

Foresighting Investments in Agricultural Innovation

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SYNOPSIS

Individuals, firms, and governments have a common interest in gaining a more accurate sense of the future to identify potential achievements, successes, and failures; discern new opportunities; or reduce risk. New, future-oriented evaluation methods are needed to complement current methods, which are largely *ex post*—in other words, they account for past outputs, outcomes, and impact. Given the impossibility of seeing into the future, the only solution is to gather and analyze information to think about and prepare for the future. Tools such as foresighting can make an important contribution to this process by clarifying a country's position with regard to strengths, weaknesses, threats, challenges, and opportunities, focusing attention on longer-term issues (including difficult institutional and political issues), and securing a sufficient level of commitment from stakeholders to enable the necessary processes of reform, restructuring, transformation, and change.

BACKGROUND AND CONTEXT

Most decisions are based on implicit assumptions about the future. People depositing funds with a bank assume that they will be able to withdraw their capital when it is required. Investors fund a new business venture because they anticipate profits. When farmers expect good demand for their crop, they may plant an extra field. Assumptions such as these are both rational and functional; few decisions can be made without assuming that a significant degree of stability and continuity will prevail. Because it is also true that these assumptions sometimes prove incorrect, it is important to assess the balance between risk and reward involved in each decision and to gauge the reliability of the individuals and the strength and trustworthiness of the institutions on which the plan depends.

Individuals, firms, and governments therefore have a common interest in gaining a more accurate sense of the future, either to improve their chances of making a successful investment or to reduce the risk of loss. The problem is that the future for any given sector, nation, or individual will be determined by a complex combination of interacting variables that cannot be anticipated with precision. The response is to identify better ways to think about and prepare for the future (Postrel 1998). Foresighting is a means of gathering and using information to think strategically about the future, including the future of agriculture (de Lattre-Gasquet 2006). Foresighting assumes that the future is not predetermined or even predictable but that it will be influenced by choices made today.

FORESIGHTING TOOLS AND APPLICATIONS

Foresighting is a strategy for change, rather than a strategic plan, although it often feeds into a strategic planning process. Foresighting is both a process and a set of tools for managing and communicating knowledge, setting priorities, coordinating goals, and encouraging innovation in science and technology. It involves an iterative and interactive process of systematically exploring possible future economic and social dynamics, including factors such as science, technology, institutions, environment, and development options. The aim is to identify strategic areas of investment that will yield the greatest economic and/or social benefits (Rutten 2001). From an innovation systems perspective, organizations pursue foresighting exercises to (Popper et al. 2007): encourage strategic and future-oriented thinking; support innovation strategies and priority setting; identify research/investment opportunities; generate visions and images of the future; cope with “grand challenges” facing the economy, society, and environment; and promote public debate and trigger necessary actions.

Teagasc, established in 1988, is the national body providing integrated research, advisory, and training services to Ireland's agriculture, food industry, and rural communities. The Teagasc 2030 foresight exercise (launched in 2006, ending in 2008 with an international foresight conference) sought to establish a broadly shared vision for the Irish agrifood industry and rural economy in 2030. That vision would enable Teagasc to meet science and technology needs in the short, medium, and long term.

The foresighting process. Teagasc 2030 was overseen by a steering committee of national and international representatives from government, industry, and universities. The committee was assisted by a foresight panel of experts from Teagasc, other government departments, state bodies, universities, farming and rural organizations, and food industries. A foresight working group from Teagasc's research, advisory, and training directorates completed background papers on drivers of change and possible future scenarios and handled day-to-day running of the project. The knowledge base was developed in workshops, other events, and consultations with stakeholders and international experts.

The scenarios. Involving elements of imagination but drawing on likely developments in the agrifood sector, rural economy, and world over the next 20 years, Teagasc 2030 developed five scenarios and described their effects on the organization:

1. **Ireland—The Food Island.** The value-added food sector in 2030 has many new elements such as convergence of the food and pharmaceutical industries.
2. **Globally Competitive Farming.** In 2030, a diversified agrifood sector competitively produces milk, beef/sheep, and tillage crops.

3. **Energy Squeeze Fuels Agriculture.** With oil production declining steadily, agriculture is vital to global food and energy security.

4. **A European Agriculture.** This scenario addresses the socioeconomic aspects of the rural economy and the consequences of a European economy partly isolated from the rest of the world by tariffs and restricted trade.

5. **Sustainable and Rural.** Sustainability, climate change, and environmental security have precedence: The 2030 bioeconomy delivers competitive agri-environmental products and services.

Lessons and response. Based on the scenarios, strategic and operational responses emerged:

- **For the sector:** Promote knowledge generation and dissemination, learning, and problem solving. Policy drivers at the European Union and national level create new markets and opportunities.
- **For farms, firms, and policy makers:** Adapt quickly to changing circumstances, generate added value, and support innovation.
- **For Teagasc:** Address the new challenges and needs facing the Irish agrifood knowledge system. Excellence in supporting science-based innovation will depend on building organizational capabilities in leadership, partnership, and accountability. Teagasc will establish a new technology transfer service for food companies, strengthen investment in biosciences, enhance the depth of its scientific effort, and continue upgrading its educational programs to the highest international standards.

Source: Teagasc, www.teagasc.ie.

The next sections of this note describe elements of the foresighting process, how to select an appropriate foresighting tool, the use of complementary tools, and the development of alternative scenarios. They conclude with examples of how these processes unfolded in agricultural foresighting in Ireland (box 7.9) and Jamaica (box 7.10).

Foresighting process

Foresighting is often spearheaded by individual organizations or collaborating groups who have a stake within the innovation system (for example, by strategic partnerships or innovation councils, among others). The organization

Objective and process. Jamaica's sugar industry was the largest employer of agricultural labor and used the most (and much of the best) arable land, but it depended on a European Union trade regime that was being phased out. Jamaican sugar was not competitive and would have to undergo profound restructuring to survive. A research program at the University of the West Indies attempted to address these issues through linked foresight exercises involving government, academics, and industry from 2003 to 2010. Following a 2003 Delphi study that identified drivers of change and a 2004 foresight workshop to identify land-use scenarios, by 2009 public and private partners had developed an integrated assessment that generated more accurate predictions than official forecasts. An integrated policy development project in 2010–11 identified options for improved policies, using geographic information system mapping as the basis for a national spatial plan. The cost of the seven years of foresighting was an estimated US\$150,000.

The scenarios. In early 2008, a diversification plan involving privatization and the manufacture of ethanol presented three scenarios:

1. **Diversification would succeed.** The area used to produce cane for ethanol would increase significantly. The contribution to mitigating climate change would offset probable negative consequences for river and coastal water quality.
2. **Diversification would fail.** Much land would become available for other purposes (housing, tourism, forestry) or revert to scrub. Some options would be environmentally positive, but much

would depend on how the change process was managed.

3. **Multi-objective optimization** demonstrated a possible solution that could achieve a range of developmental goals. Extensive, low-value agriculture would shift to intensive, high-value agriculture, increasing revenue, profits, and skill transfer while reducing environmental impact.

Outcomes and lessons. Following the withdrawal of Brazil's plan to invest in Jamaica's ethanol industry and an even more acute budgetary crisis in 2010–11, the Government of Jamaica chose to sell the sugar industry to a foreign company. This outcome illustrates how pressing short-term needs, in conjunction with international uncertainties and domestic politics, often entail the loss of strategic direction and potential future prosperity.

The foresighting exercises resulted in three significant advances. First, the identification of future scenarios helped to establish that better future outcomes were possible. Second, the process helped to identify the weaknesses and vulnerabilities in current policies. Third, the dialogue between officials, academics, and industry representatives was genuinely useful. Yet the exercises could not resolve deep core weaknesses in governance. Most decisions are still taken on a sectoral basis without considering cross-sectoral effects. Ministry officials participated in the debates, but not ministers. No sufficiently powerful group exists to address the large disparities in wealth, influence, and power in Jamaica and arrive at an optimal outcome. Vested interests continue to dominate the informal networks where key decisions are made.

Source: Author.

initiating the foresighting exercise does not necessarily facilitate the process. A common procedure is to establish a steering committee for the exercise and a foresight working group to manage implementation. This approach was used for a foresighting exercise for agriculture in Ireland (box 7.9). For the Jamaican sugar industry, a team of foresight experts was contracted to help users define the steps and tools in a foresighting exercise to meet the needs of different users (in general, users might include firms, industry associations, multinationals, or governments).

Rutten (2000) explains that there are no blueprints for organizing a foresighting exercise. The process itself has four key stages, however:

1. Bring together a wide range of information resources and key stakeholders to discuss and define the core objective(s) of the foresighting exercise.
2. Identify and engage a wider group of stakeholders (typically involving both public and private sector organizations) in the process.

3. Establish a foresighting task force (or a steering committee with an implementing working group) with key stakeholders represented, ideally with the support of a foresight expert.
4. Design and develop the foresighting exercise. Select the tools for the strategic analyses, and set the timelines for completion.

This process is not a linear series of steps. At each of these four stages, new information may be injected, additional stakeholders may become involved (they can sometimes include criminal or vested interests), and organizational changes may affect the level of human and financial resources allocated to the exercise. The exercise will need to remain sufficiently flexible to respond to these challenges and changes while remaining productive. The outputs of the process should include the following:

- **Determining** the economic, social, environmental, and institutional factors that might encourage or inhibit innovation (either in a particular country, or among firms, or in government).
- **Clarifying** the position of a country (or firms or government) with regard to its strengths, weaknesses, threats, challenges, and opportunities, usually by focusing attention on the longer-term issues.
- **Securing** a sufficient level of commitment from stakeholders to enable the necessary processes of strategic reform, restructuring, transformation, and change.

Selecting the appropriate foresighting tool

As summarized in table 7.7, three key strategic planning tools are used to develop future-oriented analyses in the foresighting process:

- **Technology roadmapping** identifies key trends in the market and clarifies those trends and their relation to organizational goals; then technological and managerial decision-making occur to achieve the preferred future.
- **Delphi studies** review significant trends in relevant areas (such as emerging scientific and technological opportunities, needs for education and training, and so forth) and identify the most plausible outcomes, plus any associated threats and opportunities.
- **Foresighting and backcasting exercises** identify organizational and institutional drivers of change plus their

interactions, clarify “known unknowns,” assess vulnerability to events, identify possible outcomes, backcast to the present day, and build a strategy for managing change.

Examples of online toolkits for foresighting are listed in the “resources” section of this note, following the references.

Complementary tools in the foresighting process

Aside from the three major foresighting tools, complementary methods of information gathering can be used in the process, depending on timelines and tasks assigned within the task force or to the foresight expert:

- **A horizon scan** examines the external environment for potential threats and opportunities or early signs of disruptive technological change.
- **A decision tree** is developed by constructing a logical sequence of pertinent questions, such as “If this plan fails, what are our other options?”
- **User requirements capture.** When a particular group (such as consultants or a local elite) has all of the relevant information, they may be able to control the agenda and determine the answers. A user requirements capture process helps to forestall elite capture and information asymmetries. The information base for all users is developed, displayed, discussed, and modified in an iterative process, often using graphic-rich software that allows data to be overlaid in layers (a GIS is one example).

Foresighting and defining alternative scenarios

Scenarios (different possible visions of the future) can be used to formulate long-term policy, institutional strategy, and research programs (Johnson and Paez 2000). In a foresight exercise, a process of defining and describing scenarios is used to explore the way that choices made today will lead to alternative futures. Scenarios are usually encapsulated in brief, illustrative descriptions of possible future states of a system. A common technique is to develop a small set of alternative scenarios, which is helpful for imagining, structuring, and analyzing different possible futures. Scenarios can range from the probable (most likely) future to possible best-case and worst-case futures. The storylines are discussed widely and critiqued.¹ Ideally, like the overall foresighting

Table 7.7 Foresight Tools

Characteristic	Foresight tool		
	Roadmapping	Delphi	Foresight/backcasting
Purpose	Identify key trends in market, clarify organizational goals, make technological and managerial choices to achieve preferred future	Review significant trends in relevant areas and identify most likely outcome, plus any associated threats and opportunities; can be more accurate than individual consultation and more reliable than statistical groups made up of noninteracting individuals whose judgments are aggregated	Identify drivers of change plus interactions, identify “known unknowns,” assess vulnerability to events, identify possible outcomes, backcast to present day, build strategy for managing change
Typical user	Individual firms	Industry associations	Large multinational corporations, governments
Typical time horizon examined (years)	1–10	5–20	10–50+
People involved and numbers	Experts and decision makers; 10–20	Experts (different disciplines); 30–100+	Experts and stakeholders; 20–50
Type of process	1 day introduction, 1 day run-time, monitoring and implementation	Coordinated, iterative discussion of expert judgments on defined issues; responses are kept anonymous but fed back to group, clarified, ranked and reevaluated in a minimum of 3 rounds, 3 months' preparation, 3 months' run-time	Facilitated discussion, present “what-if” challenges and counterfactuals, 3 months' preparation, 2 days' run-time; a large national exercise will require 1 year's preparation, 2 years' run-time
Role of foresight expert	Introduce concept	Coordinate, derive scenarios	Facilitate, challenge, manage process
Key challenges	Getting experts and decision makers to engage, overcoming organizational inertia	Identifying and recruiting the panels, managing the process	Identifying and recruiting key stakeholders, facilitating the process, maintaining momentum
Key questions to guide information gathering / analysis	<ul style="list-style-type: none"> – What are our core technologies? – Could we use them more effectively? – Could an innovation make our technology obsolete? How quickly could we adapt? – What are the trends in our sector? Could a new competitor or a new market emerge? – What is our competitive advantage? – What are the priorities for maintaining, upgrading, or replacing our core technologies? – What resources will be required to update our technologies and upgrade our skills? 	<ul style="list-style-type: none"> – What is the issue to be addressed? – What is important about the issue? – What are possible future scenarios for this issue? – What views create tensions on the issue? 	<ul style="list-style-type: none"> – What are the key assumptions underlying this plan? – What is the “worst case” situation? – What if this plan doesn't work? – What is the contingency plan?
Examples	Institute of Grocery Distribution (UK) used roadmapping to identify food production issues that could affect the food chain and to facilitate a more considered introduction of new technologies in the future on behalf of its members, who were major retailers and food and agricultural research institutes (IGD 2003)	Rikkonen, Kaivo-oja, and Aakkula (2006) described the use of Delphi expert panels in the scenario-based strategic planning of agriculture in Finland; Stewman and Lincoln (1981) conducted a Delphi study on the likely timeframe for expected breakthroughs in the biological sciences from recombinant DNA (RDNA) research, with emphasis on basic knowledge and three applied areas: agriculture, industry, and medicine	De Lattre-Gasquet (2006) examined three case studies on the use of foresighting in agricultural research and development priorities: one at the commodity level (cocoa), one at the level of a national system (Dutch agriculture), and one at the level of an organization (the International Food Policy Research Institute's 2020 Vision)

Source: Author.

exercise, scenarios are updated with further assessments of the environment, drivers of change, and likely interactions between system variables in the progression from current conditions to a future state. Boxes 7.9 and 7.10 provide examples of scenarios developed within wider foresighting in Ireland and Jamaica; IAPs 4 and 5 provide examples from India and Chile.

POTENTIAL BENEFITS

Attempts to prepare for the future can generate a range of benefits. The general advantages of a strategic planning process are that it can help any organization assess its threats and opportunities, clarify the issues, determine its priorities, and integrate all of the important variables into a single coherent plan. This is true irrespective of the quality of the plan that results. A strategic planning process also helps to identify any weaknesses (such as insufficient capital, inadequate technical capacity, inappropriate management, or gaps in the supply chain) that will have to be addressed and thereby clarifies the priorities for borrowing and investment, hiring and firing, and R&D.

The advantage of future-oriented strategic planning is that it facilitates more objective consideration of today's real problems. The foresight exercises may depoliticize and decontextualize the problems, which then allow the problems to be addressed more realistically. Thinking about forces that will shape the future, such as demographic trends, can indicate the future pattern of market demand (for example, for food, energy, water, and housing) and the need for investments in new technologies to meet that demand (see, for example, Clayton and Staple-Ebanks 2002). A foresight approach, using techniques such as scenario planning and integrated assessment to incorporate social, economic, and environmental factors, can ultimately identify and present the best available, optimal, or even win-win outcomes, which different organizations and interest groups may find acceptable. Finally, many planning exercises are flawed because of information asymmetries. A possible solution to this problem is a user requirements capture process, which can be built into a strategic planning exercise. This process involves two or three iterations in which users are shown possible outcomes, give their feedback, and refine the model.

POLICY ISSUES

The chief policy issues related to foresighting are related to reducing the risk of failed policies; addressing cultural,

institutional, and political barriers; providing sufficient resources to implement the results of foresighting exercises; and ensuring that policy change can be sustained.

Reduce the risk of costly policy failures

For poor and developing countries, the primary policy issue in foresighting and strategic planning is that these exercises can reduce the risk of policy failures with high human and developmental costs. One of the most important differences between rich and poor countries is that the cost of a policy failure in a rich country is usually in terms of its opportunity cost—the loss of the wealth that might have otherwise been generated. Although poor and developing countries have a greater need to prepare for the future, most have just a small fraction of the capacity (the skills, knowledge base, access to information networks, and so on) that rich countries deploy on such exercises. For this reason, it is exceptionally important for poor countries to use policy tools that are effective, robust, and cost-effective.

Address barriers to progress and provide sufficient resources for foresighting

Strategies for change, including the use of foresighting, usually have to address issues such as institutional culture and local politics. As the example of the Jamaican sugar industry suggests, it is often important to address the political, cultural, or economic factors and institutional policies that seriously impede progress, because development trajectories can become locked in by the real or perceived cost of developing alternatives, the reluctance to write off sunk expenditures, or a lack of relevant skills.

Managing in the present while preparing for the future often involves gathering new sources of information, establishing where and when change is needed, building a consensus, and mobilizing people and institutions around the new strategy. Commitment, time, and financial resources are essential to support foresighting, especially the implementation phase.

Link foresighting with institutional change to ensure sustainability

A policy issue especially relevant to innovation systems is that innovation cannot usually be imposed. A solution that is not widely understood, or which cannot be easily assimilated or at least accommodated by local cultural and political systems, generally will not gain wide support and will fail

once external funding and/or pressure are withdrawn. Foresighting exercises can inform innovation at the policy and investment levels, but to ensure sustainability, they must be linked to assessment and change processes within the organizations involved in the innovation system (see TN 2). Ultimately, the dynamics of innovation and change cannot be understood without a broad concept of knowledge, including competencies and capabilities, practices and routines, and meanings, beliefs, and perceptions (Williams and Markusson 2002). A foresight exercise takes all of these factors into account to map out a development plan which may be visionary but is also practical and realistic, so that it ensures immediate and long-term benefits for the economy and society.

LESSONS LEARNED AND RECOMMENDATIONS

Foresighting cannot, by itself, solve all problems. Other factors must be addressed, as seen in the example from Jamaica and discussed throughout this sourcebook. These factors include the role of multistakeholder collaboration for good governance (modules 1 and 6); sensible macroeconomic and regulatory policies (module 6); investments in education, advisory services, and research capacity (modules 2, 3, and 4); and an innovative, entrepreneurial private sector (module 5). All have an important role to play in encouraging technological dynamism, investment, and associated processes of economic diversification and growth, as well as a move into higher-value products and services that meet market demands.

Experience with foresighting exercises suggests that foresighting is a best practice for formulating a long-term strategic plan that enables reform and encourages innovation. The foresighting process and associated tools provide a structure for assessing factors that are internal (internal strengths and weaknesses of the science, technology, production, and institutional base) and external (changing global markets and other critical factors in the external environment). A foresighting exercise also lays the groundwork for a review process to anticipate key market opportunities by updating findings with information on new and emerging technologies in conjunction with an analysis of the current restructuring of key sectors of the global economy in relation to science, technology, and production. The identification of such market opportunities could, with good management, create demand for a process of institutional

and wider economic restructuring, provide the economic impetus to support a widening skill base, attract and retain human and financial capital, and make a decisive move along the value chain, thereby escaping from low-growth, low-margin markets.

Key recommendations for practitioners include the following:

- ***Many policy advisors, planners, and donor agencies find it difficult to talk openly about political problems*** that can undermine innovation processes, such as vested interests and corruption. They often prefer to talk about technical issues as if they could be addressed in isolation. Transparency is sacrificed and the exercise loses credibility with stakeholders. In fact, the real impediments to progress are often the political, cultural, or economic factors that determine which solutions are adopted and supported and how and when this occurs. It is useless to present an analysis of technological choices as if the final decision is value-free. The only way to map out a potentially viable solution is to engage with and understand the political and cultural issues.
- ***For these reasons, it is extremely important that participants in foresighting exercises understand that a systematic examination of the possibility of failure and an honest discussion of the pattern of previous failures are the only ways to improve the chances of success.*** Well-organized feedback to the client and participants enables the process to tolerate the dissent, complexity, and uncertainty that is typical of strategic analyses.
- ***Foresighting is a process, not a one-time activity.*** The time required may have to be extended in light of new information or significant changes in the external environment (such as a recession). A national process can take several years and cycle over a longer period. Regular interaction with participants at all stages of the process is needed to ensure that the exercise does not suffer from stagnation or “groupthink” as well as to ensure that new stakeholders are identified, recruited, and fully involved.
- ***Ideally a foresighting exercise should be commissioned formally*** so that it is clearly accountable to client demand. It is recommended that a foresighting expert be contracted as a facilitator, but the expert does not replace the need for a steering committee and working group to implement the exercise.