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# Scenario Planning to Guide Long-Term Investments in Agricultural Science and Technology

*Theory and Practice from a Case Study on India*



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## **Acronyms and Abbreviations**

AIS	agricultural innovation systems
AKIS	agricultural knowledge and information systems
ARD	Agriculture and Rural Development Department, World Bank
BJP	Bhartiya Janta Party
CAS	country assistance strategy
EMBRAPA	Brazilian Agricultural Research Corporation
ESSD	Environmentally and Socially Sustainable Development, World Bank
EU	European Union
FDI	foreign direct investment
FICCI	Federation of Indian Chambers of Commerce and Industry
GM	genetically modified
GoAP	Government of Andra Pradesh
GOI	Government of India
ICAR	Indian Council of Agricultural Research
ICT	information and communication technology
ISNAR	International Service for National Agricultural Research
M&E	monitoring and evaluation
NAIP	National Agricultural Innovation Project, India
NARO	National Agriculture Research Organization
NARS	National Agriculture Research Systems
NATP	National Agricultural Technology Project, India
NCAP	National Center for Agricultural Policy
NGO	nongovernmental organization
PPP	public-private partnerships
R&D	research and development
RNF	rural nonfarm
SASAR	South Asia Agriculture and Rural Development, World Bank
S&T	science and technology
SHG	self-help group
SWOT	strengths, weaknesses, opportunities, threats analysis
TERI	Tata Energy Research Institute
UK	United Kingdom
UNEP	United Nations Environment Programme

## **Preface and Acknowledgments**

This paper describes a scenario planning process carried out to guide the long-term science and technology investments under the National Agricultural Innovation Project of India. The initial idea to explore scenario thinking originates from the workshop on Development of Research Systems to Support the Changing Agricultural Sector, organized by the Agriculture and Rural Development Department of the World Bank and held in Washington, D.C in June 2004. The paper incorporates the theory and practice associated with scenario planning process. It also presents the final scenario story lines on the future of Indian agriculture.

The authors especially thank Ron Bradfield from the Strathclyde University and the scenario-writing team: Suresh Pal, Rajeswari Raina, Sachin Chaturvedi, G. Chandra Chekhar, and Prof Dayanatha Jha. Particular thanks are given to the following people for their time and helpful comments on the manuscript: Paul Sidhu Singh (SASAR), Indira Ekanayake (LCR) and Richard Chisholm (EAP). Ian Noble (ENV) and Rinku Chandra also are acknowledged for providing supplemental material. The Knowledge Sharing and Learning Innovation Grant is acknowledged for its financial support. The Knowledge Sharing and Learning Grant is acknowledged for its financial support, as are DFID and Netherlands Consultants Trust Fund. Alicia Hetzner is acknowledged for editing the manuscript, and Marisa Baldwin and Melissa Williams for the logistics associated with publishing.

## Executive Summary

A number of global changes are taking place with implications for the rural and agricultural sector. Population growth, improved incomes, and shifting dietary patterns continue to increase and diversify the demand for food and other agricultural products. Agriculture is increasingly market and private sector driven. At the same time, the natural resource base underpinning agricultural production is under threat.

While it is increasingly clear that agricultural research systems need to reform to play their anticipated roles in the future, it is far less clear how and to what to respond. Investments in agricultural science and technology tend to pay off in the long run more than in the short term. Research projects may take several years, and the diffusion of the results may take another several years. Nevertheless, the decisions on the investments in the science and technology system of tomorrow need to be made today. This necessity requires that these decisions should be based on a solid assessment of what the future will hold.

Traditional planning and forecasting practices on their own are not enough to serve our needs in getting the insights and answers to the future. Trend analysis is based on the assumption that the factors that drove change in the past will continue to drive it in the future. *Scenarios*, on the other hand, are not predictions, but narratives of alternative environments in which today's decisions may be played out. Scenarios are more similar to hypotheses of different futures specifically designed to highlight the risks and opportunities involved in specific strategic issues. Thus, alternative scenarios describe future conditions in which a system of organizations, such as research systems, may have to operate, as defined by sets of distinct hypotheses on key variables that affect the development of a particular organization. Scenarios are built around variables that are independent of the organization but that strongly affect its functioning and position. The use of scenarios provides useful insights about an uncertain future and improves perceptions and judgments in decision-making. Scenarios help to break out of the mindset that the future will be a continuation of the past. They also help to identify critical decisions that must be made to maximize the future role and impact of the technology system.

To address the challenging emerging issues facing agriculture in India and to consolidate the gains under the completed National Agricultural Technology Project, the Government of India (GOI) and the World Bank agreed to undertake a new National Agricultural Innovation Project (NAIP). However, large part of the future, particularly of agriculture in India, is uncertain. Therefore, a *scenario assessment process* was decided to be applied to address many of the uncertainties, and to help define the key decisions that need to

be taken to ensure that India's agricultural technology system is well prepared for the future.

The assessment also was expected to enable participants, including representatives outside the public sector, to develop a shared perspective on a future that is not necessarily a continuation of the past. In essence, the scenario analysis and development were expected to guide the design and preparation of the NAIP in India.

*The objective of this paper* is to illustrate the utility of scenario planning methodology in supporting strategic planning and long-term agricultural research and development investments, and thereby supporting organizational development in an agricultural context. The paper is divided in 2 parts: (1) description of scenario planning theory and methodology and (2) application of the methodology in the design of NAIP.

*Scenario planning* is a structured process of thinking about and anticipating the unknown future. The objective is to examine possible future developments that could impact on individuals, organizations, or societies to find directions for decisions that would be the most beneficial in any future environment. Scenario planning entails the development of scenarios that come in sets, reflecting the fundamental uncertainty of the situation. Scenarios show how different interpretations of the driving forces of change can lead to different possible futures. Setting up several scenarios creates possibility space, and it is within this space that the future is likely to unfold.

Scenarios are *an important and useful tool* in providing a neutral space for discussion, helping to build consensus on the key issues facing various stakeholders. Besides being useful in strategy formulation, scenarios can be used in policy development, conflict resolution, group learning, and rehearsing management decisions. Scenarios can be used in an intervention model, but they are not the intervention model itself. It is important to decide what the purpose of the scenario planning exercise is going to be. Some scenario projects are undertaken to address a specific problem or question, whereas others are meant to install a permanent capability to do so. For these reasons, there are no general-purpose scenarios or general-purpose scenario approaches guaranteed to result in a satisfied client.

*Scenario development process.* Although scenario planning and scenarios are custom made, they almost always include elements related to scanning (broadening the perspectives, gathering unbiased information and knowledge), design (mapping general development trends to form a base for the scenario framework), story outlining (the scenarios are developed with substance and body), and discussions on implications (looking at today's strategic agenda and alternatives in light of the alternative scenarios). Other important elements include elicitation, such as interviews or strengths, weaknesses, opportunities, threats (SWOT) analysis; research to build robust comprehensive scenarios; consultation to verify the relevance of the scenarios; strategic conversation; and creativity. The main steps in a scenario development process can be organized around a series of workshops and intervening research projects.

The basic process of scenario planning and development in India was intended to include the following steps:

1. *Identify driving forces.* Taking into consideration the political conditions, economic developments, social developments, environmental, trends, and technological changes, assessment is made of the driving forces for change in the future.
2. *Identify predetermined factors.* Assess which future developments are predetermined, that is, will take place in any scenario.
3. *Identify critical uncertainties.* Identify the critical areas in which the future is uncertain and can easily flip-flop.
4. *Develop scenario plots.* A scenario is defined by combining a small number of sets of critical uncertainties. A comprehensive description of how the future would look under this scenario then is developed. These futures must be plausible.
5. *Consult.* A rigorous consultation process to clarify the scenarios involves presenting the scenarios to a large number of people who have expertise relevant to the scenario exercise, collecting their comments, and incorporating the comments in the framework and scenario stories. Consultation will reveal the gaps in knowledge of the system being studied. Part of the consultation phase is to decide on additional research in areas in which new or more knowledge will improve the quality of understanding.
6. *Assess the implications of the different scenarios.* The best possible responses of the organization(s) concerned to each of the plausible future scenarios are assessed.
7. *Compare possible responses to the different scenarios.* Two elements in the comparison require special attention (1) the actions that can be found in all responses and tend to be associated with low risk and (2) the responses that differ more among scenarios. Responses in these fields may require further assessment to understand how the impact of change on these variables can be managed. Differing responses also may lead to the development of correlated response policies and/or monitoring indicators to keep a close watch on the future.

For the success of the project, the participation of high-level officials, farm leaders, senior leaders from the public and the private sectors, nongovernmental organization (NGO) leaders, donor representatives, experts on agricultural development, and some remarkable people was required. The project was managed by SASAR and ARD. An Indian coleader was invited, and experienced scenario experts led and facilitated the workshops and the analytical work between the workshops. A procedure around a number of workshops and additional research work was designed. However, the plan was modified based on the needs and available resources. Its main steps included an initiation workshop at Bank HQ, interviews with "remarkable people," an introduction workshop in India, a scenario analysis and design workshop, finalization and presentation of the scenario storylines, and scenario analysis results workshops to define the way

forward relative to NAIP and Indian Council of Agricultural Research (ICAR) leadership.

*Lessons learned.* The scenario analysis contributed to the design of the NAIP in the following ways:

1. It helped ICAR think about the issues beyond its own technical competence and to strengthen the realization that the world that it is serving now requires new approaches.
2. It helped the project design team define the scope of the project component, that is, the institutional development of NAIP. It also helped to identify the importance of enhanced capacity for dialogue and interaction with other stakeholders. Flexibility, rather than pursuance of one reform strategy, was considered a key trait for a successful organization in a rapidly changing world.
3. The scenarios can be used as a source of inspiration for the competitive calls for research consortia. To extract and analyze the right technological, researchable issues, a candidate consortium needs to provide clarity on the development pathway of the subsector on which it is working. The scenarios also may be used to facilitate a dialogue between public and private sectors and to produce inputs and insights for the next Country Assistance Strategy (CAS);
4. The impact of the scenario analysis tends to manifest more in implicit rather than explicit ways: scenario analysis strengthens the ability for strategic conversation. This ability is very important when consensus among people with very different perspectives on the future needs to be achieved.

*Recommendations* derived from the process:

1. Adequate attention must be paid to the needs to allocate sufficient time and resources for creating client ownership and to compose a multidisciplinary scenario team and participant group.
2. The scenario analysis can be applied within certain boundaries, for example, a country CAS, sector strategy, project preparation, or regional plans for very small countries. However, applying the analysis in very large initiatives, such as overall global issues, is far more challenging.
3. Due to significant time requirements, particularly during the consultation process (validation), it is recommended that the scenario process be implemented well ahead of project preparation.
4. To avoid delays, attention needs to be paid to the following issues: the need for a full-time manager for the overall process; managerial and time requirements associated with a 5-person part-time writers' team rather than 1 full-time scenario editor/writer; a need for significant research capability and allocation of adequate resources; a potential reluctance to farm out research work to third-party research institutes; and the potential problems of operating a virtual team over long distances and managing political sensitivities.

5. With these lessons kept in mind, the process adopted is effective and well suited for policy development work. It has proven its value in particular for stimulating and increasing the value of the wide stakeholder strategic conversation.

## 1. Introduction

A number of changes worldwide are taking place that have implications for the rural and agricultural sector. Population growth, improved incomes, and shifting dietary patterns continue to increase and diversify the demand for food and other agricultural products. Agriculture is increasingly market and private sector driven. At the same time, the natural resource base underpinning agricultural production is under threat (Rajalahti and others 2005).

Typically, many important decisions about how, when, and where to act are based on our expectations for future events and needs. However, when the world is highly unpredictable and we are working from a limited range of expectations and knowledge, our expectations and interventions may be proved wrong (Peterson and others 2002). In agriculture, revolutionary advances in biological and information sciences offer great potential to address these new demands and resource constraints. However, making research benefits available to small-scale farmers is a challenge. International trade is increasing rapidly, bringing with it new challenges for farmers to remain competitive and for governments to ensure the safety of agricultural value chains.

While it is increasingly clear that agricultural research systems need to reform to play their anticipated roles in the future, it is far less clear how and to what they will be responding. Therefore, an important question is how to adapt agricultural research systems to best meet the new demands of the changing world and environments and how to improve their responsiveness to the changing needs of the agricultural sector (Rajalahti and others 2005). Investments in agricultural science and technology tend to pay off in the long run more than in the short term. Research projects may take several years, and the diffusion of the results may take another several years. Five to 10 years easily go by before investments in the technology systems impact on the agricultural sector. Still, the decisions on the investments in the science and technology system of tomorrow need to be made today.

Accountable decision-making requires an adequate level of knowledge and confidence in our assumptions about this knowledge. Thus, the ability for an organization to critically review its assumptions on external developments and to incorporate thinking about external uncertainties in a structured way is of key importance ([www.Scenario Thinking.Org](http://www.ScenarioThinking.Org)). This importance requires that any of these decisions be based on a solid assessment of what the future will hold.

Traditional planning and forecasting practices on their own are not enough to serve our needs in obtaining the insights and answers to the future. Several approaches have been used to understand the future. Two that are well

known are *trend analysis* and *scenario analysis*. Trend analysis is based on the assumption that the factors that drove change in the past will continue to drive change in the future. For several variables that are important to understand the future, such trends can be predicted with reasonable precision. Demographic variables are among the variables for which past trends often provide good insights in the future (van der Heijden 1996).

Scenarios, on the other hand, are not predictions nor are they strategies. Scenarios are narratives of alternative environments in which today's decisions may be played out. They are more similar to hypotheses of different futures specifically designed to highlight the risks and opportunities involved in specific strategic issues (Ogilvy and Schwartz 2004). Thus, alternative scenarios describe future conditions in which a system of organizations, such as research systems, may have to operate as defined by sets of distinct hypotheses on key variables that affect the development of the organization. Scenarios are built around variables that are independent of the organization but that strongly affect its functioning and position. In complex situations of rapid change, scenarios represent explicitly the interrelated uncertainties that are most important to a planning problem at hand. Scenarios provide useful insights about an uncertain future and improve perceptions and judgments in decision-making. They help to break out of the mindset that the future will be a continuation of the past. They also help to identify critical decisions that must be made to maximize the future role and impact of the technology system (van der Heijden 1996).

To consolidate the gains under the completed National Agricultural Technology Project (NATP) and to address more challenging emerging issues, the Government of India (GOI) and the World Bank agreed in principle to undertake a National Agricultural Innovation Project (NAIP). However, a large part of the future, particularly of agriculture in India is, uncertain. For agricultural science and technology in India, for example, there are many major uncertainties: How will global warming affect the production characteristics of Indian agriculture? Will the private sector take a bigger role in agricultural research, or will it remain a small player? Will the global markets for agricultural products remain affected by subsidies from the developed world, or will they be less distorted? and Will India have high nonagricultural growth, or will it be stagnant? The challenges for the technology system in a scenario with a large role of the private sector, an open undistorted global market, and high nonagricultural growth are very different from the challenges in a scenario with a small private sector, a distorted global agricultural market, and low nonagricultural growth. As an example, investments to strengthen the Indian technology system would be more focused on commercial supply of export products in the first case and on staple food for home consumption in the second.

A scenario assessment process was decided to be applied to address many of these uncertainties, and to help define the key decisions that need to be taken to ensure that India's agricultural technology system is well prepared for the future. The assessment also was expected to enable participants, also including representatives outside the public sector, to develop a shared

perspective on a future that is not necessarily a continuation of the past. In essence, the scenario analysis and development were expected to guide the design and preparation of the new World-Bank-funded NAIP in India.

*The objective of the paper* is to illustrate the utility of scenario planning methodology in supporting strategic planning and long-term agricultural research and development (R&D) investments and, thereby, support organizational development in an agricultural context. The paper is divided in two parts: (1) description of the scenario planning theory and methodology and (2) application of the methodology in the design of NAIP of India.

## 2. What Are Scenarios and Scenario Thinking?

Scenario thinking is a structured process of thinking about and anticipating the unknown future with no pretense of being able to predict the future or being able to influence the environment in a major way. The objective is to examine possible future developments that could impact on individuals, organizations, or societies to find directions for decisions that would be the most beneficial in any future environment. The philosophy is to proactively think and plan for future developments instead of being a passive victim of change ([www.ScenarioThinking.org](http://www.ScenarioThinking.org)).

Scenario thinking always includes a number of possible future scenarios that are (logically) internally consistent and plausible stories about significant events in possible futures. Scenarios are *not* predictions of the future but can be used to identify a number of possible alternative futures and, optionally, how to get there (Strategy Survival Guide, or SSG). Scenarios come in sets, reflecting the fundamental uncertainty in the situation. They show how different interpretations of the driving forces of change can lead to different possible futures. By setting up several scenarios, a *possibility space* is created, and it is within this space that the future is likely to unfold. Scenarios also overlap in aspects of the future that are likely to persist (SSG, van der Heijden 2005).

Why would we be interested in alternative scenarios of future? Scenarios can help planning and decision-making by describing future conditions in which a system or organizations may have to operate, as defined by sets of distinct hypotheses on key variables that affect the development of the organization. They can help to break out of the idea that the future will be a continuation of the past and help identify critical decisions that must be made to maximize the future role and impact of, for example, an organization, company, or a technology system (van der Heijden and others 2002).

Usually, decisions are based on “mental maps” of the future. However, our understanding of the world is always partial, because our thinking is colored by our training and experience. Until we compare our assumptions with those of others, we are not even aware that we have such limited maps (van der Heijden and others 2002). Scenarios can help address these limitations by providing mental maps that cut across disciplinary boundaries in a structured way and turn boundary assumptions into endogenous variables. Exploring and enriching assumptions together across disciplines provides increased variety in mental maps to make us more efficient decision-makers, and better planners (van der Heijden 2005).

Thus, the strength of scenarios and scenario planning is based on the following positive features: (1) they respect differences and encourage multiple perspectives; (2) they combine quantitative and qualitative

knowledge; (3) they combine different fields of knowledge and ways of knowing; (4) they reframe questions across disciplines; (5) they project the future as “full of possibilities”; and (6) they are based on collaborative conversation (van der Heijden 2005). Box 2.1 lists common reasons for carrying out a scenario-planning process.

While scenarios emphasize different mental models and are based partly on intuition, they also are built as analytical structures. They combine quantifiable elements with more intangible aspects using strict causal logic. At the same time, they can raise powerful questions for which causality proves weak, showing users where knowledge is inadequate and research is required. Thus, scenarios are built around variables that are independent of the organization but that strongly affect its functioning and position. In situations of complexity and rapid change, scenarios represent explicitly the interrelated uncertainties that are most important to a planning problem at hand. For this reason, they can feed the strategic conversation within a given organization that is focused on implications and possible responses (van der Heijden 2005).

#### **Box 2.1 Why Carry Out a Scenario Planning Process?**

Reasons commonly specified include:

- Changing the mental map of senior executives
- Overcoming group think
- Fostering "out of the box" thinking
- Helping planners expand the horizon of their thinking
- Anticipating unconventional risks and changes in rules of the game
- Helping to align views and create a common language among a team
- Discussing unconventional ideas in a safe setting
- Giving new impetus to an ongoing strategic conversation
- Involving both line and staff in the planning process
- Wind tunnelling strategic options
- Triggering invention of new strategic options
- Networking with new “sparring partners.”

*Source:* van der Heijden 2005.

### 3. For What Can Scenarios Be Used?

Scenarios are an important tool in providing a neutral space for discussion. They thus help to build consensus on the key issues facing various stakeholders. Many people emphasize creativity, expanding mental maps, and thinking the unthinkable with only a vague reference to strategy as strong reasons for engaging in scenario planning. A number of categories of purpose include sense making, exploration, strategy testing, anticipation and reading weak signals, generating a unique insight, eliciting knowledge, delivering a message, building accommodation, building consensus, team building, morale building, and enabling strategic conversation (van der Heijden 2005).

As well as being useful in formulating strategy, scenarios can be used in policy development, conflict resolution, group learning, and rehearsing management decisions. They can be used at many levels: nations, government, regions, sectors, multinational companies, small and medium-sized enterprises (SMEs), single institutions, and multiorganization partnerships. Similarly, scenarios can be used over any time frame, dependent on the primary objective for using them. Scenarios developed to aid team development, for example, are likely to be developed more quickly and have a shorter shelf life than those used for policy development (SSG).

Scenarios are, however, only tools. They can be used in *an intervention model*, but they are not the intervention model itself. To develop an effective scenario intervention project, it is important to decide what the *purpose* of the scenario planning exercise is. Some scenario projects are undertaken to address a specific problem or question—often one-time events—whereas others are meant to install a permanent capability to address a specific problem or question. These often are ongoing activities. Some scenarios are intended to open up minds, some to create closure around a strategy. Some aim to make sense of a puzzling situation; some intend to produce ideas for action. Long-term scenario projects may aim to develop anticipatory skills or to turn participants into experiential learners (van der Heijden 2005). Table 3.1 illustrates four broad purposes of developing scenarios and scenario projects.

It is important to note that only the client can specify the purpose of the scenario project. The purpose of the intervention determines what needs to be done in the project and choice of intervention model (van der Heijden 2005). Because of this, there are no general-purpose scenarios or general-purpose scenario approaches that are guaranteed to result in a satisfied client (however, see chapter 4). The chance that someone else's scenarios have any use is small. Each project must be custom-designed based on the specific objectives and needs of the specific organization. Only dedicated customized approaches can work and have the potential to become highly successful

(van der Heijden 2005). Box 3.1 summarizes the main characteristics of a good scenario and limitations in scenario use.

Table 3.1 Scenario Purpose Matrix		
	One-time	Ongoing
<b>Opening up</b>	The <b>sense making</b> purpose: A one-time exploratory-question-raising scenario project. <i>Indicated for an organization that has entered choppy waters and finds it difficult to articulate what the business environment requires.</i>	The <b>anticipation building</b> purpose: An ongoing exploratory scenario activity to raise the important questions. <i>Indicated for an organization that has been caught too often misjudging what will happen in its environment.</i>
<b>Seeking closure</b>	The <b>strategizing</b> purpose: A one-time decision-making scenario project. <i>Indicated for an organization facing a major decision of a strategic nature, in which uncertainty muddles decision-making.</i>	The <b>organizational learning</b> purpose: An ongoing decision-making scenario activity. <i>Indicated for an organization living in a fast-moving environment, in which the competitive advantage is in learning faster.</i>

Source: van der Heijden and others 2002.

Broadly speaking, there are two types of scenario projects: *adaptive* and *generative projects*, also referred to as *linear* and *iterative* projects, respectively. The most important question to resolve is whether the client aims for an adaptive or a generative scenario project. If things are going well for the organization, and/or when an organization desires to secure survival or the status quo, an adaptive project may be all that is needed. In this type of a situation, a sequential approach toward scenario building, followed by

**Box 3.1 Summary: Characteristics of a Good Scenario and Limitations of Its Use**

Good scenarios:

- Are based on analysis of change drivers
- Enable critical uncertainties and predetermined elements to be distinguished
- Are credible and compelling
- Are internally logical and consistent.

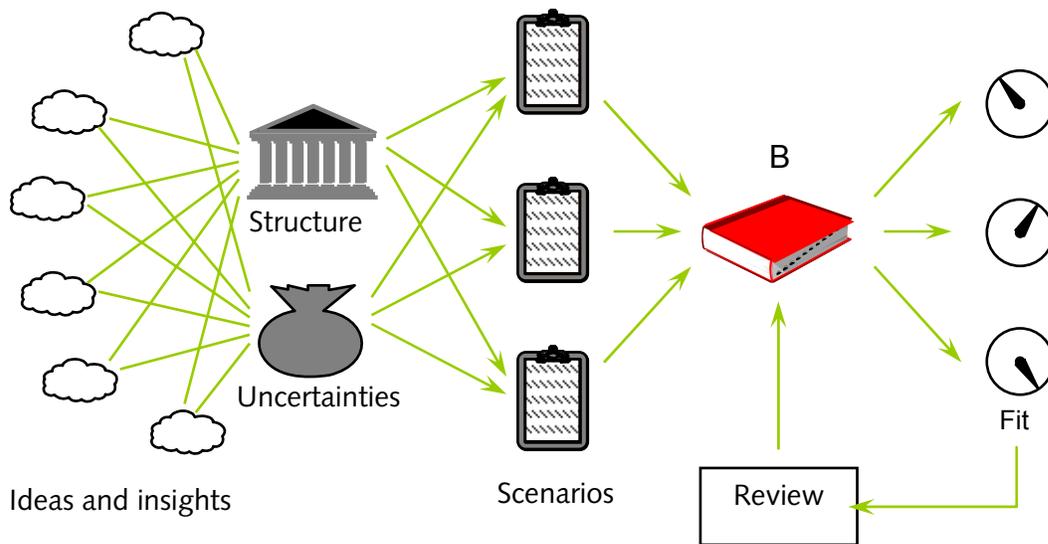
Scenarios will not:

- Make the decisions
- Begin an unstoppable course of action
- Ever be entirely right (although elements of each scenario could be)
- Persuade everybody.

Source: Scenario Survival Guide.

testing and adaptation of strategic options looks adequate. Figure 1 illustrates the various steps in an adaptive scenario development process (van der Heijden 1996). In this process, scenarios can be seen as testing conditions for the strategy. They are used as means to think through future policies and decisions. The scenarios are the “laboratories” in which different strategies can be tested. By using more than scenario, robustness of the strategy is tested specifically in different conditions.

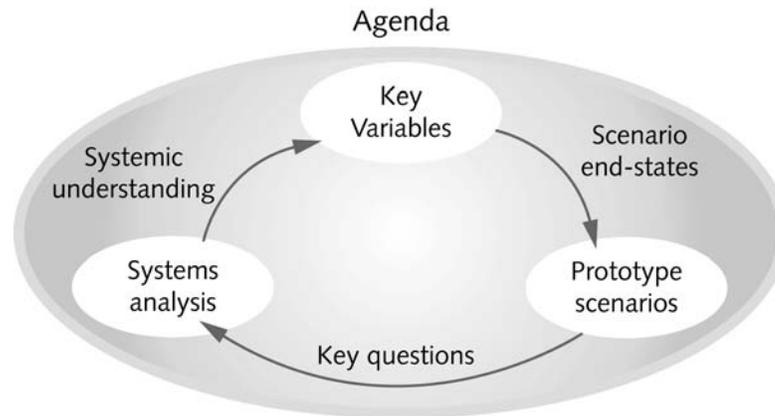
**Figure 3.1 Principle of Linear or Adaptive Scenario-Based Development Process**



Source: van der Heijden 1996.

However, when an organization is searching for a new original insight to reposition its activities and to create new opportunities, a generative approach can be adopted until such a new and unique insight starts to emerge (van der Heijden 2005). For example, a generative approach is likely required when a project aims at making sense of a puzzling situation, including “intractable” problems and fundamental repositioning issues. Figure 3.2 illustrates the various steps in a generative scenario development process. The activities iterate between, on the one hand, creating a holistic overview of the current and developing team understanding of the total problem situation by using scenario building, and, on the other hand, detailed expert analysis of specific issues that surfaced in this process. In this type of scenario project, the scenarios are not considered as final products but as question raisers leading to detailed research. The findings of such research then need to be incorporated in the overall picture using scenario building techniques in the next iteration. Iterations continue until further progress in understanding levels off. The number of iterations required to come to a satisfactory level of overall understanding depends on the problem situation and is difficult to predict. A generative process is much more demanding and less predictable in terms of resources and time required, and this should be factored in the planning and resources (van der Heijden 2005).

**Figure 3.2 Principles of Iterative or Generative Scenario-Based Development Process**



Source: van der Heijden 2005.

The discussion so far on the purpose of scenario planning can be summarized by reference to Vicker’s decision framework, which argues that every human activity requires a judgment in three areas: (1) appreciative judgment, answering the question of what is actually going on in the problem situation; (2) value judgment, answering the question of how developments are evaluated, that is, as good, bad, or indifferent; and (3) instrumental judgment, answering the question of what levers for action we judge that we have at our disposal. Scenario planning can help decision-makers in each of these three areas, but the interventions required are rather different (table 3.2).

<b>Judgment area</b>	<b>Purpose</b>	<b>Intervention</b>
Appreciative	Making sense	Analytical Iterative Deductive
Values	Enhancing the strategic conversation	Intuitive Iterative Inductive
Instrumental	Strategy development, wind tunneling	Analytical Linear Incremental

Source: Vickers 1995.

## 4. Real-Life Scenario Applications

*Scenario thinking* has been carried out for a long time. Shell Group Planning introduced the methodology as early as the 1960s and anticipated the possibility of what became the 1970s energy crisis. Scenario thinking since has evolved as a powerful methodology to enable groups to structurally anticipate change and incorporate external uncertainty into internal decision-making (box 4.1). Military planners were the first to apply *scenario planning*. For example, most states' departments of war maintain a continuously updated series of strategic plans to cope with well-known military or strategic problems. These plans are almost always based on scenarios (Wikipedia).

As mentioned, the best scenarios are always client and context specific. However, at times, resources do not allow generating a scenario from scratch; therefore, one may have to resort to using preexisting and tested generic scenarios. Examples of generic scenarios include the United Kingdom Department of Trade and Industry (DTI) scenarios produced for their “futures lab.” There also are many other “off-the-shelf” scenarios (see references). The Generic Scenarios paper by the Strategy Unit Strategic Futures team (Cousens and others 2002) presents summaries and provides links to generic scenario sets to provide background materials to help those interested in using scenarios for their own projects. However, there is little evidence that such approaches produce any long-term value for the client.

### **Box 4.1 1995 Long-Term Energy Scenarios Developed by Shell**

The 1995 Long-Term Energy Scenarios recognized that the energy system was anything but static. Normal market dynamics could reduce greenhouse gas emissions in two ways: by advancing energy efficiency or making renewable energy competitive. Converging technology advances would enable increasing efficiency, for example, by developing “super car.” Renewables would start by supplying niche markets, reduce costs with experience—as had previous technologies—and eventually compete with conventional fuels as depleting resources raised fossil fuel prices. The cost of exploiting increasingly remote resources would make large-scale reliance on coal uneconomic. Nuclear energy would be hampered by costs and public acceptability.

The scenarios explored the extremities of two “what if” questions. What if energy efficiency improved at the maximum historic rate? And what if renewables were able to expand supply as fast as oil early in the 20th century (Sustained Growth)? The latter scenario explored the upper limit of potential renewable energy growth and led to the oft-quoted estimate of 50 percent of world primary energy being met by renewables by 2050. This estimate is among the highest potential renewables share and lies outside the range of the new International Panel on Climate Change (IPCC) scenarios.

*Source:* Shell 2001.

The point is that any scenario presentation can cover only a very small segment of what is going on in the world. Unless this segment has been carefully chosen to be relevant to the needs of the client, the chance of overlap is small indeed (<http://www.strategy.gov.uk/downloads/survivalguide/downloads/Scenarios.pdf>).

Scenarios also can be applied in *agriculture and natural resource management* in multiple ways and at multiple scales. Examples of scenario exercises on agriculture and natural resource management include the following:

### **Millennium Ecosystem Assessment**

(<http://www.millenniumassessment.org/en/index.aspx>), a global assessment of the current and future state of the world's ecosystem services, used scenarios as a tool for analyzing complex systems and understanding possible outcomes. The second volume of the Millennium Ecosystem Assessment series explores the implications of four different approaches for managing ecosystem services in the face of growing human demand for them:

- The Global Orchestration approach is defined as socially conscious globalization, one in which we emphasize equity, economic growth, and public goods, reacting to ecosystem problems when they reach critical stages.
- Order from Strength represents a regionalized approach, in which our emphasis is on security and economic growth, again reacting to ecosystem problems only as they arise.
- Adapting Mosaic is also a regionalized approach, but one that emphasizes proactive management of ecosystems, local adaptation, and flexible governance.
- TechnoGarden is a globalized approach with an emphasis on green technology and a proactive approach to managing ecosystems.

The Scenarios volume is expected to help decision-makers and managers identify development paths that better maintain the resilience of ecosystems, and can reduce the risk of damage to human well-being and the environment. (<http://www.millenniumassessment.org/en/Products.Global.Scenarios.aspx>)

### **Genetically Modified (GM) Crops Project**

The GM Crops team used a scenario-based approach to consider the range of costs and benefits that could be associated with the growing, or not growing, of GM crops in the United Kingdom (UK). The central purpose was to consider the relative costs and benefits of alternative futures for the UK (over a 10–15-year time scale), both with and without the commercialization of GM crops on UK farms. The scenarios did not predict the future, nor did they have probabilities attached to them. ([http://www.strategy.gov.uk/downloads/survivalguide/skills/eb\\_scenarios.htm](http://www.strategy.gov.uk/downloads/survivalguide/skills/eb_scenarios.htm))

GEO3, the third Global environmental outlook from UNEP, used a scenario approach to develop an integrated set of global scenarios focusing on sustainable development. The GEO3 scenarios were descended from a set of global sustainability scenarios developed by the Global Scenarios Group (<http://www.gsg.org/>) at the Stockholm Environmental Institute (<http://www.sei.se/>). For additional examples, see also Peterson and others 2003 and Westhoek and others 2006.

Box 4.2 describes how scenario planning was applied in Brazil to guide agricultural research institute's future program.

The World Bank has applied scenario thinking and planning in a few occasions. Box 4.3 includes examples of scenario applications involving the World Bank.

**Box 4.2 Scenario Planning by Brazilian Agricultural Research Corporation**

In 1989 Brazil was at the end of the "lost decade" of economic stagnation and a year before the first popularly elected president in 25 years. EMBRAPA, the Brazilian Agricultural Research Corporation, was in decline, as were most public agencies in the country after years of economic and political turmoil. A multidisciplinary team of 30 researchers devoted 6 months to learn how to apply alternative scenarios in the design of institutional strategy for the coming decade. After 6 months, they published a report containing 4 scenarios and an analysis that called for substantial repositioning of the organization. The report also recommended a broad strategic planning exercise.

The report led to an effort to rethink agricultural research in Brazil and to reposition EMBRAPA in terms of strategy, structure, and process. The scenarios focused attention on profound but little understood changes that were just beginning to occur in government, agricultural production, and in the market. In the process, EMBRAPA found much new energy and many new challenges. One small but significant result was that EMBRAPA realized that it would need to maintain its relevance and its public support under elected governments with potentially very different agendas. To contain the risk of losing political support, to strengthen the understanding of the role of research for agricultural development, and to be well tuned in to political developments, it decided to post a scientific advisor to the parliament.

*Source:* Johnson and D'Apice Paez 2001, 301–08.

**Box 4.3 Examples of Scenario Applications in Agriculture/NRM Sector and by the World Bank (or coordinated by the World Bank)**

*A. IAASTD/AKST*

The International Assessment of Agricultural Science and Technology (IAASTD) is a three-year collaborative effort (2005–07) that will evaluate the relevance, quality, and effectiveness of agricultural knowledge, science, and technology (AKST) in relation to meeting certain development and sustainability goals. These goals are reducing hunger and poverty; improving nutrition, health, and rural livelihoods; and facilitating social and environmental sustainability. In association with this assessment, four scenarios will be developed.

Source: <http://www.agassessment.org/>.

*B. Corporate Applications in the Bank*

A team in the Strategy Group of the Strategy, Finance and Risk Management (SFR) Vice Presidency (VPU) has been exploring the use of scenarios as a tool for long-term strategic dialogue at the institution. The Group launched the scenario effort. The focal question was, “What major changes in the world could reshape development by 2020?” The Group had two main objectives in mind:

1. To develop a set of plausible but provocative scenarios that would facilitate fresh thinking about long-term strategic challenges for the Bank as a whole
2. To create scenario building blocks that could be used to support VPU management teams that wanted to think about their strategy (whether for a region, sector, or central function) within a broader and longer term context.

The team conducted a series of interviews and workshops, and developed a set of three plausible, yet divergent, scenarios. While the scenario stories are intended to be thought-provoking, the real value lies in the strategic discussions that they stimulate. To date, the scenarios have been utilized in a variety of workshops with regional management teams and other small groups within the Bank, and have provoked stimulating discussions about long-term uncertainty with each of these teams and groups.

*C. Overcoming Drought: Adaptation Strategies for Andhra Pradesh*

The World Bank Department of Environment with several concerned government of Andhra Pradesh (GoAP) departments (Environment, Disaster Management, Planning, Agriculture, Rural Development, Irrigation, and Rains-Shadow Area Development) and other stakeholders wanted to complement the existing state and central government programs by enhancing the state’s capacity to assess the long-term impacts of drought and increase resilience at different spatial levels to drought risks.

For this purpose, they carried out a study to (1) develop a robust analytical framework for simulating the long-term impacts of drought at the micro (drought-prone areas) and macro (state) levels, (2) conduct a quantitative probabilistic risk assessment of the impacts under different scenarios, and (3) assist the GoAP to develop a forward-looking and anticipatory strategy for adapting to frequent drought events and conditions of water deficit.

In addition to the macroeconomic and drought management scenarios, the modeling framework to account for the possible increase in frequency and severity of droughts that may occur due to human-induced climate change also was developed. In this context, this study is linked to a larger Bank work program in a new strategic area on adaptation to climate variability and longer-term changes.

Source: Climate Change Team and Bio Carbon Fund, The Department of Environment, World Bank. [www.WorldBank.org/ClimateChange](http://www.WorldBank.org/ClimateChange).

## 5. How to Carry Out Scenario Thinking and Scenario Development

Before developing a scenario agenda, a few important questions must be raised at the very beginning of the scenario project. The activities, stakeholders, resources, and time allocation depend on (1) who sponsors the process; (2) what the primary purpose of the project is; (3) who will be using the scenarios; and (4) what the expected outcomes are (van der Heijden 2005).

### Project Definition and Launching

The “VOCATE” analysis can serve as a general guide for defining and launching the key parts in a scenario project (box 5.1). In addition, it is important to pay attention to the following subsidiary questions that may help further define the context: how long do we have; who should be involved and how much time will they need; how much will it cost; and how long do we need to look ahead (van der Heijden 2005)?

### Scenario Development Process

Although intervention models are custom made to focus on the needs and values of the client, they almost always include elements related to scanning (a time of opening up, broadening the perspectives, and gathering unbiased information and knowledge), design (general development trends are systematically mapped to form a base for the scenario framework), story outlining (the scenarios are developed with substance and body), and discussions on implications (looks at today’s strategic agenda and alternatives in light of the alternative scenarios). The process entails other important elements, such as elicitation, interviews or SWOT (strengths, weaknesses, opportunities, threats) analysis, research to build robust

#### **Box 5.1 Launching the Scenario Project Using a VOCATE Analysis**

- V:** Why do the owners consider the specified transformation a good idea, and what value system drives them to want to achieve this?
- O:** Who are the owners of the project, who is the client, and who decides afterwards whether the project is a success or a failure?
- C:** Who are the people at the receiving end of this activity, the customers, and how will they be affected? How will they be reached?
- A:** Who are the actors who will bring the transformation about? Who are the facilitators and the other participants?
- T:** What transformation will the project achieve, that is, what is the description of the preproject relevant situation and what are we aiming for post project?
- E:** What are the limits of this activity? What in its environment will be taken as given?

Source: van der Heijden 2005

comprehensive scenarios, consultation to verify the relevance of the scenarios, strategic conversation, and creativity (Scenarios Nextwork; van der Heijden 1996, 2005). The following paragraphs describe the most important aspects in scenario development process, starting with “know your client.”

*Know Your Client and His/Her Timeframe:*

A very important part of the VOCATE analysis is definition of the client. Thus, the number one rule of scenario-based planning is *know your client*. The project must start by knowing the client and its aspirational system, because the client is the party that will ultimately decide on whether the project was successful (van der Heijden 2005).

Mapping out the action space of the client involves surfacing the client’s action perspective, based on desirability, plausibility, and uncertainties. It is sometimes helpful to identify *the key decision* facing the organization, discuss it, and develop a clear understanding of useful questions to ask about the decision (Ogilvy and Schwartz 2004). However, not all scenario projects concern “key decisions” (see below).

One must keep in mind that the action space of the client may be constrained by mandatory rules and regulations that need to be adhered to. The action space also may be limited by assumptions of freedom or willingness to act by the clients themselves. Having clarity on these points from the beginning will ensure that the results of the project will speak to the client's own-perceived ability to take action. Conclusions that fall outside this space will be experienced as irrelevant, leading to disappointment. Success will stand or fall with aiming the outcome of the project within this action space from the beginning (van der Heijden 2005). For scenarios to be truly useful learning and planning tools, they must teach lessons that are highly relevant to the client’s decision-makers (Ogilvy and Schwartz 2004).

It is worthwhile to note as part of the sense making process that scenarios also can be *exploratory* rather than decision focused. Scenarios are a powerful tool for exploring more general areas of risk and opportunity. Such scenario thinking can serve as the basis for subsequently developing more focused scenarios and for initiating a broader strategic conversation throughout the organization. Nonetheless, even exploratory scenarios must be built around a relevant client need, or the scenarios will lack focus and internal consistency (Ogilvy and Schwartz 2004).

The following questions may help in understanding the client (van der Heijden 2005):

- Is the client analytically and quantitatively oriented? Do the decision-makers come from an engineering culture? Or was it intuitive and qualitative, with a background possibly in history, philosophy, or psychology?
- Is the management optimistic or anxiety-ridden?

- Are the managers linear or systems thinkers? Do they think in terms of events following each other in a sequence, or do they look for causal interlinkages and feedback?
- Do they have a political position and/or prejudice?
- Are they elitist or populist?
- Are they prone to conspiracy theories, or can they accept the logic of accidents in the past?
- Are they mesmerized by own ambitions and prejudices, or will they be capable of learning new things?
- Are they subject to a herd instinct?

Besides determining client's focal questions/s or issues, it is important to remember the timeframe of the scenario. It will affect the range of movement and creativity within the scenario. In medical scenarios, for example, biotechnology, genetic medicine, and noninvasive surgical procedures should be mature technologies in 2010, but they will not be relevant to a scenario with a 5-year time horizon (Ogilvy and Schwartz 2004).

#### *Compose a Scenario Team:*

After identifying the client and its aspirations, and overall timeframe, it is essential to further define the project. An important aspect of the VOCATE analysis is to identify the *scenario team*. The core team will be responsible for scenario project and workshop management, providing the sponsoring organization's points of view, and internal communications. Experienced scenario-planners should also form part of the team to lead the process and ensure clarity on the focus of relevance (SSG).

Teams should spend time together in advance of the project to consider what values they share. That the team members have shared values is an important condition for success of the project. Without it, keeping the team together through the project will be an uphill struggle.

Besides sharing values, it is essential for team members to agree on the allocation of responsibilities and tasks. Constituting questions to the team include:

- What sovereignty do the team members have in the project domain? What levers can they pull?
- How does the team define its agency? What responsibility are the members prepared to take on?
- How does the team define its identity, and how do they want to be seen by the outside world?
- What does the team need from the outside world and how can it reciprocate?

*Identify Major Stakeholders and Other Participants:*

Besides the main client, decide who else will be affected and have an interest in the possible outcomes. Identify their current interests, and whether and why these interests have changed over time. If scenarios are to be used, it is essential that they have widespread buy-in. The best way to achieve this is by giving the relevant people a “sense of ownership” of the scenarios (SSG).

A scenario project team will include some or all of the following contributors:

- Manager who is responsible for the overall scenario process
- Part-time participants who are involved because of their interest in and knowledge of the subject matter but who not involved much between the scenario workshops
- Research leaders who are responsible for collecting and incorporating various data needs in the scenarios
- Editor/writing team that is responsible for writing the scenario storylines
- Part-time specialists
- ‘Remarkable people’ from various sectors who have studied areas specified in the scenario agenda but are not normally part of the organization’s network and therefore can contribute original insights
- Steering team that guides the process and meets a few times during the project
- Sponsors.

Participants should be carefully recruited to include (1) some people who have a thorough knowledge of the organization and (2) some who understand the critical issue or issues to be addressed. The team should be as diverse as possible, encompassing a wide range of management levels, perspectives, and roles. Ideally, the people on the scenario team will be acquainted with a variety of intellectual disciplines: social sciences, economics, political sciences, and history. If possible, a variety of cultures should be represented. The full spectrum of organizational functions should also be present. *Internal diversity* is critical to the success of the project. The key to failure, on the other hand, is the exclusion of people who are unorthodox, challenging thinkers from inside and outside the organization (Ogilvy and Schwartz 2004).

*Define the Main Purpose:*

Besides “knowing your client” and composing the team, some scenarios may require deciding on the key purpose or question to be answered by the scenario planning. To do this, one must know the client (as explained earlier). By deciding on the key purpose/question, it is possible to assess whether scenario planning is preferable to the other methods. If the question is based on small changes or a very few number of elements, other more formalized methods, such as trend analysis, may be more useful.

*Set the Time and Scope of the Analysis:*

Take into consideration how quickly changes have happened in the past, and try to assess to what degree it is possible to predict common trends in key variables, for example, demographics, regeneration of natural resources, and product life cycles. A usual timeframe can be 5 to 10 years.

*Setting the Scenario Agenda:*

An agenda for the scenario-based planning exercise can be developed by means of a series of interviews, for example, by asking the organization's managers to express concerns and anxieties about the future. Through discussion, an agenda can be developed of issues that managers intuit will be important to the future success of the organization and on which the scenarios are to throw new light. A typical scenario agenda is a list of 4 to 5 broad themes or areas of interest in the business/sector environment in which, it has become clear, the project has the potential to help the client (van der Heijden 1996).

*Introducing Novelty:*

People tend to focus on issues strictly relevant to their business or organization. Thus, it is often hard to think outside the box. However, for scenario planning to be successful, it requires novelty, which often requires elicitation and needs to be derived from outside the organization. One way to create novelty is to involve "remarkable people." These are often academics, commercial researchers, writers, artists, consultants, or perceptive business people who have studied areas specified in the scenario agenda but are not normally part of the organization's network and therefore can contribute original insights (van der Heijden 1996). Box 5.2 provides some guidelines on how to carry out an interview with managers or remarkable people to gain insights and views on the given issues.

*Brainstorming for Key Factors:*

After the focus of the scenario work has been selected, brainstorming a list of key factors begins. Brainstorming should be led by a person experienced in facilitating brainstorming and/or scenario sessions—usually someone from outside the organization. One of the keys to successful creative group sessions is making it a practice that no idea is immediately disparaged or discarded.

*Map Basic Trends and Driving Forces:*

Much of the brainstorming revolves around identifying driving forces and key trends relating to the scenario agenda. These are the most significant elements in the external environment. They drive the scenario plots and determine their outcomes. It is important to assess to what degree these trends will affect the client. Each trend should be described and how and why it will affect the organization explained. To capture possible group thinking and tunnel vision, all trends that can be thought of are presented before any is assessed (Wikipedia).

**Box 5.2 Elicitation: Key Points on How to Carry Out the Interviews**

An interview process is a rather elaborate but productive process during which the interviewer(s) need to pay attention to a few rules:

*Setting the tone and trust*

1. As much as possible, interviews should be open-ended. The questions should be general and intended to trigger free-flowing conversation.
2. Each interview should be opened by explaining the purpose of the exercise, and what happens to the data collected (anonymity, sorting by subject). These clarifications can build trust to enable a free discussion.
3. The interviewer should establish him-/herself as a genuine listener by paying attention to what arises in the mind of the listener and feeding this back to the interviewee. Although some interaction takes place between the interviewer and interviewee, the interviewer needs to be careful not to dominate the discussion.

*Triggering and maintaining the discussion*

4. Trigger questions can initiate the discussion and maintain the momentum. A set of "seven questions" has been effective.
5. The first three questions aim to elicit a list of main uncertainties in the business/sector and its environment. The interviewee could be asked to list her/his concerns and uncertainties. For example, if the interviewee could pose only three questions to a clairvoyant, how would the interviewee use those questions?
6. The next question is turned around: the interviewee could answer the questions posed to a clairvoyant. One way to do this is to focus on good and bad scenarios.
7. All this time, the interviewer should participate but preferably in a reactive mode (clarifying, feeding back) in order not to influence the discussion too much.
8. It is good to have a few additional open-ended questions available on, for example, important lessons from the past, important decisions ahead, constraints in the system, and the epitaph question on what s/he wants to be remembered for.

*Process*

9. While the conversation goes on, everything needs to be recorded. Usually hand-written notes work best.
10. To retain the trustful atmosphere and to take turns with questions and note-taking, the interview team should consist of two to three people.
11. It is useful to compare the notes immediately after each interview to ensure that everything has been recorded.
12. The important insights of relevance and significance need to be identified for further processing. Typically, 40 to 60 insights can be identified and recorded as short bullet style statements, and later clustered around a few important themes.
13. All interviewed persons should receive a report of the results of the conversations.

Source: van der Heijden 1996.

It is important to consider all five general categories of forces and trends: social, technological, economic, environmental, and political forces that interact with one another to create complex and interesting plots (Ogilvy and Schwartz 2004). Appendix D lists the key drivers identified during the scenario design workshop on Indian agriculture. External input (reality checks), often in the

form of specially invited guest speakers, are often used to introduce new knowledge and new views into the process. Bringing in outside guests is also a popular way of increasing the motivation and dynamism among participants (Scenarios Nextwork). At this point, it is also useful to assess whether any linkages between driving forces exist, and rule out any "impossible" scenarios (for example, full employment and zero inflation) (Wikipedia).

*Find Key Predetermined and Uncertainties:*

The next step is to distinguish predetermined elements from uncertainties. The key forces that seem inevitable, or *predetermined*, are trends that are unlikely to vary significantly in any of the scenarios. These forces might be slow-changing phenomena (the development of new oil resources), constrained situations (U.S. social security crisis, availability of land and water per person), trends already in the pipeline (demographics), or seemingly inevitable collisions. These forces should be reflected, implicitly or explicitly, in each of the scenario plots (Ogilvy and Schwartz 2004).

The uncertain forces are those that are most likely to define or significantly change the nature or direction of the scenarios. The uncertainty assessment should be measured by two criteria: how uncertain is the team of its outcome, and how important is the outcome to the client organization? Consensus about which of the forces are the most critical uncertainties emerges only after extensive discussion. There are three fundamentally different approaches to determine the basic premises of a small number of scenarios: inductive, deductive, and incremental. The inductive method is less structured and relies largely on the patience of a group to talk and talk until consensus is reached. The deductive approach uses simple techniques of prioritization to construct a 2 x 2 scenario matrix based on the 2 most critical uncertainties (Ogilvy and Schwartz 2004). The incremental method may be suitable when the scenario planning method is not yet embedded in the thinking style and the client is strongly attached to an "official future." This method entails careful analysis of the official future scenario and its internal consistency through trend analysis and actor logic. Depending on the outcome of the analysis, the official future is either retained, or adjusted by using the deductive method (van der Heijden 1996).

One helpful way to separate the division of forces and trends into predetermined and uncertainties is to map the driving forces on two axes, assessing each force on an uncertain/(relatively) predictable and impact scale. All driving forces that are considered of relatively low impact are discarded. Driving forces whose impact is relatively predictable, for example, demographics, can be included in any scenario, so the framework should not be based on these. This process leaves the team with a number of important and unpredictable driving forces (Wikipedia). Usually two main trends, commonly those that have most uncertainty, are drawn out and shown as axes (dimensions) on which the scenarios can be plotted (Cousens and others 2002).

*Identify the Extremes:*

The team needs to identify the extremes of the possible outcomes of the (two) scenario dimensions and checks the dimensions for consistency and plausibility. Three key points should be assessed:

1. Timeframe: Are driving forces compatible within the timeframe in question?
2. Internal consistency: Do the dimensions describe uncertainties that can construct probable scenarios?
3. Are any of the identified stakeholders in disequilibrium compared to their preferred situations, and will their disequilibrium evolve the scenario? Given these particular stakeholders, is it possible to create probable scenarios? This point is most important when creating macroscenarios in which governments, or large organizations will try to influence the outcome (Wikipedia).

*Define the Scenarios:*

The next step is to define the scenarios by plotting them on a grid. Usually, 2 to 4 scenarios are constructed. One approach can be to create all positive elements in one scenario and all negative elements (relative to the current situation) in another scenario, then refining these. However, this approach is not generally recommended, and, in the end, it is best to avoid purely best-case and worst-case scenarios (Wikipedia). One helpful way to define scenarios is to map the main events in the scenario against time in a “story map” (see examples in appendix D) and experiment with various ways of arranging the events over time.

*Write Out the Scenarios:*

Writing out the scenarios requires composition of narratives on what has happened and what the reasons can be to lead to the proposed situation. The narratives should try to include good reasons why the changes have occurred, which helps further analysis. Finally, each scenario should be given a descriptive (and catchy) name for easy reference (Wikipedia, SSG). The final descriptions of the scenarios can take many forms. The best results are often obtained when the scenarios take the form of well-written stories that are appealing and stimulating (Scenarios Nextwork).

*Identify Further Research Needs:*

An important step in the development of comprehensive, plausible, and good quality scenarios requires identification of additional research needs. The data needs vary based on the scenarios, and the scenario design team should assess for which more information is needed. Scenarios typically require both qualitative and quantitative data. Qualitative data, for example, through a description of the microeconomic situation, may convey the main scenario messages and can be very helpful when presenting information to a nonscientific audience. Quantitative data may employ the collection of macroeconomic, social, and environmental data, or even modeling tools that incorporate quantified information to calculate future developments and changes presented in the form of graphs and tables. It is also useful to obtain

more information on the motivations of stakeholders, and possible innovations that may occur in the sector (van der Heijden 1996; Wikipedia).

*Consultation to Assess the Scenarios:*

Another important step after the scenario writing is to carry out a rigorous consultation process to verify the relevance of the scenarios: fit for the purpose; internal consistency; archetypical nature; and whether the scenarios represent relatively stable outcome situations (Wikipedia). This process involves scenario presentations to a large number of people who have expertise relevant to the scenario exercise, collection of their comments, and subsequent incorporation in the framework and scenario stories. Original workshop delegates should always be consulted. However, for good engagement, scenarios must be widely circulated. When distributing the scenarios, however, one should make clear whether they are being distributed for comment or for information (SSG). Normally, this process results in additional changes in and clarification of the scenarios, and may take significant time. However, this consultation process is critical for the outcome of the scenario process and for its application.

A more complicated iterative scenario development process—not a “one-off” process—involves research; systems analysis; additional scenario workshops; and usually second-, third-, and sometimes fourth generation scenarios. For this reason, it is also necessary to build in the capacity to revise scenarios when there is some fundamental change to underpinning drivers. Thus, a team member should be assigned to continually review the validity of scenarios (SSG).

*Assess the Implications:*

An assessment should be made of the best possible responses of the organization(s) concerned to each of the plausible future scenarios and to the whole set. Relevant stakeholders will be invited to consider strategic implications by articulating strategic options that are indicated by the developments as discussed in the different scenarios. Articulating options usually involves two steps: option generation by scenario and option evaluation across all scenarios (van der Heijden 1996).

In the first step (option generation), one group of people normally handles one scenario. The task is to think through strategic options indicated by the developments in the scenario. The group first translates the scenario into terms that are relevant to their own specific situations, and then considers how they would wish to react to the events in the scenario (van der Heijden 1996).

In the second step (option evaluation), all the options associated with the different scenarios will be clustered to create a small number of broad strategies to be carried further. The performance of each optional strategy will be evaluated in each scenario, followed by discussion on how to make the strategy more robust across all the futures considered. Subsequently, one must identify the signals that should be followed in the environment to ensure that, when the time arrives for subsequent decisions, a better idea has been

developed on where the environment is heading (van der Heijden 1996). Box 5.3 summarizes the main stages in a scenario development process/project.

### Organizing the Scenario Work via Workshops and Research

The main steps in a scenario development process can be organized around a series of workshops and intervening research projects. The work is carried out by the participants at each workshop, lasting 2 to 3 days each, and in the periods between workshops. The workshop methodology is a flexible way to work in which plenary discussions alternate with more focused work in break-out groups. A number of workshop facilitation tools can be used to ensure a creative but focused atmosphere (Scenarios Nextwork).

Workshops should be documented directly on location. Instant documentation is an essential part of the method of moving the process forward. After each workshop, a complete documentation is put together to guide the group through the process (Scenarios Nextwork).

Unless the team has decided that additional research will not deepen understanding, research topics should be carefully specified after the workshop and allocated to research teams to produce additional insights to improve and clarify the scenarios. Depending on the findings, additional scenario workshops may have to be called to decide on how to incorporate what has been learned.

### Final Words

The scenario planning can be an emotional journey through stages of elation, letting go of assumptions, severe information overload, disorientation, too many scenario ideas, confusion on how to use, being swept away, and final elation at seeing the future afresh.

*Experience helps to retain confidence that all will come together in the end.*

—Kees van der Heijden

#### Box 5.3 Summary of Main Stages in a Scenario Project

*Design:*

- VOCATE analysis
- Exploration with stakeholders (interviewing)
- Identification of themes and scenario project definition
- Scenario project design

*Scenario exploration:*

- Multidisciplinary scenario workshops
- Issue research
- Articulation of new insights, cross-disciplinary modelling
- Scenario design and writing storylines
- Testing implications

*Dissemination of insights:*

- Scenario presentation and publishing
- Gaining endorsement
- Presentation of results, communication, application

*Source:* van der Heijden and others 2002.

## **6. Relationship to NAIP**

Investments in agricultural science and technology tend to pay off more in the long run than in the short run. Research projects may take several years, and the diffusion of results may take another several years. Still, the decisions on the investments in the science and technology system of tomorrow need to be made today. This necessity requires that any of these decisions is based on a solid assessment of what the future will hold. Scenario planning can help to unravel the future and thereby guide the strategic planning of the Indian agricultural research system.

Agriculture and agricultural R&D in India face a number of uncertainties. For example, will biotechnology, especially genetically modified organisms, become widely accepted? How will global warming affect the production characteristics of Indian agriculture? Will the private sector take a bigger role in agricultural research, or will it remain a small player? Will the global markets for agricultural products remain affected by subsidies from the developed world or will they be less distorted? Will India have high nonagricultural growth, or will it be stagnant?

The challenges for the technology system in a scenario with a large role of the private sector, an open undistorted global market, and high nonagricultural growth are very different from the challenges in a scenario with a small private sector, a distorted global agricultural market, and low nonagricultural growth. As an example, investments to strengthen the Indian technology system would be more focused on commercial supply of export products in the first case and on staple foods for home consumption in the second. Therefore, the objective of the proposed scenario planning project is to revisit the future development of Indian agriculture in the light of the many uncertainties that surround it.

This assessment will help to define the key decisions required to ensure that India's agricultural technology system is well prepared for the future. The assessment will also enable participants to develop a shared perspective on a future that is not necessarily a continuation of the past. In April of 2005 the Indian Council of Agricultural Research (ICAR) successfully completed the National Agricultural Technology Project (NATP). To consolidate the gains under NATP and to address more challenging emerging issues, the Government of India (GOI) and the World Bank agreed in principle to undertake National Agricultural Innovation Project (NAIP). The scenario analysis contributes to the quality of future strategic planning and informs the design of this new phase of the World-Bank-funded NATP. Box 6.1 provides a summary of NAIP.

The scenario project has run concurrently with the project to approve the NAIP and put it in operation. The timing of both is shown in table 6.1. The

**Box 6.1 Summary of the Indian National Agricultural Innovation Project**

The Indian National Agricultural Innovation Project (NAIP) aims to contribute to the transformation of Indian agriculture from a self-sufficiency orientation to more of a market orientation in which income generation and employment creation gain importance. The specific objective is to accelerate the collaborative development and application of agricultural innovations among public research organizations, farmers, the private sector, and other stakeholders.

The project will be implemented by the Indian Council for Agricultural Research (ICAR). It will be financed through a loan of US\$200m and a contribution by ICAR of US\$ 50m.

NAIP will carry out activities to strengthen the capacity for dialogue and interaction between the ICAR and the state agriculture universities. In addition, NAIP will focus on three lines of work:

1. In recognition of the growing importance of the market, research on production to consumption systems
2. In recognition of the persisting poverty and natural resource management problems in parts of the country, research to improve rural livelihoods in disadvantaged areas
3. In recognition of the need to have capacity to solve the problems of tomorrow, basic and strategic research in the frontier areas of agricultural science.

NAIP will be open to all scientific organizations of the country and will actively engage the private sector, farmer organizations, and NGOs in developing a series of large consortia working on problems of major significance to the future of Indian agriculture. Research consortia will be selected principally through competitive processes. NAIP will put in place a series of mechanisms to ensure that every organization that is interested in participating in NAIP will be able to compete.

*Source:* National Agricultural Innovation Project Appraisal Document. World Bank.

intention was that the processes inform each other. The scenario project evolved with NAIP, which in turn benefited from the understanding developing from the scenario work. This approach is sometimes called wind tunneling, in which NAIP model is tested in various “environmental” conditions specified by the scenarios.

<b>Table 6.1 Timing of NAIP Preparation Relative to Scenario Development</b>		
<b>Timing</b>	<b>NAIP</b>	<b>Scenario project</b>
September 2004		Internal planning workshop in Bank
April 2005	Start project preparation	Scenario agenda workshop at ICAR
July 2005	Draft Project Appraisal Document (PAD)	Scenario building workshop First-generation scenarios
August 2005	Polished PAD	Research on validity of first-generation scenarios
October 2005	Quality enhancement review	
December 2005	Project Appraisal	
February 2005	Negotiations	Second-generation scenarios are concluding and being circulated for comments
April and June 2006	Board approval	Workshops in India and at Bank on implications of scenarios
July 2006	Effectiveness	
<i>Source: Authors.</i>		

## 7. Scenario Procedure in India

### Basic Process

To provide guidance, insights, and vision for the planning of the proposed NAIP, a scenario building exercise was undertaken by the World Bank in collaboration with ICAR. The basic process of scenario planning and development in India was intended to include the following steps:

*Identifying driving forces.* Taking into consideration political conditions, economic developments, social developments, environmental trends, and technological changes, an assessment is made of the driving forces for future change.

*Identifying predetermined factors.* The next step is to assess which future developments are predetermined, this is, will take place in any scenario. As an example, population growth is a variable that tends not to change quickly.

*Identifying critical uncertainties.* The essential step of scenario planning is to identify the critical uncertainties. These are those areas in which the future is uncertain and can easily flip-flop. An example of a highly critical uncertainty in many countries is the type of government: right or left wing.

*Developing scenario plots.* A scenario is defined by combining a small number of sets of critical uncertainties. A comprehensive description of how the future would look under this scenario then will be developed. These futures must be plausible.

*Consultation.* A rigorous consultation process will be carried out to clarify the scenarios and to make them "arche-typal." This process involves presenting the scenarios to a large number of people who have expertise relevant to the scenario exercise, collecting their comments, and subsequent incorporating the comments in the framework and scenario stories. Consultation will identify gaps in knowledge of the system being studied. Part of the consultation phase is further research in areas in which new or more knowledge will improve the quality of understanding.

*Assessing the implications of different scenarios.* An assessment is made of the best possible responses of the organization(s) concerned to each of the plausible future scenarios.

*Comparing possible responses.* Finally the responses to the different scenarios are compared. Two elements in the comparison require special attention. First are the actions that can be found in all responses and tend to be associated with low risk. Second are the responses that differ more among scenarios. Responses in these fields may require further assessment to understand how the impact of change on these variables can be managed.

## Practical Procedure

### Participation

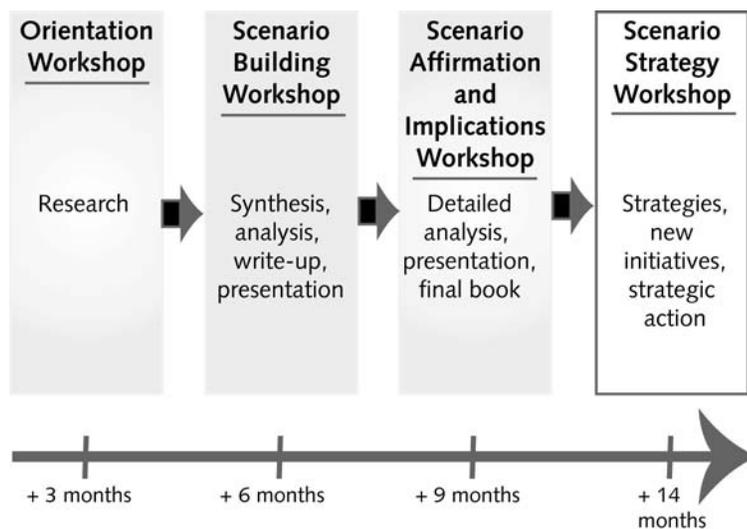
High-level participation was required for the success of the project. Farm leaders from several parts of the country were the first group of participants. Senior leaders in the Ministry of Agriculture, Director General (DG) of ICAR, several Deputy DGs, and Vice-Chancellors of several state agriculture universities represented the public sector. The private sector was represented by senior leaders from seed and agrochemical industries as well as by executives from agricultural credit organizations and leaders of agricultural processing, trade, and marketing organizations. Senior NGO leaders were also identified. Participation was completed with donor representatives, experts on agricultural development, and some “remarkable” people. It also was considered essential to include experts in politics, economics, society and culture, and ecology.

### Leadership

The project was managed from SASAR (Willem Janssen) and ARD (Eija Pehu and Riikka Rajalahti). An Indian coleader, Mr. Mruthyunjaya (National Director, National Agricultural Innovation Project) was invited. Kees van der Heijden<sup>1</sup> and his colleague, Ron Bradfield,<sup>2</sup> led and facilitated the workshops and the analytical work between the workshops.

A procedure around three workshops was designed. Figure 7.1 illustrates the complete planned set of workshops for India and NAIP.

**Figure 7.1 Plan for Organizing the Scenario Planning Process around Three Workshops**



Source: Authors.

<sup>1</sup> In the 1980s Kees Van der Heijden was in charge of Strategic Planning at Shell, where he contributed significantly to the development of scenario planning methodologies. In the 1990s, he held chairs in strategic management at the Universities of Strathclyde and Nijenrode. After retirement, he joined Templeton College at Oxford as an Associate Fellow.

<sup>2</sup> Ron Bradfield is a scenario consultant from Strathclyde University.

### *Initiation Workshop in the World Bank*

An initiation workshop (September 16, 2004) was organized in the World Bank to introduce the scenario planning concept and process and to receive wider buy-in among relevant staff. Participants included the scenario expert, and SARAR and ARD staff from headquarters and the India office. In addition, other resource persons familiar with scenario methodology were invited to provide presentations on Indian agriculture and R&D, natural resource management, and global trends. The full workshop program is shown in appendix A.

During the workshop, the participants were divided into three groups to identify and address the following issues: ownership of the process—who is the client; boundaries of the project; and further definition of the goal. The key findings/conclusions are summarized below.

#### 1. Ownership of the scenario process and results—the main client:

- It is important to sequence the work to enable further discussion with and buy-in by the key partners.
- Broad stakeholder consultation is needed at the beginning of the process. This can be carried out through organizing a workshop, or sequencing the process into specific parts defined by the stakeholders, including the private sector and farmer organizations.
- Institutional change is at the heart of ownership creation and this process. To facilitate institutional change, champions should be identified, for example, within the Ministries of Agriculture, Planning, Finance, and ICAR itself.
- The project will not have a final owner at this point. Ownership will be defined by the stakeholders.
- To achieve buy-in, the following points are important:
  - ~ Honest explanation that business as usual may not work
  - ~ Projecting a few examples of possible futures and the various changes/impacts on them
  - ~ Use of “dramatic” examples, such as impact of climate change

#### 2. Project boundaries:

- Setting the project boundaries is challenging. They should not be defined by the planned NAIP.
- Interviews with the stakeholders can reveal many boundaries. Asking them to come up with the initial list of issues is critical.
- Paying attention to a balance between diversity and relevance, and between control and normative views is essential. Over-simplification should be avoided.
- Global issues of the Indian situation are focused on. Then broad categories of uncertainty (demography, governance, economics,

environment, NRM, social and technological issues, social cohesion) are defined, broken down, discussed with client, and filtered.

- Issues to consider include public-private partnerships, grassroots enterprises, knowledge economy, major socioeconomic developments, priority policy areas, intellectual property rights issues, agricultural engineering, trade, environment, water. All of these are relevant, but the list must be kept manageable.
3. Further definition of the goal:
- A key question is: how can India's agricultural system(s) be positioned so that it/they can be successful under different conditions? Both policy issues and institutional design must be addressed (within 10–15 years) to be able to respond to the changes (allows farmers and agribusiness be part of this "design").
  - Where should/how should ICAR position itself in terms of which technologies to pursue?
  - It is essential to identify/define the plausible/necessary options: feed the people, sustain resources, and promote trade.

#### *Interviews with "Remarkable" People*

Before the first scenario-building workshop in India, the scenario team interviewed a number of "remarkable people" to explore the issues and concerns for future agricultural development in India. Eleven interviews were conducted with experts from different stakeholder groups, including the government, academia, farmers, and international agencies. Interviewees' vision and insights greatly aided the identification of driving forces and predetermined factors affecting agricultural development in India, as well as the next scenario-building step (workshop in New Delhi, July 5–7, 2005). The lists of interviewees, interviewees, and their main insights appear in appendix B. Chapter 5 provides the basic guidelines on how to carry out interviews with "remarkable people."

The key issues raised by the 11 interviewees clustered around 4 themes (box 7.1). The centrality of these themes was confirmed in discussions held in the initial planning workshop for the scenario exercise (April 21–22, 2005).

#### *Initial Scenario Planning Workshop*

A two-day introduction workshop in India (April 21–22, 2005) launched the process and obtained inputs from the participants, including ICAR experts, NAIP leadership, representatives of farmers' associations, World Bank SASAR staff, and the core scenario team. The full list of participants is shown in appendix C.

The workshop program followed the following steps:

Day 1:

- Introduction to scenario analysis
- Identification of drivers of change

**Box 7.1 Key Issues Raised by the “Remarkable” People**

The key question posed to the interviewees was: When thinking of the future of Indian agriculture, what keeps you awake at night?

Four main themes emerged from these interviews:

1. Will there be enough water for future generations? How can water be managed sustainably?
2. What will drive Indian agriculture in the future: the government or the market? What is the right balance?
3. How will rural communities change? How fast will rural urban migration proceed, and what is the future of small-scale farming?
4. How can rural stakeholders voice their views—women, farmers, private sector?

*Source: Authors.*

- Participants’ views on India’s agricultural research and future
- Presentation of feedback obtained through interviews with “remarkable people”
- Scenario analysis to organize and make sense of different trends and issues
- Discussion of how to use outcomes of a scenario exercise and boundary analysis (through working groups).

Day 2:

- NAIP in relation to scenario planning exercise
- Scenarios: Where are we now?
- Discussion (in working groups): Who owns the exercise? Who slows down the exercise? Who should be engaged? Who are the clients? How can we get more mileage out of it?
- Next steps and conclusions: Composition of the scenario team and timeframe of the exercise.

The main results of the workshop are recorded in box 7.2.

Lessons learned from the first India workshop were:

- Development of client ownership requires time and persistence. The main client, particularly the leadership, must be very well aware of the purpose and methodology to be applied.
- Sufficient capacity building for the client is required at the beginning of the process. Otherwise, misunderstandings may reduce effectiveness and usefulness of the process.
- It is very useful to carefully explain the scenario process as well as how it relates to the potential task, in this case, the design of NAIP. One approach is to compare the two parallel processes and show the links between them.
- As the methodology is new to most participants, written instructions for the various working groups will improve effectiveness of the sessions.

**Box 7.2 Main Results of Scenario Introduction and Launching Workshop in India**

The main issues raised by participants concerning India's agriculture were:

2. Agriculture is changing due to multiple forces, both internal (urban demand, equity, land size, water availability, energy price) and external (WTO, energy price). The current research system must transform to respond to these changes.
3. To become more effective, the extension system requires a serious overhaul.
4. A balance is required between a focus on food security-self-sufficiency-grain crops and a focus on market development-income.
5. The development of the future R&D agenda requires the inclusion of multiple stakeholders, including civil society, farmer organizations, and private sector.
6. Overall human development should be an important component of the future development of rural areas, because agriculture will have a diminishing role as a livelihood source.
7. Nonfarm income sources are growing in importance. The R&D system must embrace this challenge.
8. The diminishing natural resource base and land size entail serious challenges for agriculture and R&D, particularly in marginal areas.

Participants raised the following issues in relation to the scenario development process:

1. A number of national and international expert organizations should be consulted on these themes: energy; trade; development policies, economic, social, and environmental institutions; technology; and public administration.
2. The core team should consist of ICAR personnel.
3. It is important to identify champions from stakeholder groups.
4. Transparency is crucial and requires briefings to stakeholders, existence of a website, societal discussion, electronic conferencing, and e-consultation.
5. Measurement of success requires definition of appropriate targets.
6. A "business as usual" scenario might be useful to add.

*Source: Authors.*

- When setting the agenda, broad participation is essential to widen the perspective and gain additional insights. In this case study, besides ICAR staff, participants should include several farmer group and private sector representatives and World Bank staff.

*Scenario Analysis and Design Workshop*

A 2.5-day scenario analysis and design workshop (July 5–7, 2005) was organized to identify the key scenarios that would be developed. The following critical elements of each were to be described: driving forces, predetermined factors, and main uncertainties.

The workshop methodology included a number of brainstorming and "consensus-seeking" sessions—four groups or in a larger plenary—on the driving forces, development of story strands, clustering and prioritizing of the driving forces (using brainstorming and clustering of post-it notes), development of scenario snapshots and names, development of first-stage scenario designs, systems diagrams and story maps, scenario presentations, identification of strong and weak points and further research questions,

quantification, and next steps. The full scenario design program, participant list, and the four system diagrams and story maps are in appendix D.

## Summary of Scenario Analysis Workshop

The procedure focused on identifying the driving forces for development, and then on trying to cluster these driving forces into a few "major dimensions" that may turn out to be in one state or in another. In the workshop, three major dimensions on the future of Indian agriculture were identified as follows:

1. *Economic management*, which could be very strongly market based and liberalized but also could be more government controlled and centrally led
2. *Social fabric of the countryside and in the country* in general, which could be very strong, with rural people well organized in villages that are able to take care of their problems; or which could be weak, in which case the marginalization of the poor would be higher
3. The extent to which global warming would hit India and would increase production and resource management (water!) challenges.

Using the first two dimensions as the axes of a 2 x 2 matrix, 4 combinations emerged that can serve as perspectives on the future of Indian development. In one of the combinations, the third dimension of rapid global warming is introduced. All scenarios start from a historical development toward more market liberalization. In two scenarios this trend continues, while in two others, it is reversed. Two scenarios combine market liberalization with more cohesion and societal equity, while the others develop the themes of differences and personal resilience. Figure 7.2 illustrates the four dimensions of the scenarios.

Box 7.3 summarizes the main points in each of the four scenarios.

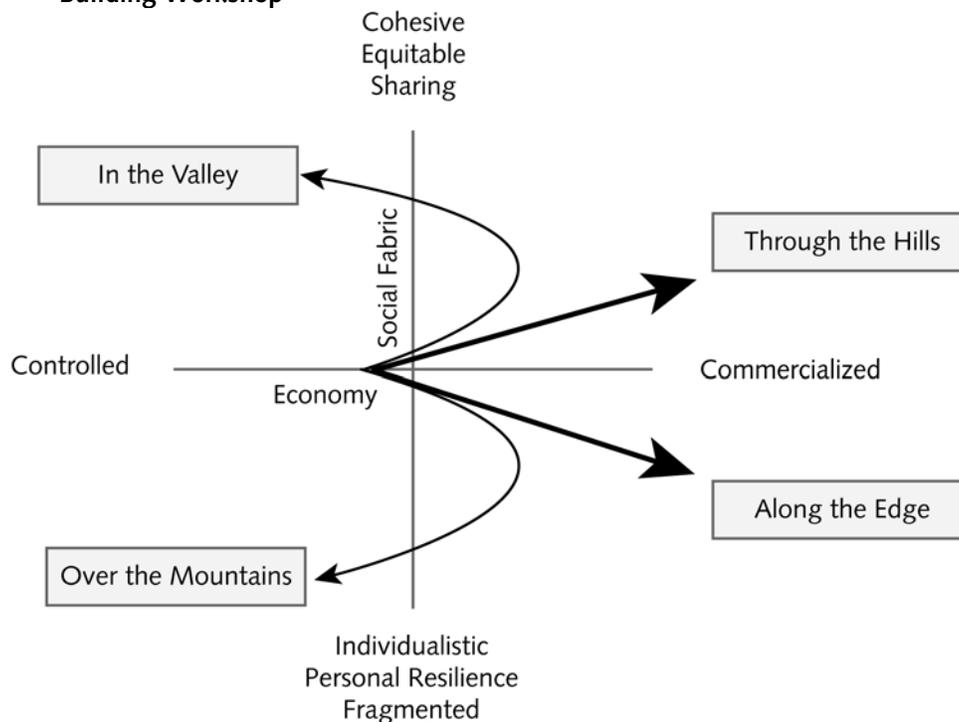
Once the scenarios were identified, subgroups worked on describing the "end state" in the year 2035 and in laying out the way in which the end state would be reached. The main challenge to the subgroups was to produce reinforcing causal loops that enable these scenarios to come about. At the end of the workshop, a writer's team was composed. This team had the responsibility to elaborate the four different scenarios and to start presenting them to different audiences, to validate their relevance and plausibility.

Lessons learned from the scenario building workshop:

- The scenario process proved to work very well within the Indian culture, which is accustomed to brainstorm and philosophize over a number of issues. The process truly engaged people to think outside their every-day domains and resulted in four very different but plausible scenarios. A number of other issues are key for this to happen, namely:
- Experienced scenario leaders are a key to a successful process.

- It is of paramount importance that the scenario-building exercise include participants with multidisciplinary skills and different views, in this case, people also outside the agricultural sector;
- It is also very important to include participants of the groups that process aims to influence, for example, government, private sector, ICAR, and farmer representatives.

**Figure 7.2 Initial Scenario Plots on Indian Agriculture Developed during Scenario Building Workshop**



Source: Authors.

### *Development of Full Scenario Stories and the Consultation Process (validation)*

Subsequent to the scenario-building workshop, the core writers' team—one writer from each scenario group—with the help of the scenario team director, elaborated the four scenarios into comprehensive detailed descriptions. This process included collecting supplemental macroeconomic data, describing the microeconomic situation, and bringing in a social fabric. Eventually, the storylines focused on two major issues: the degree of cohesion in Indian society and the organization of India's collective business. These issues were presented in a 2 x 2 matrix, resulting in 4 scenarios, of which 1 also addressed climate change implications. This last initially was in the Valleys scenario (box 7.1) but later, for internal consistency, was moved to the Over the Mountains scenario. The stories described the end state (2035) as well as a description on how we get there (2005–35).

Once the detailed scenario descriptions were finalized, the core team started a consultation process. The team designed a scenario presentation and a brief

**Box 7.3 Synopses of Initial Four Scenario Storylines**

Four storylines were developed in the July 5–7, 2005 scenario building workshop:

1. The scenario *In the Valley* starts from a strong desire for cohesion and equity in the economy that results in a societal preparedness to accept a significant degree of governmental control to achieve this. The price paid is a modest level of growth (around 3 percent pa) in which most people share to some degree. Productivity develops slowly. Global warming hits hard.
2. The scenario *Along the Edge* assumes that economic development becomes the number one priority, and significant inequity is allowed to exist as a powerful incentive to increase productivity. The scenario explores how far such a view could be taken before inequity becomes so intolerable that the “collective” must step in to moderate the worst manifestations of market power. This is a story of societal limits to development and growth.
3. In the scenario *Over the Mountains*, a “free for all” society runs into serious problems to such an extent that people call for a return to strong governmental control. The potential positive effects of such a strong government are explored. After a period of very serious difficulties, the center takes hold of the situation and turns things around.
4. In the scenario *Through the Hills*, concerns for cohesion and equity also are strong, but they are balanced by the desire to create incentives for productivity improvement through market forces. The two objectives often are not in harmony, particularly when the system experiences unexpected external shocks or when choices have to be made. In this scenario, cohesion wins out in such circumstances, but in the long run a powerful base for a successful market economy is created.

Source: Authors.

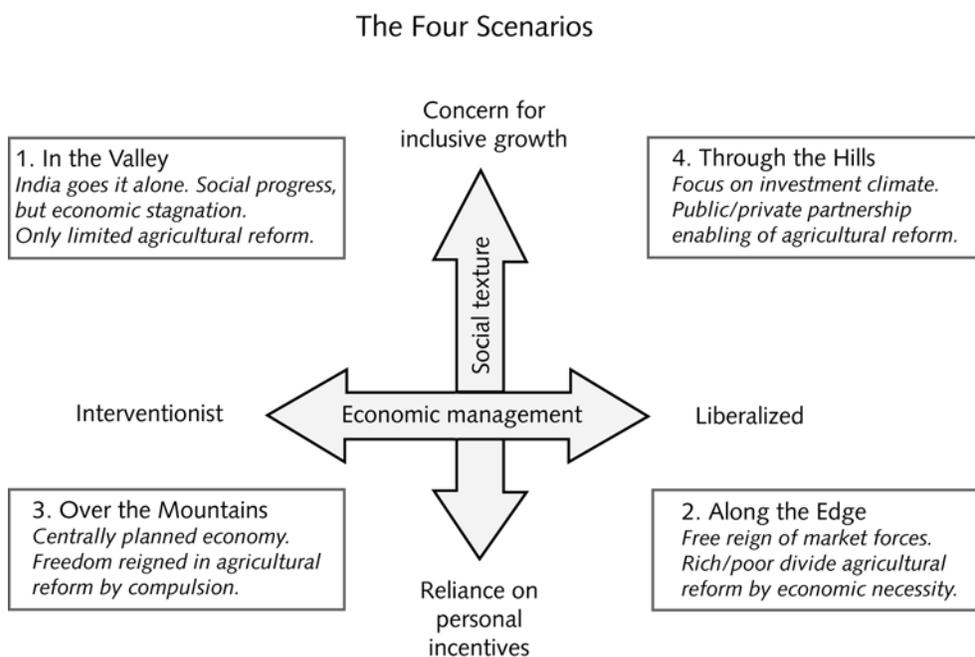
description of the process. These plus the four storylines were presented to political scientists, economists, government, business, and media people, farmers, and technologists to validate the scenarios (validation). The limited scope of the India scenario project did not allow use of the more complicated iterative process (chapter 3) and therefore, may have bypassed some of its potential value.

This consultation process, including the writing of the scenarios and development of a presentation, continued from July 2005 until March 2006, and was carried out in stages. Members of the writers’ team were first involved in discussions of the first draft scenarios in their own organizations. The feedback resulted in improvements in the following areas: more focused,<sup>3</sup> clearer distinctions between the scenarios, and less wordy. As a next step in Delhi and Bombay in November 2005, the writers’ team presented the scenarios to a wider audience of various groups and individuals who could be expected to have important insights concerning the future of agriculture in India. The team started from the material as developed during the July 2005 workshop and written up by the writers’ team, which had been turned into an initial presentation. The team prepared

<sup>3</sup> Two main changes were the (1) increased focus on the link between performance of the overall economy and operational scale in agriculture and (2) move of climate change and other crises from Valley to Mountains.

a briefing note (appendix G), indicating the state of play at that time. The new draft has been circulating since giving rise to further debate and comments. It was decided not to finalize for the time being to allow the very productive ongoing “strategic conversation” to continue a bit longer. The results of the consultation appear in appendix G. The final scenario plots developed by the writers’ team are shown in figure 7.3.

**Figure 7.3 Final Scenario Plots Developed during Scenario Design and Consultation**



Source: Authors.

### *Implications Workshop Replaced by Two Scenario Analysis Results Workshops*

Following scenario validation, the next step was to move the discussion toward the implications of the scenarios. Rather than implement them immediately after finalizing the scenario storylines, the implications work was decided to take place under ICAR/NAIP responsibility once NAIP is in effect.

Depending on the type of implications, certain elements in the scenario descriptions may be refined or certain possible actions may be submitted to further scrutiny. Low-risk strategies will be defined, and risk management approaches will be identified for the higher risk strategies. The material coming out of the scenario analysis then will be made publicly available and brought to the attention of the research groups that want to submit proposals for the large competitive grants that will be made available under NAIP. Implications include technology. Therefore, an implications workshop will address the need for more technological content of the scenarios. But, in addition, the future implications discussion will cover a much wider

agricultural innovation arena. This workshop will rely partly on the same participants but will draw more heavily on the client organization, ICAR.

### *Scenario Analysis Results Workshops in India and World Bank Headquarters*

This first scenario analysis workshop in India (May 2006) was organized to discuss the results of the scenario analysis on the future of Indian agriculture. The scenario “stories” were well received, and the subsequent discussion evolved around the following findings:

- Meaning of “innovation”
- Importance of considering nontechnological issues
- Preferred world view and how ICAR could contribute to it
- Series of suggestions received to strengthen the scenarios, one of most important of which was to highlight the role of technology
- Agreement that the information in the scenarios can be continuously enriched.

The discussion led to the following conclusions:

- The technological pathways for Indian agriculture may develop in very different directions, and the ICAR-led innovation system is a taker as well as a maker of those directions.
- To arrive at the “more inclusive but still high-growth” scenario, there is major need to work on institutional arrangements (farmer organizations, sector boards, cooperatives) and to fully explore the potential of nonfarm rural employment. The latter can be pursued by encouraging agroprocessing, putting in place an agricultural service sector, and creating nonagricultural-based employment. These changes would have implications for NAIP activities. They not only would be technology driven but also must incorporate social organization and institutional innovation.
- NAIP does not have to promote one particular type of development pathway. However, the large consortia financed by NAIP may develop a view on the future of their subject matter within Indian agriculture.

Additional discussions with ICAR revealed three possible applications for the scenarios:

1. At NAIP launch, scenarios may be used to initiate discussion on the future of agriculture and the implied role for the innovation system.
2. Scenarios may be used further in the visioning activities of the project component on “Basic and strategic research in the frontier areas of agricultural science.”
3. Scenarios may be made available as background material for the development of the research consortia proposals (financed by NAIP).

The second scenario analysis workshop in Washington, D.C. (June 2006) was organized to conclude the involvement of the World Bank in the scenario

development process. One of the main issues was to agree on the way forward under the leadership of ICAR/NAIP.

*Additional Workshop*

In case there are many open questions after the previous implications-results analysis workshops, an additional workshop may be required in which new scenarios are presented and analyzed. The scenario analysis then would become iterative, and new insights would be added (figure 3.2 in chapter 3).

The core team would conclude the scenario analysis by elaborating the outcomes of the process. These results could then be used in other processes such as the design of NAIP, or strategic planning of ICAR or other agricultural research organizations.

## 8. Conclusions and Recommendations

Scenario analysis contributed to the design of NAIP in the following ways:

1. The scenario process helped ICAR to think about the issues beyond its own technical competence and strengthened its realization that the world that it is serving requires different approaches from the past. This awareness was sharpened by a series of stakeholder consultation meetings.
2. The scenario process helped the project design team in define the scope of project component 1, that is, NAIP's institutional development. The scenario analysis helped to identify the importance of enhanced capacity for dialogue and interaction with other stakeholders. Flexibility, rather than pursuing one reform strategy, was considered a key trait for a successful organization in a rapidly changing world.
3. The scenarios can inspire competitive calls for research consortia. A candidate consortium needs to provide clarity on the development pathway of the subsector on which it working to extract and analyze the right technological, researchable issues. The scenarios also may facilitate a dialogue between public and private sectors and to produce inputs and insights for the next Country Assistance Strategy (CAS).
4. The impact of the scenario analysis tends to come more in implicit than in explicit ways. Kees van der Heijden, the scenario team leader stated, "Scenario analysis strengthens the ability for strategic conversation. That is very important where consensus among people with very different perspectives on the future needs to be achieved!"

Additional recommendations were:

5. Two essential issues for adequate attention are sufficient time and resources to create client ownership and the need to compose a multidisciplinary scenario team and participant group.
6. The scenario analysis can be applied within certain boundaries, for example, a country CAS, a sector strategy, project preparation, or regional plans for very small countries. However, it is far more challenging to apply the analysis in very large initiatives, for example, overall global issues.
7. Due to significant time requirements, particularly during the consultation process (validation), it is recommended that the scenario process is implemented well ahead of project preparation.
8. To avoid delays in the progress of the scenario process, attention needs to be paid to the following issues:
  - Need for a full-time manager for the overall process

- Management and time requirements associated with the operation of a 5-person part-time writers' team, rather than 1 full-time scenario editor/writer
  - Need for significant research capability and allocation of adequate resources
  - Potential reluctance to farm out research work to third-party research institutes
  - Potential problems operating a virtual team over long distances and managing political sensitivities.
9. Keeping in mind these lessons, the process adopted is effective and well suited for policy development work. It has proven its value, particularly for stimulating and increasing the value of the wide stakeholder strategic conversation.

## Appendix A. Initiation Workshop Program, September 14, 2004

Time	Topic	Speaker
8.30–8.45	Welcome: Why are we interested in scenario planning for Indian agriculture	Sushma Ganguly (Sector Manager) and Eija Pehu (Advisor), ARD
8.45–9.15	Introduction to scenario planning	Kees van der Heijden (Scenario Specialist), Templeton College, Oxford University
9.15–9.30	Discussion	
9.30–10.00	Main uncertainties in the future of Indian agriculture	Dina Umali-Deininger, Lead Economist, SAR
10.00–10.15	Discussion	
10.15–10.30	Coffee	
10.30–10.50	Quantitative scenarios to guide investment decisions	Mark Rosegrant, (Sr. Research Fellow) IFPRI
10.50–11.10	Scenario planning to identify challenges and opportunities in climate management	Robert Watson, Chief Scientist, ESSD
11.10–11.30	Discussion	
11.30–12.00	Designing and implementing scenario planning for Indian agriculture	Kees van der Heijden and Willem Janssen, Senior Agricultural Specialist, SAR
12.00–13.00	Food for work (working lunch) A: Ownership: Who owns the project? Why does the owner want the project? B: Boundaries: Who should participate? What are the limits of the project? C: Impacts: Who will be affected? What will be transformed?	Three working groups
13.00–13.30	Working group reports	
13.30–14.00	Closing comments	Connie Bernard, Director, SASAR

## **Appendix B. Interviews with “Remarkable” People**

The interview with the “remarkable” people was held in April 18–20, 2005 in New Delhi, India and involved the following people:

### **Interviewers:**

Kees van der Heijden, Associate Fellow, Templeton College,  
Scenario Team Leader  
Eija Pehu, Adviser, World Bank  
Riikka Rajalahti, Agricultural Specialist, World Bank

### **Interviewees:**

*(in the order that interviews were carried out)*

Deepak Ahluwalia, Senior Economist, World Bank  
Mruthyunjaya, Director of NATP, ICAR  
Martien van Nieuwkoop, Lead Agricultural Specialist, World Bank  
Vibha Dhawan, Tata Energy Resources Institute (TERI)  
Raju Barwale, MAHICO company  
John Briscoe, Senior Water Adviser, World Bank  
P. Chengal Reddi, Farmer Federation  
Mangala Rai, Director General, ICAR  
Rada Singh, Secretary of Agriculture

### **Main Findings of the Interviews:**

The main question posed to the interviewees was “What keeps you awake at night?” The key issues evolved around the following themes:

- Water, water, water—“water wars”
- Markets
- WTO—are we competitive?
- Monsoon
- Natural disasters

The section below provides a list of the main issues identified during the conversations.

#### *Geopolitics:*

- Competition/collaboration between India and China in the world scene
- Position of India in the world food market, WTO, both “offensive and defensive” positioning

*International Competitiveness:*

- Farm productivity and cost of production internationally
- Competitiveness of labor-intensive production
- Agricultural sectors with comparative advantage for India (for example, medicinal plants, fruits)
- Potential in seed business (business in Africa?)
- External pressures for liberalization
- Import vs. self-sufficiency—dependence on foreign food sources

*Megatrends Affecting Agriculture:*

- Urbanization (employment? linkages? rural poverty to urban poverty?)
- Exit from agriculture—who exits, how fast?
- Diet revolution (meat, milk, fish, eggs)
- Growth of the economy vs. disparities (North-South, rural-urban, rich-poor)
- Growth of the population
- Degree of under-nourishment of the population
- Nutritional imbalances in the diet
- India is a big place—great variation between and within states

*Players:*

- Role of the private sector
- Space for the private sector
- Public/private partnerships (who, how, in what areas?)
- Trade associations
- New role for the government (facilitation, enabling environment, regulation)
- Role of the civil society sector (farmer organizations, NGOs)
- How to facilitate interaction?

*Agriculture-Based Industry:*

- Productivity
- Yield growth stagnated, need intensification
- Contribution of new technology
- Fragmentation in farming
- Size of holdings
- Economies of scale

## *Agriculture and Rural Development*

- Share of resource poor farmers, expression of demand
- Future of farmer organizations
- Balance between food security and diversification
- Diversification
- Diversification of production (crops, livestock, aquaculture)
- Growth of processed foods
- Supply chain (from farm to fork)
- Length of the supply chain, distance farmer-consumer
- Development of the supply chain (processing, packaging, quality, certification, market intelligence)

### *Agricultural Inputs:*

- Arable land
- “Breeds and Seeds”
- Research and new technologies (basic/strategic/applied balance)
- Improvements in extension (“the last mile”: at district-and-below levels, new ways–ICT, private extension, radio, CDs)
- Spreading local solutions across the country
- Credit arrangements for small holdings/microfinance
- Managing farmer’s risks (insurance schemes)
- Overcoming government line ministry compartmentalization
- Water

### *Water:*

- Surface water management and policies
- Ground-water extraction
- Switch to less water-intensive crops
- Water use efficiency (policies, technologies)
- Future dependence on import of water-intensive crops (rice)
- Allocation of water rights
- Development of nation-wide economic water pricing
- Effect of global climate change (glacier depletion, variability)

### *Government’s Role:*

- Government mindset
- Emphasis on food self-sufficiency
- Future of “government will take care” mindset

- “Poor farmer needs to be protected” mindset
- Strength of political leadership to pursue change
- Privatization
- Deregulation and privatization
- Efficiency of the government sector
- Competence and skill set of the public servant
- HR development
- Turnover of political cadre
- Fragmentation in government
- Management of incentives
- Future of farm subsidies (for example, power)
- Future of support prices
- Future of protectionism and import duties
- How about OECD country subsidies?
- Delivery and efficiency of government services
- Relevance of Government R&D agenda in changing world
- Attention to marketing (including quality management, grading, value chain)
- Attention to extension
- Fiscal limits and availability of government money
- Responsibilities national/state government

*Voice of the Stakeholders:*

- Voice of the farmer
- Farmer organization (fragmentation, politicizing)
- Voice of the private sector
- Unified voice rather than noise
- IPR arrangements
- Voice of research
- Research findings to support policy-making

## Appendix C. Scenario Planning Workshop, April 21–22, 2005

Program for the scenario planning workshop in Delhi:

Time	Item	Speaker /discussion leader
Chairman: Dr. Mangala Rai, Secretary, DARE and DG, ICAR		
<b>21 April 2005</b>		
11.30–12.00	Welcome Opening remarks	Dr. Mruthyunjaya Dr. Mangala Rai Dr. Eija Pehu
12.00–12.15	Coffee/tea	
12.15–12.45	Introduction to scenario analysis Drivers of change	Dr. Willem Janssen Dr. D. Jha
12.45–13.00	Silence. Individual thinking through to note down future issues of Indian agriculture	Prof. Kees van der Heijden
13.00–14.00	Lunch	
14.00–14.30	Presentation of feedback obtained through interviews	Dr. Eija Pehu
14.30–15.30	Enrichment of feedback with the results of thinking through	Prof. Kees van der Heijden
15.30–16.00	Scenario analysis to organize and make sense of different trends and issues	Prof. Kees van der Heijden
16.00–16.15	Introduction to working groups: How to make use of the outcomes of a scenario exercise and boundary analysis	Dr. Riikka Rajalahti Dr. P.S. Sidhu
16.15–16.30	Coffee/tea	
16.30–17.15	Working groups meet	Dr. Mruthyunjaya Dr. P.S. Sidhu
17.15–18.00	Plenary discussion	Dr. Mruthyunjaya Dr. P.S. Sidhu
Chairman: Dr. M.V. Rao, Chairman, SAP (Coastal), NATP		
<b>22 April 2005</b>		
9.30–9.45	Summary of day 1	Dr. Mruthyunjaya Dr. Willem Janssen
9.45–10.00	Introduction working groups Round 2. Who owns the exercise? Who steers the exercise? Who should be engaged? Who are the "Clients"? How can we get more mileage out it?	Dr. P.S. Sidhu

<b>Time</b>	<b>Item</b>	<b>Speaker /discussion leader</b>
10.00–11.15	Working groups meeting	
11.15–11.30	Coffee/tea	
11.30–12.15	Results in plenary	Dr. M.V. Rao Dr. Mruthyunjaya
12.15–13.00	Next steps and conclusions Composition of scenario team, timeframe	Dr. Mruthyunjaya Dr. Willem Janssen
13.00–14.00	Lunch	
14.00–1500	Interface meeting of World Bank mission members with NATP Core Team of ICAR	

## Appendix D. Scenario Analysis and Design Workshop, July 5–7, 2005

Three-day program:

Day 1	Day 2	Day 3
Introduction of participants	Progress review	Progress review
Introduction/purpose	Update story strands	Update story strands
Discussion of process	<i>Finish rounds of topical input and brainstorming DFs</i>	<i>Systems diagrams</i>
<i>Team vision</i>	First clustering and prioritizing	<i>Second round story telling</i>
Brainstorming driving forces (DFs)	Horizon year matrix design	<i>Development of story maps</i>
Story strands	<i>Development of scenario snapshots</i>	Scenario presentations
Feedback on interviews/earlier work (with "remarkable" people)	<i>Scenario naming</i>	Strong/weak points
<i>Brainstorming DFs</i>	Introduction to scenario stories	Research questions
<i>After dinner: Topical input and brainstorming DF's</i>	<i>Description of current reality</i>	Allocation research work
	<i>First stage scenario design</i>	Quantification
	Systems analysis	Further steps
	<i>After dinner: Systems diagrams</i>	Review and conclusion of the workshop

## Participant List:

### *World Bank Participants:*

Willem Janssen, Senior Agricultural Specialist, SASAR  
Paul Sidhu, Senior Agricultural Specialist, SASAR, India  
Martien Van Nieuwkoop, Lead Rural Development Specialist, SASAR, India  
Deepak Ahluwalia, Senior Economist, SASAR, India  
Deepak Mishra, Senior Economist, SASAR  
Eija Pehu, Advisor, ARD  
Ron Bradfield, Strathclyde University  
Kees van der Heijden, Templeton College  
Riikka Rajalahti, Agricultural Specialist, ARD

### *Delhi Participants:*

Vijay Sardana, Executive Director, Centre for International Trade in  
Agriculture and Agro-based Industries, New Delhi  
D. Jha, New Delhi  
Suresh Pal, Principal Scientist, National Centre for Agricultural Economics  
and Policy Research, New Delhi  
I.P. Abrol, Centre for Advancement of Sustainable Agriculture, New Delhi  
Sachin Chaturvedi, Research Fellow, Research and Information System of  
Developing Countries, New Delhi  
Rajeswari Raina, National Institute of Science, Technology and Development  
Studies (NISTADS), New Delhi  
Mrithyunjaya, ICAR, New Delhi  
Bandhopadhyay, New Delhi

### *Out of Delhi Participants:*

R.S. Deshpande, Professor, Institute of Socioeconomic Change, Bangalore  
G. Chandrashekar, Hindu Business Line, Mumbai  
J.K. Jena, National Fellow, Central Institute of Freshwater Aquaculture,  
Bhubaneswar  
Alka Goel, National Fellow, College of Home Science, Uttaranchal  
B.R. Yadav, National Fellow, Dairy Cattle Breeding Division, National Dairy  
Institute, Haryana  
Rama Rao, Principal Scientist, National Academy of Agricultural Research,  
Hyderabad  
Uma Swaminathan, Vice-President, Self Employment Women's Association,  
Ahmedabad  
Nisha Shah, Vice- President, Self Employment Women's Association,  
Ahmedabad

## **Scenario-Building Drivers Identified during the Brainstorming and Grouped in Themes**

The workshop group listened to and discussed a number of introductions on relevant topics. Each introduction was followed by a brainstorming session during which participants identified relevant driving forces that needed to be taken into account. Each driver was written on a post-it note and displayed

on the wall. A large number of post-its were collected during this process. Following the last presentation and brainstorming, participants moved the post-its around to create a more limited number of clusters each covering a subsection of the ideas generated. This consolidation produced the following themes (each shown with its underpinning post-its as they were generated and allocated):

*Governance/Policies*

Political system  
Political system  
Accountability  
Decentralization  
Institutional efficiency  
Adaptability of the public system  
System inertia  
Coalition policies  
New agriculture policy  
Quality of social services  
Better service delivery  
Government of India orientation, interventionist/facilitation  
Degree of liberalization  
Public/private partnership  
Global commitments  
International commitments  
External subsidies  
Public investment, financial, human capital, technology  
Public investment levels  
Slowing public investment level  
Infrastructure development  
Fiscal stress  
Political influence on self-sufficiency  
Food management  
Stakeholder participation  
Governance in research and delivery  
Public opinion on agriculture

*Legal Environment*

Labor laws  
Regulatory mechanism  
Customs/tariffs act  
Revisiting laws impacting agriculture  
Geographical indications  
Law, essential commodities  
Local laws, APMC  
SSI reservation, marketability of produce  
Forward contract regulation act  
Biodiversity laws  
Ownership of genetic resources

IPR laws

*Social Issues*

Gender inequalities

Increased role of women

Gender roles

Service orientation

Gender roles

Social conflicts

Change in value system

Religion

Religion

Religion, culture, values, and ethics in society

Caste relations and power structure

Population growth

Life expectancy

Insecurity increasing

Health, HIV

Marginalization of farmers

Change in value systems

Flexibility in rural employment markets

Migration

Migration increasing

Family structure

Extended family to nuclear family system

Quality of social services

Animal welfare concerns

*Macroeconomy*

Globalization

International trade

Regional disparity

Dominance of regional issues over national issues

Regional cooperation India/China

Energize and create new institutions

Urbanization

Infrastructure

Employment growth in value addition

Rural sector + 20 percent of agricultural GDP

Unemployment

Rural nonfarm employment

Income growth

Income growth relatively more important than population growth

Income distribution

Private sector investment in rural areas

The 3 I's: input/information/investment

Employment growth in service sector up by 10 percent of jobs

Growth of Indian economy relative to China

Credit availability

Potential high-growth-allied agriculture (livestock, fisheries, morti, flori, seri)

*Markets*

Commercialization of agriculture

Lack of markets

Exchange opportunities, multifunctional

Urbanization

Global trading opportunities

Global competition and collaboration

Domestic market reforms

Infrastructure development

Strengthen local market, *swadesi*

Market structure development

Quality standards

Creation of brands to increase value-added for farmers

Preferences of consumers

Shifting dietary patterns

Changing demand for food

Potential high-value livestock products

Private sector development

Private sector partnership, PPP

Role of multinational companies

Supermarkets

“Supermarketization”

Long-term values vs. “supermarketism”

Cost efficiency

Contract farming

Cost of energy

Price of energy

Capital markets

Market credit

Risk management

Risk management and insurance

*Knowledge and Information*

Alignment of priority setting for public expenditures with...drivers

Direction of S&T

Integrated solutions to multiple problems

Revamped R&D in agriculture

Innovation, incentives/recognition/flexibility

Knowledge/skill-based agriculture

Knowledge society

Life-long education

Knowledge systems

Education

Effect of biotech on productivity

Capacity to partnership building in public R&D system

Regional and global partnerships  
More empowerment and knowledge denial  
Revolutions in biological and information sciences  
Increased knowledge and skills in agriculture  
Mechanization innovation  
Science and technology lagging or leading?  
Advances in technology  
Long term vs. short-term thinking  
Decentralization of R&D autonomy at state level  
Technology transfer, nonagriculture to agriculture  
Technology adoption  
Uncoordinated efforts  
Biotechnology  
Technological development infrastructure  
Commoditization of knowledge  
New communication technology  
Access to information  
Lack of information  
Cheap access to communications  
Skilled manpower in R&D and extension  
Faster communications system

*Farmers*

Agricultural inputs  
Multiple employments to ensure livelihood  
Ability of farmers to invest  
Allocation agriculture to nonagriculture  
Farmer conservatism  
Migration of farmer children  
Farmer leadership building  
Entrepreneurship development  
Voice of farmers  
Farmer's organization  
Product specialization  
Entry barriers

*Natural Resources*

Natural resource base decreasing  
Pollution  
Environmental crisis  
Intersectional competition for resources  
Shrinking/deterioration of natural resources  
Pressure for sustainability  
Alternative land use  
Shifting land use  
Renewable sources of energy  
Energy availability  
Rationalization of land relations

Inheritance system and fragmentation of land

Land rights

Landholdings down

Competition for land and water, need for increased productivity

Water quality

Water availability

Water management, productivity, efficiency

Soil quality

Biodiversity

Agricultural biodiversity

Animal husbandry

### *Climate Change*

Pollution

Climate change

Extreme weather patterns

Natural disasters (including droughts)

Ecological degradation

## **Scenario Figures: Four Story Maps and Systems Diagrams**

Having ranked these themes in terms of their importance to the future of Indian agriculture and their level of predictability, two main dimensions emerged around which the scenario matrix was constructed (see figure 7.3). The group split up in 4 subgroups, each one developing one of the scenarios in more detail. Using the full list of driving forces, the teams identified events that would play a role in the scenario story line and having written these on a post-it note located these in a “story map,” which connects events causally over time. Having produced a first-cut story map, the teams identified the main story strands of their emerging scenario and tried to understand the underlying systemic forces giving rise to this chain of events. They expressed these in a system diagram that became the underlying story logic. The groups iterated a couple of times between story map and systems diagram in this way until they were satisfied that they could logically argue the story line as composed. The following story maps and systems diagrams that were constructed are presented in figures AD.1 through AD.8.



Figure AD.3 Along the Edge Story Map

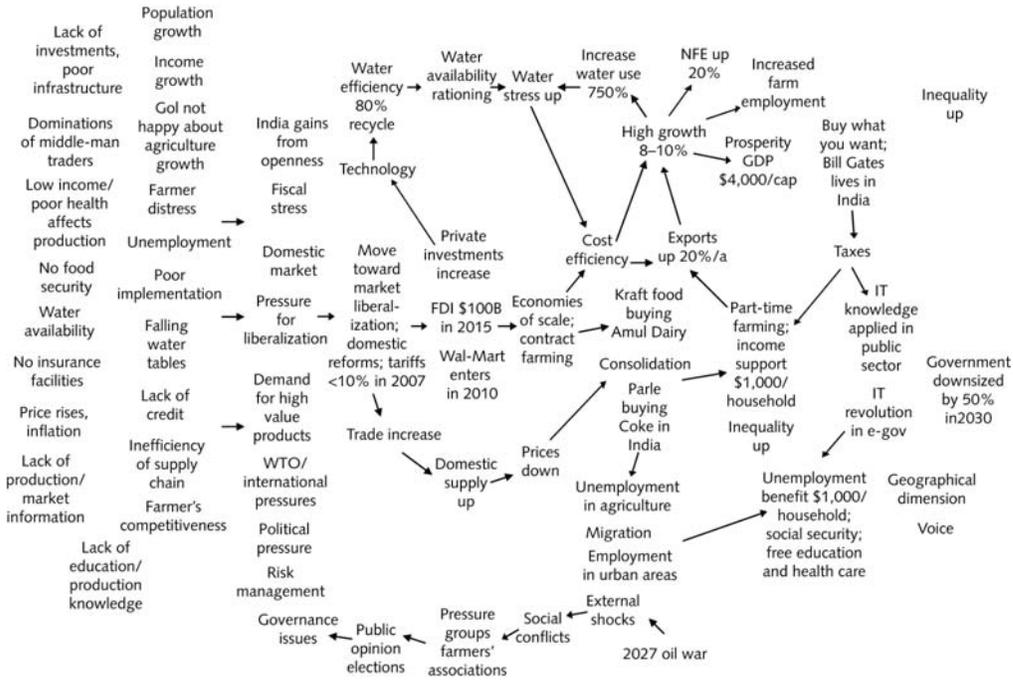


Figure AD.4 Along the Edge Systems Diagram

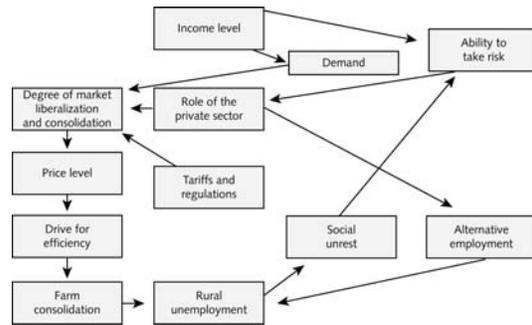


Figure AD.5 Over the Mountains Story Map

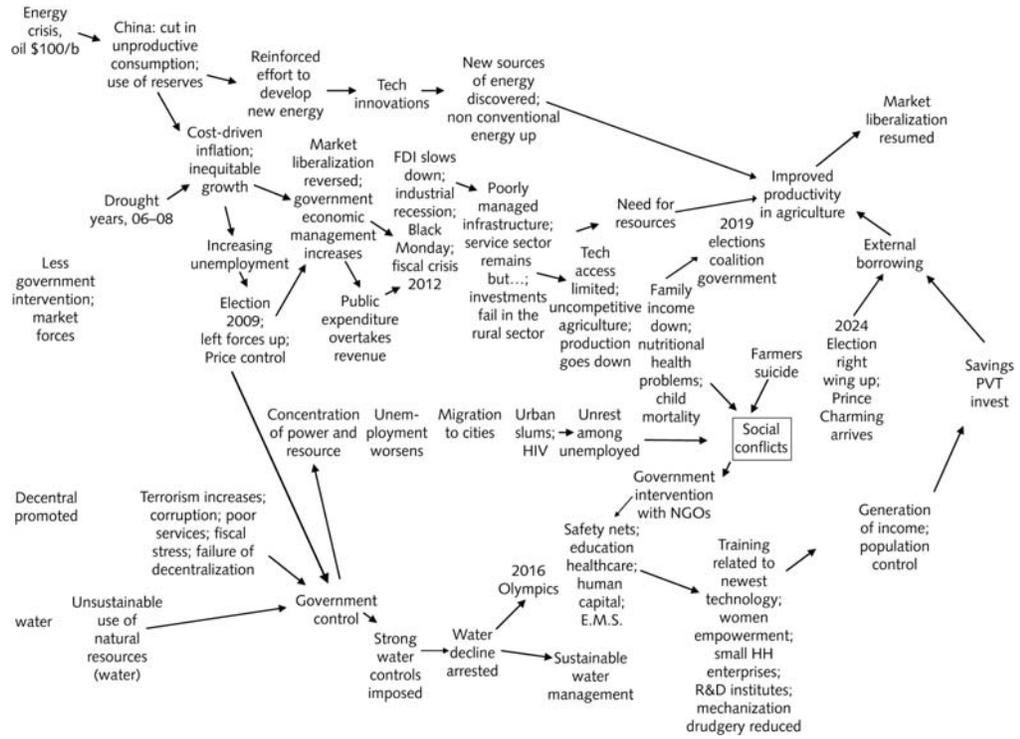


Figure AD.6 Over the Mountains System Diagram

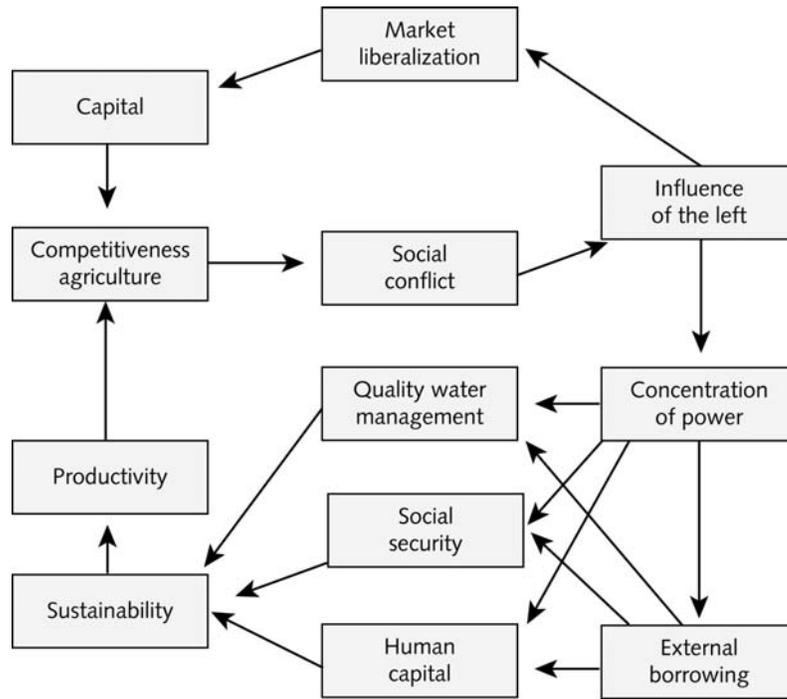


Figure AD.7 Through the Hills Story Map

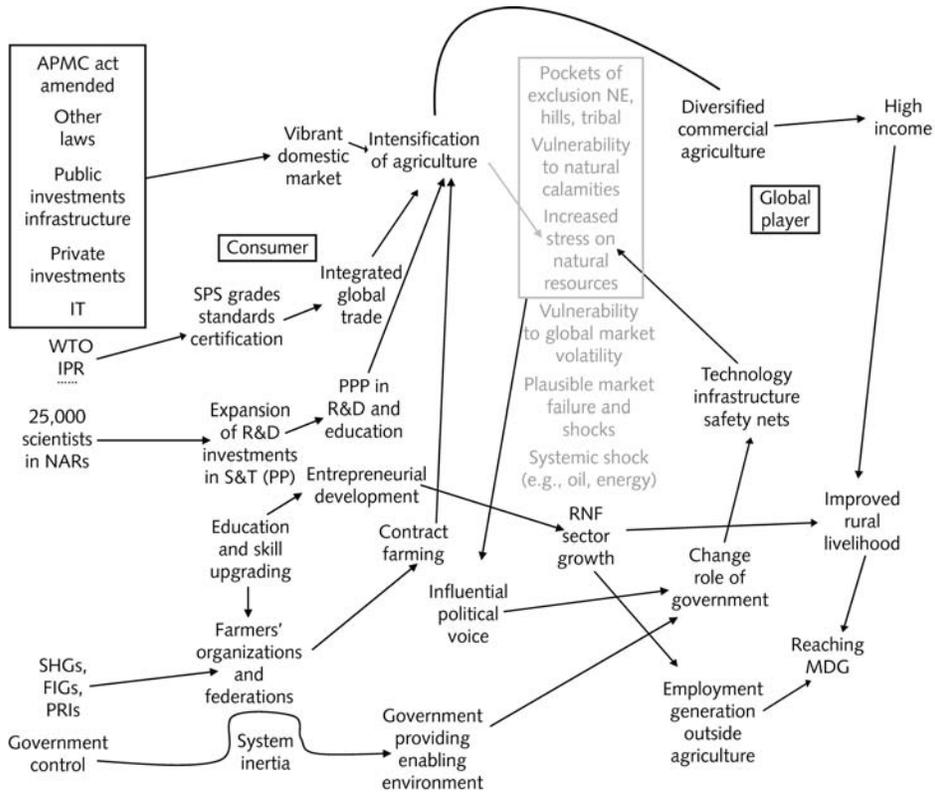
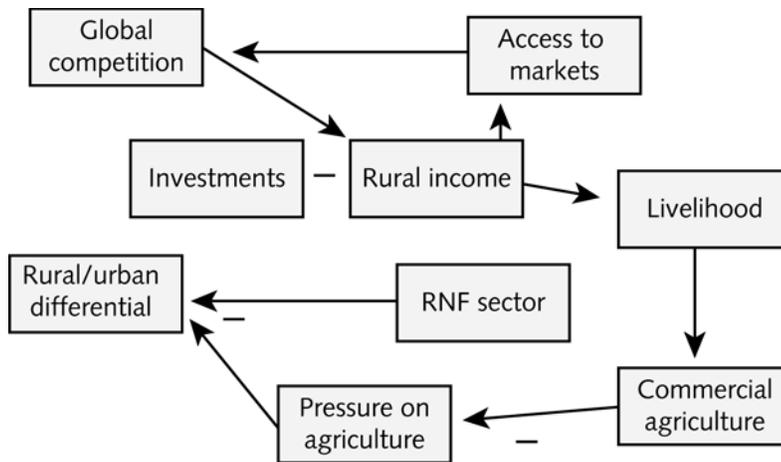


Figure AD.8 Through the Hills System Diagram



## Appendix E. Four Scenario Stories

In this appendix, the four scenario storylines (as of May 10, 2006) are described in detail.

### *Future of Agriculture in India: A Scenario Project*

ICAR are in the process of developing a new innovation project called the National Agricultural Innovation Project (NAIP). As part of policy development for this project, a group of experts was brought together to explore, by means of scenario planning, the future of agriculture in India.

Scenario planning is an approach to policy development that aims to take into account the intrinsic uncertainty of the future. This is done by considering the merits and demerits of options in more than one account of the future called scenarios. The current project looks at 4 different futures/scenarios. The scenarios as such do not prescribe policies, but depict the environments in which the policies may play out and against which these policies can be considered and tested. They are not predictions, but rather are plausible alternatives of what might develop.

Any policy study implicitly assumes that there is something about the future that can be anticipated; otherwise, one is wasting one's time. Therefore, an essential part of any scenario project is the consideration of what is seen as "predetermined" in the situation. Predetermined elements are events or developments that can be predicted because they are already "in the pipeline." Examples in the Indian agricultural context include:

- High economic growth (combination of economic policies and demographic windfall)
- Urbanization
- Increased open trade environment
- Water scarcity.

In scenario planning, the process of scenario building alternates with consideration of what is predetermined or uncertain, the two phases influencing each other as the scenario building project proceeds. The choice of predetermined elements and key uncertainties structures the scenarios, while the scenarios develop insights on what is predetermined and what is fundamentally uncertain.

This report describes the outcome of such a process focused on agriculture in India. We first discuss a few critical predetermined elements that have shaped the scenario development, followed by a discussion of the critical uncertainties, an overview of the scenarios, and a development of the scenarios in some detail. Finally, we compare the scenarios.

We emphasize that *the purpose of this study and of this report* is not to make recommendations but to *explore the future environment in which policies will play out*. The "client" of the exercise is the agricultural innovation community in

India. The scenario process addresses rural innovation in a broad context, involving technological, but also societal, economic, and political aspects. In developing policies and plans, the Innovation planners in India need to consider the shape that agriculture will take in the future. The context of this study is the whole agricultural policy arena. It considers the political/economic and social context in which Indian agriculture will develop.

Agriculture's development is intrinsically uncertain, depending on how a number of key driving forces will play out. The agricultural innovation community has little or no control over these contextual forces. Personal preferences one way or the other may exist, but there are no "levers" to seriously affect the context within which agriculture will develop. Therefore, *the scenarios are not intended to be normative*. They are put forward simply as four different, but plausible, ways in which the political/social context of agriculture in India may develop and provide a common background against which agricultural innovation policies can be tested. The scenarios can be interpreted as alternative stories about the country as a whole on a macro scale or as descriptions of different ways in which parts of the country could develop in parallel. In this way they provide useful inputs into the strategic conversation and help in overcoming compartmentalization and the danger of looking at things individually rather than as a portfolio.

Driving forces considered in this analysis include national and international market conditions, the low level of overall productivity in the current highly fragmented agricultural industry; the regulatory framework; the growing inequality in the booming Indian economy, especially between stagnating rural incomes and the rapidly developing service economy; and the ever-increasing support required from government to keep small farmers in business (and the problems of targeting this effectively).

### *Predetermined Elements*

On the basis of this analysis, the scenario team concluded that, if national economic growth is to continue, significant change is in store for Indian agriculture. Future high levels of growth of the economy will be intrinsically coupled with fundamental reform of the agricultural sector. Growth is ever more in danger of being derailed by India's poorest inhabitants (25 percent of the population lives below the poverty line),<sup>1</sup> who are increasingly bitter at missing out on the wealth being created following a decade and a half of economic growth. Driven by this increasing wealth gap, India's Maoists are represented in a quarter of the country's districts. Policy-makers worry about an electoral backlash against liberalization.<sup>2</sup> In his address to the January 2006 World Economic Forum in Davos, Finance Minister Chidambaram suggested that "economic reforms will not be accepted unless basic minimum needs are addressed."

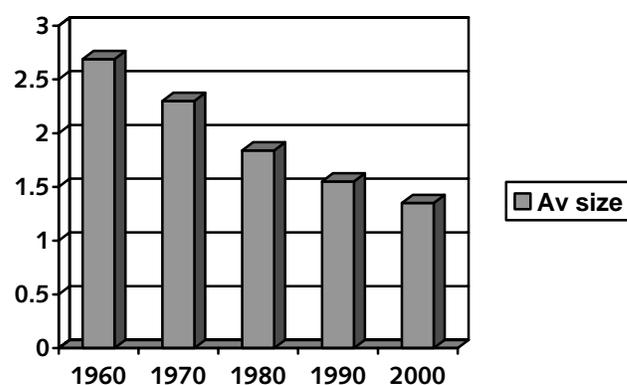
Of the statistically poor, 70 percent live in rural areas (the percentage of the population below the poverty line is approximately the same in rural and in urban areas).<sup>3</sup> Rural incomes depend on many factors, but agricultural income is the main driver. Government is pursuing policies to increase agricultural income. The main targets and priorities center on irrigation—

increasing agricultural output by extending the surface of irrigated land—and bringing in new technologies (Finance Minister Chidambaram in Davos).

However, the scenario team concluded that, as important as these policies are, irrigation and technology alone will not achieve the “order of magnitude” increase in agricultural productivity and income per capita that the economy needs. Other contributing factors will include a reduction in transaction costs (including development of markets/development centers and integrated supply systems), diversification toward higher value products in a more prosperous society, and remittances. This quest for value addition will focus attention on the way that agriculture is structured and organized in relation to its economies of scale. Over time, many rural poor will find lucrative jobs in urban areas and eventually migrate, or will find work in nonfarm rural jobs. The shift of rural people to nonfarm employment will be accompanied by a consolidation of the scale of operation in agriculture itself. The resulting economies of scale will create a reinforcing loop driving agricultural development, with increased resources invested in productivity, which in turn will increase resources.

The current average land holding countrywide is 1.4 ha and still falling (figure AE.1)]<sup>4</sup>. The main reason for this small size is the practice of splitting up holdings between one generation and the next. In the current situation, most farmers could not survive on their own and depend on a complex patch-work of regulations, subsidies, and support to survive at or near the poverty line (box AE.1). While agriculture's share of GDP has declined to 22 percent, the sector still holds the bulk of India's labor force, approximately about 60 percent. Employment in agriculture is estimated at 220 million of a total national employment of 380 million.<sup>5</sup> As the numbers above indicate, the average income in agriculture is several times lower than in the rest of the economy. The larger part of India's labor pool is absorbed in agriculture for lack of alternative productive employment.

**Figure AE1 Average Landholdings over Time (in hectares)**



Source: Directorate of Economics and Statistics, Department of Agriculture and Cooperation, Ministry of Agriculture, government of India.

**Box AE.1 Agriculture Has Become Relatively Stagnant**

- Splitting up holdings between one generation and the next has for the majority led to farming on the edge of poverty, without slack to absorb disturbances.
- This requires government to continue to step in to smooth out negative shocks to the system (latest example: energy prices)
- This has created a patchwork of controls, regulations and subsidies that are extremely difficult to get rid of
- The result is a degree of rigidity in agriculture with 125 million farm families and government locked together in a “self-organizing” criticality.
- Can the scenarios consider options to break out of this?

Source: Authors.

In addition, small subviable farms have very little or no access to technological innovation or to high-value markets due to their inability to make investments, which adds to their very low future income potential.

Continued economic growth and successful poverty reduction imply developing gainful nonagricultural employment for this large group.

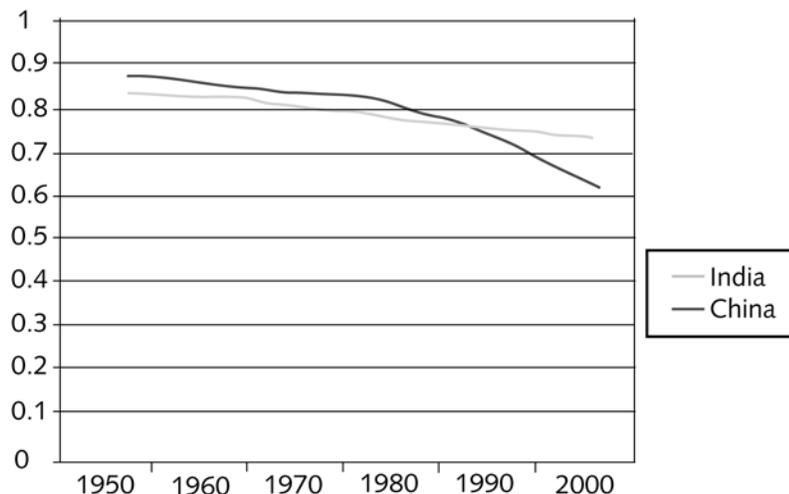
The scale and the face of Indian agriculture will change greatly in light of the economic transformation that the country is experiencing. The enabling condition for this will be an increase in the scale of operations and a consolidation of the many small farms into a smaller number of commercially viable businesses. The underlying driving force will be the opening up of alternative employment opportunities for the rural population outside agriculture. In the Indian context, consolidation of ownership will play only a modest part; innovative solutions will be found to achieve economies of scale through operational consolidation, in which the rental market will play an important role. The increase in farm viability will strongly enable and reinforce other value-enhancing developments such as high-value production in response to urban demands, innovative market and supply line development, and use of new technology. *Managing the transformation in a way that enables the poor to escape poverty in this way is the central challenge for the economy at large and the innovation policy in particular.*

Besides the changes in scale and product mix and the growing nonagricultural employment, another major predetermined element will be the increasing scarcity of water, which inevitably will occur over the coming years requiring a major response from the industry.<sup>6</sup>

The enabling conditions required for continued agricultural growth are fourfold: the creation of new and more productive employment opportunities for the rural population outside agriculture; institutional innovation across the value chain; rapid development of high-value agriculture, and an enabling environment to consolidate operations. A similar situation obtains in China, in which rural population numbers have been significantly reduced (figure AE.2) and in which the government is pursuing a declared policy of urbanizing an additional 330 million people over the next 15 years.<sup>7</sup> The biggest challenge for the Indian economy as a whole is to enable this agricultural reform and the related transformation of many millions of livelihoods (box AE.2). Prime Minister Manmohan Singh said, “Agriculture

still accounts for 60 percent of our labour force. I hope we will create more jobs. But essentially over a period of time, our salvation lies in getting people to move out of agriculture.”<sup>8</sup>

**Figure AE.2 Rural Population as a Percent of Total**



Source: Compiled from various World Development Reports.

### Key Uncertainties

On the basis of these predetermined elements, the team has explored four scenarios. The scenarios combine alternative assumptions on the fundamental driving forces shaping economic management. Will concerns for inequality or for productivity growth dominate the evolution of the country’s social texture? Will the country continue to pursue a liberalized economic model (as perceived to date), or return to a more controlled economy (as is seen in some South American countries)?<sup>9</sup>

These forces can be structured in a 2 x 2 matrix with the main distinctions organized by the 2 key uncertainties (figure AE.3):

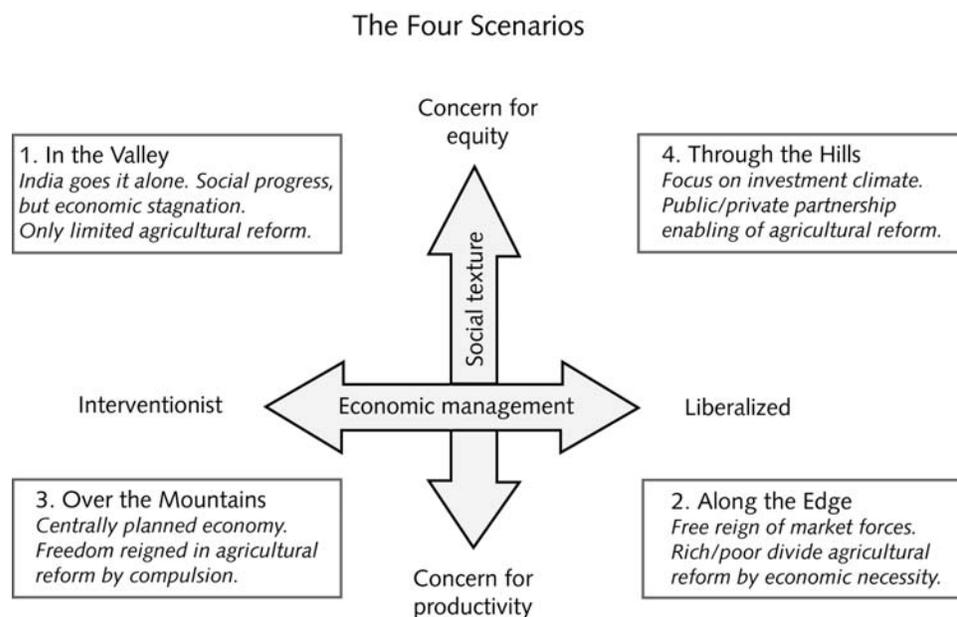
1. Key societal value: “Equity and equality” vs. “productivity and efficiency”

#### Box AE.2 Agricultural Reform Driving India’s Economic Development

- Scale of operation (scale of ownership) is the key issue. Small subviable farms lack the ability to invest in mechanization and productivity, dragging down rural development and holding back/aborting India’s economic take-off.
- To avoid this happening the Indian agricultural system will be reformed.
- This will have 3 aspects:
  - 1) Enabling environment for consolidation of holdings.
  - 2) Creation of new employment for those displaced.
  - 3) Institutional innovation across the value chain.
- How will this be achieved?

Source: Authors.

Figure AE.3 Four Scenarios



Source: Authors.

## 2. Electorate's choice: "Intervention" vs. "liberalization"

Figure AE.3 shows the four scenarios placed in the appropriate quadrant of the matrix, with a short descriptive characterization relating to the implications for agricultural consolidation.

### Scenario Overview

In the first scenario (Valley) agricultural reform/consolidation fails due to lack of alternative employment opportunities in the insufficiently growing manufacturing sector. Instead, agricultural policies focus on extending the surface of irrigated land and bringing in new technologies. As scale is not addressed, subsistence levels of income continue. The ever-increasing rich/poor gap resulting from growth in the service economy increases pressures across the country against the economic boom. Political preference swings toward a more interventionist planning approach to the economy. There is a renewed interest in redistribution of income, social safety nets, and top-down protection of the indigenous economy. New regulations and protectionist measures are put in place. The investment climate deteriorates; economic growth stagnates; and India pulls away from the global economy.

In the other three scenarios, agricultural consolidation takes place but is driven by different forces and different processes. In one scenario (Edge), modern India proves more tolerant of inequality than normally assumed, and market forces are allowed to force the economies of scale issue through a process of gradual deregulation and liberalization of agriculture. Small farmers simply have no alternative but to consolidate their holdings into larger units. In another scenario (Mountains, consolidation is promoted by

government, following an interventionist model. Farm owners are put under pressure to combine into professionally run larger units or face compulsory purchase orders. In the last scenario (Hills), government adopts an enabling stance, focusing on the investment climate, increasing public and private sector investments in rural health, education, training, and infrastructure development; and smoothing out regulatory barriers. In the resulting positive economic climate, attractive employment opportunities develop in the manufacturing sector, and rural people are incentivized to move into more lucrative industrial jobs, bringing in their land holdings into larger, professionally run contract farming firms (reverse tenancy).

In the next paragraphs, these four scenarios will be expanded. As the scenarios are intended for use in the innovation community, we illustrate each scenario with a small vignette describing the implications for a specific innovation system, namely, the introduction of rain-fed sorghum varieties and related technologies for cultivation, processing, and packaging.

Today, rainfed agriculture, especially cultivation of hardy minor millets, such as sorghum, contributes to the income of farmers, landless labor (and women) in 11 major States in India. The crop has immense industrial potential in terms of its use in poultry feed and other cattle feed industry. Yet, the use of rainfed sorghum varieties and related technologies for cultivation, processing, and packing remains limited.

The scenario vignettes highlight the structural changes in the entire economy that enable or arrest the growth and evolution of the innovation system by reference to the actors who are interacting in socially and economically productive ways to keep the sorghum innovation systems going.

We will meet actors in the *demand domain*: local schools/hospitals, Pizza Hut, consumers, health foods sector.

There are actors in the *research domain*: plant breeders, meat research—private and public sector, packing materials research, health foods research.

There are actors in the *policy domain*: Panchayat member, minister, Agricultural Produce Market Committee, regulatory authority.

There are actors in the *enterprise domain*: sorghum farmers—small/medium/large depending on scenario they are in, poultry industry, feed manufacturing industry, sorghum processors, transport industry, meat processing/equipment manufacturing industry.

There are actors in the *intermediate domain*: information services/media, rural financial organizations (banks, venture capital funds, microfinance self-help groups [SHGs]), NGOs, or community-based organizations (CBOs), gender committees.

Not all actors appear in each scenario. Their presence/absence relates to the nature of the specific scenario story.

## **Scenarios in Detail**

### *In the Valley*

In 2006 the haves/have-nots gap is increasing at the same time as people's aspirations are rising. More than 100 television channels tell people what is on offer and how well other people are doing. The resentment of the many people who are missing out is increasing: "Job creation must accompany economic growth."<sup>10</sup> However, the Indian growth model is not producing the jobs required.

There is concern about the evolution of values in society. "Advertising has succeeded in making luxuries into necessities, in portraying persuasion as knowledge. The value system is changing; we are gradually moving to "everyone for himself." Luxuries are now necessities, and children are focused more on earning for themselves than on caring for their parents. Indians have always been critical of what they see as American selfishness, the way children relegate parents to retirement homes so they can pursue their own lives. Now, suddenly, they are hearing such stories among themselves."<sup>11</sup>

We invite the reader to join us in the year 2030 from where we look back over the last 25 years. It has become clear how a significant part of the electorate moved against the primacy given to economic development as a result of the ever-increasing rich-poor divide in the country and the resulting values shifts. The argument was simple: the earlier, more liberal approach just was not delivering the alternative employment needed. The 20XX elections moved political preference toward a more interventionist planning approach to the economy, with renewed interest in welfare state measures and redistribution of income. It was felt that, as India was modernizing, it had to create an explicit safety net, including unemployment insurance, pension schemes, and health care, targeted at individual workers to shield them from business cycle fluctuations. Economic growth is desirable, but it should also benefit the poorest segment of society.

Resolving the dilemma between growth and distribution proved too difficult. New regulations and protectionist measures were put in place. With this new focus, India became less attractive for investors. The investment climate remained weak, and investments stayed away. As a result, the "jobless" economic growth, driven by the IT and services sectors, of the beginning of the new century ran out of steam. The local economy depended increasingly on protective government measures. India left the WTO and pulled away from the global economy. The majority view was that control of inequality was the first priority and a developing safety net ensured that extreme poverty became less prevalent. Taxes increased and became more progressive. In this scenario, people accepted the inevitable, as fairness was seen as more important than development and entrepreneurship.

There was a strong push toward delegating government power down to Panchayat level. The challenge was picked up by the local communities. Women played an ever-increasing role in affairs. Accountability was

stressed. People were interested in “appropriate technology” developed at the local level. For example, the *e-Choupal* (the village computer) was

**Valley Summary:**

- Resist change
- Fall back to tradition, the “Gandhian dream”
- Swing to the left, call for government/state intervention
- Need to moderate inequality—reduced wealth gap between rich/poor
- Modest progress on poverty
- Develop “safety net”
- Taxes high and progressive
- Protect indigenous economy; India disengages from WTO
- Trade—international 12 percent
- GDP growth rate falls to 3 percent per annum
- Push toward more effective local government + Panchayats
- Infrastructure—modest growth
- Migration—back to villages; rural/urban differential reduced
- Focus on accountability—50 percent of MPs are women
- Environmental management—air/water/climate
- Technology follower—limited opportunity/creativity
- Water rationing

available to ensure that farmers got competitive rates for their produce. The journey to any one market could take several hours, so by checking the current market rates, farmers could take their produce to the place offering the best price. However, due to lack of investments, the electricity could be off for days at a time. Consequently, the rural personal computer came with two solar panels. Throughout daylight hours, these charged two car batteries, which kicked in if the main supply failed.<sup>12</sup>

Even so, some progress was made in the area of agricultural productivity, mainly through grassroots innovations in irrigation and technology development. Extension became a key issue, and innovative solutions were developed. The trend toward ever-decreasing landholdings ended and was reversed somewhat in the recent past to increase economies of scale. However, farms remained very small on average, and there was little or no progress toward consolidation due to lack of alternative employment opportunities. As a consequence, farm incomes remained low. There was a strong commitment to protecting the weakest in the chain, resulting in an increasingly complex set of rules and regulations. Various attempts were made to achieve regulatory reform, and some progress toward simplification was made from time to time. However, when unexpected events happened, farmers relied on the government to step in and protect their livelihoods. The government had no alternative other than to respond, because, for electoral reasons, rural India was too big a sector to displease. Overall, the system remained rigid. The big land and farm consolidation project that everyone knows must happen to lift India into the twenty-first century remained in the future, due to lack of alternative employment opportunities.

**Valley Vignette:**

The rainfed sorghum farmer is living a relatively safe life: there is an assured public sector agricultural produce market for the little that s/he can produce. Basanti, a village woman, finds herself facing a less competitive low equilibrium world in which a few new varieties of rice/wheat are provided from the public research system. As a small farmer in this system, she has no choices to make because the State and the local agricultural production committees decide on land and water use. The need for rainfed sorghum is reinforced by the worsening water scarcity. The poultry industry is no longer the major consumer of rainfed sorghum. Even this low-quality sorghum is essential now—but labeled as nutritious food—to maintain food security. The little that is produced is processed by local women's self-help groups and supplied to local schools for their mid-day meals and to local hospitals. Despite a wave of neonationalism and socially responsible women leaders at the helm reinventing traditional food, there is little growth in the processing/livestock industry. Without enough growth and external support to fuel investment, any additional supply of meat/ processed food—even equipment for food processing—comes from China.

Following the principle of subsidiarity, central government retained responsibility for the big national resource allocation decisions. An example later in the scenario period was the distribution of increasingly scarce water resources, which were rationed from the top down.

*Along the Edge*

"Edge" pursued the opposite development from the Valley scenarios. It becomes accepted that prosperity will only happen if the individual is incentivized to leave uneconomic activity and switch to productive employment. It is increasingly argued that the poor are more resilient than they are normally given credit for by commentators, and that equal opportunity is more important to them than mere rhetoric of equality.

Once again, join us in 2030 to look back over the last 25 years. We can see how *a new doctrine emerged: the more prepared people are to face competition, the more tolerant of it they will be*. Access to and improving the quality of education (development of self-confidence), including higher education, and improving access to finance (development of competition) became priorities, primarily activated in the private sector.

Differentiation was allowed to increase. "Squatters do more with less than anybody."<sup>13</sup> This became an often-quoted response to the large numbers of landless people ending up at the fringes of the big cities. The phenomenon was further institutionalized by the government's granting squatters "security of tenure" rights as well as access to politics, mainly through NGOs' providing growing legitimacy and participation in the larger city. As a consequence, squatters became recognized and accepted as a legitimate form of urban development.

People were prepared to live with the negative effects and the instability that resulted. Crime rates went up; a feeling of insecurity developed among the well-to-do; and powerful military and police forces were deployed to control unruly behavior. Government's main concern was balancing between, on the

**Edge Summary:**

- Market-led growth, strong liberalization push
- Regulations “streamlined” to favor investors
- Focus on urban development (lower cost of service delivery)  
Social cohesion weakens
- Unconditional FDI allowed
- Farm support gradually phased out
- High economic growth
- Not enough economic growth to provide employment for all, including natural population growth and displacement from agricultural consolidation
- Smaller farmers lose out. Mass migration from rural to urban areas, from agriculture to other sectors
- Initially, major poverty issues, social unrest, unemployment, higher crime rate, strained gender relations; calmer waters later
- Average farm size increases; investments and technology access and adoption are high. IT/knowledge extensively used by farmers to reduce transaction costs. Supply chain developments.
- Agricultural exports growing at 20 percent pa with big, diversified export basket.
- Government downsizes and withdraws from distributive policies.  
Water prices reflect marginal cost of supply or opportunity cost, whichever is the highest

one hand, creating incentives toward increasing productivity and, on the other, controlling disturbances and riots.

The positive side of the scenario was the rapid economic development that resulted from this new approach. Government and business each had a clear focus on its principal role: market-enabling for the first and profit-making for the second. Government liberalized its regulations and restrictions. This was a business-friendly world in which firms were given considerable freedom to develop. Investments from both domestic and foreign sources poured in, and the economy developed fast. Infrastructure deficits were targeted, and distribution channels were modernized, with reliability a key issue being addressed. Bureaucracy was streamlined, and sectors such as retailing and banking were liberalized.

Employment opportunities jumped, enabling agricultural consolidation to move quickly. The effects in the rural areas were massive and fundamental. The small subsistence farmer became extinct; in this competitive world, there was no way for her or him to survive. With the protective hand of the government gradually removed, she had no alternative other than to leave her holdings and move to an urban center to seek alternative employment in the booming manufacturing industry. A minority of farmers were lucky enough to find employment nearby in the new rural nonfarming industrial sector. Most had to leave the land that had been in their families for generations to find their luck elsewhere. These were extremely tough times.

Meanwhile the land was rented out to, or bought by, larger farm enterprises and amalgamated into single operational holdings that could be mechanized and worked economically. Investments could be made in machinery and

**Edge Vignette:**

Three friends from the last batch educated in entirely public sector universities meet for a reunion. They find their lives reshaped, and their fortunes and commitments taking different turns. Massive out-migration from agriculture (especially of small farmers and landless labor forced by the market to seek some livelihood in urban areas or in the villages) has forced Arpita to take up the cause of health and well being of the people who are now living on the edge of crisis and are increasingly prone to social tensions/crime. She makes vain attempts to get the State and other private players interested in health and healthy sorghum-based diets. However, sorghum and other feed grain are now grown for the growing livestock/meat processing industry and export. Industrial investment in villages provides some employment—especially to skilled labor. Sandeep's growing agribusiness takes over Pizza Hut, and builds other vertical linkages (wheat and other grain mills, investing in massive corporate farms, poultry and dairy industries). Major investments by poultry industry, farms, manufacturers/service providers (cold storage, packing, transport) and increasing profits for these investments are ensured by Ramesh, the third of this batch of friends, who turned to politics.

Rainfed sorghum production is limited to some large farms in the absolutely dry parts of the country; the other farms produce feed grain/fodder buying their water requirements. The large number of unemployed are given food cards—a drain on the economy no doubt but a necessary evil supported by food imports from other grain producing countries. Economic growth can afford this drain!

input factors and only a fraction of the labor employed previously was now required. In addition, a great deal of new technology that had become stuck "in the pipeline" due to the inability of the small farmers to raise funds could now be implemented. Productivity jumped on both these accounts, and the larger farm enterprises now started to promote local development of downstream activities, adding to the growth of the nonfarm rural sector.

Today in 2030 much of this is behind us. Ex-farmers proved themselves to be hard-working and intelligent, and generally did not have a great deal of trouble in finding attractive alternative employment. The great majority are much better off than before. Ex-farm-laborers found it more difficult to find alternative employment and relied heavily on the development of the nonfarming rural sector in their own area. Unemployment remained high.

The country has come through a painful process of major reforms in a relatively short time. The social cost has been very high, and India is now a very different place. In particular, the rural world has been irrevocably transformed. There still is a large contingent of unskilled low-wage workers struggling to make ends meet. There still are many low-wage jobs. There also are many very rich people. However, the process is moving, and rural poverty is being tackled.

*In the Mountains*

In "Mountains" we explore a "central planning" approach in which government turns the need for agricultural consolidation into a top-down project. We assume that this is the consequence of some serious disruptions

**Mountains Summary:**

- Major events (environment, economic) instill feeling of crisis
- Swing to the left, demand for government action
- Government intervenes in the economy
- Populist measures to restabilize  
Public sector expands; community participation and accountability reduces.
- Government strongly promotes agricultural consolidation State by State.
- New land reform allows compulsory purchase orders if other measures fail.
- Agricultural incomes of the survivors increase due to scale effects.
- Constitutional reforms. Water nationalized
- Efficient country-wide water management boosts agricultural performance
- Agricultural growth—investments increase and international trade flourishes.
- Development of employment for displaced farmers/laborers is government driven. High migration to urban areas.
- Many employment projects can survive only with government protection.
- Inward-looking approach; deteriorating climate for private investment  
Bureaucratization kills R&D; ineffective IPR.
- Economic growth held back under heavy hand of centralist policies.

in the agricultural system—the combination of natural disasters, serious water shortages, and climate change—leading to severe economic dislocation. The incidence of major climate events, including droughts, storms, rising sea level, and other events is increasing, and is seriously affecting agriculture. It dawns on people that climate change threatens to put far more people at risk of hunger than previously thought. Scientists say expected shifts in rain patterns and temperatures will lead to serious repercussions for agriculture, for example, the important cereal crops not showing the improved yields that many expect.

Once again, we look at this scenario from a future perspective. Looking back from 2030, it has become obvious how many of the big global issues are related. Natural disasters, accompanied by sky-rocketing global energy prices (crude oil passing the psychological \$100/barrel barrier in 2007) were followed by the crash of the American dollar due to the inability of the US economy to continue to absorb the world's savings. This caused a severe global recession. Demand dropped globally with economic activity being severely curtailed. Prime Minister Manmohan Singh's proposed target of 10 percent growth was missed by a wide margin. Business everywhere, including agricultural business in India, suffered.

While relations with Pakistan improved, issues relating to China loomed as a source of new geopolitical tension. In addition, "catastrophic" terror as a form of warfare continued to be felt as a threat, not only in the US but world-wide. Generally, people felt insecure.

The turning point came when the avian flu pandemic, involving transmission directly from human to human, finally became a reality. Because of air travel, the outbreak diffused much more rapidly than it would have in earlier decades. Many more millions of people died. In response, air travel to and

**Mountains Vignette:**

Sukhram used to be a “model farmer.” He himself now finds that difficult to believe. He had a marginal farm on which he grew wheat, grain, and fodder; and had a dairy with four buffaloes and a few birds too. He feels that the economy is growing well. However, his farm is now part of a large District Coop Farm, under the Haryana State Government. He no longer thinks of cultivating sorghum or even wheat—and has no incentive to tell these urban-bred farm managers and scientists about some of his local crop management techniques: “Why should we produce more? I can live off the food + meat cards given to us under the Social Security Scheme—it’s PDS for the Underprivileged.” The last straw was when Bakshi Seeds (a well-meaning and highly informed seed producer and trader) went out of business, and Bakshi migrated to Australia to be with his son. After that, there was no one left in the village to discuss market trends or feed mixtures for poultry that the industry was trying out.

Sukham believes that the multinational companies cheated poor farmers and exploited labor. Getting information from the Seeds Division of HAU (who took over Bakshi’s firm) is next to impossible, with forms to fill and hours to wait—“and our consolidated farm does not need all that anyway with the State Civil Supplies Corp. buying up all our produce.” Rainfed sorghum is not a popular crop, but in dry areas in which nothing else grows, there is still a demand; and the State poultry/dairy units do use it for feed grain. Sukham’s son-in-law knows about the minor millets grown for these purposes and for food supply in the burgeoning slums. “With no new investment coming in, and cut-throat competition for jobs, these slum dwellers are lucky they have a State that gives them at least a sorghum meal.”

from Asia, and with it trade, quickly fell to only a fraction of what it had been, multiplying the severity of the economic crisis.

With many casualties across the country, people cried out for government to do something. Indian farmers and agricultural workers, especially those who were not owners, became an even more powerful political constituency for government intervention. Their call proved a mandate for central government to take control. A window of opportunity opened for government to take risks. The first area calling out for reforms was the agricultural sector. With so many people living on the edge of poverty in an economic sector embattled by economic recession and severe climate events, agriculture had become a particularly vulnerable sector in need of consolidation. It was noted that China had a declared policy to urbanize over 300 million people over the next 10 years. For the first time in history, something similar seemed possible in India. With States having the prime responsibility for agriculture, central government created the enabling conditions for strong local policies. Government set out to reorganize the agricultural sector region by region, to combine small subsistence farms into much larger, commercially viable undertakings with enough credit-worthiness to tackle the emerging issues. This consolidation was mandatory, resulting in a large number of small farmers and their laborers withdrawing from agriculture. Central enabling conditions included the rental market, for example, legislation allowing tenancy and “reverse tenancy” across the country. To put teeth in the program, a measure of last resort was introduced

through which States could issue compulsory purchase orders if any other approach failed.

However, the policy was “carrot and stick.” A crucial enabling condition of the project was the provision of alternative employment in the rural areas. This took the form of government-inspired private investments as well as government-sponsored activities, in the form of public-private partnerships, in areas where no self-standing private initiatives were forthcoming. As a consequence, over time government acquired a significant and increasing responsibility for economic activities organized in the public sector, concentrated in the more remote, economically unattractive areas of the country. As these were all activities rejected by the private sector, they could not stand on their own in the market and require ongoing government support and protection. They are becoming millstones around the neck of central government. The activities are requiring an ever increasing amount of government regulation. On the other hand, the agricultural sector increasingly is able to stand on its own feet, and agricultural subsidies are being phased out. Even so, the situation is becoming less and less manageable.

### Through the Hills

In “Hills,” the “India Everywhere” presence at the World Economic Forum in Davos in 2006 is just one manifestation of India’s newfound optimism about the future. More and more people discover that they can do much more than they had thought possible, and a positive “can-do” attitude pervades. There is a new will to overcome the forces of resistance and tradition and to do the “right” thing economically. The new spirit provides maneuvering room for the government to take economic reform further. In 2005 Minister of Commerce Nath suggested that there were two India’s: one India exports \$14 billion worth of software and services, runs multinationals, and provides the offshore brains....the other India is unable to escape material privation and disenfranchisement, and elects representatives who are captives of vested interests and perpetrate the politics of poverty....” In “Hills” the ability to envisage a better future and the belief that something can be done to make it happen start to spread in the “second India,” as reflected in increased interest by the private sector in making investments in rural areas. An important aspect of this is *a shared belief that productivity must contribute to social progress and vice versa, and not only in the long run. Rural areas are no longer seen as part of the problem, but as a potential market with significant economic opportunities.*

What does this scenario look like from the vantage point of 2030? The key to change was the recognition of scale in agricultural production as the key variable in the overall growth equation of the Indian economy. Scale suddenly was on everyone’s agenda. It was recognized that bringing about a successful consolidation was the provision of productive alternative employment, which could be created only by the development of the manufacturing sector of the economy. The policy aim was to increase investments in the countryside to generate a surplus that could then be

invested in other areas and enable people to move off the land, not in misery but with cash in their hands.

To bring investors, government set out to develop an attractive and competitive investment climate as its number one priority. The policy objective was to do this without the painful consequences of escalating inequality. The principle adopted was to cause the necessary reforms by bottom-up push rather than top-down pull. Certain regulatory frameworks had to stay in place to smooth over the transition from protected to free-market economy. However, the overall trend was toward gradual regulatory reform. Smoothing over transitions was seen as a fundamental government task in “Hills,” but only on a transitional basis.

The task was huge. The target in “India Vision 2020” for to create over 200 million jobs in 20 years covered only the natural growth of the population. Adding the needs for consolidation of agriculture doubled the number of jobs needed.

The attractive investment climate was promoted by a significant increase in investments in education, training, and infrastructure. One of the early reforms was to increase fast-track decision-making by making the system less bureaucratic. Central government set out to tackle red tape, including the dizzying patchwork of State regulations existing at the start of the century. Significant progress was made in a few years. For example, the average time to start a business was reduced from 89 days to 41. The time needed to register property was brought down from average 67 days to 32. The time needed to enforce a contract was lowered from 425 days to 241.<sup>14</sup>

It became recognized that these were productive investments with a clear and identifiable pay-out in terms of economic development, and therefore justified economically. The government could not afford to make these

**Hills Summary:**

- Investment climate becomes the overriding priority.
- Defense expenditure is moderated.
- Market led—liberalized, public/private partnership
- Investments accelerate in education and rural infrastructure, building, and maintenance. Deficit financing tolerated for productive investments. Private sector involvement through PPP
- Globally integrated—exports/imports high, FDI into India takes off.
- High social cohesion, fostering positive “can-do” spirit, helped by democracy involving the grass-roots
- Attractive employment opportunities tempt small farmer off the land.
- Scale of agricultural operations increases as holdings are combined.
- Institutional innovations allow dramatic increases in scale of agricultural production without violating people’s property rights.
- Share of employment in agriculture reduces, moving closer to agriculture’s share of GDP.
- Corporate social responsibility + effective local governance  
Water prices reflect cost, but volatility smoothed out by government intervention.

investments on its own because of its fiscal deficit as a result of high defense spending, a large bureaucracy, as well as a series of State-owned *quangos* (organizations that are financed by government but act independently of it). When government finance limitations were putting a cap on directly available public funds, arrangements were made with the private sector to get access to investment funds through PPPs. In 2008 the private sector overtook government in infrastructure development. Progress was huge, not only in volume but also in quality. For example, in 2030 factories suffer only 1 power failure a month on average, compared with 17 in 2006.

As a consequence there was a major increase in activity and growth both in the public and the private sectors in training and infrastructure, the two areas for which government took primary responsibility. The purpose was to open up the country for investments in productive jobs. It was recognized that foreign investors put high value on transparency in decision-making, and bureaucracies across the country were streamlined. With infrastructure and a trained workforce in place, India quickly reaped private investments in manufacturing.

Key developments were the abolition of the SSI anomalies and the labor law simplification of 2008. These had unleashed unprecedented levels of foreign direct investment and fostered brisk growth in light- manufacturing industries, such as toys, leather, shoes, textiles, and apparel, for which India's cost advantage and skilled workforce were instrumental in India's becoming a strong global presence. The new positive investment climate and the growth prospects that it entailed turned into solid gold when the major banks

#### **Hills Vignette:**

A steady phase of development, led by a strong sense of social cohesion and responsibility in an upbeat, entrepreneurial atmosphere presents a pleasant transformation of the rural economy in Bihar to Ajit, a NRI who comes visiting after 25 years' absence. Ajit left India in the midst of a crisis in which increasing privatization and an indifferent State had made life difficult. He comes back to find his village transformed to a neat, peaceful locality with healthy educated residents. Ajit's brothers (Ramu—a political leader and Kesav- a poultry exporter) and his sister (Anita—a teacher with various social and civic engagements) are leading highly fulfilling lives. An uncle heads the transport service agency.

This transformation in rural Bihar, they tell him, came with the conscious choice of trade-led growth with a socially enforced norm (enforced through active policy advocacy) to promote rural employment. As capital was drawn in by the new investment-friendly climate, and with productive local economic involvement in every enterprise or industry promoted, private sector investment in research, health, infrastructure, and education also grew. This investment was largely private, within civic regulations/norms. As employment in the rural nonfarm sector grew and people moved out of agriculture, farm sizes increased, providing options for the focused use of land and crops, such as rainfed sorghum for the poultry industry. The diverse range of consumers for Bihar's poultry products (a variety of new meats too -- under major global food brands and local ones) led to better and more profitable enterprises in and around the livestock sector, and more local employment, better incomes, living conditions, and lifestyles.

put in place special credit lines (“multi-micro credits”). These resulted initially in a numerous grassroots initiatives and afterwards in consolidation of larger scale rural businesses.

People found a model for what they were doing in the niche that India had developed for itself in cutting and polishing low-cost diamonds for the global middle class. More than 7 of 10 diamonds in the world were being polished in Surat. Diamond processing created close to 500,000 jobs there, nearly half as many jobs as India's entire information technology industry. It was recognized that while IT may be the shop window for Indian development, the fate of India's rural poor depends more on industrial cities such as Surat.<sup>15</sup>

The resulting attractive alternative employment opportunities became strong incentives for small farmers and their farm laborers to come off the land, and to bring their holdings together in larger, commercially viable units under professional management. This consolidation was facilitated by a new Land Reform Act 2007. The new act counteracted the reform of 1972, which had been instituted to provide land for the poor and had imposed ceilings on land ownership and security of tenure. It had been recognized that the older act had worked more to encourage subdivision of land than consolidation of the sector and had become counter-productive.<sup>16</sup> Anything standing in the way of creating larger operational units in agriculture was reviewed and, if possible, changed. The new legislation enabled reverse tenancy, waived stamp duty on mutual transfer of land intended to consolidate fragmented holdings into larger coherent units, and relinquished government control over cooperatives.<sup>17</sup>

In 2030 people could see how the success of the agricultural reform program, resettling 100 million farmers and farm laborers, essentially had depended on the twin-track approach of *job creation through infrastructure combined with institutional innovation*. This program had facilitated the integration of such a large number of people into the industrial sector without undue pain and frustration. It was seen as a prime example of how *the combination of economic reality with Indian values* could achieve superior results.

### *Scenarios Compared*

#### **Scale and Landholding**

Scale is not the same issue as landholding. Scale drives investments, unit cost, and productivity. The main driving force in increasing scale is “development of alternative employment for the under-employed.” The way alternative employment develops in the scenarios follows:

- *Valley*: Small holdings continue as now. Some agricultural development takes place through upgrading to higher value products, but this development remains relatively small.
- *Edge*: Privately held lands increase in size under market forces. The poor have no alternative but to sell and move out.
- *Mountains*: The scenario is centrally driven consolidation, by compulsory purchase of small holdings if necessary.

- *Hills*: Small landowners are attracted to lucrative alternative employment; scale is achieved through innovative institutional arrangements such as reverse tenancy to large farms.

#### **Incentives for Farmers**

- *Valley*: The gap is not enough to move; farmers “stay on” out of tradition; gradual development of new social safety net.
- *Edge*: Economic survival forces farmers to bring their holdings into larger units; government removes protection.
- *Mountains*: Scale is created by government-driven consolidation and alternative job creation. Push by government.
- *Hills*: Increasing gap between agricultural and industrial pay levels becomes a strong incentive to look for alternative employment. Favorable investment climate. Pull from the employment market.

#### **Water Management**

- *Valley*: Muddling through, rationed.
- *Edge*: Decentralized, privately owned supply/storage systems. Commercial cost charged to users.
- *Mountains*: Large-scale publicly owned supply/storage systems.
- *Hills*: Storage systems in public/private partnership. Users pay commercial long-term cost.

#### **Concluding Remarks**

The scenarios described in this document are intended to contribute to the policy debate around innovation in the agricultural sector in India. They do not predict the future; on the contrary, they highlight the sort of uncertainties that policy-makers are faced with. They enable policy-makers to see how wider nonfarm contexts and processes shape innovation—the use of knowledge for development.

Having analyzed different scenarios, this scenario team has concluded that certain trends are likely to persist or even accelerate, and therefore are recommended as planning assumptions. Specifically, it is likely that with rapid development of the Indian economy in the coming years, the farming industry will structurally change toward a significant increase in scale of farm enterprises. These scalar changes will draw from or be induced by changes outside farming. Consequently, the nature of innovation in agriculture will change. The scenarios describe how, as a consequence, different actors or partners in development, sources of knowledge, sociocultural norms, and overall performance of the agricultural and rural economy will change. Planning and investments in agriculture must then shift from a focus on technology generation/extension toward a wider set of factors enabling rural innovation.

These four scenarios illustrate that institutional or process changes are just as, or possibly even more, important than technological changes, for enabling

the use of knowledge for development. In other words, other domains, apart from research and technology, will become of increasing importance to the agricultural innovation community. These include the demand, policy, enterprise, and intermediate domains. The last comprise the information services/media, rural financial organizations—banks, venture capital funds, microfinance—NGOs, and gender committees. With the anticipated reform of the agricultural sector, new knowledge in these wider domains increasingly will add value to existing practices and outcomes. These wider domains deserve increasing attention.

“Research and simple transfer of technology is not any longer the whole answer. Innovation involves putting together different pieces of knowledge, information and technology in ways that create novelty and change in a location. Technology needs to be integrated with other sources of knowledge—farmer’s knowledge, market knowledge, political knowledge, societal knowledge, etc.—to allow it to be used in locally relevant ways.”<sup>18</sup>

The scenario team suggests that this set of scenarios illustrates the increasing importance of agricultural policy-makers’ using this broader canvas in the coming years.

Factors and processes to enable innovation can be deliberated and planned; or can come about through shocks and radical upheavals.

<b>Main indicators</b>	<b>2004 Base</b>	<b>2030 Valley</b>	<b>2030 Edge</b>	<b>2030 Mountains</b>	<b>2030 Hills</b>
Ppl rural areas (%)	71.0	66.0	26	45	38
Poverty (%)	26.0	11.0	19	16	14
Income pc (US\$)	620.0	1,400.0	4,200	2,900	3,600
F water avail (km <sup>3</sup> /a)	1,280.0	1,000.0	1,280	1,320	1,280
Agri/GDP (%)	21.0	21.0	10	15	11
Avg farm size (ha)	1.4	1.7	12	10	9
Agri employment (%)	65.0	55.0	20	25	30

## Appendix F. Scenario Presentation (as of May 2006)

### Scenario Planning to Guide Investments in the Agricultural Innovation and Policy System

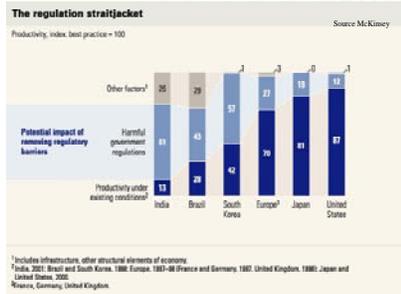
Where should the innovation effort be focused ?

#### What is likely?

- China and India the “big stories” in the world economy
- More info-intensive world
- Escalating energy (and other commodities) prices to continue
- Escalating water scarcity and cost
- Abrupt climate change
- Economic take-off sustained.

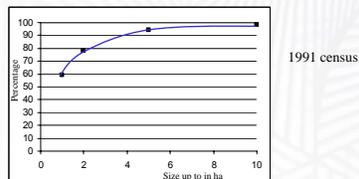
#### Limits to growth ?

- If it takes 60% of the population to do what 25% (or less) could do
- Then 65% of the population effectively carries 35% (hidden unemployment)
- Built-in poverty ?
- Can economic take-off sustain under these circumstances ?

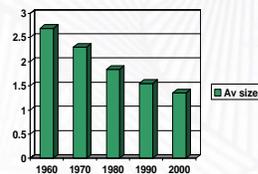


Why is Indian agriculture so heavily regulated ?

#### Landholding size distribution



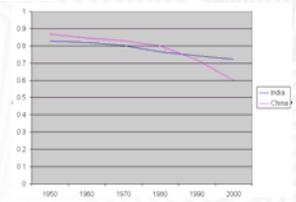
#### Average landholdings over time



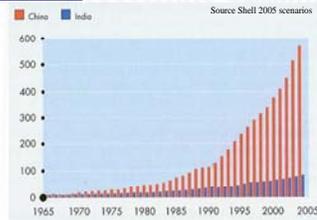
### Agriculture has become relatively stagnant

- Splitting up holdings between one generation and the next has led to farming on the edge of poverty, without slack to absorb disturbances
- This requires government to continue to step in to smooth out negative shocks to the system (latest example: energy prices)
- This has created a patchwork of controls, regulations and subsidies that are extremely difficult to get rid of
- The result is a degree of rigidity in agriculture, with 125 million farm families and government locked together in a "self-organizing criticality"
- Can the scenarios consider options to break out of this?

### Rural Population %



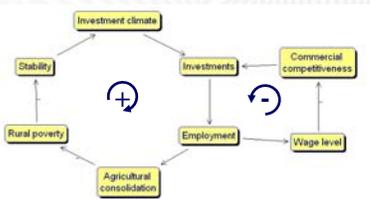
### Manufacturing value added (real 2000 USD billion)



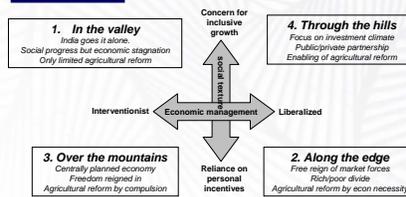
### The key question

- Agricultural diversification
  - Scale of operation (if scale of ownership): is the scale adequate to invest for mechanisation and productivity and to access technology/extension
- The problem can abort India's economic take-off
- To avoid this happening the Indian agricultural system has to be reformed
- This will require:
  - 1) Institutional innovation across the value chain
  - 2) Enabling environment for consolidation of holdings
  - 3) Creation of new employment for those displaced
- How will this be achieved ?

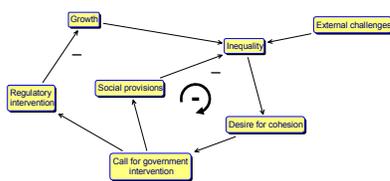
### India Development System



### The Four Scenarios



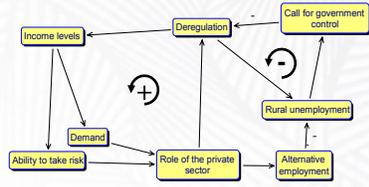
### In the Valley, driving forces



### Scenario "In the Valley" in 2030

- Little progress on poverty. Growing unrest by dispossessed.
- Fall-back to tradition, the "Gandhian dream", resistance to change.
- Swing to the left, call for government/state intervention
- Need to moderate inequality - reduced wealth gap rich/poor
- Need to reduce crime
- Development of "safety net"
- Taxes high and progressive
- Protection of indigenous economy, India disengages from WTO
- Trade - international (12%), domestic/CSAs (84%)
- GDP-growth rate down to 3 to 4% per annum
- Push towards more effective local government + Panchayats
- Infrastructure - modest growth, focus on maintenance
- Migration - back to villages, rural/urban differential reduced
- Focus on accountability - 50% MPs are women
- Environment management - disaster/ climate/ resource
- Technology follower - limited opportunity/creativity
- Water rationing

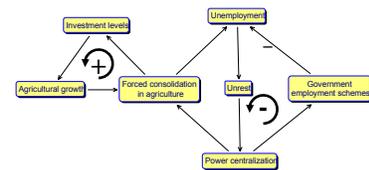
**Along the Edge, driving forces**



**Scenario "Along the Edge" in 2030**

- Market led growth, strong liberalization push
- Regulations "streamlined" in favour of investors
- Social cohesion weakens
- India develops service sector, becomes R&D hub.
- FDI in agriculture introduced
- Farm support gradually phased out
- High economic growth.
- But not enough to provide employment for all, including natural population growth and displacement from agricultural consolidation
- Smaller farmers loose out. Mass sell-out and migration from rural to urban areas, from agriculture to other sectors
- Major poverty issues, social unrest, unemployment, crime rate up, gender relations worsen.
- Average farm size increases – investments, technology access and adoption are high, IT/knowledge extensively used by farmers to reduce transaction costs
- Agricultural exports growing at 20 per cent pa with big and diversified export basket.
- Government down-sizes and withdraws from distributive policies
- Water prices reflect marginal cost of supply

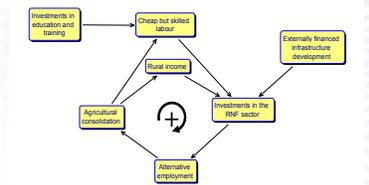
**Over the Mountains driving forces**



**Scenario "Over the Mountains" in 2030**

- Major events instill feeling of crisis
- Swing to the left, demand for government action
- Government intervenes in the economy
- Populist measures to reestablish
- Expanding public sector, community participation reducing
- Government strongly promotes agricultural consolidation on state-by-state basis
- New land reform allows compulsory purchase orders if other measures fail
- Agricultural incomes of the survivors increase due to scale effects
- Constitutional reforms. Water nationalized
- Efficient water management boosts agricultural performance
- Healthy agricultural growth – increased investments and international trade flourishes.
- Government carries responsibility for employment for displaced farmers/ labourers. Many employment projects can survive only under government protection
- Inward looking approach - deteriorating climate for private investment
- Bureaucratization kills R&D – ineffective IPR
- Economic growth held back under heavy hand of centralist policies

**Through the Hills driving forces**



**Scenario "Through the Hills" in 2030**

- Investment climate becomes the overriding priority
- Defense expenditure is reduced
- Market led - liberalized, public/private partnership
- Accelerating investments in education and rural infrastructure, building and maintenance. Deficit financing tolerated for productive investments. Private sector involvement through PPP.
- Globally integrated – exports/imports high, FDI takes off
- High social cohesion, fostering positive "can-do" spirit
- Democracy – involving the grass-roots
- Attractive employment opportunities tempt small farmer off the land
- Institutional innovations allow dramatic increases in scale and productivity of agricultural production without violating people's property rights.
- Corporate social responsibility + effective local governance
- Water prices reflect cost but volatility smoothed out by government intervention

**The scenarios compared**

**Scale and landholding**

*Scale is not the same issue as landholding. It is scale that drives investments, unit cost and productivity. The issue is "taking people off the land by development of alternative employment".*

- **Valley:** small holdings continue as now. Some development through upgrading to higher value products, but relatively small.
- **Edge:** privately held holdings increase in size under market forces. Poor are have no alternative but to sell
- **Mountains:** enforced consolidation, if necessary by compulsory purchase of small holdings
- **Hills:** small landowners move to attractive alternative employment, scale achieved primarily through renting out to large farms and contract farming firms (reverse tenancy)

### Incentives for farmers

- **Valley:** gap not enough to move, "staying on" - tradition and social safety net
- **Edge:** economic survival forces sale of holdings to larger units
- **Mountains:** government compulsion and alternative job creation
- **Hills:** increasing gap between agricultural and industrial income levels, government facilitation of attractive alternative private sector employment

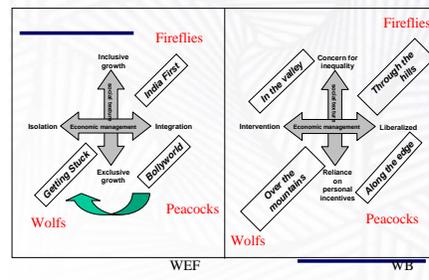
### Water management

- **Valley:** muddling through, decentralized (catch the rain where it falls)
- **Edge:** decentralized, privately owned supply/storage systems
- **Mountains:** large-scale publicly owned supply/storage systems
- **Hills:** storage systems in public/private partnership

### Comparative Statistics of the Four Scenarios - 2025

Main indicators	2004-base	In the Valley	Through the Hills	Along the Edge	Over the Mountains
Population (m)	1080	1300	1470	1350	1470
Ppl rural areas(%)	71	66	38	26	45
Poverty (%)	26	11	14	19	16
Income p.c.(US \$)	620	1400	3600	4200	2900
F.WaterAvl(km <sup>3</sup> /yr)	1280	1000	1280	1280	1320
Agrl./ GDP (%)	21	21	11	10	15
Avg.farm size(ha.)	1.4	2	12	20	18
MainAgrl.Lbor(%)	65	55	30	20	25
FDI (US \$ b./yr)	4	10	80	100	65

### Scenarios compared



### Implications

### Implications for Agricultural Policy and Agricultural Research ????

- New policies, rules, norms for agricultural sciences to work with other partners in development,
  - Including ecological security
  - Including social security
- Innovation under stress – technologies and institutional arrangements for adapting to consolidation/ climate change/ water crises/ trade distortions
- Institutional innovations to enable consolidation
- Enhancing rural land and labour productivity – increasing scale, land holding and rural non-farm employment
- Policy and investment options for improving efficiency of:
  - Line departments, finance, input supply
  - Surface irrigation system
  - Agricultural technology systems
- Specific technologies and policies/rules – IT, Biotech, mFI, etc

### Rural non-farm employment

- **More explicit models are needed for rural non-farm employment.**
- Aspects:
- . investment climate
  - . infra-structure, connectivity and transport
  - . skills and education
  - . industry versus services
  - . economic incentives
  - . relation with the scale question
  - . who are the entrepreneurs

## Appendix G. Consultation Process: Comments Received on the Scenario Presentation and the Scenario Storylines

Consultation was carried out through a number of stages. The results are summarized below.

### Key Scenario Discussions (6–12 November 2005)

Members of the scenario writers' team made a first series of scenario presentations in November 2005 to various groups and individuals who could be expected to have important insights concerning the future of agriculture in India.

Prior to these presentations, members of the writers' team had discussed the first-draft scenarios in their own organizations. The feedback had been that improvements should be made in the following areas: clearer, more focused distinctions among the scenarios, less wordy. These comments had been noted, and the team now took the scenarios to a wider audience. Meetings took place in Delhi and Bombay.

We started from the material as developed during the workshop in July 2005, written up by the writers' team which had been turned into an initial presentation. The team had prepared the following briefing note, indicating the state of play at that time.

*This is the 'learning and modification' phase of this scenario planning exercise. The purpose of this scenario presentation is to learn from people who have rich insights in the area. Scenario planning does not predict the future. That is impossible. Instead, we aim to improve decisions and choices by exploring various possible developments that might have a bearing on the agricultural sector. Scenarios concern significant events in possible futures. They come in sets, reflecting uncertainty in the situation. They overlap in aspects of the future likely to persist. They draw from history, current contexts, and intuition. They combine quantifiable elements with intangible aspects. They must be internally consistent. They are intended to assist the strategic conversation, focusing on implications and possible responses, and raising powerful questions.*

*The topic is 'innovation in agriculture' in India. The scenarios are aimed ultimately at improving investments in agricultural innovation. Investing in innovation does not necessarily mean investments in technology generation alone. Technologies—varieties, crop management practices, protein enhancements in animal feed—are the hardware. They are important and must be made available to*

*the economy. Investing in innovation also includes investing in many other processes (ways of working, rules, norms) and facilities (rural employment, rural infrastructure, education, health services) that enable the use of these technologies—the software. This broader conceptualization demands a better picture of how agricultural innovation in India relates to other features of the economy and emerging challenges at the national and global levels.*

*Scenarios help policy-makers and other decision-makers see what we want to plan for and achieve in Indian agriculture. However, they are not just visions. Besides seeing where we want to get to, scenarios tell us how we can get there or how to avoid getting there. This presentation is meant for learning. Criticism and comments are necessary and are invited from the experts in this conversation.*

Making the trip to Bombay proved especially fruitful, as we found a different, more commercially oriented perspective there compared with the discussion so far. The first meetings took place in Bombay, with Chandra Shekhar and Kees van der Heijden attending. Discussions were held with the following organizations: a group of business journalists, the Indira Gandhi Institute, Mr. Barwale, chairman of Mahyco/Monsanto, and Indian Merchants Chamber.

The discussion in the Indira Gandhi Institute was highly technical but proved very fruitful. They suggested building a simple model of the relationship between agriculture and the Indian economy that would substantiate and clarify what was going on in the scenarios. We never took up that option. (This later proved to be a missed chance as it would have put the scenario team on a firmer footing to substantiate the framework used in the scenario structure.) Their key message was that certain elasticities in the economy could be predicted, were in fact predetermined, and the scenarios should reflect those if we wanted them to be plausible and internally consistent. They made the point that *economies of scale in agriculture was the key variable* that connected development of the agricultural sector with continuing high levels of growth experienced in the general economy. Apart from the direct contribution of economies of scale to economic performance, the relationship also has indirect elements, since viable businesses are in a better position to develop value- and productivity-enhancing activities.

We incorporated this point in our presentation to the Indian Merchants Chamber. This proved a very productive meeting. The discussion was lively as there was a minority view arguing that mass migration into the cities resulting from economies of scale would create chaos and could derail the economic development process. It was argued that we should not consider the small farmers as part of the agricultural industry at all. Instead, we should see them as people who, as part of their subsistence level existence, are growing their own food in the best way they know how. The country should leave them to it and be grateful that they are not (yet) on the move. This was not the view of the majority, who considered poverty the big fundamental threat to the future economic well-being of the country. It was argued that this also was the government view as clearly expressed by the

PM, for example, in an interview by the *McKinsey Quarterly*. It was argued that India could progress only if "all 3 legs moved" (agriculture, industry, and services). This discussion provided important ideas for fleshing out the scenario framework later on.

The discussion at Mahyco reinforced the importance of the viability of agricultural businesses for the productive use of new technology toward higher value and productivity. The technological agenda of farms depends on 5 factors; (1) size of the farm, (2) water availability, (3) cost of energy, (4) ability to exploit comparative advantage, and (5) availability of infrastructure. Once again, economies of scale were seen as paramount.

The scenario creating the most difficulty in most meetings was Mountains. We were told that the Indian democratic system would not allow any government to interfere with the agricultural sector to the degree suggested unless the country found itself in a dire emergency.

We came away with the strong feeling that, assuming that we would do justice to the points raised, the scenarios could be important question-raisers for the business community (there are opportunities in all scenarios, but different opportunities in different scenarios) and the technological community (considering the economic and social cost/benefit balance of technological options in all scenarios, not just one).

Following the meetings in Bombay, members of the scenario writers group then attended a series of meeting with experts in Delhi. The team here included Rajeswari Raina and Kees van der Heijden. The organizations involved were the Office of the Principal Scientific Adviser, Office of the Secretary of Agriculture, FICCI (Federation of Indian Chambers of Commerce and Industry) and TERI.

The main message concerned the political aspects of the scenario stories and the limited room for maneuver available to the government ("The government cannot push the small farmers. We won't even think about it.") We were advised not to assume that the future could be engineered. Checks and balances had to be maintained. These comments were particularly relevant in relation to the Mountains scenario but reflected also a wider willingness/capacity to think systemically and in a macro sense about this complex territory.

We found that in reaction to the scenarios, Ministry of Agriculture personnel fully endorsed the overriding importance of scale of operations to drive economies of scale.

Other aspects requiring attention included scenarios for water management; the ability of the system to react to crisis; the feasibility of foreign direct investment (FDI) in agriculture; the political scenarios (Congress or Bhartiya Janta Party (BJP)-centric); role of the States; quality of governance; international integration and security considerations; meaning of societal texture, cohesion, and community responses; link between societal cohesion and economic growth; and more attention for the RNF sector. We also

received a list of suggestions on how to improve the scenarios stories at a more detailed level, which we have worked into the current story lines.

We found that experience in other countries would be of great interest. We were asked whether the World Bank could promote similar scenario exercises in Brazil and China for reference.

At various points during this week, scenario team members deliberated on how to make use of what was being learned. As a result, the team decided to incorporate the following structural features to strengthen the scenario presentation:

- To improve focus and clarity by using the theme of operational consolidation and economies of scale as a more central driver of the overall logic. Specifically, Valley would be the scenario in which operational consolidation did not happen, as a result of which economic growth would slow down as per the existing story line. The other three scenarios would describe three alternative ways in which operational consolidation would come about: through market pressures (Edge), through government dirigisme (Mountains), or through enabling policies and investment climate (Hills). We concluded that this structure was entirely consistent with the existing matrix framework and the axes selected in the scenario workshop. We renamed the axes “inclusive/exclusive” and “interventionist/liberalized,” in this way strengthening the matrix and clarifying the overview.
- To improve the plausibility of the Mountains scenario, we decided to emphasize an early crisis as the driving force of government dirigisme. We therefore would move all climate change and other environmental problems from Valley to Mountains. We also would highlight the water problematique and consider other potential global crises in economics, politics, and health. We found that by bringing together these aspects, we could improve the coherence of this part of the story, generating a feeling of plausibility around the whole scenario.

The team also decided on a series of research topics that justified further attention. These included:

- Underpinning the *quantification* with econometric modeling
- Developing an underlying *Rural Nonfarm (RNF) employment* logic to provide more detail on how this develops in the various scenario stories, and in particular in Hills
- Developing ideas on how the *political shifts* happen in the various scenarios
- Developing a commentary in the scenarios on the contribution of *good and/or bad governance* to the story line.
- Developing data on the dynamic of agricultural reform in *China and Brazil*, against which the scenarios can be compared
- Developing the *water “model”* as underpinning the scenarios.

This concluded this part of the scenario project. The team departed with the intention to consult experts in the six areas specified and to meet again after that to prepare the final draft of the scenario paper.

## Appendix H. Scenario Analysis Workshop

The purpose of the scenario analysis results workshop was to share the outcomes of the analysis inside the Bank as well as to agree on the ways forward under the leadership of ICAR/NAIP.

The scenarios were developed through a series of workshops and interviews in which numerous Bank staff and Indian government officials, and private sector and farmer organizations representatives participated. Based on alternative assumptions for the management of India's economy and the texture of its society, four scenarios were developed: In the Valley, Along the Edge, In the Mountains, and Through the Hills.

<b>Workshop Program: The Future of Agriculture in India MC C1-200, Friday, June 9, 10.00–13.00</b>		
<b>Time</b>	<b>Activity</b>	<b>Speakers</b>
10.00–10.10	Welcome	Chair
10.10–10.25	Introduction to approach	Kees van der Heijden
10.25–11.05	Presentation of scenarios	Suresh Pal (National Center for Agricultural Policy) and Rajeswari Raina (Center for Policy Research)
11.05–11.25	Implications for the Bank and for NAIP	Eija Pehu (ARD) and Willem Janssen (SASAR)
11.25- 11.55	Discussion openers	Dr. Mruthyunjaya (National Director, NAIP) and Connie Bernard (SASAR)
11.55–12.45	Open discussion	
12.45–13.00	Wrap-up and concluding comments	Fayez Omar and Gajanand Pathmanathan
13.00	Close	Chair
13.00	Lunch	

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### **Additional Web Site Resources:**

Centre for Scenario Planning and Future Studies. University of Strathclyde:  
<http://www.gsb.strath.ac.uk/cspfs/scenariosBibliography.asp>

Global Business Network: <http://www.gbn.com/>

Hodgson, T. 2003. Strategic Thinking with Scenarios. MetaBridge:  
<http://www.metabridge.com/assoc/stratscen1b.html>

How to build scenarios: <http://www.wired.com/wired/scenarios/build.html>

Metabridge AB. Scenario Thinking—from shock learning to anticipatory learning:  
<http://www.metabridge.com/CompCausalText/scenThinkingCT.htm>

Garry Peterson—Scenario Planning:  
<http://www.geog.mcgill.ca/faculty/peterson/scenarios.html>

Royal Dutch/Shell: [http://www.shell.com/home/Framework?siteId=royal-enandFC3=/royal-en/html/iwgen/our\\_strategy/scenarios/dir\\_scenarios\\_28022005.html&FC2=/royal-en/html/iwgen/leftnavs/zzz\\_lhn5\\_4\\_0.html](http://www.shell.com/home/Framework?siteId=royal-enandFC3=/royal-en/html/iwgen/our_strategy/scenarios/dir_scenarios_28022005.html&FC2=/royal-en/html/iwgen/leftnavs/zzz_lhn5_4_0.html)

Scenario Planning Resources by Martin Borjesson:  
<http://www.well.com/~mb/scenario/>

ScenarioThinking.org: [http://scenariothinking.org/wiki/index.php/Main\\_Page](http://scenariothinking.org/wiki/index.php/Main_Page)

Strategy Unit Strategic Futures team: <http://www.strategy.gov.uk/downloads/survivalguide/downloads/Scenarios.pdf>

## Endnotes

<sup>1</sup> IDR 2004–05.

<sup>2</sup> Anand Giridharadas.

<sup>3</sup> IDR 2004–05.

<sup>4</sup> “India: Re-energizing the Agricultural Sector,” World Bank, 2005.

<sup>5</sup> IDR 2004–05.

<sup>6</sup> “India’s Water Economy,” World Bank, 2005.

<sup>7</sup> C. Elizabeth, *Economy*, US Council on Foreign Relations.

<sup>8</sup> Interview with *McKinsey Quarterly*.

<sup>9</sup> “Latin America looks leftward again,” *NY Times*, 18 December 2005.

<sup>10</sup> Yogesh C. Deveshwar (CII).

<sup>11</sup> Former Minister Khanduri.

<sup>12</sup> Spencer Kelly, BBC.

<sup>13</sup> Robert Neuwirth.

<sup>14</sup> World Bank data.

<sup>15</sup> A. Waldman, *NY Times*, 7 Dec 2005.

<sup>16</sup> “India: Re-energizing the Agricultural Sector,” World Bank, 2005.

<sup>17</sup> Ramesh Chand in “India’s Agricultural Challenges.”

<sup>18</sup> RIPWIG Reporter, December 2005.