Biotechnology Advisory Panel

Second Report

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THE Keystone CENTER

1628 Sts. John Road
Keystone, Colorado 80435
Phone: 970.513.5800
Fax: 970.262.0152

www.keystone.org

1020 16th Street, N.W.
Second Floor
Washington, D.C. 20036
Phone: 202.452.1590
Fax: 202.452.1138

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Background

Biotechnology Advisory Panel

On September 22, 1999 Chad Holliday—Chairman and Chief Executive Officer for DuPont—announced his company's intention to form an independent panel "to guide our actions, help us create positions on important issues, and guide and challenge us in the development, testing and commercialization of new products based on biotechnology." Since that time, a prestigious Panel of individuals from around the world has been convened. The group has met biannually to exchange information and opinions on various aspects of biotechnology.

Panel Membership

The Biotechnology Advisory Panel members represent a diversity of international interests, academic and vocational expertise, and cultural backgrounds. All are cautiously optimistic about the potential good biotechnology can do as the world struggles with how to deliver safe and nutritious food to the world's populations while decreasing the use of chemical input. At the same time, the Panel members are well aware of the unknowns and potential downsides associated with biotechnology. It is part of their role to raise such issues, and push DuPont's thinking on these issues. Panel members believe companies and countries need to work cooperatively in an effort toward sustainable development and with a strong commitment for core values that guide use of new technology and that it is important to draw on a diversity of experience in order to navigate beyond historical mistakes and to properly address future problems. The Panel asserts that this type of interactive dialogue can have value for the multi-national corporation as well as for the regions of the world represented on the Biotechnology Advisory Panel.

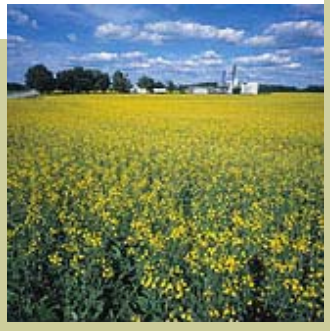
The Panel comprises 5-8 individuals who serve for a period of time and then rotate off the Panel to allow for new perspectives to have a seat at the table. Panel members' travel expenses are covered and members are offered a small honorarium for the time they spend in meetings.

Purpose of the Report

The intention of this report is to provide a second assessment of the Panel's interaction with DuPont and their level of satisfaction in participating on the Advisory Panel. It has been approved by all Panel members.

This report is divided into three sections:

- Background information regarding the Panel and current membership;
- The Panel's assessment regarding their participation on DuPont's Biotechnology Advisory Panel— this assessment represents the consensus view of the Panel members who have attended meetings between January 2002-January 2004. Since that time, two additional members have rotated onto the Panel. While they have had fewer interactions with DuPont, Sven Thormahlen and Marcelo de Andrade strongly support the assessment outlined.
- Individual perspectives from each of the Panel members regarding their particular areas of interest and expertise as it relates to biotechnology.



Panel Members

Dr. Arthur Caplan (Panel member from February 2000–October 2004)

Emanuel and Robert Hart Chair for Bioethics and Director of the Center for Bioethics at the University of Pennsylvania. Dr. Caplan is an internationally known bioethicist. Additional information about Dr. Caplan is available on the Center for Bioethics website.

Professor Chunming Chen (Panel member from January 2002–Present)

Founding President of the Chinese Center for Disease Control and Prevention, previously known as the Academy of Preventive Medicine. She is currently the senior advisor of the institution and a professor of nutrition. She is also special advisor for international collaboration, Union School of Public Health, Beijing Union Medical University (PUMC), chairperson of the advisory committee on public health, Chinese Ministry of Health, Advisor of the Chinese State Consultative Committee on Food and Nutrition, a member of the World Health Organization's Expert Advisory Panel on Nutrition, and a member of the United Nation's Food and Agriculture Organization Expert Panel on Ethics of Food and Agriculture. Professor Chen is an internationally recognized expert in nutrition.

Dr. Marcelo C. De Andrade (Panel member from November 2004–Present)

Dr. de Andrade is the founder and chairperson of Pro-Natura, the first international nongovernmental organization based in the Southern Hemisphere to specialize in sustainable development. An ardent advocate for sustainable community development, Dr. de Andrade has dedicated his career to biodiversity conservation, environmental preservation and restoration and improving the quality of life for societies around the globe. A testament to his dedication and vision, de Andrade was the 1997 recipient of the George and Cynthia Mitchell International Prize for Sustainable Development, which is equivalent to the Nobel Prize for the sustainable development area. This was the first time in the history of this mark of distinction that the Mitchell prize and related cash award were both given to just one individual. He is currently also a member of CONCEC, a private-sector advisory panel for the Brazilian government; Counterpart International and Earth Restoration Corps.

Dr. Pablo B. Eyzaguirre (Panel member from December 2002–Present)

Dr. Eyzaguirre, a specialist in social and ecological anthropology, tropical farming systems, and agrarian institutions, is a senior scientist for anthropology and socio-economics in the Genetic Resources Science and Technology group of the International Plant Genetic Resources Institute (IPGRI), which is based in Rome. Previously he worked as senior officer in the International Service for National Agricultural Research (ISNAR) in The Hague, where he managed a global project on research institutions for agricultural development and natural resource management in 50 small developing countries. He also has conducted intensive field research in west and central Africa.

Father Kevin T. FitzGerald, SJ (Panel member from November 2003–Present)

Father FitzGerald is internationally-known and sought after for his expertise in human genetic engineering, cloning and stem cell research. A Research Associate Professor in the Department of Oncology at Georgetown University Medical Center, and the Dr. David Lauler Chair in Catholic Health Care Ethics, his research interests include investigation of abnormal gene regulation in cancer and ethical issues in genetics. For the past 10 years, FitzGerald has served as an ethics consultant for the National Society of Genetic Counselors and is also an ethics consultant to the March of Dimes and the Unites States Catholic Conference. He is also a member of the American Association for the Advancement of Science Program on Dialogue on Science, Ethics and Religion.

Ms. Carol Tucker Foreman (Panel member from December 2002–Present)

Carol Tucker Foreman is a well-known and respected consumer advocate and a distinguished fellow and director of the Consumer Federation of America's Food Policy Institute. She has had a major impact on diet and health in the United States over the last 25 years. She served as CFA executive director from 1973-77 and returned to the organization in March 1999. As assistant secretary for food and consumer services in the U.S. Department of Agriculture from 1977 to 1981, she oversaw the development of the U.S. government's first Dietary Guidelines for Americans and also had responsibility for the nation's food assistance programs, food stamps, school lunch and WIC—the Women, Infants and Children Supplemental Feeding Program—as well as meat, poultry and egg inspection and the food grading system.

Dr. V. Prakash (Panel member from December 2002–Present)

Dr. Prakash is internationally known for his work in sustainable food and nutrition security and is director of the Central Food Technological Research Institute (CFTRI) in Mysore, India. CFTRI is highly regarded as a networking R&D Institute in Food Science & Technology, which works to build sustainability into the technologies of post-harvest agricultural practices of large producers and growers as well as small entrepreneurs. He is a fellow of the Indian Academy of Sciences, the National Academy of Agricultural Sciences, the Association of Food Scientists and Technologists in India, and the International Union of Food Science and Technology. As a scientist in the area of biotechnology, Dr. Prakash has won a large number of awards and is a member of several international committees. On June 30, 2004 the President of India presented Dr. Prakash with one of the highest civilian awards "Padmashree" for his work.

Dr. Sven Thormahlen (Panel member from March 2004–Present)

Vice President of the Research and Development Organization of the Danone Group, a world leading company in the field of dairy products, biscuits and mineral water. Dr. Thormahlen has held a variety of positions within the Research and Development organizations of leading healthcare and consumer goods companies throughout France, Germany and the United States. His experience covers product research, product development, clinical studies and quality assurance.

Panel members rotate off after a period of time in order to bring in new perspectives. Panel Alumni who have contributed important perspectives to DuPont include:

Dr. Andre Capron, held the position of Director of the Institut Pasteur de Lille in France, during his tenure on the Panel.

Jonathan Lash, President of World Resources Institute (WRI), United States

Tiahoga Ruge, held the position of Director General of the Center for Education and Training for Sustainable Development, Mexico, during her tenure on the Panel.

Dr. Braulio Fereira De Souza Dias, held the position of Director of Biodiversity Conservation/ Secretary of Biodiversity and Forests, Ministry of the Environment, Brazil, during his tenure on the Panel.

Dr. R.K. Pachauri, held the position of Director-General Tata Energy Research Institute (TERI), India during his tenure on the Panel.

Dr. Florence M. Wambugu (Panel member from February 2000–October 2004)

Dr. Florence M. Wambugu, the founder and Chief Executive Officer of Africa Harvest Biotech Foundation International (AHBFI), which fights hunger, malnutrition and poverty in Africa and the developing world by assisting and equipping farmers to produce an abundant sustainable harvest of healthy, nutritious crops. Dr. Wambugu has over 25 of years experience working in the field of agriculture in Africa and has developed models that combine the use of science & technology and value chain strategy to enable small holder farmers to increase their productivity and access prime markets. Dr. Wambugu is an internationally renowned scientist for providing leadership in public-private sector partnership building that has resulted in down stream impact of marginalized communities in Africa. Additional information about her is available on the AHBFI website.

Biotechnology Advisory Panel Assessment

Observations from the Panel members based on interaction with DuPont

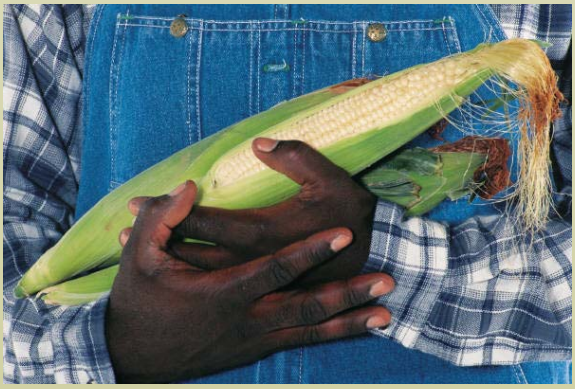
The Panel believes DuPont has an increased appreciation for how diverse cultures, countries, and peoples view biotechnology and the associated risks and benefits differently. We have particularly seen increased understanding around socio-cultural issues at the DuPont corporate level, and members look forward to increased interaction at the business level, particularly with the Agriculture and Nutrition Platform.

We wish to recognize that we are at a critical moment in the life of the Panel. In this next year, all of the original members will have rotated off of the Panel. Additionally, Paul Tebo, Vice President for Safety, Environment, and Health and John Himes, Senior Vice President for Corporate Strategy, who were true champions of public participation and input for DuPont, have both retired. These charter members and champions have institutionalized the Panel in a way that allows it to continue to grow and evolve with a changing environment, even beyond their own personal participation. We hope that we can use this transitional time to revisit how the Panel can continue to most effectively contribute to the company's thinking at the platform and corporate level.

In addition, we think that the rotation of Panel members presents two opportunities for DuPont. First, we would encourage DuPont to stay strategically connected with members who have rotated off the Panel. We are happy to help the company think through a strategy to stay connected to alumni in a way that does not prove to be too burdensome. Furthermore, we recognize and commend the job DuPont has done in identifying new voices and perspectives to bring to the Panel as the biotechnology debate evolves. We would be pleased to provide recommendations on additional perspectives that should be considered in the future.

Actions DuPont has taken in this area

Consideration of scientific, societal, ethical, environmental, and cultural impacts while designing and commercializing products.



We have urged DuPont to consider, at the earliest points in the research and development process, the non-scientific factors that may affect a potential product or technology's success. This assessment should occur before a great deal of intellectual and financial investment has been made in a particular product or technology that may fail based on factors other than scientific viability. The Panel has recommended that DuPont bring in external perspectives that can shed light on the potential questions or concerns during these early phases. Additionally, we recommend that there be good monitoring to ensure that DuPont stays consistent with its acknowledged obligations to society while maintaining its success in the marketplace.

DuPont has worked closely with the Panel as the company developed a comprehensive research stewardship approach that has a number of "gateways"—a diversity of questions are asked regarding whether the societal, political, and cultural impacts would make investing in a particular technology or product line unwise. In some cases this approach may indicate to DuPont that it should anticipate a great deal of work and investment to address some of the non-scientific factors. The Panel feels this approach is proactive and progressive, particularly given DuPont's identity as a "science company."

Formation of DuPont's Bioethical Principles and Positions.

DuPont representatives participated in some discussions with the University of Pennsylvania's Center for Bioethics regarding the potential of an industry-wide code of ethics. Based on that experience, DuPont chose to develop their own bioethical principles and positions. The principles and positions were developed over nearly a year and in close coordination with the Panel members. At every turn, the Panel pushed DuPont to stretch themselves and what commitments the company would make. The result is a set of eight principles that can be found on the website at http://www.dupont.com/biotech/difference/principles.html. In our mind, the development of these principles ranks highly among DuPont's leadership actions. The Panel continues to urge DuPont to use its influence among industry colleagues to adopt these principles, or to draft their own.

Development of a pilot program that advances the needs of the poor through biotechnology.

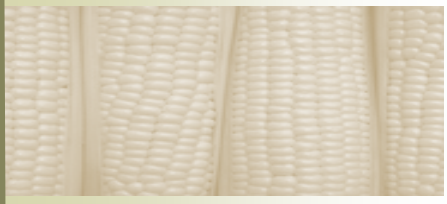
With the distribution of the first Biotechnology Advisory Panel report, it was suggested that the Panel have a joint session with DuPont's Board of Directors. The Panel members interacted with the Board and discussed issues they felt were most pressing regarding biotechnology. Specifically, Panel members urged DuPont to be more aggressive in pursuing pilot projects that work to improve the lives of the poor through biotechnology. As a result of this conversation, the Board moved to create the Cura Village Community Project in partnership with Africa Harvest. This project will provide farmers with disease and insect-free tissue culture banana planting materials to increase yields and productivity. The project also includes hybrid maize demonstration plots to increase farmer knowledge and production of this staple food crop.

Investment in biodiversity through the Global Crop Diversity Trust.

The Panel is optimistic about the potential of private sector applications of biotechnology to contribute to public goods and social benefits, and has urged DuPont to actively contribute to such efforts that may lead to better health and nutrition, environmental sustainability, and capacity building in developing countries. We are particularly excited about the investment in the Global Crop Diversity Trust as an example of DuPont's investment in environmental sustainability, and we commend the company for this action. The Panel remains interested and concerned with preserving biodiversity—particularly crop diversity—around the world. The Panel strongly believes that preservation of indigenous germplasm is important to maintaining maximum biodiversity as well as honoring and respecting cultural preferences and practices. DuPont has pledged $1 million to the Global Crop Diversity Trust, an international fund charged with securing long-term funding for the support of genebanks—storage facilities for plant germplasm—and crop diversity collections around the world. Formed in 2002 by the United Nations Food and Agriculture Organization and the 16 Future Harvest Centers of the Consultative Group on International Agriculture Research, the Trust has been charged with raising a $260 million endowment to maintain the world's most critical germplasm for agricultural and industrial crops as well as to support struggling collections—especially those in developing countries that may particularly wish to preserve the germplasm of coarse grains with high nutritional benefit.

Finding genes far afield: What DuPont is doing about it.

The November 2001 issue of the scientific journal *Nature* suggested transgenic material was found in Mexico landraces near the Oaxaca, Mexico, despite a moratorium on growing biotech corn in the country. A cross-company team was formed with DuPont that looked at the issues being raised from technical, political, and societal viewpoints. Those of us on the External Advisory Panel were consulted on the issue, the potential ramifications, and the needed action steps. Information gaps were identified and fact sheets were developed in English and Spanish. DuPont and other industry leaders have made their technical expertise and capabilities available to those in the public sector investigating the issue.



Areas the Panel would like to continue to challenge DuPont's thinking in the future:

Invest DuPont power and leadership to influence the U.S. government.

As a Panel, we will continue to push DuPont to be a leader internationally. The Panel is disappointed that DuPont does not choose to more actively lobby the U.S. Government to support the Convention on Biodiversity and other international agreements. DuPont is a powerful and influential company and it is disconcerting that while DuPont is quietly supportive of many of the principles in these treaties, it does not invest its influence in support of them. While DuPont continues to push the frontiers of agricultural and food science, it could do more to be a trusted partner. It is our perspective that not being supportive of these international agreements hurts DuPont's credibility.

Focus on DuPont's contribution to the world's nutrition.

As a Panel we are pleased that we will have increased interaction with DuPont's Agriculture and Nutrition Platform and the DuPont personnel in Saint Louis and Des Moines. We are particularly interested in working on a strategy to address some of the nutritional and health needs of people and how to increase access and choice through nutritious food. The Panel strongly encourages DuPont to responsibly react to negative global health trends in diet and nutrition, such as issues of micronutrient malnutrition and the rise of obesity. The Panel hopes DuPont will capitalize on the ingenuity of the private sector to contribute to the improved nutrient quality and dietary diversity of foods. It is our view that DuPont should more closely associate with companies whose profits are based on healthy dietary trends and consumption patterns.

Develop metrics for the Bioethical Principles and Positions.

Principles and positions are only as strong as the metrics by which you evaluate your performance and progress. We strongly urge DuPont to develop metrics that will challenge the company to be high-achieving as they strive to live by their principles and positions. We encourage the company to solicit external feedback in the development of these metrics.

Continue to determine what actions demonstrate DuPont's position regarding support of Informed Consumer Choice.

In January 2004 we had a fascinating session on Informed Consumer Choice. A multitude of issues were discussed including how DuPont can act in a way that supports Informed Consumer Choice around biotechnology-enhanced foods. The issue is complicated in that DuPont's interactions primarily focus on farmers (DuPont's customers) and not on the end consumers who ingest the food. Panel members continue to emphasize that while the company's relationship with farmers is important, its reputation with consumers is influential in whether the company is ultimately viewed as a "good actor" or "bad actor" among multinational companies.

Furthermore, we recognize that DuPont does not believe it is appropriate or necessary to label products produced from biotechnology that are substantially equivalent to their non-biotechnology counterparts. Additionally, we understand it to be the company's position that labels should contain data based on science and addressing issues of risk as it pertains to the product. Members of the Panel continue to suggest that labels responsive to consumers must address not only the final product, but also the process by which the product was made. Given these, and many other issues, we hope to have additional conversations regarding what DuPont means when it says the company is "in support of Informed Consumer Choice."

While many Panel members support labeling for the benefit of consumers, and believe that DuPont could use its influence to assuage fears and remove barriers within industry, the Panel is prepared to work with DuPont to determine whether other actions may adequately address consumers' right to make an informed choice about what they buy and eat. These actions may mean additional steps at the point of sale: the use of toll free numbers, websites, and flyers or inserts.

Lastly, the Panel also hopes DuPont will think through scenarios that would result in the company's labeling position to change. We think that this exercise will continue to inform and add clarity to the company's position.

Develop a strategy as to how DuPont will be a leading company in addressing the needs of the poor through its innovative technologies.

The Panel is pleased that DuPont is exploring and piloting projects that will attempt to address the needs of the poor through biotechnology or other DuPont technologies. We look forward to understanding the early data from projects such as the Cura Village Community Project to determine its effectiveness. While the Panel thinks these individual projects are invaluable, we strongly feel that the next step is to define a longer-term and more comprehensive strategy regarding how the company hopes to participate in addressing the needs of the poor. The Panel particularly urges DuPont to develop strategies for Africa and Asia, which are clearly the most vulnerable to hunger and poverty and the associated impacts. Of particular interest would be a comprehensive study and resulting action plan regarding how DuPont technologies could impact a reduction in hunger and poverty in these regions of the world while at the same time have an impact on enhancing quality of life.

Panel Member Perspectives

Dr. Arthur Caplan
Director
University Of Pennsylvania Center for Bioethics

Question: ***As a bioethicist, what are your primary concerns regarding the development of biotechnology?***

Art Caplan: Biotechnology has come in for some very rough treatment in terms of ethics. It simply got off on the wrong foot. Companies failed to be clear about what foods had genetically modified ingredients, what the rules were for introducing these ingredients into the environment and what sorts of tests had been done to verify safety. Biotechnology can be used, in my view, ethically in the food chain. Those who wish to use the technology need to do three things: Clearly label all foods or have information available on all foods so the consumer can make informed choices about foods with genetically modified ingredients; use the technology to make food healthier and safer for the consumer—demonstrating "value on the plate" for genetically modified foods; and reduce the burden of modern farming on the environment by adhering strict rules that respect and enhance biodiversity.

"People value informed consent because they value their right to determine how they live their lives."

The Panel has advised DuPont that having a set of formal principles to guide the development and commercialization of biotechnology would be very useful. Over the past year and a half, The Center for Bioethics at the University of Pennsylvania has been developing a set of principles that cover a range of points such as labeling, responsibility, fair access, respect for diversity and the duty to make food safer and healthier. At the most recent meeting, the Panel members and DuPont began the discussion of these draft principles.

Question: ***The issue of informed consent is hotly debated in the arena of biotechnology. What are the bioethical considerations you would highlight and what is your best advice to DuPont regarding this issue?***

Art Caplan: People value informed consent because they value their right to determine how they live their lives. To do this people require information about risks, benefits, options and alternatives in making choices. DuPont must be very sensitive to the power of the value accorded informed consent. Every action taken to advance the utilization of biotechnology must be consistent with each individual's right to exercise choice about what they eat and what is present in their environment.

Professor Chunming Chen
Professor on Nutrition
Chinese Academy of Preventive Medicine

Question: ***What are the major barriers to biotechnology crops meeting the nutritional needs of the Chinese people?***

Professor Chen: My greatest concern is regarding nutrition for children. Emphasis in China, due to the population, needs to be on increasing the nutritional value for crops such as rice and wheat, not necessarily crop yield. Biotechnology can be extremely helpful in this challenge and there is huge potential for collaboration between companies like DuPont and the Chinese people. We must find ways to exchange information and knowledge among scientists from DuPont and scientists in China. The biggest barrier is the intellectual property rights issue. It is necessary for developing countries to design partnerships that allow for free flow of scientific information without becoming dependent on foreign companies in an unhealthy way. I very much look forward to continued Panel discussions on this topic.

"It is necessary for developing countries to design partnerships that allow for free flow of scientific information without becoming dependent on foreign companies in an unhealthy way."

Question: ***Education is clearly an important issue to you. What educational issues need the most attention in biotechnology?***

Professor Chen: In China, and in other countries, education is important as people do not understand the risks and benefits of biotechnology foods, and sometimes this can lead to misunderstanding about the technology. Some scientists understand this issue, but if mainstream citizens are given fair and balanced information, they will have the ability to choose. Newspapers and television programs that emphasize scientific perspectives on the risks and benefits are likely to be the most effective way to reach the Chinese public.

Question: ***What role should the private sector have in education?***

Professor Chen: The private sector should provide resources in terms of information, funding, and experts. In China, the government and organizations such as the Society for Science should also play a role in delivering educational messages about the risks and benefits of genetically modified foods.

Dr. Marcelo C. de Andrade
Chairman, Pro-Natura

Question: How would you advise that responsible companies integrate sustainable development into their long-term planning?

Dr. De Andrade: I think of sustainable development as a practice in which socio-economic variables are linked with nature conservations objectives in the search for alternatives to improve the quality of life in human habitats without degrading the environment. Long-term strategies regarding sustainable development must be built into the business models. Companies make a mistake when sustainable development is only at the corporate strategy level and has not been properly implemented at the business level. As a company like DuPont looks to move from oil-based inputs to bio-based inputs for products, the pressures for water, land, and labor become very important. To the extent that a company can work to improve the quality of labor, land and water use, this is significant. If additionally the company is able to employ and responsibly partner with local labor forces, then the company is also building capacity in developing economies.

"With an increased earning potential, those in developing economies will emerge as consumers in the world marketplace."

Question: How can DuPont increase their consumer base within a sustainable development framework?

Dr. De Andrade: DuPont is currently reaching nearly one billion people with their products. In order to start to reach the additional 4.5 billion, the company will need to invest in developing economies. This helps in the short term by increasing the supply side of bio-based inputs for a company like DuPont. If DuPont is able to provide the necessary technologies and training for those in developing economies, then those small and medium-scale farmers are able to contribute to the supply base of materials that the company needs in order to make products. In time, those farmers will have earning potential that allows them to invest and expand their own wealth. With an increased earning potential, those in developing economies will emerge as consumers in the world marketplace.

Question: How should success be measured in the practices of sustainable development?

Dr. De Andrade: The successful implementation of a sustainable development framework means that the environmental, economical, and societal aspects of an initiative are all healthy and compatible for the long-term. There needs to be performance indicators for each of the three aspects of sustainable development: environmental, economical, and societal. For example, under a sustainable development model you might seek to decrease or decelerate deforestation in a particular community or region and measure progress against such goals. Additionally, you would have a metric for economic health such as family average income and how it changes over time. A metric for societal health might be applying a Quality of Life index for the region's people.

Dr. Pablo B. Eyzaguirre
Senior Scientist—Anthropology and Socioeconomics
International Plant Genetic Resource Institute

Question: ***You speak often of the "democratization of biotechnology." What do you mean by this and why do you think it is an important concept?***

Dr. Eyzaguirre: I think of the democratization of biotechnology as increasing the number and types of people involved in the market place, while preserving a range of choices that reflect different values. In other words, it is providing more options to more people. There are two ways to think about growing a market for a product. One is by increasing supply through expanding access to the product or diversifying the types of products. The other is by increasing demand and driving out competitors, which sometimes results in decreasing public access and choices, at least in the short term. Both make money, but increasing access is a democratic principle and one I support over an exclusive approach. For example, DuPont was among the first companies to democratize a product and an industry as was done in the past with nylon. The invention of nylon greatly increased access to commodities at a much more accessible price. DuPont opened up the textiles market to a new set of customers that were previously excluded. Nylon was democratic and spread to all areas of the textile business, and yet, silk producers are still in business and doing well. Hence access to the nylon market has increased the ability to choose among different types of materials earlier.

"I think of the democratization of biotechnology as increasing the number and types of people involved in the market place, while preserving a range of choices that reflect different values."

Question: ***How does this concept of "democratization" translate to bio-based materials and agricultural biotechnology?***

Dr. Eyzaguirre: The area of bio-based materials is very exciting and has a huge potential to democratize a variety of industries and products. Bio-based materials are those products made with biological inputs and substrates such as plastics and fuels from corn. Despite high research and development costs, it is easy to see that once commercialized, using a corn substrate as a resource input is likely to be cheaper, environmentally cleaner, and more efficient. However, the area of agricultural biotechnology has been hugely disappointing when it comes to democratization. I believe, as much of the world does, that all people have a right to nutritious food, a healthy environment, and to practice customs and lifestyles particular to their culture. To date, agricultural biotechnology has not yet contributed to these rights. Current applications of biotechnology in agriculture seem to favor homogenization of landscapes and food habits, and the concentration of agricultural markets and seed supply in fewer hands. In many cases, the spread of biotechnology in agriculture has become politicized with scientific perspectives sidelined, environmental impacts ignored, and the food security and nutritional needs of the poor in developing countries being parodied or neglected. I am not sure that competitiveness and maximizing profitability in agricultural biotechnology can deliver the promise of general well-being and public goods in the way that the biomaterials can. However, I am enthusiastic about efforts of DuPont and others to put agricultural biotechnology into the public domain. Where food and agriculture is concerned, I see the greatest contribution of molecular biotechnology in the creation of public goods. Perhaps public-private partnerships in licensing and spreading new agrobiotechnology processes may be a way that large private innovators in biotechnology, like DuPont, can provide more diverse products to meet the needs of a wider range of consumers and cultures.

Father Kevin T. FitzGerald, S.J., Ph.D.
Center for Clinical Bioethics
Georgetown University Medical Center

Question: ***Does being in the food business, or in DuPont's case providing seed that grows into food for humans, predicate a different type of ethical and moral obligation?***

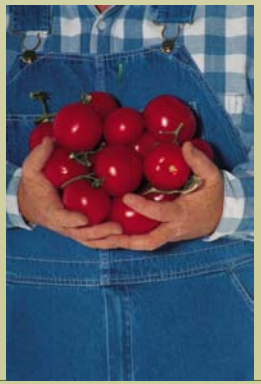
Father FitzGerald: I think that being in the business of "basic needs" such as food, water, and shelter carries an increased moral and ethical obligation, as it can be a matter of life or death for struggling people. That being said, many companies are willing to take on these responsibilities because not only is the company able to provide something critically important to survival, but it's also wise to be in the business of selling something that everyone needs—such as healthy food or clean water. These mutual benefits are quite compatible, but need to be addressed responsibly.

"I think that being in the business of "basic needs" such as food, water, and shelter carries an increased moral and ethical obligation, as it can be a matter of life or death for struggling people."

Question: ***Are there moral and ethical obligations that should be considered by multi-national companies when entering partnerships with developing economies?***

Father FitzGerald: When multi-national companies look at doing business in developing economies, they are often focused on the legal and regulatory questions. Almost never adequately explored or discussed is the inequality of power between a multi-national company and people who desperately need good, nutritious food. At first glance it looks like a seed or food company holds all of the cards. However, the reality is that it is not without some risk that companies hope to forge partnerships with those in developing economies. The company's hope is that as standards of living continue to rise, there will be additional capacity for those farmers and citizens to buy and choose products as they see fit. This can absolutely be mutually beneficial to companies, as well as to those living and participating in the developing economies.

From my perspective, companies have an obligation to openly dialogue with farmers, citizens, and government officials in developing nations about their hopes and goals. Companies need to be open to the possibility that they may hear that the current circumstances are not right for them to enter a particular market. Companies that are patient and looking at a long term strategy will be ready when conditions change, especially if they remain in dialogue with these communities. Also, dialogue should focus on the overall livelihood and health of the people not just on seeds or food products. This approach makes good business sense and it's also the responsible approach to take when you are in the business of basic necessities.



Question: ***What role does religion have in the considerations about biotechnology?***

Father FitzGerald: Religions provide frameworks and guidance that articulate the fundamental principle that people count, and that their lives are valued. The emerging biological and genetic technologies have moved past the manipulation of inorganic material, to the manipulation of life and the living. Religions and religious frameworks are only starting to grapple with the moral and ethical questions raised by these emerging technologies.

Ms. Carol Tucker Foreman
Distinguished Fellow and Director
The Food Policy Institute
Consumer Federation of America

Question: ***Do you think the current U.S. regulatory system for biotechnology is sufficient?***

Ms. Tucker Foreman: The current regulatory system is not adequate to protect public health, to assure public acceptance of food biotechnology, or to assure confidence in government risk managers. Most of the laws were written long before food biotechnology was conceived. Three federal agencies and ten different statutes apply inconsistent rules and standards. Most egregiously, the FDA is not required to examine and declare plant products safe for human consumption before they are allowed on the market. It is illegal to market a genetically modified plant without applying for and receiving approval from the USDA that the plant will not harm other plants or to market a genetically modified pest-protected plant without first applying for and receiving approval from the EPA that the plant will not harm the environment. But in a bizarre ordering of priorities, the process for determining human safety of genetically modified plants is voluntary. While there is a mandatory pre-market safety approval for transgenic animals, the process is secret, with no public participation. The food biotechnology industry fears that a more rigorous and open regulatory system will increase the time and costs of bringing products to market. However, such a system could also reduce the chance of future mistakes and accidents and increase public confidence in the safety of the food that comes from this new technology. It would likely save money in the long run.

> ***"A formal, mandatory, pre-market food safety approval process would put a structure into place that is consistent with trust granted by the American public."***

Question: ***What factors might create a driver for such regulatory change?***

Ms. Tucker Foreman: American consumers have been eating genetically modified foods for a decade but the products are invisible and, when asked, consumers are less accepting of them than they were five years ago. The current products came to market before most Americans were aware of food biotechnology. Now they are aware and the next generation of products is likely to be more visible and more controversial. The regulatory system may not be strong enough to assure public tolerance of genetically modified wheat in our daily bread or the manipulation of sentient beings to build a bigger bull. It may not be sufficient to prevent drug corn from ending up in breakfast cereal. These are not scientific issues but they are legitimate public concerns and good business as well as good government requires finding a way to respond to them.

Question: ***How can a company like DuPont be most responsible given this new slate of products and the current regulatory framework?***

Ms. Tucker Foreman: If DuPont wants to protect its current investment and fulfill its obligation as a good corporate citizen, it should work to achieve public policies that assure both the highest level of human and environmental safety and that respond to very real public concerns about this new, exciting and disquieting technology.

Dr. V. Prakash
Director
Central Food Technological Research Institute

Question: ***What are the factors that influence what people in India choose to eat?***

Dr. Prakash: It is important that any new concept introduced in India must honor and be responsive to the variation in lifestyle, religion, culture, and regional biodiversity in order to maximize success. India is a conglomeration of many cultures. A short distance in any direction and you can find yourself in a different region with its own language, customs, and traditional foods. It should be noted that the Indian diet continues to change to reflect alterations in lifestyle, for example the trend toward convenient or instant foods is a recent phenomenon. At the same time religion, culture, and custom continue to heavily influence the types of food selected and eaten. Interestingly enough, many of those eating habits and practices go beyond a 5,000-year history and have been found to be quite scientific as we continue to understand the nutritional contributions and the different needs of gender, age, and other factors. Lastly, nutritional and health data from scientists influences how people think about their diet. An example of this is that there is a trend in the urban areas toward the eating of lesser known grains and pulses for their nutritional merits and health benefits, because of awareness of nutrition.

"I think that if biotechnology can aid in making "wasted lands" agriculturally viable, the technology will have made an important contribution to food security in India; while also enhancing biodiversity with food and nutritional security for safe food."

Question: ***How might biotechnology address some of the agricultural needs in India?***

Dr. Prakash: There are two major types of lands in India, the fertile agricultural land; and the "wasted land" which has not grown anything for years. I think that if biotechnology can aid in making the less used lands agriculturally viable, then biotechnology will have made an important contribution to India; while also enhancing biodiversity with food and nutritional security for a safe food.

Question: ***What is your best advice on how applications of biotechnology can best interface with culture?***

Dr. Prakash: It is important when we address the application of biotechnology that we are honoring people and the strong practices and beliefs they have had for thousands of years. Additionally, one has to bring in awareness and explain how science can help fight hunger and poverty around the globe. At the same time, it is important to remember that culture and science co-exist and both have a role in improving the quality of life.

Dr. Sven Thormahlen
Vice President of Research & Development
Danone Group

Question: ***Is the biotechnology debate evolving in Europe? Do you sense that the climate for acceptance of biotechnology is changing?***

Dr. Sven Thormahlen: I do not think that the Europeans are moving toward the acceptance of biotechnology. I think this is for a few reasons. First, Europeans revere tradition and old world ideals and they are invested in the economic and political stature they enjoy. This is quite different from the United States which has a comparatively short history steeped in rejecting traditional ways, and valuing change and exploration. The feeling in Europe is that new technologies are a particular threat to cultural values.

Second, Europeans are generally conservative when it comes to risk. If there is a real or perceived risk then they will likely reject the technology until there is more data to prove the safety and efficacy of it. Furthermore, the sequencing of products was all wrong for Europe. If biotechnology companies had first introduced products that had a consumer benefit, then Europeans would have been much more likely to accept the risk. Instead, companies introduced products for farmers. Europeans, in general, are far removed from this aspect of the food value chain. Thus, they felt no benefit and felt it unnecessary to accept potential risks without benefits.

Lastly, Europeans are sympathetic to the disadvantaged. Biotechnology companies have not adequately made the case that these technologies are not only safe, but that they may hold the best opportunity for addressing issues of malnutrition and hunger.

"Europeans care deeply about the issue of renewable and sustainable fuels and materials. They will likely be very open to applications of biotechnology that are not linked to food and agriculture."

Question: ***How might a responsible biotechnology company approach doing business in Europe? How could the company be responsive to the concerns voiced?***

Dr. Sven Thormahlen: First, share your science openly with thought leaders, politicians, and non-governmental organizations. Go and visit with them, the more that they know about your technology and products, the better. Even if they have different views on the risks and what level of risk they think is reasonable, at least they will understand the science behind it. Second, address the youth in Europe. They are trying to find their way in a culture that wants to hold onto the past. The youth may be more open to promise of emerging technologies. Lastly, Europe is not immune from the fast pace, entertainment culture found around the world. Pursue compelling advertisement campaigns that convey what your company stands for, what your values are, and what your products are.

Question: ***Are the concerns the same for bio-based products as they are for agricultural biotechnology?***

Dr. Sven Thormahlen: Europeans care deeply about the issue of renewable and sustainable fuels and materials. They will likely be very open to applications of biotechnology that are not linked to food and agriculture.

Dr. Florence M. Wambugu
Executive Director
A Harvest Biotech Foundation International

Question: ***Why should DuPont consider more North-South country partnerships in the area of biotechnology? Who would gain from such partnerships?***

Florence Wambugu: Partnerships around the development and distribution of genetically modified organisms and crops can benefit both the North and the South a great deal. The North has the infrastructure and the investment capital necessary to develop and customize biotechnology products for various regions. The North is looking for additional markets for the technology they have developed. The South represents untapped markets for the North. We have a great deal of people and a food deficit; there is a huge need for consumer products offered through biotechnology.

Question: ***What then, are the barriers to this producer/consumer relationship developing?***

"The art of 'doing business' is very different from country to country and culture to culture."

Florence Wambugu: While countries in the South, like Africa, have the market—the countries are not developed enough to be sustainable markets for the North. Currently the South does not have the money to purchase these products we are very interested in. Thus, part of a good North-South relationship is helping the South create and stabilize their infrastructure, which naturally leads to a country's increased ability to purchase biotechnology products. A necessary part of this equation is determining the issue of intellectual property rights and benefit sharing of genetic resources. It is a lot of legwork, but is ultimately a win-win situation for both the country and the company.

Question: ***What types of mistakes have you seen companies make when trying to develop relationships with countries such as Kenya? What advice would you give to DuPont as they consider such partnerships?***

Florence Wambugu: The art of "doing business" is very different from country to country and culture to culture. While e-mail and telephone are efficient ways of doing business in today's world, in some places, "you don't really exist, until they see your face." It is essential to work with local indigenous people. It is the ethical and smart thing to do as these individuals have the respect and trust of the consumers DuPont will try to reach. The private sector, government agencies, international aid organizations, and local communities all have a role in the capacity building that will create and maintain strong North-South partnerships.

The Keystone Center for Science and Public Policy serves as a 3rd party neutral facilitator for DuPont's Biotechnology Advisory Panel. Please contact Janesse Brewer of The Keystone Center with any questions or comments regarding this report. Ms. Brewer can be reached at 970.513.5847, or by e-mail at jbrewer@keystone.org.

Prepared by **The Keystone Center**

Colorado Office

1628 Sts. John Road

Keystone, CO 80435

Phone 970.513.5800

Fax 970.262.0152

Washington D.C. Office

1020 16th Street, N.W.

Second Floor

Washington, D.C. 20036

Phone: 202.452.1590

Fax: 202.452.1138

www.keystone.org