U.S. Submission on Socio-Economic Considerations

June 12, 2017

As outlined within the Convention on Biological Diversity's notification number SCBD/SPS/DC/MPM/KG/PD/PS/86495 under the Cartagena Protocol on Biosafety, the United States Government is pleased to submit its "experiences on national processes and best practices related to socio-economic considerations in decision-making related to living modified organisms." We recognize that this call for submissions is broader than the scope of Article 26 within the Protocol, "Socio-Economic Considerations," and thus have has offered literature citations that are in line with this request.

We emphasis that Article 26 of the Protocol is not compulsory and that Parties are permitted, but not required, to take socio-economic considerations into account in decision-making. We support the rights of Parties to incorporate socio-economic considerations as part of the decision to import. However, we also wish to highlight the limited scope of socio-economic considerations that can be considered under Article 26 of the Protocol and that these considerations are required to be consistent with international obligations.

The United States assesses the safety of products, including products developed using biotechnology that fall within the definition of "living modified organisms," to protect both human health and the environment. Three U.S. regulatory agencies are responsible for the oversight of new products: the U.S. Environmental Protection Agency (EPA), the U.S. Food and Drug Administration (FDA), and the U.S. Department of Agriculture (USDA). Together, these agencies work through a process known as the Coordinated Framework for the Regulation of Biotechnology (Coordinated Framework). In January 2017, the U.S. Government published an Update to the Coordinated Framework, which clarifies the existing roles of each of the regulatory agencies. The Update and corresponding documents can be viewed here: https://obamawhitehouse.archives.gov/blog/2017/01/04/increasing-transparency-coordination-and-predictability-biotechnology-regulatory

When evaluating products, the U.S. Government provides an opportunity for the general public to submit comments regarding proposed regulatory decisions during a defined public comment period on https://www.federalregister.gov/. Public comment periods may capture socio-economic considerations and can be submitted by both domestic and foreign persons. Public comments are used in the decision making process before a final regulatory decision is made. Through this regulatory approach, the United States has successfully protected both human health and the environment, while also ensuring that biotechnology-derived products reach the market for farmers and consumers in a timely manner.

The below publications are a subset of peer-reviewed, scientific publications that have assessed the socio-economic impacts of biotechnology in the United States over the past two decades. These reports are used to inform U.S. biotechnology policy.

Studies conducted with support from the U.S. Department of Agriculture (USDA)

These information provided below reflects illustrative examples. For more information please see https://www.ers.usda.gov/topics/farm-practices-management/biotechnology.aspx

1. **Adoption of Genetically Engineered Crops in the U.S.** This data product summarizes the adoption of herbicide-tolerant and insect-resistant crops since their introduction in 1996. https://www.ers.usda.gov/data-products/adoption-of-genetically-engineered-crops-in-the-us/

2. **Genetically Engineered Crops in the United States. Economic Research Report No. (ERR-162).**
   Genetically engineered (GE) crops (mainly corn, cotton, and soybeans) were planted on 169 million acres in 2013, about half of U.S. land used for crops. Their adoption has saved farmers time, reduced insecticide use, and enabled the use of less toxic herbicides. Research and development of new GE varieties continues to expand farmer choices.
   https://www.ers.usda.gov/webdocs/publications/45179/43668_err162.pdf?v=41690

3. **The First Decade of Genetically Engineered Crops in the United States. Economic Information Bulletin No. (EIB-11) 36 pp, April 2006.** Ten years after the first generation of genetically engineered (GE) varieties became commercially available, adoption of these varieties by U.S. farmers is widespread for major crops. Driven by farmers' expectations of higher yields, savings in management time, and lower pesticide costs, the adoption of corn, soybean, and cotton GE varieties has increased rapidly. Despite the benefits, however, environmental and consumer concerns may have limited acceptance of GE crops, particularly in Europe. This report focuses on GE crops and their adoption in the United States over the past 10 years. It examines the three major stakeholders of agricultural biotechnology and finds that (1) the pace of R&D activity by producers of GE seed (the seed firms and technology providers) has been rapid, (2) farmers have adopted some GE varieties widely and at a rapid rate and benefited from such adoption, and (3) the level of consumer concerns about foods that contain GE ingredients varies by country, with European consumers being most concerned.
   https://www.ers.usda.gov/webdocs/publications/43731/13396_eib11_1_.pdf?v=41746

4. **The Economics of Glyphosate Resistance Management in Corn and Soybean Production Economic Research Report No. (ERR-184) 52 pp, April 2015.** Widespread use of glyphosate (a highly effective herbicide) for corn and soybean has led to glyphosate resistance, and recent surveys suggest that acreage with glyphosate-resistant weeds is expanding. This report explores a number of issues related to the decline of glyphosate's effectiveness and choices for managing resistance to it.
   https://www.ers.usda.gov/webdocs/publications/45354/52761_err184.pdf?v=42207

5. **Off-Farm Income, Technology Adoption, and Farm Economic Performance. Economic Research Report No. (ERR-36) 53 pp, February 2007.** The economic well-being of most U.S. farm households depends on income from both on-farm and off-farm activities. Consequently, for many farm households, economic decisions (including technology adoption and other production decisions) are likely to be shaped by the allocation of managerial time among such activities. While time allocation decisions are usually not measured directly, we observe the outcomes of such decisions, such as on-farm and off-farm income. This report finds that a farm operator's off-farm employment and off-farm income vary inversely with the size of the farm. Operators of smaller farm operations improve their economic performance by compensating for the scale disadvantages of their farm business with more off-farm involvement. Off-farm work reduces farm-level technical efficiency, but increases household-level technical efficiency. And adoption of agricultural innovations that save managerial time is associated with higher off-farm income.
   https://www.ers.usda.gov/webdocs/publications/45734/11796_err36_1_.pdf?v=41056

6. **Economic Issues in the Coexistence of Organic, Genetically Engineered (GE), and Non-GE Crops. Economic Information Bulletin No. (EIB-149) 41 pp, February 2016.** Two decades after genetically engineered seeds became available, GE varieties are common in U.S. corn, soybean, cotton, canola, and sugarbeet production. Markets for food containing non-GE ingredients also exist. This report examines organic and conventional product markets, common

coexistence practices, and the economic impacts when GE material is detected in non-GE products.
https://www.ers.usda.gov/webdocs/publications/44041/56750_eib-149.pdf?v=42424

7. **Consumer valuation of information about food safety achieved using biotechnology: Evidence from new potato products. Food Policy 69 (2017): 82-96.** This study focuses on the role of food labels and information for affecting consumers' valuation of food safety achieved through application of biotechnological (biotech) methods. In 2002, potato products cooked to a high temperature were first reported to contain the human carcinogen acrylamide. Research discoveries using genetic engineering can substantially reduce carcinogenic-forming potential, and thereby increase food safety of potato products. Adult consumers from three distant regions of the U.S. were the subjects in lab auctions of potato products. They engaged in distinct rounds of bidding, first without packaged information and again after receiving information about the food safety risks and benefits of new biotech potato products. The study finds that willingness-to-pay (WTP) for these new potato products are not significantly different from conventional potato products under no information. However, exposure to a scientific perspective and scientific plus industry perspectives increases participants' willingness-to-pay for the new potato products and reduces willingness-to-pay for conventional products. Exposure to the negative perspective on the new technology significantly reduces willingness-to-pay. Consumer valuation of the new potato products is affected by food labels, information, and consumer attributes. A consumer information program could be needed to gain consumer acceptance of these potato products or other foods that have been genetically modified to increase certain food safety dimensions.
http://www.sciencedirect.com/science/article/pii/S0306919217301756

8. **What do Farmers' Weed-Control Decisions Imply about Glyphosate Resistance? Evidence from Surveys of U.S. Corn Fields. Pest Management Science (2017).** The first case of glyphosate-resistant weeds in the United States was documented in 1998, two years after the commercialization of genetically-engineered herbicide-resistant (HR) corn and soybeans. Currently, over 15 glyphosate-resistant weed species affect U.S. crop production areas. These weeds have the potential to reduce yields, increase costs, and lower farm profitability. The objective of our study is to develop a behavioral model of farmers' weed management decisions and use it to analyze weed resistance to glyphosate in U.S. corn farms. On average, we find that weed control increased U.S. corn yields by 3700 kg ha−1 (worth approximately $255 ha−1) in 2005 and 3500 kg ha−1 (worth approximately $575 ha−1) in 2010. Glyphosate kills approximately 99% of weeds, on average, when applied at the label rate in HR production systems, if glyphosate resistant weeds are absent. Resistance has a fairly small impact on control when small numbers of glyphosate-resistant weeds are present but can reduce average control dramatically in states where resistance is more widespread. We find that glyphosate resistance has had a significant impact on weed-control costs and corn yields of U.S farmers.
http://onlinelibrary.wiley.com/doi/10.1002/ps.4598/full

9. **Revisiting the Impact of Bt Corn Adoption by U.S. Farmers. Agricultural and Resource Economics Review 41/3 (December 2012) 377–390.** This study examines the impact of adopting Bt corn on farm profits, yields, and insecticide use. The study employs an econometric model that corrects for self-selection and simultaneity. The model is estimated using nationwide farm-level survey data for 2005. Regression analysis confirms that Bt adoption is associated with increased variable profits, yields, and seed demand. However, the results of this analysis suggest that Bt adoption is not significantly related to insecticide use. This result may be due to the fact that insect infestation levels were lower in 2005 than they were in previous years.
http://ageconsearch.umn.edu/bitstream/141671/2/fernandez-cornejo%20-%20current.pdf

10. **Farm-Level Effects of Adopting Herbicide-Tolerant Soybeans in the U.S.A. Journal of Agricultural and Applied Economics, Volume 34, Issue 1, April 2002, pp. 149-163.** This paper estimates the on-farm impacts of adopting herbicide-tolerant soybean on herbicide use, yields, and farm profits, using an econometric model that corrects for self-selection and simultaneity and is consistent with profit maximization. The model is estimated using nationwide farm-level survey data for 1997. Given that the use of herbicide-tolerant soybeans involves the substitution of a particular herbicide—primarily glyphosate—for other herbicides, we explicitly consider this substitution process in the model.
https://www.researchgate.net/profile/Jorge_Fernandez-Cornejo/publication/5139203_Farm-Level_Effects_of_Adopting_Herbicide-Tolerant_Soybeans_in_the_USA/links/00b7d522e27e388213000000.pdf

11. **Technology adoption and off-farm household income: the case of herbicide-tolerant soybeans. Journal of Agricultural and Applied Economics, Volume 37, Issue 3, December 2005, pp. 549-563.** We model the interaction of off-farm work and adoption of agricultural technologies and the impact of adopting these technologies on farm household income from on farm and off-farm sources after controlling for such interaction, and estimate the model for the case of adoption of herbicide-tolerant (HT) soybeans using a nationwide survey of soybean farms for 2000. We find that adoption of HT soybeans is positively and significantly related to off-farm household income for U.S. soybean farmers, after controlling for other factors. In addition, while on-farm household income is not significantly related to adoption, total household income increases significantly with adoption.
http://ageconsearch.umn.edu/bitstream/43487/2/Fernandez-Cornejo%20JAAE%20December%202005.pdf

12. **Conservation Tillage, Herbicide Use, and Genetically Engineered Crops in the United States: The Case of Soybeans. AgBioForum, 15(3): 231-241.** This study examines the extent to which adopting herbicide-tolerant (HT) soybeans affects conservation tillage practices and herbicide use. The model is estimated using a state-level panel dataset extending across 12 major soybean-producing states from 1996 to 2006. The results of our analysis suggest that HT adoption induces farmers to adopt conservation tillage practices. Our results also show that HT adoption leads to a decrease in quality-adjusted herbicide use.
http://agbioforum.org/v15n3/v15n3a01-fernandez-cornejo.htm

13. **Genetically Modified Crops and Household Labor Savings in US Crop Production. AgBioForum, 12(3&4) 2009: 303-312.** In spite of widespread adoption, there is mixed evidence as to whether adopting genetically modified (GM) crops increases farm welfare. One possible reason for widespread adoption is the labor savings. Using a treatment effect model we estimate the time savings associated with adopting a GM crop. We find a significant savings in household labor for soybeans, but not for other crops.
https://mospace.umsystem.edu/xmlui/bitstream/handle/10355/6921/GeneticallyModifiedCrops.pdf?sequence=1&isAllowed=y

Studies conducted by the National Academy of Sciences, Engineering, and Medicine (NASEM) with support from the U.S. Government, and references cited there within.

1. **The Impact of Genetically Engineered Crops on Farm Sustainability in the United States (2010)** is a comprehensive assessment of the environmental, economic, and social impacts of the GE-crop revolution on U.S. farms.

https://www.nap.edu/catalog/12804/the-impact-of-genetically-engineered-crops-on-farm-sustainability-in-the-united-states

Genetically Engineered Crops: Experiences and Prospects (2016) is a comprehensive report examining a range of questions and opinions about the economic, agronomic, health, safety, or other impacts of genetically engineered (GE) crops and food. https://www.nap.edu/catalog/23395/genetically-engineered-crops-experiences-and-prospects