

**Respect for the Environment—A Chemical Company's Vision for a Partnership with Nature**

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The essence of Du Pont Agricultural Products' approach to environmental stewardship is contained in the phrase "in partnership with nature."

Before dealing with this in depth, it is necessary to set a context describing some of the factors that will influence the evolution of agriculture into the next century.

In the industrialized countries of the Northern Hemisphere, we were fortunate to have been able to satisfy the need for quality food at an affordable price for a large part of the population. This was possible because of enormous advances in agriculture through science, technology, and the dedication of our farmers. Subsequently, we have had the luxury to turn our attention to improvements in our environment.

In the highly industrialized countries, we are actually confronted with a substantial surplus of agricultural commodities. To stabilize supply and demand and keep agriculture viable into the future, we have resorted to price subsidies and production quotas on certain crops. The same purpose is the basis of major programs in western countries to reduce overall agricultural output by taking land—at least temporarily—out of production. We do appreciate the beneficial side effect of soil conservation and water protection.

Wherein then, lies the value of your work and ours? The work of studying the impact of diseases, pests, and weeds on agricultural production and coming up with a cure. In seeking an answer, we must bring the less fortunate people into the equation; those in the industrialized nations and the broad masses in many of the lesser industrialized countries, mostly south of the Tropic of Cancer. Today, many of these people do not have access to the minimum recommended daily caloric intake; they are malnourished or plainly starving.

This is not a new development. The situation is widely recognized as inhumane or at least embarrassing to many of us. But neither the industrialized countries nor the international bodies such as the United Nations have so far found ways to deal with the issue in a lasting manner.

This is a distribution issue today, but it will also be a production issue in the future.

It appears that the gap between those who have and those who don't is widening. This alone creates potentially explosive situations. In addition, the global political and military tension between the allies of the United States and the Soviet Union, which has dominated the international agenda since the end of World War II, has eased to the point where other issues, such as world trade, the environment, and world hunger are gaining prominent status.

There is yet another component of great significance. Ignoring the potential impact of global epidemics such as AIDS on the worldwide population growth, it is predicted that the number of people on this earth will reach 11 billion by the year 2050; roughly four times as many as a century before in 1850, and about twice as many as today. This means that by the middle of the next century, we must produce at least twice as much food as is currently provided, either in quantity or in higher nutritional value.

Ninety-seven percent of today's world food supply is grown on 3% of the earth's surface. The increase in cropland acreage of 0.15% per year is not even one-tenth of the predicted annual 1.7% increase of the population. A portion of the new cropland is being derived from the conversion of tropical rain forests and other environmentally important ecosystems; ecosystems that should be, and one day hopefully will be, preserved in the interest of mankind. This means that the increase in production will have to come mostly from today's arable land, through new varieties, improved production technologies, and control of diseases, pests, and weeds to reduce losses.

In addition, the projected population growth is likely to be uneven: 2.5 times as fast in the poor countries as in the industrialized nations. In other words, in 1950, the ratio between rich and poor was 1:2; in the year 2025, this will have changed to 1:5, up from today's ratio of approximately 1:3. This shift will probably significantly change the dynamics of global society.

Global is a key word. It characterizes the changes that have occurred since the end of World War II. Single countries, with well-protected borders and limited information flow, have joined major trading blocks with open borders between many countries and have an almost unrestricted flow of information. This, combined with today's global means of transportation, has already resulted in mass migrations, triggered by poor economic conditions. Left alone, the result could be a strain on the infrastructure of the receiving countries or regions to the point of possible collapse.

To deal with the issue of population growth and to increase the production of food, we must at least maintain—and probably increase—current high levels of agricultural productivity. Agriculture in the United States, with a 13% share of worldwide production, plays a major role today and will continue to do so. The United States is the world's largest exporter of agricultural products. American consumers are also fortunate in so far as they only have to spend an average of 10% of their income on food. This compares very favorably with other highly industrialized nations, such as France and Japan with 16 and 18%, respectively. People in the lesser industrialized nations have to spend between 32% (in Mexico) and 50% (in India and China) of their income.

I am convinced that plant protection chemicals will remain an integral part of production agriculture. Texas A&M has estimated that the removal of chemicals from agricultural production would result in yield losses from 25 to close to 60% in crops such as wheat, corn, soybeans, cotton, fruits, vegetables, and rice. Needless to say, there would be a rather steep impact on price and affordability. In spite of significant efforts and successes in biotechnology, it appears that no alternative technology exists that can reliably replace chemistry in the foreseeable future on a worldwide scale.

Chemical plant protection is not undisputed and carries historical baggage such as excessive use and a lack of understanding of side effects. Today's issues, real or perceived, range from food safety, the quality of surface and ground water, worker safety, off-target drift, pest resistance, and endangered species to waste management and the discomfort around new technologies.

While there are legitimate concerns that must be addressed,

many appear unfounded, based on scientific grounds.

Nevertheless, this is an issue where emotions and feelings often far outweigh facts, where lack of understanding can turn relatively low-risk situations into seemingly major catastrophes, such as the Alar scare that occurred 2 years ago in the United States.

People who work in the chemical industry or are related to it generally are not recognized for the value they provide to society. To the contrary, we are often viewed suspiciously by parts of the public as to our motives. We, like anyone in this audience, want to make a decent living. But we also seek satisfaction in believing we are contributing to society at large. A negative public attitude, therefore, really affects us, not only in a material way, but also in an emotional way, and it lowers the quality of our life. To be, and remain, an industry under siege by the public has another potentially deadly side effect. There is a risk that companies can no longer attract the brightest and most dedicated college graduates who are the key to the future.

With this frustration and concern in our minds, we at Du Pont started discussing our future some 5 years ago. Ten of us, the management team of Du Pont Agricultural Products, one of the world's leading and fastest growing plant protection businesses, withdrew from the world into the mountains of New Mexico. We did some soul searching, and after intensive work in small groups, we arrived at a vision for our business that we were willing to share with and explain to our 5,000 teammates worldwide.

"It is our will to enter into a growing partnership with nature so that we play a leading role in creating a better world. We, the Ag Products team, have a vision for continuous improvement in the quality of life. We intend an exciting new collaboration with nature . . . where, combining nature's gifts and ours, we greatly exceed today's knowledge of what is possible. . ."

The group was excited and, although the language of the vision was somewhat lofty, the intent was clear. Our existing portfolio at that time didn't contain any product with characteristics in gross violation of our vision.

Nevertheless, as we started to live the vision, we chose to discontinue some products and to eliminate uses of others that resulted in relatively high levels of residues and had limited value to the farmer. We did not do this under regulatory pressure, but to meet our own higher standards. For new compounds at various stages in development, we are approaching safety and environmental standards that we expect to withstand public scrutiny far into the 21st century. On account of those standards, we discontinue work early in development on compounds that do not meet those standards. Here are some quotes from a termination report on a highly active compound: "indicated high mortality of trout eggs and larvae . . . ; it was established this candidate provided unacceptable risk to the aquatic environment . . . The product would not meet our vision."

We are fortunate to be part of a company that has made a strong commitment to the environment. These efforts go back as far as 1938, when Du Pont issued its first statement of environmental responsibility. Just a few years earlier, in 1935, Haskell Laboratory was founded with the charter to study the impact of chemicals in the workplace and to recommend ways to protect workers. I believe this was the first major effort in this field in industry and government. This philosophy has continued under our present management, and Du Pont was honored in 1987 with the World Environmental Center's gold medal for International Corporate Environmental Achievement.

Our vision describes a desirable end stage or a set of goals for which to aspire. To translate the long-term objectives into guidelines for the day-to-day operations, stewardship principles had to be developed. Those stewardship principles are supposed to guide not only our scientists, production workers, and sales personnel, but also to alert, guide, and educate our customers. The stewardship principles have been discussed with our people for about 2 years to clarify what they mean and how we will have to change our behavior. We are now in the process of broadly implementing them.

I would like to share these stewardship principles with you and give you some examples on how they have already been applied. Let me start with some quotes from the preamble. "We are committed to providing quality products and services that contribute to an abundant and safe supply of food and fiber for the world's people . . . we will adhere to the highest standards for safe operations and for the protection of the environment, our people, customers and the citizens of the communities in which we do business . . . we will continue to encourage and support responsible use of our products through label instructions, training and other programs."

The first of nine principles deals with food and fiber safety, and states "We will only sell products that, when used in accordance with label instructions, result in safe food and fiber." The inclusion of the phrase, "when used in accordance with label instructions" in this and other principles has left many of us with the uneasy feeling of having potentially weakened the statement. However, in spite of all the recommendations and education, actual use rate and mode of application are generally beyond our control. Major programs on applicator training and risk communication have been in place for several years. We have phased out less environmentally acceptable products and have widened the margin of safety of others by modifying preharvest treatment intervals or postharvest use elimination. We are monitoring residues on fruit and vegetables from the farm to the consumer's plate. This study is expected to confirm that actual residues are minimal and clearly within the established residue tolerances.

Du Pont has an active program of developing diagnostic kits to provide easy-to-handle tools for disease detection and to determine residue levels of some of the most important plant protection chemicals. Disease detection kits are already used commercially in Europe in cereals.

Our principle on surface and ground water quality states: "We will only sell products that, when used in accordance with label instructions, result in the preservation of the quality of surface and ground water."

Here, label changes have been implemented as a result of better understanding the behavior of our products in soil and water. The introduction of Londax rice herbicide, with a very favorable disappearance profile in water, has replaced older compounds. The dry-direct application of herbicide granules, replacing the usual spray solutions, has eliminated tank clean-out procedures and the need for disposal of waste water. Major efforts are put into the training of applicators and farmers on how to protect the quality of water. In the United States, we were one of the early leaders of the Alliance for a Clean Rural Environment, known as ACRE, that promotes water quality through education and the careful monitoring of ground-water resources. Worldwide, we support the efforts of the International Plant Protection Manufacturers' Association, GIFAP, in their attempt to train people in the proper use of products and worker safety.

This leads me to our next principle on worker safety, by which we are committed to "continually improve practices with the objective of ensuring worker safety in the manufacturing, transportation and use of our products." Major efforts are under way to monitor residue levels and to determine safe reentry periods in treated fields. Pictograms are often the most effective means of effective communication to promote worker safety with a less-educated workforce.

We have stewardship principles pertaining to on-target use, resistance management, and wildlife and resource conservation.

We have committed ourselves to "only develop, manufacture and market products that are compatible with natural ecosystems. We will support integrated management practices that preserve the quality of soil and water, protect endangered species, and promote the coexistence and sustainability of agriculture, wildlife and beneficial organisms."

One of the projects we are particularly enthusiastic about is a long-term study on different cropping systems at Du Pont's Remington Farms in Maryland. This 3,000-acre complex has approximately two-thirds of its acreage devoted to wildlife man-

agement. The remaining 1,000 acres produce mostly corn and soybeans. In a partnership of Du Pont, various universities, EPA, USDA, and the Rodale Institute, four different cropping systems are tested on 20 acres each over a minimum of 5 years. The test plan includes different levels of input and schemes of crop rotation, all within the constraints of wildlife management.

The objective is to measure production, monitor environmental impact, including water management, and determine long-term economic viability. We are proud of having forged a private-public partnership to support the farmers as the stewards of the land.

Our principle on waste management is totally aligned with corporate commitments. Du Pont's target numbers on reduction of toxic air emissions, general waste reduction, and recycling have been widely publicized.

Changes in our manufacturing processes do, or will, eliminate large amounts of undesirable solvents. Continuous manufacturing processes have already eliminated the need for storage of some highly toxic intermediates, such as MIC. The introduction of our low-use-rate sulfonylurea herbicides has not only lowered the use rate per acre to about 1% of the older compounds, but the generation of waste per acre treated has also been reduced by 20–25%. High on the list of priorities is the reduction of nonreturnable packaging material. Tablet formulations, water-soluble bags, and returnable steel containers are a beginning in that area. Du Pont, like other companies in our industry, strongly supports and participates in plastic container recycling projects in more than 25 states.

Our last stewardship principle deals with product quality and says: "In recognition of the impact our products have on the Quality of Life and on the Environment, we will only produce products of superior quality and purity to ensure customer satisfaction. . . . We will better serve our customers by partnering only with contractors and suppliers who meet our quality standards. . . . We will continuously measure our total product performance, including biological results, and use the data to improve our existing products and provide opportunities for new product discovery and formulation."

We believe Du Pont can, and will, play a major role in improving the world's food supply by providing food of high quality, that is produced in a way that does not deplete or destroy the environment and that is safe to grow and to consume. We know we have a way to go in fulfilling our vision of a partnership with nature and improving the quality of life. I hope, however, you share my view that we are heading in the right direction. Your support on that journey will be greatly appreciated.

#### ACKNOWLEDGMENTS

Information for this talk has been obtained from internal sources of Du Pont and the following publications:

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