Workshop Report

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The structure of agriculture is a broad notion that pertains to the organization, performance and social implications of the food and fiber system. The term was first employed in the 1970s, primarily by social scientists. But following the publication of *A Time to Choose: A Report on the Structure of Agriculture* by the U.S. Department of Agriculture (USDA) in 1980, the structure of agriculture notion came into more common usage.

While the concept of the structure of agriculture has been employed for about two decades, it can mean many different things. The conventional definition grew out of the U.S. Department of Agriculture's work in the late 1970s (USDA 1980; Economics, Statistics, and Cooperatives Service 1979) and related activities of U.S. Congress (Committee on Agriculture, Nutrition, and Forestry 1980). The traditional farm-structure-oriented use of the phrase "structure of agriculture" involves parameters such as farm numbers, the size distribution of farms, farmland tenure and ownership, labor patterns, enterprise-level and regional specialization of production, the incidence of off-farm employment and so on. In recent years, however, the structure of agriculture has increasingly been understood in broader—essentially food-system—terms. This broader, food-system conception of the structure of agriculture includes the aforementioned farm structure factors, and in addition is concerned with the nature of the linkages across each of the segments of the food and fiber system from research and development, farm input manufacturing, and on-farm production and reproduction to food processing, storage and distribution, marketing, retailing, preparation, consumption, and disposal. As with the traditional conception of the structure of agriculture, the food-systems oriented one is concerned with the performance and other implications of how the system is organized.

Participants' Views

The participants in the NABC 6 workshop on biotechnology and the structure of agriculture generally embraced this broader conception of structure. But while there was general agreement that the future of biotechnology should be considered in terms of this more encompassing definition of the structure of

agriculture, the workshop participants exhibited a wide range of views about the implications of biotechnology for the structure of agriculture.

Many of the workshop participants tended to see the structure of agriculture as necessarily involving social equity as well as economic performance dimensions. In this view, equity aspects of the structure of agriculture (e.g., the implications of new technology for the viability of family farming and for the distribution of land ownership) are critical because of widespread public support for moderate-scale, family-operated farms and for the notion that public researchers have a special responsibility to serve this clientele. Put somewhat differently, there is concern that new technologies may reinforce or accelerate the trend toward the industrialization of the food system. Industrialization of the food system involves: declining self-employment, an increased scale of production, growing specialization and vertical integration, and decreased control by farmers and consumers within the food system.

Other workshop participants, while often sympathetic with equity concerns, tended to see the efficiency, coordination and competitiveness of the food system as being the most important set of criteria for assessing biotechnology and the structure of agriculture. It was noted by several participants that a food system that produces safe food in an efficient manner is the most equitable system from a larger societal standpoint. From this perspective, food system industrialization can often be a mechanism for ensuring that this system produces safe, abundant, inexpensive food.

It was also noted by several observers that many issues about the relationships between biotechnology and agricultural structure are neither unique to biotechnology nor "new." Rapid structural changes in agriculture have occurred continuously since the 19th century, and particularly since the end of World War II (Cochrane 1993). Technology has played a significant role in propelling and shaping these historic structural changes (Committee on Agriculture, Nutrition, and Forestry 1980; Rodefeld et al. 1978). It was generally agreed, however, that the fact that the connections between technologies and the structure of agriculture were ignored in years past does not imply that the implications of biotechnology for agricultural structure can safely be ignored in the 1990s.

Nonetheless, it is clear that the rise of biotechnology has served as a lightning rod for catalyzing interest in and concern about the structure of agriculture on the part of citizens, scientists, research administrators, land-grant universities, federal legislators or U.S. Congress/Canadian Parliament, and society as a whole. As public funds for agricultural research become more scarce, citizens and policymakers are demanding increased accountability for how public research funds are spent. Whether and how public investments in biotechnology help to achieve public and/or community goals such as creating opportunities for self-employment in farming, assisting family farmers, increasing the efficiency of food production and distribution, and ensuring

safety and nutritional quality of the food supply are aspects of accountability of public research that require increased attention.

Presenters ' Views

These differences in viewpoint were amply reflected in *both* of the workshop presentations. Dean Kleckner, President of the American Farm Bureau Federation, spoke with pride about America's family farming heritage and how family farmers are responding to marketplace signals and in the process are becoming more efficient while responding to consumer preferences. But he acknowledged that, as farmers respond to the marketplace when making decisions about what they grow and how they grow it, trends such as larger farms and farm consolidation are occurring. Kleckner suggested, however, that world population growth makes it necessary for American farmers to get even more efficient, to produce more and to rely even more on science-based advances such as those now beginning to come from biotechnology.

William Browne, Professor of Political Science at Central Michigan University, summarized how federal policymakers, especially members of the U.S. Congress, view biotechnology and agriculture. He noted that, on one hand, there is considerable concern that biotechnology will play a role in increasing structural inequities in agriculture—enabling the big producers to get even bigger and putting the smaller producer at a greater disadvantage. But Washington policymakers do not know what they can do to stop the process. Browne stressed that many policymakers also hold out hope that biotechnology can lead to new production methods, such as biopesticides and biofertilizers, that will help resolve conflicts between farmers and environmentalists. For these reasons Browne predicted that most policymakers will be inclined to take a "hands-off" approach with regard to new regulations on the applications of agricultural biotechnology.

IDENTIFICATION OF PRIORITY ISSUES

With this background, the workshop group of nearly 60 members went through the standard process for identifying issues and formulating recommendations. During the first day's workshop process the four breakout groups brought a total of eight priority issues to the attention of the entire group. The eight priority issues are given verbatim (as recorded on sheets by each breakout group) since the way an issue was expressed (e.g., as a question, as an interpretation, as a statement of facts; briefly or at length) can help to convey the meanings intended by the workshop participants. The eight priority issues were:

1. How do we encourage democratic citizen participation in biotechnology? What are the ethical/social issues attached to biotechnology? Who has the responsibility for communicating/acting as a consultant about the issues to people? There is a need for balanced information—when scientists presented

extreme viewpoints on either side of an issue, it alienates the average person and they become discouraged. There is a need for forums—different types and on different issues. Who are the stakeholders in agricultural biotechnology? How do you include all people and how do you weight their representation? There is a need for conflict resolution. How do we deal with a lack of consensus? There is a need for international representation.

2. Who has access to biotechnology? Can access be equalized? Is it fair? Should it be fair? Who decides these things? Who determines what sort of role developing countries play? Should everyone have an equal stake?

3. The degree to which public/consumer concerns are addressed has determined how biotechnology affects the structure of agriculture—always has and always will.

4. Distribution issues: the distribution of individual rights (by social class or wealth among different types of farmers) determines how biotechnology affects agriculture.

5. Will biotechnology contribute to further vertical integration in the food system, and what are the consequences for various sizes and types of producers?

6. Biotechnology will change the definition of "food system" to include a broader set of firms, markets and institutions, e.g., pharmaceutical companies if pigs become "insulin factories." What are the implications of agricultural biotechnologies for producers and firms already in the system?

7. Biotechnology is another technology that is part of the industrialization of the food system. We need to better understand consumer preferences using current social science research results and techniques, and asking new questions. We need a clear system of risk assessment, starting from consumer demand.

8. Assessment of the scale of biotechnology—Does biotechnology speed up food-system industrialization? There is a need to do impact assessments on the scale impacts, economics, and other measures of biotechnology and use this information as the basis for public policy in private and university settings.

The workshop participants then agreed by acclamation that the eight issues could be combined into four major issues, as follows:

• Agriculture, as a part of the food system, must be responsive to the consumer. Is biotechnology impeding or improving the ability of agriculture to be responsive? (Issues 1, 3, and 7 above)

• The responsibility of decisionmakers is to insure the widest possible access to biotechnology so that it does not, itself, come merely to validate or

contribute further to the structural imbalances in the agriculture and food system. (Issues 2 and 4 above)

• Biotechnology will contribute to greater vertical integration in the food system. (Issue 5 above)

• There is a need for evaluation of the long-term impacts of biotechnological innovations in research and product development on the structure of agriculture. (Issues 6 and 8 above)

DEVELOPMENT OF RECOMMENDATIONS

The four breakout groups' deliberations led to a number of recommendations that were ultimately discussed by the entire workshop. After the discussion, each participant in the workshop was asked to assess the recommendations by indicating whether s/he strongly agreed with, was neutral toward or strongly disagreed with each of the recommendations.

For each of the recommendations listed below, there is a notation regarding the nature of the overall vote. A "consensual" recommendation is one for which there are several (6 or more) expressions of strong agreement and few (two or fewer) expressions of strong disagreement. A "neutral" recommendation refers to one for which there were few (<3), if any, expressions of either strong agreement or strong disagreement. A "controversial" recommendation is one for which there were many (> 10) expressions of strong disagreement (though it was the case that each of the two controversial recommendations had 4 or more expressions of strong agreement as well). Finally, recommendations were judged to be "mildly controversial" if there were many (> 15) expressions of strong agreement and a few (3 to 4) expressions of strong disagreement. For each recommendation, the number of persons expressing strong agreement or support (SA) and the number expressing strong disagreement or opposition (SD) is given in parentheses. Note that since there were approximately 60 persons in the workshop, three expressions of strong agreement or strong disagreement with a given recommendation represented the views of about 5 percent of the total group.

RECOMMENDATIONS

Biotechnology and Responsiveness to the Consumer

Agriculture as a part of the food system must be responsive to the consumer. Is biotechnology impeding or improving the ability to be responsive? There were three recommendations for addressing this issue.

There is a need to develop national standards for consistent, clear communications to give balance to information. Standards would give the information credibility, (controversial recommendation [4 SA; 16 SD])

To get information out, use labeling, media and brochures at supermarkets. NABC could be used as a forum for developing guidelines and recommendations.

(controversial recommendation [6 SA; 10 SD])

Information should go out to both consumers and producers, (neutral recommendation [0 SA; 0 SD])

Equity of Access to Biotechnology Innovations

The responsibility of decisionmakers is to insure the widest possible access to biotechnology so that it does not, itself, come merely to validate or contribute further to the structural imbalances in the agriculture and food system.[1] There were four recommendations:

Provisions are needed to take into account the costs incurred in regulatory procedures in the creation of products/processes for minor/local uses, (mildly controversial recommendation [19 SA; 3 SD])

The utility patent system was not designed with plants and animals in mind. There is a need for a new Intellectual Property Rights (IPR) system designed specifically for living organisms, or parts thereof. The new system should balance profit with the public desire to encourage invention in general. (consensual recommendation [23 SA; 0 SD])[1] [2]

There is a need to strengthen public sector research and technology delivery systems. (consensual recommendation [10 SA; 2 SD])

A forum involving all stakeholders needs to be created in which issues of international access are discussed and attempts at resolution are made, (consensual recommendation [12 SA; 0 SD])

Biotechnology and Vertical Integration of the Food System

Biotechnology will contribute to greater vertical integration in the food system. There were four recommendations:

Land-grant universities should be encouraged to form public/private partnerships to encourage the use of biotechnology and to develop products. (consensual recommendation [7 SA; 0 SD])

Land-grant universities should remain neutral in the debate on vertical

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[1] Two persons who were not members of the workshop but who reviewed the first draft of this report strongly expressed the view that the influence of private funding on experiment station research priorities tends to lead to new technologies that are more responsive to the needs of large farmers and agribusiness firms than to smaller operators and rural communities.

[2] Note that while there were no SD responses among workshop members, one meeting participant who reviewed the report expressed very strong disagreement with this recommendation. This person felt that while the current IPR system may require amendments (e.g., to exempt "farmer-saved seed" from patent coverage), these changes can readily be accommodated within the current patent system.

integration in the food system, (consensual recommendation [13 SA; 0 SD])

Land-grant universities should increase public good research for which there is an inadequate profit motive, (consensual recommendation [19 SA; 1 SD])

Land-grant universities should seek a broader support base for public good research, (consensual recommendation [21 SA; 0 SD])

Evaluation of the Long-Term Impacts of Agricultural Biotechnologies

There is a need for evaluation of the long-term impacts of biotechnological innovations in research and product development on the structure of agriculture. There was one overall recommendation for addressing this issue:

Land-grant colleges or equivalent institutions should take the lead in convening broadly representative stakeholders to develop standards and procedures for the long-term sustainability of the agriculture and food system. These principles should be applied to all levels of the system. A wide range of criteria—sustainability, health and safety, social and economic equity—should guide these evaluations, (mildly controversial recommendation [19 SA; 4 SD])

SUMMARY

Strong disagreements usually prevail in discussions about biotechnology and the structure of agriculture, and the range of views represented in the NABC 6 structure of agriculture workshop was particularly broad. Significant differences of opinion remained at the end of the workshop. Nonetheless, workshop participants agreed that the future impacts of biotechnology on the structure of agriculture are an important dimension of whether and how these new agricultural technologies will contribute to the public good, and that the nature of these impacts will be a crucial component of public perceptions of the accountability of the research system. The workshop was particularly successful in its having yielded a number of recommendations involving strong consensus, neutrality, or only mild disagreement.

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