The state of foresight in food and agriculture and the roads toward improvement

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NB: Chapter F2 and F3 are developed in separate reports

The GCARD 1, the Roadmap and the need for improved foresight

To target research, innovation and policies more effectively to desired future impacts we need to better understand how key issues in agriculture and rural development may develop in the future. Participants to the first *Global Conference on Agricultural Research for Development (GCARD1)* reached a good comprehension of current constraints. At GCARD 1, a group of foresight practitioners moderated a session presenting the main outputs of exchanges between the authors of nine exercises and invited guests[1]. As a result, the Roadmap recognises that "improved foresight" is essential for understanding future agricultural and rural development contexts and changes around the world and for driving the research and innovation required to meet these needs. GCARD1 also highlighted the fact that all stakeholders must be involved in identifying possible future needs in agriculture and rural development, if research, innovation and policy are to benefit the poor as intended.

The GCARD Roadmap defines this notion of "improved foresight" as "...*forward-looking, anticipatory research and analysis integrating a range of perspectives on key issues, making use of the best available data and interpretations from different sources and directly integrating the diverse views of farmers and other stakeholders on specific problems, so that important issues are examined through multiple 'lenses'".*

It also specifies that*: "The need for improved foresight must be addressed by mobilizing expert analyses within countries to analyze specific themes of concern and bringing together, via GFAR and the regional fora and on a coherent and regular basis, the diverse national and international initiatives to examine relevant development scenarios through different lenses, learning from the outcomes of the different models and perspectives employed. Alongside this, stakeholder- wide consultation will be mobilized through national and regional fora, to 'ground-truth' the realities and impacts of trends among poor rural communities."*

How the GCARD2 foresight session contributes to achieving this purpose?

The GCARD2 process on foresight is intended to advance the Roadmap actions required, paving the way for developing more effective approaches in line with the partnership principles, smallholder farmer and impact-centred focus of the GCARD. The key question the foresight session intends to address is: "**What role could smallholder farmers play in meeting future needs in food and nutrition security, poverty alleviation and sustainable management of natural resources?"**

The foresight breakout session will follow a progressive sequence enabling participants to i) advance in generating collective views leading to convergent actions through lessons learnt from diverse foresight studies (Session F1), ii) reflect on the emerging challenges for research, innovation and polices with long term perspective and on how these can be translated into priorities and actions (Session F2) at national/regional level (F2.1) and at global level (F2.2), and iii) reflect on the processes associated with improved practices in foresight (Session F3) through equitable partnerships (F3.1) and capacity development (F3.2). It builds upon the

[1] See Hubert, B. et al. (2010). Forward Thinking in Agriculture and Food, Perspective n°6, September 2010, CIRAD. http://www.cirad.fr/content/download/4595/42828/version/2/file/Perspective06.pdf

results of the foresight exchange workshop which brought together 30 participants, held in Beijing in October 2011 during the 2011 CGIAR Science Forum. The workshop outputs indicated the three issues to be developed as a common agenda for foresight practitioners (evolution of farming patterns, future transformation of land-use, links between food demand and agricultural production).

Expected outcomes of the GCARD foresight session

The GCARD Organizing Committee has defined a set of expected outcomes from the foresight breakout session as follows:

- *Session F1: i) Understanding of the advantages of bringing together different approaches and lessons learnt regarding future needs by bringing common analyses to diverse foresight studies and ii) generating collective awareness of the scope and value of foresight in guiding research, with commitments from those using diverse approaches to work in a more integrated way.*
- *Sessions F2.1: i) What can be learned when foresight approaches are added to existing regional prioritization processes, and ii) a set of collective actions agreed to improve the use of foresight in making research and innovation systems more responsive to future development needs of small-holders through inclusive prioritization at local/regional level.*
- *Session F2.2. i) A set of proposed collective actions agreed to improve the use of global foresight in making research and innovation systems more responsive to future development needs at global level and ii) a set of proposed collective actions agreed to give global foresight a stronger focus on smallholder farmers.*
- *Session F3.1. i) A set of proposed collective actions agreed to make foresight considerations better targeted on the livelihood needs of smallholder producers, through their equitable participation in forward-looking, anticipatory research and analysis?*
- *Session F3.2 i) A set of proposed collective actions to strengthen national foresight capabilities, for countries to determine their own future needs and take better account of the particular needs of smallholder farmers.*

How the foresight breakout session was prepared

The preparation and technical implementation of the GCARD2 foresight session formally started under the supervision of the GCARD Organising Committee in September 2011. Figure 1 summarizes the preparatory process. It consisted of the following actions:

1. A foresight exchange workshop involving practitioners in order to identify key issues and questions;
2. An inventory of existing forward looking anticipatory research and analysis related to agriculture, rural development and farming patterns;
3. Screening and selection of relevant cases using a transparent criteria (recent i.e. less than 5 years; focusing on agriculture, rural development or farming patterns; looking at least 10 years foresight; existence of documented evidence of the results and the process; willingness to share the results);
4. Production of a database and detailed, focused, short case studies under a series of briefs called "t*he Futures of Agriculture*";
5. Production of an objective, inclusive update on the state of relevant forward looking anticipatory works worldwide;
6. Selection and adjustment of the most illustrative case studies to a common presentation format;
7. Global and regional consultations of the update results.

All intermediary outputs were made available through dedicated pages of the GFAR website.

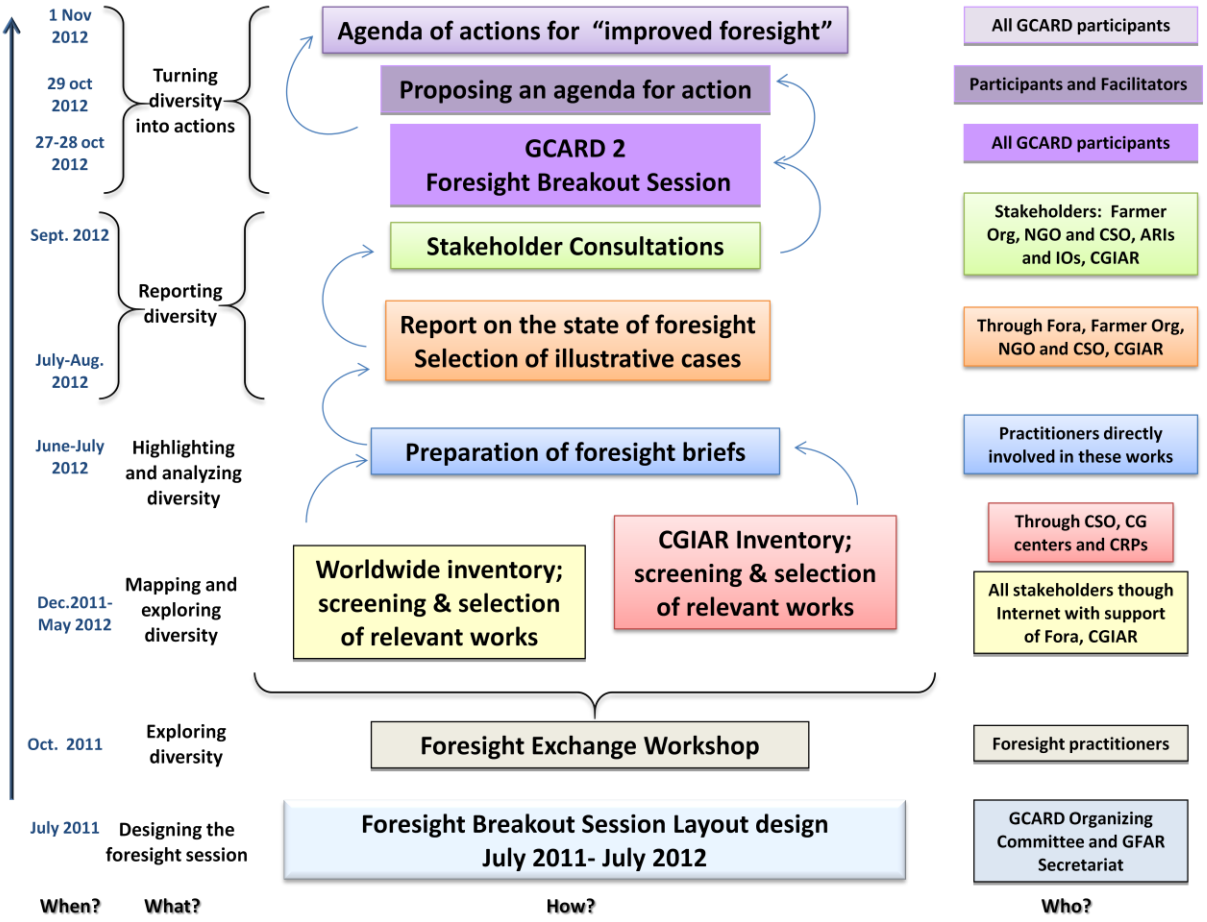


Figure 1. The process to the GACRD 2 foresight breakout session

Chapter F1. Improving Our Future Visions

Content

- The Need for Foresight
- The Current State of Foresight
- Toward Improved Foresight

1.1 The Need for Foresight

The future of agriculture and beyond, the future of rural and world poverty, the future of food and nutrition security and the future of our natural resources, will depend on the decisions we are making today. These decisions have not only to answer the urgent and burning issues we are currently facing; but have also to integrate the challenges of the future. Research, innovation and policies are expected to provide answers or solutions to current problems where they can. They are also expected to anticipate and prevent future problems.

Forward looking, anticipatory research and analysis are particularly adapted for shedding lights on this complexity. It is impossible to predict what will happen in the long-term; but it is possible to inform on what could happen. Thinking forward is possible and there is a long history of forward-looking, anticipatory research and analysis.

Defining Foresight

The GCARD Roadmap refers to forward looking, anticipatory research and analysis in a way that is fully consistent with the concept of foresight defined by the European Commission as: *"a process which combines three fundamental elements: prospective (long-term or forward-looking) approaches, planning (including policy-making and priority-setting) approaches, and participative approaches (engaging stakeholders and knowledge sources)".* [2] The word *foresight* will be used hereafter as an equivalent to "forward-looking, anticipatory research and analysis". Foresight works are characterized by a long-term horizon, longer than 10 years and up to 50 years. Works considering a time horizon shorter than 10 years are not included in the current report on the state of foresight.

Foresight does not just help seeing what the future will be so that we can adapt to it, it gives us the capacity to anticipate potential futures and to built from that the future we want, taking active steps to move in that direction.

Why foresight?

There are many reasons for undertaking foresight. Nine major objectives to foresight can be identified (Table 1). These objectives include content, process and impact. Content-related objectives are based on the production of new knowledge (barriers and drivers, future thinking in particular identification of issues that should alert and support decision-making,

[2] Popper, R. (2009), **Mapping Foresight**: Revealing how Europe and other world regions navigate into the future, EFMN, Luxembourg. http://ec.europa.eu/research/social-sciences/pdf/efmn-mapping-foresight_en.pdf

Grand Challenges). Process objectives refer to the way foresight operates (cooperation and networking, shared visions, actions and public discussions). Impact objective relate to the domain foresight influences (policy development, STI strategy/priority setting, research/investment areas). These three dimensions and related objectives are also present in the inventory whose results will be presented shortly.

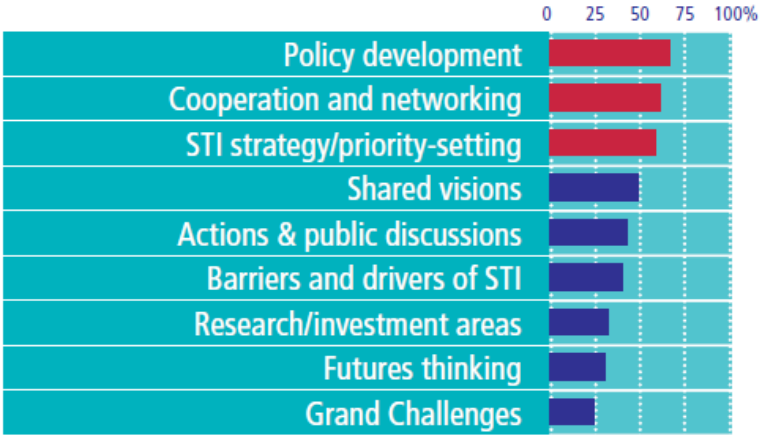


Table 1. Main foresight objectives
Note: STI = Science Technology and Innovation; in red >50% of answers.
Source: Popper 2009, page 26.

This diversity of objectives shows that it is impossible to establish a standardized way in doing foresight. Foresight may have one or more objectives and it cannot be confined to a single one; such as priority-setting for research investment for example.

How and what kind of foresight work we conduct is determined by the way those who engage in it, users and practitioners see the world, by the type of question we intend to answer and the scale at which we look at these questions. This includes also the possibility to engage in foresight to challenge the ways we see the world, the questions and problems we currently consider as priorities. Foresight does not need always to respond to enquiry from a "client" about a specific problem. It can also develop to raise the attention on new issues, new challenges.

There is consensus that foresight studies should be policy-informing, but not policy-prescriptive. Informing policy includes exploring options and anticipating or measuring implications.

Summary: Engaging in foresight

- Foresight is a systematic effort to promote effective processes to proactively think about the future; it relies on long-term approaches, informs planning and involves stakeholders.
- Objectives depend on who is engaging in foresight. These include generating knowledge ("foresight for enquiry"), generating interactions, generating action ("foresight for change"). These are often combined.
- Foresight neither predicts, nor prescribes; but helps societal choices by informing about different possible futures and related pathways.

An overview of foresight methods

Foresight methods can be characterized with two different sets of criteria: their nature (whether quantitative, semi-quantitative or qualitative) and how information is collected or processed (through evidence, expertise, interaction or creativity).[3] More than 30 different tools can be used and combined in order to do foresight works (Figure 2). Quantitative methods are mostly associated with quantitative evidence and expertise while qualitative methods are mostly associated with interaction, expertise and creativity. Most of these tools are not specific to foresight: SWOT, brainstorming, Delphi, Modelling, expert panels, surveys, literature reviews, for example can also be used in other contexts. They are used in foresight because they facilitate specific data production related to future issues or stakeholder interactions. Other tools such as backcasting, futures workshops, scenarios, extrapolation, etc are more specifically designed for foresight work.

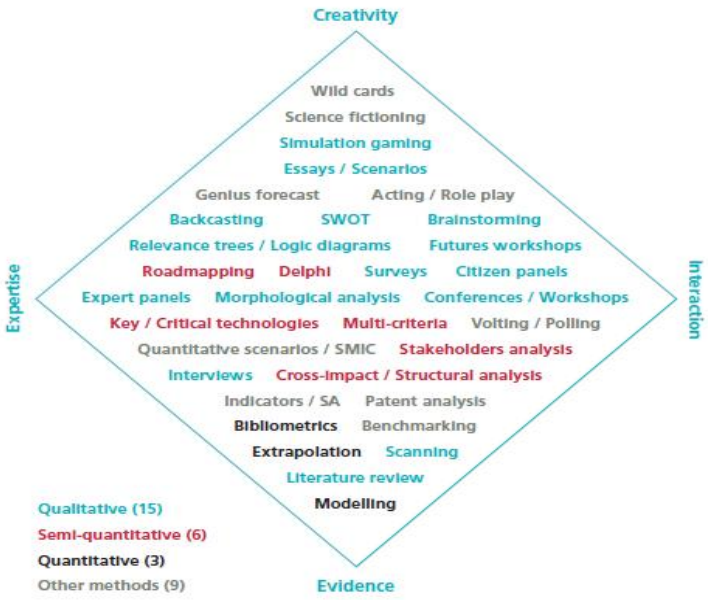


Figure 2. Foresight methods
Source: Popper 2009, page 72

Quantitative methods

Quantitative methods consider that the uncertainties which characterize our futures can be represented by a specific set of quantifiable core variables and a stable set of equations. They mainly use trend extrapolation and modelling, including econometric models and simulation. Trend extrapolation intends to calculate with the highest accuracy possible what would be the most likely evolution of the system if all the trends and influencing variables do not change. The most likely future situation is calculated from the past evolution. The resulting future situation corresponds to a trend scenario, often called "business as usual". If the future depicted in this scenario is not desirable by society, then business as usual is not an option.

[3] Hereafter, semi-quantitative methods will be called "mixed methods".

Econometric models and simulations provide pictures of likely future situations using a "what if" hypothesis applied to one or several variables within the model, assuming that the basic structure of the model remains unchanged. When a quantitative change is introduced, a new calculation leads to a different description of the future. If the resulting situation is more desirable by society, it indicates that decisions which will make this perturbation occur will have a positive effect.

Quantitative methods have the advantage to make explicit some assumptions about relations between variables and components of the model.

Qualitative methods

Qualitative methods consider that the uncertainties which make our future unknowable can be explored, identified and to some extent characterized through scenarios which can inform decision and action. They aim at producing reliable anticipations of what could happen in the future using a wide range and combination of tools; among which the most common are scenarios, literature review and expert panels. Qualitative methods consider that the current drivers of change can evolve. By identifying potential new drivers and related variables, alternative and plausible sets of futures can be inferred. A large number of people are usually involved because the nature of the information used requires inputs from multiple perspectives and a wide range of different domains.

Scenario based works describe plausible future situations in rupture with the main trend due to changes in the key drivers shaping the present situation. They usually cover a wide range of situations, some of them being undesirable while others could be considered as the preferred futures. Rupture scenarios provides information about the consequences of different types of ruptures. They help anticipating changes whose effect would be more or less desirable for society. In some cases, only one rupture scenario is developed, depicting a preferred future based on stakeholder interactions. This is called visioning.

Qualitative methods have the advantage of articulating in a logical way various and disparate components.

Mixed methods

Mixed methods apply mathematical principles to quantify information with a qualitative nature. Then quantitative information is collected using statistical methods. In the Delphi for example the opinions of experts are quantified, while in structural analysis matrices are used to calculate the reciprocal impacts of different types of variables. Mixed methods include also approaches where qualitative tools are used to define the structure of a quantitative model and the variables that should be included.

Is there a "right" method?

The difference between quantitative and qualitative methods is sometimes more blurred than it appears here. Many foresight works combine quantitative and qualitative approaches. Both methods have their limitations as indicated below.

Quantitative methods

- New driving forces which could significantly alter the futures cannot be directly included in trend extrapolation or econometric models without changing the structure of the model.
- Availability of reliable quantitative data is a limiting factor. When not available, assumptions can be made, but at the cost of precision.
- Important qualitative drivers are represented through "proxies". A proxy is an indirect measurement more or less connected to the variable that cannot be directly measured. For example, a driver such as trade liberalization can be approximated by a single quantitative variable such as the level of tariff imposed on the good/product.
- Precision decreases with time. The longer the projected time period the less likely the selected variables in the model will behave as expected and the more likely other variables play a stronger role.
- Precision is neither an equivalent to accuracy, nor to correctness. A very precise value does not mean that it is accurate or correct. Assumptions must be made clear and reporting the confidence interval, that is the reliability of the point estimate, is as important as the actual result itself.

Qualitative methods

- The identification of key variables/driving forces can be biased by the perception people have of their environment. This is also true for quantitative methods.
- When thinking in terms of rupture we cannot take into consideration what we don't know or what we cannot grasp with current understanding of our world. Scenarios representing various plausible futures still remain a limited representation of possible futures.
- Relevance decrease with time. With time uncertainties grow and make the choice of the key drivers less plausible.
- Overall coherence of anticipated future situations can be deficient as multiple, contrasted and sometimes antagonistic factors are considered together.

Summary: Foresight methods

- Foresight relies on a diversity of methods ranging from qualitative to quantitative;
- Methods are context dependent and there is no single approach. What matters is that the method fits the objective and the available resources, addresses relevant questions and allows participatory approaches;
- Methodological advances are still needed to develop credibility based on evidence, creativity, interaction and expertise.

1.2 The current state of foresight in agriculture

The key findings presented below are based on the analysis of 43 cases. A further 30 cases were detailed and reported through published briefs (see Annex 1). The source of information and how the analysis was undertaken is detailed in Annex 2. This analysis led us to identify some key features that characterize the current state of foresight, in terms of content (challenges, issues and priorities), process (why, how and by whom) and impact.[4] Lessons learned from the cases and interactions with foresight practitioners feed the last section of this first chapter, "Toward improved foresight".

Overview of the inventory

This overview provides first some data about the 43 cases related to the topics they addressed, the scale, participation, cost and geographic coverage. It also provides a synthesis of the most important points that can be extracted in relation to the faming patterns of the future, the future of land use and the future evolution of production and consumption, including controversies.

The inventory in numbers

Scale	World	Regional	National	Sub-National	Multi-scale*
Total	14	13	12	3	2

**Multi-scale means that foresight work was simultaneously conducted at different scales*

Method	Quantitative	Mixed	Qualitative
Total	8	14	21

Duration	Mean	Max	Min
Year	1.83	5.00	0.25

Cost (10^3US $)*	< 100	100-500	500-1000	1000-2000	2000>
Number	11	12	7	8	4

**Cost is based on estimates including human resources, one case not available.*

Focal topic of the foresight works

The 43 foresight works for which information has been collected directly from their authors show the following spread of focal topics (for the detail of the topics see f3).

- At the global level, 12 foresight works with a focus on food security and agriculture;
- At the national level, 13 works: seven focusing on the future evolution of agriculture, 3 on research priorities and system, two on territorial development and one on climate change;
- At the regional level 8 works: four focusing on food agriculture, three on rural societies, one on low carbon society;

[4] More detailed discussion on content, especially issues and challenges related to foresight at regional/local and global level will be provided respectively in section F2.1 and F2.2. More detailed discussion on process will be developed in sections F3.1 and F3.2.

- Up to 6 specific works: two focusing on commodities, two on technology and two on others;
- At the global level, 3 foresight works focusing on bio-physical factors;
- One foresight work focusing on capacity development.

What these works say about the farming patterns of the future

Evolution

Farming patterns of the future are characterized by a distinction between two types: industrialized large-scale agriculture and small-scale agriculture. In both cases, they will have to be more profitable and more sustainable.

The first type is associated with trends towards more and more concentrated commodity production. It could take the form of large productive consortium highly attracting investments from diverse sources.

The second type could take different forms according to the location (small-size family farming in regions where people are poorer and levels of education low or where it can play an important role in the economy and social life), hobby or part time farming for niche markets. Small size farming patterns would have to adjust to climate change to survive. It is considered having an untapped potential since agriculture is very local context dependent.

Some works consider that the first type is likely to dominate in the future because agricultural intensification is still needed and surviving farms will need to be more and more market oriented. This is also associated with a strong concentration of ownership in order to take advantage of economies of scale. In developed countries there will be fewer and larger farms, with a growth of non-family farms producing for energy and bio-based industries. Small farms could be progressively replaced by larger agribusiness buying and merging smallholdings into larger, more efficient farms. Agro-enterprises with access to capital, market and technologies will increase.

Other works consider that there could still be room for coexistence of commercial (medium, large scale) with family agriculture or with very extensive agriculture, with the appropriate policies aiming at the preservation and development of the diversity of farming systems. A mix of systems could therefore emerge, to benefit from local knowledge and biodiverse production systems on one hand (family scale), and skills in marketing and processing on the other (industrial scale).

Controversies about evolution of farming patterns

1. Farms will be larger and more concentrated versus farms will be smaller versus different types of farms will co-exist.
   This controversy is fed by the exploration of alternative scenarios leading to contrasted future situations to which different types of farms are more adapted. In these scenarios, the farming patterns of the future are mainly determined by exogenous forces (see drivers below). Location is also an element of the controversy, with contrasting situations between developed and developing countries.

2. Family agriculture will play a key role for food security versus large scale-industrial farms will play a key role.
   This controversy is fed by the fact that the potential of family small scale agriculture has not been realized yet, and by the fact that food security can be considered at various scales from global to local.

Drivers of change in farming patterns

Most of the works agree that the futures of farming patterns are determined by the simultaneous and interconnected play of multiple drivers. Others focus on a reduced number of drivers, usually linked to technology and market. The most frequently mentioned drivers are policies, power relations and institutions, economic forces, climate change, technology development and population growth and ageing. Access to, access to and use of natural resources, including energy and consumption patterns are also mentioned.

Policies, through incentives, criteria of performance (economical vs. environmental and social), land rights reform, investment in research and development are seen as a driver that could counterbalance the play of effect of economic forces leading to the concentration of production and the predominance of large-scale industrial farms, or the transfer of less competitive crops to soils with less productive potential. The future of the smallholder farming patterns appears to be determined by the conjunction of the evolution of market forces, public policies and capacity of the small farmers to adapt to and influence these evolutions.

What they say about land use

Evolution

Agricultural expansion is seen as a likely development taking place mostly in the developing world, particularly in Africa and until 2030, and in other land-rich countries like Brazil, while it stabilizes or shrinks in developed countries. Agricultural expansion would have large impact on environments with two contrasted situation: the separation between spaces for agricultural production and natural spaces or a multifunctional use of land, with agriculture offering ecosystem services. While there is theoretically sufficient land available for agriculture to feed nine billion people in 2050 even preserving forests, there would always be arbitration between cultivated land expansion and elevation of crop-yield. However, some scenarios signal also the possible abandonment of land due to urban migrations, loss of fertility, overexploitation of resources and climate change.

A new crop geography is expected, caused by among others, the switch from beef production to dairy production, more land devoted to production of agro-environmental products and services, confinement of former extensive livestock production freeing more land for food crop production, the opening marginal lands for agriculture, the displacement of less competitive crops to less productive land.

Controversies about future land use changes

1. Agricultural land expansion versus agricultural land reduction
   This controversy is fed by the divergent and opposite effect of different drivers of land use changes, such as expansion of urban area and non food land use versus need to produce more food, or intensification freeing more land versus demand for non food products.

2. Multifunctional use of agricultural land versus specialized use of agricultural land
   This controversy is fed by the uncertainty related to potential opposite effects of policy orientation and economic forces.

3. Rural area abandonment versus rural area revitalization
   This controversy id fed by the uncertainties about the future states of the drivers of population migration toward urban area, such as services, quality of life, employment. Here again policies are important potential drivers which could shape the current trends in different ways.

Drivers of land use changes

At least seven key drivers are considered as having a major influence on future land uses. These are:

1. Climate change and particularly the rising sea levels which would force farmers to shift to higher attitudes, modify the possibility to farm (abandonment of agricultural land, exploitation of new land);
2. Urbanization understood as the patterns of population moves between rural and urban areas, essentially conditioned by the services offered in urban areas that people cannot access in rural areas. Competition on land between activities (urban development, tourism, agriculture) is seen as increasing;
3. Land acquisition by foreign investors (also sometimes called land grabbing) such as China, Japan, and South Korea buying/leasing land overseas for agriculture production;
4. Changes in consumption pattern, especially meat consumption, dairy products and cereals, with contrasted patterns between regions, especially developed and developing countries;
5. Land management policies have major consequences for future land use, whether they would focus on a balanced allocation between different activities or not. This includes the evolution of customary law and local institution;
6. Prices of commodities and other products that can be competing from the same land;
7. Demand for non-food products which could be produced on agricultural land, such as bioenergy, forest products, mining products and environmental services.

Controversy about the evolution of the link between production and consumption

1. Standardization of consumption patterns and food is supplied by international market versus regional and diversified consumption patterns supplied by local/proximity production systems

This controversy is fed by the combination of uncertainties related to the possible evolutions of the dietary patterns and the capacity of different farming patterns to respond to these evolutions. The local dimension is adding to uncertainty.

What they say about how agricultural production link with food consumption

Evolution

Though largely recognized, the links between agricultural production and food consumption are not often explicitly analyzed in the foresight works. Possible evolutions consider an increasing amount of food exported for foreign consumption and growth in the amount of food sold locally through direct farm sales or farmers markets with the integration of smallholdings into formal supply chains, in connection with the development of new markets for local products and short chains (urban consumers, tourism).

Drivers of the evolution of the link between production and consumption

Diet changes and production patterns are inextricably linked but in the future, evolution of consumption is seen as the driving force.

Dietary patterns are considered the key determinants of production targets, especially the animal content of the diets. How consumers modify their diet in the long-term is a key issue. This includes changes related to food quality (certification) and diversity, switching from food prepared at home to food prepared outside, concerns for integrated production systems (fair trade), animal welfare, or environmental sustainability (waste management, agro-ecological production). Urban consumers in developing countries will be carrying much more weight than today. Consumer behaviour is also driven by other factors such as urbanization and economic growth and market- clearing prices. Consumption will gain growing influence on the production periods.

The development and strategy of firms (food industry as well as retail) is also a key driver. These include integration and spread of supermarkets with cold chains which can boost local production.

Policies targeting consumers are also seen as having a substantial role through their potential to influence food consumption habits. Waste management emerges an area where policies can influence both production and consumption sides.

New challenges

The challenges presented thereafter appear in the most recent foresight works. They are new because they focus on non-traditional drivers of the future.

Policies matter!... And can be included in foresight. The most important point we can highlight in terms of content from the inventory is that policies[5] are among the key drivers of change. This is particularly true for qualitative foresight at national level. Actually, policies (in the sense of how, are considered as potential drivers of change towards non-trend scenario, potential factors of rupture. That policies matter is not just a general statement; foresight works go deeper and contribute to define how policies can shape the future. These include governance/cooperation styles, enabling environment for technology, type of leadership in the public sector, existence of a public vision, priorities, degree of intervention. In addition, some works specifically link the question of land with policies. Quantitative foresight cases however do not incorporate policies into their key drivers with a few exceptions. The implication for future foresight work is to explore more systematically why and how policies could evolve and do it in a way that will be actionable. Indeed, foresight works in the past, especially technology foresight, concluded with policy recommendations. But they usually saw policies as external factors. Policy-makers and more generally stakeholders are no longer mere end users of foresight works - they are included in foresight investigation.

The findings of the EFMN inventory (Page 92) also conclude that "policy shift" is the most common call for change resulting from foresight works.

Alternative options to "farming as usual" exist. Many foresight cases tell us that there are alternative options to the current paradigm of productivity, short term profit and related "business as usual scenario". They also give us clues about what these options could be.

Farming in the future world: A large number of cases, most of them using scenarios or visioning, display the possibilities of different futures with different ways of farming. Although a very limited number of them directly include considerations related to the futures of farms, more works provide insights about future challenges related to farming in the future. The first challenge is the necessity of interaction between different types of farms. How can different farms co-exist in the same geographic and economic space? Some cases demonstrate that location matters due to bio-physical and socio-economic variations and advocate for development of context-specific foresight work. A second challenge puts the first one in a broader context, exploring a possible move towards other options than only productivity and short-term profit. A step further is the societal challenge with a different conception of agriculture related to climate change and environment, or a different society.
Yet, a paradoxical result is that while many stakeholders are concerned with the livelihood of smallholder farmers, this is rarely the central point in the future studies that have been identified. Only a few cases explicitly mention this as a point of the analysis, and all are cases from developed countries and/or international organizations. The challenge for future foresight is to incorporate more people-centred questions and to do it at more national/local level.

Alternative options to "consumption as usual" exist. Various foresight exercises refer to the changes of people's consumption behaviour and the implications for people's health,

[5] Policy refers here to how and why a government acts at various levels. It is about the principles guiding action taken by the administrative or executive branches of the state. It does not refer to a specific public decision such as a price, a tariff a subsidy or a technology.

natural resource use and climate change. Some underline also that alternative options for healthier diets and more sustainable resource use do exist. The challenge for future foresight is to explore and anticipate alternative evolutions of consumption patterns with a focus on the identification of the forces driving these evolutions.

Societal values matter! Not just agriculture. Foresight cases include societal drivers of change, under the forms of values, behaviour and education. Cases either directly express them as drivers of change, or implicitly refer to values and behaviours as drivers of change; particularly in the cases highlighting consumption patterns or waste management as new challenges. A direct implication for future foresight work is to explore how and why values and behaviours could evolve, and to do it in a way that will be actionable.

"Old challenges"

Yet, the cases do not discard the existence and, still, relevance of more conventional factors such as market, technology, biology, etc.

Economic forces remain also key drivers, especially shaping the "business as usual" scenarios. Economic integration in Africa and Europe are mentioned as key drivers along with policies in some cases too. International food trade is also mentioned.

Technology is still considered as a driver in several cases, though not as a stand-alone driver.

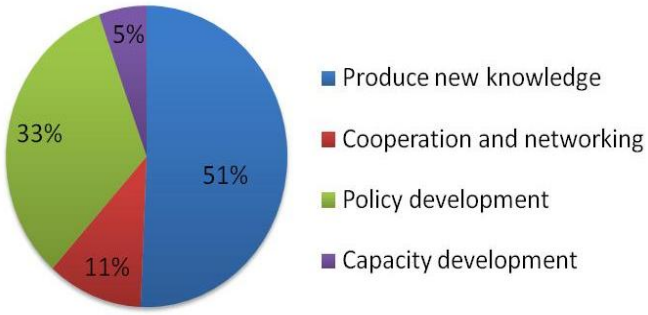
Bio and environmental factors such as climate change or disease are also considered in some cases.

Conclusion: Foresight challenges in 2012

- Policies and societal values are becoming recognized drivers of changes, potentially leading to rupture scenarios, while more conventional drivers such as market, technology and bio/ environment factors remain present, usually shaping the trend or business as usual scenarios;
- The challenge for future foresight work is to integrate more systematically these new drivers in the analysis, rather than considering them as external factors. This means working on understanding how and why policies and societal values could evolve;
- Foresight works question the conventional views of technology-based farm productivity in many dimensions, ranging from alternative options to productivity increase to alternative societal visions, through alternative/multiple ways of farming and farming patterns;
- Future foresight work will have to focus more on ways and means by which people may change their attitudes and behaviours as citizens and consumers in order to provide more knowledge about the link between "people, profit, and planet". It will have to account more for diversity taking into consideration variations at local/national level as multiple drivers do lead to different potential evolutions in different context.

Current foresight processes

Why people/organizations engage in foresight?

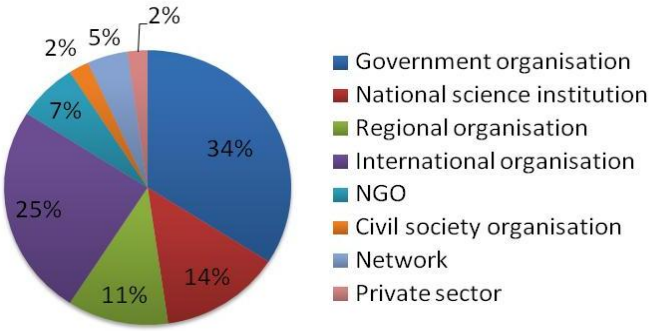


From the analysis of the inventory, two main types of objectives come forward. The first one, common to all but four cases is the generation of knowledge, what we could call "foresight for enquiry". The second objective concerns less than half of the cases. It is related to priority setting and policies, what we could call "foresight for change". This indicates that not all foresight work take as a deliberate objective to influence decision making. In itself, foresight must also be recognized as a heuristic activity whose results are not necessarily sought to change things, at least not directly and not as an explicit objective. This must be taken into consideration when discussing impact/influence of foresight.

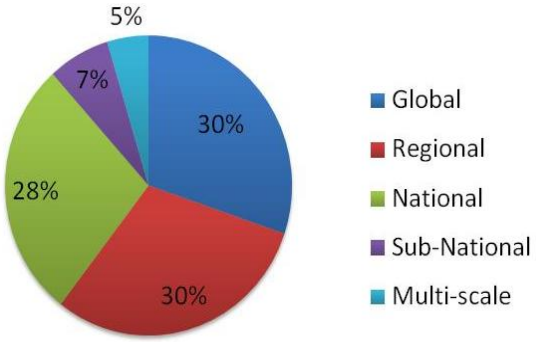
Capacity development and networking appear far below with respectively 2 and 3 cases.

Who does foresight?

Large majority of foresight work are initiatives taken from the same individuals/ organizations who conducted the work.



Demand-driven foresight represent less than the third of the cases. This pattern is more pronounced at global level. Global foresight works are in large majority developed by global organizations for their own use (e.g. IFPRI) or because it is part of their activity (FAO). National foresight works are more often conducted upon demand from national authorities and usually executed by units/organizations within the national systems.



We found more foresight works at global/regional level than at national level. This result is contrasting with the results of the EFMN inventory showing a majority of foresight work at national level. Two factors explain this difference[6]. First, the EFMN includes European countries which have

[6] The possibility of having missed local/national level foresight work should not be discarded. The EFMN report also raise this possibility in their inventory: *"... activities at the sub-national level have been difficult to detect through monitoring for a variety of reasons (e.g. lack of international visibility, language barriers, etc.)..."* (p22).

developed their own national foresight capacities. National foresight capacities in our inventory are much more limited. Second, international/regional organizations in agriculture and development have built their own and permanent capacities to undertake foresight (FAO, IFPRI, APEC, etc). In addition, developed countries undertaking foresight on agriculture work at the global/regional level (Sweden, UK, France, etc.).

The distribution of foresight work across regions reveals some striking evidence.

World	A&P	Africa	CAC	Europe	LAC	NA	MENA
13	10	4	0	8	10	3	5

The first striking element is the quasi absence of Sub-Sahara African foresight. Only four cases have been identified. These are from South Africa, the most developed country of the continent or result from cooperation with a regional or international organization. We have not been able to identify any national foresight work a part from these cases.[7] This finding is consistent with the EFMN report results stating that Africa remains under-represented here." Yet, Africa is included in some international foresight activities (including participation of African teams in the United Kingdom (UK) Foresight Programme, in the BFP/CIAT and the CCAFS programmes). Similarly we could not find recent foresight work in Central Asia and the Caucasus. Latin America and Caribbean (LAC), Asia and the Pacific (A&P) are the regions were most foresight cases come from.

A second striking element is that civil society organizations are almost completely absent. When looking at the origin of the foresight demand, (Table1) the large majority of foresight initiatives comes from international organizations (IO) and government organizations, (GO) usually ministries of agriculture.[8] A large majority of these works are undertaken at the "own" initiative of the organization which does the work. This is true for all IO and national science institutions in the inventory and half of the GO. Logically, this is reflected in the level of analysis, with most works being done at national, regional and international levels. GO and NSI in developing countries all undertake national level foresight, while in developed countries a substantial number of them undertake also regional or global foresight (for example in The Netherlands, Sweden, France, South Africa, UK).

A third striking element is that most foresight at national level in the South is conducted by the most developed or emerging countries in the South. These countries are South Africa in Africa, Brazil, Argentina and Chile in LAC, India, Thailand, Taiwan and Indonesia for A&P. None of the Least Developed Countries has been identified as having engaged in any foresight activity at any scale by their own means. Due to the local nature of this work, some of these local foresight works may have escaped our investigation, though even here the practitioners we consulted tended to confirm this assertion.

[7] Though the inventory cannot be exhaustive, there is no available evidence of recent foresight works in agriculture and rural development in Africa with exception of Morocco.

[8] The inventory could not include private sector companies. There is thus a bias which underestimates the initiatives taken by the private sector, especially International Companies. However, according to the knowledge of consulted foresight practitioners, there are very limited initiatives on foresight undertaken by private sector companies at national or sub-national level in developing countries. More work is underway with private sector firms in order to have a more comprehensive view of their involvement in foresight.

How is foresight done?

Scale and Methods. When crossing methods used and scale of work, we observed that the majority of quantitative works are conducted at the global level. While qualitative works are quite evenly spread across the different geographic scale, proportion of quantitative work is higher at global level compared to regional and national levels (Figure 3).

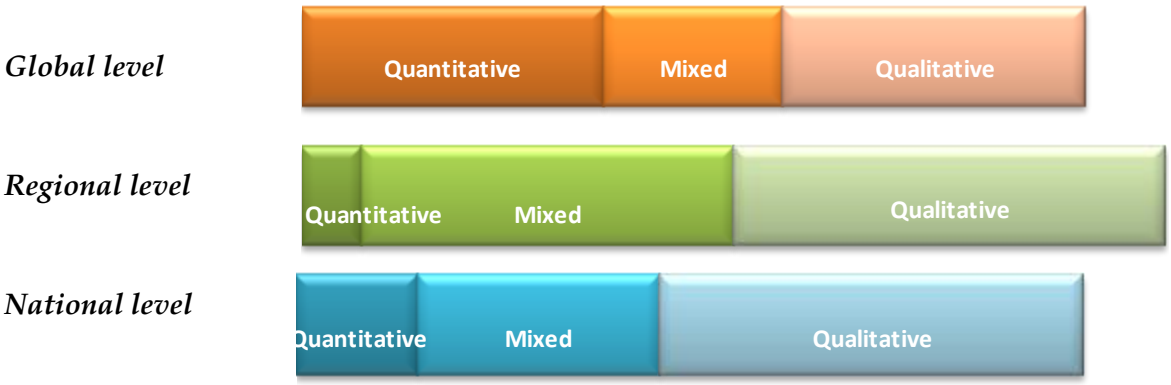
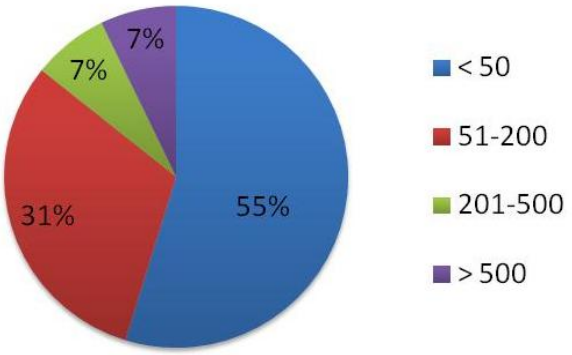


Figure 3: Distribution of methods and scale in the foresight inventory (local foresight is not included).

Several cases indicate crossing disciplines and methods as a key lesson to be learned in order to deal with complex issues tackled by foresight work. Crossing disciplines means to integrate a wide-range of disciplines rather than having various disciplines work towards a common goal in separation. Trans-disciplinary visions linking disparate dimensions result from such an approach. Crossing methods includes combining quantitative and qualitative methods and working with bottom-up and top-down approaches simultaneously.

Other cases highlight the importance of using scenarios to foster discussion, enable experimentation, hold constructive debate among stakeholders with diverging interests, sensitize participants to future research, raise societal awareness about future challenges and generate shared solutions and shared vision.

Altogether, the type of methods used in agricultural foresight do not differ very much from those identify in the EFMN inventory. However, quantitative methods are proportionally more frequently used than reported in the EFMN inventory, especially trend analysis and modelling.



Stakeholder inclusion. Our analysis here focuses on the scale of inclusion of the various constituencies who are directly concerned by the outputs of the foresight works. We were facing the same difficulty as the EFMN did in analyzing diversity.
The scale of inclusion is not a perfect proxy, but it helps revealing some useful facts. As for the EFMN results (p38), we find that most of the foresight works included no more than 50 persons. All but one global foresight works involved less than 50 persons. Many quantitative global foresight works were

reported as non or little participatory. Foresight works based on mixed methods at global level are more evenly distributed into participatory and non participatory - depending on the intensity they use the qualitative methods which are combined with quantitative methods. All global qualitative foresights are considered to be participatory, though they are not numerous. The picture is more balanced for regional and national foresight works where roughly half of them involved more than 50 persons. At national level the distribution among participatory and non participatory foresight is more spread but there is also a pattern associating more participation with more qualitative work. Only two cases reported more than 500 people consulted. In the first case consultations were physically organized while in the second they took place through a Delphi survey and virtual contacts.

Several lessons learned from stakeholder involvement can be reported. Stakeholder involvement is crucial for ensuring full implementation and for broadening the knowledge base. However, stakeholder involvement has implications on the foresight work. The first one is that frame-breaking (that is; deeply challenging a paradigm) may be berated by some stakeholders who support the paradigm. Yet, not having these stakeholders on board could jeopardize the capacity of foresight to influence stakeholders' behaviour. One case shows this dilemma with a powerful stakeholder able to impede the implementation of actions resulting from the foresight work, while its presence in the work itself would not have allowed to reach the same conclusions. Foresight has virtues as a process for consensus building and through stakeholder involvement but does not guarantee success in case of strong stakeholders' divergence of interests.

Conclusion: Foresight patterns in 2012

- The world scene of foresight in agriculture shows a prevalence of global, quantitative or mixed, works with rather limited participation of stakeholders. These works are developed by experts or scientists from international organizations or national organizations from advanced countries in the North.
- A smaller, yet noticeable number of national level foresight works in the South use more mixed or qualitative methods associated with more participation of stakeholders. These works are in general more expensive and longer; they are developed by organizations from emerging or developed countries in the South.
- Least developed countries do not have significant presence in foresight in agriculture.
- Civil society organizations do not have significant presence in foresight in agriculture.

Impact: Influence and Change

A good half of the foresight works we analyzed aimed mainly at producing knowledge; hence assessing their impact on research, policy or innovation would not be fair. In addition, the inventory concentrated on recent foresight works and many authors of the cases indicated that it was too early for an analysis of impact. In order to report adequately on the impact of these foresight works, we had to take these points into consideration.

We have thus differentiated two different "impact" categories: a soft impact that we call "influence" and a hard impact that we call "change".[9] Influence reported in the cases cover

[9] The purpose of this analysis is not to assess the quality of the foresight works in the inventory. The purpose is to show what kind of impact can be expected from foresight, to document it and bring elements for thought about making foresight more actionable.

different dimensions: i) raising awareness and fostering debates (RA/FD) beyond the participants of the foresight work, ii) linking stakeholders (LS) who would not have interacted together without the foresight work, and iii) contributing to development of methods (DM), internally and externally. Change reported in the cases cover also different dimensions: i) directly transforming internal policies/priorities/orientations (TIP) which would not have happened without the results of the foresight work, ii) directly transforming external policies/priorities/orientations (TEP) which would not have happened without the results of the foresight work and iii) directly provoking organizational/functional changes (OC). Results are presented in Table 2.

Category of impact	**Influence**			**Change**		
Impact dimension*	***RA/FD***	***LS***	***DM***	***TIP***	***TEP***	***OC***
Brief 01				x		
Brief 02	x			x		
Brief 03	x			x	x	
Brief 04				x	x	X
Brief 05	x					
Brief 07			x			
Brief 08					x	
Brief 09 and 15	x		x			
Brief 10					x	
Brief 11	x					
Brief 13				x		
Brief 14	x	x				
Brief 16	x					
Brief 17			x		x	
Brief 18	x	x				
Brief 19	x					
Brief 20				x		
Brief 21	x					
Brief 23	x			x		
Brief 26	x	x				
Brief 27			x		x	
Brief 28				x		X
Brief 30					x	
Brief 32	x	x			x	
Brief 33						
Brief 34				x		X
Brief 35	x					
Brief 36				x		

Brief 37				**x**		
TOTAL	**14**	**4**	**4**	**11**	**8**	**3**

Table 2. Impact of foresight
** Acronyms are explained in the text above the table*
Source: GFAR, based on 30 Briefs developed from the inventory and available at the time of the report.

Influence of foresight. Half of the cases have reported evidence of their capacity to raise awareness and foster debate beyond the people directly engaged in the foresight work. This occurred at all levels. In some cases, the "provocative" or challenging nature of the results has triggered interests of wider circles of stakeholders. Linking stakeholder is one dimension of influence that is clearly associated with national/local level foresight. The proximity of the work makes it easier to bring together different stakeholders and engage them to interact directly. Other cases reported an impact through methodology development, either internally, or externally. All these cases relate to quantitative methods that have been either further developed or transferred.

Foresight for change. All foresight works which reportedly have generated change through the transformation of policies are commissioned or requested by a decision-maker either internally or externally. One third of the foresight works analyzed have induced new policy or priorities within the organizations which engaged in these works. Direct change means in these cases the implementation of internal policies or internal actions oriented by the results of the foresight work. All of them except one are either national or regional cases.

Several cases report evidence-based change in external organizations directly related to their results[10]. For examples, Teagasc 2030 results fed the formulation of new research priorities in the agri-food sector. Outcomes of the BFAP scenarios were incorporated in the strategic planning of the red meat industry in anticipation of the 2010 FIFA World Cup. CCAFS scenarios process is engaging in strategic planning with key regional bodies such as the East African Community (EAC) General Secretariat. The French National Research Agency explicitly refers to PARME foresight in its 2012 Call for Proposals. The Netherlands government health council and the European Commission have used PBL foresight studies to underpin policies on food, agriculture and environment. The secretariat for environment of the provincial Government of Mendoza has incorporated the foresight framework and the scenarios in the formulation, execution and diffusion in its Environment Management Plan and in the Provincial Law for Territorial and Soil Use Classification. United States of America executive branch officials, industry groups, or legislators make request to FAPRI-MU for research or for analysis of specific policy options. Brazil's nationally-appropriated mitigation actions, National Policy for Climate Change and "*Programa ABC*" are based on the knowledge generated by the SCAF Brazil project. The Morocco 2030 foresight contributed to the formulation of the *Plan Maroc Vert*.

[10] The case of Quebec is not included here, because even if some results were actually implemented by the Government, these are marginal compared to the main conclusions of the work, which have not been implemented.

Communication with policy-makers is key in the usage of foresight. This point is highlighted in various cases. Ownership of results by policy-makers seems to require more than one spot exercise. An established and recognized foresight capacity is more likely to influence policy decision, research priorities and innovation. This in turn requires investment in capacity development. Foresight exercises can also directly lead to significant organizational changes such as the creation of a permanent unit responsible for initiatives to create a culture of continuous foresight within a research organization or the reorientation of an action plan.

Monitoring impact. In some global cases, wider impacts were reported, but without solid evidence to support their reality. This raises the issue of foresight impact evaluation. In most cases, influence or changes were reported because the inventory directly asks this question and requested the authors to provide supporting evidence. Given the results of our analysis showing that, indeed, foresight has the capacity to influence our visions or to change our priorities, future foresight works, especially "foresight for change" need to include impact monitoring processes. So far, no cases had a built-in provision of resources for impact monitoring or assessment, or a clear strategy of how to achieve impact, not even a communication plan.

From (old and new) challenges and results to actionable priorities. Some cases show that integrated vision of the futures is not directly linked to clear and integrated actions. Resulting priorities in these cases finally take the form of a series of separate bullet-point actions, looking more like a shopping list rather than an integrated strategy towards a better future. Even processes starting from a rather clear vision integrating a limited number of objectives can lead to several dozens of "priorities" for research. It is usually the method used which makes more difficult the integration of results into a compact strategic agenda for action. In the above-mentioned cases, the constitution of separate topical think-tanks or working groups led to this proliferation of separate priorities. The same can be seen in most of the regional priority-setting exercises for the GCARD 1 which are reported in the regional "Update Briefs". The implication for future foresight is to produce actionable content, identifying the sequences of actions that need to be taken in order to move along a desired path.

Conclusion: Impact in 2012

- Evaluation of impact of foresight must take into consideration whether the work aims at producing knowledge or at producing change;
- Foresight capacity to influence stakeholders is witnessed by the numerous cases which have raised awareness and/or provoked debates based on their result;
- The capacity to change policy and orient actions is very much linked with the demand for foresight from a decision-maker, and the ability of foresight leaders to directly interact with decision makers in the policy setting process;
- Impact evaluation is still insufficient and needs to be strengthened in future foresight works.
- Future foresight works aiming at change will have to focus on how alternative options can be turned into actions.

In addition to the analysis of cases, we have also analyzed the contributions of the foresight practitioners who participated in the three write workshops. In these workshops, they collectively discussed what "improved foresight" may imply. They looked at WHAT topics should be (better) explored, either because they are new challenges and issues or because

they have been relatively neglected in the past and poorly studied so far. They also looked at HOW improved foresight can be achieved, based on their, discussing methods, tools and principles for carrying out foresight which has better chance of having positive impact in the society as a whole.

What questions improved foresight needs to address

A range of topics was mentioned at the write workshops[11]. When combined with the results of the inventory, we can highlight some clusters of questions/issues for future foresight work. These referred to foresight to be carried out at different levels (global, regional, national, local). In San José, there was a clear common question about institutional change within the agricultural innovation system and within that; the link between research and development/change on the ground. In Bangkok, emphasis was put on focusing foresight questions (such as climate change phenomena) on smallholders, a niche not yet fulfilled. "Who will be farming in the future? And how?" were considered important questions to be answered. These topics are grouped thereafter in five clusters of questions.

1. ***The "Farming World" questions***:
    - Future of those (smallholders) working on agriculture: who will be farming; employment; adaptation to climate variability for resource poor smallholder farmers; access to and transfer of technology and capacity to absorb new information and technology; market participation of resource poor small holder producers;
    - Future of (rural) societies: Ageing Society, How to achieve ecologically sustainable societies; conservation of local culture; impact of increasing urbanization in agriculture; land use and territorial planning.

2. ***The Policy questions***: how to structure the economic system to achieve better equity and stability, regulatory policies for agricultural trade; international cooperation; disaster preparedness;

3. ***The Knowledge questions***: use of ICT for agricultural development, new information and knowledge access for rural and agricultural communities, preparing rural communities for shift to knowledge based economics/societies, evaluation of a regional agricultural innovation system;

4. ***The Food questions***: Food security, food demand, consumption trends, impact of increasing urbanization on food production, effects of intellectual property on agricultural production and food security;

5. ***The Resource/Technology questions***: Energy efficiency and agro-energy production, soil nutrient management, water-use and resource management, impact of transgenic technologies, biodiversity use, ruminant genetics and nutrition, livestock production;

[11] Participants in Rome did not discuss the topics of foresight, only the methods, tools and principles.

These clusters are mutually linked. The first three correspond to new questions, while the food and resource/technology questions are more habitual. The challenge of improved foresight will be to deal with them simultaneously rather than separately and to do it at different scales which will still have to be interconnected.

How can we move toward improved foresight?

Actionable Foresight. Foresight may have very different objectives/purposes. Some of them aim to directly inform policy-makers; others are endeavours of foresight practitioners to generate knowledge, sometimes with the hope that their results will be a "grain of sand" which can trigger change in the long run. Very often, foresight aims at helping others to understand what is at stake, and is not directly connected to decision-making. These differences are often a result of whether the studies respond to an external demand or not.

Most participants consider that the role of foresight studies is to open options and reflect on their implications so that policy-makers and other stakeholders can have more comprehensive views on the choices they have[12]. Yet, this requires further debate, especially when we consider foresight has defined earlier in this document, which include planning dimensions. One of the key challenge for improved foresight will be to link more effectively the results a foresight investigation/research with its use by stakeholders for decision, both in terms of tools and methods (linking visions to actions) and in terms of processes (including decision-makers in the foresight research).

Stakeholder inclusion. The involvement of stakeholders from an early stage of the foresight is important to provide the needed "traction" between the foresight results and the actual decision-making. The more local the stakeholders to engage, the simpler the method to be used to gather their inputs without compromising the legitimacy and methodological rigour of the work. ICT was seen as a key potential area to be explored in this respect. A number of initiatives already making use of such tools was mentioned, including ICT-enabled futures (an experience in South Africa which collected the view of 10 000 people in a very short time, many of them illiterate) and Futures 2.0 (FS 2.0 – Oxford University).

Capitalize and open. Future foresight work should capitalize on existing knowledge and initiative through inter-institutional and cross-sector collaboration. Involving different stakeholders and institutions is important, accommodating different (alternative) points of view. A purposeful effort must be made to include these different views; to allow "thinking out of the box". It was mentioned that there is a need to bring in more – new and young - people into foresight. Here too, capacities become an issue. In this case, capacities refer to the technical expertise of (local, national) researchers to join hands in a larger forward looking endeavour. Such capacities can be built both by "learning by doing", through exchange between such researchers and through early training. The latter implies also incorporating forward looking anticipatory studies in university curricula.

[12] More about the discussions during the write workshops, including agreements and controversies can be found in Annex 4.

Opening a space for improved foresight: the Global Foresight Hub

The agricultural challenges ahead are diverse and complex - economic, environmental and social dimensions affect future food and nutritional security, poverty reduction and the capacity to sustainably use natural resources.

Through the 2010 GCARD Roadmap, stakeholders from all sectors requested that the Global Forum on Agricultural Research (GFAR) initiates actions to improve the prioritization and focus of agricultural research and create more relevant and effective innovation systems. For wider utility and impact integration of knowledge and results into societal debates and policy-making is needed.

In order to enable this integration, GFAR has opened a space for collective action - the *Global Foresight Hub*. Officially established in 2011, the Hub has already gained international recognition during the meeting of the G20 on agriculture. It has benefited from the support of GFAR, EFARD, the Government of France and FARA. It is technically supported by staff from the GAFR Secretariat and operates through its individual members on a voluntary basis. The GFH is not an implementing operating agency. However, it brings together individual competences into an operational collective capacity in foresight.

GFAR through the Hub offers the unique characteristic of a neutral multi-stakeholder mechanism. It is expected to help, for example, the CGIAR to incorporate foresight consideration in its Strategy and Results Framework Action Plan. The Hub supports and interconnects three key activities contributing to provide opportunities toward improved foresight (Figure 4).

1. ***Stimulating foresight research and foresight-based scientific debates*** on the future of agriculture and rural development, so as to identify common findings, controversies and limits to the current knowledge with regard to future stakes. For this, GFAR with the support of EFARD has established a "*Forward Thinking Platform*" as an inclusive mechanism for those engaged in strategic foresight to share results, compare methods, and discuss controversies arising from their experiences.[13]

2. ***Connecting Science and Society*** so as to ensure regular dialogue between scientists, policy makers and civil society, enabling the stakeholders, especially representatives of smallholder farmers, to voice their visions and contribute to the societal choices shaping research, innovation and policy. "*Policy Dialogue Platforms*" constitute the main mechanism through which this connection takes place. Such platforms are venues where advances in foresight, facilitated through the Forward Thinking Platform, will be debated. The GCARD 2 and its focus on foresight is one of these venues at global level.

3. ***Building capacity of all stakeholders in forward thinking*** while collectively adjusting the content of AR4D to societal needs. GFAR has started to open a space for collective capacity building, region by region, starting with Sub-Saharan Africa, supporting a "*Global Foresight*

[13] Advances from the Forward Thinking Platform are developed in Section F2.2. of the current report and will be presented in the sub session F2.2. of the GCARD2.

Academy". The concept of foresight academy is that of an arrangement at regional level for the development and recognition of skills and capabilities of young professionals through the implementation of foresight works on high-priority issues across GFAR regional constituencies.[14]

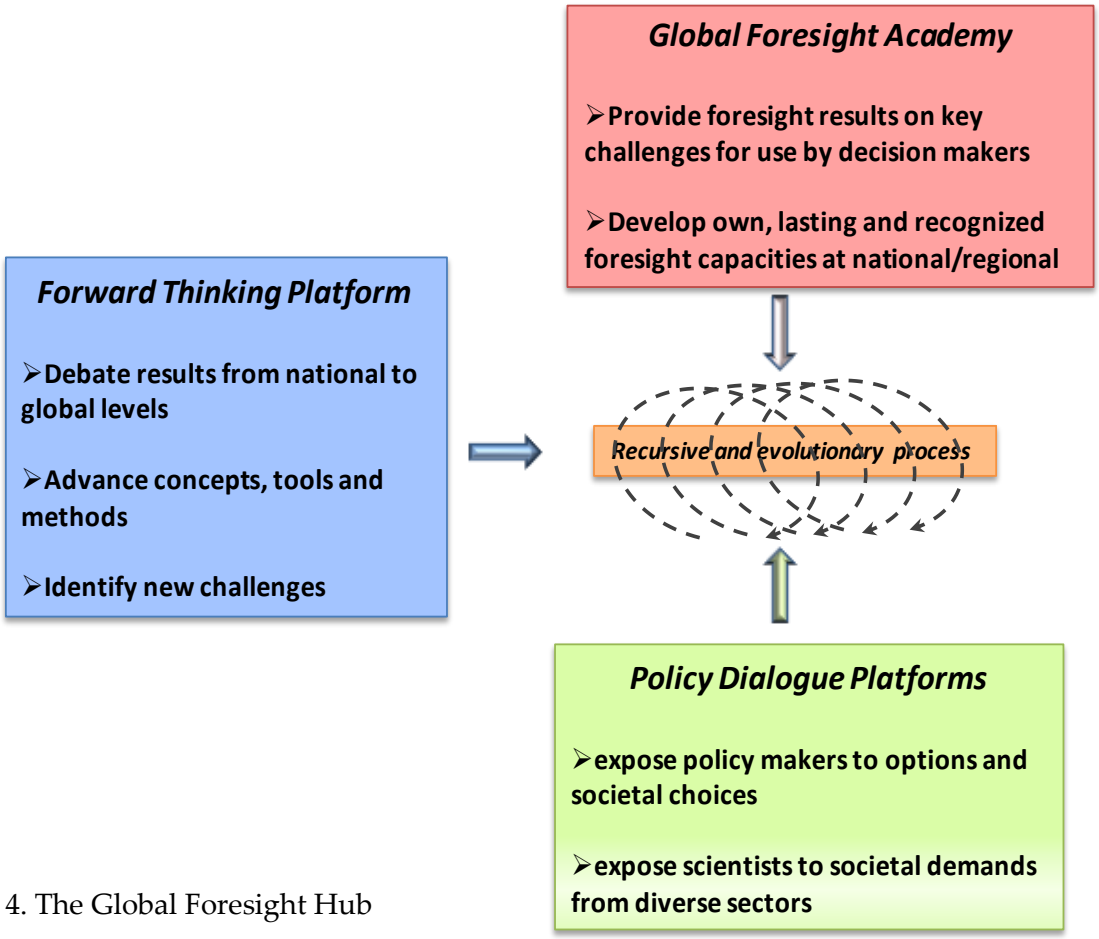


Figure 4. The Global Foresight Hub

To what extent does the GFH contribute to improved foresight?

- Opening an inclusive space for all foresight practitioners to exchange their worldviews, approaches and work together on new/different ways of doing foresight, and new challenges;
- Opening a space for connecting foresight practitioners and stakeholders and reflecting on how to make foresight more usable, more actionable and easier to evaluate;
- Providing opportunities for the promotion of foresight as a needed capacity in national AR4D systems, with particular focus in regions where this capacity is insufficient.

The hub is designed to enable GFAR fulfil its mandate as an open and inclusive catalyzing mechanism, linking advanced research institutes, CGIAR centres and international policy bodies and initiatives with national and regional agricultural research and development

[14] FARA has launched an initiative to develop the African Chapter of the Global Foresight Academy. This initiative is developed in section F3.2 of the report and will be presented during sub-session F3.2. of the GCARD2.

organizations including farmer and civil society organizations. Further development of the Hub as a sustainable network, if desired by the GFAR constituencies, will require progressive commitments from the constituencies themselves at global, regional and national levels.

Annexes

Annex 1. List of the Briefs in the series The "Futures of Agriculture"

This is the list of the Briefs posted on the GFAR website. They refer to the foresight cases collected through the inventory. (*Downloadable briefs have a built-in hyperlink; some Briefs are repeated because they provide information for different regions*). The acronym used in the document to refer to the case is indicated in parenthesis).

Global
Brief No. 02: **A Table for seven billion: Six billion have enough to eat – (only) one billion to go** (Oxfam)
Brief No. 09: **Biofuels and agricultural markets: Implications for food security** (IFPRI Biofuel)
Brief No. 13: **Towards sustainable world food systems: drivers, key issues and research needs** (Dualine)
Brief No. 15: **Does Less Meat for Some Mean Cheaper Food for Others?** (IFPRI Changing Diets)
Brief No. 16: **Exploring the limits of food and farming systems: the Agrimonde scenarios** (Agrimonde)
Brief No. 17: **World food supply in a context of environmental change and increasingly competing claims on natural resources** (PBL)
Brief No. 38: **What are the likely developments in world agriculture towards 2050?** (FAO AT2050)

Under preparation:
Brief No. 40. **What challenges is agriculture facing? Five scenarios for 2050**.
Brief No. 41. Steeg van de J. and Herrero M. (2012). **The livestock - climate - poverty nexus**.

Sub-Sahara Africa
Brief No. 03: **No foresight, no food? Regional scenarios for Africa and South Asia** (CCAFS)
Brief No. 10: **Bureau for Food and Agricultural Policy (BFAP): Your partner in decision making** (BFAP)
Brief No. 12: **Bringing agricultural research back to the African agenda**
Brief No. 14: **How might agriculture develop in Southern Africa? Making sense of complexity** (SASP)
Brief No. 21: **Debunking the water scarcity myth: understanding future water use challenges** (BFP/CIAT)

A&P
Brief No. 18: **Seeking harmony: Scenarios for nature conservation and agricultural development in Kapuas Hulu district, Indonesia** (COLUPSIA)
Brief No. 19: **Evolving towards a Low-Carbon Society** (APEC LCS)
Brief No. 20: **Shaping the future for agriculture in Taiwan** (Taiwan 2025)
Brief No. 21: **Debunking the water scarcity myth: understanding future water use challenges** (BFP CIAT)
Brief No. 22: **Re-orienting Agricultural Research in the Asia-Pacific**
Brief No. 23: **The Future of Thai's Agriculture** (Thai 2020)
Brief No. 24: **Towards a more food-secure Asia and the Pacific**

Under preparation:
Brief No. 39. **Building a shared vision: Scenarios for collaborative land use planning in Seram Island, Central Moluccas Regency**, Indonesia.

MENA
Brief No. 06: **What research do we need to increase agricultural production? Stakeholders' perspectives**
Brief No. 08: **Shaping French trans-disciplinary research priorities for the Mediterranean** (PARME)
Brief No. 11: **Food security in the Mediterranean in 2030: From foresight to research priorities** (SAMAQQ)
Brief No. 21: **Debunking the water scarcity myth: understanding future water use challenges** (BFP CIAT)

Under preparation:
Brief No. 42. Benoit G. and Ait-Kadi M. (2012). **Maroc Agriculture 2030**.

LAC
Brief No. 21: **Debunking the water scarcity myth: understanding future water use challenges** (BFP/CIAT)
Brief No. 28: **Posibles escenarios para la investigación, la innovación y el desarrollo en los países de Cono Sur** (CONOSUR)
Brief No. 29: **Prioridades regionales de investigación en América Latina y el Caribe: Experiencia de FORAGRO para GCARD 2010**
Brief No. 30: **Can climate change affect the future of crop production in Brazil?** (SCAF Brazil)
Brief No. 31: **I'd Rather be Foresighted than Myopic: Foresight Exercises for Agriculture, Food Security, and R&D in Latin America and the Caribbean**
Brief No. 32: **El futuro ambiental de una provincia: Mendoza al año 2030** (Mendoza 2030)
Brief No. 33: **Can Brazil feed the world? Not yet, but it has the potential!** (IPEA)
Brief No 34: **Chile agroalimentario, forestal y rural al 2030** (Chile 2030)
Brief No. 36: **Building the 5th Strategic Plan of Embrapa 2008-2023** (EMBRAPA 5SP)
Brief No. 37: **Innovar para un agro colombiano competitivo** (Agro Colombiano)

EU
Brief No. 01: **Sustainable food consumption and production in a resource-constrained world** (SCAR3)
Brief No. 04: **Teagasc 2030: Creating knowledge for Ireland's bioeconomy** (Teagasc 2030)
Brief No. 05: **Foresight prompts researchers in pest management to look beyond research** (Endure)
Brief No. 07: **The future of rural Europe: Lessons from a multi-scale modeling approaches** (Eururalis)
Brief No. 08: **Shaping French transdisciplinary research priorities for the Mediterranean** (PARME)
Brief No. 13: **Towards sustainable world food systems: drivers, key issues and research needs** (Dualine)
Brief No. 17: **World food supply in a context of environmental change and increasingly competing claims on natural resources** (PBL)

North America
Brief No. 26: **Preparing for emerging challenges to animal health in Canada** (Fore-Can)
Brief No. 27: **A Quarter Century of Forward-Looking Policy Analysis** (FAPRI-MU)
Brief No. 35: **Securing and Building the Future of Quebec Agriculture and Agrifood** (Quebec)

Annex 2. From inventory to analysis

The inventory was conducted in order to expand the current knowledge we have on foresight in agriculture beyond the important, yet few, works that were analyzed in preparation of GCARD1. More than 1 000 responses were received from the 6 000 contacts made through electronic mail using databases from various organizations (GFAR, ILAC, CIAT, ARINENA, FARA). More than 400 respondents answered that they had engaged in foresight activities related to agriculture, rural development or farming systems, that their work was documented and that they were willing to share their work with us. We contacted all these 411 respondents and asked for the documents.

A group of 11 foresight practitioners from various organizations and countries screened these documents and answered to three questions:[15]

1. Is the work recent (less than 5 years)?
2. Is the work looking at least 10 years ahead?
3. Is it related to agriculture/rural development/farming systems?

The first question focused the inventory on recent works. It corresponded to the willingness to document potential progress made towards improved foresight as defined in 2010 in the GCARD1. However, limiting the inventory to post-2010 cases would have been too constraining and would not have given enough material for analyzing results, impacts and highlighting lessons learned. Conversely, expanding the inventory too far back in time would not have given elements for discussing recent changes in the practice of foresight. Using a five-year retrospective period was an appropriate compromise. It did not mean that former works were not important and that no foresight existed before this period.

All works to which the answers were "yes" to the three questions entered the database of selected cases. In addition, a multi-lingual group of interns conducted a bibliography and web review in search for other works which may have been overlooked. In total we found 65 relevant cases.

It is likely that there are works that we did not discover, though we believe that these are not numerous. The inventory is an on-going and open process that will extend beyond the GCARD. We expect to progressively feed this inventory with more data and update it regularly to incorporate new works. It is also likely that we have not been able to fully implement all criteria. This is mainly due to the inclusive nature of the inventory. However, the selected relevant cases provide so far the most comprehensive update on recent foresight in agriculture.

Most of the cases are based on a great variety of documents, ranging from slide shows to referred journal articles, including various type of grey literature such as internal reports. In order to enable a wider audience (including civil sector organizations) to access these works and easily find their key messages, we proposed to the authors to produce shorter, concise

[15] Reviewers came from Universities (3), National research Centers (3), International Research Centers (4) and Organizations (2); they are citizens from eight different countries: Argentina, Australia, Brazil, France, Germany, The Netherlands, South Africa, Tanzania and the UK.

and attractive Briefs of no more than four pages. Each Brief had to provide key elements/messages on content/process/impact/lessons learned.

For this purpose we conducted three write workshops respectively in Italy for Europe, Central Asia, Near East and Africa, in Thailand for participants from Asia and the Pacific, and in Costa Rica for America. The objective of each workshop was to bring together authors of foresight works from the same geographic area for three days and to help them produce a four-page Brief highlighting results, processes, impact and lessons learned. We contacted all authors of the case. Many were not available at the various dates proposed for the workshop, while some of them proposed to work on the Brief remotely. In total, 29 Briefs were directly produced by workshop participants in these workshops. In addition, foresight resource persons from diverse regional fora developed a specific Brief on regional priorities from GCARD1 to GCARD2. Six[16] authors contributed via a remote-facilitation process. We published all Briefs in a series called "*The Futures of Agriculture*" available with open access from the GFAR website.[17]

In addition to the individual work, the three workshops provided the opportunity to conduct collective discussions and exchange among foresight practitioners focusing particularly on lessons learned and the improved meaning of foresight. The results of these discussions, based on the practical experience of the field foresight practitioners are also incorporated in this document.

[16] To be updated (so far six case are under interaction on the Brief : UK Foresight, 5 scenarios for 2050, Maroc 2030, Organic Asia 2030, Papua New Guinea 2030, FAO AT2050).

[17] Tentatively http://www.egfar.org/content/writeshop-1-outputs-briefs (link to be updated when all Briefs completed)

Annex 3. Details of the focal topic of the foresight works in the inventory

Twelve foresight works at global level with a focus on food security and agriculture

1. The Future of Food and Farming and Global Sustainability;
2. Challenges facing food production and land use, global and Europe;
3. The future state of world agriculture and food situation;
4. Global analysis of food and agriculture production systems and its impact on those living in poverty;
5. Sustainable Food Consumption in a resource-constrained world;
6. Global strategic analysis for sustainable food;
7. Building scenarios of strategic planning for food security, environments and livelihoods;
8. Diets change and the future of agriculture;
9. Identify research priorities and challenges for (i) people and societies; (ii) land, resources and territories; (iii) energy; and (iv) agriculture, food and health;
10. Global Food Security;
11. Foresight of the world food supply in a context of increasingly competing claims;
12. Illustrating market impacts of biofuels on food prices.

Three global foresight works on bio physical factors

1. Climate change impacts on agricultural yields;
2. Global bioenergy potentials from agricultural land in 2050: Sensitivity to climate change, diets and yields;
3. Providing focus for water, food and poverty in river basins.

Eight regional works focusing on food agriculture (4), rural societies (3) or low carbon society (1)

1. Agriculture and food futures in the Mediterranean region;
2. Exploring the future of food and agriculture in East Asia;
3. Scenario analysis for the Agriculture in Latin America and the Caribbean;
4. Scenario analysis of the role of *Cono sur* as a food reserve for the world;
5. Foresight for agriculture, food security and R&D in LAC;
6. The Future of Rural Europe;
7. Food security and agriculture in southern Africa;
8. Exploring potential change in rural areas in Europe;
9. Development of a vision for new pathways for a low-carbon society in Asia.

Twelve national works focusing on the future evolution of agriculture (7), research priorities and system (3), territorial development (2) or climate change (1)

1. Developing of a long term vision for Irish agriculture and food;
2. Agriculture and commodity trend, policies for South Africa;
3. Priority setting of the future agriculture in Taiwan;
4. Agriculture baseline and policy analysis for USA;
5. Scenario and projection of the agricultural sector in Brazil;
6. Illustrating of a long-term vision of agriculture in Thailand;
7. Future challenges for the agriculture and agrifood sector in Quebec;

8. Foresight for innovation of the agricultural and forest sector in Chile;
9. Identifying actions of I+D+I for innovation of the agricultural sector in Colombia;
10. Scenarios for the future of the national agricultural research system in Brazil;
11. Land use and natural resource management in Indonesia;
12. Territorial development of the Mendoza Province;
13. Simulation of climate change impacts on crops in Brazil.

Six specific works focusing on commodities (2, technology (2) or other (2)

1. Foresight on the future of medicinal plants production in the Andes.
2. Forecasting supply and demand for cereals in Nepal.
3. Quantitative estimates of returns on potential new technologies
4. Developing a tool to discuss on pest management for EU.
5. Foresight for animal health emergency management in Canada

One foresight work focusing on foresight capacity development

1. Innovation Foresight for MEDA Partners in the European Research Area

Annex 4. Further thoughts on improved foresight from writeshop participants

Points of agreements

- Assessing the impacts of foresight is important to learn from the process, and inform future forward looking exercises, but this should be done in direct relation with its initial aims;

- There is no normative way to do foresight, spaces for foresight for enquiry and foresight for change need not only to co-exist but also to interconnect;

- Foresight for changing societal behaviour has greater chances of success if done at local level where the possibilities to directly include decision makers are greater. However, global level works may lead to greater impact if they change the way a large number of people, or prominent leaders think/behave/act/make decisions;

- Impact of foresight includes also a capacity building process, through which practitioners and stakeholders learn, share and discuss. The process, in itself, is as important as the results of the work;

- More local level works is needed in connection to global initiatives. Regional or national issues (e.g. biodiversity in the Amazonia, national agricultural innovation systems) are better explored with a combination of regional/national and local foresight. Local level anticipatory work can be documented as "cases studies" which inform a higher level analysis.

Controversies:

- During the Rome Workshop, doing foresight was considered as a right even if not asked for by interested parties such decision-makers, civil society organizations, etc. In Bangkok and San Jose participants stressed that foresight has to be demand-led and to aim at a clear outcome (e.g. inducing decision-maker to change policies or priorities). This controversy reflects a difference about how foresight is considered in different contexts. One possible reason is that foresight research is largely accepted and practiced in Europe while it still remains a challenge in other regions. Foresight is thus more legitimate in these regions when it is demand-driven;

- There were diverging opinions whether foresight studies should lead to policy recommendations. Most participants consider that this should not be the case. No common ground was reached.

Chapter F2. Foresight Guiding Research and Innovation

F2.1. At national/regional level

- Latin America and Caribbean
- Asia and the Pacific
- Sub Saharan Africa
- Near East and North Africa
- Central Asia and the Caucasus
- Europe

This part is developed separately by each regional forum.

F2.2. At global level

The state of global foresight in agriculture
Focal topic of the foresight works
New challenges
Impact: influence and change
Towards improved global foresight

This part is developed in a separate report under processing.

Chapter F3. The Voice of Smallholders in Shaping Priorities

This chapter is developed in a separate report under processing.

F 3.1. Improving Foresight through Equitable Partnerships

Current practices
How can farmers shape priorities through foresight?

F 3.2. Developing Capacities for Improved Foresight

Who does what today?
Commitments toward developing local capacities:
The African Chapter of the Global Foresight Academy
FORAGRO commitment for LAC Academy
How the CGIAR can support regional foresight capabilities