CENTER FOR
FOOD SAFETY

July 9, 2014

House Agriculture Committee
Subcommittee on Horticulture, Research, Biotechnology and Foreign Agriculture
1301 Longworth House Office Building
Washington, DC 20515-6001

Statement by Center for Food Safety's Doug Gurian-Sherman, Ph.D. to the Subcommittee Hearing on the Societal Benefits of Biotechnology

To the Members of the Subcommittee:

Center for Food Safety (CFS) is a nonprofit public interest organization that works to protect public health and the environment by curbing the proliferation of harmful food production technologies and by promoting sustainable agriculture. In furtherance of this mission, CFS uses legal actions, groundbreaking scientific and policy reports, books and other educational materials, and grassroots campaigns on behalf of its 500,000 farmer and consumer members across the country. CFS is a recognized national leader on the issue of biotechnology, and has worked on improving its regulation and addressing its impacts continuously since the organization's inception in 1997.

GE crops have had a wide range of effects on agriculture and the environment. On balance, the negative impacts of GE have been substantial, while the benefits have been relatively small and equivocal, and usually better and more cost-effectively addressed by other available methods and technologies. The benefits from the technology are being reversed by resistant weeds and insects that are reducing the efficacy of several GE crops.

Agriculture is facing huge challenges in coming decades from climate change, growing population and resource shortages, such as scarce fresh water. And although highly productive, our agriculture system has large global impacts on the environment, such as reduced biodiversity the hundreds of coastal "dead zones" around the world, which must be reduced. It is reasonable, after 30 years of research and development, to expect genetic engineering to have started making substantial inroads into these problems, but it has not. This should serve as a caution about claims that dramatic improvements to agriculture from GE are immanent. The need for genetic engineering to provide sustainable food security in coming years has not been established, and although it may provide some future benefits, a misplaced emphasis on genetic engineering is likely to divert scarce resources from better alternatives.[1]

Pesticide Use

Overall pesticide use has increased dramatically in recent years on GE crops, by an estimated 400 million pounds more in the US than would have been the case if these crops had not been

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commercialized.[2] Although promoters of GE often emphasize other possible traits, which have mostly not come to fruition, about 85 percent of GE acreage worldwide is devoted to herbicide resistant crops, with almost all the rest consisting of Bt insect resistance. The regulatory pipeline of GE crops in the US consists mostly of new herbicide resistant crops.

The dramatic increase in herbicide use in recent years is due largely to an epidemic of herbicide resistant weeds, infesting over 60 million acres[3] across 36 states –an area the size of Wyoming– which are already putting some cotton farmers out of business. Some have claimed that this is not due to the GE crops. But these crops were designed to use the herbicides that weeds have developed resistance to, so this is not a convincing argument. Similarly, it has been pointed out that resistance has occurred to other pesticides in the past. While true, it is widely accepted that the GE crop/herbicide system has greatly exacerbated this problem.[4]

The use of herbicides on herbicide resistant GE crops is also a major contributor to the decimation of iconic monarch butterfly populations in the US.[5]

It has been suggested that the herbicide in question, glyphosate (the active ingredient in Roundup) is less toxic than herbicides it has replaced. However, USDA is set to approve a new generation of GE crops resistant to older more dangerous herbicides, such as 2,4-D. These new crops are projected to increase overall herbicide use dramatically. Several of these older herbicides are also associated with elevated rates of several cancers and other serious diseases in farmers and farm workers, and are likely to cause additional environmental and economic harm, such as drift damage to other crops.[6,7] This will lead to more herbicide resistant weeds, including some that may become resistant to all or most of our remaining effective herbicides.[8]

By contrast, ecologically based farming methods have been shown to control weeds with over 90 percent reduction in herbicide use.[9]

Productivity and Yield

It is important to understand that we produce enough food. Prominent economists have shown that hunger and famine are the products of inequality and poverty, and usually have little to do with the supply of food.[10] For example, there are over 40 million food-insecure people in the US, despite more than adequate food production. However, growing population and increasing animal product consumption and climate change may put pressure on food supplies in coming decades.

Some GE crops have provided small to modest increases in yield in some countries and in some years. For example, of the two main food and feed crops in the US, corn and soybeans, analysis of the peer-reviewed science literature shows that the engineered genes contribute only about 3 to 4 percent to corn productivity, with no clear increase for herbicide tolerant soybeans.[11] Some individual farmers, for example, those with particularly high pest infestations, may see bigger increases in yield, but the overall productivity benefit to US agriculture and the world has been small. To put this in context, over the period that GE crops have been commercialized in the US, corn yields have increased about 30 percent, and GE has provided only about 14 percent of this productivity increase. A more recent study, using a larger data set, shows about a 10 to 11 percent yield increase in corn in the areas where the genes are used.[12] Based on the 63 percent of corn acres containing Bt traits at that time, GE increased overall corn productivity by about 7, or about 23 percent of the yield improvement in corn in the US since 1996.

By contrast, other methods, mainly conventional breeding and improved cultivation, have accounted for between 77 and 86 percent of the productivity increases in corn since GE traits have been commercialized, based on the research discussed above. For soybeans, virtually all productivity increases have come from these conventional sources. Analysis of data from Europe has shown that productivity increases of corn have been as high as in the US without the use of GE.[13] Overall, the data show that GE has not contributed substantially to productivity improvement in developed countries.

While more productive and less expensive than GE, public funding for conventional breeding has declined over the past several decades to levels that threaten its viability for many crops. Many prominent scientists have pointed out that we have barely scratched the surface of the potential for breeding to greatly improve crop production and sustainability.[14] Breeding is also much less expensive than GE, with estimated costs of about $1 million per new trait, while biotech industry estimates put the cost of new traits from genetic engineering at about $140 million.[15]

Similarly, inexpensive ecologically-based farming methods can increase yields by 20 to 40 percent in many situations with minimal reliance on harmful pesticides.[16] Yet these methods are discouraged by current farm policies that favor unsustainable monocultures of GE corn and soybeans that encourage pests. For example, corn rootworm is the major insect pest of corn in the US, and has developed resistance to the major GE trait leading to increasing insecticide use. But alternating crops from year to year (rotation) largely eliminates the need for genetic engineering or insecticides to control rootworm.

The situation in developing countries is more complex, with fewer data. Modest yield improvements are sometimes observed from genetic engineering, but these are often much less than obtained by methods using agroecological farming principles, which often more than double yield.[17] Over 10 million farmers and their families are already using these methods, on over 20 million acres. Development and dissemination of these methods should be emphasized rather than expensive GE technologies. These ecological practices are also much less costly for poor farmers to implement than buying inputs such as engineered seeds or the resources these crop varieties require to be highly productive, such as fertilizers and pesticides. Crops engineered with individual traits, such as resistance to an insect pest, may also leave poor farmers vulnerable to the many other environmental challenges that they face over time, such as drought or other pests. Farming using ecological science principles, on the other hand, improves resilience to environmental challenges.

For these and other reasons, the most thorough international assessment of the scientific and technological needs of developing country farmers, the IAASTD, concluded that GE should play only a minor role in coming years.[18] This assessment involved hundreds of scientists and analysts and was modeled after the international climate assessments (IPCC), was sponsored by the World Bank and several UN Agencies including the WHO, and is the definitive science assessment of agriculture needs in developing countries.

Addressing Unmet Challenges

Agriculture must address many challenges in coming years, such as resilience in the face of climate change, the reduction of pollution from fertilizers and pesticides, and reduction of the use of scarce resources like water. So far, GE has done almost nothing to address these issues, while breeding and ecological farming (agroecology) have made substantial inroads and have even greater untapped potential. Many of these challenges are complex, and require many crops genes. Genetic engineering has not shown that it can address such complex traits, and this will be an ongoing challenge.

For example, genetic engineering has produced only one gene for tolerance to drought, in corn, which has very limited efficacy under moderate drought conditions. It is estimated that, if used by US farmers, it would improve corn productivity by only 1 percent in a typical year. It has little potential to help under severe or extreme droughts.[19] Meanwhile, breeding has produced many varieties of corn, rice, wheat, sorghum, cassava, millet and other crops with improved drought tolerance. Agroecology, by increasing soil organic matter, improves the ability of the soil to retain water, helping crops survive droughts.

Nitrogen fertilizer is the main cause of most of the hundreds of coastal dead zones around the world. It is also the source of nitrous oxide, a climate change gas 300 times more potent than carbon dioxide. While conventional breeding has improved nitrogen use efficiency over the past several decades, by as much as 20 to 40 percent in several major crops, GE has contributed no commercial traits to reduce nitrogen use.[20]

Agroecology has even more potential for reducing nitrogen use and pollution. Research has shown that one ecological method can reduce nitrogen pollution by 40 to 70 percent, while also increasing soil fertility and greatly reducing soils erosion.[21] Other research has demonstrated that agroecological methods can reduce fertilizer and pesticide use by over 90 percent, while increasing productivity and maintaining or increasing profit to farmers.[22]

Conclusions

Genetic engineering has provided some benefits, such as decreasing insecticide use. But this benefit is threatened by insect resistance due to the unsustainable use of this technology. Herbicide resistant weeds are driving up herbicide use dramatically and is harming the environment. Despite many billions of dollars of investments and 30 years of research, GE has not addressed in a meaningful way the many challenges we face in agriculture. Meanwhile, cheaper and more effective methods, such as breeding and agroecology, are neglected by our research establishment and farming policies. Genetic engineering may make some contributions to improving agriculture in coming years, but at considerable cost, and much less than is needed.

Instead of focusing on this limited technology, much more investment is needed in proven, effective, and less expensive methods such as breeding and agroecology.

Respectfully submitted,

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