Foresight Exchange Workshop

“How to integrate agriculture and environmental stakes in foresights?”

With the support of the following institutions

16th October 2011
Beijing
# Table of Contents

- **Presentation of the meeting** ......................................................... 3

## Part I. – Participants’ contribution based on foresight exercises ................. 4

1. Bourgeois Robin (GFAR) ............................................................................. 4
2. Marie de Lattre Gasquet (ANR) ................................................................. 6
3. Marcio De Miranda Santos (CGEE) .......................................................... 8
4. Timothy Hall (European Commission) ....................................................... 10
5. Tanja HICHERT (Institute for Futures Research) ....................................... 15
6. Bernard Hubert (Agropolis International) ................................................ 17
7. Contribution of Jon Hutton (UNEP-WCMC) ........................................... 19
8. Claudia Juech (Rockefeller Foundation) .................................................... 20
9. Erik Millstone (Univ. Sussex) ...................................................................... 21
10. Siwa Msangi (IFPRI) .................................................................................. 25
11. Emilio RUZ (PROCISUR) .......................................................................... 29
12. Katindi Sivi Njonjo (Institute of Economic Affairs) ................................. 31
13. Sébastien Treyer (Idri) ............................................................................... 33
14. Contribution of Maurits van den Berg (Netherlands Environmental Assessment Agency) ................................................................. 35
15. Contribution of: Lucia Wegner (Center of Development Innovation) ...... 40
16. Contribution of Duncan Williamson (WWF UK) ...................................... 42
17. Contribution of Angkarn Wongdeethai (NSTI Policy Office, Thailand) ...... 45
18. Hartwig de Haen (University of Göttingen, Germany) .............................. 46

## Part II. – Expectations of other participants ............................................. 48

1. Stefano Del Debbio (Istituto Agronomico per l’Oltremare) ...................... 48
2. Hedge Mruthunjaya (National Centre for Agricultural Economics and Policy Research) ........................................................................ 49
3. Gine Zwart (Oxfam Novib) ......................................................................... 50

**List of participants** ................................................................................. 51
Foresight Exchange Workshop: How to integrate agriculture and environmental stakes in foresights?

This Foresight Exchange Workshop will address the question of taking simultaneously into consideration agriculture and environmental stakes when developing foresight studies.

It will bring together around 30 professional who work with a forward thinking approach related to the future of agriculture and rural development.

It will be a highly interactive, dynamic process whose outputs will be presented and discussed during the foresight plenary session of the Science Forum on Tuesday, October 18.

Invited participants will contribute to the exchanges and debates by providing short papers that will give the opportunity for reflecting on (1) methods and approaches, and (2) main findings and results.

Program of the workshop

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>08:30 – 09:00</td>
<td>Registration of participants</td>
</tr>
<tr>
<td>09:00 – 11:00</td>
<td>Presentations and discussion of participants’ contributions</td>
</tr>
<tr>
<td>11:00 – 11:30</td>
<td>Coffee Break</td>
</tr>
<tr>
<td>11:30 – 13:00</td>
<td>Presentations and discussion of participants’ contributions</td>
</tr>
<tr>
<td>13:00 – 14:00</td>
<td>Lunch</td>
</tr>
<tr>
<td>14:00 – 15:30</td>
<td>Open discussion on key emerging transversal issues</td>
</tr>
<tr>
<td>15:30 – 16:00</td>
<td>Coffee Break</td>
</tr>
<tr>
<td>16:00 – 17:00</td>
<td>Discussion and validation of key messages to be presented during Foresight Session of Science Forum (18th October 2011)</td>
</tr>
<tr>
<td>17:00 – 18:00</td>
<td>Discussion of the next steps towards GCARD 2012</td>
</tr>
</tbody>
</table>

The Beijing Foresight Exchange Workshop is part of the activities of the Global Foresight Hub under its Forward Thinking Platform component.

Organization team

Bourgeois Robin (robin.bourgeois@fao.org)
Hubert Bernard (bernard.hubert@avignon.inra.fr)
Labbouz Benoît (benoit.labouz@wanadoo.fr)
Treyer Sébastien (sebastien.treyer@sciences-po.fr)
Part I. – Participants' contribution based on foresight exercises

The following contributions are presented in alphabetical order of the participants names.

I. 1. Bourgeois Robin (GFAR): **Linking agriculture and environmental stakes in a territorial foresight on the role of agriculture and the rural world in Mayotte in 2020**

A territorial foresight aimed at identifying possible future evolutions of agriculture and the rural world in Mayotte was conducted in 2010-2011 in cooperation between CIRAD, the Regional Council of Mayotte and the State, using the Participatory Prospective Analysis (PPA) approach I developed ([www.uncapsa.org/Publication/cg46.pdf](http://www.uncapsa.org/Publication/cg46.pdf)). PPA is a comprehensive prospective method leading to anticipation of scenarios using structural analysis and expert-based methods. This work yielded nine scenarios that have been discussed through individual surveys of more than 340 inhabitants in Mayotte and collective assessment with more than 15 organisations involved in agriculture and rural development. A leaflet about the future of agriculture and the rural world in Mayotte and a Memento for action have been produced and they will be publicly debated by the end of this year.

The scenarios are: The Integrated Rurality; The Agricultural Twilight; The Internal Border; The Maoré Trading Post; Self management; Agricultural entrepreneurs; urban dwellers and tobes; The Maoré garden; Dualities; The Mosaic.

**I. To what extent an agriculture-environmental stakes nexus was incorporated**

68 variables were identified (59 internal and 9 external variables) through expert-meeting methods and a structural analysis was conducted in order to identify the key drivers. Among internal variables, 8 were clearly agricultural variables and 5 environmental variables.

**Agricultural variables**
- Access to land; Access to agricultural inputs; Control and regulation of agriculture; Functionality of Agriculture; Agricultural production modalities; Trading of agricultural products; Local supply of agricultural products; Type of farmer; Agricultural income.

**Environmental variables**
- Access to water; Level of exploitation of natural resources; Environmental quality in rural areas; Sanitary risks (animal); Sanitary risks (human).

Seven key drivers were used to build the frames of contrasted and mutually exclusive scenarios: Behaviour of the population; State of infrastructure; Place of immigrants; Agricultural production modalities; Land use decision making process; Control and regulation of agriculture; Local knowledge and knowhow.

Among these drivers, two are agricultural variables but there is no environmental variable. Among external factors, two environmental variables are included (Climatic events and Climate change). This result indicates that the future evolutions of agriculture and the rural world in Mayotte are not only determined by agricultural variables, and even not determined by the nexus agriculture x environment. Non environmental/agricultural dimensions account for 2/3 of the variables. In particular, social, economic and policy variables represent more than 50% of all variables.
2. The reasons for it
Integration of agriculture and environmental variables was not specifically thought in this work, but it is its inherent feature to enable the inclusion of any relevant dimensions related to the question to be addressed. The process of identifying the drivers of the future of agriculture and rural world was non-normative, leaving open the possibility to incorporate multiple dimensions in the analysis.

3. What was the methodology used to deal with this nexus
Process: The expert-meeting based process ensured covering agriculture-environment linkages, since expert participants came from very different background, bringing knowledge and experience from various fields enabling to deal with complexity through a holistic approach considering the interwoven dimensions of the question addressed.
Methods: Brainstorming, visualisation techniques, structural analysis, morphological analysis, scenario building and testing of results have permitted to combine in a logical and articulated way quantitative and qualitative drivers as well as various dimensions.

4. Resulting new ideas/reflections/outputs
I was not involved in GCARD 1, however from this work it appears that locally, the most important new idea was that the future of agriculture and rural world is not only determined by the classical agricultural variables, but also and in more important proportion by a complex association of multidimensional variables (policy, behaviour, regulation, knowledge). Also, environmental dimensions did not appear as key drivers in the evolution of the future of Mayotte. Yet, as the impact of various scenario was related to the environmental state of the island, they appeared as an *ex post* driver in the evaluation of the scenarios by the people who were consulted. Environmental variables do not shape decisions *ex ante*, but when visualised under the form of the likely impact of alternative decisions they strongly affect the societal choices of the population.

5. My expectations
- Paving the way for regular exchanges in forward thinking methods so that we enrich our tools and methods with sharing experiences and results,
- Opening a field for combining quantitative and qualitative methods,
- Make advances in linking multi-dimensional variables in comprehensive analysis,
- Identify some key issues that will need further commitment from foresight specialists worldwide in order to better understand future evolution and related current needs current,
- If possible, develop a capacity to involve decision makers in forward thinking not only as end user but also as fully relevant contributors.
I. 2. Marie de Lattre Gasquet (ANR): **Foresight experience of Marie de Lattre-Gasquet**

Over the last few years, I have been involved in several foresight exercises:

1. **PARME – Research and partnerships for the Mediterranean Region**
   
   
   This foresight exercise has been coordinated by Agropolis after a call for proposals launched by ANR. The objective of the exercise was to identify the main challenges for the Mediterranean region and the most important research topics to face most appropriately these challenges. The approach has been pluridisciplinary and transversal. More than 130 experts coming from ten countries and a great number of institutions and disciplines (agronomy, energy, environment, geography, sociology, etc.) were involved. The foresight considered the future challenges in an integrated fashion. Three main domains for research were identified:
   
   - Men and women, their societies and their territories,
   - Natural resources: environment, water, soils, energy
   - Agriculture, food, health
   
   The organization was as follow: Orientation committee (15 members); Synthesis group of previous foresight exercises (30 experts); Transversal group (28 members, specialists of different fields); 4 thematic groups (culture and societies; resources and territories; energy; agriculture, food and health).

2. **Agriculture Energy 2030**
   
   http://agriculture.gouv.fr/agriculture-energie-2030,1440
   
   The “Agriculture Energy 2030” foresight study was led by the Centre for studies and strategic foresight of the French Ministry of Agriculture, Food, Fisheries, Rural Affairs and Spatial Planning. A group of about 40 experts were involved during 18 months. The scenario method was used.

   The energy issue is of major importance for the future of agriculture in France. Control of energy consumption is an economic issue for agricultural holdings, which consume energy both directly and indirectly. The share of this consumption in production costs varies widely according to the type of farming. The energy issue also involves logistics, the organization of agricultural supply chains and the pattern of distribution of farming activities across regions. Moreover, energy and climate are intertwined issues. Agriculture is in a position to contribute to national targets for combating global warming. With the four scenarios, three areas offering room for manoeuvre were highlighted. Four broad, general objectives for public action by the ministry and thirteen operational objectives were also identified.

3. **AGRIMONDE**
   
   http://www.international.inra.fr/the_institute/foresight/agrimonde
   
   This foresight study explores the possible futures of farming and food systems worldwide in 2050. The study should pinpoint the fundamental issues with which agricultural research will be faced in order to give CIRAD and INRA the means to forecast and prepare for the future in terms of public research systems and priorities as well as of their strategic position on an international level.

   The Agrimonde foresight project, had the following general objectives: 1) to design the modalities of strategic reflection based on a foresight approach, with the aim of illuminating
research orientations in the fields of agriculture and food, in the broad sense of the term; 2) to initiate the process of debates and interactions on these topics, and their appropriation, on a national scale; 3) to promote the participation of French experts in international debates on the subject.

4. IAASTD – North America and Europe – Looking into the future

http://www.agassessment.org/reports/subglobal/Agriculture_at_a_Crossroads_Volume_IV_North_America_and_Europe_Subglobal_Report.pdf

The chapter 5 of the NAE report entitled “Looking into the Future for Knowledge, Science and Technology and AKST” showed that choices about agricultural knowledge, science and technology (AKST) was built around four questions:
- What are the key drivers for knowledge, science and technology (KST), their major uncertainties and consequences for AKST?
- What are the key drivers for agriculture, their major uncertainties and consequences for AKST?
- What are the key drivers for agricultural knowledge, science and technology (AKST) and agricultural research and innovation systems and their major uncertainties?
- What are some future normative AKST systems and their potential contributions to sustainable development goals?

For each driver, the questions show that the future is uncertain. Each driver also points to fields where AKST needs to be developed or expanded.

5. Foresight on two commodities : cocoa and natural rubber

CIRAD carried out these exercises on cocoa and *hevea* in the late 1990s –early 2000s. They had similar objectives, i.e. to identify the research questions on which the researchers should focus, and to help researchers accept changes in their research priorities. Emphasis was put as much on the process as on the results of the foresight exercises. They lasted about eighteen months and were divided into three phases: (1) objectives, time scale (2015) and geographical coverage were defined ; (2) key variables and the scenarios were identified. The process chosen was a blend of rationality and intuition. A knowledge base that could be updated and could serve as a permanent observatory of the commodity chain was prepared. (3) the dissemination of outputs and the linkage with strategy were done. The results were presented to large meetings with more than 300 stakeholders of the commodity system. The results attracted attention because they had a commodity chain perspective and a global point of view. The recommendations created a common ground for discussion.

6. Expectations for the workshop

- To discuss how to do foresight on complex issues that have to be looked on a large scale (e.g. land use);
- Methods to improve linkages between foresight and strategy;
- How to go from a close system to political arena.

---

I. 3. Marcio De Miranda Santos (CGEE): Strategic Foresight as a toll for enhancing competitiveness of Brazilian industrial sectors

This is a summary of the main aspects of the use of strategic foresight by the Center for Strategic Management and Studies on Science, Technology & Innovation – CGEE to envision opportunities for, and avoid threats to, industrial sectors in the next fifteen years. Sectors studied include: aeronautical, cosmetics, medical equipments, furniture, naval, leather and shoes, textiles, plastics, construction, automotive, and industrial automation. The methodology is currently applied to examine future opportunities for the country to strengthen its role as a global food producer.

1. CGEE’s FORESIGHT APPROACH AS APPLIED TO INDUSTRIAL COMPETITIVENESS

The foresight approach used was developed to allow for strategic and technological roadmaps to be produced, adapted to the unique requirements for each sector analyzed. It encompasses four main phases as follows:

(a) Foresight Planning; (b) Understanding the Present (c) Futuring Perspectives; and (d) Prospecting Future Opportunities.

Foresight Planning, includes: (1) defining a work plan and foresight approach; and (2) negotiating with stakeholders the main focus of the study, in the understanding that some of the sectors are to ample to be taken in its entirety.

Understanding the Present includes: (1) data-hunting and gathering; and (2) segmentation and prioritization.

Futuring Perspectives includes: (1) scanning and detecting trends; and (2) developing vision and action goals.

Finally, the fourth phase, Prospecting Future Opportunities, includes: (1) defining strategies and roadmaps; and (2) making recommendations.

As can be easily understood from the above, Strategic Foresight is more about setting up and conducting a process aiming at exploring future possibilities than the sole application of one or a couple of methods and techniques. It is also important to highlight that an adding-value chain is often established along the process, allowing for data to be transformed into information, than to knowledge and finally into strategy. The figure below illustrates the process:

2. LESSONS LEARNED

Some industrial sectors have fragmented production chains, while others sectors are organized with major stakeholders clearly identified and responsible for well-defined roles. In a fragile production chain, the strategic roadmaps mainly suggested ways to organize the industrial sector as a first step towards increasing competitiveness. In the case of the more organized sectors, strategic roadmaps are commonly designed to leverage global competition, focusing on an action plan to promote middle and long term gains;
Developing shared future visions is important. They will impact the recommendations for new technologies and how they may be used to improve the competitiveness of each industrial sector in a social-tech dynamics;

The use of appropriate language and communication tools and nice visualization techniques were taken into full attention to involve participants, mainly those coming from the private sector. All efforts were made to produce dense summaries of what has been achieved throughout the main phases of the process;

Early involvement of stakeholders is key to facilitate the development of shared commitment amongst key decision makers. This is not only important for strategies to be developed in the final phase but also for decisions be taken towards the implementation of the main recommendations derived;

Industrial stakeholders initially show disbelief in any government support and were unable to evaluate the potential of the Strategic Foresight to produce collective intelligence on competitiveness. This behavior changes during the elaboration of the roadmaps and, as they got involved, they started to promote the political environment to implement the foresight recommendations.
I. 4. Timothy Hall (European Commission): The Budapest Declaration and Presentation of SCAR

This contribution presents the Budapest Declaration, issued by the Standing Committee on Agricultural Research (SCAR) of the European Commission, after the Budapest conference named: “Transition towards sustainable food production and consumption in a resource constrained world”, where the report of the 3rd Foresight Expert Group to the SCAR (see also contribution by S.Treyer p.31) had been presented and discussed. The SCAR is also presented briefly.

The Budapest Declaration

Globally the food insecurity is increasing in the resources constrained world and is associated with political and economical turmoil. Europe must focus on research areas of strategic importance that can enable a swift transition towards sustainable food consumption and production in a resource constrained world.

- Calls for a common understanding among Member States and European institutions that a well coordinated transition strategy is indispensable to cope with the “Grand Challenges” ahead.
- Europe also has a responsibility to contribute to the strengthening of global food security.
- The Budapest Conference has started a new phase based on a long-term view for both research priority setting and policy planning alongside the major challenges that Member States, Associated States and Europe are facing.
- Calls on decision makers in the public and private domains, the Council, the European Parliament and the Commission to take forward this process and support the recommended measures to enable the necessary transitions towards resource-efficient and sustainable food systems, for the benefit of the farming community by considering the regional differences of Europe.

The first decade of the 21st century has seen an increasing number of new “grand challenges” for food and agriculture. They include amongst others climate change, energy and water supply or (re-)emerging diseases which all affect the potential of future agriculture and food security. In addition, they are further exacerbated by the current economic and financial crisis and the increasing scarcity of natural resources and the destabilization of ecosystem services. These “grand challenges” are a real threat not only to future food supplies, but also to global stability and prosperity. They are increasing the uncertainty about the future development of agriculture making it difficult to see how the growing demand for food and other bio-based materials in a bio-economy can be met without further compromising the provision of ecosystem services on which society and the entire economy depend. There is an urgent need to take these challenges seriously and prepare the ground for a transition towards a more efficient, sustainable food consumption and production in a resource constrained world.

Since the 1st and 2nd SCAR Foresight Exercises it has become increasingly obvious that we are facing a new “quality of change” with the effects of many driving forces combining to redefine the world food situation over the next 30 to 40 years. This increase in complexity and global connectedness might not only lead to decreased stability and increased vulnerability but also to a sharp increase in the costs of errors.
It seems clear from the 3rd SCAR-Foresight Report that the future of sustainable food consumption and production in an increasingly resource-constrained world is in our hands. The “Grand Challenges” demand an integrated and effective approach with public research playing a key role in supporting the necessary and inevitable transition towards a more sustainable development path. But agriculture and food industry has also a crucial role to play in looking for adequate business models able to manage the new challenges. Member States and Associated States in Europe need to develop a coherent and effective approach to prioritize agricultural research and innovation by targeting the “grand challenges” with a clear strategy based on a long-term view. Building such a strategy requires in particular to:

**Consider the expected resource scarcities in long-term research priority setting and take planetary boundaries seriously**
The predominant form of agriculture, food processing and retailing relies heavily on cheap inputs and the potential impact on this of long-term resource scarcity trends has been largely overlooked until now. Some of the scarcities, such as soil degradation or biodiversity loss, have long time lags before impacts become visible and this demands a long-term view to be taken towards the orientation of research. In an era of scarcity there is an imperative to decouple food production from the currently high or intensive resource use in order to stay within planetary boundaries and avoid crossing critical thresholds, which can trigger a tipping into an undesired stage.

**Support trans-disciplinary research to understand the complexity of agricultural systems and enhance agro-ecological and resilience research**
The challenge of food security has social, economic and environmental dimensions and research will need to cover all of these if improvements in food production through research are to be adapted and considered sustainable. In order to increase the productivity of agriculture in a sustainable manner and hence the resilience of systems, the interactions between these three dimensions and the many feedbacks between them need to be better understood by encouraging and strengthening trans-disciplinary research. Increasing agro-biodiversity is considered the key to strengthen the response capacity and resilience of food systems.

**Give consumer-oriented research a higher priority in public funding**
In an era of scarcity it is becoming increasingly important to address production and consumption jointly because of the linkages between the two. So far the focus of research and policy has been on the supply-side by providing technological innovations. However social innovations in the domain of production are as important as technological ones. Therefore, it is important to address demand-side issues, and to reduce the present unsustainable levels of consumption. Research on behavioral or structural changes in food systems and supply chains should be given a higher priority. Food processing and retail industry will play a crucial role in enabling the necessary changes in production and consumption patterns.

**Take a cross-sectoral approach and make public agricultural knowledge and innovation systems (AKIS) fit for coping with the new and interconnected challenges**
In the light of the major challenges and uncertainties ahead continued investment in relevant research and innovation at EU and national levels is considered critical in achieving the transitions required to make the food system more efficient and resilient. The necessary transformation towards sustainable food systems could also benefit from stronger public-private partnerships. New business models, new investments in sustainable food production or new processes with respect to the use and conservation of biodiversity in industrial processes
are just a few examples for the potential to contribute with eco-innovations. A continued and increased investment in AKIS is critical in addressing the transition to new food consumption and production patterns that respect the interlinked global scarcities. It is necessary to carefully reflect current research priorities in the light of the new challenges and adjusting them accordingly. Public funding is particularly important in those areas which do not attract private funding. The translation of R&D into innovation is also important to make better use of existing output. The European Innovation Partnership, as envisaged by the Commission, could catalyse the existing capacities towards innovation in particular by improving the connections between the areas of research, advice, market and agriculture.

**Explore new ways of policy coordination and consider the trade-offs between different sector policies**

The need expressed in the report for better integration of the different research areas and public-private-partnerships to stimulate innovation has to be complemented by a much stronger push in pursuing multiple goals in research policy. Sustainable food production or resource efficiency goals have to be supported in an integrated way by various other policies such as food, health, environment or energy. The trade-offs between different sector policies and between resources will become an increasingly important issue which has to be managed in an efficient way for the long-term benefit of society.

**Take a long-term view for both research policy and research priority setting and enable more efficient research spending by strengthening transnational program cooperation**

Global interdependence is a fact and the economic realities are moving much faster than political reactions. Some of the main questions raised in the foresight report are of a global nature, necessitating a long-term orientation and internationally coordinated approaches in research if we are to deal effectively with the complex nature of the challenges faced. Europe is not immune to developments in other regions of the world. Considering the size and the speed of these changes, “time” has become a scarce commodity in its own right. There is an urgent need to take a longer-term view in the orientation of research priority setting by aligning research planning alongside the major challenges. As most countries are under considerable economic pressure, the effectiveness and efficiency of the use of scarce research budgets could be further increased by boosting the trans-national coordination effort, with better alignment of national programmes helping to address the range of urgent research challenges.

---

**The Standing Committee on Agricultural Research (SCAR),**

**Mandate and missions**

In 1974 the Council of the EU established SCAR with the mandate to advise the Commission and the Member States on the coordination of agricultural research in Europe. In 2005, SCAR was given a renewed mandate from the Council to give inputs to all research areas of the KBBE (Knowledge-Based Bio-Economy) and to set up a coherent European research agenda for agriculture. SCAR is made up of the 27 EU MS, with delegates from Candidate Countries and Associated Countries as observers. The delegates are in charge of national public agricultural research programmes and the group is chaired by the Director «Biotechnologies, Agriculture and Food» of the European Commission DG Research. The SCAR mandate covers a wide spectrum of disciplines and scientific domains pertaining to all challenges confronting food systems. It works to a wider and more up-to-date definition of the term ‘agricultural research’, looking beyond the aspects of research relating to...
production and encompassing the so called ‘fork-to-farm’ concept, emphasising research for sustainable agriculture, and including non-food uses, biodiversity, forestry and rural development. It also has a remit in formulating recommendations on the organisation of the whole agriculture knowledge system in Europe (including innovation and education).

The renewed mandate of SCAR is a response to the fact that European research efforts often remain fragmented, poorly coordinated, underinvested, and lack critical mass. In many situations no one single MS has the full resources or capacity to carry out the necessary research and policy developments alone.

**Actions and tools**

1. **Mapping and strengthening EU research capacities**

One major contribution of SCAR is the mapping of agricultural research systems in Europe through the European Commission funded “EU-AGRI-MAPPING” project, which has collected and analysed data on European agricultural research capacity (institutions, scientists, projects, activities) and identified trends and needs in this field.

SCAR has also highlighted the high demand for harmonisation and sharing of support services to the delivery of research throughout Europe. A European network on “Shared European infrastructures for agricultural research” was created with the objective to analyse the potential for sharing infrastructures either in relation to the ESFRI roadmap or not. In the long term, the objective is to contribute to the development of a European policy for agricultural research infrastructures in line with research priorities.

Finally, a dedicated website ([http://ec.europa.eu/research/agriculture/scar/index_en.cfm](http://ec.europa.eu/research/agriculture/scar/index_en.cfm)) provides a complete and regularly updated picture of the national agricultural research systems in all SCAR countries.

2. **The development of FORESIGHT monitoring and alert mechanism**

The SCAR has initiated in 2006 a foresight exercise to formulate possible scenarios for European agriculture over the next 20 years on which to base the prioritisation of agriculture-related research in Europe in the medium-to-long term. This process was strongly encouraged by the informal Council of Agriculture Ministers (Krems, 28-30 May 2006).

**1st phase**

Accordingly, the European Commission established a first Foresight Expert Group (FEG) to gather and analyse foresight information available in national, regional and international studies with respect to eight major drivers, to use this information in formulating future scenarios and to carry out an initial assessment of the implications for the RTD requirements of European agriculture.

The reports from the FEG1 were disseminated among relevant stakeholders and discussed, together with other foresight exercises, at a major international Conference “Towards future challenges of Agricultural research in Europe” (26-27 June 2007). This marked a major success in establishing a platform for the discussion of foresight in relation to long-term European agriculture research needs.

**2nd phase**

Building on the conclusions of the Conference, the SCAR decided to establish a Foresight Monitoring Mechanism aiming at providing early signals and warnings about emerging and new problems at regular intervals. The mechanism has to be supported over time to deliver useful insight about possible changes as early as possible.

---

3 Climate change, environment, economy and trade, energy, societal changes, science and technology, rural economy and health
4 Disruption scenarios: Climate Shock, Energy Crisis, Food Crisis, Co-operation with Nature
A second Foresight Expert Group was appointed by the Commission to gather, analyse and synthesise information in order to provide research policy orientations. The FEG2 report was released in December 2008 and focussed on resilience, vulnerability and crisis.

3rd phase
The third SCAR Foresight Exercise from 2011 initiated with the appointment of an expert group (FEG3) which issued a report "Sustainable food consumption and production in a resource-constrained world" recommending that research, innovation and agricultural knowledge systems must be fundamentally reorganised and must integrate multi-disciplinary approaches. It also proposes that sufficiency-oriented research, innovation and communication must become a priority, in particular on resource efficiency in agricultural production, including new farming systems that balance the dimensions of sustainability and food processing, including cascading uses and waste reduction.

3. Networking of research programme funders and managers
SCAR adopted a structured approach for prioritisation of research topics for further collaboration, through the establishment of a number of Member/Associated State Collaborative Working Groups (CWGs).

The establishment of CWGs is an alternative, more flexible and less formal, mechanism to the ERA-NET scheme, but with the same objective to stimulate and ultimately increase research collaboration between funders and programme managers on key-research areas. Since 2005, around 20 CWGs have been set up by European countries engaging voluntarily and on a variable geometry basis in the definition, development and implementation of common research agendas based on a common vision of how to address major challenges in the field of agricultural research.

CWGs are working in a similar way to ERA-NETs, following the same step-by-step approach - focussing on information exchange during the early stages, identifying gaps in research and priority areas for collaboration and, where applicable, launching joint activities and/or common research calls.

SCAR supports the CWGs in their effort to become self-sustaining and to interact with other research coordination bodies such as ERA-NETs and European Technology Platforms.
I. 5. Tanja HICHERT (Institute for Futures Research): Foresight Activity in Agriculture-Environment

The last foresight activity I was involved in that relates to agriculture (which included environmental aspects) was a comprehensive study on the “Future of African Agriculture” for a private sector South African-based bank, Standard Bank. Standard Bank Group is the largest bank in Africa and it is 20% owned by the Industrial and Commercial Bank of China. Given the wide range of endogenous and exogenous factors shaping the future of agriculture in Africa, the main purpose of the study was threefold: (Methodology used is highlighted).

1. To establish in greater detail the patterns of production, trade (in and among African countries, and with the rest of the world) and consumption of agricultural products in Africa, and to provide simple extrapolations (5 year projections) of these current trends as a point of departure in imagining the future of African agriculture;

2. To identify, by means of horizon scanning, emerging trends, drivers, signals and potential wild cards that may shape the future of African agriculture, and to construct scenarios of plausible (10 to 15 year time horizon) futures based on key drivers (e.g. land availability, water scarcity, governance, demographic change, climate change, etc.);

3. Thereby developing a holistic picture of emerging African agriculture in order to identify broad areas of business opportunities (emerging segments) in African agriculture as a starting point for more detailed and more focussed studies.

Earlier work that I co-authored, after facilitating scenarios relating to Southern African agriculture and trade, explains why developing scenarios / applying a futures research approach is useful; How Might Agriculture Develop in Southern Africa? Making Sense of Complexity can be found on the International Institute for Sustainable Development (IISD) website.

In addition to the studies mentioned above, I produce a monthly horizon scanning newsletter-type document for the Rockefeller Foundation’s Searchlight Project in my capacity as a director of the South African Node of the Millennium Project, which is part of a global futures think tank. This regularly deals with the agriculture-environmental stakes nexus as the newsletter’s key focus is on dealing with poverty, equitable growth and resilience, amongst others, in Southern Africa.

I also give public talks on the “Driving forces shaping agriculture in Africa” typically at SAIIA symposiums and participate in the annual launch of the Bureau for Food and Agricultural Planning’s yearly “Agricultural Outlook” study which concentrates on forecasts and modelling, but also includes scenarios as variations off the baseline.

---

5 Environmental (and other) aspects are automatically included because futures research begins from a multi-disciplinary, all-encompassing, systems thinking approach.

6 Horizon scanning is the art of systematically exploring the external environment for potential opportunities, challenges and likely future developments relevant to African agriculture. It is a sense-making exercise that analyses the present in order to better understand the future. It explores both new, strange and unconventional ideas, as well as persistent challenges and current trends. The horizon scanning output was also utilised to sensitize participants ahead of a scenario planning exercise as it enables richer, more comprehensive and robust scenarios.

7 The scenarios were constructed during a two day workshop using an accelerated GBN-type methodology whereby experts from multiple perspectives and wide-ranging, different disciplines engaged in structured, facilitated, collective strategic conversation.
Ideas, reflections and outputs from all of the above inevitably boil down to the immense need for a better understanding of, and therefore being better able to deal with, complexity in the issues around agriculture, food security, the environment, etc. The issues are not only complex, inter-related, inter-linked, systemic, and unpredictable, but also turbulent, and we tend to want deal with them using “yesterday’s logic” (as Peter Drucker so aptly put it). Not only is there a need to develop skill sets in managing complexity and uncertainty, but also a need to be able to work on different time horizons.

My expectations then also revolve around the above-mentioned needs;

• looking for collaborative ways to better manage the complexities and uncertainties inherent in the agriculture-environment nexus,
• taking a long-term view in recognition of shorter-term priorities and vested interests,
• how and where to access (create) better data,
• and how to better understand and try anticipate/mitigate systemic agriculture-environment nexus risks.

After chairing the Steering Committee of the Agrimonde Foresight on behalf of Inra and Cirad, as head of the French Initiative for International Agricultural Research (FI4IAR), I have been at the initiative of the Forward Thinking group organized in 2010. FI4IAR and the Technical Centre for Agricultural and Rural Co-operation ACP-EU (CTA) decided to take stock of the diversity of approaches, assumptions and methods and to identify robust results and methodologies using a comparative analysis. They invited the authors of the main recent forward looking exercises to introduce their research to a working group of 30 people: scientists, research managers and decision-makers from ministries, research organizations, private corporations and NGOs, as well as wise people with long experience, broad knowledge and outstanding reputation (see list at the end). Three meetings were organized before and during the GCARD 2010.

In 2010 and 2011, I have coordinated the PARME Forward-thinking Workshop “**Quelles recherches et quels partenariats pour la Méditerranée?**” [What research and what partnerships for the Mediterranean?]. The Mediterranean world is a very rich area, from a biogeographical, historical and cultural perspective. But it is also particularly sensitive to global change affecting economies, societies, ways of life and the environment, especially the climate. One of the main challenges in the region is to build a truly integrated Euro-Mediterranean area, both from the economical and from the political points of view. The research community can play a role in building such a project. This is the idea behind the prospective workshop on research and partnerships in the Mediterranean called ARP-PARME (Atelier de Réflexion Prospective – Partenariats et Recherche en MEDiterranée), initiated by the French National Research Agency (ANR) and coordinated by Agropolis International. This workshop had two main objectives. The first one was to identify the fields of research and innovation which are essential for a sustainable development of the area. The second one was to define the associated cooperation mechanisms for effective and efficient action, both on the research and on the development levels.

Over a period of 18 months (from January 2010 to June 2011), this project implied more than 130 experts encompassing a wide range of disciplines (agronomy, energy, environment, geography, social sciences, etc.) and belonging to sixty organizations from ten countries. During the time-course of the project, 15 workshops were organized, whether on specific topics, or multidisciplinary, or for steering and coordination matters. The study was organized in four steps: (i) an overview of prospective studies about the Mediterranean region published during the last 10 years; (ii) the establishment of a shared foresight frame and the setting-up of thematic working groups; (iii) the identification of research priorities to tackle the big issues in each field covered by the study and (iv) a transverse analysis of these priorities in order to highlight their linkages.

The study first lead to an overview of the big challenges the region will face towards 2030, and then to argued research priorities in five broad fields: people and societies, territories, natural resources, agriculture and food, health. The related issues were explored in an integrated way, in link with people and their territories. In the field of people and societies, research priorities concern the interactions of civilizations and their effects on the evolution of cultures, religions, values, identities and political organizations. As far as territories are concerned, the questions turn around vulnerabilities and complementarities between rural and urban areas and their governance. In the domain of natural resources, the main concerns are about adaptive management of socio-ecological systems, about optimization of knowledge and use of water at different scales and about how to ensure regional energy security with
minimum impact on the environment. Concerning agriculture and food, the issue of food security from the quantitative, nutritional and sanitary points of view is essential. It is addressed at the levels of agricultural policies, production systems, supply chains and food processing. In the area of Human health, research priorities are focused on the emerging problems of chronic diseases due to unbalanced food diet and lack of physical activity. Considering Environmental issues in regard of agriculture, two main outputs are:

**Preserving Mediterranean ecosystems, long-anthropised environments**

Located at the intersection of tropical, arid and temperate influences, the Mediterranean region is a unique biogeographical entity, considered one of the 34 hotspots of global biodiversity. Its rich and varied natural environments show high rates of endemism. Because of its three millennia of permanent human occupancy, it has also seen many novel types of interaction between human societies and their environments. But these anthropo-ecosystems are particularly threatened as the region is being quickly and deeply affected by global changes.

In order to maintain all functions, goods and services provided by these socio-ecological systems to the societies that depend on them, an adaptive management approach is needed, based at once on the development of new fundamental knowledge, on action research involving scientists, managers, policy makers and local people, and the ongoing melding of available knowledge into operational tools to explore new ways of management. Research must seek a better understanding of species’ and communities’ adaptive and evolutionary processes, as well as the structural and functional aspects of biodiversity. Environmental management and development systems must take heed of the multiplicity of users, by means of mediation devices, but also taking into account natural hazards (fires, floods, etc.). Given how long human actions have affected all Mediterranean ecosystems, arguments on environmental management must take full account of agricultural production and animal husbandry practices.

**Designing of innovative production systems suited to global changes**

Mediterranean agriculture, being deeply rooted in specific communities and rural areas, is particularly sensitive to global changes. On the one hand, climate change could exacerbate the characteristics of Mediterranean climate (low rainfall and high summer temperatures) and the frequency of extreme weather events (heat waves, late frosts, droughts, torrential rain). On the other hand, economic, industrial and financial globalisation threatens to break down societal patterns that are themselves rapidly changing. Thus, the major challenges are to characterise the diversity and dynamics of the various types of Mediterranean agriculture and to take advantage of their specific features while adapting them to changing conditions.

What is needed is a “new” agronomy, taking into account local knowledge and based on the control of agro-ecological processes, the development of water-efficient cropping systems and the use of the spontaneous and domesticated biodiversity of the Mediterranean. Again, farmers’ practices and the socioeconomic and regulatory processes by which they are framed and constrained need to be analysed, understood and guided. The objectives are at once an increase in agricultural production, the provision of various environmental services, the maintenance of complementary income-earning activities in rural areas, and a contribution to development and spatial planning. Achieving these goals calls for the implementation of new participatory collective design approaches and the use of tools such as simulation of complex systems, multi-criteria analysis, etc…

Cooperation mechanisms are also discussed, both to foster scientific cooperation among countries, institutions and laboratories and to facilitate the adoption of innovations by public authorities, SMEs, managers and civil society organizations.
I. 7. Contribution of Jon Hutton (UNEP-WCMC)

1. The main agricultural trends which could impact biodiversity

The main agricultural trends are clear – increased land under cultivation or pasture, and/or increased intensification of cultivation and animal husbandry.

2. They key challenges are:
   - The value and accuracy of the scenarios being used to shape our view of the future. They produce possibilities that we need between 6 and 70% more land. This is un-useable.
   - In any case, changes are happening quickly as a result of financial investment (speculation in particular), not some sort of central planning. As a result, we are likely to overshoot the short to medium-term need, both bringing more land under cultivation and increasing the intensity of existing cultivation!
   - The forces of globalisation are so powerful that small-scale farming is likely to be viewed as unworthy of investment, and therefore unworthy of survival!
   - Most analysis assumes that there is ‘unused’ land in Africa and Latin America. This may or may not be correct, depending on how one views the existing use of that land. In Africa, most land is used in traditional ways by communities who do not have legal title.
   - The development of agricultural potential in Africa (in particular) will therefore create winners and losers. We face trade-offs and we need to understand these better. It may be impossible to halt the march of large scale and intensive agriculture (and for many reasons, lots of people will not want to), but we do need to be attenuating its worst impacts on local livelihoods and biodiversity.
   - Our interest are in a) bringing agricultural and biodiversity scientists together to create mutual understanding, b) to have them assess agricultural potential, local stakeholders and critically important biodiversity in integrated process, and c) to examine ways in which the trade-offs can be developed.

I lead the Rockefeller Foundation’s cross cutting research unit, supporting the New York headquarters as well as the regional offices in Nairobi and Bangkok. The Research unit is responsible for supporting research-related grant-making as well as for detecting and assessing novel ideas for future programmatic interventions and risks or opportunities for ongoing.

To do so, we have conducted a number of foresight activities, including

- A workshop of leading foresight experts at the Rockefeller Foundation’s conference facilities in Bellagio, in 2009. The meeting highlighted the rationale and practice of pro-poor foresight in accelerating and enhancing “smart globalization” and in gaining a better understanding of foresight in relation to a set of key issues that are relevant to the global South. Click [here](#) to access the full workshop report, titled *Foresight for Smart Globalization: Accelerating & Enhancing Pro-Poor Development Opportunities*.

- A scenario project focusing on the impact of technology on development over the next 15-20 years. The year-long project that was conducted in partnership with the Global Business Network, international grantee representatives and experts, and yielded a number of ideas for future exploration as well as crucial implications for the Foundation at large. The full report can be accessed [here](#).

- Established the Searchlight function, a group of forward-looking, regionally-focused trend monitoring grantees, mainly located in Africa and Asia, to monitor early signals in areas such as urbanization, food security, water, climate change or health by conducting regular, ongoing scanning for novel ideas, research results, and “clues” to where the world is evolving. More about the Searchlight function can be found [here](#).

- *Catalysts for Change*, a futures map created by the Institute for the Future that synthesizes and analyzes the entire body of work produced by the Searchlight trend monitoring network to identify emerging thematic clusters and create high value-added visuals to emphasize the results and findings for the purposes of strategy development, learning, and wider dissemination. The *Catalysts for Change* map will be available online shortly. A number of hard-copies will be available at the meeting.

I was not involved in previous CGIAR foresight activities, such as GCARD 1.

My expectations for the workshop: Expand my network of environmental and agricultural foresight researchers, learn and share knowledge about methods and on-going work in the field, identify potential future projects.
I. 9. Erik Millstone (Univ. Sussex): UK Foresight Project on The Future of Food and Farming: challenges and choices for global sustainability

Why?
The project was commissioned by the UK government’s Chief Scientist, John Beddington, following a presentation he made in which he focused on the risk of ‘a perfect storm’; and it was strongly supported by the then Prime Minister – Gordon Brown.

A pivotal concept was ‘food security’, which was defined as encompassing considerations of

1) sufficiency, 2) safety, 3) sustainability and 4) equity.

The project assumed steps should be taken to diminish the risks of such a ‘perfect storm’

“The global food system will experience an unprecedented confluence of pressures over the next 40 years... global population size... many people are likely to be wealthier... competition for land, water and energy will intensify, while the effects of climate change will become increasingly apparent.”

The project did focus on the agriculture-environmental nexus, and explicitly criticised UK historic practices of treating agriculture and environment separately, and implicitly the EC/EU and CODEX.

The argument had already been settled in the UK in 2001 with the creation of DFFRA (the Department for Environment Food and Rural Affairs), following the abolition of the Ministry of Agriculture, Fisheries and Food.

The study was unusually comprehensive and sophisticated - the ‘environment’ was characterised not just in thermodynamic and ecological terms, but also in economic and political terms.

Methodology

5 key challenges were identified as

1) Sustainable supply and demand
2) Volatility of supplies and prices
3) Hunger
4) Climate Change and
5) Maintaining biodiversity.
Those issues were addressed by commissioning:
22 reviews of potential ‘drivers of change’ (including eg Population, Climate Change, Energy, Water, Economics and Urbanisation)
56 ‘State of Science Reviews’
7 Regional Reviews (covering eg the UK, China, the Nile and Mekong basins, India and Brazil).
a set of 13 additional reviews and working papers’,
and workshops,
and 29 studies of Sustainable Intensification in African Agriculture.

Analysis and interpretation
A substantial amount of material and analysis was gathered; the task of distilling it into a 211 page Final Report and a 44 page Summary Report was very challenging.
That challenge was complicated by the uncertainties, and arguments and analyses that were often contrary, and sometimes even contradictory.
The manner in which that process was conducted was difficult to discern, and complicated by the change of government in the UK in May 2010.

The resulting ideas, reflections & outputs
None of the conclusions were new to scholars, but some represented new for the UK government.
High-level conclusions included: “…policy in all areas of the food system should consider the implications for volatility, sustainability, climate change and hunger…policy in other sectors outside the food system also needs to be developed in much closer conjunction with that for food. These areas include energy, water supply, land use, the sea, ecosystem services and biodiversity.” [then adding] “Achieving much closer coordination with all of these wider areas is a major challenge for policy-makers.”

Action needed on all four fronts simultaneously:
1. More food must be produced sustainably through the spread and implementation of existing knowledge, technology and best practice, and by investment in new science and innovation and the social infrastructure that enables food producers to benefit from all of these.
2. Demand for the most resource-intensive types of food must be contained.
3. Waste in all areas of the food system must be minimised.
4. The political and economic governance of the food system must be improved to increase food system productivity and sustainability.
The solution is not just to produce more food, or change diets, or eliminate waste. The potential threats are so great that they cannot be met by making changes piecemeal to parts of the food system. It is essential that policy-makers address all areas at the same time...Nothing less is required than a redesign of the whole food system to bring sustainability to the fore.

It is necessary to revitalise moves to end hunger. Greater priority should be given to rural development and agriculture as a driver of broad-based income growth, and more incentives provided to the agricultural sector to address issues such as malnutrition and gender inequalities.

It is also important to reduce subsidies and trade barriers that disadvantage low-income countries. Leadership in hunger reduction must be fostered in both high-, middle- and low-income countries.

Policy options should not be closed off...the Project’s Final Report has argued the importance of, within reason, excluding as few as possible different policy options on a priori grounds. Instead, it is important to develop a strong evidence base upon which to make informed decisions. [But that statement represented a political compromise amongst the project’s ‘Lead Expert Group’, eg between proponents of GM crops and agro-ecologists, and avoided setting priorities.]

Comments and issues for discussion
Too little was said about how agricultural R&D agendas can be coupled more directly to the needs, conditions, aspirations and expectations of the intended beneficiaries. (cf Farmer First)

This issue has been raised in CGIAR institutions; while experiments have taken place, measures to ensure that the needs of and challenges facing the rural poor directly influence R&D agendas have yet to be properly and systematically implemented.

Sustainable intensification
The concept of ‘sustainable intensification’ was used by the UK Foresight study, and elsewhere too, but the meaning and applications of those ideas remains far too vague.

Too often it is interpreted narrowly in physical and ecological terms that fail to include economic, social and cultural dimensions.

Clarity is needed about what is to be ‘sustained’ and what is to be changed.

The report acknowledged that: “…information on international production and the size of commodity stocks is generally poor and in some cases deliberately withheld.”

It also says: “There is a strong case for establishing an emergency food reserve and financing facility for the World Food Programme to help low-income countries facing sudden increases in bills for food imports when price spikes occur...
... This has already been proposed by others. It may also be appropriate for individual states to consider creating strategic reserves of food commodities.”

Help and encouragement should be given to developing countries to establish (or re-establish) public sector food stocks that can serve to buffer supply and price volatilities, so as to protect the vulnerable rather than enrich the powerful.

I maintain that the rules governing the buying and selling of food stocks and food futures need to be more not less restrictive.

In particular ‘naked short-selling’ of food stocks or futures should be unlawful; buying and selling of wholesale food stocks should be restricted to companies that own or use physical stocks.

The impact of commercial speculation on food price volatility was discussed, but the report suspended judgement on its significance, and suggested no particular measures.

Indeed it says: “It is beyond the scope of the Project to make technical recommendations about the workings of commodity markets.”
I. 10. Siwa Msangi (IFPRI): Brief Note on Foresight for Agriculture-Environment Nexus

Summary
Within the last year, IFPRI has been involved in a collaborative exercise to determine the environmental impacts of different biofuels policies within the US. This exercise was carried out as part of a scoping study to see how a ‘Low Carbon’ Fuel Standard could be implemented nationally in the US (http://steps.ucdavis.edu/research/Thread_6/lcfs), following the example set by the state of California. The component that IFPRI evaluated was the land use implications of alternative policy combinations – where the existing Renewable Fuel Standard (RFS) is complemented with a Low-Carbon Fuel Standard of varying stringency. The projection horizon was 2030, so as to coincide with those of other energy-related studies (AEO of the US EIA (EIA, 2010), WEO of the IEA (IEA, 2008), etc). The results illustrate the clear linkage between policy-driven impacts on agriculture within the US, and the implications they have for agricultural markets and the trade-off between agricultural and non-agricultural land in other regions of the world. In this way, a critical dimension of the agriculture-environment nexus was addressed.

Methodological Description
The basic approach that was used to look at the agriculture-environment linkages was to couple the IMPACT model (Rosegrant et al 2001,2008) with the US-focused BEPAM model (Khanna et al 2011, 2011). The IMPACT model is focused on agricultural supply and demand, and is a global multi-market, partial equilibrium model – that takes the socio-economic drivers of population and income change, to model changes in food demand, while other policy drivers affect either the non-food demand (like biofuels) or the agricultural yields (like investments in research and development). Figure 1 (below) illustrates these linkages, and how they relate to human welfare outcomes like malnutrition.

[Figure 1 here]

The BEPAM model simulates the effect of alternative US biofuel policies on agricultural production, prices and exports – which are then imposed upon the IMPACT model, in order to look at the international effects. The schematic below (Figure 2) shows this linkage, within the context of key drivers of change.

[Figure 2 here]

The scenarios that were considered reflected changes in the US biofuels study in which

- The existing RFS policy is the sole national biofuels policy in effect
- The RFS is combined with a low-carbon fuel standard that incentivizes reductions in the carbon intensity (CI) of the average fuel pool, through:
  - Imposing a 15% reduction in average CI
  - Imposing a more stringent 20% reduction of CI
  - Imposing a ‘penalty’ for land use change, reflected in an ‘iLUC’ factor
  - Imposing a carbon tax, within the US

Each of these policies induces a different mix of biofuel feedstock use within the US, so as to produce ethanol and biodiesel in such a way that the blended fuel meets the targeted reductions in CI. The way in which fuel policy affects feedstock choice within the BEPAM model, induces a change in the agricultural landscape of the US – and ultimately results in a change in US exports that affects prices and land use in the rest of the world. Figure 3, below, illustrates the critical connections that make up the agriculture-environment nexus that we try and capture.
New ideas & reflections
This study brought out a number of new insights:

• Policy design is critical to the environmental outcomes that can be expected from biofuel production within OECD countries. The difference between a policy focused on supporting a particular feedstock (like maize for ethanol in the US), versus one focused on reduction of carbon intensity (like the Renewable Energy Directive of the EU) can be significant – when looking at the impacts on the agriculture-environment nexus.

• Land use change (LUC) due to biofuels cannot be separated from LUC due to agricultural expansion from growing food demand and other important drivers. The only ‘first-best’ policy is to address LUC through environmental policies that penalize carbon emissions. Given the difficulty of implementing a global carbon policy, however, indirect policies such as penalizing biofuel producers for ‘indirect land use change’ become more attractive to policy makers.

• Most of the LUC impacts from biofuels happen in Latin America and Sub-Saharan Africa. Given the potential for boosting yields (and avoiding agricultural area expansion) in SS Africa – good agricultural policy might be the best answer to this problem.

Expectations for the 2011 Foresight Forum
In the forthcoming forum, I hope that we can have a vibrant discussion on the following questions:

• Which are the outcomes we care most about in our foresight analysis (Poverty, Greenhouse Gas emissions, etc.)?

• Which foresight tools are best suited towards tracking and quantifying these outcomes?

• What are the major data gaps the foresight community has to address to better understand and quantify the key linkages in the agriculture-environment nexus?

• How can these foresight studies be best used to inform GCARD’s deliberations and further the agenda of the new CGIAR?

References


Figure 1: Schematic of modeling components in IMPACT

Figure 2: Linkages between the IMPACT and BEPAM models
Figure 3: Linkages relevant to Agriculture-Environment nexus

International

Domestic

Foodcrop-based Biofuel feedstock

Non-food crop-based Biofuel feedstock

Mkt prices

Changes in demand

Changes in production

Changes in area

Changes in yield

Changes in area

Changes in yield

ILUC-generated GHG

GHG emissions

Land use changes

Yield

GMO

Food supply

Food crop demand

Market equilibrium

Non-food crop supply

Non-food crop demand

Trade

Food

By-product

International
I. 11. Emilio RUZ (PROCISUR): Experiences of PROCISUR in Foresight Studies for the Southern Cone of Latin-America

The first systematic foresight exercise was conducted by PROCISUR in 2009. The central theme was “The role of the Southern Cone as food reserve of the world: possible scenarios for research, innovation and development”.

The study was divided in four stages: a) Preparatory phase: dimensions and critical uncertainties; b) Performance of the exercise: unfolding of possible futures of critical uncertainties; c) Analysis of the exercise: building of the scenarios; d) Implications and challenges for PROCISUR.

In developing the foresight study, the agriculture in the region was seen from five different dimensions with their interactions and critical uncertainties:

1. Science and Technology
2. Institutional Policy
3. Productive and Economic
4. Socio-Cultural
5. Environmental

The environmental dimension was incorporated as one of the key components since in the current agricultural scenarios is a vital requirement for the sustainability and competitiveness of the productive systems.

Regarding the environmental dimension and its connection to agriculture, in the course of the study the following critical uncertainties were thoroughly discussed:

- Monitoring and evaluation of vulnerability to climate change
- Technologies for adaptation and mitigation to climate change
- Sustainable land use
- Sustainable water use
- Conservation and sustainable use of biodiversity
- Environmental regulation
- Renewable energy sources in the field

The foresight study has been very useful to help set research priorities and to guide institutional innovations in the member countries of PROCISUR.

In reference to the environmental issue, it has given impetus to numerous projects related to sustainable use of natural resources and climate change. It has also been useful in promoting the development of technological tools to assess the environmental impact of rural activities. One such tool has already been used in a World Bank project developed in Uruguay called “Responsible Production”. This Project required monitoring the benefits of promoting technological practices to improve environmental and social sustainability in family farming. An assessment system for environmental impacts of agricultural activities was adapted to the Uruguayan conditions from the Brazilian model “Apoia Novo-Rural” (Geraldo Stachetti, EMBRAPA) through the cooperation of the regional program -PROCISUR.

This new adapted version called EIAR (Evaluación del Impacto Ambiental de Actividades Rurales, [http://www.cebra.com.uy/presonsable/segumiento-y-evauacion/elar/]) aims to evaluate, with an integrated approach, environmental, economic and social sustainability of farms. A set of indicators on the dimensions that are detailed below was recorded in every farm to
establish a “base line” at the beginning of the project, in order to define technological practice to implement in each farm and also for “ex post” appraisal of project impact.

- Ecology of landscape
- Air quality
- Water quality
- Soil quality
- Socio-cultural values
- Economic performance
- Farm management

Most environmental indicators are registered with field kits and some sampling for lab analysis. Assessment of the economic and social variables is carried out with specific questionnaires. Farmer involvement from answering questioners, monitoring of field variables until discussion of outcomes is an essential method requirement for successful adoption of best production practices.

In the future, PROCISUR is interested in making a second foresight study in 2012 with the following orientation: “Analysis of the sustainable productive potential and identification of technological-institutional gaps in the agrifood systems of the Southern Cone”. Therefore, our participation in this pre-foresight group opens interesting prospects for our region in terms of methodologies, looking for partners, results and future directions.
I. 12. Katindi Sivi Njonjo (Institute of Economic Affairs): **Developing regional scenarios for climate change and food security in 2030 in East Africa**

Please note that I am working in this project as a consultant who will be helping with the wider dissemination of the project and also getting stakeholder buy-in. I was not involved in the conceptualization or the actual research and scenarios building exercises.

**Introduction**

This program (see: [http://ccafs.cgiar.org/blog/developing-regional-scenarios-climate-change-and-food-security-2030](http://ccafs.cgiar.org/blog/developing-regional-scenarios-climate-change-and-food-security-2030)) is a 10-year research initiative on Climate Change, Agriculture and Food Security (CCAFS) launched by the Consultative Group on International Agricultural Research (CGIAR) and the Earth System Science Partnership (ESSP) in 3 regions (East Africa, West Africa and Indo-Gangetic Plains).

CCAFS seeks to overcome the threats to agriculture and food security in a changing climate, exploring new ways of helping vulnerable rural communities adjust to global changes in climate.

Researchers from CCAFS are working with national agriculture research institutes, nongovernmental organizations, farmers’ associations, international development organizations, meteorological centers and government officials to discuss plausible futures and contemplate what East Africa would be like by 2030.

Through scenarios building, the CGIAR Research Program on CCAFS explores new ways of helping farmers to adjust to global changes in climate and helping decision makers to weigh up the pros and cons of different policies. Inevitably, both at grass-roots levels and in the corridors of power, adjusting to climate change will mean making complex tradeoffs between food security, livelihoods and the environment. This important research will help policymakers, farmers and others affected by climate change understand the implications of their decisions when making difficult compromises.

1. **To what extent an agriculture-environmental stakes nexus was incorporated**
2. **The reasons for it**

Agriculture contributes largely to climate change by producing 10-12 percent of total global anthropogenic emissions of greenhouse gases and is a primary driver of deforestation from clearing land for food production. Given climate change, a new kind of agriculture is therefore essential, one that must meet the triple challenge of ensuring food security, adapting to climate change and contributing to climate change mitigation. Because of the importance of including agriculture on the climate change agenda, the work incorporates the concept of ‘Climate-smart agriculture’ which has the potential to mitigate greenhouse gas (GHG) emissions, while at the same time still producing food for the world’s increasing population. The approach is essentially about changing food production systems into more resilient and adaptive, 'climate-smart' agricultural practices to ensure food security.

3. **What was the methodology used to deal with this nexus;**

*Adaptation to progressive climate change*

Climate change means that future farming and food systems will face substantially modified environments as they struggle to meet the demands of a changing global population. Efforts to cope with the stresses caused by growth in demand for food and water will be confounded by a range of stresses for example higher temperatures, changing rainfall patterns and rising sea levels.
Understanding and harnessing of social, economic, cultural and institutional processes of adaptation will be used to provide plans and strategies to establish detailed adaptation pathways of food systems at the national, regional and global level.

**Adaptation through managing climate risk**

Managing the risk associated with climate variability is integral to a comprehensive strategy for adapting agriculture and food systems to a changing climate. There is need to:

- Identify and test innovations in partnership with rural communities that enable them to better manage climate-related risk and build more resilient livelihoods;
- Identify and test tools and strategies to use advance information to better manage climate risk through food delivery, trade and crisis response;
- Support risk management through enhanced prediction of climate impacts on agriculture, and enhanced climate information and services.

**Pro-poor climate change mitigation**

If the poor are to contribute to climate change mitigation, there is a need for mitigation options that have a positive impact on livelihoods, otherwise unacceptable trade-offs may occur. Carbon markets are unlikely to provide significant benefits to smallholder farmers in the near run and are highly uncertain, but livelihood options that produce mitigation co-benefits and carbon finance schemes that provide additional incentives should help farmers to meet both livelihood and environmental objectives. Special attention will be given to the trade-offs and synergies of mitigation, food security and poverty alleviation, while ensuring the health of water, land and ecosystems at different scales (e.g., farm, landscape, seascape, food value chain).

**Integration for decision-making**

It includes methods, models, databases and system metrics aimed at: enhancing assessment of the likely impacts of climate change on agricultural systems, particularly in the context of other social and economic changes; and methodologies to assess the likely impacts of different policy and program interventions to foster adaptation and mitigation in terms of poverty alleviation, food security and environmental health. It is envisioned that this will: link knowledge with action; assemble data and tools for analysis and planning; refine frameworks for policy analysis.

4. **What were the resulting new ideas/reflections/outputs (particularly for those involved in the previous exercise in 2010 before GCARD 1)**

The process encompasses: forward thinking research; will convene policy dialogue platforms and will help build the capacity at both grassroots and national levels on issues of Climate Change, Agriculture and Food Security.

5. **In addition, could you please provide some elements of expectation you have from this Foresight Exchange Workshop, and what you would particularly want to discuss.**

- Learn more about other foresight work in the globe;
- Establish dissemination networks and the probability of other regions in the globe picking this approach for their work.

After having contributed to the coordination of the Agrimonde exercise (INRA – Cirad, Scenarios and challenges for feeding the world in 2050), I have been one of the authors of the 3rd Foresight Expert Group report (FEG3) to the Steering Committee on Agricultural Research (European Commission) : “Sustainable food consumption and production in a resource-constrained world”, issued in February 2011.

This report is a survey of recent foresight and assessment exercises (2008 – 2010) concerning agriculture, particularly in the context of a resource constrained world. Its purpose is to produce recommendations for the European research and innovation policy in the field of food and agriculture.

1. & 2. To what extent an agriculture-environmental stakes nexus was incorporated; the reasons for it (or why it was not):

In the SCAR FEG3 report the issue of resources scarcities is very central, based on its prominence in a majority of recent publications and foresight. We also use the term “scarcity” in an extended meaning, making it both a social and ecological phenomenon:

1) “Classical” or “old” scarcities related to natural resource use: fertile land, freshwater, energy, phosphorus, and nitrogen,
2) “New” scarcities related to environmental limits that aggravate the “classical” scarcities: climate change including ocean acidification and biodiversity loss,
3) Societal processes that aggravate these scarcities but can also become important pathways for transitions to sustainable and equitable food consumption and production.

3. what was the methodology used to deal with this nexus:

The agriculture / environmental stakes nexus is thus incorporated in the general framework of the debate about “planetary boundaries”, pointing at crucial concepts:

- the scarcity concept matters because it puts into question the nature, the role and the pace of technological progress and innovation, with very different worldviews in controversy,
- global and local systemic interrelations among scarcities, non substitutability of natural capital, are reasons why the quality of current changes and environmental challenges can necessitate to envision radical possible or necessary changes in the food and agriculture system at the global scale,
- transition management therefore becomes a crucial concept.

In order to make these concepts more operational, the report points out two main narratives that are implicitly or explicitly driving the interpretations of the agriculture / environment nexus in the majority of recent foresight:

- the productivity narrative, for which the focus should be on increasing the productivity and efficiency of resources use in the whole chain, but often mainly restricted to the increase of vegetal biomass production per unit of land;
- the sufficiency narrative, for which efforts in productivity and efficiency are important, but not sufficient, and more thorough changes are needed in the structure of the whole global food system, and particularly in the drivers of food consumption.
These two narratives are used to show different interpretations of scarcities, of possible transition pathways, and particularly of the role of innovation and research policies.

4. what were the resulting new ideas/reflections/outputs (particularly for those involved in the previous exercise in 2010 before GCARD 1):
The main results of the report, from my point of view, consist in showing that:
- there is a consensus among recent foresights and assessments that possible future “scarcities” in the broad sense point at possible radical changes in the food system (agricultural production, food processing, and also food consumption),
- the productivity narrative would say that technological progress has always enabled to transgress physical limits of resources, but the sufficiency narrative argues that time is also scarce for such a technology based transition to occur,
- the funding of systems innovation, directed towards public policy goals specified at the agriculture / environment nexus, must be a priority,
- ecology-based and sufficiency-based innovations for food systems are going to play a crucial role in the future; changes in the processing, marketing and retailing segments of the food chain are also essential.
- the place of Europe in the global food system can not be restricted to provisioning food to global markets; competitiveness might more be an issue of pioneering in sufficiency-oriented food systems than of producing more than other potential food exporting regions;
- the transition in global food systems is also an issue of global governance, in order to prevent strategic use of scarcities.

5. in addition, could you please provide some elements of expectation you have from this Foresight Exchange Workshop, and what you would particularly be wanting to discuss.
My expectations from the workshop is to be able to engage a dialogue with the variety of foresight producers and users, among which particularly different modelling approaches of land use changes at different scales, on one hand, and on the other hand more qualitative approaches revealing implicit narratives in the design of foresights, projections and assessments, in order to enrich the two main narratives presented here, and to identify which would be the most relevant scenarios and questions to explore.
I. 14. Contribution of Maurits van den Berg (Netherlands Environmental Assessment Agency)

Expectations from this Foresight Exchange Workshop
- Learn about other participants’ experiences on:
  - topics addressed,
  - approaches followed
  - communication strategies to different target audiences,
  - integration of quantitative analysis at high level of generalization with more specific ‘how to’ questions regarding measures on the ground and governance issues.
- Identify new priorities for development and investigation

What I would particularly be wanting to discuss
- Bridging the gap between strategic national to global level analyses and research ‘on the ground’, without losing sight of the ‘big picture’ (i.e. upscaling, downscaling, cross-scaling);
- New priorities for development and investigation
- Approaches: What type of approach or combination of approaches works best for different types of issues and different types of target end users; both from a scientific perspective as well as from a perspective of stakeholder engagement (i.e. to ensure relevance to stakeholders, and to get the messages across effectively).
- Comparative studies

Main foresight activities 2010/2011:
(i) Rethinking Global Biodiversity Strategies
(ii) The Protein Puzzle
(iii) EU resource efficiency perspectives in a global context
(iv) Global integrated assessment to support EU future environmental policies (ongoing; study commissioned by the European Commission, DG-Environment)
(v) Rio + 20 (work title)

Rethinking Global Biodiversity Strategies

Institutes involved: PBL, LEI, UBC

Main objective: To identify options for reducing global biodiversity loss in the face of increasing food, wood and energy demands, and increasing pressures of infrastructure and climate change on the natural environment.

Context: The study is a contribution to the project on The Economics of Ecosystems and Biodiversity (TEEB). It was conducted on behalf of the Dutch Minister of Agriculture, Nature and Food Quality, following a request by UNEP. The report was launched during the COP 10 of the CBD in Nagoya (October 2010).

Agriculture-environmental stakes nexus: Three of the eight ‘options’ explored in this study to reduce biodiversity loss are directly related to agriculture: “Closing the yield gap”, “Reducing post harvest losses in the food chain” and “Changing diets”.

Reasons for incorporating the nexus: Agriculture, through its effects on land use and emissions has a great impact on biodiversity. Strong increase in agricultural production could
lead to increasing competition between agricultural land use and terrestrial biodiversity over the coming decades. Improving efficiency in production and food supply chains and more sustainable consumption could mitigate associated problems.

**Methodology**

- The study was performed at global level, with a time horizon until 2050. Single options to reduce biodiversity loss were analysed on the basis of formerly published studies. In addition, a combination of options was analysed alongside a “business as usual” scenario (baseline).
- Models used: LEITAP (economics), IMAGE (land use, environment) and GLOBIO3 (biodiversity). Biodiversity indicators used are Mean Species Abundance (MSA), ecosystem extent (natural and semi-natural) and wilderness areas.
- A governance feasibility assessment of the strategies investigated was performed in a subsequent study by IVM and PBL.

**Resulting new ideas/reflections/outputs:** better understanding of relations between biodiversity, agriculture and other pressures; better understanding of rebound effects, both from the consumption side and the land use side.

**Publications**


**The Protein Puzzle**

**Institutes involved:** PBL, LEI, IFPRI

**Main objectives:** to assess the consequences of the production and consumption of animal proteins for human health and the environment; and to sketch options for reducing these impacts at a global level, in a European context.

**Context:** To support the discussion on the future of EU food consumption and production, in a context of the current reform of the Common Agricultural Policy, the Common Fisheries Policy and the debates on the subject following earlier national an international publications on the subject.

**Agriculture-environmental stakes nexus:** In the study we explored the effects, until 2030, of different ‘options’ concerning livestock production and consumption, at EU level and global level, to reduce environmental impacts. Environmental aspects considered include land use change, biodiversity, reactive nitrogen emissions and greenhouse gas emissions. As proxies for food security we looked at price levels and EU self sufficiency.

**Reasons for incorporating the nexus:** a large share of the environmental impacts of agriculture is attributed to livestock production, both directly as well as via crops production for animal feed. Environmental impacts are expected to increase with population growth and
diets becoming more meat intensive. There is great variation, however, in impacts between different livestock sectors and management systems.

**Methodology**

- The study was performed at global level with special attention to the EU; with a time horizon until 2030. Seven options to mitigate environmental impacts at EU or global level were analysed alongside a reference (business as usual) scenario. The options comprise changes in diets, reducing waste, and technological improvements to accelerate crop and/or livestock productivity increase.

- Models used: IMAGE/GLOBIO in connection with two alternative economic models: LEITAP (general equilibrium model) and IMPACT (partial equilibrium).

**Resulting new ideas/reflections/outputs:** better understanding of relations between agriculture and environment and the scope for improved performance, win-wins and trade-offs; better understanding of rebound effects, which are considerable; and of differences between different modelling approaches. An interesting result was that effects of measures in the EU to reduce environmental impacts are mostly outside the EU.

**Publications:**


- A publication with focus on the comparison between the LEITAP/IMAGE-based results and the IMPACT/IMAGE-based results has been submitted to Agricultural Systems.

**EU Resource efficiency perspectives in a global context**

**Institutes involved:** PBL, European Commission (DG-ENV)

**Main objectives:** For five key resource themes, investigate: (i) the impacts of current and projected resource use, up to 2050, and in which parts of the world will they be felt most; (ii) the potential effects of boosting resource efficiency; (iii) how such interventions would interact with other resources, and how resource efficiency relates to efforts to mitigate climate change.

**Context:** This study was requested by the European Commission, to assist in its preparation of a Roadmap for a Resource Efficient Europe.

**Agriculture-environmental stakes nexus:** The resource themes focused on were (i) Energy, particularly with regard to scarcity associated with fossil fuels and their key role in climate change; (ii) land for agriculture/forestry and terrestrial biodiversity; (iii) phosphorus, especially with regard to its irreplaceable role in agricultural production; (iv) fresh water with attention to water stress in primary catchment areas; and (v) fish stocks.

**Reasons for incorporating the nexus:** The resource themes are crucial with respect to food production as well as for the preservation of (other) vitally important ecosystem goods and services. Ambitious efforts on resource efficiency could provide opportunities for synergy, but also risks of trade-offs.

**Methodology**

- The study was performed at global level with special attention to the EU. Time horizon until 2050. Scenarios analysed were combined assumptions on ambitious
resource efficiency with or without ambitious climate action, regarding all themes in conjunction.

- Models used: TIMER/IMAGE/GLOBIO and a phosphorus demand/supply model, all by PBL
- Governance and policy implications were addressed qualitatively

**Resulting new ideas/reflections/outputs:** Measures analysed to enhance resource efficiency reduce future problems, without resolving them altogether. Accompanying policies will be needed to avoid an overly strong emphasis on marketed resources and to take full advantage of potential synergies. Complementary adaptive strategies would also be needed in addition to technological solutions. Different dimensions of scarcity (physical, economic, political) highlighted for different themes.

**Publication:**

**Global integrated assessment to support EU future environmental policies (GLIMP)**

**Institutes involved:** PBL, LEI, UBC, European Commission (DG-ENV)

**Main objective:** Identify potential environmental problems and opportunities beyond current policy agenda, with special attention to global developments affecting the EU and *vice versa*.

**Context:** Study commissioned by the European Commission, DG-Environment

**Agriculture-environmental stakes nexus:** spheres of investigation identified include 1st and 2nd generation bio-energy, agricultural & trade policy reform, fisheries (analysis of alternative wild catch scenarios and implications for aquaculture and land use for crop-based feed); phosphorus (quantitative analysis of: global phosphorus cycle, opportunities for more efficient use and recycling, coastal eutrophication).

**Reasons for incorporating the nexus:** high importance attributed to competitive claims on land and other resources for food, fuels, forest products and biodiversity.

**Methodology:**
- Cases and scenarios are designed in close collaboration with a Steering Group comprised of high level scientists from several institutes and EU Commission staff.
- Models used: EcoOcean, LEITAP/TIMER/IMAGE/GLOBIO and extensions thereof.

**Resulting new ideas/reflections/outputs:** This more participatory approach to scenario analysis leads to interesting out-of-the-box ideas and insights and higher policy relevance. Final results expected early 2012.

**Rio + 20** (work title)

**Institutes involved:** PBL, ODI, IVM

**Main objective:** to evaluate the actions required to achieve a set of ambitious sustainable development targets by 2050 simultaneously.

Principal questions addressed in the study:
- What pathways would be consistent with achieving the targets?
What do long-term targets imply for near-term policy priorities?
What institutional framework and governance mechanisms are needed?

**Context:** Rio+20, United Nations Conference on Sustainable Development

**Agriculture-environmental stakes nexus:** targets are included on food security, climate, biodiversity and other environmental indicators affecting, or affected by agriculture.

**Reasons for incorporating the nexus:** food security, agriculture, climate and biodiversity are strongly interlinked, and are being analysed in an integrated manner.

**Methodology:**
- The project follows a “a back-casting from the future” approach, with pre-defined end-points of a set of scenarios; *i.e.* different pathways towards the same sustainability goals.
- Governance analysis and quantitative scenario analysis are performed more interactively than in previous PBL studies.

**Resulting new ideas/reflections/outputs:** This alternative approach of scenario building and more balanced combination of quantitative assessment with governance analysis leads to interesting discussion and creative thinking. Final results are expected in the first quarter of 2012.
1. To what extent an agriculture-environmental stakes nexus was incorporated?

The report “Who will feed the world?” was prepared in the framework of Oxfam international GROW campaign 2011-2014. It focuses in particular on the production challenge. By looking at the different players in developing countries’ agricultural systems: small scale and large scale producers and systems of production: ‘LEI – Low External Input’ agriculture and ‘HEI – High External Input’ agriculture, the research aims at exploring how to achieve sustainable agricultural growth, allowing for: Food security, Poverty Reduction, and Environmental protection. The main argument of the research is that debates which polarise small-scale versus large-scale models, or, if we consider the systems of production, ‘LEI – Low External Input’ agriculture versus ‘HEI – High External Input’ agriculture have obscured the potential of building on complementarities and the existence of multiple pathways to achieve agricultural growth and sustainability. Betting on one model only and adopting a one-size-fits-all approach is unlikely to be appropriate, given the heterogeneity of institutions, and agro-ecological, farming and demographic conditions across developing countries. Achieving the objectives of increased food production and food accessibility, and at the same time protecting the environment, requires adopting a different blend of policies, a four-pronged approach, aimed at the following:

- Supporting subsistence (family) farmers to cope with risks and vulnerability.
- Empowering small investor farmers with the necessary capacity, finance, and regulation to increase their productivity, production, and competitiveness, and in turn to contribute to food security.
- Making large investments pro-poor, by setting the right framework.
- Building on complementarities between large and small farms, when possible.

A variety of institutional arrangements could be used to combine the assets related to large scale farms: capital, technology and markets with those of small-holder producers: land, labour and local knowledge, to build sustainable food value chains. Inclusive outgrower schemes in which smallholders benefit of extension services, training, credit and market access, and large scale farmers of certainty of quality and quantity of supply can promote smallholder diversification into high-value crops and can support productivity gains.

2. The reasons for it (or why it was not)?

Answering the ambitious question of “Who will feed the world?” requires an integrated approach to food security, poverty, and environmental protection. The coming decades will require unprecedented change in global agri-food systems. Growing and changing demand for food, the impacts of climate change, responding to poverty and hunger, and rapid decline of natural resources create a set of interconnected factors that mean ‘business as usual’ is not an option if global food security is to be assured. The focus of innovation and growth in the agri-food sector must be on how to feed 9 billion in an inclusive and sustainable way, and how to get there fast. Inclusive business means creating profitable business models and strategies that help drive economic opportunity for those who would otherwise be left behind. Inclusive business at scale also ensures that the huge numbers of rural producers central to global food systems have the assets and the incentives to sustainably produce much needed large surpluses. Inclusiveness is as an important a precondition for environmental sustainability, as sustainability is for long-term business prospects and food security.

3. What was the methodology used to deal with this nexus?

The research work was based on a review success and failures, pros and cons of different players (small scale farmers versus large scale farmers) and production methods (LEI and
HEI), drawing lessons from case studies, interviews with leading figures in the agribusiness, review of literature and business models.

4. What were the resulting new ideas/reflections/outputs (particularly for those involved in the previous exercise in 2010 before GCARD 1)?

The mounting pressures to increase food security, respond to climate-change challenges, and halt biodiversity decline have prompted an intense debate on which approach to production could bring better results. However, evidence from our research shows that it makes no sense to bet on one model only. There are many pathways towards agricultural sustainability, and no single configuration of technologies, inputs, and ecological management is more likely to be widely applicable than another. This is the case of Africa, where soils are highly variable and may require biological techniques as well as increased fertiliser use, given that its use on the continent remains extremely low.

Achieving future Food security and climate change goals requires to say it in the words of Pretty (2006): “sustainable intensification” making use of the best technical and best ecological means (and local knowledge) to produce more food from the same area of land while reducing the environmental impacts.

Interesting examples of sustainable intensification include for instance: System of Rice Intensification in India which have tripled yields per acre leading to water saving up to 40 per cent, Agroforestry systems (such as nitrogen-fixing leguminous trees and shrubs) in Africa which have reduced soil degradation and improved crop yields – three-four fold, at the same time reducing the use of fertilisers and greenhouse gas emissions. No till in Ghana has limited soil loss and water runoff. No-till can reduce production costs by 15–20 per cent, by eliminating four–eight tillage operations, with fuel reductions of up to 75 per cent. Overall these methods allow to tackle the triple challenge of contributing to food security, mitigating and reducing vulnerability, and increasing the adaptability of agricultural systems to climate change.

These successful agriculture practices take place in about 3 per cent of total cultivated land in developing countries. And they could provide useful lessons for developing countries and in Africa in particular. However this requires considerable investments to research and develop technologies and methodologies and to build farmers’ capacity.

5. In addition, could you please provide some elements of expectation you have from this Foresight Exchange Workshop, and what you would particularly be wanting to discuss?

There are successful experience on the ground of environmental sustainable and inclusive business in agrifood market.- what can be the role of the different players (policy makers, NGOs, Knowledge organisations, Business) to contribute to scale up these initiatives and to achieve global food security. The big question for the coming decades is how to achieve the scale of change needed and quickly enough. Where are efforts so far remaining small ‘islands of success’ and where are they adding up to a ‘sea of change’? What inspirational examples are emerging from the past decade’s efforts? What ideas could be adapted, mutated or cross-pollinated? And where do those with experience see the opportunities for rapidly putting good ideas into practice at larger scale.

Finding practical and workable ways forward is an immense innovation agenda. Work on sustainable supply chains over the last decade offers many lessons and insights. However, so far the implications for scaling sustainable and inclusive business have only been partially connected. On-going innovation needs the space for the intermingling of experiences, ideas and inspiration.
I. 16. Contribution of Duncan Williamson (WWF UK)

1. Why did you decide to publish the report “Livewell: a balance of healthy and sustainable food choices”?

We decided to produce the document as we realised that there are many messages around what to eat, food consumption, and this has generated a great deal of confusion as to what is the best thing to do, and can lead to inactivity. We felt it would be better to build on existing advice and not add another message. We had already understood that the foods with the highest environmental impacts are the ones we are demanding more of, are the same as those that cause diet related ill health. Therefore joining the two together into a sustainable diet, seemed logical and would be a win win. By producing such a document we hope that this enable people to look at what they eat and recognise the benefits of a healthy diet or people and planet.

2. What for did you publish this report?

We decided to publish the document as we wanted to demonstrate that it was possible to define a sustainable diet, one that fulfilled all our nutritional requirements and was low carbon. The UK government and others had said it was not possible to do this and would cost too much money. WWF UK suspected this was not the case. Once we had the completed document, we then had it peer reviewed and had the British Dietetic Association endorse it. This enabled us to use it as a way of influencing government, in the UK and across Europe. By putting the document in the public arena we demonstrated that we could define a sustainable diet and subsequently are seeking to work with governments and others to take this work forward. We have received funding to run a project in the EU demonstrating the adaptability of the work to others cultures and to get sustainable diets on the policy agenda in Brussels.

3. Why are this document and its contents important for you?

This is important to WWF and myself as the food system is the key driving force behind habitat loss and over extraction of water, and a key cause of climate change. In the West many people eat too much of the wrong foods and do not realise that consequences of their food choices. It is also clear that we need to change what we eat and how we produce food in order to have a sustainable future, as part of these we need to strive for a more equitable food system to achieve global food security. If we want to achieve WWF 2050 meta goals we have to work on food in both a local and global context.

4. How did you “build” the report (methodology, contents, processes…)?

The main questions addressed in this report are:
1. What is the nutrient intake and the GHGEs of the UK population’s diet?
2. What would WWF’s Livewell plate and diet look like if they met both current dietary recommendations and the 2020 target of a 25% reduction in GHGEs?
3. Is it possible to achieve a diet with 70% reductions in GHGEs by 2050 and still meet current dietary recommendations?

To answer the first question, dietary intake data from the National Diet and Nutrition Survey (NDNS) for adults aged 19-64 years (2000/01) was compared with nutrient recommendations for health and the Eatwell plate. This confirmed the fact that the UK diet is too high in saturated fat, sugar and salt, and low in fibre compared with dietary recommendations. Furthermore, a shift to more fruit, vegetables and starch-based food and to fewer high fat and/or sugar types of food and high protein-based food (particularly meat) is needed. From
the NDNS data it was estimated that the GHGE from the UK adult diet was 7.14kgCO$_2$/adult/year, which is similar to previous estimated annual UK food chain GHGE figures.

To address the second question, the main task of the project was to develop a Livewell 2020 diet that would meet the 2020 target for reductions in GHGEs and dietary recommendations for a healthy diet. This required GHGE data for different food commodities to be matched to the actual food items consumed in the diet, as well as adjusting the GHGE reduction targets (expressed as kgCO$_2$/person/day) to take into account projected population growth by 2020 and 2050. It was assumed that GHGE reductions would be made to both the supply and demand sides within the food chain.

Total GHGEs from the food supply can be split by a nominal boundary of the regional distribution centre (RDC), i.e. primary commodity production and transport to the RDC (pre-RDC) and processing, transport to retail, storage, preparation and waste (post-RDC), in the ratio of 56:44 (Audsley et al. 2009). It is recognised, however, that this is only a nominal boundary as it is not always clear exactly where primary production ends and processing begins for different types of food. Given the limited data available for post-RDC for individual food commodities, the focus in this report was on changing food choice using pre-RDC GHGEs for which there is more comprehensive data. Using the mathematical modelling technique of linear programming, a diet was created from a list of food by placing a number of constraints on the model to ensure that nutrient recommendations were met and GHGEs minimised. For the Livewell 2020 diet additional constraints were built in, placing either upper or lower weight limits on individual food items that could be included in the diet to make it more acceptable to the UK population.

The Livewell plate developed for 2020 provides additional detail within some of the original Eatwell food groups, such as the proportion of the different sources of protein-based food. For example, in the Livewell 2020 plate only about a third comes from meat, which is significantly less than in the UK diet. The plate needs to be developed further to include additional dimensions of sustainability – for example the fruit and vegetable food group could be sub-divided to take into account seasonality and energy efficiency of production methods. A similar approach could be adopted for each of the five main food groups on the Eatwell plate.

Thirdly, it was shown that it was possible with the right combination of food to achieve a 70% reduction in GHGEs (2050 target) while still achieving dietary recommendations for health, but the range of food would be limited. Furthermore, it would be much more difficult to create a sensible diet from the list of food. A 2050 diet could include food such as meat and dairy, but in very much smaller amounts than the current diet; this would only be achievable by limiting the range of other food in the diet. It was concluded that it was unrealistic to create an actual diet as it could only be based on food available today and current estimates of GHGEs for food commodities, both of which are likely to change over the next 40 years. Taking a holistic approach to the diet, this project has shown that a healthy and low-GHGE diet can include a moderate amount of food types classed as ‘unhealthy’ or food with high GHGEs by balancing them with other lower GHGE food across the rest of the diet.

5. Some elements of expectation from this Foresight Exchange Workshop
This workshop will be an opportunity to start developing work that links together a more holistic approach to food, agriculture and the necessary research. The provisional title “How to integrate agriculture and environmental stakes into foresights?” is very interesting as
represents something that we in WWF UK feel is a vital component to any discussion on the future of food and agriculture.

For too long work on the global food system has compartmentalised the various elements, food security, economic development, nutrition, small scale farmers, industrialised systems, biodiversity and ecosystems, fresh water, climate change, soil erosion and access to markets. It is time to go beyond this practice of working in individual silos, one that has resulted in a food system that spends less on research and environmental protection than it does on marketing. By looking at the win wins, of which there are many, we can take the next step to looking a food system that benefits all stakeholders, with the environment no longer being seen as the poor relation. We need farmers, we need biodiversity, we need healthy soil and clean water and we need market access if we are to succeed in moving towards a more equitable, financially and environmentally sustainable food system.

I would hope this workshop will be used to explore who we can link developed and developing world issues, and one that brings together environment, security, socio economic realities and health all under one roof.

As part of this we need to look at food consumption, the problems with under nutrition and over nutrition, both of which seem to be worsening in a world of increasing food availability and decreasing food security. We have been looking at this in the UK, and have recognized that one way to reverse this trend in a way that benefits people and planet is to look at sustainable diets, bringing together health and environmental messages to see if they are compatible. So far we have demonstrated that a healthy diet, one that allows people to achieve all the components of a nutritionally viable diet is also one that is low carbon, and we believe this will also have a sustainable water footprint and benefit biodiversity.

In the developed world we ado not have a healthy sustainable diet, we eat too much meat, dairy and processed food, and not enough carbohydrates and fruit and vegetables and we eat too much. This has led to health problems and added a huge burden to the environment, not least through animal feed. Conversely there are of people in the developing world who do not get enough to eat and access to a healthy, sustainable diet will benefit them and their communities and will benefit the environment, as long as the food choices do not lead to a replication of a western diet and the associated impacts. I feel global sustainable consumption must be discussed. Someone who has access to a healthy diet will be able to work more, will add more to their community, suffer less food related illnesses, be more productive, concentrate better, while ensuring their food choices protect traditions, the local and the global environment and set up a food system that will thrive into the future.

The unhealthy diet takes a lot of resources and land to maintain, not least animal feed, and this workshop could start to discuss the benefits form moving away from resource intensive foods, how this will release land and water and might negate that need to turn over more land to agriculture when we can make smarter food choices in the developed world while in the developing world more food is made available. We will need to discuss how we can ensure food goes into the correct mouths, in the correct amounts without emulating the current unsustainable Western diet and food system.

1. Foresight on agriculture-environmental issues
Recently, I was involved in “Thailand Agricultural Foresight 2020” (the meaning of the agriculture in this concern covers the entire value chain i.e., upstream, midstream and downstream including food and farming, agri-agro industry, business, national/international pressures). The foresight process took place from September 2010 until May 2011: In cooperation with nine partners Knowledge Network Institute of Thailand (KNIT), APEC Center for Technology Foresight (APEC CTF), National Science Technology and Innovation Policy Office (STI), Bank of Agriculture and Agricultural Cooperatives (BAAC), Faculty of Agriculture, Kasetsart University and Office of the National Research Council of Thailand, The Thailand Research Fund (TRF), Agricultural Research Development Agency (Public Organization) (ARDA), Thailand Environmental Institute (TEI), Thai Public Broadcasting Service (THAI PBS), and Thai Post Today Newspaper.

2. Background
Thai agriculture sector employs 49% of the population and contributes 10% of GDP. There are significant opportunities and many challenges on this sector. From this token APEC CTF, STI partnership with academia, organizations have assisted and facilitated “Thailand Agricultural Foresight 2020” exploring and envisioning possible futures of what could be in the coming years, in order not only to survive but to thrive, and sustain in those harsh environments.

3. Methodology
This foresight involved not only agriculture and environmental variables but also in policy and political point of views as well as economic dimensions. Key stakeholders and experts, more than 100 participants; from relevant public/private sectors and communities throughout the value chain expressed and consolidated their visions, criticisms, and suggestions. We analyzed: Trends, Driving forces, STEEP (social, technology, economics, environment, and politics), Uncertainties, and Scenario Logics. At the beginning when we finished our two workshops we got eleven scenarios after consideration/discussion/ brainstorming process we got three scenarios.

4. Results/new ideas/reflections/outputs
This foresight resulted in two workshops and one public hearing. Findings gave an analogy on the growth of different trees according to environment and their capabilities to adjust themselves in three scenarios i.e., fallen trees, planted trees and wild trees.

5. Expectations from this exchange workshop are following
   • Strategically explore and anticipate value, concept, knowledge, and use evaluation criteria to envision.
   • Sharing and understanding relevant agriculture-environmental issues: lessons learned/obstacles and success.
   • Long-term cooperation and networking.

Topics to discuss
   • Prioritizing research topics.
   • Impacting of climate change on food.
I. 18. Hartwig de Haen (University of Göttingen, Germany): Considering agriculture–environment linkages in foresight for food and agriculture

Pr. de Haen was supposed to be one of the participants of the Foresight Exchange Workshop, but had to cancel his participation recently. He will be associated to the follow up of the workshop.

The food and agricultural sector and the natural environment influence each other in many ways, both positively and negatively. Projections of prospects for food security can indeed only be interpreted meaningfully in connection with the respective implications for the environment, for land and water use, biodiversity, climate change etc. In view of depleted resources, limited energy supplies and environmental degradation, projections should in particular generate actionable information on options for sustainable intensification of resource use and increased ecological efficiency under alternative assumptions and policy scenarios. To achieve this, foresight models (quantitative or qualitative) should ideally capture the most relevant links between agriculture and the environment as they affect any of the four dimensions of food security (supplies, access, stability, food utilization).

Generally, the agriculture-environment nexus does not only encompass aspects of sustainable production, but also those of sustainable utilization of agricultural produce. In the widest sense, the latter range from lowering levels of post-harvest losses and waste to resource-saving consumption patterns, in particular reductions of excessive meat consumption. Such sustainable utilization can result in more or less significant savings in land, water and energy, mitigate climate change, lower food scarcity and, as far as reduced meat consumption is concerned, better human health.

Following are some observations regarding my own involvement in work directly and indirectly relevant for foresight work.

1. Experience with FAO’s Global Perspective Studies
   - My past work at FAO in charge of the Economic and Social Development Department included general responsibility for the long-term perspective studies. The latest publication focused on the possible development towards 2030 and 2050 (interim report published in 2006). A study towards 2080 is currently under preparation.
   - FAO’s global perspective studies provide experts’ views on long-term developments with regard to food, nutrition, agriculture and natural resource use. Future production is derived from projections of the potential capacity of the world’s land, water and genetic resources and estimates of their respective yield potential, based on a coherent assessment of the world's agro-ecological zones. Demand is projected as a function of population and income growth, taking into account observed trends of the dietary transition.
   - The methodology is a comprehensive accounting scheme allowing consistency checks with a very detailed data base. It is largely a consistency framework balancing projected future demand with domestic supplies and trade on a country by country basis. So far, the approach was used to generate one base line outlook, i. e. no alternative scenarios.
   - The FAO framework was so far not used to incorporate agriculture-environment nexuses explicitly. For example, levels and growth of yields are projected exogenously and are thus not driven endogenously by factors such as changes in soil fertility which themselves are a function of input levels and production patterns. However, FAO’s quantitative framework incorporates agriculture-environment nexuses implicitly, in particular through
projections of productivity/yields by agro-ecological zone based on collective expert views.

- In my view, the FAO approach could in principle be formalized to incorporate explicitly some key agriculture-environment nexuses such as the effects of input intensities on yields and soil and water quality or the relationship between land use patterns and carbon footprint. Endogenizing such links would eventually allow to run the model with alternative scenarios.

2. Work on sustainable intensification
- Recently I have participated as a co-author in the preparation of the publication “Save and grow – a policy maker’s guide to the sustainable intensification of smallholder crop production” (FAO, Rome 2011). It presents practical examples of sustainable crop production intensification as components of a new paradigm and suggests policies and institutions. The book may perhaps be useful as a source of ideas for agriculture-environment links and related policies that could be incorporated into foresight exercises.

3. Projecting food insecurity and malnutrition
- A key variable which inter alia is influenced by the way agriculture and the environments interact with each other, is food security. Reducing hunger and malnutrition are essential contributions to sustainability and relevant implications of agriculture-environment nexuses. Typically, available long-term projections generate indicators such as undernourishment (FAO) or child malnutrition (IFPRI) on the basis of exogenous assumptions regarding future changes in the intra-country inequality of access to food. In reality, this inequality and its change over time are endogenously determined inter alia by environmentally relevant factors such as land use practices and poor people’s access to quality land and water resources. In conclusion, realistic foresight work should also incorporate such structural factors that determine the inequality of people’s access to food.

4. Some suggestions
- It would be a challenging outcome of the workshop, if agreement would be reached on:
  - Key issues which should be subject to scenarios and assessments within foresights covering major links between agriculture and the environment.
  - A tentative list of the most relevant agriculture-environment nexuses meriting further research. Some examples could be:
    - the impact on soil fertility of alternative levels of input use, mechanization (e. g. soils conservation technology), irrigation intensity etc.;
    - the effects on biodiversity of alternative cropping patterns;
    - the effects on climate change of alternative land use and farming systems causing different carbon footprints;
    - The environmental implications for land and water use and for required productivity growth of alternative consumption patterns (e. g. raising the shares of resource-saving food items in the diets)
  - The longer aim could be to ‘enrich’ the list of outcome indicators of foresight exercises (quantitative and qualitative) by those measuring expected implications for the state of natural resources, climate and environment.

- At the current state of knowledge, incorporation of such nexuses into formal projection models is supposedly extremely difficult due to lack of knowledge about cause and effect relationships and lack of resources. However, it is a challenge for the foresight work to go into this direction.
II. 1. Stefano Del Debbio (Istituto Agronomico per l’Oltremare)

Actually I'm not involved in any foresight activity. I will attend the meeting as observer, representing Italy as donor country.

Let me just introduce myself; at present I'm Programme Officer within the "Research and Development in Agriculture for the MDG's" project financed by the Italian Ministry of Foreign Affairs. In this framework I'm in charge of the reconstitution of the Italian Forum for Agricultural Research for Development. I'm also following EFARD activities.

IAO at-a-glance: the Istituto Agronomico per l'Oltremare is the consultancy and technical assistance institution of the Ministry of Foreign Affairs on the field of agricultural science and technology. The Institute is involved in Development Cooperation initiatives on food security, integrated rural development, environmental and natural resources management, fight against desertification.

The Institute's mission is to conceive and implement, on behalf of the Italian Development Cooperation, in partnership with local people, research, studies, technical assistance and training initiatives with the aim of reducing hunger and poverty, developing and managing agricultural and environmental resources in a sustainable way. IAO's vision is to create together with partners countries a common and sustainable future in a world without hunger and environmentally friendly.

Some of the main Projects implemented at present are: Autonomous Palestinian Territories: Agroindustry Project to support the Ministry of Agriculture to improve quality olive oil production and marketing Afghanistan/Nepal/Pakistan: Technical Assistance and capacity strengthening in agricultural sector Ethiopia - Agricultural value chain in Oromia Region IAO is also a member of AGRINATURA-EEIG.
II. 2. Hedge Mruthunjaya (National Centre for Agricultural Economics and Policy Research)

Since January 2010, I am working as a Consultant to, i) assist in M&E of a mega agricultural development program of Ministry of Agriculture of Government of India, ii) develop agricultural policy for one of the States (Haryana) in India and iii) State of Indian Agriculture Report and State of Agriculture Report of Madhya Pradesh State of India. In all these assignments, natural resource (land/soil, water and bio-mass) and environmental constraints impinging on efforts to attain targeted agricultural GDP growth exceeding 4% per year are examined and technological, institutional and policy options suggested.

During my service in various capacities and Institutions under ICAR (1976-2009), I was involved in PME activities, Total Factor Studies, Developing Vision documents for ICAR and its institutions and APAARI, Perspective Plan for Agricultural Development in SAARC Countries for 2020 and Scenario Planning for 2030 to guide long-term policy and strategy for AR4D at the time of preparing National Agricultural Innovation Project (NAIP) supported by the World Bank, Developing the South Asia Report as a part of Prioritizing the agricultural research agenda for Asia-Pacific Region Report under GCARD 2010, participating in GCARD meeting in Montpellier, France, in March, 2010 and involved as a member of the drafting team in preparing the Synthesis Report of GCARD 2010 meeting. Again, in these activities, variables/indicators relating to growth and environmental sustainability were included/analysed/discussed and alternative scenarios with suitable sensitivity analyses were proposed for decision making by the research/development system.

My purpose of attending this Meeting is to learn more on the state of art development in these areas particularly in technology forecasting, visioning and research prioritization and impact analysis (advances in methodology, cross-country experiences, and better interpretations) and others so that I will be more useful to my country in future assignments.
II. 3. Gine Zwart (Oxfam Novib)

I have not been involved in earlier Foresight activities, but from where I am sitting I see more and more cooperation and overlap of agendas between the environmental focused organizations and the more agriculture/poverty reduction focused organizations. I see this as a positive development. I am not sure if I can answer the first 4 questions, as I am not clear on what is meant with the agriculture-environmental stakes nexus and where the results should be seen.

As to my expectations of the Foresight Exchange Workshop: my expectations are high! I really hope to be able to engage in a serious debate about the future of agriculture: what should it look like? Many are convinced production systems need to be intensified but with less use and damage of the environment. How does that work, what does that mean? What are the scenarios we should be looking at and what are the consequences of the different scenarios? Related to the future of agriculture is also the future of the people dependent on agriculture and working in the sector: what should that future look like, is it true that in many countries agriculture is a poverty trap and therefore the youth do not want to stay there? If so what does that mean?

What I can bring to the meeting is the vision and the practice of Oxfam in this regard which is very much focused on agricultural development as a means towards poverty reduction and food security.
<table>
<thead>
<tr>
<th>Last Name</th>
<th>First Name</th>
<th>Business Name</th>
<th>Nationality</th>
<th>N° of the Contribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boping</td>
<td>Chen</td>
<td>WWF China</td>
<td>China</td>
<td></td>
</tr>
<tr>
<td>Bourgeois</td>
<td>Robin</td>
<td>GFAR</td>
<td>France</td>
<td>I.1. (p. 4)</td>
</tr>
<tr>
<td>Caron</td>
<td>Patrick</td>
<td>CIRAD</td>
<td>France</td>
<td></td>
</tr>
<tr>
<td>De Lattre-Gasquet</td>
<td>Marie</td>
<td>ANR</td>
<td>France</td>
<td>I.2. (p. 6)</td>
</tr>
<tr>
<td>Del Debbio</td>
<td>Stefano</td>
<td>Ministero Affari Esteri</td>
<td>Italy</td>
<td>II.1. (p. 48)</td>
</tr>
<tr>
<td>Dixon</td>
<td>John</td>
<td>ACIAR</td>
<td>Australia</td>
<td></td>
</tr>
<tr>
<td>Dos Miranda Santos</td>
<td>Marcio</td>
<td>CGEE</td>
<td>Brazil</td>
<td>I.3. (p. 8)</td>
</tr>
<tr>
<td>Eriksen-Hamel</td>
<td>Nikita</td>
<td>CIDA</td>
<td>Canada</td>
<td></td>
</tr>
<tr>
<td>Fabre</td>
<td>Pierre</td>
<td>CIRAD</td>
<td>France</td>
<td></td>
</tr>
<tr>
<td>Fengying</td>
<td>Nie</td>
<td>CAAS</td>
<td>China</td>
<td></td>
</tr>
<tr>
<td>Hall</td>
<td>Tim</td>
<td>European Commission</td>
<td>United Kingdom</td>
<td>I.4. (p. 10)</td>
</tr>
<tr>
<td>Herren</td>
<td>Hans</td>
<td>Millennium Institute</td>
<td>Switzerland</td>
<td></td>
</tr>
<tr>
<td>Hichert</td>
<td>Tanja</td>
<td>Institute for Futures Research</td>
<td>South Africa</td>
<td>I.5. (p. 15)</td>
</tr>
<tr>
<td>Hoste</td>
<td>Christian</td>
<td>Agriekium</td>
<td>France</td>
<td></td>
</tr>
<tr>
<td>Hubert</td>
<td>Bernard</td>
<td>Agropolis International</td>
<td>France</td>
<td>I.6. (p. 17)</td>
</tr>
<tr>
<td>Hutton</td>
<td>Jon</td>
<td>UNEP</td>
<td>United Kingdom</td>
<td>I.7. (p. 19)</td>
</tr>
<tr>
<td>Juech</td>
<td>Claudia</td>
<td>Rockefeller Foundation</td>
<td>Germany</td>
<td>I.8. (p. 20)</td>
</tr>
<tr>
<td>Kingiri</td>
<td>Ann</td>
<td>African Centre for Technology Studies</td>
<td>Kenya</td>
<td></td>
</tr>
<tr>
<td>Labbouz</td>
<td>Benoit</td>
<td>AgroParisTech</td>
<td>France</td>
<td></td>
</tr>
<tr>
<td>Meng</td>
<td>Xianxue</td>
<td>CAAS</td>
<td>China</td>
<td></td>
</tr>
<tr>
<td>Millstone</td>
<td>Erik</td>
<td>Sussex University</td>
<td>United Kingdom</td>
<td>I.9. (p. 21)</td>
</tr>
<tr>
<td>Mruthyunjaya</td>
<td>Hedge</td>
<td>National Centre for Agricultural Economics and Policy Research</td>
<td>India</td>
<td>II.2. (p. 49)</td>
</tr>
<tr>
<td>Msangi</td>
<td>Siwa</td>
<td>Int'l Food Policy Research Institute</td>
<td>Tanzania</td>
<td>I.10. (p. 25)</td>
</tr>
<tr>
<td>Obersteiner</td>
<td>Michael</td>
<td>IIASA</td>
<td>Austria</td>
<td></td>
</tr>
<tr>
<td>Ruz</td>
<td>Emilio</td>
<td>PROCISUR</td>
<td>Chile</td>
<td>I.11. (p. 29)</td>
</tr>
<tr>
<td>Sivi Njonjo</td>
<td>Katindi</td>
<td>Institute of Economic Affairs</td>
<td>Kenya</td>
<td>I.12. (p. 31)</td>
</tr>
<tr>
<td>Treyer</td>
<td>Sébastien</td>
<td>IDDRI</td>
<td>France</td>
<td>I.13. (p. 33)</td>
</tr>
<tr>
<td>Valceschini</td>
<td>Egizio</td>
<td>INRA</td>
<td>France</td>
<td></td>
</tr>
<tr>
<td>Van Den Berg</td>
<td>Maurits</td>
<td>PBL</td>
<td>Netherlands</td>
<td>I.14. (p. 35)</td>
</tr>
<tr>
<td>Wegner</td>
<td>Lucia</td>
<td>Centre of Development Innovation</td>
<td>Italy</td>
<td>I.15. (p. 40)</td>
</tr>
<tr>
<td>Vernier</td>
<td>Philippe</td>
<td>CIRAD</td>
<td>France</td>
<td></td>
</tr>
<tr>
<td>Wang</td>
<td>Ren</td>
<td>CAAS</td>
<td>China</td>
<td></td>
</tr>
<tr>
<td>Williamson</td>
<td>Duncan</td>
<td>WWF UK</td>
<td>United Kingdom</td>
<td>I.16. (p. 42)</td>
</tr>
<tr>
<td>Wongdeethai</td>
<td>Angkarn</td>
<td>APEC Center for Technology Foresight</td>
<td>Thailand</td>
<td>I.17. (p. 45)</td>
</tr>
<tr>
<td>Zwart</td>
<td>Gine</td>
<td>Oxfam</td>
<td>Netherlands</td>
<td>II.3. (p. 50)</td>
</tr>
</tbody>
</table>