

**Challenges for Agriculture, Environment, Farmers and Future Generations:
A Perspective Offered by Monsanto Company
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What does sustainability look like for agriculture? Common use of the term “sustainability” began with the report entitled *Our Common Future*, published in 1987 by the World Commission on the Environment and Development¹. It suggested that sustainable development is “development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” This sounds like a reasonable proposition; however, recent headlines have called the outcome into question.

We are reminded that seven out of the last eight years, the world has consumed more grain than it produced, reducing inventories to historic lows and leading to significant food price inflation for the first time in decades. Energy prices have quadrupled over the past five years, with crude oil prices reaching their highest real prices in history². Concern over global warming has surged, with experts noting the eight warmest years on record have all occurred in the last decade. The impact of these events and the global health crisis associated with HIV/AIDS are playing out in real time in Sub-Saharan Africa where average life expectancy is lower than it was in the late 1980s³.

What do these challenges mean for agriculture and what does agriculture offer those who care about sustainability? Over the past year, the senior leadership of Monsanto Company has increasingly discussed this question with farmers, policymakers, scientists, NGOs, and experts from academia and industry. What follows is what we have learned, thus far.

Meeting the Needs of Everybody

According to the U.S. Census Bureau, global population will reach 8.9 billion by 2040 and 9.4 billion by 2050 before stabilizing around 9.7 billion later in the century⁴. Implied in this estimate is a 34 percent increase by 2040 over today’s global population estimate of 6.6 billion, and a 42 percent increase by 2050. According to Dr. Bob Thompson, agricultural policy expert with the University of Illinois, as

incomes rise to the level of \$2 to \$10 per day, people eat more meat, dairy, fruits, vegetables, and edible oils – creating rapid demand growth for agricultural commodities. Even today, nearly 3 billion people live on less than \$2 per day including 46 percent of the Chinese population, and similarly large populations in countries like India and Indonesia. Taken together, population growth and rising incomes are expected to double the quantity of food demanded by 2050⁵. In fact, participants at a recent United Nations forum on food demand predicted agriculture will be called upon to produce more food over the next 50 years than has been produced in the past 10,000 years combined⁶.

While agriculture has answered the call to produce more food over the past 50 years, the United Nations Food and Agriculture Organization (FAO) still counts 854 million people as malnourished and hungry. Up to 2 billion people suffer from the “hidden hunger” of micronutrient malnutrition stemming from a lack of diversity in their diets⁷. Among the most vulnerable to the plague of hunger are young children who suffer from physical or mental developmental delays. Worse yet, an estimated 5.6 million children die each year due to hunger-related illnesses prior to their fifth birthday⁸. “Far from decreasing, the number of hungry people in the world is currently increasing,” says FAO Director-General Jacques Diouf.

What can we do?

Ensuring the Social Well-Being of One Billion Farmers

“Who are the hungry?” asks Dr. Clive James, director of ISAAA⁹. “50 percent are resource-poor farmersⁱ. Another 20 percent are landless that are completely dependent on agriculture for their livelihood.” Even today, estimates of those who are engaged in agriculture globally range up to 1.3 billion, or nearly one-half of the actively employed global population. Global experts agree that increasing agricultural productivity is a practical imperative that must be at the center of strategies to reduce hunger and poverty in order to improve the social well-being of resource-poor farmers. “Take any place on the planet that was once extremely poor and is now either developed or on its way to being a developed economy and you will almost inevitably find an agricultural revolution at the start of

ⁱ Personal Communication with Clive James, May 2008.

that – a big rise in productivity, in the amount of food grown per hectare of land,” says Dr. Jeffrey Sachs, Director of the Earth Institute at Columbia University¹⁰.

In a few short years, another type of development has resulted from the surge in energy prices as investment capital around the world has seized on the opportunity to develop renewable transport fuels from plant biomass. Political support in the United States and Europe has consolidated behind proposals to reduce dependency on foreign sources of oil, reduce greenhouse gas emissions and invest in the manufacturing of renewable fuels produced in rural economies. Today, the United States imports \$1.4 billion of foreign crude oil per day to meet demand and is expected to import up to 70 percent of its needs by 2030¹¹. The International Energy Agency projects global energy demand will increase by 55 percent by 2030, with 74 percent of this growth taking place in developing economies¹². As large, emerging economies such as China and India begin to compete for energy, industrialized nations and their political leaders search for new solutions.

Farmers who have seen their rural communities in decline look forward to a future of increasing investment and employment opportunities closer to the farm. In the United States, more than 238,000 jobs and nearly \$3.4 billion in local tax revenues resulted from the ongoing production of ethanol or the construction of renewable fuel capacity in 2007 alone¹³. Consumers have benefited as well. Agricultural economists at the Center for Agriculture and Rural Development (CARD) recently estimated U.S. consumers are saving \$0.29 to \$0.40 per gallon due to the impact of ethanol availability on gasoline prices¹⁴.

After being dormant for years, the price of food has again become an important issue. In recent testimony before Congress, U.S. Department of Agriculture Chief Economist Joseph Glauber pointed to (1) global economic growth leading to increased demand for higher protein, diversified diets in developing countries, (2) poor weather in several important grain producing countries, including a multi-year drought in Australia, (3) restrictive export policies among several important grain exporting countries (4) significantly higher energy prices across the agriculture and food chain, and (5) emergence of demand for renewable fuels as contributing to the current situation of higher food

prices¹⁵. While the prices farmers receive for commodities have risen, they are sharing their concern about the prices of farm inputs. Energy-dependent inputs such as plant fertilizers have increased in price by 228% since 2000¹⁶. Livestock producers, while also enjoying the burgeoning demand for meat, milk and eggs are significantly impacted by higher grain and energy prices.

Farmers around the world want to meet the needs of the livestock industry with cost competitive sources of protein, oil and fiber. They want to feed their children and create ample supplies for developing countries who desire to diversify their diets. They also want to be a solution to those who look toward renewable fuels for a more secure energy supply.

Who will help them?

Protecting and Improving the Environment for Future Generations

While the demand on agriculture expands, concern over human activity and the impact on our physical environment is reaching a crescendo. In 1999, the United Nations Environment Program (UNEP) reported that 200 scientists in 50 countries identified water shortages and global warming as the two most worrying problems for the next century¹⁷. The practice of agriculture is the single greatest interaction of humankind with our physical environment. Both of these issues confront the business-as-usual approach for everyone connected to agriculture.

About 40 percent of our global food supply is drawn from the 18 percent of the agriculture area that is irrigated. In order to meet increasing food demand, the irrigated area of agriculture increased from less than 100 million hectares in 1950 to more than 270 million hectares in 2005. Accessing more water and providing it to crops has been an essential and productive tool of the Green Revolution. Today, agriculture makes 70 percent of the freshwater withdrawals on a global basis, with up to 90 percent in some regions of the world¹⁸. However, the World Water Council suggests we will need 17 percent more water than is available if we are going to feed the world in 2020. Water availability has historically been addressed through global trade, creating sources of “virtual water” for arid countries in the form of grain imports. For example, the water required to produce grain amounting to the

annual imports into North Africa and the Middle East is roughly equal to the annual flow of the Nile River¹⁹.

Associated with the present and future water constraints on agricultural production is the expected adaptation requirements brought on by global warming. According to the Intergovernmental Panel on Climate Change (IPCC), the impacts will be felt most acutely in Sub-Saharan Africa where 75 million to 250 million people will be subjected to water stress and crop yield reductions of 50 percent by 2020²⁰. Large river basins in Asia and North America that are diverted to irrigation and crop production are also projected to be reduced – exacerbating the existing competition for water resources and creating new levels of stress for crop and livestock producers in all areas of the world²¹.

The 2007 IPCC summary report also suggests agriculture contributes 13.5 percent of the total global greenhouse gases; however, another 17 percent of CO₂ equivalent emissions are attributed to deforestation and land use changes²². “As I understand the statistics, somewhere between 70 and 80 percent of all the deforestation that takes place, takes place because people are trying to survive,” says World Food Prize Laureate Dr. Per Pinstrup-Anderson²³. “They’re cutting down trees in order to use the land to produce food and other agricultural commodities.” Global net forest loss per day currently stands at 20,000 hectares – an area twice the size of Paris²⁴.

“Continued improvement in efficient land use will be critical if we’re going to meet ever growing demand for food and fiber without putting more pressure on our environmental resources,” says Dr. Jason Clay of World Wildlife Fund. Agriculture is already the predominant use all habitable land, yet grain producing land per capita in 2030 is projected be just 0.08 hectares, or one-third of what was available in 1950²⁵. Topsoil is the living ecosystem upon which all of humanity is most utterly dependent, yet 40 percent of all existing agricultural lands are considered seriously degraded. While topsoil can be renewed, it takes 200 to 1,000 years to create 2.5 centimeters of rich topsoil²⁶. “Soil erosion is any nation's enemy—far worse than any outside enemy coming into a country and conquering it because it is an enemy you cannot see vividly,” says Dr. Harold R. Watson, an award-winning soil scientist. “It's a slow creeping enemy that soon possesses the land.”

What is our role?

Meeting the Challenges

The challenges facing agriculture are really challenges facing all of us. In order for agriculture to be sustainable, we must meet our present needs – providing affordable food, fiber and energy for 6.6 billion people. In fact, we have not yet achieved this. In a little over a generation, we must meet the needs of more than 9 billion people – most of whom will demand better, more diversified foods.

At the same time, how can agriculture be sustainable if we meet the needs of 9 billion people while doing harm to our only environment? This cannot happen. For agriculture to be sustainable, we need to protect and even improve the environment so future generations can meet the challenges of their day.

While many offer advice or policy on sustainable agriculture, farmers are the people who make it happen on the land. Large farmers in industrialized countries must produce sufficiently to keep food and energy affordable. Small farmers in developing countries need to feed their families and create additional income from agriculture to break the cycle of poverty and hunger. Agriculture certainly will not be considered sustainable if the social well-being of nearly one billion farmers is lost in the process.

Addressing these three challenges individually is not enough. For agriculture to be sustainable, we must: (1) meet the needs of everybody while, (2) protecting and even improving the environment, and (3) providing opportunity for the social well-being of one billion farmers. All three are essential. None are optional.

Agriculture has a history of making dramatic productivity improvements due to the deployment of numerous innovations, better genetics, and better informed farming practices. Today, Monsanto is a global leader in agricultural crop research, spending nearly one billion dollars annually on better crops such as corn, oilseeds, cotton, and vegetables. We have sought the knowledge and wisdom of others,

and we will continue to foster a dialogue on these issues. We have reflected on our company's strengths and capabilities. As we consider the challenge of sustainability in agriculture, we are prepared to partner with others to meet these challenges. The challenges are significant and meeting them will require all of us to do far more than most expect.

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