
The Seed Industry and Agricultural Biotechnology

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When discussing matters of the environment, private industry is often falsely portrayed by some environmental groups as an enemy of our ecosystem. I am here today, as a representative of the agri-business industry, to address concerns of agricultural biotechnology and its impact on the environment, particularly the concerns surrounding the environmental impact of gene escape from transgenic plants to wild plants and the development of resistance by pests to genetically altered hosts.

For the past decade I have served as the president of Delta and Pine Land Company (D&PL). D&PL is a breeder, developer, and marketer of cotton and soybean planting seed. We're based in Scott, MS, which is in the heart of the Mississippi Delta. Our Company comprises three seed companies: Deltapine Seed, also based in Scott; Paymaster Cottonseed, based in Lubbock, TX, and Sure Grow Seed, based in Centre, AL. Our international division, D&PL International, is headquartered in Scott, as well. Through these divisions, D&PL provides seed varieties that currently plant more than 70 percent of US cotton acreage and 10 percent of Southern US soybean acreage.

Delta and Pine Land Company became a provider of biotechnology in 1996 when we, in conjunction with Monsanto, introduced one of the first successful transgenic crops to the United States and the world. The crop was a variety of cotton called NuCOTN 33B. This variety contains a Bt (*Bacillus thuringiensis*) gene that controls the bollworm and tobacco budworm, and pink bollworm pests that have historically plagued cotton farmers. Other seed companies have incorporated Bt genes into corn and potatoes.

In 1997, D&PL and Monsanto introduced Roundup Ready® cotton to the marketplace, and in 1998 we followed with our commercial introduction of

Roundup Ready® soybeans. Roundup Ready® has expanded farmers' options for weed control by allowing them to spray Roundup herbicide over the top of their crops, which does not damage the cotton or soybean plant when appropriately applied. This technology offers significant advantages to our farmers who experience weed problems.

As a participant in the delivery system for genetically enhanced crops, D&PL supports biotechnology as a means to better serve our customers and to improve farming practices that will benefit the farmer and the environment.

ENVIRONMENTAL BENEFITS OF BIOTECHNOLOGY

Bt "in-plant" pesticide is a highly effective product that enables our customers to lower their costs and improve the efficiency of their operations. By providing Bt cotton to our customers, we are enabling them to increase the success of their farming operations. Farmers have enthusiastically welcomed the introduction of insect-resistant cotton because of its effective pest control and its ability to reduce costs. In 1996, for example, an Arizona farmer planted 40 percent of his acreage to Bt cotton. This farmer described his experience as both outstanding and incredible. Not only were his costs \$100 per acre less for Bt (including the technology fee) than for conventional cotton, but his yields averaged one bale more per acre for Bt than for conventional cotton.

In addition to having no pink bollworm or other bollworm activity in his Bt cotton, this Arizona grower did not need to spray for other pests. Neither the whitefly nor lygus reached levels that would trigger treatment according to University of Arizona guidelines. Beneficials, particularly spiders, were present in high numbers in this case and played an important role in reducing the numbers of insect pests.

Bt cotton offers cost saving benefits, and has been found by the Environmental Protection Agency (EPA) to be safe to humans and the environment and to offer many environmental benefits. Because the insect control agent is contained within the plant, traditional exposure of the environment and of workers to these pesticides during mixing, loading, and application is eliminated. The use of transgenic Bt crops can also reduce the environmental loading of conventional insecticides. Transgenic Bt also eliminates problems associated with the use of spray materials, including the exposure of nontarget sites.

In 1996, Bollgard cotton was planted on 42 percent of the Mississippi cotton acres. End of season surveys indicated Bollgard fields received an average of less than one pesticide treatment per field for bollworm and budworm control compared to 3.05 treatments per field for conventional cotton. In 1996, transgenic cotton reduced conventional pesticide application by 250,000 gallons. An additional environmental benefit is that the Bt protein does not persist in the plant residue and degrades rapidly, unlike conventional pesticides.

In 1996, 77 percent of Alabama's 560,000 cotton acres were planted to

Bollgard cotton. An Extension entomologist noted that Alabama went from the worst year on record for cotton insect losses (more than \$41 million) in 1995, to in 1996, the lowest amount of insecticide applications and usage since the introduction of synthetic insecticide in the 1940s. Less than 20 percent of the total cotton acreage in Alabama received any foliar insecticides in 1996. Less than 10 percent of the Bt acreage was treated a single time. Most of this was in the Gulf Coast region where plant bug sprays had suppressed beneficials and fall armyworm populations were heaviest. By reducing the amount of pesticides applied to cotton acreage, biotechnology is providing immediate and ongoing benefits to the environment.

Roundup Ready[®]— Currently, Roundup Ready[®] herbicide tolerance genes are in approximately 35 percent of US cotton acreage with the potential to reach 95 percent of US cotton acreage. Herbicide-tolerant genes currently make up about 15 percent of US soybean acreage, with the potential to reach the same level of US market coverage as herbicide-tolerant cotton. As previously stated, Roundup Ready[®] cotton and soybeans have been popular with farmers because of the advantages they offer for weed control and crop management improvements. As with the environmental benefits of Bt, herbicide tolerance allows many farmers to use smaller amounts of chemicals in their crops. Therefore, a reduced amount of chemicals is introduced into the environment.

Roundup Ready[®] varieties also assist with conservation tillage in controlling soil erosion. Soil erosion due to wind and water create environmental and agricultural sustainability issues. When water runs off from agricultural land it carries soil and nutrients with it. This movement can “silt” streams, and nutrients support increased algae growth. Loss of topsoil from the land decreases its productivity. Conservation tillage leaves plant residue on the surface to protect soils from wind erosion and provides greater infiltration of rainwater thus decreasing runoff.

While conservator tillage has been a noble objective, adoption has been complicated by a lack of options for weed control. Herbicide tolerant varieties developed through molecular biology provide a tool that makes conservation tillage more feasible. In 1997, 109.8 million (37 percent) of US cropland acres were planted using conservation tillage. Experts expect the trend toward minimum-till and no-till farming to continue at an accelerated pace with the availability of herbicide tolerant cotton, soybeans, and corn.

According to scientific studies, Roundup should be a preferred herbicide in the environment for several reasons. It provides broad-spectrum, nonselective, postemergence effective weed control on a broad range of weeds. It does not move in water due to strong binding with soil. It produces no solid residues. It rapidly degrades to carbon dioxide, water and soil nutrients. It is essentially nontoxic to mammals, birds, fish, insects, and most bacteria. It has also had extensive use around the world since 1974, and has not induced Roundup herbicide-resistant weeds.

ENVIRONMENTAL RISKS OF BIOTECHNOLOGY

Certain environmental groups are of the opinion that the biotechnology used by our industry is harmful to the environment. Delta and Pine Land Company, as well as our partners in biotechnology, disagree with this opinion. According to the American Crop Protection Association, there is no credible scientific evidence to date showing that Bt plant pesticides pose a risk of adverse effects to humans or other organisms, or that in-field uses have increased insect resistance. Nor can the mere potential for resistance development be equated with an “unreasonable adverse effect on the environment,” as has been claimed.

As a provider of biotechnology to the marketplace, we accept the responsibilities that accompany this position. We follow the standards and regulations set forth by the EPA, the US Department of Agriculture (USDA), and the Food and Drug Administration (FDA) to regulate biotechnology. We cooperate fully with these organizations and trust them to set forth regulations that are based upon credible scientific evidence.

Pesticide Resistance — Members of the agri-business community are concerned about the potential for pests to eventually develop a resistance to Bt. We are following the EPA's recommendations regarding pest resistance management to help control this potential risk. The EPA has concluded that the use of resistance management programs is an effective means of deterring the development of resistance to transgenic Bt plant pesticides and that the potential for resistance to development is not a significant current threat to the environment. In *The Environmental Protection Agency's White Paper on Bt Plant-pesticide Resistance Management* published January 14, 1998, the EPA states that: “The EPA recognizes the value of Bt plant-pesticides as effective and safer pest management tools and has determined it is appropriate to conserve this resource by requiring resistance management plans for certain transformed crops.” We agree with the EPA in that Bt plant pesticide products are likely to be beneficial by reducing the total pesticide burden on the environment and reducing the overall human and environmental exposure to pesticides. We also support the EPA's recommendation for pesticide resistance management, appropriate pesticide labeling, and education programs as a means to control possible environmental risks that could result from biotechnology being introduced to the environment.

Gene Escape — The probability of gene escape, meaning the escape of transgenic genes into wild plants, is another topic debated by industry, academics, and environmentalists. Again, we base our opinion on this issue on recommendations supported by scientific evidence.

Despite the commercial approval of 25 transgenic crops in the United States as of mid-1996, concern is still being expressed regarding the potential risks associated with genetically engineered crops. One recurring issue is the possibility of pollen-mediated escape of engineered genes into populations of wild relatives of the crop. To address this concern, the scientific community

has depended on literature on pollen dispersal generated from non-transgenic organisms. Utilization of this information requires the assumption that the pollen mediated movement of native genes and transgenes is the same. Studies have indeed shown that dispersal of the native genes and transgene into non-contiguous plots was identical, and if gene flow were to occur that it would happen slowly and at a low probability under natural optimal conditions. Another study conducted in Australia found that only a remote possibility exists of transgenes from genetically engineered cultivars passing into natural populations. To date, studies such as these suggest gene escape is not currently the prevailing concern that many groups consider it to be. Industry members are cautious in our development and delivery of biotechnology, and we believe biotechnology to be a benefit to our customers and the environment.

TECHNOLOGY PROTECTION SYSTEM

Through biotechnology, we are developing tools to address the issue of management of gene movement. Transformation of the chloroplast DNA is one method being proposed. In most plant species, chloroplasts are maternally inherited and cannot be passed on through the pollen.

Delta and Pine Land Company, along with the USDA, has been awarded a patent for a Technology Protection System. The patent broadly covers all species of plants and seed, both transgenic and conventional, for a system designed to allow control of progeny seed viability without harming the crop. The principal application of this technology will be to control unauthorized planting of seed of proprietary varieties by making such practice non-economic. However, the system may have other benefits such as controlling pollen-mediated escape of engineered genes.

The system works as follows: Varieties developed incorporating this technology will produce a normal crop when planted in the first growing season. However, seed produced from this system in the second generation will not germinate and would be useless for planting. Therefore, if transgenic traits were to be transferred to a conventional plant, that plant would not reproduce as a result of this technology protection system.

STANDARDS AND REGULATIONS

The agricultural industry participating in the biotechnology movement is faced with many responsibilities that accompany our voluntary position in the marketplace. The question we ask ourselves is not *if* we will accept these responsibilities but *how*. As I stated before, we work in full cooperation with the EPA and the USDA by following the regulations and abiding by the standards they establish. For example, the EPA has issued temporary approvals for pesticide-resistant and insecticidal genes with limitations on use coverage, and we support pesticide resistance management plans established by the EPA which benefit the American public by reducing the total pesticide burden on

the environment and by reducing the overall human and environmental exposure to pesticides. We believe that it is industry's responsibility to not only abide by these plans but also to help ensure the successful development and implementation of these management strategies. In addition, we support the required isolations and movement procedures, labeling requirements, and reporting responsibilities set forth by these regulatory agencies.

We also initiated standards of quality in our transgenic products. For instance, D&PL 's varieties, both conventional and transgenic, must pass stringent tests to meet our quality assurance standards. These rigorous standards of D&PL provide our customers confidence that our seed is of consistent superior quality in all aspects. The results of these painstaking and expensive procedures are well recognized in the farming community. We have earned the trust of our customers, and it is our commitment to maintain this trust through responsible breeding, production, and marketing activities.

CONCLUSION

As we advance our knowledge of genetics through biotechnology, and as we advance our abilities to manipulate plant life, we must proceed with caution in these activities. We are breaking new ground. In doing so we must be prepared for the skepticism and criticism that accompany such activity. We listen with interest to those critics who support their hypotheses with credible science and sound evidence. We do not accept the pressures of groups who use unfounded statements and scare tactics to halt the progress of science and the advantages it offers.

As a provider of biotechnology, the agricultural industry is helping improve the success of its farmer customers. Our customers are an important gauge of the viability of these transgenic technologies and will support only those technologies that are truly advantageous to their business and to the environment. We will continue to work closely with regulatory agencies such as the EPA and the USDA to protect our environment and to follow responsible practices of biotechnology with regard to gene escape and insect resistance. In addition, we will continue to consider the risks associated with biotechnology and base our concerns and actions on credible scientific evidence. We will continue to provide biotechnology to our customers as long as it is a proven benefit to them, to agriculture, and to the environment.