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# NABC 11: An Overview

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The focus of the 1999 NABC meeting was on exploring new developments in agricultural biotechnology and trends toward industrial consolidation in agriculture. The influence of these two major emerging factors, as separate and combined phenomena, were discussed relative to the long-term ability of U.S. and world agriculture to produce adequate, safe, and healthful supplies of food — and to do so in an environmentally acceptable fashion. The potential impacts of these new developments on the production techniques, economics, and sociology of agriculture were discussed by invited speakers and by participants during two sets of workshops. A goal of the workshops was to develop consensus statements regarding the nature of current trends and the implications of these trends on the structure and sustainability of agriculture in North America as well as the rest of the world. (Summaries of workshop discussions are presented in Part Two.)

Three keynote speakers set the stage for lively discussions and deliberations. Per Pinstrup-Andersen, an economist from the World Bank, furnished perspectives on the future in regard to population, food, and agriculture worldwide. He noted that there is enough food produced to feed everyone in the world. However, at present, over 800,000,000 people are food insecure — 180,000,000 of which are preschool children. Clearly, equitable food distribution is a significant challenge. Andersen pointed out that production, too, could become limiting in future years with an extra one billion people in Asian countries by the year 2020 and an 80 percent increase in populations in Sub-Saharan Africa. To feed these people, he predicted a 60 percent increase in food demand and production by 2020. Also projected was a 200 percent increase in demand for meat, driven in part by the increasing wealth in regions like Asia and Southeast Asia. He emphasized that the increase in food supply will not come from adding more land to agricultural production; rather, it must come from increases in

productivity per unit area of land and unit volume of water. He noted that in recent decades, it has been science that has allowed us to feed increasing numbers of people — and it is science that must be used if we are to stay ahead of growing food needs. Importantly, he predicted continued gradual drops in food prices over the next several years, a sobering thought for already hard pressed farmers.

Among emerging issues forecast by Pinstrup-Andersen were the following: a potentially strong backlash (especially in developing countries) to the globalization and consolidation of agricultural businesses; an absolute necessity to use modern science and technology to meet the growing food demands of the world; the likelihood that water may become the limiting factor in food production in the near future; concerns that the scare over food safety and health risks (especially in Europe) resulting from bacterial contaminations and mad cow disease may be lumped together with concerns over genetically modified foods — the consequences of which could be exclusion of people in developing countries from increased food supplies that could be made available through agricultural biotechnology; a need for better governance by corporate entities and governments that would allow a more equitable sharing of resources and rewards with people around the globe; and, finally, an increasing realization that conditions in certain regions of the world are very bad and that we must use all sources of help, including agricultural biotechnology, if the people of those regions are to be reasonably served by the rest of humanity.

John Pierce of DuPont provided a view of things to come in agricultural biotechnology in regard to products and in regard to business implications. He noted that the impacts of biotechnology will be large and are driving major changes in agricultural food production, marketing and distribution. Among the changes are consolidations to capture key information and technologies. Pierce emphasized that the issues and stakes are large. The value of the “food chain” is approximately one trillion dollars/year. Even small changes in the flow of dollars back and forth through the food chain (and involving myriad producers, suppliers, processors, distributors and consumers) can result in major shifts in wealth and well being. While acknowledging major consolidations within the agricultural industry, Pierce saw this as a reflection of previous and similar consolidations in other sectors of the economy. He predicted a slowing of consolidation activities and saw as unlikely the emergence of one or two juggernaut companies that might exert monopolistic power in the marketplace.

Pierce highlighted a few of the new products developed through DuPont's agricultural research programs as examples of the kinds of new products that have emerged, and will emerge, in the broader marketplace. DuPont has produced corn varieties with traits such as grain with twice the normal levels of oil, increased oil quality, higher protein content (and a more nutritious balance of amino acids), better processing qualities, higher phosphorus availability, and

higher resistance to microbes that produce mycotoxins. In soybeans research, DuPont has produced seeds with higher oil content and oils that are more stable during processing and storage. Soybeans aimed for human consumption have been developed that are sweeter and have dramatically reduced quantities of compounds that produce flatulence. He also highlighted several products aimed at increasing food safety for consumers.

In his summary, Pierce pointed to several ways that biotechnology is enhancing and safeguarding our food supplies. These include crops with higher yield potential, genetically modified crops that allow for more environmentally friendly farming practices, feeds for livestock and poultry that are more nutritious and more efficient, and crops that offer improved economic benefits for producers, processors and, ultimately, consumers. Finally, he noted that biotechnology will have direct benefits for consumers through enhanced food safety, availability of new types of functional foods, and development of foods with better nutritional qualities. All of these benefits from products of agricultural biotechnology, Pierce concluded, have important positive implications for the health and well being of people throughout the world as well as the security of their food supplies.

The final keynote speaker was Cornelia Flora of Iowa State University. She provided an overview of trends in social and economic conditions that are affecting the degree to which the products of agricultural biotechnology are accepted. Flora noted a dramatic change from a situation in history in which there was a close relationship between the producer of food and the end-user to the present situation in which the food system is a complex array of interactions between many stakeholders. She discussed six key trends she saw as affecting the social arena and the markets for the products of agricultural biotechnology: globalization, industrialization, decentralization, privatization, polarization, and engagement. Following this, Flora moved to a discussion of the factors that influence acceptance or rejection of new technologies by both producers and end-users. She noted that there are both positive and negative forces affecting acceptance or rejection of technology by an individual or an organization. The factors that affect this process are: internalization of the technology to determine if it does or does not fit with innate values; social pressure that motivates one to be seen as progressive by utilizing a new technology or scoffed at for embracing an unproven method or product; economics that indicate to a person or company a financial benefit or financial peril; and, finally, force that may be exerted by governments or organizations to cause people to adopt or reject a particular new technology. Flora emphasized that for any new technology to be accepted, there must be a trust built between producers, suppliers, and end-users. To facilitate the building of trust there must be transparent mechanisms put in place that build confidence on all sides. Finally, Flora cautioned that privileging any form of capital (financial, human, natural resource, etc.) over another can deplete all forms of capital in the long run.

To provide the conference with added perspective, Stan Johnson of Iowa State University provided an overview of policy and technology factors involved in industrial consolidation. He outlined the sources of value gained by companies through industrial consolidation, such as organizational efficiencies, strategic competitiveness, complementarity, strategic substitutes or coordination, and potential monopoly powers. He then discussed the implications of what he called “incomplete contracts.” That is, those portions of agreements that are not fully spelled out, but which can have significant impact on one or both of the parties involved. This was followed by a description of the advantages of mergers or acquisitions versus strategic partnerships.

In summarizing what he saw as trends in industrial consolidation and its consequences, Johnson highlighted three points. First, he saw industrial consolidation continuing into the foreseeable future. Second, as a result of the consolidation, he predicted that multinational companies would have and exert more and more power. Third, he saw a decrease in funding for public research and a consequent decrease in the rate of scientific discovery and technology development in agriculture. The present flurry of new discovery and innovation in agricultural biotechnology may be strongly impeded by industrial consolidation and, in the long term, slow the development of new products that benefit people around the world. With more private control of research, Johnson concluded that the levels and direction of research in the U.S. would, in the future, be dictated in large part by company profit levels. Thus, the role of public sector investment in research may be relegated to providing the “energy” that is necessary to drive innovation in the face of lethargy on the part of the heavily consolidated industrial sector. This will require a new level of public and private sector coordination in developed countries. Johnson viewed under-developed countries as being poorly equipped to participate in this coordination — a situation with clear-cut negative implications in regard to growing differences between the have and have-not nations of the world.

James Tobin of Monsanto provided an industry perspective on agricultural biotechnology. He began by emphasizing the immense challenges that face agriculture and agricultural biotechnology in the coming years. These include the daunting task of feeding two billion more people in the next thirty years, the challenge of farming with more respect for the environment and the imperative to improve the quality and nutrition provided by crops in the future. Agricultural biotechnology was seen by Tobin as facing numerous challenges: complex patent issues; regulatory systems still in development worldwide; consumer/political acceptance in Europe; intense competition; and rapid changes in the technology. Tobin then provided several examples of Monsanto products in the market or on their way to market. These included Round-Up Ready® soybeans, corn, wheat and rice, Bt corn and cotton, wheat that is resistant to head scab, corn with higher oil content, and canola oil with higher beta-carotene content. The latter was donated by Monsanto to the Agency for

International Development (AID) to help combat vitamin A deficiencies in developing countries. As a final example, Tobin pointed to the growing use of genetically engineered plants as “factories” for production of high-value pharmaceuticals and specialty chemicals.

In regard to benefits for farmers, Tobin suggested that in the future farmers will: Have a broader range of crops to plant; see a significant increase in information and crop production options; benefit from a shift in pest management from choices of chemicals to a choice of seeds; have at their command more risk management tools; experience a shift to more contract growing of value-added crops that will require identity preservation; and witness intensification of global competitiveness both in the farming and supply sectors. Likewise, he saw a powerful effect of genomics in greatly speeding the movement of new genetic traits from the laboratory and breeding fields into the hands of farmers. Finally, he envisioned agricultural biotechnology as fostering the creation and use of new systems in both developed and developing countries to successfully address the economic and environmental challenges of providing a safe and secure food supply for the people of the earth.

Fred Kirschenmann is an organic farmer and owner of Kirschenmann Family Farms, Inc. He asked the question: What kind of future can farmers expect and what kind should they create? Kirschenmann stated that the promise of agricultural biotechnology, according to some, is threefold: The technology will increase profitability; the technology will benefit pest control in an environmentally benign way; and the technology will help feed the world. Kirschenmann saw serious flaws in all three assumptions. In regard to the latter point, he posited that hunger is not so much a problem of food supply as it is a problem of food distribution. Furthermore, agriculture biotechnology will not solve other problems associated with overcrowding such as disease, political unrest, etc. As far as technology helping with pest management, Kirschenmann noted that “therapeutic intervention” with pesticides is being questioned because such systems are inherently short lived. He encouraged adoption of a restructured approach in which natural pest management systems are employed. Finally, he questioned whether farmers will benefit from agricultural biotechnology. With the push toward consolidation of the agriculture industry into perhaps as few as four “food clusters” that will control food production, processing, and distribution, Kirschenmann saw widespread adoption of contract farming and control of farmers through contracts. In his judgment, “biotechnology gives new meaning to the term tenant farmer”. He pointed to the plight of farmers in the broiler industry as a paradigm that may beset many farmers in other sectors of agriculture in the future.

Kirschenmann saw as almost inevitable the emergence of “industrial farming” controlled directly or indirectly by a few giant multinational companies. However, he predicted that such a system is likely to fail in the long run. This is due to three interrelated factors: the farms will need to be very large, highly

centralized and highly specialized in the production of one or two crops; the approach to production problems will be a direct, external counter force rather than a restructuring of the farming system to deal with the problems; and, finally, genetic engineering will lead to fewer crop species and decreased biodiversity. The increased vulnerability of this system will ultimately lead to its failure with dire consequences for those people that depend on the industrial farming system for their food. Kirschenmann pleaded for recognition of these facts and the commitment of more public research funds to serve the needs of those pursuing alternate agriculture as a more dependable and secure means of producing food.

Dennis Avery of the Hudson Institute delivered a provocative talk in which he “surrendered” to those who oppose the use of new technologies, such as agricultural biotechnology, and favor the return to more natural and environmentally friendly methods of food production. He declared that the environmentalists and anti-technology groups were winning almost every confrontation by appealing to urban audiences in developed countries who are well fed and have been taught to oppose anything that is not natural, organic or that uses newly developed, not fully tested technologies. He cautioned such people, however, that there may be important consequences to their choices and demands. In particular, he pointed to the fact that there are ever mounting world populations — and that there is an increasing wealth of those populations. As a consequence, Avery predicts there surely will be an enormous increase in demand for more food and higher-quality food. If there is not increased productivity through biotechnology and other developments in agriculture, then, surely, there will have to be more land brought into play for agricultural food production. The only major source of new land presently available are the very lands that are richest in wildlife habit — the plunder of which will have dire consequences for ecosystems around the globe.

For those who blame energy-demanding agricultural practices for causing environmental damage, Avery explains that it is far easier, and less environmentally damaging, to find new sources of energy than it is to find new, productive agricultural lands. Finally, for those concerned about the plight of rural communities in the U.S., Avery suggested that the new crops and products that can be developed through biotechnology offer rural citizens new opportunities for businesses and livelihoods that can allow a reasonable number of communities to remain viable and even prosper.

A markedly different perspective of the future of rural communities and farming was provided by Chuck Hassebrook of the Center for Rural Affairs. Hassebrook contended that family farms and sustainable systems can feed the world into the foreseeable future. He stressed that how well this goal is achieved is dependent on how society invests in the research that is necessary to allow family farming and sustainable agriculture to succeed. Hassebrook pointed to three principals that must be embraced if we are to provide a secure

and sustainable food supply for the people of the world. First, we must increase agricultural production. However, he cautioned that American farmers should not rely on exports to fulfill their needs for larger markets. Second, we must develop agricultural systems that create genuine economic opportunities in agricultural communities here and in developing nations. He noted that it is poverty, per se, that is the primary cause of starvation in the world. There is food available, but poor people in developing countries cannot afford it. Third, if our goal is to prevent hunger, we must develop agricultural systems that are resilient (i.e., cropping systems that are sustainable and crops that can withstand major challenges such as water availability, severe changes in climate, outbreaks of new diseases, etc.). Hassebrook asserted that as consolidation in the agricultural industry increases and there is a move to less diversity and larger concentrations of single species in a given area, the system of food production will become significantly more “brittle” (i.e, less resilient to rapid changes).

Hassebrook posed the question: What must we do to move to more sustainable and resilient systems in agricultural production? He offered two answers. First, he contended that we must secure the capacity for public good research. Profit-driven research will never meet the needs for all crops and for all people in either the developing world or in the U.S. He underscored this by saying that society must not allow the research agenda of public institutions to be set by profit opportunities (e.g., royalties, contracts, etc.). Second, Hassebrook urged that we change the focus of public university research to bring it on track with “public good” needs of people. He indicated that to-date, university research has focused largely on development of new products for the supply side of agriculture. New emphasis must be given to providing farmers with new production and management tools that can help them make a more reasonable return on their investments and their labors. Hassebrook concluded by saying the no social system can survive that does not consider all the people who have a stake in the system.

William Heffernan of the University of Missouri began his talk with the prediction that while agricultural biotechnology may have great promise for improving our means of feeding the hungry people of the world, the system into which its results must be funneled may prevent the promise from being fulfilled. He stated that it is social systems (largely the political and economic systems of the developed world) that will dictate how agricultural biotechnology is to be used. In the economic arena, Heffernan pointed to the rapid shift from a largely decentralized food production system in the past to a present day system of highly centralized control of food processing and distribution. He emphasized that in most sectors of the food processing industry, only four or fewer companies control more that 50 percent of the volume in those sectors. He noted also that most of the very large companies, such as Cargil, ConAgra, and ADM, are expanding their market share and control through company

acquisitions, mergers, joint ventures, and strategic alliances. More and more, these companies are seen by Heffernan as attempting to control food production from beginning to end (i.e., through control of genes, seeds, farm production via contracts, processing, and distribution to the market shelf). The ability of biotechnology researchers to discover and patent genes, and the ability of companies to “own” these genes and associated germplasm, was viewed by Heffernan as catalyzing the rapid move toward industrial consolidation in the agricultural sector.

Heffernan stated that the rapid move of agriculture toward industrialization is much the same as that which occurred in other sectors of the economy several years ago. The goal of an industrialized system that is highly consolidated is to concentrate on, and respond to, the short-term pressures of making a profit for its shareholders. In such a system, small firms and producers become marginalized according to Heffernan. In all of this he sees government, de facto, turning over responsibility for sustainable and secure food supplies to the private sector — a circumstance with potentially devastating consequences for U.S. farmers and for the poor and hungry people of the world. He urged greater investment in sociological research on food distribution systems as a key to solving the vexing problems of today and the future. In closing, Heffernan asked two questions: Is it too much to ask to slow the process of development of agricultural biotechnology and engage public debate as to the costs and benefits according to the traditions of a democratic society? Can we slow the process until we can engage other institutions in society?

Susan Offutt of the USDA/Economic Research Service focused on the role of the consumer in driving much of what is happening in agricultural biotechnology and its associated industries. She stated that understanding consumer demand is key to understanding the move from commodity agriculture to product-driven business. According to Offutt, in mature food markets such as the U.S. and Europe, people have more than an adequate quantity of food. In such a situation, their buying patterns are dictated by the foods they learn to like and the characteristics of the product (such as flavor, convenience of preparation, and price). Thus, Offutt pointed out, for a company to gain a larger share of the market in this situation, it must rely on “product differentiation.” To achieve this, companies must be in a position to control inputs, food production procedures, processing, packaging and distribution — all of which are easier in a fully integrated or coordinated industrial system. According to Offutt, biotechnology can play a key role in this scenario by providing farmers and food companies with plants and animals with improved characteristics that allow production of new or more highly differentiated foods for the consumer.

How do farmers fare in all of this? Offutt said that if farmers wish to increase income, the real question is how they increase return on farm labor. The answer that successful farmers have found, according to Offutt, is to increase the



quality of labor. That is, to increase the quality of decision-making and management skills. Toward that end, Offutt encouraged farmers to realize that while many in the world are going hungry, there are others in the developing countries whose wealth is increasing steadily. As the income of these people rises, they will begin to spend more on food — especially food with high quality protein. This growing market offers opportunities for those who anticipate the increasing demand and position themselves to take advantage of it. In conclusion, Offutt cautioned meeting participants not to demonize or lionize any one factor that may be at play in the free market system, but urged everyone to understand “causality” as the driving force in the marketplace.

The role of the federal government programs and policies in agricultural biotechnology was the topic of the talk by Cliff Gabriel of the White House Office of Science and Technology Policy. He started by pointing out the key role of Land Grant Institutions in performing research that has made invaluable contributions to the nation. However, the partnership between the government and universities has been subject to growing stress in recent years. This, Gabriel observed, led recently to a new set of principles for the partnership that recognizes that research is an investment in the future, that the linkage between research and education is vital, that peer review is essential to excellence in research, and that research must be conducted with integrity. He then provided an overview of how the government sets research priorities in agriculture and how it supports a diversity of research mechanisms such as intramural research, competitive grants, formula funds, and special grants.

Gabriel then turned his attention to how the government is involved in conflict resolution, especially in regard to agricultural biotechnology. The first principle enunciated was that the marketplace should resolve most issues and that laws and regulations, special programs, and stakeholder input should be pursued only when necessary. He then discussed a list of ongoing conflicts that the government is helping to resolve. These included organic agriculture versus biotechnology, human and environment health versus chemical pesticides, labeling of foods for health and safety purposes versus the consumer’s right to know, and reproductive cloning versus therapeutic cloning versus embryo research. Gabriel concluded by saying that we need to look carefully at our underlying national goals for the economy, health and the environment, and make sure agriculture is contributing in a positive way to achieving these goals. He stressed that the role of government is to help pave the way for technical winners in a manner that is consistent with these goals.

The wrap-up speaker for NABC11 was Paul Raeburn of *Business Week*. The title of his presentation was, “Where do we go from here?: A view from Times Square.” Raeburn chose to emphasize the fact that his view was that of someone, like most others from urban areas, whose day to day pursuit of information does not include information of the farm scene. He noted that it is this lack of information and understanding that would make the topic of NABC11 foreign

to most city dwellers. The only time New Yorkers pay attention to food prices is when there is a freeze in Florida and the price of orange juice goes up. However, the urban audience is very much in tune with the need for a healthy and safe diet. They are also mindful of the need to protect the environment. With this background, Raeburn emphasized that the bulk of urban dwellers were not at all aware that a high percentage of crops in America are now genetically engineered and that some of the foods they have been eating are derived from genetically modified plants. He did not know how these people will react when they finally realize this fact. However, he suspects that they won't be happy about being "fooled" in regard to their food. He suggested that it might be wise if the issue of labeling genetically modified foods was faced quickly and effectively.

One of the major concerns expressed by Raeburn was the need to preserve biodiversity. He noted that agriculture is quickly moving into an era when more and more pressure will be placed on land, water, and other natural resources to sustain the growing food demands of a growing world population. He encouraged there not only be preservation of wildlife habitats and forest, but that there also be strong support for the preservation of a wide variety of germplasms from which our present day crops plants have been derived. The increasing move toward monoculture fostered by developments in biotechnology and industrial consolidation could spell disaster to society if there is not a viable set of appropriate germplasms to fall back on.

Raeburn repeated that major challenges lie ahead for agricultural biotechnology. It has a mandate to help feed the world, but at the same time must face up to people in developed countries who have a fear of new technologies — especially those technologies that are perceived as potentially affecting the safety of their food supply. He also warned that perceived threats to the environment must be successfully addressed. The monarch butterfly could become as much of a symbol for those opposing agricultural biotechnology as the bald eagle was a rallying symbol for those supporting Rachel Carlson's fight against environmentally harmful chemical pesticides. Raeburn concluded by saying that there is a great need to educate people regarding agricultural biotechnology if this technology is to fulfill its potential in helping to provide people with a more secure and sustainable food supply.