

AGRICULTURAL BIOTECHNOLOGY AT THE CROSSROADS *AN OVERVIEW*

The National Agricultural Biotechnology Council's Third Annual Meeting was held in cooperation with the University of California Agricultural Issues Center at the end of May, 1991. Focusing on the theme "Agricultural

Biotechnology at the Crossroads," the meeting offered the opportunity to assess the current status and potential future impacts of agricultural biotechnology. The last decade saw many people project agricultural biotechnology's potential to raise productivity—yet that reality has not yet been achieved. Why?

More importantly, what does and should the future hold for creating an environment in which agricultural biotechnology can safely and acceptably be used to enhance productivity in agriculture?

The Third Annual Meeting was organized to address these questions and to:

- promote dialog and understanding among those with differing views;
- establish a common knowledge base and identify areas of disagreement both of fact and perception;
- reach consensus where possible on specific areas needing additional research, education or study;
- develop criteria for evaluating the appropriateness of constraints and incentives currently impeding or promoting the research, commercialization and acceptance of products;
- develop specific recommendations, including policy options.

NABC/JOYCE FELLOWS

ROLEY PIGGOTT

Agricultural Economics
UC Davis—Piggott is studying the cross-market impacts of biotechnology.

JEFFREY C. FEARN

Plant Production
Boyce Thompson Inst.
Fearn is working to characterize sym. *Aspea nodulation mutant*.

NABC/JOYCE GRADUATE FELLOWS

CASSANDRA KLOTZ

Agricultural Economics
UC Davis—Klotz is researching the adoption and diffusion of bovine somatotropin in the California dairy industry.

JOHAN F. SWINNEN

Agricultural Economics
Cornell University
Swinnen is studying the decision-making process in agricultural policy setting by different governments.

The meeting clearly promoted an exchange of views among individuals from diverse backgrounds, including animal, plant and social scientists, administrators, various interest groups (farmers, consumers, environmentalists and animal welfare groups) and entrepreneurs. With each NABC meeting the number and diversity of participants expands.

An even mix of lectures and workshop sessions provided participants with many opportunities to speak, listen and learn. The lectures included visions of agricultural biotechnology's future and assessments of the status quo of various biotechnologies, institutional concerns and socioeconomic issues. Presentations and white papers on four "national issues" provided a common foundation for the four workshops—*herbicide tolerance in crops*, *biological control of pests*, *transgenic animals* and *animal growth promotants*.

MAJOR CURRENTS

Over the course of two and half days, several themes emerged:

Agricultural biotechnology should not be viewed as an end in itself, rather, as a set of tools which might be used to achieve societal goals, whatever those might be. Margaret Mellon's talk, "Biotechnology and the Environmental Vision" (see page 66) precipitated discussions on this area throughout the meeting. The choice and development of agricultural production systems should be made with society's environmental goals in mind.

Keynote speaker Walter Truett Anderson's talk "The Past and Future of Agriculture," (see page 53) focused on the increasing awareness of *how human actions affect the environment*. Concern for the environment and limited global resources, along with an increasing ability to measure and detect these changes, will play a major role in determining acceptable agricultural production decisions in the future, necessitating long-term planning. Many at the meeting felt that *agricultural research funding should be strengthened*. Secure funding compatible with the nature of the research (i.e., commitment of funds for 10-year periods rather than the usual one to three year period) may assist in shifting the national planning horizon to the long term. At the same time, socioeconomic studies designed to reveal societal preference patterns, among other things, also should be funded.

Preserving the "family farm" was often mentioned, particularly in the workshops, as a desirable social goal which is believed to be at risk as agricultural biotechnologies become more widespread. However, the family farm is threatened by other sources more imminent than those posed by agricultural biotechnology—for instance, the high cost of current farm programs.

In order to *remain competitive in world markets*, the United States may need to have a mixture of agricultural technologies available. Developments in other parts of the world may hold serious implications for U.S. agricultural trade, particularly those involving the use of agricultural biotechnologies.

The regulatory systems involved with agricultural biotechnology need to be clearly delineated, available to the public and industry and subject to continual scrutiny. The regulatory system should not stifle basic research and should be protective of human and animal welfare.

VISIONARY PATHWAYS

The keynote speaker, journalist, political scientist and author Walter Truett Anderson suggested that agricultural biotechnology will have an impact comparable to the industrial revolution on today's productivity and life-styles. Urging those with vested interests to engage in open discussions on the potential impact of agricultural biotechnology, he emphasized the need to abandon "satanic" views of biotechnology in favor of examining what uses, both economic and humanitarian, we have for these tools. He reminded us that the history of humankind has continually been one of adapting the environment to suit particular purposes and that it is appropriate to consider the emergence of agricultural biotechnology as but one event in a chronology of discoveries which commenced when humans first started planting grains.

Reiterating stages proposed by NABC Chair Ralph W. F. Hardy in his charge to the meeting, Anderson spoke of our passing through a stage of "active science" (1860s - early 1970s) and a "transitional era" (early 1970s - early 1990s) and now of entering a "product era," characterized by large risks and large rewards, where products based on agricultural biotechnology will be developed. How well has society coped with the evolutionary process? Anderson says it is "a mixed bag," with some logical responses as well as some rather chaotic ones.

Margaret G. Mellon and Jerry Caulder followed Anderson with alternative views on the future of agricultural biotechnology. For Mellon, the Director of the National Biotechnology Policy Center, National Wildlife Federation, agricultural biotechnology should be examined within the context of broader social goals—fundamental goals such as chemical-free agriculture should be high on the agenda for public debate. She presented a vision of prosperous farmers, an abundance of safe and affordable food and a clean environment, suggesting that biotechnology was dampening our progress towards a sustainable agriculture. Mellon suggested that the agri-biotechnology industry was indeed facing a crossroads regarding commercialization, adding that credible regulatory programs are needed now if transgenic products are to reach the marketplace.

Caulder, President and CEO of Mycogen Corporation and Chair of the Industrial Biotechnology Association, enthusiastically spoke of the future of agricultural biotechnology, noting we are on the verge of having an impressive portfolio of products. He cited increased production efficiency as a path that will benefit all consumers, adding that the public needs to be better informed about the associated risks and benefits with new products. Caulder believes that agriculture would be more at risk if biotechnology is abandoned than if biotechnology becomes commonplace. Noting that the 60 day food “surplus” in the world is really an inadequate “reserve,” he called for more funding in the agricultural biotechnology area for basic research to insure that the best scientists are attracted to the area.

ON THE FRONTIERS

Looking at the frontiers of biotechnology, ten speakers attempted to answer the questions, “Where are we now? What factors are, can and should impede progress?”

Covering biological breakthroughs and bottlenecks, Calvin Qualset, the Director of the Genetic Resources Conservation Program at the University of-California-Davis, Winston J. Brill, principal of Winston J. Brill & Associates Consulting and George E. Seidel Jr., an animal physiologist at Colorado State University, all spoke about the “cutting edge” of biotechnology and its potential applications, reminding us of the frustrations and obstacles (biological, financial and regulatory) facing rapid development and release of new agricultural biotechnologies. Time delays associated with field testing are but one example.

The next four speakers broadened the scope of discussion, lending their expertise to examine issues beyond the laboratory—the institutional incentives and impediments to agricultural biotechnology. Robert B. Nicholas, a partner at the Washington law firm of McDermott, Will & Emery and Executive Director, NABC, called for a shorter and less costly regulatory framework based on the products of agricultural biotechnology rather than on the research-discovery process. Guidelines should be clear regarding jurisdiction in the various areas, a system which the public trusts, and should allow for and encourage discussion.

Offering an assessment of the incentives related to property rights, William H. Lesser, an agricultural economist at Cornell University, pointed out that companies have little incentive to invest in research or product development without sufficient reassurance that they can recoup research and development costs through ownership of resulting processes and products. On the other hand, university scientists who conduct much of the research have strong incentives to publish research results and university administrators often want ownership of those discoveries which might have commercial possibilities. Lesser identified several areas where intellectual property laws should be reexamined to “achieve a better balance between private incentive and public well-being”. Examples include the laws regarding the patenting of “pioneering discoveries” and the U.S. “first-to-invent” system. However, he felt that the state of intellectual property protection in the United States is quite extensive and its shortcomings are not principally responsible for the slow commercialization of products.

Roger Salquist, Chair and CEO of Calgene, Inc., followed with a discussion of some of the problems associated with commercialization, identifying the slow nature of the science as a serious “structural impediment”. Lack of funding, from both the private and public sectors, also slows research and development as well as the “convoluted” structure of agriculture resulting from government interventions—although he did not feel that the criticism of regulatory agencies regarding procedures and delays for obtaining field trial approvals is warranted.

The public sector’s role in agricultural biotechnology was addressed by Charles Hess, the Assistant Secretary for Science and Education at the United States Department of Agriculture (USDA), noting that as agribusi-

ness becomes more market-oriented, it is the university and government laboratories that must play an ever increasing role in doing research in biotechnology that may not lead to a definitive product. A strong national commitment to funding for agricultural biotechnology is essential for U.S. competitiveness. It is also in the public's interest to insure that the best and the brightest women and men are attracted to and remain in agricultural science. Taking exception with those who maintain biotechnology would compete with sustainable agriculture, Hess maintained that "biotechnology can help agriculture be sustainable, productive and nutritious."

Economic issues also factor into decisions to develop and use agricultural biotechnologies. Susan Offutt, Chief, Agriculture Branch at the Office of Management and Budget, presented two situations which could have a profound influence on agricultural production decisions. One, farming will become more competitive if the current round of General Agreement on Tariffs and Trades (GATT) negotiations results in a dismantling of domestic farm programs and freer international trade in agricultural products. She anticipates that farmers will respond by diversifying output mixes more than at present. Two, the Clean Water Act is due for re-authorization during the current session of Congress, and attention will focus on farming's contribution to surface water quality degradation. The "price" of using the natural environment will likely rise. In both cases, the choice of inputs and outputs will be weighed more carefully by farmers. The products of biotechnology must show a positive contribution to agriculture if biotechnology is to be accepted.

William Lacy, the Assistant Dean for Research, Pennsylvania State University, presented the fourth criterion as an essential element in evaluating future research and developments in biotechnology—and asked if it should really be considered the "first criterion." He emphasized that biotechnology presents tools to move toward social and economic goals, but also has the potential to increase inequities among groups in the U.S. and between developed and developing countries. Lacy suggested we therefore need the fourth criterion as part of our decision-making process.

The final speaker, Michael Hansen, Project Leader at the Consumers Union, believes that consumers are better informed about developments in agricultural biotechnology than is commonly thought. Noting that the

consumer will and should be demanding information on products from agricultural biotechnology, he said that consumers rank drug companies as the least credible source of information about food quality and safety. Critical of several public agency procedures, Hansen called for more governmental and industrial accountability to the public.

The Workshops: National Issues

Four workshops offered all participants the opportunity to speak, to listen, and to learn. White papers (see page 177) were distributed to workshop registrants prior to the meeting as background material for each workshop and general information on each topic was presented during the meeting in a session on "national issues." A feature common to all workshops was the variety of backgrounds and interests of the participants.

Herbicide tolerance in crops—this workshop addressed the questions, "What is the probable role of herbicide tolerant crops in agricultural production?" and "What are the benefits and risks associated with their use?"

Biological control of pests—this workshop developed strategies for a national effort to make biological control viable for farmers, consumers and agribusiness, as well as safe for the environment.

Transgenic animals—a less developed area, this workshop examined the technical difficulties, achievements and physiological consequences of producing transgenic animals. Associated moral and ethical issues, and health and food safety concerns were raised.

Animal growth promotants—this workshop had the goal of assessing the biological, socioeconomic, health and safety, environmental quality and communications problems associated with the commercialization of animal growth promotants.

Recommendations developed in these workshops can be found on pages 11 -15 and full summaries on pages 27 - 49.

CROSSROADS

While workshops and lectures helped to identify areas of common ground between participants, there were also many areas where consensus was not developed, most noticeably in the area of specific solutions. Many questions were left unanswered. "What is an appropriate level of research

funding? Who should set and monitor ethical standards in relation to research? Who should carry out impact studies? Who should be regulated? How? Who should address international concerns, and how?"

Although many questions remain, this meeting provided the unique opportunity for people from various constituencies with different values and agendas to begin to forge new relationships with groups previously considered opponents, and to begin to understand some of the common, and not-so-common, concerns.

Patricia B. Swan, Interim Provost, Iowa State University, summed up the meeting, identified both roads which have already been crossed, and many which are yet to come. Roads crossed include the definition of agricultural biotechnology as "a set of methods or tools used in living systems" as well as the acceptance that these tools will be used and regulated (see page 16).

Crossroads facing us now include "What will drive the future of agriculture and agricultural biotechnology" and "Will technology, economics or social concerns dominate widespread regulatory concerns; insuring communication among the public, the scientists, the agribusiness sector and the regulators; and the issue of funding." One of the most problematic crossroads identified was "Who gets to decide these questions?" which only serves to emphasize the importance of open forums such as NABC³.

In closing, Swan asked, "How vigorous and fearless was our examination of the issues?," adding that while she had seen some "fairly courageous sifting and winnowing in the last two days," the discussions developed at the meeting should continue. There is a need for more cooperative exploration of the roads ahead.

Agricultural Biotechnology at the Crossroads was a crossing of many visions and values in agricultural biotechnology. With this brief meeting, many points of view have come to the fore, hopefully initiating discussions and understandings and the next steps toward consensus building on the roles of biotechnology in agriculture.