

REVIEW OF AGRICULTURAL BIOTECHNOLOGY

HEARING BEFORE THE SUBCOMMITTEE ON CONSERVATION, CREDIT, RURAL DEVELOPMENT, AND RESEARCH OF THE COMMITTEE ON AGRICULTURE HOUSE OF REPRESENTATIVES ONE HUNDRED EIGHTH CONGRESS

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WEDNESDAY, JUNE 23, 2004

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON CONSERVATION, CREDIT,
RURAL DEVELOPMENT AND RESEARCH,
COMMITTEE ON AGRICULTURE,
Washington, DC.

The subcommittee met, pursuant to call, at 10:14 a.m., in room 1300 of the Longworth House Office Building, Hon. Frank D. Lucas (chairman of the subcommittee) presiding.

Present: Representatives Moran, Osborne, Burns, Holden, Case, Peterson, Dooley, and Etheridge.

Staff present: Ryan Weston, subcommittee staff director; John Goldberg, Elizabeth Parker, Claire Folbre, Callista Gingrich, clerk; Matt O'Mara, Ryan Weston, Andy Johnson, and Russell Middleton.

OPENING STATEMENT OF HON. FRANK D. LUCAS, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF OKLAHOMA

Mr. LUCAS. This hearing on the Subcommittee on Conservation, Credit, Rural Development and Research to review agricultural biotechnology is called to order.

Welcome to today's hearing regarding biotechnology. It has been nearly a year since we last held a hearing on this subject. That hearing focused on the regulatory aspects confronting biotechnology. One thing is for certain. When it comes to biotechnology, there will always be discussion regarding the most appropriate and effective form of regulation.

Today I would like to focus on something other than the regulatory aspect. I have asked our witnesses to describe quantitatively how products of biotechnology are used in agriculture. Even as this subcommittee has been tracking the growth of biotechnology the last few years, we have sometimes forgotten how important this technology has become to the rank and file producer in terms of input costs and production techniques. We are always looking for the next great innovation created by biotechnology, but the sheer amount of acceptance judged by the acres planted in biotechnology products is amazing, and while the U.S. accounts for the majority of the total percentage of plantings of biotechnology products, please note that 37 percent of biotech plantings occur outside the United States. Other countries recognize the benefits of the technology and strive to capture its potential. Even as the European Union set up road blocks to biotechnology trade, its member coun-

tries were spending millions on research and development for that very technology.

Our witnesses aptly point out how certain events such as trade restrictions have caused our domestic usage of biotechnology to ebb and flow at times. However, as I noted earlier, techniques such as no-till planting that can prevent soil erosion have to a great degree only recently come into their own with the advent of biotech products, and the world population growths and producers need to feed those extra mouths using environmentally-friendly productions techniques with increased yields. Biotechnology may be one of our only solutions.

I have also asked our witnesses to discuss current and future products that are in their research pipelines. What is the next big product for agricultural producers, or for that matter, consumers? We all know about pesticide resistance, but what about foods that produce or contain beneficial nutrients and those that may be used to create products such as ethanol or plastics? Furthermore, what biotechnology role may there be for lesser developed nations whose entire populations may thrive on one breakthrough product? We have heard about the novel possibilities of biotechnology for years and we are so much closer to seeing many of these products reach commercialization than ever before.

Finally, we will hear from researchers and capacity builders. What does it really take to get the research done and to create jobs out in rural America? Producers can use the technology in the fields, but how do small communities turn this science into steady and stable employment opportunities? Much of the projected growth for products of biotechnology has become a reality, and I am quite amazed at how important these products have become to us. I look forward to today's testimony, and I turn to the ranking member from Pennsylvania, Mr. Holden, for any comments he may offer.

OPENING STATEMENT OF HON. TIM HOLDEN, A REPRESENTATIVE IN CONGRESS FROM THE COMMONWEALTH OF PENNSYLVANIA

Mr. HOLDEN. Thank you, Mr. Chairman, for holding this important hearing to review the state of the biotechnology industry.

I would also like to thank Dr. Mel Billingsley of the Life Sciences Greenhouse from Harrisburg, PA for being here today to testify before the subcommittee. Hopefully, this hearing will provide an opportunity for all of us to learn what the biotechnology sector has been doing since the last time we met to discuss this issue.

Since the first genetically engineered crops became available in the mid-1990's, U.S. producers have been the world leaders in adopting these crops and demonstrating the numerous benefits that they can provide. Over the past few years, the biotechnology sector has made great strides in addressing a wide variety of problems experienced throughout the world. They have worked on projects that would benefit health and nutrition in undernourished populations and in such enhancing crops with vitamins and disease-fighting agents. They have also shown their commitment to a healthy environment by offering products that encourage farmers to reduce tillage, thereby reducing soil erosion.

The role of the biotechnology sector in ensuring the economic viability of both farmers and non-farmers here at home can also not be overstated. They have provided farmers with a whole new set of products to assist in increasing crop yields, giving them another means by which to keep their farms up and running, and companies such as Dr. Billingsley's play a significant role in expanding the industry in rural areas by creating well-paying jobs. Unfortunately, however, biotech firms as well as the producers who use their products have experienced barriers that have hindered the growth of the industry. One of the main barriers that they have faced has been international resistance to the use of their products. I am hopeful that the most recent complaint brought before the World Trade Organization will ultimately open up new markets for U.S. producers.

Another dilemma that industry faces is whether the current biotech regulatory structure is still appropriate, considering that many of the applications of genetically-engineered crops did not exist when the regime was established.

I look forward to hearing the testimony of the panels today, and again, Mr. Chairman, thank you for holding this hearing.

Mr. LUCAS. The Chair thanks the ranking member. The Chair would also request that other members submit their opening statements for the record so the witnesses may begin their testimony and to ensure that we have ample time for questions.

I would like to invite our first panel to the table, as they are seated and ready to go. Mr. Pete Siggelko, vice president of plant genetics and biotechnology, Dow AgroSciences of Indianapolis, IN, Mr. Thomas B. Klevorn, head of the corn and soybean business units, Plant Science, Golden Valley, MN on behalf of Syngenta, and Dr. Michael D. Dykes, vice president, Federal Government affairs, Monsanto here in Washington, DC.

You may begin, Pete, when you are ready.

STATEMENT OF W. PETE SIGGELKO, VICE PRESIDENT, PLANT GENETICS AND BIOTECHNOLOGY, DOW AGROSCIENCES, LLC, INDIANAPOLIS, IN

Mr. SIGGELKO. Well, thank you, Mr. Chairman, and good morning to you and the other members of the subcommittee.

I am Pete Siggelko, as you said, vice president of Dow AgroSciences in our Plant Genetics and Biotech business. Dow Agro is a wholly-owned subsidiary of Dow Chemical, a company that employs 40,000 people around the world, and we sure thank you for this opportunity to testify before this subcommittee this morning.

I would first like to thank you for holding the hearing because as you are going to hear my comments and those of my colleagues, we have got a lot of positive things to share with you in the field of biotechnology. I would also like to thank the committee for its long-term support of agriculture biotechnology in ensuring that we have the most productive and efficient farmers in the world for helping us produce the least expensive, safest and most abundant food supply in the world, and Mr. Chairman, my written comments have been entered into the record in their entirety.

Over the last 8 years, biotech, as you said, has made some really, really significant strides. A leadership position by one of my colleagues here at the table and substantial contributions in corn, soybeans, cotton and canola in terms of enhanced productivity. Today these crops are planted on more than 145,000 million acres worldwide, with the U.S., as you said, representing two-thirds of the crops, with good adoption elsewhere as well. Biotech also makes it possible to improve the quality, safety and nutritional contents of various foods, and we see markets opening, and Dow Chemical would be very interested in this area as well for the engineering of plants to be used as renewable fuels and lubricants derived from biomass that could help produce dependency on petroleum products.

The manufacturer of antibodies, vaccines, industrial products and pharmaceuticals is no longer a pipe dream. It is a reality, and Dow is glad to be a part of this revolution that is taking place. A number of our platforms touch agriculture, whether it is Dow AgroSciences or in Dow's industrial or biomaterials platform, and we believe that agriculture in plant-based systems are key to sustainability and the key to the future of our business in Dow. Specifically to our efforts, recently we have introduced our second Bt product in corn, insect-protected corn called Herculex through our micogen seed business. We have got several other important corn Bt products in the pipeline. In addition, we have got a Bt product that we hope to be registering later this year, and then introducing into the cotton market next year. And additionally, we continue to work on agronomic traits in the corn area around nutritionally enhanced corn, reduced phytase, as well as improved yield traits for corn.

We are also developing quite a few different second-generation products. One of the ones using the tools of biotechnology is a product called Nexera canola seed. It has got a unique oil profile, contains nutrients, fats, low saps. It has high stability for cooking applications, and as an example, this oil could, in a typical snack cracker, reduce the content of trans and saturated fats by about 85 percent, and this is a product that is available today. It is not a GMO product. We did use the tools of biotech to create it, but it is a product that is available today. We grew it primarily in Canada, though we are expanding the production to Europe, and we are looking for areas of adaptation in the United States to ramp up the availability of this oil. But we are selling it today.

We also use plants and plant-cell systems to manufacture novel biologics and therapeutics for human and animal health. The benefits of plant-based manufacturing systems are great, and the resulting vaccines and antibodies are going to change the way that diseases are treated in the future. At the present time, we are building a facility in Lincoln, NE for the production of vaccines in the animal health industry, and we will launch the first plant-made vaccine for the poultry industry in 2006, and we have got several important follow-on vaccines and work oriented towards one very important one that is affecting the U.S. poultry industry and exports, and that is avian influenza.

In addition, we are working in the area of food safety and in reducing the load the pathogens such as e. coli in cattle and sal-

monella in poultry. In this area of plant-produced pharmaceuticals and in proteins, the USDA has done a remarkable job here in stepping up their activities to regulate this field and help the field develop over the last couple of years. Biotechnology and renewable resources, Dow is I think contributing to the transformation of the industry from just pure agricultural commodities to differentiated products. We are currently using corn, soybean, wheat, castor, sunflowers and other oil crops for the development of new high-performance polyurethane carpet backing for plastics, for fiberboard, epoxy coatings just to name a few, and most notably in Nebraska is Cargill Dow Polymers that is using corn byproducts or corn as raw materials for the production of plastics.

And in closing, just a few comments for your consideration. We hope the Government continues to be a staunch and aggressive advocate of these technologies, at the national as well as the international level. To date, a lot of our success is attributed to your support and the support of the administration. When we look to the future, it is also going to be important that the Government facilitate and incentivize the continued development of the technology in the area of private and public research agreements, procurement programs, grants and funding of collaborations. We continue, and my colleagues, to work to bring technological innovations to the market because we have enjoyed a certain amount of freedom to operate while being covered by a pragmatic science-based regulatory system.

Sites like Hawaii and Puerto Rico served as really a lifeline for us for research and development efforts through their favorable climates, fertile environments, rich academic and public resources, and although we are making a lot of progress in communicating with these stakeholders, we still face real threats in these geographies, and we need continued support from you to maintain these geographies.

Lastly, we have made significant progress since the initial debut of biotechnology less than a decade ago, and we are clearly in the midst of a biotechnology boom. Yes, there are challenges, but not only are products being introduced and adopted by the American farmer that are steadily improving our productivity, but Dow and our colleagues are bringing on a suite of new and exciting products with greater, more tangible consumer and grower benefits.

Thank you, Chairman.

[The prepared statement of Mr. Siggelko appears at the conclusion of the hearing.]

Mr. LUCAS. Thank you.

Mr. Klevorn.

STATEMENT OF THOMAS B. KLEVORN, HEAD, CORN AND SOY-BEAN BUSINESS UNITS, PLANT SCIENCE, GOLDEN VALLEY, MN, ON BEHALF OF SYNGENTA

Mr. KLEVORN. Good morning, Chairman Lucas, Ranking Member Holden and members of the subcommittee.

My name is Tom Klevorn. I am with Syngenta. I would like to thank you for the opportunity to be here today to discuss Syngenta's role in biotechnology. As the first company to commer-

cialize a plant biotechnology product, we have a long history with biotechnology, as well as a deep commitment to its future.

Syngenta is a world-leading agribusiness company committed to sustainable agriculture through innovative research and technology. We believe in delivering better food for a better world through outstanding crop solutions, and we take pride in meeting our commitments to our stakeholders. Our total sales in 2003 were approximately \$6.6 billion across all products. In North America, specifically in the United States, Syngenta's biotechnology research is conducted primarily at Syngenta Biotechnology, Incorporated, which is located in Research Triangle Park, NC. Our corn and oilseed business in North America, which includes the NK brand, is headquartered in Golden Valley, MN. Rogers, our vegetable seed business for North America, is headquartered in Boise, ID. These brands market all of our biotechnology traits and products.

I agree with my colleague that the use of plant biotechnology has increased substantially since the introduction of the first biotechnology plant products in 1996, and there were two; Syngenta Event 176 and Bt-11, both for protection against corn bore in corn. We have also found that one-third of the global biotech crops were planted in developing countries in 2003. Syngenta invests heavily in research and technology to add value to our existing business, and to create opportunities for future growth. Of our 19,000 employees across the globe, approximately 5,000 and about 1,000 in the United States work in research, technology and development, and we invest about \$2 million each day, or about \$730 million a year, in research and development.

While we conduct a lot of private research, we have also donated the results of some important discoveries to the public domain. In May of this year, we announced our donation of a substantial portion of our Arabidopsis functional genomics seed collection to the Arabidopsis Biological Resource Center hosted at the Ohio State University in Columbus, OH. Syngenta is also making the sequence information universally available by placing it into the international gene database GenBank. In 2002, Syngenta shared its rice genome sequence research with the International Rice Genome Sequencing Project, which is a 10-nation public effort, with the goal of promoting improvements in rice production globally. Syngenta's data was used to accelerate the completion of a high-quality draft sequence that is available to the global research community through international databases.

In 2000, Syngenta began working with the inventor of Golden Rice to form a Humanitarian Board to oversee the development of a vitamin-A enhanced rice product that could be distributed free to farmers in developing countries. Collaborative research underway between Syngenta and the Humanitarian Board is aimed at increasing vitamin-A expression in rice. Large-scale research trials in the U.S. this year will move Golden Rice one step closer to becoming a real option in the fight against malnutrition and related diseases.

Commercially, Syngenta, primarily through the NK brand, sells several corn and oilseed biotechnology products today. In field corn, these traits include insect resistance and herbicide tolerance. Our

soybean business includes herbicide tolerance products. We also market an insect-resistant sweet corn under the Rogers brand.

In addition to insect resistance and herbicide tolerance products, Syngenta's biotech research and product development pipeline includes several exciting products. Within the next 3 to 5 years, Syngenta will bring forward amylase corn, phytase enzyme feed supplement, longer-shelf-life bananas, fusarium-resistant wheat, vegetative insecticidal protein corn and second-generation products for insect resistance in corn and cotton. Further down the road, we are managing projects in the areas of drought tolerance, biopharma and disease resistance. Today, I would like to focus our testimony on some of our products that are close to commercialization and go beyond traditional input traits.

An exciting product coming through our development pipeline is amylase corn. This is a corn plant genetically modified to express high levels of a novel alpha amylase enzyme, which is a critical ingredient in the production of ethanol. Amylase in general is an enzyme that has been used in ethanol production and other processes for quite some time, and is currently used in the dry grind ethanol industry to accelerate the conversion of the starch in corn to sugar. Without enzyme being located in the corn seed, in the grain, our amylase corn has the potential to significantly improve this process and thus the overall efficiency of ethanol plants, and this would include yield increases, process improvements and possibly reduced ethanol production costs.

Syngenta's amylase enzyme is thermostable, which allows more efficient utilization of the enzyme during the ethanol production process. Although it would be grown on a relatively few number of acres, Syngenta is seeking full feed and food and export approvals for this product. We are currently conducting field trials in the United States, primarily in Nebraska, and a pilot study for this product for possible launch in 2006 or 2007.

Quantum phytase is the brand name of a new novel enzyme feed supplement that can help livestock producers lower feed costs and deliver greater nutritional benefits to monogastric animals, such as swine and poultry, in an easy to use and more consistent and efficient format. The product has received registration in Mexico and Brazil and has been introduced commercially in both countries. U.S. and Canadian approvals are anticipated in 2004. One advantage of Quantum phytase versus existing products is its inherent thermo-stability versus competitors which gives feed producers more flexibility because it can tolerate heat-treating used in ration production without any loss of efficiency. Our research also indicates that Quantum phytase can improve an animal's nutrient utilization, potentially allowing animal producers to reduce overall feed costs. Quantum phytase also allows producers to reduce the amount of supplemental phosphorus added to feed resulting in reduced phosphorus in the manure, a potentially significant benefit from an animal management as well as an environmental perspective.

Finally, a product with a more direct benefit to consumer is our extended-shelf-life bananas. This banana ripens slowly and remains ripe for an average of 3 to 5 days longer than conventional bananas, which is an important feature for consumers as well as

retailers of the product. The banana also delivers 10 to 12 days of extra green life, which is a value to banana growers and shippers.

As I believe this shows, Syngenta is fully committed to biotechnology and the promise that it holds for agriculture, including producers, growers, processors, retailers and consumers, as well as others involved in the production of agricultural products on a global basis.

I would like to thank you for the opportunity to share with you the many things that Syngenta is doing in plant biotechnology today and will continue to do in the future, and at the appropriate time, I would be happy to answer questions.

[The prepared statement of Mr. Klevorn appears at the conclusion of the hearing.]

Mr. LUCAS. Thank you. Now we will see if I can mangle the third name in a row. Mr. Dykes.

STATEMENT OF MICHAEL D. DYKES, VICE PRESIDENT, FEDERAL GOVERNMENT AFFAIRS, MONSANTO, WASHINGTON, DC

Mr. DYKES. Thank you, Mr. Chairman, members of the committee.

My name is Michael Dykes. I am vice president for government affairs for Monsanto Company. I have been involved in agriculture all my life. I come from a farm family in Kentucky, and I have firsthand knowledge of how important new innovations are for farmers. I would like to thank you for holding this hearing today and giving us an opportunity to share with you some of the Ag biotech developments now and for the future.

Monsanto Company, headquartered in St. Louis, MO, is an American company with nearly 14,000 people. We are working to deliver products and solutions to help meet the world's growing food needs while conserving natural resources and protecting the environment. One of our first biotech products was Roundup Ready soybeans that were genetically enhanced to provide herbicide tolerance. This allows Roundup herbicide to be applied directly over the top of the crop and provides outstanding weed control without damaging the crop. We also developed Bollgard cotton and YeildGard corn, which helps control the major insect pests in those crops and reduces the use of chemical insecticides.

Because of the success of our first biotech crops, we are able to reinvest approximately \$1.4 million a day in biotechnology and plant breeding research to improve agriculture and food quality. Farmers, the environment, society in general have and will continue to benefit from these new products through dramatic reductions in pesticide use, significant increases in yield, better soil and water quality, enhanced food/feed quality and improve grower profitability.

I am going to walk through a couple of charts with you that I have that illustrate some of the dramatic growth we have seen in biotechnology over the last 10 years, as my colleagues have pointed out.

[Chart]

This first chart shows the growth in biotech from 1996 through 2003. The cumulative is 167.2 million acres in 18 countries that

were planted with biotech crops last year, and you can see the green. There is the soybeans and the corn, the cotton and the canola. By far, the largest biotech acreage is in the United States, and U.S. farmers reap most of the benefits. Just to highlight one particular aspect of the benefits, in 2002, the National Center for Food and Agriculture Policy found that 8 biotech crops in use by U.S. farmers were developing major annual benefits. \$1.2 billion in reduced cost, 4 billion pounds of increased yield, and a 46-million pound reduction in pesticide use.

Now that I have discussed the current products that are already in the marketplace, I would like to highlight a number of products in our development pipeline. We are currently testing both corn and soybeans in various parts of the U.S. to screen for the effectiveness of stress-tolerant genes in different environments. Drought stress causes enormous loss of food and fiber virtually everywhere on earth, including here in the U.S. While these results are promising, commercialization is several years off. I have a couple of charts on this.

[Chart]

The first one is showing you soybeans that have been undergoing tests in our research labs in Chesterfield, MO with drought tolerance. As you can see, those on the left were the control without the gene. Those on the right is with the drought-tolerance gene. One of the early signs of drought stress in soybeans is drop of leaves, and you can see that—a lot more vibrant, vegetative growth with those with the gene.

[Chart]

The second chart will show you some field trials that we have done with drought tolerance in corn. I think the results in the years here with the yields are quite dramatic, and you can see those on the left, corn without the gene, and those with the corn with the gene. This was a field trial done in 2003 in Kansas. For all us who are familiar with growing corn on the farm, you can tell that those on the left—that the leaves are all twisted, which is a normal reaction to corn when it is under drought stress. And one of the advantages of the drought-tolerant genes is you prevent the twisting and rolling of the leaves. I don't know if you can see that from where you are sitting, but with that on the right, you can see that the leaves are open and wide. Again, early results, but quite promising in terms of drought stress as a part of the overall stress pipeline of genes we are working on, which would include cold stress, nitrogen and drought.

We are also working on several food quality traits that we believe will benefit consumers. We are developing soybean and canola oils that will enable food companies to offer consumers economical food products with reduced or in some cases zero trans-fats while maintaining the taste. The second generation of soybean oils will enable food products to have the same low trans-fat benefits plus improved flavor and extended shelf-life. Long-term research involves ways to produce crops enriched with Omega 3, a fatty acid which is the component that makes a seafood diet heart healthy. We are looking at ways to use plants to produce Omega 3, giving consumers the ability to consume more Omega 3s in their foods that they eat every day.

We are also using biotechnology conventional breeding to develop corn that is ideal for production of ethanol. This corn, high in fermentable starch, could make ethanol production more cost-efficient. In fact, last March, Congressman Osborne, appreciate your participation in the ribbon-cutting ceremony of an E-85 pumping station in Grand Island, NE in your district when we worked with the OR cooperative.

In conclusion, Mr. Chairman, we are looking for new solutions to problems that have challenged farmers and societies for thousands of years, and we are finding those solutions in nature through biology and biotechnology. We believe very strongly at Monsanto that agriculture innovation and creativity is the pathway for U.S. agriculture to continue to compete successfully in the global marketplace and for the benefits of technology to multiply for farmers, consumers and the environment. We believe as society begins to fully understand the untapped potential of this technology that there will be an exciting future for biotechnology, one that Monsanto is very proud to be a part of.

Thank you very much, and as my colleague said, I would be happy to entertain any questions.

[The prepared statement of Mr. Dykes appears at the conclusion of the hearing.]

Mr. LUCAS. Yes indeed. Thank you. Certainly the panel's testimony indicates just how exciting the prospects are for what lies ahead of us.

First question addressed to the whole panel and whoever might care to answer or all, what would you say is the biggest single threat, or the biggest threat perhaps is a better way to describe it, to the biotechnology advancement that we have and we are continuing to work on? What is our greatest threat?

Mr. SIGGELKO. I think there might be some consensus around this, but we have created and registered products in the United States, and one of the challenges is the acceptance overseas in a regulatory program that actually is very difficult to work through. As an example, Herculex had a registration for food and feed in the United States in 2001, but because of lack of import approvals on receiving countries—I mean, it is quite different than pesticide registrations, it was an additional workload stewardship, of course, to get to the point of having those important approvals where we could begin the process of business and not affect the trade of our customers.

So I'd see if my colleagues here have a comment, but I'd say that that is one or two of the major issues.

Mr. KLEVORN. I agree that acceptance globally is a key issue for the products. I would also say that in terms of taking the technology forward, unless we can convince ourselves that in the short term, there is return for everybody involved, it will have a dampening effect on future investments for this technology going forward. So I think that the acceptance piece is the critical issue around the globe.

Mr. DYKES. I would concur with those. I think the science-based predictable regulatory processes around the world are critical to facilitate in trade and to continue to bolster consumer confidence in the foods that they eat are safe and wholesome. I think our admin-

istration and our three regulatory agencies are doing a tremendous job in trying to work toward ensuring that we have the freedom to operate around the world. I think the other thing that is important to us as technology providers is protection for intellectual property rights around the world, because in order to be able invest the amount of money we are investing in research every day to bring new technologies to market, we have got to be able to capture value from that around the world.

Mr. LUCAS. And along that line, in the last hearing that we had, clearly it came through that if the rest of the world had the kind of regulatory regime that we have in the United States that the level of confidence around the world would be greater. That is a challenge they are going to have to work on improving. But unless we make progress in that acceptance issue around the world, knowing of course that the American market is so tremendous, how long can you companies continue to make what have to be rather substantial sums investment-wise in the short-term sense working towards these long-term profit targets?

You have obviously committed huge amounts of resources in the last decade on things that will not immediately bear financial fruit. Describe for us a little bit of the logic that goes into how you make those decisions too in the environment we are in.

Mr. SIGGELKO. Well, I will take a stab, and I am sure that the other guys will have have a twist as well. I guess there is, Mr. Chairman, two different approaches. The one is individual companies, and then one as an industry. There is a group in the United States—I am talking about the—a little bit on the industry first in the U.S. called the Council for Biotechnology Information, which has been an organization sponsored by a number of different groups to talk about the benefits of biotechnology and to do outreach and education.

Similar kind of activities are taking place in other parts of the world that are being funded by industry to a fairly substantial degree to try and help and work on acceptance, and I would also get to the individual company pieces. All of us are working very close together to if you want to say hold the burlap together on how we take products to market. We are trying to be lock-step in how we develop products, how we take them so we don't cause our customers here in the U.S. trade issues, and I think that we are doing some pretty good things together to self-police.

But at the end of the day, in these large-commodity crops where there are incorporating traits, and there is a potential for an impact on trade, and we don't see a lot of relief in the near term, it does have a damper on the amount of investment that we are willing to make, and it redirects us to use other forms of the technology.

Mr. KLEVORN. One of the things that Syngenta does is focus on crops where we think we can make money in the short term, so we will tend to focus on crops where the value that we create can be realized by everybody that is involved. Corn as opposed to something like a vegetable crop, so that handles not only the capture of the money—of the value that is created, but it also helps us avoid some of the acceptance issues that might be associated with a vegetable crop, as opposed to a grain crop. What that means is

that some of the benefits we could put into a whole variety of crops is not going to be realized in the short term.

So our main method of doing it is to focus on crops and the focusing markets where the money is available. The U.S. and corn, for instance, would be a top priority for I think everybody at the table.

Mr. DYKES. We take a similar approach. We are focused on core crops, corn and cotton, soybeans and canola. We look at introducing new traits where we can work closely with our grower customers and where we are satisfying a need and delivering a value to both our shareholders and to our grower customers, and that is kind of what guides and directs our investment decisions in this biotech world.

Mr. LUCAS. Thank you. The Chair now turns to the ranking member from Pennsylvania, Mr. Holden.

Mr. HOLDEN. Thank you, Mr. Chairman.

All of you talk about the problems with acceptance in foreign markets. Currently, what percentage of biotech products are exported?

Mr. SIGGELKO. And Michael probably has got some statistics closer to his fingers.

Mr. SIGGELKO. Yes. Sixty-five percent of the corn I guess in the U.S. is used for animal feed, and then I don't know what the next fraction is for food consumption. Then the balance is exported. Michael, I don't know if you want to—and a good percentage of the corn is treated with biotechnology products.

Mr. DYKES. I would just add on soybeans, we are probably looking at about 50 percent of the U.S. soybean production is exported.

Mr. HOLDEN. And what is the primary market it goes to?

Mr. DYKES. Of the soybean exports, I think China is now the single largest importer of U.S. soybeans. Europe collectively as a collection, a country, is probably still the largest, and I think it used to be—I don't know if the figures have changed recently, but about half of our exports go to Europe. China has imported an excess of a billion dollars of U.S. soybeans.

Mr. HOLDEN. Mr. Siggelko, in your testimony, you talk about how Dow is helping with the transformation of U.S. agriculture by using corn, soybeans and a number of other commodities to develop biomaterials for industrial use. Could you elaborate on what some of these products are and how they could be used?

Mr. SIGGELKO. Yes. I guess there are two different twists. One is using natural products. The one, we mentioned wheat, is using wheat straw in combination with the epoxy systems to manufacture construction panels. It is a venture we have in Canada, but another one is a group that is between Dow scientist and land grant university scientists concentrating in the area of oils to develop new edible oils, but also to take and modify various oil crops to use as industrial feed stocks. One example is the use of hyolaic vegetable oils where the sunflower, soybean or canola for use in the manufacture of polyurethanes and flexible foams.

Those are the areas that we are looking, and one of the biggest investments that have been made is in Nebraska between Dow and Cargill Dow Polymers in the production of polylactic acid and PLA polymers.

Mr. HOLDEN. Thank you. Dr. Dykes, Monsanto recently withdrew its regulatory submissions for Roundup Ready wheat. Would you please explain to the subcommittee why you decided to defer to commercial—

Mr. DYKES. I think this goes back to the previous question we had about making decisions on research and development monies and bringing new products to the market. We remain committed to Roundup Ready wheat. We made a business decision, working closely with the North American Wheat Growers and the U.S. Wheat Associates with the decision on wheat and decided to delay the introduction of Roundup Ready wheat until such time as there is another biotech trait in the wheat industry.

I think there are a couple reasons for that. Roundup Ready wheat was focused this—as Monsanto's effort was focused on Hard Red Spring wheat, a market, the number of acres for Hard Red Spring have been declining over the past few years and such a narrow segment of the overall wheat industry that we think for the introduction of a biotech trait in wheat, some of the things that my colleagues are working on, such as fusarium-resistant wheat, which will have a wider application across more sectors of the wheat industry, may be the first products to come through, and we may follow with our Roundup Ready technology, once there has been some other technology traits introduced into the wheat market.

Mr. HOLDEN. Thank you, Dr. Dykes. I think in your opening statement, you said you are investing \$1.4 million a day in research?

Mr. DYKES. Yes, sir.

Mr. HOLDEN. How about our other two panelists? How much money are your companies spending on research?

Mr. KLEVORN. We are spending about \$2 million a day across all of our research and development efforts.

Mr. SIGGELKO. And in the case of Dow, it would probably be about, for agricultural research, probably about—I am not going to get that right—\$750 to \$800,000 a day, if you want to call it.

Mr. HOLDEN. Thank you, Mr. Chairman.

Mr. LUCAS. The Chair now turns to the gentleman from Nebraska, Mr. Osborne.

Mr. OSBORNE. Thank you, Mr. Chairman, and thank you for being here today and I appreciate the role that some of you take in Nebraska, and I just had a couple of questions. You know, we are interested in pharmaceutical crops because of the drought and when you don't have a lot of water, we assume that there have to be some setbacks, and as a result, you don't farm as much land when it is pharmaceutical, and therefore, you can use what water you do have to concentrate.

I just wondered if you had a comment on what you look for in terms of finding where you are going to grow pharmaceutical crops. Are you looking for something really isolated or whether the setback is required, so anyway, that is I guess my first question.

Mr. KLEVORN. I will take that. I think the first thing since we want to make sure that we comply with all of the regulations that would be involved with a pharmaceutical product is that we try to keep that as separate and far away from other crops as possible. It really depends though on what crop is selected as the vehicle to

develop the pharmaceutical product, and it is easier to use a product that a crop that we know a lot about. So corn would be easier to use, soybeans would be easier to use than something that is relatively new. We just haven't worked with those crops that much.

But our first item is to see what the regulatory situation looks like, make sure that we comply with those, and initially, it looks like that is going to require some segregation from the rest of the population.

Mr. OSBORNE. Well, the reason I asked the question is that we have a very large part of Nebraska that is called Sand Hills. Once in a while, you run across a center pivot out in the middle of the Sand Hills, 20 miles from the nearest cornfield, so you know that is pretty safe. But on the other hand, you have some people who are trying to or are at least thinking about pharmaceuticals right next to other crops. And so I understand we will have to look at the regulations and I understand that.

Mr. SIGGELKO. Mr. Osborne, if I could make a comment?

Mr. OSBORNE. Yes.

Mr. SIGGELKO. I think it goes back to the question the chairman asked as well. Necessity is the mother of invention. There have been some issues and complications with open-field production. Dow is doing research in both areas, so I would say on the crop side, we would definitely work towards the side of isolation, good security, very tight stewardship control. On the other hand, from the necessity is the mother of invention, we are also using—in the facility that we are building in Lincoln, NE, is a bio-contained system using plants, but it is not open-field production that we think is going to be—for the types of products that we are building is going to be a more effective way to go, but it is agriculturally based.

Mr. OSBORNE. All right. Well, thank you. The last question I have is with the ongoing drought out there, even 5 years, and you were talking about drought-tolerant soybeans and corn. Where are you on that? How far along are you where something like that can actually be used?

Mr. DYKES. The pictures I showed you were from a field trial in Kansas on the corn, and the soybeans I showed you were from our research labs in St. Louis. We are in the early stages. We are probably looking at sometime within a decade of actually introducing commercial products. We are doing field trials of several different gene concepts in both corn and soybeans across the corn and soybean belt, and again, things look very promising now, but we are probably looking at another decade, sometime within the next 10 years before we see commercialized products.

Mr. OSBORNE. And what type of water saving would you assume that would be? Can you get by with one-half, two-thirds, three-quarters the water that a normal crop would use, or do you have any data on that?

Mr. DYKES. Well, we have looked at different levels of water, and we have looked at different levels of water at different times during the growth stages, and we don't have a firm number on that just yet with the different gene constructs. Water has a different value to the crop, depending on the stage of the growth that the water

occurs. So we haven't quantified any of that, but it does look promising, from what we have seen.

Mr. OSBORNE. Well, most of the corn savings we grow is irrigated, so we can control when it gets there, but we are just running out of water. You know, our reservoirs are practically dry, and so, I wish it was next year that you had it available, but—

Mr. DYKES. We do too, sir.

Mr. OSBORNE. All right. I yield back, Mr. Chairman.

Mr. LUCAS. The Chair now turns to the gentleman from Hawaii, Mr. Case.

Mr. CASE. Thank you, Mr. Chairman, and Mr. Chairman, I did ask for comments from members of my agriculture community and would ask leave to insert these comments into the record. Thank you, Mr. Chairman.

To all three of you, what you say is incredibly promising. I think we all realize here, at least in this room and in DC and elsewhere in the agriculture community, incredible promise. I think the Chair's question was a very good one, and I will tell you that what I think the biggest challenge at least for you, or at least it is my biggest challenge as a Member from the district that hosts a lot of your research—I think all three of you are active in my district. My biggest challenge is not ensuring foreign confidence but domestic confidence in what you are doing. There are certainly some parts of our society that will simply have a fairly knee-jerk reaction to any research along these lines, but that is not what I am talking about.

What I am talking about is more reasons, more trained, more highly-educated people that have thought this through on a scientific basis, and some of the testimony that I asked of the Chair's leaves to insert in the record comes from people like Dr. Vansuela who is an extension specialist at the University of Hawaii, or from a farmer by the name of Te Datenkona, highly-trained, highly-educated, who has taken some concerns from the scientific perspective, question that are worth asking. And I ask each of you I guess for some elucidation on what you are doing not only to broaden the base of support that you have for what you are doing, because I think most people may not be familiar with what we are taking about here, the tremendous potential, actuality and advances that are possible from this research, but also to answer their concerns.

Because I think it is very important for us to have that level of confidence in our system and from where I sit, dealing with my constituency in Hawaii, those concerns are real and oftentimes are unanswered, and it is not just up to us in Government to answer them, it is your huihana, as we say in Hawaii. It is your vested interest to do that, so what are you doing to ensure that you continue to have a base of public confidence in what you are doing, not just in Hawaii but throughout our country? I think you have got to maintain that base here before we worry about the rest of the world. We need to worry about the rest of the world, but we need to worry about the home front too.

Mr. SIGGELKO. Council for Biotechnology that I referred to, one of the primary efforts there is outreach and education about what is agricultural biotechnology and how it is used. So I think we have to continue and we are planning to continue that effort. And you

are right. All three of us do have locations in Hawaii. As I mentioned, we are in Puerto Rico as well, because of the growing environment, the number of cycles that you can work through in a year, so they are very important.

One of the things we have got to make sure just as the locales where we have got chemical plants in the United States, we have got to be good local citizens and I think be pretty transparent about the work that we do and the kind of work that is taking place. There is nothing to hide and just as we are the council for biotechnology information in the continental United States, we need to be taking a similar approach in Hawaii, and you are suggesting there is need for education, and well, we will take that feedback and try to step up that activity because we certainly have nothing to hide.

But as you say, I think there is going to be a certain percentage of the population we won't be able to sway, but a good percentage that we can help educate.

Mr. DYKES. I agree with your comments about the need to educate, especially in Hawaii. I was in Hawaii about a month ago to visit with several people, the Director of Agriculture and the Director of Health, the Mayor of Maui and members of the Farm Bureau, the Sugarcane Producers, Enterprise Honolulu and several others. Hawaii is critical to all of us. All of us have operations there. We are doing some basic plant breeding research in Hawaii. I think the issue in Hawaii has been that we have been there for several years. We have been going about our efforts doing our research. It is one of the 50 States. It has a great climate, as Pete alluded to in his testimony. It is the ideal place for us to do our work.

But we have not taken the time to go and educate people about what we are doing, and we have got to do a better job of that, and we are setting about trying to do that. We have an organization in Hawaii that all of us participate in called the Hawaii Crop Improvement Association. We are looking to hiring an executive director there, a local Hawaiian who can be there on point to help answer questions and address the concerns on the different islands. We are working with the director of health to maybe do a physicians' educational program so physicians can get continued medical education credits, working with the University of Hawaii on that.

We worked with the American Farm Bureau and the Hawaii Farm Bureau chapter down there. We are giving tours of our facilities as my other colleagues are giving tours of theirs, which is something we just haven't done because people haven't asked and our researchers haven't thought about that. While I was there, we gave a tour for one of the members of the Hawaii State Legislature. We are doing some public education programs. We are doing the outreach. We trying to do the education, and our strategy has been that we have got to educate the educators so that we can get a multiplier effect because we won't be able to get around to talk to each and every individual.

I think another issue there that we face in Hawaii that we haven't had in the other States, in the other States, we have growers like the National Corn Growers and the National Cotton Council, the American Soybean Association that are there to talk first-

hand about what they see is the benefits of these products, which has been tremendous for us. In Hawaii, since this is research, we don't have the local growers there to speak out either. So those are several steps, Mr. Case, we are doing to try to address the issue. We are aware of it. Any suggestions you have for ways we can better do that, we are open to it because Hawaii is critical to what we are trying to do.

Mr. CASE. I would just comment I don't think this is just a Hawaii issue, although you have both spoken to it, and I am certainly sensitive to it from my district's perspective. I think it is a broader issue than simply my jurisdiction. I think you are going to—if you don't have it in other places, you will probably have some of the same concerns soon enough.

Thank you for your efforts though.

Mr. LUCAS. The Chair now turns to the gentleman from Kansas, Mr. Moran.

Mr. MORAN. Mr. Chairman, thank you very much.

Just for a snapshot, you all mentioned the amount of research dollars that you are spending privately. What is the relationship between business and the university community, private and academia? How do those dollars compare to what is going on in the university setting in biotechnology research?

Mr. SIGGELKO. An estimate that we have developed is that the tech provider's larger companies are probably about one-third of the global spending in the field. You know, and compare and contrast it to the agricultural chemical side, it would be almost exclusively within the chemical industry and not outside, and I think it is quite the opposite in the agricultural biotechnology area.

Mr. DYKES. We try to do collaborative research with the land grant institutions, private institutions, public institutions. Work collaboratively with them around the 50 States, and with the institutions internationally, as well.

Mr. MORAN. So the research dollars that you described earlier, they may contracting with the universities to conduct that research? This is not necessarily scientists or research scientists within your individual companies?

Mr. KLEVORN. That is correct. In fact, for example, with some of the insect-resistance products, we do a lot of work with universities to help us design insect-resistance management programs that work from a regulatory perspective and work in terms of good stewardship for their products. So it is a collaboration. I don't have a number for you to say it is 30 percent of 10 percent today. We can look into that and get back to you with that information. But it is not just private money that doesn't work with other areas outside of the companies.

Mr. MORAN. What Federal dollars are available for research in biotechnology? Are there dollars that either you compete for or that are available to universities from USDA?

Mr. KLEVORN. I don't know the answer to that question. I will say that depending on how you look at biotechnology, if you are looking at it as a way to enhance energy utilization or enhance nitrogen utilization, things like that, there are probably a lot of places that frankly we haven't explored as deeply as we should

have to work with different Government and State agencies to help develop some of the technology.

Mr. MORAN. I assume it is true that there may be some public policy benefits that accrued to this kind of research that may not result in an economic benefit to a private business, and therefore, incentives for that kind of research may be important. Is that accurate?

Mr. SIGGELKO. Yes. That would be the way we would look at it. I agree with Tom. When you talk about petroleum alternatives and developing alternative feed stocks, energy sources, using biomass, longer term, higher risk, and I think we will shy away from it. On the other side, I mentioned some of the animal health and human work we are doing with plants. Here is a place we are investing the money with other groups in the U.S. and other places to let the build capability leverage their expertise because it is risky. You know, and we are not developing the internal staff and internal fixed cost, but we are leveraging world-class expertise outside.

So as Michael said, there is a tremendous amount of our funding that is what we call outside contract research funds that supports outside institutes in doing our targets work.

Mr. MORAN. The research that you are doing now, are you seeing financial returns for that research, or are the benefits much more long term than that?

Mr. SIGGELKO. Well, the one particular product that I mentioned, the first plant-made vaccine that we will register that will be a relatively small one because we are blazing new trails. We register in 2006, launch in 2007. So it should begin to generate. But the seeds and input traits, insect traits, herbicide tolerance traits, those are out in the marketplace and making money today. A number of the other ones—and our oils business is out in the market today.

The pharmaceuticals, the animal health products in plants longer term, it is a portfolio that we have got to look at of near, medium and long term in evaluating how much we want to spend and the risk we want to take.

Mr. MORAN. Currently, what percentage of your market for the benefits that arise from biotechnology are—United States are domestic as compared to your opportunity to receive a return for your investment from farmers abroad?

Mr. DYKES. Well, I think as the chart I showed you earlier about the acres, the vast majority of those acres are grown in the U.S. We talked about growing in 18 countries, but the vast majority of them are U.S. acres and benefits that occur in the U.S. farmers. I wanted to respond too to some of your research questions, as well. We are doing collaborative research with University of Illinois and USDA ARS on—soybean rust as one example of a collaborative research project.

Sources of funding for biotech research, the USDA certainly worked closely with the universities to fund public research. The Danforth Institute Plant Sciences Center in St. Louis I know is working under competitive grants. I think they work exclusively with competitive grants, and some of their funding comes from NIH, National Science Foundation. So that is just another example, and perhaps some of the gentlemen on one of the next panels can

give you a better handle on some of the sources of funding, but those are a couple of examples.

The other comment you made about local universities, it is always advantageous for us when we are thinking about new products to have the land grant institution's expertise and the agronomic management practices of that crop. So we introduce it. We also have the benefit of all of the agronomic practices associated with that in that particular State, so that is another benefit to us as well working with the universities.

Mr. MORAN. Thank you for your response. Thank you, Mr. Chairman.

Mr. LUCAS. The Chair turns to the gentleman from California, Mr. Dooley.

Mr. DOOLEY. Thank you, Mr. Chairman, and thank all of you for taking the time to testify today. I think when we look at consumer acceptance and market access, obviously a lot of us are continuing to be concerned about the reluctance of EU to approve a number of products there, and also are very concerned about the proposed traceability and labeling standards that they have put in place.

What I would be interested in hearing from you is there a consensus within the industry that the United States should be setting a precedent in terms of a standard for adventitious presence? You know, we have set somewhat of a precedent in terms of our regulatory structure, which gives us I think a foundation to challenge some of the impediments to market access internationally. Do we need to be doing the same type of approach with the adventitious presence?

Mr. DYKES. Mr. Dooley, I would say that adventitious presence policy is extremely important to us. I think we are all in total agreement that it is extremely important. A U.S. position on that will be extremely important internationally. I think at this time, other countries have come forward with a policy on adventitious presence. They have done it in different manners. They have set numerical levels. I think the approach that the U.S. is working on is a science-based approach, and I think it is the appropriate way to address the problem. But we do need a U.S. policy, which would allow the U.S. to take a leadership role internationally in bringing about some standards to the whole area of adventitious presence.

We are heartened by what we hear from USDA and FDA that they are currently working on that, and we eagerly await the policy coming forward. But yes, we think it would be extremely beneficial and we would like to see the U.S. do that.

Mr. SIGGELKO. I just reiterate that in order for the U.S. to take a leadership position and try and establish some standardization and coordination around the world, we need to establish that position. You know, recent conversations as Michael said, indicate there is good progress with FDA and some contacts with administration representatives that there is good progress along that front, and I think our leadership there in establishing a policy will help us internationally.

Mr. DOOLEY. I agree that we need to maintain our consistency with a science-based approach. But do you envision then that USDA and FDA is going to be able to come up with an actual numerical number, or do you think that that will have to be one that

will be maybe commodity or product-specific? I mean, right now, if we look at the EU is proposing on a, what is it, 0.9 percent or something of that nature, I would be interested if you can elaborate just a little bit in terms of what would you envision would be the best approach in the U.S.? Is it a blanket number?

Mr. DYKES. I would take the first stab on that. I think the approach that the U.S. is considering as we have worked with them and as we have discussed and we don't know what that will be until it comes out, but it is my understanding that they are looking at a scientific early food safety assessment to make a scientific judgment that if small quantities of this trait were to be in the food or feed supply that there would be no food or feed safety issues. And it doesn't set a numerical level because that may vary with the various proteins produced with the trait.

I know from the trade, the commercial aspects, a numerical level is what is important to facilitate trade, especially against contracts. I would envision that if the U.S. had a policy such that there was a scientific basis that if some small amounts were to show up in food or feed that it would be safe that perhaps the trade then, depending on the particular transactions, could establish the level that would facilitate trades for the various commodities in the various export destinations.

Mr. DOOLEY. I guess on another issue, as we see the expansion of some of the genetically-enhanced products beyond the pesticide resistance or herbicide resistance into some of the pharmaceutical based and animal biological products, is the present structure under the coordinated framework which has an APHIS, FDA, EPA—are we moving to the point where we need to revisit on whether or not we need to rationalize the approval process, or do you think that the present structure that we have in place is adequate to give the confidence that consumers presently have with our approval process, as well as providing the confidence in the international marketplace?

Mr. SIGGELKO. I think it really depends on the nature of the product. I mentioned two different aspects of the production. You can go open field or you can bio-contained. If it is bio-contained you are using plants as factors, a manufacturing system. So for instance, for an animal health vaccine, I am going to go through USDA and CBB and go that route. It is not an issue. At least the regulatory path seems clear. It is less clear with the other three, but I know that they are working through that one. We have had conversations with through bio with FDA recently, and I think that there is good progress being made in improving that structure between the three.

Mr. DYKES. I would add that on the plant side, I think there are a couple of hallmark differences of the U.S. system that has afforded us the freedom to operate we have seen and the adoption by U.S. farmers of biotech crops to date. And I think it starts with a coordinated framework and starts with the assumption that just because soybeans are biotech, it doesn't mean that they are inherently different, that there is anything unique about them, which is different than, per say, the European Union because if they are biotech, they automatically have to go through some regulatory process.

I think the other hallmark about the U.S. system that we haven't seen in other systems is the U.S. system has what we call learning in it. As they learn as they become more familiar with these traits, they modify the rules and stipulations around them, and I am thinking about the research plots, field trials where we have modifications and whether it is permitted or notification. I think the other area is the USDA is currently looking at revising and updating their approach to biotech regulations at APHIS, and I would like to compliment the folks at APHIS for what they have done. I think they have done a great job, as have the people at FAS, and we have commented on that.

We totally support what they are trying to do. We think it is a move in the right direction. So I think the U.S. system has functioned, the coordinated framework has functioned quite well, and I think it is the reason we are seeing and are able to show the charts we have been able to show about the crop acres production adoption.

Mr. KLEVORN. I think there are two parts to your question. One was about does the system as we have it today provide safety and does it give us the security in our food supply that we want, and I think it does. It does a great job. But the second part of it is what if we did it a different way? Could we benefit in some way? And from at least from Syngenta's perspective, one of the key issues is what can we do to get products to market faster? So if we could redesign or refocus efforts such that we could get products to market more quickly yet maintain the security that we are accustomed to and need that would be a good thing.

I don't know the answer to that, exactly how that would be done, but speed is critical.

Mr. LUCAS. The gentleman's time has expired. The Chair now turns to the gentleman from Georgia.

Mr. BURNS. Thank you, Mr. Chairman, and I appreciate the panel's input and expertise. I want to come back to a couple things.

Consumer confidence and acceptance, and Mr. Case pointed this out. We may need to continue to work on the education side of that. Oftentimes, I think consumers look at the GMOs and the biotech crops as being a one-sided benefit, benefits perhaps the producers or benefits perhaps the companies that you represent. You know, have there been any though or effort or expenditure of resources determining the benefits other than production and yield and how can we market this not only to the U.S. but also to our foreign markets, as far as saying hey, this is better?

We have always used technology. We have always used technology to prove productivity in agriculture, whether it is equipment or process or bioengineered products or chemicals or fertilizers or what have you. But I think the disconnect is that the consumer certainly in other areas of the world is less receptive than perhaps they should be, given good information. They are comparing GMOs to non-GMOs. They comparing GMOs to organics, and now the question is how do you respond to those effectively and not look self-serving?

Mr. DYKES. My response to that would be I think with nearly 10 years in the marketplace, 167 million acres of biotech crops, and

we have not seen one episode of food safety issues relating to biotech——

Mr. BURNS. Have there been any studies that would show the long-term impact of GMOs on human consumption?

Mr. DYKES. It is always a question we get is what about the long-term impacts. We do the regular safety, standard reviews of the traits and the proteins before we introduce them into the marketplace based on the parameters we know to assess human safety, and we are constantly monitoring those, reporting anything we see, and if we see any impacts, we obviously would take those off the market and make changes to them.

But again, I come back to based on the safety studies we do when we launch products and we gain regulatory approval, we have seen nothing, and with a 10-year history of safe use and with 167 million acres we have seen nothing. I think those are the most compelling reasons that consumers should have confidence that the biotechnology traits are safe. In terms of consumer benefits, the yields and profitabilities, I agree with you that they see those as benefits accruing to farmers. But I do think the environmental benefits, the pesticide reduction is a consumer benefit because it benefits all consumers, farmers and consumers and the general public as well.

The reduced sediment in local water treatment facilities due to the increased adoption and no till and reduce tillage practice I think is another consumer benefit for small, local communities that have an improved water quality perspective. I think those are some of the examples that benefits that do accrue, and as this panel has said, I think we are on the cusp of modified oils, the trans fat issue that food companies are going to have to comply with by 2006, potentially some of the Omega 3. I think also some of the traits that we have today in the BT crops reduce the amount of micotoxins in corn, for example, which is another human health concern, and clearly, we have seen the reduction in micotoxins as a result of BT corn products.

Mr. BURNS. Perhaps that is a message that needs to be more effectively communicated. Let us talk about canola for a second. Canola has a lot of opportunity, and certainly in the Southeast where I am and I have planted Roundup Ready beans and I have dealt with Bt cotton and that is just what we do. But canola is an opportunity crop for the Southeast. Given me your perspective of how effectively canola will become a crop choice, perhaps in the oil market.

Mr. SIGGELKO. Yes. I mentioned that in my testimony. We are growing a Nexera seed, which produces an oil we call Natreon oil, and I have said it is trans fat free, low sat and high stabilities. It is a hyolaic canola oil, well adapted to Canada. We are growing springs in Europe. We are looking to adapt it into the United States, and we understand in Georgia there has been a substantial breeding program and an effort, and we are working actually with folks in the State, as well as Kansas and Oklahoma, to produce more of the product, as well as in Argentina to ramp up the availability of the oil.

So we are quite excited about it, and I think it has got a great potential fit.

Mr. BURNS. One more question. On WTO, the EU is using, the biotech excuse to provide a moratorium on certain crops and the U.S. has a case filed against them. And going back to Mr. Dooley's question about traceability and labeling, should the U.S. maybe take an aggressive stance with WTO on the EU's traceability and labeling regulation?

Mr. DYKES. We have worked closely with the American Soybean Association, American Farm Bureau and the other food and Ag producing groups, and we share the concern about the EU traceability and labeling, and I guess one way to characterize that that I think brings it home is one of the hallmark problems we see with traceability and labeling. Labeling of soybean oil where there is no detectable differences would be required while processing aids produced in Europe would not be required to be labeled under the labeling traceability regime. We think that is somewhat discriminatory against U.S. produced soybean oil, and we think it will have a damaging impact on soybean oil usage.

So we totally support what our customer groups are working on and bringing us to the attention of Mr. Zok at USTR and in asking for the USTR to take action on this against the Europeans.

Mr. BURNS. Do your colleagues share your views?

Mr. KLEVORN. Syngenta's perspective on this is we would like to see exactly what the costs involved are and what impact it might have, and once we have the information, we will make a decision as to how we think things ought to go. But right now, I don't think we have enough of the facts at hand to take a decision one way or the other.

Mr. BURNS. OK.

Mr. SIGGELKO. I concur with Michael that our intent is to support our customer groups, and I guess I will sneak back to one relative to the benefits question that you were asking and a comment that Michael made. You know, our companies have different strategies. Some of us are more in the crop protection chemical side, as well as the biotech side, and just to put forth probably the view of Syngenta as well, that crop protection chemicals go through a very rigorous evaluation and safety testing protocols, and we hold the position that they are every bit as safe as our biotechnology products.

Mr. BURNS. Thank you, Mr. Chairman. I yield back.

Mr. LUCAS. The gentleman's time expired and time for questions expired. The subcommittee wishes to thank the panel for their insights provided with their testimony and by their answers in this issue, gentlemen, and I ask the next panel to come to the table.

David Winkles, president of the South Carolina Farm Bureau, Sumter, SC, on behalf of the American Farm Bureau Federation, Mr. Fred Yoder, chairman of the National Corn Growers Association, Plains City, OH, Dr. Joseph H. Bouton, director, Forage Improvement Division, the Samuel Roberts Noble Foundation, Ardmore, OK, Dr. Mel Billingsley, CEO, Life Sciences Greenhouse of Central Pennsylvania, Harrisburg, PA.

And Mr. Winkles, whenever you are ready to begin, you may please.

STATEMENT OF DAVID WINKLES, PRESIDENT, SOUTH CAROLINA FARM BUREAU, SUMTER, SC, ON BEHALF OF THE AMERICAN FARM BUREAU FEDERATION

Mr. WINKLES. Good morning, Mr. Chairman, and thank you for the opportunity to represent the South Carolina Farm Bureau and the American Farm Bureau here today.

Along with being president, I am also a corn, cotton and soybean producer in Sumter County, SC. American agriculture continues to be the world leader in the adoption of agriculture biotechnology, accounting for 63 percent of the world total plantings. In the U.S., plantings of biotech soybeans, cotton and corn continue to expand. For example, in 2004, it is projected that 86 percent of the total soybean crop will be biotech varieties. That is up from 81 percent just in 2003. American farmers have seized the opportunity offered by biotechnology to improve their production efficiency. They have recognized that the adoption of new technology is essential to maintaining a competitive advantage for U.S. agricultural exports.

American production of crops utilizing biotechnology is expected to continue to rise. New varieties of biotech corn, cotton and soybeans are being developed, and in the future, biotech wheat, rice, sugarbeets, alfalfa, apples, bananas and lettuce and strawberries will also be available. In 2003, other countries planting biotech crops increased 15 percent to a total of 167.2 million acres. U.S. productivity has increased the importance of developing and maintaining markets, both domestically and internationally, for products derived through biotechnology. Market development, both domestically and internationally, is dependent on public policy that delivers three outcomes.

First, we need to maintain an unbiased, science-based regulatory system that inspires consumer confidence and avoids unnecessary traceability and labeling requirements. In the United States, Government agencies play an important role in providing unbiased, science-based evaluations concerning the safety of biotech commodities. Requiring mandatory labeling and traceability of foods containing commodities enhanced through biotechnology in effect nullifies the regulatory system in place. If the science concludes that a product is safe for human consumption, it becomes unnecessary to label this product as genetically engineered or genetically modified.

Second, we need to defend against current threats to market access for biotech crops and expand access where current restrictions exist. In the last 1990's, the European Union instituted a moratorium on approvals of any new products enhanced through biotechnology. This year, the European Commission approved its first biotech commodity since the moratorium was instituted. However, it is too early to judge whether the EU will begin to undertake approvals within a reasonable period of time. The EU's introduction of new regulations governing the approval, marketing, labeling, traceability and importation of food and feed produced using modern technology last September is a problem for many American farmers.

Farm Bureau opposed the imposition of any import restrictions labeling or segregation requirements for products derived through biotech enhancement once they have been approved according to

internationally accepted scientific principles as safe for animals, humans and the environment. Convincing arguments exist that the new EU regulations to be in breach of the WTO rules. Farm Bureau supports the U.S. Government filing a complaint with the WTO on this issue. If new regulations are left unopposed, there is nothing to prevent other nations from adopting the EU protectionist template.

The Biosafety Protocol has created some disruptions in trade. The United States currently is not a party to the Biosafety Protocol. Farm Bureau does not believe that the U.S. ratification of the convention on biodiversity, a precursor to becoming a party of the Biosafety Protocol, is in the interest of American agriculture. AFBF supports addressing the documentation requirements of the Biosafety Protocol through the trilateral arrangement signed by the United States, Mexico and Canada.

Third, we need to create an environment conducive to the development of new biotechnologies if U.S agriculture is to maintain its place on the technology frontier.

In conclusion, American agriculture has enthusiastically embraced the benefits that biotechnology provides to production efficiency, and in turn to the agricultural competitiveness of the United States. We look forward to continuing our work with Congress on this important issue. AFBC is committed to ensuring broader acceptance of these products internationally, and continued domestic consumer confidence. We will work with Congress and the administration to address unnecessary trade barriers implemented by other countries for commodities enhanced through biotechnology.

Thank you for this opportunity to testify on this important issue. I would be happy to answer any questions.

[The prepared statement of Mr. Winkles appears at the conclusion of the hearing.]

Mr. LUCAS. Mr. Yoder.

STATEMENT OF FRED YODER, CHAIRMAN, NATIONAL CORN GROWERS ASSOCIATION, PLAINS CITY, OH

Mr. YODER. Good morning, Chairman Lucas, Ranking Member Holden, and members of the subcommittee.

My name is Fred Yoder and I am Chairman of the Board for the National Corn Growers Association, and I am also past Chairman of the NCGA's biotechnology working group, and I would like to thank the subcommittee for giving me the opportunity to testify and speak today regarding biotechnology in agriculture.

Biotech offers corn growers improved efficiencies and potential profits when managed wisely, and with regulatory oversight based on sound science. The introduction of new varieties of corn and their proliferation across the Corn Belt is redefining current systems of price discovery, consumer information, health regulation and trade management. Currently, 13 biotech corn varieties are approved in the United States for commercial use, three of which are herbicide-resistant, three are insect-resistant, and the other seven are stacked varieties. Stacked trait crops combine two or more traits in the same crop.

As you know, corn is the largest crop in the United States, with over 79 million acres planted last year, producing 10 billion bushels of grain. Corn acreage is likely to increase this year, with nearly half devoted to varieties derived from biotechnology. Corn producers across the country are already learning about the benefits of biotechnology, and we expect acceptance rates to continue to climb in the foreseeable future.

Acceptance rates for agricultural biotech in corn and other crops rests primarily on the economic and environmental benefits. As a small businessman, farmers like myself understand the importance of minimizing risk and increasing returns on investment. Agricultural biotech helps maximize benefits unlike any innovation since the introduction of the tractor. Biotechnology contributes to profitability by allowing corn growers to reduce chemical applications, energy use and devote fewer man hours to produce the same bushel of grain.

In addition, agricultural biotech has led to a significant increase in the adoption of environmentally-friendly, no-till farming practices. No-till farming conserves topsoil, preserves soil moisture, reduces energy requirements and lessens runoff while the crop residue from the previous year is left standing. Overall, farmers planting biotech corn varieties increase production by 3.5 million pounds of corn in 2001. The increased efficiency resulted primarily by saving crops that otherwise would have been destroyed by European and Southwestern corn borers. This ultimately generated an additional \$183.4 million in revenue for farmers while also reducing pesticide use by 8.4 million pounds.

Innovations in the first wave of agricultural biotech relied on single agronomic traits focused on crop production and pest management. However, farmers like me will demand greater efficiencies and yields before increasing biotech corn acres in production. The future of agriculture biotech is exciting and it is rich with promise. The second wave of innovations will increase trait stacking and focus on plant performance. Let me highlight two examples.

Perhaps the most notable trait recently introduced in corn hybrids prevents the damage from the corn rootworm. The USDA estimates the pest causes \$1 billion in lost revenue every single year to the U.S. corn crop. The EPA estimates corn rootworm are responsible for the single largest use of conventional insecticides in the United States. Adoption of new rootworm-resistant varieties in threatened areas could reduce chemical spraying by an additional 14 million pounds while boosting yields and saving additional dollars in inputs.

Input traits are best characterized as low hanging fruit, and technology providers are nearing introduction of varieties that are more complex and easier to grasp by consumers. While input traits continue to be of interest to corn farmers, maximizing value to the consumer and processors will necessitate the commercialization of output traits that have value in the marketplace well beyond the farm gate.

There are corn varieties in the pipeline that will increase the efficiency and yield of ethanol production, while reducing energy costs. They will also produce a higher quality output of DDGS. Since many of the new ethanol dry plants operating today and in

construction are farmer-owned, this will mean opportunities for growers to capitalize on value-added ventures in rural America.

Consumer acceptance and confidence in our regulatory agencies is vital to the success of this technology. As producers, corn growers have to be mindful of our customers and ensure that there is open communication with grain handlers, millers, processors and food retailers across the country. Our association works closely with our partners in the food chain, continuing an open dialogue to head off problems before they occur.

Corn growers have the unique opportunity to take part in one of most important changes in agriculture history. The development of agricultural biotech offers a fantastic opportunity for increasing the value of the corn crop, as well as significantly benefiting consumers. By working with private sector groups, such as AgBiotech Planning Committee, agricultural associations can help facilitate adoption while ensuring proper stewardship. At the same time, Government needs to ensure regulatory agencies are properly funded and have the tools to do their job. Together, we can ensure U.S. agriculture remains a leader in technological innovation and production of corn.

We look forward to working with the subcommittee on this and other issues of importance in the future. I thank you again for the opportunity to address you, and I would welcome your questions.

[The prepared statement of Mr. Yoder appears at the conclusion of the hearing.]

Mr. LUCAS. Thank you. Mr. Bouton.

STATEMENT OF JOSEPH H. BOUTON, DIRECTOR, FORAGE IMPROVEMENT DIVISION, THE SAMUEL ROBERTS NOBLE FOUNDATION, ARDMORE, OK

Mr. BOUTON. Thank you, Chairman Lucas, Congressman Holden and other members of the subcommittee.

I am Joe Bouton, director of the Forage Improvement Division of the Samuel Roberts Noble Foundation. The Noble foundation is a private foundation located in Ardmore, Oklahoma. Since its founding 1945, the Noble Foundation has conducted educational programs to assist farmers and ranchers in the southern Oklahoma and north Texas region as part of its charitable mission. The Noble Foundation expanded its agricultural research operations through the creation of two research groups: a basic plant biology group in 1998, and an applied group in 1997, the Forage Improvement Division.

Research in the Noble Foundation's Forage Improvement Division has centered on development of improved forage grass and legume cultivars for use by farmers and ranchers in the southern Great Plains. Cultivars, commonly called varieties, are a group of plants that breed true for specific traits through generations of seed increase, such traits being governed by genes. Thus, cultivar development is the process of enhancing or adding genes and minimizing undesirable genes and their related traits.

Dependability is the critical characteristic needed in the region's harsh environment. Therefore, our main target species are perennials, such as tall fescue, bermudagrass, hardinggrass, western wheatgrass, alfalfa, and red and white clover. Target traits in-

clude drought and heat tolerance and pest resistance. Improving nutritive quality is another important trait. We approach the incorporation of useful genes that govern these traits almost exclusively with conventional selection and breeding techniques. In this approach, we collect as much of the known plant germplasm, often from the USDA plant germplasm system, and screen it for the target traits. Sometimes the traits are very complex or difficult to manipulate, and biotechnology approaches become an option.

For example, in many forage species, lignin is deposited along the cell walls, resulting in poor rate of digestion during rumen breakdown of the forage. Basic research by our Plant Biology Division identified two genes in the lignin pathway that when down regulated resulted in less lignin deposition. We have now successfully down regulated these genes in alfalfa and tall fescue, with a concurrent increase in the digestibility of the forage. This same approach is now being investigated with bermudagrass.

In May 2003, we co-hosted with Texas A&M University the Fourth International Symposium on Molecular Breeding of Forage and Turf in Dallas, Texas. There were approximately 200 scientists in attendance from 19 countries. Research talks were many and varied on every aspect of basic biotechnology. This symposium and many like it is direct proof that basic research in biotechnology is intense and growing. Whether we will be able to deliver useful biotechnology traits for agricultural use is another matter. First, there has not been a new crop de-regulated in several years. I am defining a new crop as one that has never been in commercial production while containing a biotech trait. Since all our target species would represent new crops by that definition, then we are concerned that even doing all requisite safety trials may not be enough to ensure de-regulation.

Second, two crops, creeping bentgrass and alfalfa, are currently being assessed by USDA-APHIS for de-regulation for the Roundup Ready gene, and 1980's technology that is currently found in millions of acres of corn, soybeans and cotton. Since alfalfa is one of our target species, and creeping bentgrass represents a perennial grass similar to many of our target grass species, we are watching very intently the final disposition of these two applications. The fact that the creeping bentgrass application has now been in the process longer than any crop to date is not encouraging.

So for these new crops, it is hoped that the regulatory agencies will concentrate on assessing real versus perceived risk. At the end of the day, these agencies will need to make decisions on what are the real risks, establish a rigorous regulatory process to assess these risks, oversee the regulatory process in a fair manner, and make a decision. We can then all move forward based strictly on the value of these traits to the environment, the farmer, American agriculture and all the citizens of this country.

Thank you, Mr. Chairman.

[The prepared statement of Dr. Bouton appears at the conclusion of the hearing.]

Mr. LUCAS. Thank you. Mr. Billingsley.

**STATEMENT OF MEL BILLINGSLEY, CEO, LIFE SCIENCES
GREENHOUSE OF CENTRAL PENNSYLVANIA, HARRISBURG, PA**

Mr. BILLINGSLEY. Thank you, Chairman Lucas, Ranking Member Holden, and members of the committee for the opportunity for the opportunity to address a few of the many important issues which surround the development of life sciences in rural areas.

My name is Dr. Mel Billingsley, and I am the president and chief executive officer of Life Sciences Greenhouse of Central Pennsylvania. The greenhouses were created in the Commonwealth via legislation in 2001, using the Master Tobacco Settlement Agreement, and there are three greenhouses, ours being the one that serves primarily a rural organization.

Many States have chosen to exploit biosciences for economic development for obvious reasons. First, the U.S. Department of Labor has indicated that the job growth in life sciences is expected to be 13 percent greater than that in comparable areas. Secondly, these are very high-paying jobs, often earning more than \$18,000 more than the average annual salary. And third, there are a broad range of sectors that are involved in the biosciences industries, including agricultural feed stock and chemicals, drugs, pharmaceuticals and manufacturing, medical devices, research and testing. This gives numerous opportunities, many of which can be manifest in a rural setting. Recently, Pennsylvania produced a State-of-the-Industry Report in 2004 and identified more than 2,000 establishments across the State employing more than 84,000 people, indicating a very important sector.

Not all of the sub-regions of Pennsylvania, however, can be developed into specific sub-sectors. Indeed, I think the specifics of the regional strengths must be identified. Central Pennsylvania has numerous assets to grow industry. In particular, Aventis Pasteur is one particular example, located in their manufacturing plant in Swiftwater in the Pocono Mountain regions, producing influenza. This employment base creates jobs for 1,500 people in a primarily rural area, and also relies on some of the agricultural products from that rural area in the form of eggs.

Similarly, there are other opportunities that are created by small pharmaceutical manufacturing entities in the region. Indeed, in Pennsylvania, a significant portion of the economy is driven by small manufacturing entities for pharmaceutical and Ag biotech, with a combined output of over \$575 million, indicating that this is a strong driver industry, even in the rural parts of the State. I would like to take the next few minutes to identify a couple of the factors that account for the promising growth and assess some of the needs that may be addressed by addressing policies that tend to affect the rural areas.

I am referring to a recent Battelle report. There are a chain of events that are needed to develop the life sciences. First and foremost, it is helpful to have institutions, primarily land grant institutions, that draw on National Institutes of Health, NSF, USDA and related Federal funding for basic research, and Central Pennsylvania has the good fortune to being the home of a large land grant university in the form of Penn States, numerous small universities and a medical center. These institutions bring in over \$580 million

in basic research funding and provide faculty and student talent, as well as intellectual capital.

Beyond this talent, the biosciences development for new life sciences industries requires an infusion of cash, and these are extremely cash-intensive and you have heard from several members today of more mature bioscience companies that are large sector industries. The Life Sciences Greenhouses, in conjunction with public and private partnerships, needs the Federal support in the form of small business innovation research grants and technology transfer grants and progressive State-friendly policies to help grow these life sciences. Some of the policies include tradable task credits for research and development and net operating loss carried forward policies.

My institution, Life Sciences Greenhouse, serves as a catalyst to facilitate collaboration between regional research institutions, industry, the Federal Government, and also provides various forms of much-needed seed capital in the form of risk leveraged investments in starting companies. I think that the demand for the early-stage seed capital greatly strips the supply, and this is particularly true in rural areas, which are often less the beneficiary of angel investment and scheduled venture capital investments. Any Federal incentive to provide this capital, in and above what is beyond, should not be at the detriment of the existing SBIR and STTR programs, and in fact, these programs need to be modified so that they can continue to back small venture backed companies to compete for funding.

By coupling the effective use of Federal funds, such as they are available now, along with some of the targeted Federal Capital Programs, such as the Small Business Administration, New Market Venture Capital and Rural Development Program, I think we can begin to address some of the needs of the capital available for rural development.

In summary, growing life sciences-related industries in and rural industries is really about the density of ideas, capital and talent, and it is quite possible, as I have hopefully communicated to you today, for a rural area like Central Pennsylvania to contain or attract sufficient quantities of each. With appropriate Federal assistance it seems likely that a growing number of regions in the country will be able to participate in the economic promise of the life sciences industry.

Thanks for the opportunity to address some of these issues, and I will be glad to answer any of your questions.

[The prepared statement of Mr. Billingsley appears at the conclusion of the hearing.]

Mr. LUCAS. Thank you.

Dr. Bouton, clearly the Noble Foundation has done a great deal of research and work on forage, and as you pointed out, an extremely important issue to those producers who live on the eastern side of the Rockies is mother nature is very inconsistent and the climate is awfully challenging. But you are not a land grant university. You are not a research in a university. You are not a for-profit enterprise. What do you do with the technology, the traits, the things that are developed at the Noble Foundation? What becomes of that information?

Mr. BOUTON. Well, for us we are hoping to deliver the traits from our Plant Biology Division, like I mentioned in my testimony, for the lignin genes into a cultivar. Now of course, we are not a seed company like you pointed out, so we would have to license our material to a seed company that could take the production and marketing rights and bring them into the southern Great Plains in an efficient manner. So that is what we would look to do, yes.

Mr. LUCAS. And in the resources, those licenses would generate or be plowed back into research at your Foundation?

Mr. BOUTON. Right. Well, of course, we use our endowment to fund most of our research. We would probably look for a small royalty string though to come back into our research program.

Mr. LUCAS. And is it fair to say that from the description of your research, that you are doing both conventional and biotech models at Noble?

Mr. BOUTON. I would say that we are taking a more exclusively conventional approach right now. As I mentioned in my testimony, we are a little worried about what the future is for crops like we deal with, so we do have a pretty substantial biotech application. We are investing about a million a year into that. But we do worry about it and when would we back out or go strictly conventional.

Mr. LUCAS. Mr. Winkles, Mr. Yoder, I think we would all agree that world grain stocks right now are at a fairly low point, and it wouldn't take much of a dramatic weather event to create some real shortages. At the same time, in much of the developing world, we see some significant economic improvement. By that I mean not only are a substantial number of consumers on this planet finally perhaps to afford what they need, but they can actually afford to improve the quality of their diets, and that brings me to my next question.

Do you think that producers around the world from the perspective of the groups that you are a part of that you represent here today that we can meet those challenges, whether it is Mother Nature or a changing set of international consumer patterns, if we don't use every technology resource available to us? Can we keep up?

Mr. WINKLES. Mr. Chairman, that is an excellent question, and I firmly believe that biotechnology is one of the elements that we have to have the access to in the U.S. agriculture to maintain competitive, as I mentioned earlier. I visited with our research arm at the extension, our land grant university, and asked directly what other technologies are being developed? And if you look back in time, we had crop protection chemicals come along. We have had hybridization. Now we have got biotechnology. According to him, there was really nothing else on the horizon, except things like nanotechnology, and I am not exactly sure how that would adapt to agriculture.

But we firmly believe that the use of biotechnology would be critical in providing the protein and food needs worldwide. We fully realize that 95 percent of the world's consumers are outside of the borders of the United States, and we fully believe that we need to have access on an unbiased basis to all of those consumers.

Mr. YODER. Mr. Chairman, I would just echo what Mr. Winkles said, that clearly there are needs out there to feed the world, and

when you look at what biotechnology is compared to conventional breeding when we develop new varieties to go to the field, I mean you can literally cut your time in half. So the other thing too that—well, I think once you get feeling good about what biotechnology is, it is just another way, another methodology to improve and enhance what you are doing. I look at what happened when hybrid corn first came out, and all the naysayers were saying it is going to be a tough way to do it.

When you conventionally breed you also breed in a bunch of stuff you don't want. So you spend years getting rid of the stuff you don't. Biotechnology offers the opportunity to isolate exactly what you want to put in it in a very efficient way and get things to market very quickly. I think biotech is win/win for whether we grow it here in the United States or grow it in some other areas of the world that have some real challenges. I know the Danforth Center in St. Louis is working on some things on how they can grow crops in dry, arid conditions, even with salty water.

And so there is all kinds of different things that developing cultures can do to enhance their profitability and their way of making life better for them, as well as it is here in our own country.

Mr. LUCAS. Thank you, and the Chair turns to the ranking member, Mr. Holden.

Mr. HOLDEN. Thank you, Mr. Chairman. I had a question for what the Federal Government could do as far as investment in research, but Dr. Billingsley I think answered it in his statement, using the land grant institutions as well as other vehicles, and we need to continue to work on that. Mr. Chairman, I know that is a priority for you, as well.

Gentlemen, all morning we have been hearing about the major obstacle is acceptance, and I am just curious what all of your companies and your industry has been doing to educate the public on the safety of biotech products, and is there anything else that the Federal Government should be doing that we are already not doing in trying to increase our experts and trying to convince the world that the biotech products are safe?

Mr. WINKLES. Let me take a crack at that first, Mr. Holden.

American Farm Bureau has instituted a program where we had recruited individuals to go out into local community to speak before civic groups; Rotary Club, Elks Club; all different types of individuals at the local level and try to inform about what was real in biotechnology versus what some of the perceptions were. So we have actually taken the debate or taken factual information to the local level. I think we can all continue to do that, but I think probably one of the most important things that the U.S. Government can continue to do is a strong process of regulation, of assessment and approval, one that leaves no questions to doubt. And they also need to be vocal about the safety of that system and how rigorous it is.

What I have found in dealing with biotechnology now since the mid 1980's is that the consumer is often quick to make judgments. If you ask them what they want, they are quick to tell you. But we find that buying patterns are very different than what they say they want. So we need to be careful in being sure that we register what we do based on what consumers do rather than what they say they want. But we all need to be more active in the information

process. There is much too much misinformation out there about what the effect of biotech products are. You know, it goes back to what Mr. Dykes said. There has never been a case where you can show any harm from any biotech product.

Mr. YODER. Along with that, I would like just to tell you a little bit about what National Corn Growers is doing to do that. We have a program called "Know Before You Grow", and that so that we can demonstrate when these new products come out that we use them properly. I mean, we think we have some great regulatory agencies to give us some good science-based ways to grow this stuff, but we have more responsibility on our plate now to make sure we do it right, to make sure we keep the technology viable, and that we can go ahead and continue to have the life science companies develop new ones.

As far as other ways we try to make people understand the safety of what we are doing is I have been lucky enough to—the last several years to be able to participate in a joint U.S. Grains Council NCGA biotech trip to European Union to talk to farmers, to consumer groups, to legislators and people like that, and it has been very good to be able to explain to them because it has been talked about earlier that there is really no consumer value to these current products we have on the market, and that is simply not true.

I know if you care for the environment, when we can save 40 million tons of topsoil every single year by using biotech, when we can save water and when we can save the sediment and things like that, if you care about the earth, it is a good thing to do, and save pesticides. Even though we realize that as mentioned earlier, we also have the safest pesticides in the world today, I am a consumer too and if I can avoid putting some pesticides on there and have a plant naturally have resistance, then I want to do that. And as we talked to the European people, especially the farmers, they understand it. They get it. They would like to have access to this technology. But the consumer groups are very strong over there and we just have to keep—

Mr. HOLDEN. A real problem.

Mr. YODER. We just have to really keep working on them to make them understand that there is benefits to them and the promise of new output traits coming down the pike that are going to benefiting them directly.

Mr. HOLDEN. OK. Dr. Bouton?

Mr. BOUTON. Well, the main thing I would say is to have a strong regulatory process. You know, I was complaining a little bit about it, but mainly it is because no decisions were being made. I would like to see decisions made, but we want it rigorous and we want it transparent. But I think in the process and possibly even in the educational effort or getting the word out is we probably need to separate the process from the product. We ask questions about biotech as a process, like if you start with biotech, there is something bad. But it is really the products that are coming out, the traits that we should concentrate on both the regulatory and the educational effort, I think.

Mr. HOLDEN. OK. Dr. Billingsley?

Mr. BILLINGSLEY. In Pennsylvania, I think we are blessed with both a strong pharmaceutical industry, as well as strong agri-

culture, and I think the general awareness pattern has been to use trade organizations and regional groups to use a science-based education program for the populous at large that biotechnology holds promise in a number of areas, and as a result, not just an economic growth engine, but it is making life better for people. So I think people need to be educated at the very fundamental level that there is nothing intrinsically wrong with the process, that it is a legitimate process for modifying foods, drugs, biologics that has great promise.

Mr. HOLDEN. Thank you. Thank you, Mr. Chairman.

Mr. LUCAS. The gentleman's time has expired.

The subcommittee wishes to thank the panel for your time today, and with that, without objection, the record of today's hearing will remain open for 10 days to receive additional material and supplemental written responses from witnesses to any question posed by a member to a panel. This hearing of the subcommittee on Conservation, Credit, Rural Development and Research is adjourned.

[Whereupon, at 12:09 p.m., the subcommittee was adjourned.]

[Material submitted for inclusion in the record follows:]

STATEMENT OF W. PETE SIGGELKO

Good morning Mr. Chairman and members of the subcommittee. I am Pete Siggelko, vice president of Plant Genetics and Biotechnology at Dow AgroSciences. Thank you for this opportunity to testify before this subcommittee of the US House Committee on Agriculture. I would first like to thank you for holding this hearing because, as you'll hear, we have a lot of positive things to share with you today. I'd also like to thank this committee for its long-term support of agricultural biotechnology and for ensuring that we have the most productive growers and the world's cheapest, safest, and most abundant food supply.

With an increase in consumer confidence and the development of a science based regulatory system that has served as a model for the rest of the world, Dow AgroSciences and my fellow colleagues within the life sciences and technology sector have been able to bring innovative products to market and to invest in novel, exciting breakthrough products for the future. Moreover, through open communication and collaboration with the value chain, we have enjoyed unprecedented support by U.S. growers and food chain customers. On behalf of Dow AgroSciences and The Dow Chemical Company, it is my privilege to discuss with this esteemed committee the current status of agricultural biotechnology and our current and future product development efforts. My written comments have been submitted to the record in their entirety.

Dow AgroSciences LLC based in Indianapolis, Indiana, USA, is a global leader in providing pest management and biotechnology products that improve the quality and quantity of the earth's food supply and contribute to the health and quality of life of the world's growing population. Dow AgroSciences has approximately 5,700 people in more than 50 countries dedicated to its business, and has worldwide sales of US \$3 billion. Dow AgroSciences is a wholly owned indirect subsidiary of The Dow Chemical Company. With annual sales of \$33 billion, The Dow Chemical Company has over 40,000 employees globally and serves customers in more than 180 countries and a wide range of markets that are vital to human progress, including food, transportation, health and medicine, personal and home care, and building and construction, among others.

The initial phase of agricultural biotechnology brought us products for disease and insect protection. These products filled a very important niche for modern farmers by bolstering their Integrated Pest Management, or IPM, programs. To both large and small farming operations, biotechnology has resulted in increased yields and reduced costs. This technology will also continue to deliver traits, such as drought tolerance, that can revitalize agricultural economies in areas where the land has been non-productive for years. As global populations increase exponentially over the coming decade, it will be imperative that agriculture keep up with the resulting burgeoning demand. As recently noted by Mr. Diouf, Director General of the UN Food and Agriculture Organization, food production will need to increase 60 percent by 2050 and will require intensified cultivation, higher yields and greater productivity.

We will have to use the scientific tools of molecular biology, in particular the identification of molecular markers, genetic mapping and gene transfer for more effective plant enhancement, going beyond phenotype-based methods.

In a relatively short period of time, biotechnology has made significant contributions to the enhanced production of key commodities such as corn, soybeans, cotton and canola. Today, these crops are planted on more than 145 million acres worldwide with the United States representing more than two-thirds of all biotechnology crops planted globally. The adoption of bioengineered plants has been the most rapid in the United States where there has been a 20-fold increase in the area of biotechnology crops over the last seven years. We expect this adoption trend to continue globally over the coming years.

Biotechnology also offers the ability to improve the quality and enhance the nutritional content of various foods. New varieties of soybeans and canola, for example, that have healthier fat content profiles are now practical and, in some cases, already available to the consumer. In the non-foods area, we see markets opening for genetically engineered renewable fuels and lubricants derived from biomass that could slash the dependency on petroleum products. Manufacturing antibodies, industrial products and pharmaceuticals in plants is no longer a pipe dream; it is a reality. Through the continuing support of the U.S. Congress and the members of this committee and subcommittee, the industry has been able to realize some of the real benefits of biotechnology with more innovative products and solutions to come. As industry has said all along, biotechnology is a tool that will enable innovation and the introduction of products with transparent consumer benefits if we can maintain consumer confidence and nurture an environment that allows for our freedom to operate. Largely, the United States has successfully achieved both objectives.

The Dow Chemical Company (Dow) is part of this agricultural biotechnology revolution. A number of Dow's biotech platforms touch agriculture Dow AgroSciences Plant Genetics and Biotechnology platform and Dow's Industrial and Bio-based Materials platforms. I would now like to turn my attention to some of the specific and exciting biotechnology innovations we are working on within Dow.

Dow AgroSciences has recently introduced its second Bt product, Herculex[®] I insect resistant corn, in the United States. We also have two exciting insect traits for corn in the pipeline, including a novel rootworm product that is nearing final regulatory approval, and a Bt cotton product, Widestrike, that will be introduced through PhytoGen, our cotton seed joint venture, in 2005.

It had been said that the next wave of biotechnology would involve the genetic modification of crops tailored to specific consumers, whether for food, feed, fiber, fuel, lubricants, soap and other characteristics, perhaps even pharmaceutical and plastic components. Today, many of these products are here. We are developing second generation products that truly offer unique benefits to the consumer and end-users. Using the tools of biotechnology and improved agricultural practices, Dow AgroSciences has been able to develop and commercialize a novel product called Natreon[™] canola oil that can reduce the amount of saturated and trans fat in food products today. Recent research shows that trans fats can be even more harmful to health than saturated fats. It is estimated that trans fat could be causing more than 20,000 deaths in the United States each year. Research shows a strong link between diet choices and obesity, and chronic diseases such as cardiovascular disease and Type 2 diabetes. By replacing partially hydrogenated oils with Natreon canola oil, the amount of saturated and trans fat could be reduced by as much as 85 percent in a typical cracker, directly benefiting American consumers. Natreon is a readily available and practical alternative to partially hydrogenated oil for food service and manufacturers who are looking to simultaneously decrease trans and saturated fats in their products today. This product can provide consumer benefits now by being part of the solution to the complex problem of obesity and the resulting chronic diseases.

The canola industry is rapidly expanding production of canola and Natreon. In order to meet consumer demand Dow AgroSciences hopes to expand this opportunity to canola producers in many of the states represented by members of this committee such as Oklahoma, Kansas, Georgia, Minnesota and many more.

Dow is also using plant and plant cell systems to manufacture novel therapeutics and biologics for both animal and human health. The benefits of a plant-based manufacturing system are great, and the resulting products have the potential to alter how diseases are treated in the future. Plant-made biologics contain no materials of animal origin, mitigating the chance of contamination with extraneous disease agents during use; work without risks of adverse effects associated with most current vaccines; and are very stable requiring no refrigeration and offering needle-free delivery. This is truly revolutionizing how we administer animal vaccines.

Dow AgroSciences is rapidly carving a space in the Animal Health market segment, a well-established, regulated global industry with current sales of approximately \$12B. Today, biologics (vaccines and antibodies) account for \$2.8B and are the fastest growing segment of this industry. Currently, Dow AgroSciences is building a biosecurity facility in Nebraska to develop animal therapeutics and is on track to launch the world's first biocontained, plant-made animal health vaccine by 2006. Several other plant-made vaccines, including an Avian Influenza vaccine, are in varying stages of research, with projected launches beginning in 2007. Dow AgroSciences also has scientific collaborations with a number of world-class institutions and governmental entities including USDA.

Closely related in terms of benefits to industry and consumers are our company's activities in the area of food safety. Food safety is a high profile, high consumer concern with a significant impact on the US and global economy. The Centers for Disease Control estimates there are 76 million cases of food-borne illness and 5,000 deaths per year. The top six food safety pathogens cost the U.S. economy between \$6B and \$34B per year (USDA-ERS estimate). One of the targets Dow is currently developing is an antibody for E. Coli 0157:H7 to be administered orally to cattle prior to slaughter. These efforts will complement the existing Hazard Analysis and Critical Control Point (HACCP) food safety program adopted by the Food and Drug Administration (FDA) and the USDA, further enhancing the security and safety of the food supply.

Similarly, we are exploring the use of plant systems to develop human therapeutics. For example, Dow's Plant Biopharmaceuticals platform comprises a full spectrum of approaches, including not only whole plants for open field production, but also other plant-based and viral vector technologies, with production in greenhouses and growth chambers. Open field acreage devoted to pharmaceutical host plants is extremely small—approximately 100 acres in the United States in 2003—and likely to remain so. Industry experts estimate that, even if the technology reaches a high level of success, acreage for all types of plant hosts will amount to no more than 8,000-12,000 acres annually at maturity. Dow recognizes that rigorous corporate stewardship and strong government regulations are necessary for the long-term success of this platform.

Industrial Biotechnology: Use of renewable agricultural resources in biotechnology processes

Three years ago, the Organization for Economic Cooperation and Development (OECD) published a report examining 21 biotechnology case studies. The report painted a compelling picture of the possibilities inherent in biotechnology to lead to improved consumer products, more efficient industrial processes leading to reduced costs and improved productivity, and a significantly reduced environmental footprint. Just weeks ago, Biotechnology Industry Organization (BIO), the industry organization representing more than 1,000 biotechnology companies, academic institutions, state biotechnology centers and related organizations from around the world, released a new report, building upon those 21 case studies and asked the question, "What if the benefits of these 21 case studies were extrapolated to broad industrial sectors?" The answer? A vibrant picture of economic revitalization and environmental renewal.

Today, renewable agricultural resources are increasingly being employed as a feedstock for the subsequent development of industrial materials. Dow is helping with this transformation of U.S. agriculture. Currently, Dow's biotechnology and bio-materials platforms are utilizing corn, soybean, wheat, castor sunflower, and a variety of oilseeds to develop novel biomaterials such as plastics, high performance polyurethane carpet backing, fiberboard, and epoxy coatings to name a few. Some are still "lab bench" projects, several years from the market while others are actually commercialized today.

Substituting raw materials based on plant-derived oils for those based on fossil fuels can lead to important benefits including a significant reduction in greenhouse gas emissions while providing alternative opportunities for commodity agriculture. For example, NatureWorks™ PLA currently being produced by Cargill Dow at its Blair, Nebraska, site significantly reduces fossil fuel consumption by up to 50 percent, and generates 15 to 60 percent less greenhouse gases (GHG) than the material it replaces.

Public private partnerships also remain an important part of the equation and are essential to fueling many of these new opportunities. The Oilseed Engineering Alliance represents such an effort. This initiative joins scientists from Dow and the public sector, under a U.S. Department of Energy grant, to develop options for using agricultural crops as raw materials to produce plastics, chemicals, and other industrial products. Also, the consortia is working to improve traits of specific oils and

fatty acids in soybeans, canola, sunflower and other crops to help deliver new solutions in nutrition, health care and material science.

Concluding Remarks: The future of agricultural biotechnology and allied opportunities

In closing, we have a few final thoughts and recommendations for the Committee's consideration. We hope the U.S. Government continues to be a staunch and aggressive advocate of these new technologies on a national and international front. Through our government agencies and the U.S. Congress, we need to continue to dismantle any non-scientifically-based trade barriers that would seek to restrict trade of commodities produced through biotechnology and promote trade agreements that guarantee the free and open trade of our agricultural products, whether produced through traditional or newer methods. To date, much of our success is attributed to your unwavering support and the administration's efforts to bolster the regulatory framework governing biotechnology.

The government has an important, continuing role in assuring the development, commercialization and adoption of biotechnology and renewable resource-based materials. Government agency research agreements, contracts, grants, and funding for collaborations are enabling and encouraging development of key technologies throughout industry. There is still much scientific discovery to be done to fully benefit from a bio-based economy grounded in agriculture. Basic research must continue to be funded by the federal government. It is equally important the government help remove the barriers and obstacles to commercialization that exist in the nascent industrial biotech industry through efforts such as the USDA's Bio-Based Purchasing Rules. Government procurement can help give fledgling products a chance to overcome the significant conversion hurdles often encountered in the market. What is critical is that these efforts allow bio-based products to compete fairly and equitably with incumbent materials.

As is the case with industrial biotechnology, the government has an important role to play in nurturing research in plant made pharmaceuticals. Support, in the form of programs such as a cooperative research agreement Dow has entered into with the National Institutes of Health (NIH) to seek rapid vaccine production systems, will help not only nurture an evolving industry but also play a critical role in important matters of national policy, ranging from affordable and accessible health care to Homeland Security. This benefits us all. The government must also play a role in ensuring a fair and balanced regulatory system that allows for a viable plant biopharmaceuticals industry and ensures the continued safety of our food supply.

Lastly, Dow and the biotechnology industry have been able to bring technological innovations to the market because we have enjoyed a certain freedom to operate while being governed by a pragmatic science based regulatory system. Sites such as Hawaii and Puerto Rico serve as the "lifeline" for our research and development efforts due to their favorable year-round climates, fertile environment, and rich academic and public resources. It is incumbent upon all of us to continue to reach out to these geographies to ensure full understanding amongst all stakeholders and to facilitate cooperative relationships between constituents, the local community, local institutions, industry and government. Today we are facing real threats to our freedom to operate in these areas and we need continued support from this body.

In closing, we have made significant progress since the initial debut of biotechnology less than one decade ago and are clearly in the midst of a biotechnology boom within agriculture. Not only are products being introduced and adopted by the American farmer at a steadily increasing rate, but Dow has been able to use tools of biotechnology to start bringing forward a suite of new and exciting products with greater tangible consumer benefits. Thanks to this body for its continued support and oversight of this technology. This has greatly contributed to our success as an industry, enabled us to expedite introduction of new tools for U.S. farmers, and is now helping us realize some of the cutting edge technological breakthroughs we have long been discussing.

Thank you, Mr. Chairman. I'd be glad to take any questions that you or your colleagues have at this time.

STATEMENT OF THOMAS B. KLEVORN

Good morning Chairman Lucas, Ranking Member Holden and Members of the Subcommittee. I would like to thank you for the opportunity to be here today to discuss Syngenta's role in plant biotechnology. As the first company to commercialize a plant biotechnology product, we have a long history with biotechnology and a deep commitment to its future.

Syngenta is a world-leading agribusiness company committed to sustainable agriculture through innovative research and technology. We believe in delivering better food for a better world through outstanding crop solutions, and we take pride in meeting our commitments to our stakeholders. The company is a leader in crop protection, and ranks third in the high-value commercial seeds market. Total sales in 2003 were approximately US\$ 6.6 billion. Syngenta employs some 19,000 people in over 90 countries.

In North America, Syngenta's biotechnology research is conducted primarily at Syngenta Biotechnology Inc., which is located in Research Triangle Park, North Carolina. Our corn and oilseed business in North America, which includes the NK Brand, is headquartered in Golden Valley, Minnesota. Rogers, our vegetable seed business for North America is headquartered in Boise, Idaho. These brands market our biotechnology traits.

ADOPTION OF BIOTECHNOLOGY

According to the United States Department of Agriculture's Economic Research Service (ERS), the adoption of biotech insect resistant corn has grown from its introduction in 1996 to roughly 30 percent of all corn grown in the United States in 2003. The ERS also shows that in the United States in 2003 use of herbicide tolerant corn increased to roughly 15 percent of total corn acres, herbicide tolerant soybeans were a little over 80 percent, herbicide tolerant cotton was at 60 percent and insect resistant cotton was utilized on 40 percent of those acres planted to cotton. These statistics show that farmers in the United States are continuing to adopt this technology at an increasing rate since the introduction of the first biotech plant product in 1996, Syngenta's Event 176 corn.

On a global scale, the International Service for the Acquisition of Agri-biotech Applications (ISAAA) states that total global acres of biotechnology crops were up 15 percent to 167.2 million acres in 2003. These acres are planted in 18 countries with more than 85 percent of resource-poor farmers in the developing world planting biotechnology crops. ISAAA also found that one-third of the global biotech crops were planted in developing countries in 2003.

SYNGENTA'S RESEARCH AND TECHNOLOGY

Syngenta invests heavily in research and technology to add value to our existing business and to create many more opportunities for future growth. Of our 19,000 employees across the globe, approximately 5,000 work in research, technology and development. We invest \$2 million dollars each day totaling \$727 million dollars per year in research and development. Of the \$727 million, \$146 million is spent annually on biotechnology.

Why such a big investment in research and technology? We believe there is a huge global demand for new agricultural products, including biotechnology, and a business case for investing in technologies to deliver them. We need to develop new products to meet this demand which is being driven by population growth, scarcity of arable land and a consumer need for broader choice and higher quality. Consumers globally also need more affordable food with the opportunity for improved health and nutrition. New research leads us to develop products that meet this need and combat new strains of diseases and pests to help enhance food safety and the security of the food supply.

While we conduct our own private research, we have also donated the results of some important discoveries. In May of this year, we announced our donation of a substantial portion of our arabidopsis functional genomics seed collection (arabidopsis is considered the "lab rat" of plant research) to the Arabidopsis Biological Resource Center (ABRC) hosted at The Ohio State University, USA. The ABRC will distribute the collection of approximately 48,000 seed lines in collaboration with the Nottingham Arabidopsis Stock Centre in Nottingham, UK. Syngenta is also making the sequence information universally available by placing it into the international gene database GenBank. The collection will be available in late-May 2004. This knowledge will support the development of innovative new agricultural technologies that can help improve food production.

In 2002, Syngenta shared its rice genome sequence research with the International Rice Genome Sequencing Project, a ten-nation public effort with a goal of promoting improvements in rice production. Syngenta's data was used by the IRGSP to accelerate completion of a high quality draft sequence that is available to the global research community through international databases. Genome sequencing, a tool of biotechnology, is being used to create crop improvements that utilize both conventional breeding and transgenic technology.

In 2000, Syngenta began working with the inventor of Golden Rice, Dr. Ingo Potrykus, to form a Humanitarian Board to oversee the development of a vitamin-A enhanced rice product that could be distributed free to farmers in developing countries. Collaborative research underway between Syngenta and the Humanitarian Board is aimed at increasing vitamin-A expression in rice. Large-scale research trials in the United States this year will move Golden Rice one step closer toward becoming a real option in the fight against malnutrition and related diseases.

SYNGENTA'S PRODUCT PIPELINE

Syngenta, primarily through the NK brand, currently sells several corn and oil-seed biotechnology products. In field corn, these traits include insect resistance and herbicide tolerance. Our Soybean business includes herbicide tolerance products. We also market an insect resistant sweet corn under the Rogers brand.

In addition to insect resistance and herbicide tolerance, Syngenta's biotech research and product pipeline includes several exciting projects. Within the next 3–5 years, Syngenta will bring forward amylase corn, Quantum phytase enzyme feed supplement, longer-shelf life bananas, fusarium resistant wheat, vegetative insecticidal protein cotton, and second-generation products for insect resistance in corn and cotton. Further down the road, we are managing projects for drought tolerance, biopharma and disease resistance. Today, I would like to focus our testimony on some of our products that are close to commercialization and go beyond traditional input traits.

An exciting product coming through our development pipeline is amylase corn. This is a corn plant genetically modified to express high levels of a novel alpha amylase enzyme which is a critical ingredient in the production of ethanol. Amylase, in general, is an enzyme that has been utilized in ethanol production and other processes for quite some time, is ubiquitous in nature, and is generally recognized as safe (GRAS) by the Food and Drug Administration. In fact, it is even present in human saliva to aid in the process of digestion. This enzyme additive is currently used in the dry grind ethanol industry to accelerate the conversion of the starch in corn to sugar. With our enzyme being located in the corn grain, our amylase corn has the potential to significantly improve this process and thus the overall efficiency of ethanol plants, including yield increases, process improvements and possibly reduced ethanol production costs. Syngenta's amylase enzyme is thermostable which allows more efficient utilization of the enzyme during the ethanol production process. Although it will be grown on a relatively small number of acres, Syngenta is seeking full food and feed and export approvals for its amylase corn. We are currently conducting field trials and a pilot study on this product for a possible launch in 2006–07.

Quantum phytase is the brand name of a new, novel enzyme feed supplement that can help livestock producers lower feed costs and deliver greater nutritional benefits to monogastric animals (swine and poultry) in an easy-to-use, more consistent format. This product has received registration in Mexico and Brazil and has been introduced commercially in both countries. US and Canadian approval are anticipated in 2004. One advantage of Quantum versus existing products is its inherent thermostability which gives feed producers more flexibility because it can better tolerate heat-treating used in ration production without loss of efficacy. Our research also indicates that Quantum phytase can improve an animal's nutrient utilization, potentially allowing animal producers to reduce overall feed costs. Quantum phytase also allows producers to reduce the amount of supplemental phosphorous added to feed resulting in reduced phosphorous in the manure, a potentially significant benefit from an animal management and environmental perspective.

Finally, a product with a more direct benefit to consumers is our extended shelf-life banana. This banana ripens slowly and remains ripe for an average of three to five days longer than conventional bananas, which is an important feature for consumers, and retailers of bananas. This banana also delivers 10–12 days of extra green life which is of value to banana growers and shippers.

As I believe this shows, Syngenta is fully committed to biotechnology and the promise it holds for agriculture including producers, growers, processors, retailers, consumers and others involved in the production of agricultural products.

I would like to thank you again for the opportunity to share with you the many things that Syngenta is doing in plant biotechnology. I would be happy to answer any questions you have at this time.

STATEMENT OF MICHAEL D. DYKES

Mr. Chairman, members of the committee, my name is Michael Dykes, and I am vice president of government affairs for Monsanto Company. I appreciate this opportunity to meet with you today. Thank you for holding this hearing and your continued support of biotechnology. I am also grateful to the Department of Agriculture, the Environmental Protection Agency and the Food and Drug Administration for their oversight and commitment to the products of biotechnology.

I would like to begin by giving you some background about Monsanto and our business. Monsanto, based in St. Louis, Missouri, is an American company of nearly 14,000 people dedicated to making a positive difference in agriculture in the United States and around the world.

Our vision is "abundant food and a healthy environment." We are working to deliver products and solutions that help to meet the world's growing food needs, while conserving natural resources and protecting the environment.

Monsanto has a long history of turning innovative science into successful, high-value products that improve the efficiency of crop and animal agriculture. Biotechnology is an example of our commitment to agricultural innovation. We developed Roundup Ready seeds that have been genetically enhanced to provide herbicide tolerance thereby allowing Roundup herbicide to be applied directly over the top of the crop in the field. This provides outstanding weed control without damaging the crop.

We have also developed Bollgard cotton and YieldGard corn, which helps control the major insect pests in those crops and reduces the use of chemical insecticides. Our biotechnology products have enjoyed outstanding acceptance by growers in the United States and other countries. Because of the success of our first biotech crops, we are able to reinvest in biotechnology and conventional plant breeding research. We spend approximately \$1.4 million a day on research and development of new technologies to improve agriculture and food quality. Farmers, the environment and society in general have and will continue to benefit from these new products through dramatic reductions in pesticide use, significant increases in yield, better soil and water quality, enhanced food/feed quality and improved grower profitability.

Demand for biotechnology products

As I mentioned, our products have been widely adopted by U.S. farmers and other producers around the world and grower adoption continues to expand. Our first biotech crop, Roundup Ready soybeans, was introduced in 1996 and planted on less than 2 percent of U.S. soybean acres that year. In 2004, USDA estimates that biotech soybeans were planted on 85 percent of all soybean acres in the United States.

For cotton growers, we developed Roundup Ready cotton, Bollgard insect-protected cotton and the combination of these traits. The first cotton products were introduced in 1996 and were planted on approximately 13 percent of U.S. cotton acres. This year, biotech cotton traits were used on 76 percent of all U.S. cotton acres.

There is a similar success story for biotech traits in corn. This year, biotech corn was planted on 46 percent of U.S. corn acres, up from the 3 percent adoption rate in 1997, the introductory year. U.S. corn growers are planting a number of corn varieties containing Monsanto traits including Roundup Ready corn, YieldGard corn (which is protected against European corn borer), YieldGard Rootworm corn (which is protected against corn rootworm, the major pest in corn) as well as corn varieties containing combinations of these traits. Next year, we anticipate the availability of Yieldgard Plus, a corn variety that "stacks" the traits to protect against both the corn borer and rootworm. This will be especially helpful to farmers in parts of the country that have significant populations of both pests. In addition, we expect a corn product that will not only protect against both pests, but also be tolerant of Roundup.

In the last 5 years, the amount of biotech acreage for each crop—corn, cotton and soybeans—has more than doubled. We currently license our technology to 219 corn and 259 soybean seed businesses.

International adoption. Internationally, the acreage planted with biotech crops increased by at least 15 percent in 2003—the seventh straight year that global farmers have adopted biotech crops at a double-digit pace. Around the world, 167.2 million acres in 18 countries were planted with biotech crops last year. Since the introduction of biotechnology in 1996, there has been a 40-fold increase in planted acreage. Almost one-third of the global biotech crop acreage was in developing countries—up from 25 percent in 2002. An estimated 7 million farmers grew biotech crops in 2003, of which an estimated 6 million were in developing countries. An estimated 55 percent of the soybeans grown worldwide were biotech soybeans, with 21

percent of the cotton, 16 percent of canola and 11 percent of the corn grown globally with biotech traits.

Benefits for U.S. farmers. Although biotechnology conveys benefits around the world, by far, the largest biotech acreage is in the United States and U.S. farmers reap most of the benefits.

Consider these facts:

- In 2002, the National Center for Food and Agricultural Policy found that eight biotech crops in use by U.S. farmers were delivering major annual benefits: \$1.2 billion dollars in reduced costs, 4 billion pounds of increased yield and a 46 million pound reduction in pesticide use.

- Biotech soybeans and corn have contributed much of that benefit, not only in cost savings and reduction in herbicide applications, but also in soil conservation and stream protection. Biotech crops facilitate the practice of conservation tillage, allowing farmers to control weeds without plowing their fields. This keeps sediment out of streams and reduces fuel consumption as growers make fewer trips across their fields. An American Soybean Association grower survey found that the introduction of biotech soybeans was the single largest factor in growers' decision to switch to conservation tillage.

These biotech cotton and corn products have contributed to major reductions in insecticide use. The National Center study calculated that biotech cotton reduced 1.8 million pounds of chemical insecticides each year. This study predicted that rootworm resistant corn, which we introduced in 2003, could replace 14 million pounds of pesticides each year.

Future benefits beyond the farm. By protecting soil, reducing pesticide use and saving fuel, biotechnology is benefiting farmers and the environment. A number of products in our development pipeline can bring benefits to consumers and society at large.

Working in collaboration with several smaller companies, we have identified and begun testing genes that control stress responses in plants, with the hope of improving the tolerance of crops to drought. Water is the most limiting resource for agriculture in many parts of the world. Drought stress during critical parts of the growth season cause enormous losses of food and fiber virtually everywhere on Earth, including here in the U.S. In some global regions, the problem is critical.

Early results have been exciting. These photographs show a comparison of unimproved plants next to plants containing an experimental drought stress tolerance gene. We have seen results like this in soybeans, rice and corn. This last chart shows corn that was field-tested last year with drought stress during growing season. Plants improved with the experimental drought stress tolerance gene show observably better protection from wilting during the drought and a bigger harvest at the end of the season.

These positive results are early indicators that genes can be discovered and developed to protect crops from drought stress, delivering a bigger harvest. Much work remains before useable products can be ready, but we are working to bring these benefits to farmers.

For the consumers, we are developing oil seeds that provide health benefits by providing improving flavor while reducing or eliminating trans fats. By 2006, we expect to have these oil products commercially available. By 2008, the next generation of oil products will be providing oils that are more stable and stay fresher longer on our pantry shelves.

For instance, Omega 3, a fatty acid, is the component that makes a seafood diet so heart healthy. We are looking at ways to use plants to produce Omega 3, giving consumers the ability to consume more Omega 3's in the foods they eat every day. We also are developing a soybean that will produce heart-healthier oils.

On another front, we are using biotechnology and conventional breeding to develop corn that is ideal for production of ethanol. This corn, high in fermentable starch, could make ethanol production more cost-efficient and help address the ever-increasing concern about oil production and gasoline prices.

These are not just concepts anymore, they are real corn and soybean plants that we can expect to see in farmers' fields near the end of this decade.

Humanitarian benefits. Micronutrient deficiencies, especially those of vitamin A, iron and zinc, remain a large problem for several populations, particularly women of childbearing age and young children. Monsanto has worked with an international consortium of partners including The Bill and Melinda Gates Foundation, USAID, and the Asian Development Bank, to help address malnutrition issues in a new program called, "Harvest Plus". Monsanto donated critical corn genomic information to aid in the development of a nutritionally enhanced African variety of maize with increased levels of vitamin A. We are hopeful this information will help researchers

successfully develop vitamin A maize that would be another tool to help alleviate vitamin A deficiency.

In 2003, Monsanto and the other technology providers worked with the African Agricultural Technology Foundation (AATF) whose mission is food security and poverty reduction. This Foundation in partnership with the Rockefeller Foundation and USAID provides resource-poor farmers with the potential technological solutions for sustaining agricultural production. One of the goals of AATF is to find solutions to the complex intellectual property arrangements that often hamper plant biotech research and development in Africa.

In addition, Monsanto is working throughout the international community to donate technology to benefit developing countries. We have donated our database of the rice genome so that researchers around the world can improve this food staple for billions of people. We also have trained scientists from developing countries and shared technology that might someday help to protect cassava or sweet potato against devastating viruses or increase vitamin A content of staple foods to help fight childhood blindness that is rampant in developing countries.

In conclusion, we are looking for new solutions to problems that have challenged farmers and society for thousands of years. We're finding those solutions in nature through biology and biotechnology.

And, the potential is great. Biotechnology today is where the computer industry was in the 1950's. The coming decades are poised to bring us biotech products as revolutionary and important to us as computers are today. As scientists continue to make technological breakthroughs, we will see the truly revolutionary products that have captivated scientific discussions for decades.

Innovation has been a priority for U.S. farmers for centuries. The result is American growers are at the leading edge of important new breakthroughs things like biotechnology, precision farming and modern planting and harvesting equipment that are reshaping the global agricultural environment.

We believe very strongly that agricultural innovation and creativity is the pathway for U.S. agriculture to continue to compete successfully in the global marketplace and for the benefits of technology to multiply for farmers, consumers and the environment. We believe, as society begins to fully understand the untapped potential of this technology, that there will be an exciting future for biotechnology one that Monsanto is very proud to be a part of that future.

STATEMENT OF DAVID WINKLES

Good morning Mr. Chairman and members of the subcommittee, I am David Winkles, president of the South Carolina Farm Bureau Federation and a corn, cotton and soybean farmer in Sumter County, South Carolina. I have a special interest in agricultural biotechnology; I served on the secretary of agriculture's first agricultural biotechnology advisory committee and I was chairman of the United Soybean Board when biotech soybeans were first exported to France. I am pleased to be here today to present the views of the American Farm Bureau Federation (AFBF) on the important role that biotechnology plays in American agriculture. AFBF represents member families in all 50 states and Puerto Rico.

American agriculture continues to be the world leader in the adoption of agricultural biotechnology. In 2003, plantings of biotech crops in the United States accounted for 63 percent of the world's total plantings. U.S. plantings of the three major biotech crops continue to expand. For example in 2004:

- 86 percent of total soybean plantings will be modified to be herbicide-resistant, up from 81 percent in 2003,
- 76 percent of upland cotton plantings will be biotech cotton, up from 73 percent in 2003, and
- 46 percent of corn plantings will be biotech corn, up from 40 percent in 2003 (ASCI prospective planting report March 2004).

American farmers have seized the opportunity offered by biotechnology to improve their production efficiency. They have recognized that the adoption of new technology, like biotechnology, is an essential in maintaining a competitive advantage for U.S. agricultural exports on the world market. The advantages of biotechnology crops include the environmental benefits of lower pesticide requirements and decreased soil erosion, increased yields, disease-resistance and fuel savings. The future for this technology is bright—new biotech plant varieties are currently being developed that produce crops which are high in essential vitamins and minerals and drought, salt and cold-tolerant.

American production of crops utilizing biotechnology is expected to continue to rise. The approval of new varieties of biotech crops will play a part in this increase.

New varieties of biotech corn, cotton and soybeans are being developed that address a wider range of production limiting factors and in the future wheat, rice, sugar beets alfalfa, apples, bananas, lettuce and strawberries will move into the biotech era. Currently, approximately 25 agricultural biotech products are on the market and it is expected that an additional 24 varieties of biotech crops will be available within six years.

While the United States is the world leader in the production of agricultural crops enhanced through biotechnology, other countries are also expanding biotech crop production. In 2003, global biotech crop acreage experienced the seventh consecutive year of double-digit growth when the global area of biotech crops increased 15 percent, to a total of 167.2 million acres. In 2003 a total of 18 countries planted biotech crops, up from 16 in 2002.

The increase in production of biotech crops in the United States and abroad has increased the importance of developing and maintaining markets, both domestically and internationally for products derived from biotechnology.

Market development, both domestically and internationally, is dependent on public policy that: Maintains an unbiased, science-based regulatory system that inspires consumer confidence and avoids unnecessary traceability and labeling requirements for biotech commodities; Defends against current threats to market access for biotech crops and expands access where current restrictions exist; and Creates an environment conducive to the development of new crop varieties enhanced through biotechnology.

I would like to elaborate on these points.

Maintaining an unbiased, science-based regulatory system that inspires consumer confidence and avoids unnecessary traceability and labeling requirements

Biotechnology in the United States is monitored by several Federal agencies, including the Food and Drug Administration (FDA), the Department of Agriculture (USDA) and the Environmental Protection Agency (EPA). These government agencies play an important role in providing unbiased, science-based evaluations concerning human and animal safety of biotech commodities.

Requiring mandatory labeling and traceability of foods containing commodities enhanced through biotechnology in effect nullifies the regulatory system in place. If the unbiased, science-based regulatory system concludes that a product is safe for human consumption, it becomes unnecessary to label this product as "genetically engineered" or "genetically modified."

If consumers, either domestically or internationally, demand products free from biotech ingredients, the market will function to develop brands that meet the choice of these consumers through a voluntary labeling system. Why should all consumers be forced to pay the cost of a mandatory traceability and labeling system when the biotech-enhanced product in question has been approved as safe for human consumption?

Defending current threats to market access for biotech-crops and expanding access where current restrictions exist

Science-based approval for biotech commodities is critical. The approval process in the European Union (EU) has caused disruptions in the trade of biotech-enhanced products. Resolving these issues quickly is necessary to prevent further disruptions.

The EU's current approach to biotechnology is inconsistent with scientific outcomes obtained from exhaustive risk assessments undertaken on products of agricultural biotechnology. In 1999, the EU instituted a moratorium on approvals of any new products enhanced through biotechnology. Prior to the moratorium, the EU approved eight agricultural biotech commodities. In 2004 the European Commission approved its first commodity enhanced through biotechnology since the moratorium was instituted. Reportedly, two further biotech commodities are currently awaiting approval. It is too early to judge whether the EU will begin to undertake approvals for products enhanced through biotechnology within a reasonable period of time.

The EU's introduction of new regulations governing the approval, marketing, labeling, traceability, and importation of food and feed produced using modern technology last September is a problem for American farmers. Farm Bureau opposes the imposition of any import restrictions, labeling or segregation requirements for products derived through biotech enhancement once they have been approved according to internationally accepted, scientific principles as safe for humans, animals and the environment. The Farm Bureau position is consistent with the World Trade Organization (WTO) that recognizes Codex Alimentarius as the organization responsible for establishing internationally recognized food safety and trade guidelines. The Codex Alimentarius Commission has adopted a policy that directs its working committees to recommend adoption of only those guidelines that are based on sound sci-

entific principles. There is no scientific basis for treating approved food products enhanced through biotechnology differently than other foods.

Convincing arguments exist that the new EU regulations could be in breach of the WTO Technical Barriers to Trade Agreement and the Sanitary and Phytosanitary Agreement. Farm Bureau supports the U.S. government filing a complaint with the WTO on the issue of the new EU regulations. If the new regulations are left unopposed there is nothing to prevent other nations from adopting the EU template. The proliferation of the EU template could create trade zones where the costs of meeting the supply requirements for commodities derived from biotechnology are prohibitive.

It is imperative that we work together to secure foreign regulatory acceptance for products enhanced through biotechnology. Farm Bureau supports increased efforts to educate the public worldwide regarding the safety and benefits of products developed through biotechnology. Recently Farm Bureau leaders visited China and Japan as part of the AFBF International Biotechnology Promotion and Education Program initiative. The objective of the mission was to inform Chinese and Japanese farmers, policymakers and agricultural experts about the benefits of agricultural biotechnology and to promote confidence in the safety and benefits of such technology.

Some disruptions to international trade have occurred since the Biosafety Protocol came into force on September 11, 2003. There have been cases where non-government organizations (NGOs) have picketed ships claiming that the shipments did not have the documentation required under the protocol. The United States currently is not a party to the Biosafety Protocol. The appropriateness of the United States ratifying the Convention of Biodiversity, a precursor to becoming a party of the Biosafety Protocol, is again being discussed. Farm Bureau does not believe that U.S. ratification of the Convention on Biodiversity is in the interest of American agriculture.

AFBF supports addressing the documentation requirements of the Biosafety Protocol through arrangements such as the trilateral arrangement signed by the United States / Mexico / Canada on the "Documentation Requirements for Living Modified Organisms for Food or Feed, or for Processing (LMO/FFP's)". AFBF believes that this is the best mechanism for ensuring that future shipments transition smoothly through the import process. We believe that the trilateral arrangement is the most suitable mechanism for ensuring certainty in the trading environment between parties and non-parties of the Biosafety Protocol, therefore, AFBF supports extending this agreement to other countries that are parties to the Biosafety Protocol.

Creating an environment conducive to the development of new biotechnologies.

If U.S. agriculture is to maintain its place on the technology frontier, it is imperative that an environment conducive to innovation and adoption of new technologies is fostered. Government and private-sector research and development centers should be reassured that the United States is working to ensure that there will be a market both domestically and internationally for approved products derived from biotechnology.

In conclusion, American agriculture has enthusiastically embraced the benefits that biotechnology provides to production efficiency and in turn the competitiveness of U.S. agricultural commodities on world markets. We look forward to continuing our work with Congress on this important issue. AFBF is committed to ensuring broader acceptance of these products internationally and continued domestic consumer confidence. We will work with Congress and the administration to address unnecessary trade barriers implemented by other countries for commodities enhanced through biotechnology. Thank you for this opportunity to testify on this important issue. I would be happy to answer any questions.

STATEMENT OF FRED YODER

Good morning. Chairman Lucas, Ranking Member Holden and members of the Subcommittee, my name is Fred Yoder. I am Chairman of the Board for the National Corn Growers Association (NCGA) and past Chairman of the NCGA's Biotechnology Working Group. I would like to thank the Subcommittee for giving me the opportunity to testify and speak today regarding agriculture biotechnology.

The National Corn Growers Association is an organization founded in 1957 and represents more than 33,000 dues-paying corn growers from 48 states. The Association also represents the interests of more than 300,000 farmers who contribute to corn checkoff programs in 19 states.

The National Corn Growers Association's mission is to create and increase opportunities for corn growers in a changing world and to enhance corn's profitability and usage across this country. Biotechnology remains vital to the future of corn growers

as we search for new markets and provide grain that is more abundant and of better quality.

Biotechnology offers corn growers improved efficiencies and potential profits when managed wisely and with regulatory oversight based on sound science. The introduction of new varieties of corn and their proliferation across the Corn Belt is redefining current systems of price discovery, consumer information, health regulation and trade management.

BIOTECHNOLOGY VARIETIES IN CORN

Existing biotech corn has two main traits, herbicide tolerance and insect resistance. Herbicide tolerant crops can withstand broad-spectrum herbicides that are effective against harmful weeds. This allows farmers to spray less often with just one herbicide and often reduces the need for tillage, which reduces soil runoff. The vast majority of the biotech crops planted are herbicide tolerant. Pest resistant crops have been enhanced with naturally occurring pesticides. The most common protein is bacillus thuringiensis, or Bt. This protein wards off crop-eating insects like rootworm, bollworm and the European corn borer.

Currently, thirteen biotech corn varieties are approved in the United States for commercial use, three of which are herbicide-resistant, three are insect resistant and the other seven are stacked varieties. Stacked trait crops combine two or more traits in the same crop.

PRODUCER ACCEPTANCE

As you know, corn is the largest crop in the United States, with over 79 million acres planted last year, producing 10 billion bushels of grain. Corn acreage is likely to increase this year with nearly half devoted to varieties derived from biotechnology. Corn producers across the country are already learning about the benefits of biotechnology and we expect acceptance rates to continue to climb in the foreseeable future.

Acceptance rates for agriculture biotech in corn and other crops rests primarily on the economic and environmental benefits. As small businessmen, farmers like me understand the importance of minimizing risk and increasing returns on investment. Agriculture biotech helps maximize benefits unlike any innovation since the introduction of the tractor. In fact, according to the Council on Biotechnology Information (CBI), average profits in corn range between five dollars to as much as sixty dollars per acre. As cited earlier, biotechnology has contributed to this rise by allowing corn growers to reduce chemical applications energy use and devote fewer man hours to produce the same bushel of grain.

It is important to point out that acceptance rates for biotech corn varieties are not linear from year to year. As the attached chart illustrates, biotech plantings dipped between 1999 and 2001. Several factors explain this pattern. First, in 1998, the European Union (EU) imposed a moratorium on approvals of new products derived from biotechnology. This effectively halted bulk commodity shipments of corn to the EU. Farmers decided to delay additional plantings in future years until a stable marketplace re-emerged. Second, the discovery of StarLink corn in the food chain had an impact on plantings in the next crop year. Lastly, pest pressures during this period were not significant so farmers chose to plant other hybrid varieties. However, emergence of corn borer and rootworm infestation damaged the corn crop and accelerated plantings after 2001.

Furthermore, asynchronous approvals in the international market and geographic differences are dominant factors for different adoption rates for biotech varieties in the Corn Belt. For example, when evaluated state-by-state, Iowa, Illinois, Minnesota and Nebraska account for 60 percent of the value of biotech corn production (see attached chart).

ENVIRONMENTAL BENEFITS

While the environmental benefits of agriculture biotech are well known, it is helpful to highlight them nonetheless. As you know, agriculture biotech has led to a significant increase in the adoption of environmentally friendly no-till farming practices. No-till farming conserves top soil, preserves soil moisture, reduces energy requirements and lessens runoff while the crop residue from the previous year is left standing. In addition, biotech varieties help enable farmers to use more benign herbicides that rapidly dissipate in soil and water.

From a global perspective, the adoption of no-till farming practices significantly reduces the release of greenhouse gas emissions, which may help slow global warm-

ing. (In contrast, when cultivated soil is exposed to air, organic matter is oxidized, releasing carbon dioxide—an ozone-depleting gas—into the atmosphere).

Overall, agriculture biotech has reduced the amount of pesticides used in U.S. production by 46 million pounds. As additional biotech varieties are introduced, more than 163 million pounds of pesticides could be eliminated from current cropping practices. Specifically, farmers planting biotech corn varieties increased production by 3.5 million pounds of corn in 2001. The increased efficiency resulted primarily by saving crops that would otherwise have been destroyed by European and Southwestern corn borers. This ultimately generated an additional \$183.4 million in revenue for farmers while reducing pesticide use by 8.4 million pounds.

It is important to note that not all U.S.-grown biotech hybrids are approved in major export markets and therefore should not be placed into export channels. NCGA advises its members to avoid potential trade disruption with our export customers and to take the necessary steps to keep biotech grain in the domestic distribution chain where necessary. As you know, this is primarily an issue with the European Union. However, with the proliferation of multilateral environmental agreements (MEAs) like the Biosafety Protocol, it is likely agricultural producers in the United States will be faced with even greater requirements to channel products for export customers.

Farmer acceptance of additional biotech varieties will largely rest in a simple cost/benefit analysis. Innovations in the first wave of agriculture biotech relied on single agronomic traits focused on crop production and pest management. However, farmers like me will demand greater efficiencies and yields before increasing biotech corn acres in production.

FUTURE INNOVATIONS

The future of agriculture biotech is exciting and rich with promise. The second wave of innovations will increase trait stacking and focus on plant performance.

A major factor affecting the reduction in corn grain yields in the United States and the rest of the world is water stress. Every corn field is impacted by water stress to some degree. Not only are some acres not available for growing corn because of insufficient water, yields may be reduced or inconsistent on the remainder of acres. Corn is the second largest user of agricultural irrigation which increases potential conflict for available water, especially in the drought prone western United States.

To remain profitable and competitive, U.S. farmers need access to technologies that help them consistently grow a high yielding and high quality corn crop. NCGA is supportive of the application of biotechnology to create corn crops that maintain high yields under water stress. Drought tolerant corn plants produced by biotechnology are currently being tested for their tolerance to water stress and it will be several years before they are approved and commercialized.

Perhaps the most notable trait recently introduced in corn hybrids prevents damage from the rootworm. The United States Department of Agriculture (USDA) estimates the pest causes one billion dollars in lost revenue annually to the U.S. corn crop. The Environmental Protection Agency (EPA), estimates corn rootworm is responsible for the single largest use of conventional insecticides in the United States.

According to the National Center for Food and Agriculture, adoption of new rootworm-resistant varieties in threatened areas could reduce chemical spraying by an additional 14 million pounds. Furthermore, experts believe rootworm corn could eventually be grown on 15 to 25 percent of corn acres in the United States, boosting yields and saving additional dollars on agricultural inputs.

Looking forward, the National Corn Growers Association is working with a technology provider to develop nematode resistance in corn. Nematodes currently reduce corn yield by three to seven percent. Many chemical nematode control options are under review and are likely to be removed from the market due to their environmental and health hazards. This could lead to a situation in which growers have very limited nematode control options. Our research is working to allow growers to protect their crops while they protect their health and the health of their communities.

These input traits are best characterized as “low hanging fruit” and technology providers are nearing introduction of varieties that are more complex and easier to grasp by consumers. While input traits will continue to be of interest to corn farmers, maximizing value for the consumer and processors will necessitate the commercialization of output traits that have value in the marketplace beyond the farm gate.

A clear path for commercializing output traits is to develop those that have the shortest path to the consumer. The corn industry currently has a number of established markets. Two of which are the ethanol dry mill and livestock industries.

There are corn varieties in the pipeline that will increase the efficiency and yield of ethanol production while reducing energy costs. They will also produce a higher quality output of distillers dried grains with solubles (DDGS). Since many of the new ethanol dry mills operating and in construction are grower owned, this will mean more opportunities for growers to capitalize on value added ventures in rural America.

Research is also focused on livestock nutrition. The livestock industry consumes more corn than any other market segment (57 percent) and will likely use a greater share of the nation's corn crop in the future. Biotechnology can facilitate delivery of essential nutrients, and increase bone health while reducing pollution. Research is ongoing, increasing the presence of phytase, improving amino acid content, increasing Vitamin B3 and Omega-3 fatty acids while controlling the presence of parasitic worms.

Lastly, corn can help deliver essential nutrients through food enhancement. These innovations are best separated into two categories, those that benefit all consumers and those that benefit consumers in developing nations.

Obviously, developed nations have different health profiles than developing countries. For example, although Vitamin A deficiency does occur in the United States, it is rare compared to deficiencies in developing nations. The key health concerns in developed countries are cardiovascular disease and cancer. Consumers are very interested in having access to foods that can facilitate therapies like antioxidants and lycopene.

Research cites lycopene as being important in protection from prostate cancer. While the biosynthetic pathway is well understood in tomatoes and other organisms, it appears that there is increased bioavailability when lycopene is consumed with oils from corn. This would seem to indicate lycopene would be a good candidate for expression in corn plants. In addition, one of the technology providers is working to develop plant derived oils that have a much better composition for cardiovascular health. These oils may be able to reduce this risk of heart disease by as much as forty to fifty percent.

CONSUMER ACCEPTANCE

If there is one challenge that looms on the horizon that is of greatest concern to corn growers is consumer acceptance. Consumer acceptance and confidence in our regulatory agencies is vital to the success of this technology. As producers, corn growers have to be mindful of our customers and ensure there is open communication with grain handlers, millers, processors and food retailers across the country. Our association works closely with our partners in the food chain continuing an open dialogue to head off any problem before it occurs.

We also believe consumer acceptance of biotechnology will increase with the dissemination of science-based information. Responsible and accountable management by biotechnology providers, producers, suppliers and grain merchandisers is imperative. While consumers see advantages in food developed with biotechnology, we cannot squander the good will and confidence built up over the past decade. We need to reach out both domestically and internationally to enhance consumer attitudes. We need only look to the European Union to see the results of neglecting this critical constituency.

Corn growers have a unique opportunity to take part in one of the most important changes in agriculture in history. The development of agriculture biotech offers a fantastic opportunity for increasing the value of the corn crop, as well as significantly benefiting consumers. By working with private sector groups like the AgBiotech Planning Committee, agriculture associations can help facilitate adoption while ensuring proper stewardship. Government needs to ensure regulatory agencies like the Animal and Plant Health Inspection Service (APHIS), EPA and the Food and Drug Administration (FDA) are properly funded and have the tools to do their job.

Together, we can ensure U.S. agriculture remains a leader in technological innovation and production of corn. To be sure, the future of agriculture biotechnology is filled with uncertainty, but we stand ready to confront the challenges that await us. We have so much to lose if we do not move ahead.

We look forward working with the Subcommittee on this and other issues of importance in the future. I thank you again for the opportunity to address the Subcommittee and welcome your questions.

STATEMENT OF JOSEPH H. BOUTON

The Samuel Roberts Noble Foundation is a private foundation located in Ardmore, Oklahoma. Since its founding in 1945, the Noble Foundation has conducted educational programs to assist farmers and ranchers in the southern Oklahoma and north Texas region as part of charitable mission. The Noble Foundation expanded its agricultural research operations through the creation of two research groups: a basic plant biology group, in 1988, and an applied group in 1997, the Forage Improvement Division.

Research in the Noble Foundation's Forage Improvement Division has centered on development of improved forage grass and legume cultivars for use by farmers and ranchers in the southern Great Plains. "Cultivars" are a group of plants that breed true for specific traits through generations of seed increase, such traits being governed by genes. Thus, cultivar development is the process of enhancing (or adding) genes and minimizing undesirable genes (and their related traits).

Dependability is the critical characteristic needed in the region's harsh environment. Therefore, our main target species are perennials such as tall fescue, bermudagrass, hardinggrass, western wheatgrass, alfalfa, and red and white clover. Target traits include drought and heat tolerance and pest resistance. Improving nutritive quality is another important trait.

We approach the incorporation of useful genes that govern these traits almost exclusively with conventional selection and breeding techniques. In this approach, we collect as much of the known plant germplasm, often from the USDA plant germplasm system, and screen it for the target traits. Sometimes, the traits are very complex or difficult to manipulate and biotechnology approaches become an option. For example, in many forage species, lignin is deposited along their cell walls resulting in a poor rate of digestion during rumen breakdown of the forage. Basic research by our Plant Biology Division identified two genes in the lignin pathway that when down regulated resulted in less lignin deposition. We have now successfully down regulated these genes in alfalfa and tall fescue with a concurrent increase in digestibility of the forage. This same approach is now being investigated with bermudagrass.

In May 2003, we co-hosted with Texas A&M University the Fourth International Symposium on Molecular Breeding of Forage and Turf in Dallas, Texas. There were approximately 200 scientists in attendance from 19 countries. Research talks were many and varied on every aspect of basic biotechnology. This symposium, and many others like it, is direct proof that basic research in biotechnology is intense and growing. Whether we will be able to deliver useful biotech traits for agricultural use is another matter. First, there has not been a new crop de-regulated in several years. I am defining a "new crop" as one that has never been in commercial production while containing a biotech trait. Since all our target species would represent "new crops" by that definition, then we are concerned that even doing all requisite safety trials may not be enough to insure de-regulation. Second, two crops, creeping bentgrass and alfalfa, are currently being assessed by USDA-APHIS for de-regulation for the Roundup Ready gene, a 1980's technology that is currently found in millions of acres of corn, soybean, and cotton. Since alfalfa is one of our target species, and creeping bentgrass represents a perennial grass similar to many of our target grass species, we are watching very intently the final disposition of these two applications. The fact that the creeping bentgrass application has now been in the process longer than any crop to date is not encouraging.

It is hoped that the regulatory agencies will concentrate on assessing real versus perceived risks. At the end of the day, these agencies will need to make decisions on what are the real risks, establish a rigorous regulatory process to assess these risks, oversee the regulatory process in a fair manner, and make a decision. We can all then move forward based strictly on the value of the traits to the environment, the farmer, American agriculture, and all citizens of this country.

About The Samuel Roberts Noble Foundation

The Samuel Roberts Noble Foundation, Inc., a not-for-profit Oklahoma corporation and private foundation, operates in part to enhance agricultural resource management and plant productivity through consultation, demonstration, applied biotechnology, and basic research. Consistent with its founder's original vision, Noble is one of the nation's largest endowments whose charitable mission includes the conduct of research for agriculture enhancement. Noble was founded in 1945.

Noble's research operations are based on its headquarters campus in Ardmore, Oklahoma and on more than 15,000 acres located in southern Oklahoma. Noble conducts its agricultural and research operations through three operating divisions: Agricultural, Plant Biology, and Forage Improvement.

The Agricultural Division assists farmers and ranchers through a variety of services, including consultation, education, research and demonstration. The primary goal of this division is to serve farmers and ranchers within a 100-mile radius of Ardmore.

The Plant Biology Division, occupying more than 100,000 square-feet of laboratory and administrative space, performs basic research in plant metabolism and responses to pathogens and pests. Its focus in recent years has been on the understanding and improvement of legumes. With more than 18,000 species, legumes are second only to grasses in terms of economic importance worldwide. Moreover, legumes are an excellent source of protein and dietary fiber, which are usually deficient in the diets of people in developing nations. Using the model legume system *Medicago truncatula*, the division conducts research to enable the improvement of legumes, such as alfalfa, clovers, peanuts, soybeans, lentils, and chickpeas. Researchers believe their work in *M. truncatula* has the potential to significantly impact hunger and farming practices on a global scale.

The research of the Forage Improvement Division centers on the development of improved legume and grass forages for use by farmers and ranchers in the southern Great Plains. The challenges faced by southern Great Plains agriculture can be broadly classified into concerns with cost, ease of use, dependability and environmental desirability of production. Improved forages can address each of these concerns. As part of a recent \$85 million campus improvement project, a new 85,000-square-foot laboratory building, set for completion in October 2004, will provide state-of-the-art facilities in which the division can conduct its research. A recently completed 45,000 square-foot research greenhouse complex serves the Forage Improvement Division as well as the Agricultural and Plant Biology divisions.

Noble organizationally forms a "technology pipeline" uniquely capable—through a single entity—of taking discoveries from the bench of Plant Biology through trials and cultivar development in Forage Improvement to the hands of farmers and ranchers for evaluation through the Agricultural Division. From gene discovery to the farm or ranch, the Noble uses a focused, multidisciplinary organization to improve agriculture and its use, locally, regionally, and worldwide in accordance with its overall philosophy regarding the betterment of agriculture: science and biotechnology alone cannot improve agricultural productivity but must complement improvements and advancements in production or management techniques.

Noble employs more than 285 people from 16 countries, 70 of whom are PhDs. Noble scientists serve on the editorial boards of nine international journals, and the fourteen principal investigators of the Plant Biology and Forage Improvement divisions collectively hold more than ten adjunct professor positions at United States universities, including Oklahoma State University, Rice University, University of Georgia, University of Oklahoma, University of Texas, Texas A&M University, and Washington State University, as well as the University of York, York, UK.

In 2003, Noble scientists published more than 100 articles in peer-reviewed journals, including *Nature*, *Science*, *Proceedings of the National Academy of Sciences USA*, *Plant Cell*, *Plant Journal*, *Crop Science*, *Theoretical and Applied Genetics* and *Agronomy Journal*.

STATEMENT OF MEL BILLINGSLEY

Thank you, Chairman Lucas, Chairman Holden, and Members of the Committee for the opportunity to address this morning a few of the many important issues surrounding the development of life sciences industries in rural areas. My name is Dr. Melvin Billingsley and I am the President and Chief Executive Officer of the Life Sciences Greenhouse of Central Pennsylvania. The Life Sciences Greenhouse—created by the Commonwealth of Pennsylvania in 2001 with funds from the Master Tobacco Settlement—is working to accelerate economic growth and job creation in central Pennsylvania by advancing commercialization of discoveries in the life sciences. There are, in fact, three regional greenhouses in Pennsylvania, but the Central Greenhouse is the only one of the three that serves a largely rural geography. As I will explain, this presents several unique challenges.

Pennsylvania is far from the only state seeking to stimulate economic development via biotechnology. *Laboratories of Innovation: State Bioscience Initiatives 2004*, a report prepared for the Biotechnology Industry Organization by Battelle Memorial Institute and SSTI, indicates that as recently as 2001, just 14 states had identified the biosciences as an economic development opportunity; today, 40 states are targeting the biosciences for development.

Perhaps the most obvious reason for the interest in the biosciences is the expected growth rate—an analysis of U.S. Department of Labor projections suggests that be-

tween now and 2012 the biosciences will grow at a rate that is 13 percent greater than overall employment. In addition, the biosciences tend to generate a wide array of high-quality jobs. According to the aforementioned Battelle study, the average annual salary of workers in the biosciences was \$18,600 more than the national average. Finally, the biosciences encompass a broad range of specialized subsectors. The most significant of these are agricultural feedstock and chemicals; drugs and pharmaceuticals; medical devices and equipment; and research and testing. This assemblage translates into a wide breadth of opportunities. By way of example, the recently released Pennsylvania Bioscience State-of-the-Industry Report (June 2004) identifies more than 2,000 establishments employing nearly 84,000 people across subsectors within the state.

It's important to note that not every subsector can be found in every corner of the Commonwealth. One of the keys to growing biotech in rural areas—indeed, to growing biotech anywhere—is accurate identification of regional strengths.

Among central Pennsylvania's strengths is the manufacturing of pharmaceuticals and medical devices. Aventis Pasteur, located within the Pocono Mountains in the town of Swiftwater, employs over 1,500 people in the production of influenza and other vaccines. When Aventis (formerly Rhone-Poulenc Rorer) purchased this facility from Connaught Laboratories in 1994, it employed only 400 people. Naturally, the nearly four-fold increase in employment has had a tremendous positive impact on the local economy. The converse situation can be found in the Lancaster County town of Marietta. This town is the site of a Wyeth facility that historically produced influenza vaccine and other biologic agents. At its peak, this facility employed roughly 1,200. Unfortunately, that number has been reduced to about 400 and the plant will likely shut down completely by December 31st. A challenge peculiar to rural areas is that redeployment of such a facility is typically more difficult than might be expected in an urban area.

The examples I've cited thus far, Aventis Pasteur and Wyeth, are large companies—defined as those employing more than 500 people. But according to Manufacturing Pennsylvania's Future, a January 2004 report authored by Deloitte Consulting, LLP, only 7 of Pennsylvania's 74 pharmaceutical companies can be classified as large; the remaining 91 percent employ fewer than 500 each and are classified as small- to mid-sized enterprises (SMEs). These SMEs are significant economic drivers for central Pennsylvania: in the southcentral part of the state, pharmaceutical manufacture accounted for output of \$575 million last year; in the northcentral part of the state, pharmaceutical manufacturing has emerged within the last ten years as the region's largest economic driver, with double-digit growth and output more than 2½ times the next largest driver.

Similarly, medical device and equipment manufacturing can also be found in rural areas of southcentral Pennsylvania. Again, these entities are generally smaller enterprises, are diverse in focus, and contribute significantly to local economies.

I would like to take the next few minutes to identify the factors that seem to account for the promising growth I've described, and conclude with an assessment of what's needed to capitalize on the momentum.

Referring again to the Battelle Report, there is a chain of events that begins with sufficient and modern research facilities. Such facilities tend to attract talented researchers. These researchers, in turn, attract federal dollars in the form of grants from the National Institutes of Health, the National Science Foundation the Department of Agriculture, et cetera, and industry investment in the form of grants, contracts and partnerships. Central Pennsylvania has the good fortune of being home to the main campus of a major land grant university, Penn State, as well as the Penn State Milton S. Hershey College of Medicine and a third large research institution, Lehigh University. These institutions house outstanding facilities and equipment, draw more than \$580 million in basic research funding annually, and attract talented researchers and students who provide the intellectual capital that serves as the foundation of any biotech enterprise. Some number of faculty and students can be expected to become entrepreneurs; others will feed the biotech workforce pipeline. In my capacity as Director of the Section of Technology Development and Research Resources at Penn State College of Medicine, I saw firsthand this evolutionary process.

Beyond a wealth of research and talent, development of the biosciences requires significant investments of time and money. This industry is extremely cash-intensive, spending, on average, three times more in development costs than other technology-based sectors. It typically takes five to ten years before investments begin to show returns, and the investments tend to be relatively risky. Given these conditions, the pool of willing private investors is fairly small, necessitating public/private partnerships like the Life Sciences Greenhouse, an assured flow of federal funding in the form of SBIR and STTR grants, and progressive, start-up friendly policies like

tradable tax credits for research and development and net operating losses carry forward policies.

My organization, the Life Sciences Greenhouse of Central Pennsylvania, serves as a catalyst facilitating collaboration among regional research institutions, existing life sciences companies, emerging bioscience start-ups, government agencies, economic development organizations, and private investors. We are a source of the scarce yet crucial seed- and early-stage capital required by developing companies. I should point out that our role is to not only fund, but assist in all aspects of company development and prepare them for the next round of risk-based capital. The funding is typically delivered in laddered, milestone-driven increments and leveraged with in-house business and scientific expertise and the resources of the above mentioned partners. Demand for this early-stage capital greatly exceeds our capacity and clearly points to the need for additional sources of such funding. Federal incentives to provide capital are sorely needed, particularly in rural areas outside our nation's largest urban centers, since angel investors and venture capitalists tend to cluster and invest in more developed areas.

Any federal incentives to provide capital to early stage companies must not come at the expense of the funding for basic research via NIH, NSF, etc., or from the critical Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs. These funding streams are an essential part of the business development continuum and must be continued or expanded. One change to the SBIR and STTR programs is warranted: the eligibility criteria needs to be modified to allow small venture-backed companies to compete for funding. The exclusion effectively serves as a punitive measure against promising early-stage companies, robbing them of one of their most valuable tools—capital for growth. By coupling effective federal funds with targeted programs such as the Small Business Administration's New Markets Venture Capital Program, we can begin to address the relative lack of seed capital available for rural development.

In summary, growing life sciences-related industries in rural areas is really about the density of ideas, capital and talent. It is quite possible, as I've hopefully communicated to you today, for a rural area like central Pennsylvania to contain or attract sufficient quantities of each. With appropriate federal assistance, it seems likely that a growing number of regions within our nation will be able to participate in the economic promise of the life sciences industry. Thank you for the opportunity to address this hearing. I'll be glad to answer any questions.

STATEMENT OF MICHAEL AUSTIN

I am writing on behalf of the Hawaii Crop Improvement Association as its current president in favor of agricultural biotechnology. Agriculture biotechnology is an important part of Hawaii's agriculture. The seed industry in Hawaii has shown rapid growth, a recent survey conducted by the Hawaii Agriculture Statistics Service (HASS, 2004) reported expenditures exceeding \$50 million dollars per annum. Over the last 10 years, the value of Hawaii's seed industry has grown annually at 20 percent, while employing approximately 1000 people in the industry (HASS, 2004). The industry continues to grow with projected expenditures of \$65 million dollars by the year 2006.

Biotechnology is allowing farmers the opportunity to increase yields while decreasing the use of pesticides. Biotech products such as Bt corn and roundup ready soybeans, that offer enhanced and environmentally friendly weed and insect control, are examples of successful biotechnical breakthroughs that were developed in part in Hawaii. New technologies such as these are helping increase yields while allowing farmers to use fewer inputs.

With the Earth's population exceeding 6 billion people (to put this in perspective there were 3 billion people in 1959, the year I was born) the need to increase grain and other important crop yields is paramount. Biotechnology not only holds the promise for higher yields but can also be leveraged to restrict expansion onto marginal and unsuitable agricultural lands. Hawaii offers the ability to efficiently grow three crop generations per year while greatly hastening the development of new varieties for commercial introduction. These favorable attributes provide the greatest flexibility for developing new products in the shortest time possible.

The negative press that agricultural biotechnology receives is due to a small minority of people who happen to roar the loudest. Surveys taken in Hawaii indicate that the majority of people are in favor of agriculture biotechnology. It is up to the agricultural industry to continually increase educational awareness of the benefits of biotech crops.

STATEMENT OF STEVE DAUGHERTY

Thank you, Chairman Lucas for convening this hearing of the Subcommittee on Conservation, Credit, Rural Development and Research on the state of the agriculture biotechnology industry. We at Pioneer Hi-Bred International, Inc. and our parent company, DuPont, appreciate the efforts you and the members of this subcommittee, as well as your staffs, have taken to support biotechnology, a science that we believe has shown tremendous benefits, as well as great potential for farmers and consumers worldwide. It is our pleasure to provide you with our perspective on biotechnology as it stands today.

First, although you may be familiar with our business, let me provide you with a brief background on Pioneer. Pioneer was founded over 75 years ago, by noted agriculture innovator Henry Wallace, who served as Secretary of Agriculture under President Franklin Roosevelt and was a former Vice President of the United States. Pioneer is headquartered in Des Moines, Iowa and employs more than 6,000 people in more than 70 countries. Building on an earlier partnership, in 1999, Pioneer became a wholly-owned subsidiary of DuPont, while continuing to focus on our mission of helping America's farmers get the most value from each unit of land and helping them meet the nutritional needs of consumers around the globe. Pioneer has been a leader throughout our history in improving the characteristics of crops such as corn, soybeans, alfalfa, sorghum, sunflowers, canola and wheat.

Throughout much of the last century, the world has seen a continual improvement in the productivity of crops through four main factors: tillage, weed and insect control, fertilizers and genetic improvement. As we look toward the future, and the rapidly increasing global population we must feed, it is apparent that genetic improvement will be increasingly important in keeping the trend of increased production on track.

New technologies to modify and enhance seeds are now being used to develop products that have extraordinary potential for increasing productivity and enhancing the abilities of farmers to feed the world. These technologies have the added benefit of offering options and value opportunities to farmers regardless of the size of operations. Some of the opportunities to sustain or enhance profitability include increased productivity and production of grain with specialty or value-added traits.

These new technologies, because they are associated with food production, should be and are, coming under close scrutiny by scientists, governmental bodies, consumers and journalists. Pioneer agrees with and wants to ensure that all those interested in genetic technologies such as biotechnology, understand the value of plants that are now being called genetically modified. Pioneer supports the right of everyone to examine and debate the relative merits of any new technology.

Pioneer has been involved in the study and development of seed products utilizing the tools of biotechnology for more than 15 years. During that time it has become apparent that biotechnology offers the potential for enhancing a wider range of traits and methods in crops than was previously available. Biotech crops contribute to increases in crop productivity, the conservation of biodiversity, a reduced impact on the environment and increased economic stability. The enthusiasm for this potential is borne out by the increasing amount of land planted to biotech crops each year. We are witnessing the most rapid adoption of a technology in the history of agriculture. As our counterparts in the industry have also noted, approximately 150 million acres globally have been planted in biotech crops in the last year, the majority of those acres in the United States. However, adoption rates of biotech crops in the developing world continue to increase as well; over much of the last decade, the global acreage of biotech crops has increased by double digits annually. The planting of biotech crops in the developing world is 40 times greater than it was since the introduction of biotechnology crops in 1996 and as a result, one-third of all hectares planted with biotechnology crops are in developing countries.

Why is this a good thing? We believe the answer to that question is evident now and will become even more evident in the future. For the benefit of farmers, biotechnology has already contributed to increased production through the use of insecticide-resistant varieties that ward off highly damaging pests. These products significantly reduce the need for fall tillage and for spray applications of insecticides and pesticides.

Currently, Pioneer is offering biotech corn and soybean products that are resistant to prolific, damaging pests such as European Corn Borer, and products that are herbicide tolerant. In addition, within five to 10 years, Pioneer will be offering corn and soybean varieties that will have improved traits for drought tolerance (a universal environmental stress causing more than \$8 billion in losses for farmers globally. Other traits that Pioneer hopes to address using biotechnology include, disease resistance, nitrogen utilization and improved yields. Of perhaps greater interest to

consumers, we will be offering varieties with improved traits for processing, energy availability, flavor and protein functionality.

As the benefits of biotechnology become more clear and widespread, we believe its acceptance will broaden. However, we realize that working as a company and in partnership with our industry counterparts, we must continue to work with legislative and regulatory bodies around the world and with consumers to be open and informative about the work we are doing. Toward that end, we appreciate very much the efforts of the House and Senate Biotechnology Caucuses to provide information to Members of Congress and their staffs regarding the technology and the regulatory structure that monitors its progress into the marketplace. We pledge to continue to provide the Caucuses and individual Member offices with the information they need to address biotech issues as they emerge in constituent contacts and in a legislative context. Furthermore, Pioneer and DuPont have been full partners and will continue to be, in the Council for Biotechnology Information (CBI), which was formed for the purpose of providing consumers with the information they need about biotech products.

Pioneer will continue to enhance the genetic performance of crops, utilizing a wide array of technologies, including biotechnology. We will, as we have for more than 75 years, thoroughly test these products to ensure their safety before they are offered to our customers.

No technology should be employed simply because it is possible. Science-based regulation of these new products is supported by Pioneer and DuPont, and we strive to meet or exceed all the regulatory requirements placed on the introduction of these products worldwide.

As the first company in the world to develop, produce and market hybrid corn, we have a seven-decade old commitment to preserving the environment and increasing the productivity of farmers everywhere. Crops genetically enhanced through new technology are a natural extension of that commitment as we move into the next century. Again, thank you Mr. Chairman and other Members of the subcommittee for the opportunity to provide input on the ag biotech industry. We at Pioneer and DuPont look forward to continuing our work with you in the future.

STATEMENT OF LAWRENCE ELWORTH

Mr. Chairman and members of the Subcommittee, thank you for the opportunity to provide this written statement on the implementation of the conservation provisions in Farm Security and Rural Investment Act of 2002 (farm bill). My statement focuses on the Environmental Quality Incentives Program (EQIP) and the unique challenges facing specialty crop producer participation in the program.

The Center for Agricultural Partnerships (CAP) is a 501(c)(3) nonprofit organization whose mission is, CAP has worked with more than 70 organizations and companies in seven states to help farmers use more effective farming practices on more than 150,000 acres. Since 2002, CAP has worked with partners in Michigan, California, and North Carolina to increase growers' knowledge and ability to use EQIP and overcome challenges that limit their participation.

Specialty crop producers have unique capabilities, significant opportunities and strong incentives to adopt sound conservation practices. Since specialty crops require intensive management growers are particularly able to apply sophisticated conservation practices in their operations. Practices that protect water quality, conserve water, prevent soil erosion, and conserve wildlife habitat are available for use on a wide scale in specialty crop production. In addition, unique opportunities exist for growers to apply a wide range of pest management practices through the conservation programs that protect air resources, prevent non-target impacts and create healthy ecosystems. Finally specialty crop growers must deal with a formidable array of state and Federal regulations such as the Clean Air Act, Endangered Species Act, Clean Water Act, state and Federal pesticide laws.

The opportunities for conserving natural resources in specialty crops are as significant as those offered in other sectors of agriculture. However, those opportunities have not materialized for the vast majority of specialty crop growers in the first two years of farm bill implementation.

The use of the terms "specialty crops" or "minor crops" is solely intended to distinguish these crops from traditional program crops, i.e., wheat, corn, soybean, rice, cotton and field grains. It is not intended to imply that these crops are not important—in fact, they account for more than 40 percent of all crop value in the U.S.

8ENVIRONMENTAL QUALITY INCENTIVES PROGRAM

Congressional Intent Benefits from the 2002 farm bill to specialty crop producers were an important part of the debate in Congress. One way in which the concerns of members were addressed was the promise that the conservation programs would provide increased opportunities for specialty crop participation. It was assumed that the larger amounts of money that were authorized would allow specialty crop producers to participate in the conservation programs along with other producers. Congress went so far as to add report language to the farm bill to spell out its intent for EQIP:

“The Managers are aware of the unique conservation and production practices utilized by specialty crop growers throughout the United States. The Managers expect the USDA to ensure that adequate resources are made available for specialty crop conservation practices under the EQIP. The Managers also expect that, in carrying out the financial assistance provisions of the various conservation programs, the unique production practices involved in fruit and vegetable production are taken into account when drafting and implementing regulations to carry out those programs. In particular, the Managers would direct the Secretary when enrolling a producer who is already undertaking activities related to integrated pest management, make those ongoing activities eligible for financial assistance after the date of enrollment.” (p. 74, Conference Report).

Even with significant interest from Congress and significant opportunities for resource conservation, there is still enormous untapped potential for specialty crop producers to participate in EQIP. The lack of participation stems from the lack of knowledge and working relationships between the Natural Resources Conservation Service (NRCS) and the specialty crop community, the immense demands on NRCS to implement the new farm bill programs and the way in which NRCS has implemented EQIP.

ISSUES

Lack of knowledge and working relationships. The vast majority of specialty crop growers have had virtually no contact with NRCS or the conservation programs. As a result they have little knowledge of how NRCS operates, few working relationships at the local state or national levels, and thus limited ability to take advantage of the programs. Given that lack of familiarity, the transaction costs seem overwhelming for a grower to initiate the process of applying to the conservation programs.

Specialty crop producers are unlikely to have had any contact with NRCS programs in the past and have very little knowledge about EQIP, opportunities to participate or what they must do to become acquainted, much less apply to the program. If they are aware of the program they typically find the application process daunting and the benefits remote. Thus applications from specialty crop growers overall have been very limited.

- NRCS and specialty crop producers have had very little interaction over the years. While there are notable exceptions in parts of several states, such as Michigan, California, and North Carolina, NRCS has had limited acquaintance with specialty crop producers, their crops, or production methods.

- NRCS, as a whole, does not have extensive expertise in key technical areas such as pesticides and pest management that are critical to specialty crops or knowledge about the regulatory and environmental issues that have such a large impact on producers

- Most grower groups for specialty crops and the advisors who work with them, e.g., Cooperative Extension and private consultants, also have minimal knowledge about NRCS, EQIP or other conservation programs. Thus the normal routes by which growers would become aware of new opportunities and receive support in using them, are not currently effective in helping them participate in EQIP.

- Specialty crop producers are not widely represented on state and local committees that provide guidance on priorities and program implementation. As a result, issues of importance to specialty crop participation are fully considered.

The net effect of these factors is that using EQIP has been daunting to growers and their organizations. Due to the lack of working relationships and communication between NRCS and the specialty crop community, outreach and knowledge have lagged, while problems have gone undetected and unresolved.

NRCS and farm bill implementation. NRCS has faced the daunting task in implementing the farm bill provisions. Since passage in May 2002, NRCS has had to promulgate new regulations, roll out new programs, and handle significantly increased dollars for the programs. It has had to accomplish these tasks under tight time

frames created by the mid year passage of legislation in 2002 and the late passage of appropriations bills in fiscal year 2003. These pressures have limited NRCS in key areas.

Outreach Increasing the participation of specialty crop growers in EQIP requires extensive outreach to familiarize growers with the program and NRCS procedures, enable them to understand the application process and fully comprehend the range of practices that they can use in resource conservation. Outreach is also needed to effectively involve specialty crop producers in state and local committees and to create working relationships with grower groups and others in the grower community.

Program responsiveness In order to increase specialty crop participation it is important to account for unique conservation and production challenges in the implementation of EQIP. Many of the problems that growers encounter, such as low incentive payment rates, have been created inadvertently or without complete information. Increasing grower access to EQIP will require the resources and attention to accurately identify problems and work with NRCS to resolve them.

Implementation of EQIP. While there are numerous variations among states in the precise ways that they administer EQIP—for example, some states rank applications at the county level, whereas others rank them at the state level—these basic issues are of important to specialty crop producers in all states.

Eligibility. On a number of occasions growers have been discouraged by NRCS staff from applying to EQIP for incentive payments to carry out integrated pest management (IPM) if they have done IPM in the past. This stems from a lack of knowledge among NRCS staff at multiple levels about the number of specific and distinct pest management practices that are available to growers. It has proved to be a major stumbling block for specialty crop participation.

Application process. The application process is particularly daunting for specialty crop producers who are unfamiliar with the programs and procedures. The forms and procedures can be confusing for growers who, since they have not previously participated in farm programs, are not even in the USDA system. Growers are also often unaware of the range of conservation practices available for them to use and may not realize what they need to do in order for their applications to be successful. The time and effort in making an application coupled with unsure prospects for being selected has tended to discourage a sizeable percentage of the relatively few growers who are sufficiently aware of EQIP to consider applying.

Ranking of applications. The ranking of proposals is an important part of the EQIP application process. NRCS has significantly more applications than it has money to spend. Under the new farm bill, applications are to be ranked by the level of environmental benefits they provide in meeting national priorities and resource concerns. This has proved problematic for specialty crop producers in several ways:

- The ranking process essentially requires that, in order to successfully apply, growers must address multiple resource concerns. However, as noted, growers are often unfamiliar with the range of practices available, conversely NRCS is often unfamiliar with the unique conservation and production practices for specialty crops. This makes the application process complicated for growers unfamiliar with the program and leads to their applications not being funded if they are not aware of the wider range of practices they might use.

- To the extent that states have gone to a standard statewide ranking sheet and/or ranked all applications at the state rather than the county level, specialty crop producers find it difficult to rank high enough to get their applications approved.

- Geographic priority areas—the key to enrolling specialty crop producers in EQIP under the last farm bill, for example in Michigan, was having a geographic priority area. Under the previous farm bill geographic priority areas were established that allowed conservationists to focus on unique problems in areas where specialty crops predominated. Under the new legislation the mandate for priority areas was eliminated, leaving specialty crop producers to compete against livestock and major crop producers.

Conservation Planning. In many states a conservation plan is required for growers to apply. Most specialty crop producers, having never been involved with NRCS programs, do not have a conservation plan. Writing plans for those growers, who have never been involved with NRCS and who have diverse cropping systems is particularly complicated and time consuming. NRCS staff rarely have sufficient time or resources to work with a significant number of new growers.

- Growers or their consultants must absorb the entire cost of the conservation planning process since TSP funds are not available until after the producer's contract is signed. This is a big hole in the program in many states that dramatically limits the ability of specialty crop producers to participate in EQIP.

TECHNIQUES AND PAYMENT RATES

- Incentive payments in many states are inappropriately low or non-existent for key land management practices such as pest management.
- In many states incentive and cost share are available only for scouting under the 595 pest management standard. Other techniques, such as the use of biological controls, mating disruption, and/or reduced risk pesticides, would create significant environmental benefits. Only a handful of states provide incentive payments rates for those mitigation techniques that would provide significant resource improvements in specialty crop production.

Summary. Although the farm bill increased the amount of the program dollars that must go to livestock operation from fifty to sixty per cent nationally, the increased funding still provides greater opportunity for specialty crop producers to participate. EQIP has been used in specialty crops for pest management practices under the 1996 farm bill for the construction of pesticide storage, mixing and loading facilities (cost-share payments) and to support the use of integrated pest management practices (incentive payments).

It is also important to recognize, that there are parts of the country where NRCS and the grower community work well together. In some regions, NRCS staff are well acquainted with the grower community and there are good connections at the state and local levels. Good examples of how the program can work to support IPM in specialty crops exist in specific counties in Michigan (vegetables, cherries), North Carolina (apples), and California. In other regions, there is a willingness at the state or county level to improve working relationships with specialty crops.

NRCS deserves a great deal of credit for its effort in those important examples. However, it is the fact that those examples have been so successful while their diffusion has been so limited that makes it critical to increase specialty crop participation.

Overall, despite these good examples, specialty crop producers largely are not participating in or benefiting from the conservation programs in any considerable measure. Many of the reasons for this lack of participation are interrelated. For example, the fact that difficulty in applying to EQIP is very much connected to the historic lack of interaction between NRCS and specialty crop producers. Dealing with these complex issues will require a concerted effort at the state, national and local levels.

Recommendations: There are several things that NRCS can do to help overcome the hurdles for specialty crop producer participation in EQIP. Taking these steps would have immense value to resource conservation and growers and would help create a strong foundation for their participation in other conservation programs such as the Conservation Security Program (CSP).

- Establish a national commitment to working with the specialty crop community through EQIP and other conservation programs.
- Convene a meeting between the Chief and specialty crop producer groups to create better working relationships
- Establish a committee of state conservationists and producer groups to identify problems and opportunities for specialty crop participation
- Create a specific staff responsibility in the Chief's office to oversee interaction with specialty crop producers
- Communicate to state offices the importance of working effectively with specialty crops
- Provide additional outreach support for states that work with specialty crop producers
- Establish pilot projects in key specialty crop states to create high profile examples for increasing participation that can be duplicated in other states and regions.
- Include participation by specialty crop producers as one of the criteria in performance incentives for states

Conclusion. Although challenges exist for increasing specialty crop use of EQIP, the potential for conservation benefits more than justifies the effort. The experiences of CAP and its partners have shown that these challenges can be overcome through targeted efforts that increase knowledge, create strong working relationships, provide support in the grower community, and make critical changes in program implementation. That experience can be duplicated for growers nationwide, through diligence, strategic use of resources, and the development of strong partnerships with NRCS. The benefits to growers, NRCS and resource conservation from such an effort would be considerable.