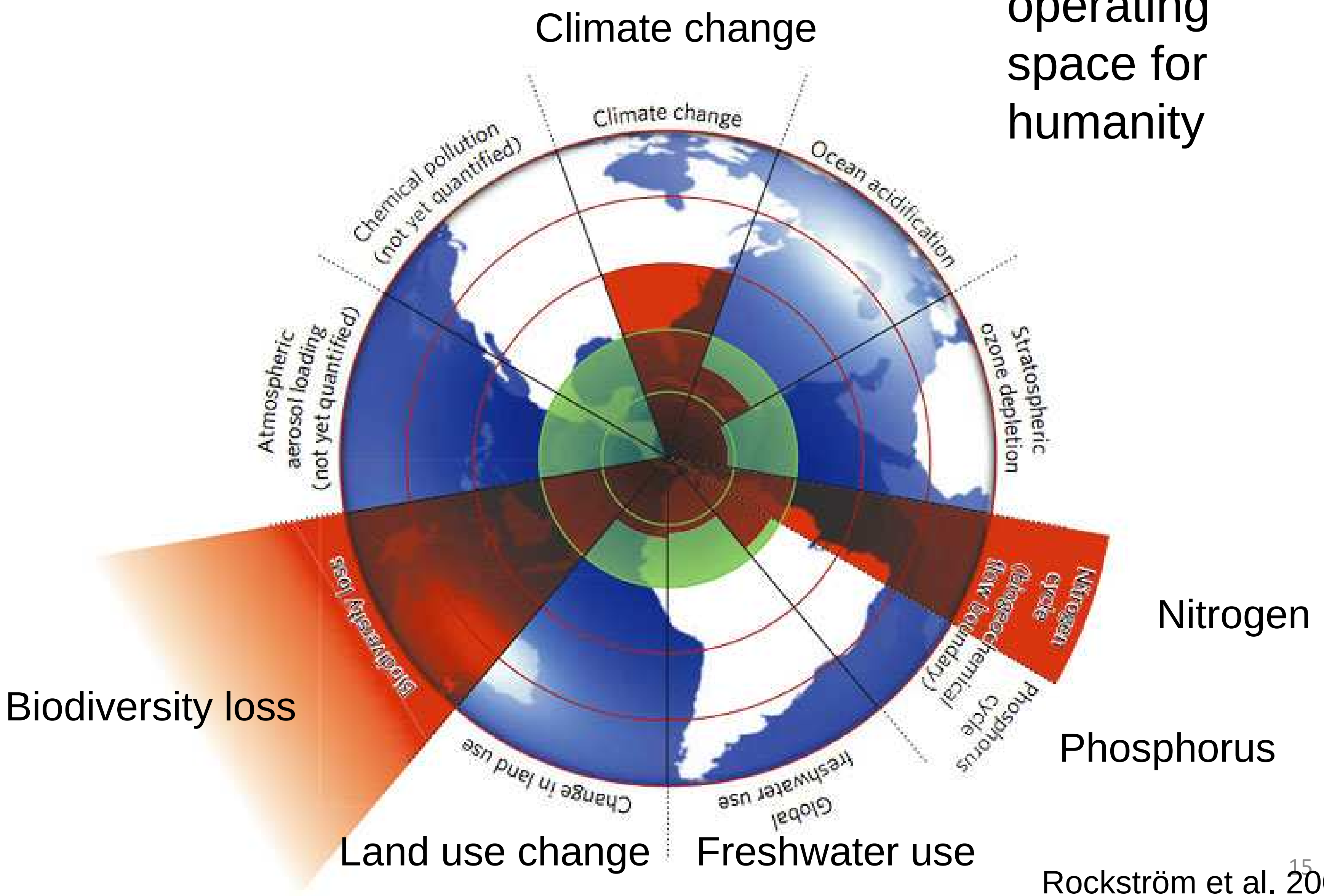
Scarcities

- ***Definition*: a social concept of imbalances, inefficiencies, constraints**
- Observed shortage of natural resources,
- Perceived dependency on natural resources and fear of global depletion
- Political, social, organisational, institutional and economic obstacles also contribute to scarcities.
- “Old scarcities”: fertile land, freshwater, energy, P
- “New scarcities” increase “old” ones: climate change, biodiversity loss
- Socio-economic context: agricultural knowledge systems, governance, economic development, urbanization as drivers, barriers and solutions

Passenier and Lak (2009)

‘New’ scarcities

A safe operating space for humanity



Rockström et al. 2009

Scarcities

Insights:

- Economic development = strongest driver, further worsened by urbanisation
- Amount, method and type of food production = strong impact on water, energy and nutrients, pollution and consequences, e.g. climate change and biodiversity loss
- Water, N and energy: no shortage, but efficiency issue
- P least connected to other scarcities
- Climate change and biodiversity loss aggravate each other in manifold ways, but badly understood; combined effect makes food production system vulnerable

Scarcities

- Reinforcing feedbacks that speed up change are the most prominent mechanism of interactions between scarcities.
- Tipping points = unquantifiable risk for food security; mainly related to climate change - biodiversity relations.
  - Die-back of coral reefs, destruction of coastal ecosystems and over-exploitation of marine resources = most urgent, maybe even catastrophic risks for global food security
  - Systemic instability = large-scale, multi-source pressures
- Time lagged scarcities (P, soil degradation, genetic diversity) underresearhed
- Governance = key root of any scarcity + heart of the solution

A picture of a resource-poor world

- **Interactions between scarcities: positive feedbacks = faster, unpredictable change and unknowns**

- Implications for research:
  - Need for enhanced understanding of complex interactions and possible disruptions
  - Uncertainty, surprise, complexity: need for transdisciplinarity and linking approaches (technology, systems, basic research, innovation and application)
  - Efficiency in existing systems; new production ways that drastically reduce external resource input
  - Scale-up systems research and apply diversity of approaches to make food system resilient to surprise and scarcity

Transitions

- Processes instigated to achieve **long-term** changes in **systems** so that “wicked” problems (such as potential scarcities) can be tackled
- Entail a wide **complexity** of interrelated developments in economics, culture, technology, institutions and the environment
- Imply great **uncertainty** because the course they take is unpredictable and is influenced by exogenous factors

Passenier and Lak (2009), Loorbach and Rotmans (2010)

Transitions

- Three transition pathways:
  - Consumer-driven pathway
  - Technology-driven pathway
  - Organisational innovation-driven pathway
- Enabling conditions
  - Policy context
  - Rural and regional context
  - Knowledge and innovation systems context
- KBBE as unifying concept?

Transitions

Format

- Facts: major trends, link to scarcities
- Drivers of the evolution of the future of technologies etc.: focus on new trends / changes in trends
- Narratives
- Policies in support and hampering evolution
- Research implications

Example 1: Food consumption

- Facts:
  - First nutrition transition: expansion (more calories) and substitution (more veg oil, meat and sugar) (‘MEATIFICATION’)
  - Second nutrition transition: substitution back to veg = only emerging
- Drivers of the evolution:
  - Innate preferences for sugars and fats
  - Higher income
  - Lower food prices
  - Technological advances
  - Mass media
  - Food processing, marketing and distribution

Example 1: Food consumption

- Narratives:
  - Productivity narrative takes demand as given and only considers the first nutrition transition
  - Second nutrition transition one of the main building blocks of the sufficiency narrative
- Policies:
  - Current policies biased towards meat and sugar based diets
  - Importance of communication and framing
- Research implications:
  - Drivers of nutrition transitions
  - Development of adequate substitutes
  - Role of government

Technology

- Biotechnology, nanotechnology, ICT, agro-ecology, energy: threats and opportunities for tackling production, resource and consumption issues
- KBBE:
  - Fusion between two concepts:
    knowledge-based economy and bioeconomy.
  - Danger of social factor disappearing with industry
    as main player of the bioeconomy.

Example 2: GM

- Facts:
  - Prime focus on 4 traits: herbicide tolerance, pest resistance, and to a lesser extent stress tolerance and product quality
  - 134 million ha GM cultivated (10% of global acreage)
  - 90+% for 4 crops (soybeans, rapeseed, maize, cotton)
  - Future: ‘stacked products’, combination of traits
  - Field trials of 130 species, fastest adoption for soybeans (2/3 of global acreage) and cotton (47% in 2008)
- Drivers of the evolution:
  - Costs of GM technologies and time to market.
  - Competing technologies (e.g. marker assisted selection)
  - Evolution of scientific debate: complexity of gen gen expression; concern for uneven reporting of effects

Example 2: GM

- Narratives:
  - Fits well the Productivity Narrative, with a large potential to address scarcities (new Green Revolution)
  - Does not fit well the Sufficiency Narrative, although there is potential:
    - Other approaches such as agro-ecology better suited in LDCs
    - Hunger is a problem of poverty
- Policy
  - High regulation and coexistence costs
  - IPR: problem of monopolies; role of open access approach (requires different socio-technic configuration)
  - Public opinion: negative

Eurobarometer (2010)

Table 3: Trends in support for GM food (excluding DKs)

% respondents who agree or totally agree that GM food should be encouraged

	1996	1999	2002	2005	2010
United Kingdom	52	37	46	35	44
Ireland	57	45	57	43	37
Portugal	**63**	**47**	**56**	**56**	**37**
Spain	**66**	**58**	**61**	**53**	**35**
Denmark	33	33	35	31	32
Netherlands	59	53	52	27	30
Norway	37	30			30
Finland	65	57	56	38	30
Belgium	57	40	39	28	28
Sweden	35	33	41	24	28
Italy	51	42	35	42	24
Austria	*22*	*26*	*33*	*24*	*23*
Germany	*47*	*42*	*40*	*22*	*22*
Switzerland	34				20
Luxembourg	*44*	*29*	*26*	*16*	*19*
France	*43*	*28*	*28*	*23*	*16*
Greece	*49*	*21*	*26*	*14*	*10*

Example 3: Organisational innovation

- Facts:
  - Increasing concentration of power and resources in multinationals: problem to show abuse
  - Tertiarisation of food (importance of added services)
  - Sustainability as core competence of food processors rather than CSR strategy
  - Experiments with new forms of governance (e.g. Round Table for Responsible Soy)
- Drivers of the evolution:
  - Competition, globalisation, need to differentiate
  - Shift from an industrial society to a society based on services
  - Consumer consciousness and pressure from civil society

Vision: purpose

- Guarantee long-term **food security** for Europeans and contribute to growing world food demand
- Provide Europeans with quality, value and diversity of food, produced **sustainably**
- Maintain viable rural communities, thus contributing to employment and to **territorial balance**

Vision: principles

1. Serve well-being of all stakeholders
2. Use resources efficiently and optimally (cascading principle, no waste)
3. Conserve critical resources
4. Stimulate diversity and inclusion (resilience and equity)
5. Interdisciplinarity + end user involvement = transdisciplinarity
6. Allow for experimentation
7. Better coordinate and monitor research
8. Stimulate involvement of the public

Implications for research (and CAP)

- Traditional approach fails: worked well in the past, insufficient progress towards sustainability, innovation gap, narrow focus not aiming at tackling multiple challenges simultanenously
- New approach of two parallel and overlapping approaches:
  - Build on existing technologies and knowledge systems
  - Develop radically new farming systems

Implications for research (and CAP)

- Build on existing farming systems (component type research):
  - Builds on existing research on productivity and sustainability
  - ‘Incremental approach’ (NRC), ‘Sustainable Intensification’ (The Royal Society)
  - Identify and develop methods that enhance certain aspects of sustainability
  - socio-economic and cultural research needed to accelerate adoption

Implications for research (and CAP)

- Develop new farming systems (holistic):
  - Builds on science & technology in which agriculture is a vital component in the management of natural resources and emphasizes a systems-based approach to knowledge production and sharing
  - Current knowledge infrastructure excluded ecological, local and traditional knowledge, but also the socio-cultural sciences → embrace broader set of understandings + focus on multiple sclaes
  - Builds on the strengths of natural systems and favors diversity that is fundamental to design resilient systems