Introduction

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Biotechnology disputes fall into the ever-expanding category of policy disputes characterized by multidimensionality and complexity. By their very nature, these disputes are centered around politically charged issues of allocation of rights to resources, as well as distribution of the benefits and costs of technological change. They typically involve a high degree of scientific uncertainty, long time horizons, and decisionmaking at multiple jurisdictional levels. Such disputes are therefore likely to pose exacting challenges. They involve a wide range of political, economic, social, and scientific considerations. Their satisfactory resolution therefore requires multistakeholder participation in a process of finding and maintaining a dynamic balance between political and technical priorities. In this process civil society can provide much of the expertise and creative thinking that is required to identify needs, generate innovative policy options, and implement agreements while governments retain their preeminent functions of ultimate decisionmaking.

At the beginning of 2003, the International Food Policy Research Institute (IFPRI) and the Food, Agriculture, and Natural Resources Policy Analysis Network (FANRPAN) embarked on a multistakeholder initiative aimed at raising awareness, promoting dialogue, and catalyzing consensus-building mechanisms toward improvement of the institutions and policies governing biotechnology in agriculture and its implications for food security in southern Africa.

The primary motivation for the initiative was the food emergency facing southern Africa. Inadequate, poorly timed, or inappropriate policy responses to small domestic food supplies combined with inadequate human, infrastructural, and organizational capacity in domestic markets to leave millions of people in the region at

risk of starvation. Several years ago, in 1991, similar interactions among poor weather, policy failures, and market failures left millions of southern Africans similarly exposed. But the food emergency of 2002–03 was different from that of 1991–92 in one crucial respect. Thousands of tons of food available to help cover shortages in southern Africa contained unspecified amounts of genetically modified (GM) grain (specifically, *Bacillus thuringiensis* [*Bt*] maize) and were thus considered suspect—or even poisonous—by some governments unsure of the implications of GM food for human health and the environment. Efforts to accommodate that uncertainty pitted erstwhile partners in national and regional food relief against one another in an increasingly heated political environment.

The presence of GM food in the region not only raised political temperatures; it also rendered inordinately more difficult a range of basic tasks and operations in food relief—for example, moving grain through ports and across borders. Perceived risks associated with GM food created an entirely new set of transaction costs. How, for instance, was Malawi to move maize donated by the United States, and thus containing *Bt* maize, through Tanzania in mid-2002 in the absence of complementary biosafety protocols in Tanzania and Malawi, and in the absence of associated testing machinery? Ad hoc measures had to be hammered out, under extreme pressure, on such seemingly mundane issues as how to load grain into rail cars and trucks with minimal "escape," how to cover the loaded cars and trucks, and how long to allow the loaded cars and trucks to sit in given positions. The opportunity cost associated with such logistical hurdles, coupled with the region's general reticence toward potentially life-saving but GM food, elicited intense scrutiny and opprobrium from food donors and relief agencies.

Countries in the region have responded to the debate on genetically modified organisms (GMOs). At a meeting of the Southern African Development Community (SADC) Council of Ministers for Food, Agriculture, and Natural Resources (FANR) on July 5, 2002, in Maputo, Mozambique, it was noted that the lack of a harmonized (regional) position on GMOs was creating serious operational problems in movement of food and nonfood items. Consequently, the council advised member states to engage in bilateral consultations and to explore mechanisms to facilitate movement of humanitarian aid in the form of food that might contain GMOs. The FANR ministers approved the establishment of an advisory committee on biotechnology and biosafety to develop guidelines to safeguard member states against potential risks of GMOs in the areas of trade, food safety, contamination of genetic resources, ethics, and consumer concerns (SADC 2003). The committee has been constituted and is developing the requested guidelines.

More broadly, African leaders have resolved to build regional consensus and strategies to address concerns emerging with advances in modern biotechnology, including genetic engineering. This resolution is manifested in decisions of the

African Union (AU) and the New Partnership for Africa's Development (NEPAD). Specifically, Decision EX.CL/Dec. 26 (III) of the AU Summit calls for the development of a common African position on biotechnology. Those attending the second meeting of the NEPAD Science and Technology Steering Committee decided that the Secretariat of NEPAD and the AU Commission should establish a high-level panel of experts to prepare a comprehensive African strategy and a common position on biotechnology, including applications for agriculture, health, the environment, mining, and manufacturing. This high-level panel will be comprised of eminent experts and opinion leaders who will provide comprehensive advice on current policy issues associated with the ethical, social, regulatory, economic, scientific, environmental, and health aspects of biotechnology, including genetic engineering.

Clearly the content and nature of the debate on how to respond to food crises have been fundamentally and irreversibly altered. So too have been those elements of the debate on how to achieve longer-term agricultural growth and food security through self-sustaining processes of growth fueled by technological advance in agriculture. Many stakeholders believe that in the wake of GM food will come GM agricultural technologies. Enduring uncertainties and controversies over the relevance, efficacy, sustainability, and safety of those technologies appear to render such a progression unpalatable to many.

A key recognition is that the uncertainties and controversies surrounding the role of biotechnology in agricultural development and food security enhancement are not confined to southern Africa but are global in scope. In most cases these uncertainties and controversies appear to have two dimensions. One dimension applies to relatively well-informed stakeholders, the other to relatively uninformed stakeholders. Because the relatively uninformed, either by design or by default, often rely on the relatively well-informed for guidance, understanding the foundations of differences among informed stakeholders is crucial. The problem becomes even more complex when there are grave discrepancies among the relatively well-informed (in the United States and the European Union) on how to proceed and when these stakeholders try to persuade the relatively uninformed to follow their respective lines of reasoning in dealing with this technology. Multistakeholder dialogues help to convey information on all aspects of certain issues and thus contribute to informed and democratic choices.

Conflicting Disciplinary Perspectives: Biophysical Sciences vs. Social Sciences vs. Humanities

Differences among informed stakeholders in the debate on biotechnology in agriculture appear to stem in part from contrasting disciplinary approaches and

methodologies in knowledge generation. The tight, narrow, experiment-based hypothesis-testing approaches in the biophysical sciences contrast with those in the social sciences, which are concerned with looser, broader collective behavioral hypotheses in which both theory and data provide ambiguous guidance on causal relationships. Increasing use of experimentation in the social sciences holds prospects for bridging this particular disciplinary divide. But it reinforces another, namely that between the sciences on the one hand and the humanities on the other. The reductionism that drives model building and hypothesis testing in the sciences is negated in the humanities, where explanation is often built on narrative depictions of dialectic tensions between individual agency and societal determinism.

Consider the following hypothetical exchange among a biophysical scientist, a social scientist, and a scholar from the humanities—say, a molecular geneticist, an economist, and a social historian. Suppose they are discussing the value of research on how resistance to trypanosomosis (a dominant parasitic livestock disease in Africa) might be maintained and enhanced while retaining and reinforcing characteristics of economic importance to farmers, and on how "trypanotolerance" can be imparted to susceptible animals while retaining their other important traits. Historically this research has been field-based, but it is increasingly biotechnology-driven.

> *Molecular geneticist:* This research is extremely valuable to Africa. The techniques we employ are state-of-the art. We can demonstrate that marker-assisted selection of target genes within breeds of disease-tolerant animals, and marker-assisted introgression of target genes from tolerant to susceptible breeds will give rise to productivity gains due to increased capacity to control parasite development and thus limit the onset of anemia. The impacts on livestock health and thus on poverty alleviation in Africa will be enormous.
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> *Economist:* Yes, but how sure are you about those productivity gains? When will they appear, and with how much variability? Remember that farmers are pretty conservative in their breed preferences, particularly those farmers rearing multipurpose animals in mixed crop-livestock production systems, as in much of Africa. Outputs of your research must meet farmers' needs. Those needs are reflected in selections of animals based on traits for which heritability is already known. Not all of those traits are linked to trypanotolerance. The relevance of research on trypanotolerance, and, most important, the likelihood that farmers will actually adopt outputs of that research and realize the potential gains are therefore not at all clear.
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> *Social historian:* The history of the last two centuries is replete with examples of new and revolutionary technologies. That history teaches that

> although many of these inventions did change the world for the better, many did not. Most important, a significant number of these technologies turned out to have both benefits and risks that were wholly unanticipated beforehand. In many cases, some benefits and risks were not discerned until long after the technologies were well entrenched. And all along there were heated arguments for and against this or that technology. If there is a lesson from this, it is that only time and a commitment to openness in identifying and debating both benefits and costs will bring increased understanding of what this kind of technology might mean to Africa's livestock keepers.

Competing Paradigms: Modernism and Postmodernism

The deep epistemological divergences defined by alternative disciplinary perspectives are further accentuated by a more fundamental conceptual (paradigmatic) clash based on differences surrounding the role of science and technology in human development. That clash pits modernists against postmodernists.

Modernism is predicated on beliefs that science and technology yield outcomes that are largely positive and beneficial, and that with scientific and technological advance human progress and development are inevitable and good. For modernists human history is captured in global, culture-neutral theories and patterns ("metanarratives") in which levels and rates of scientific and technological advance are decisive, and in which agency (and thus power) resides primarily with countries and peoples occupying prominent positions on scientific and technological frontiers.

Postmodernism is largely a reaction to the assumed certainty of scientific, or objective, efforts to explain reality. For postmodernists reality is constructed, knowledge is subjective, and thus interpretation is everything. Progress and development are far from being natural outcomes of scientific and technological advance, or of human history. Rather, the only sure outcome of science and technology, and of the passage of time, is change. Concrete experience therefore takes precedence over abstract principles, implying multiple ways of knowing, multiple truths, multiple sources of agency (and power), and a general incredulity toward metanarratives. According to this schema, science and technology have had their chance, but have failed to deliver. Scientists can no longer stand apart from society, unwilling to share the burden of finding solutions to the risks imposed by their inventions.

Consider the following hypothetical exchange between a modernist and a postmodernist on the risks posed by GM technologies.

> *Modernist:* There is far too much woolly, antiscientific thinking flying around. Prove to me that GM technologies pose any more risk than do

traveling in a car or flying in a plane. The risks posed by GM crops are dwarfed by the risks we confront every day, using conventional technologies. Just think about the risk of *not* taking advantage of the benefits promised by GM technology. Isn't that risk pretty clear? Isn't it continued hunger and poverty around the world? Isn't that outcome fully avoidable? Why *not* give Nature a nudge toward greater efficiency? Who are we to deny millions of poor, starving people the opportunity to live better, longer, more rewarding lives? What kinds of leaders would allow their citizens to suffer in that way?

Postmodernist: Not even the greatest scientist on this earth could "prove" that to you. You are enamored with science, yet you misapply it. You are blinded by it. The fact is that genetic engineering can unleash forces more powerful than even atomic energy, with unparalleled potential to harm life as we know it—and for all future generations. We also have a responsibility to these future generations. And those leaders you condemn out of hand—how can you begin to pass judgment on them when you have no idea about the political pressures they are facing? Who are you to impose your priorities and values on them?

Divergent Political Myths: South vs. North

A third divisive force in the debate on biotechnology in agriculture relates to political mythmaking—that is, to differences in myths about the nature of the global political order dominant in the South versus those dominant in the North.

In the South, a significant thread of political mythmaking springs from centuries of technology-driven domination by the North. It is therefore not uncommon to hear sentiments such as the following: "We must be constantly on guard against new forms of exploitation. This biotech thing is just another way for these people to make themselves richer—to make us more dependent on them. And if the Europeans and Americans want to fight over who will get richer from biotechnology, then they should not use us as proxy battle grounds."

In the North, despite sustained efforts toward greater inclusion and participation of "Southern" voices in development policy formulation, elements of the famous "white man's dilemma" persist. And so one might hear statements such as this: "We cannot turn our backs on millions of hungry people. Our future is intimately tied up with theirs. Luckily we have answers to their problems. The challenge we face lies in helping them—in helping their leaders—make the right choices."

Key elements of these clashes in disciplinary, paradigmatic, and political perspectives can be found in almost every public utterance on the role of biotechnology

in agriculture. Not surprisingly, such elements run through and underpin the deepening controversy surrounding the role of GM food in meeting southern Africa's food shortage. They also hold sway in the debate on the role of biotechnology in meeting the region's longer-term agricultural growth and food security goals.

Objectives

There is an urgent need for greater clarity in concepts, facts, and potential actions toward the development of consistent institutions and policies governing biotechnology in southern African agriculture. Specifically, there is a pressing need to increase awareness, promote dialogue, and catalyze consensus-building mechanisms among national and regional stakeholder groups spanning public bodies (including parliamentary and judicial organs), the private sector, and civil society. The objective of the proposed initiative is therefore to facilitate and guide such dialogue and mechanisms.

Anticipated Outputs

The proposed process of policy dialogue and consultation is expected to result in the following set of outputs:

1. increased understanding among key national and regional policymakers and shapers of major developments and applications in agricultural biotechnology in the region, including central gaps and priority constraints;

2. greater awareness of, dialogue about, and consensus among key national and regional policymakers and -shapers on central policy trade-offs associated with GMOs in southern African agriculture;

3. greater awareness of, dialogue about, and consensus among key national and regional policymakers and -shapers on alternative institutional and organizational arrangements governing biotechnology in agriculture, and the potential consequences for national and regional responses to food crises and chronic food insecurity;

4. consensus recommendations (ideally in the form of a resolution or declaration) to enhance the ability of national and regional policies, programs, and regulations governing agricultural biotechnology products to spur agricultural growth and food security while ensuring protection of human health and the environment; and

5. an action plan for investment toward strengthened institutions and policies governing biotechnology in southern African agriculture, including an agenda for regional research, capacity strengthening, and outreach.

Methodology

A number of initiatives with similar objectives and outputs have been undertaken in several parts of the world. Their conceptual foundation would appear to be a method known as technology assessment (TA) developed by the U.S. Congress in the 1970s. TA was a political investment aimed at giving members of Congress access to independent, objective, and competent information on scientific and technical issues. As a result, congressmen were able to appreciate a fuller set of implications of legislative projects. Political choices among viable alternatives were thus better informed. Since then, the concept of TA has evolved further, largely in developed countries outside the United States. Wider stakeholder participation has been incorporated to better integrate varying interests and values. This greater emphasis on participation has reinforced the political dimension of TA and offered potential for democratizing technology through the entry of previously excluded knowledge, needs, experiences, and values. Questions of power, influence, and responsibility now arise explicitly and are confronted (Daele et al. 1997; Australian Museum 1999; Calgary 1999; Nentwich 1999; Goven, 2001). Efforts with some of these features have been attempted in developing countries—for instance, in Africa (Thamy 2002) and in South America (REDBIO 2001).

A New Initiative

The initiative promoted by FANRPAN and IFPRI adapts and applies key elements of the TA approach. Specifically, a carefully managed but highly participatory process is envisaged involving 40 to 50 high-level policymakers, senior representatives of a range of stakeholder agencies, and respected scientific leaders, brought together for an integrated series of roundtable discussions on biotechnology, agriculture, and food security in southern Africa. Three interlinked roundtable gatherings are planned, spread out over several months. A steering committee (SC) was appointed at the first meeting, with membership drawn from among the invitees. The SC will determine format, content, and participation at the meetings, supported by a working group drawn from the convening institutions.

To ensure a nonbiased approach, FANRPAN and IFPRI carefully considered issues of funding and legitimacy when planning the workshop, and took the position that the workshop would be funded only by IFPRI resources, although there were indications that other donors would be willing to fund. A self-selected internationally composed board of trustees governs IFPRI, and the board's composition and governance structures are transparent and public. FANRPAN has a similarly

legitimate governance structure. Dr. John Mugabe was asked to chair the session not only because he is a skilled moderator, but also because his participation and the participation of NEPAD gave the workshop an Africa-wide legitimacy. Once a structure had been established, the group could approach other donors and there would not be a problem with legitimacy.

Roundtable Meetings: Toward Consensus Recommendations

It was decided that the 40 to 50 participants in the roundtable discussions would comprise 30 to 40 stakeholders (including members of the SC), 5 to 10 speakers and technical or subject matter experts, and 5 to 10 organizers. Given these numbers, the aim of the meetings would not be to reach definitive conclusions but rather to foster broad participation and open debate on clearly defined questions under procedurally fair conditions.

The first meeting was crucial. The meeting, which took place on April 24–26, 2003, in Johannesburg, South Africa, drew high-level policymakers, senior representatives of a range of stakeholder agencies, and respected scientific leaders. The meeting was carefully managed and highly participatory, using concepts and practices of multistakeholder processes. Key challenges revolved around ensuring that all relevant parties were involved, accurate scientific information was made available, links with official decisionmaking bodies were promoted, and fairness and efficiency were recognized and embraced as evaluation criteria. Seven background papers were prepared as input into the meeting. Two of these papers—a regional synthesis paper and a paper on concepts and practices of multistakeholder processes—were presented and discussed. The other five papers—which addressed a range of policy issues raised by biotechnology—were not formally presented, but all the authors were present at the meeting and contributed to the discussions. Material from both categories of papers is included in this volume.

A second round of studies will be commissioned based on the outcome of the first meeting. Experts selected by the SC will complete these studies. Results of the second round of studies will be discussed at the second meeting, which again will be two to three days in duration.

A third round of studies will be commissioned based on discussions at the second meeting. Again, experts selected by the SC will complete these studies. The third and final meeting will be devoted to discussing results of the third round of studies, identifying consensus recommendations (that is, a resolution or declaration), and, if relevant, outlining an appropriate follow-on action plan.

Organization and Overview of the Book

The implementation of agricultural biotechnology for food and feed production stimulates considerable controversy the world over, with strongly conflicting views

not only about the technology itself but also about the ethical questions involved. Both aspects are open to interpretation and frequently polarize opinions both within and across countries. Nevertheless, with food security a major world challenge—perhaps the greatest challenge for southern Africa—agricultural biotechnology offers significant potential to alleviate food insufficiency by providing crops targeted to particular environments.

Chapter 1 provides a synthesis of the current status of agricultural biotechnology in southern Africa. The SADC countries vary in the degree to which they have developed and applied biotechnology and the associated systems governing its use; this situation should be exploited to ensure that all countries attain a minimum level of technical and regulatory capacity, especially for monitoring the development and use of genetic modification technologies and their resulting products. It is crucial that countries recognize their interdependence in the context of the current global economy and the need to monitor the movement of materials across borders. Adequately equipping the general public, especially farmers, will go a long way in building self-monitoring mechanisms, which will complement efforts by regulatory authorities to limit the unintended spread of GM products. An informed society will also influence the national research agenda, thereby ensuring that the constrained research and development resources of countries in the region are used to address priority issues.

Chapter 2 presents the key conceptual issues inherent in processes involving multiple stakeholders. Fundamentally, multistakeholder processes aim to address the multidimensional, complex, and intrinsically politically charged issues associated with technological change, such as the allocation of rights to resources and the distribution of costs and benefits. Three examples of such processes are presented to illustrate the central arguments, the social and political context within which policy change is debated and implemented, and the mechanisms available to facilitate discourse and ultimately decisionmaking. Success in reconciling deeply held perspectives and arriving at consensus on future directions depends on the extent to which the following challenges are met: (1) involving relevant parties in discussions and negotiations, (2) expounding accurate scientific information, (3) making significant linkages to official decisionmaking, and (4) adopting fairness and efficiency as evaluation criteria.

Chapter 3 addresses the range of political and ethical issues raised by biotechnology. It may be argued that governments and the scientific community have a duty to ensure the responsible diffusion of technology. Some argue that the current situation requires that technology be introduced immediately to alleviate suffering, while others take a more cautious approach, arguing that the technology should be introduced only after risk-benefit assessments have been carried out and appropriate legislation and regulatory frameworks are in place. The chapter seeks

not to determine an answer but rather to put forward the issues and arguments to facilitate informed decisionmaking for each country.

Chapter 4 focuses on food safety and consumer choice policy, aiming to identify policy options and trade-offs relevant to southern Africa. In general, the genetic, metabolic, and food composition changes of future crops, including crops targeted to the needs of developing countries, are expected to make them more complex than first-generation crops and consequently may pose more complex regulatory questions. The chapter highlights the even greater scientific uncertainties in the southern African region, and proposes a scientific and values-based framework for analyzing policy options and trade-offs. A detailed analysis of U.S. Food and Drug Administration policies is also provided, including the scientific, legal, and political basis underlying them, to familiarize the SADC countries with the official position of the U.S. government as it relates to the United States and (to a large extent) international and bilateral discussions and negotiations.

Chapter 5 examines the role and purpose of biosafety, and the opportunities and challenges that the region faces regarding research and development in genetic engineering (GE) and the importation of GE products and their movement within and across SADC countries. Various positions are presented for exploration, again raising important issues of transboundary movement. The success of a biosafety policy framework will depend on country and regional commitment and cooperation, enabling policy instruments, sustainable human and financial support, and enhanced public understanding and awareness of biosafety issues and regional responses to the Cartegena Protocol.

Chapter 6 focuses on policy issues concerning intellectual property rights (IPR) in agricultural biotechnology, looking at both positive and negative aspects and considering urgent needs, including comprehensive policy guidelines for biotechnology application in southern African countries, IPR policies that define the role of protection in agricultural inventions, capacity development, partnerships among stakeholders to enhance technology transfer to address food security in southern Africa, networking and use of local groups in advocacy and awareness creation, and provision of the funding necessary to achieve these aims.

Chapter 7 addresses trade policy issues. As major food importers, the SADC countries must identify ways to take advantage of cheap GM grain while guarding against negative human health effects. Although there are advantages to the use of biotechnology, it is not a panacea for alleviating the area's food security needs. SADC member countries must act as a cohesive group in areas of mutual interest during negotiations of international agreements.

In the final chapter major lessons and recommendations are drawn, focusing on issues raised in expanding and sustaining multistakeholder processes in Africa, increasing awareness, and designing and implementing policy. Given the self-

contained nature of the preceding chapters, readers interested principally in this set of issues can jump directly to this final chapter.

The proceedings of the April 2003 meeting in Johannesburg are found in Appendix A. The aim is not to provide a blow-by-blow account of the discussions, but rather to highlight the major issues addressed, the central areas of controversy and dispute, the key decisions made, and the most critical outcomes agreed to for future action. A central outcome of the meeting was the selection of the steering committee. The committee was selected so as to reflect the multistakeholder outlook of the dialogue. It was charged with preparing for future dialogues, facilitating linkages with other ongoing activities, and synthesizing and disseminating results of dialogues. Clusters of priority issues identified as a provisional list for the committee to consider for future dialogues fell into the following categories: biosafety policies and frameworks, trade, protection of intellectual property, risk assessment, protection and conservation of biodiversity, public and private sector roles, and policy formulation processes. The program and participant list are found in Appendix B.

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