NATIONAL ENVIRONMENTAL POLICY ACT DECISION
AND
FINDING OF NO SIGNIFICANT IMPACT

Syngenta Company
Event SYN-05307-1 Corn

United States Department of Agriculture
Animal and Plant Health Inspection Service
Biotechnology Regulatory Services

The United States Department of Agriculture (USDA) Animal and Plant Health Inspection Service (APHIS) has developed this decision document to comply with the requirements of the National Environmental Policy Act (NEPA) of 1969, as amended, the Council of Environmental Quality's (CEQ) regulations implementing NEPA, and the USDA APHIS' NEPA implementing regulations and procedures. This NEPA decision document, a Finding of No Significant Impact (FONSI), sets forth APHIS' NEPA decision and its rationale. Comments from the public involvement process were evaluated and considered in developing this NEPA decision.

In accordance with APHIS procedures implementing NEPA (7 CFR part 372), APHIS has prepared an Environmental Assessment (EA) to evaluate and determine if there are any potentially significant impacts to the human environment from a determination on the regulated status of a petition request (APHIS Number 10-336-01p) by Syngenta Company (Syngenta) for their genetically engineered Event SYN-05307-1 Corn (hereafter referred to as 5307 Corn) that expresses an eCry3.1Ab protein to protect corn plants from corn rootworm insect damage. This EA has been prepared in order to specifically evaluate the effects on the quality of the human environment that may result from approving the petition seeking nonregulated status for 5307 Corn. The EA assesses alternatives to a determination of nonregulated status of 5307 Corn and analyzes the potential environmental and social effects that result from the proposed action and the alternatives.

Regulatory Authority

"Protecting American agriculture" is the basic charge of APHIS. APHIS provides leadership in ensuring the health and care of plants and animals. The agency improves agricultural productivity and competitiveness, and contributes to the national economy and the public health. USDA asserts that all methods of agricultural production (conventional, organic, or the use of genetically engineered (GE) varieties) can provide benefits to the environment, consumers, and farm income.

Since 1986, the United States government has regulated genetically engineered (GE) organisms pursuant to a regulatory framework known as the Coordinated Framework for the Regulation of Biotechnology (Coordinated Framework) (51 FR 23302, 57 FR 22984). The Coordinated Framework, published by the Office of Science and Technology Policy, describes the comprehensive federal regulatory policy for ensuring the safety of biotechnology research and products and explains how federal agencies will use existing Federal statutes in a manner to ensure public health and environmental safety while maintaining regulatory flexibility to avoid impeding the growth of the biotechnology industry. The Coordinated Framework is based on several important guiding principles: (1) agencies should define those transgenic organisms subject to review to the extent permitted by their respective statutory authorities; (2) agencies are required to focus on the characteristics and risks of the biotechnology product, not the process by which it is created; (3) agencies are mandated to exercise oversight of GE organisms only when there is evidence of "unreasonable" risk.

The Coordinated Framework explains the regulatory roles and authorities for the three major agencies involved in regulating GE organisms: USDA's APHIS, the Food and Drug Administration (FDA), and the Environmental Protection Agency (EPA).

APHIS is responsible for regulating GE organisms and plants under the plant pest provision in the Plant Protection Act of 2000, as amended (7 USC §§ 7701 *et seq*.) to ensure that they do not pose a plant pest risk to the environment.

The FDA regulates GE organisms under the authority of the Federal Food, Drug, and Cosmetic Act (FFDCA). The FDA is responsible for ensuring the safety and proper labeling of all plant-derived foods and feeds, including those that are genetically engineered. To help developers of food and feed derived from GE crops comply with their obligations under Federal food safety laws, FDA encourages them to participate in a voluntary consultation process. The FDA policy statement concerning regulation of products derived from new plant varieties, including those genetically engineered, was published in the Federal Register on May 29, 1992 (57 FR 22984-23005). Under this policy, FDA uses what is termed a consultation process to ensure that human food and animal feed safety issues or other regulatory issues (e.g., labeling) are resolved prior to commercial distribution of bioengineered foods.

The EPA regulates plant-incorporated protectants under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). EPA also sets tolerance limits for residues of pesticides on and in food and animal feed, or establishes an exemption from the requirement for a tolerance, under the Federal Food, Drug and Cosmetics Act (FFDCA) and regulates certain biological control organisms under the Toxic Substances Control Act (TSCA). The EPA is responsible for regulating the sale, distribution, and use of pesticides, including pesticides that are produced by an organism through techniques of modern biotechnology.

Regulated Organisms

The APHIS Biotechnology Regulatory Services' (BRS) mission is to protect America's agriculture and environment using a dynamic and science-based regulatory framework that allows for the safe development and use of GE organisms. APHIS regulations at 7 Code of Federal Regulations (CFR) part 340, which were promulgated pursuant to authority granted by the Plant Protection Act, as amended (7 United States Code (U.S.C.) 7701-7772), regulate the introduction (importation, interstate movement, or release into the environment) of certain GE organisms and products. A GE organism is no longer subject to the plant pest provisions of the Plant Protection Act or to the regulatory requirements of 7 CFR part 340 when APHIS determines that it is unlikely to pose a plant pest risk. A GE organism is considered a regulated article if the donor organism, recipient organism, vector, or vector agent used in engineering the organism belongs to one of taxa listed in the regulation (7 CFR 340.2) and is also considered a plant pest. A GE organism is also regulated under Part 340 when APHIS does not have information to determine if the GE organism is unlikely to pose a plant pest risk.

A person may petition the agency that a particular regulated article is unlikely to pose a plant pest risk, and, therefore, is no longer regulated under the plant pest risk provisions of the Plant Protection Act or the regulations at 7 CFR part 340. The petitioner is required to provide information under §§340.6(c)(4) related to plant pest risk that the agency may use to determine whether the regulated article is unlikely to present a greater plant pest risk than the unmodified organism. A GE organism is no longer subject to the regulatory requirements of 7 CFR part 340 or the plant pest risk provisions of the Plant Protection Act when APHIS determines that it is unlikely to pose a plant pest risk.

APHIS' Response to Petition for Nonregulated Status

Under the authority of the plant pest provisions of the Plant Protection Act and 7 CFR part 340, APHIS has issued regulations for the safe development and use of GE organisms. As required by 7 CFR 340.6, APHIS must respond to petitioners who request a determination of the regulated status of GE organisms, including GE plants such as 5307 Corn. When a petition for nonregulated status is submitted, APHIS must make a determination if the GE organism is unlikely to pose a plant pest risk. If APHIS determines, based on its Plant Pest Risk Assessment (PPRA), that the genetically engineered organism is unlikely to pose a plant pest risk, the genetically engineered organism is no longer subject to the plant pest provisions of the Plant Protection Act and 7 CFR part 340.

Syngenta has submitted a petition (APHIS Number 10-336-01p) to APHIS seeking a determination that their genetically engineered 5307 Corn is unlikely to pose a plant pest risk and, therefore, should no longer be a regulated article under regulations at 7 CFR part 340.

SYN-05307-1 Corn

SYN-05307-1 contains an insecticidal protein, eCry3.1Ab, and was developed for the American corn market. In the U.S., a complex of three species of highly injurious corn rootworm

(*Diabrotica*) larvae cause significant damage to corn (Hoeft et al., 2000). The eCry3.1Ab protein protects corn from feeding damage due to *Diabrotica*, and, thus, confers resistance to transformed corn plants to corn rootworm. Corn varieties containing this transgene have the potential to displace costly applications of conventional US-EPA-restricted use rootworm insecticides (Syngenta, 2011c). Growers are expected to see benefits as an alternative to the application of conventional insecticides, as well as economic benefits through increased crop yield, more effective corn rootworm resistance management, and increased marketplace competition for insect-protected seed products (Syngenta, 2011c).

Coordinated Framework Review

Food and Drug Administration

5307 Corn is within the scope of the FDA policy statement concerning regulation of products derived from new plant varieties, including those produced by genetic engineering. Syngenta initiated the consultation process with FDA for the commercial distribution of 5307 Corn and submitted a safety and nutritional assessment of food and feed derived from 5307 Corn to the FDA in January 2011 (Syngenta, 2011c).

Environmental Protection Agency

The EPA regulates plant-incorporated protectants (PIPs) under FIFRA (7 U.S.C. 136 *et seq.*) and certain biological control organisms under TSCA (15 U.S.C. 53 *et seq.*). Before planting a crop containing a PIP, a company must seek an experimental use permit from EPA. Commercial production of crops containing PIPs for purposes of seed increases and sales requires a FIFRA Section 3 registration with EPA. Syngenta obtained an experimental use permit (67979-EUP-8) from US-EPA that allowed for broad-scale field testing of 5307 Corn and various stack combinations that include 5307 Corn. The Experimental Use Permit was initially granted on June 1, 2010, with effect through February 28, 2012 (US-EPA, 2010c), and was extended (US-EPA, 2012) on March 3, 2011 with effect through December 31, 2013. In connection with this Experimental Use Permit, US-EPA established, and then extended (US-EPA, 2011a), a previous temporary exemption from the requirement for a tolerance for eCry3.1Ab residues in corn commodities, pursuant to §408(d) of the Federal Food, Drug, and Cosmetic Act . Phosphomannose isomerase (PMI), the selectable marker protein produced by 5307 Corn plants, is exempt from food and feed tolerances (US-EPA, 2004).

In April 2011, Syngenta submitted applications to the US-EPA for registration of the eCry3.1Ab PIP in corn (Syngenta, 2011c) and in two breeding stacks involving specific GE corn traits that are no longer the subject to the requirements of Part 340 and the plant pest provisions of the PPA (US-EPA, 2011f). These breeding stacks include specifically Bt11 X MIR604 X TC1507 X 5307 X GA21 and Bt11 X MIR162 X MIR 604 X TC1507 X 5307 X GA21 corn. In addition to the corn rootworm control provided by 5307 corn, the controls provided by the other nonregulated constituents of these stacked combinations are:

- A Cry1Ab protein for lepidopteran control (Bt11)
- A modified Cry3A protein for corn rootworm control (MIR604)
- A Cry1F protein for lepidopteran control (TC1507)
- A double mutated 5-enolpyruvylshikimate-3-phosphate synthase enzyme for glyphosate tolerance (GA21)
- A Vip3Aa20 protein for lepidopteran control (MIR162); and
- A phosphinothricin acetyl transferase enzyme for glufosinate tolerance (Bt11 and TC1507)

The US-EPA registration was sought for the PIP as a stand-alone cultivar (i.e., not part of a breeding stack) for a manufacturing-use product; Syngenta will not seek an end-use product registration from US-EPA for 5307 Corn (Syngenta, 2011c). Rather, commercial registrations were sought for the two breeding stack products that include 5307 Corn. A conditional registration was made by EPA for the stacked product, EPA Reg. Number 67979-17 on June 10, 2011. Concurrently, Syngenta also submitted a petition (Petition No. 1F7857) to the US-EPA to establish a nonexpiring exemption from the requirement of a tolerance for eCry3.1Ab residues in food and feed commodities.

Scope of the Environmental Analysis

Although a determination of nonregulated status of 5307 Corn would allow for new plantings of 5307 Corn anywhere in the U.S., APHIS primarily focused the environmental analysis to those geographic areas that currently support corn production. A determination of nonregulated status of 5307 Corn is not expected to increase corn production, either by its availability alone or accompanied by other factors, or cause an increase in overall GE corn acreage. To determine areas of corn production, APHIS used data from the National Agricultural Statistics Service (NASS) to determine where corn is produced in the U.S. (UDA-NASS, 2010). Corn is primarily produced in an area of the U.S. commonly known as the Corn Belt, which includes Iowa, Illinois, Nebraska, and Minnesota, and parts of Indiana, South Dakota, Kansas, Ohio, Wisconsin, and Missouri. These ten states comprised approximately 73 percent of the nation's corn production in 2011 (USDA-NASS, 2012a; USDA-NASS, 2012b). 5307 Corn is regulated in part by FIFRA, due to classification of the Cry protein product as a pesticide by EPA.

Public Involvement

On July 13, 2012, APHIS published a notice in the Federal Register (77 FR pages , Docket no. APHIS-2012-0024) announcing the availability of the Syngenta petition, and the APHIS PPRA and draft EA for a 60-day public review and comment period. Comments were required to be received on or before September 11, 2012. All comments were carefully analyzed to identify new issues, alternatives, or information. A total of 86 comments were received from individuals during the comment period. Comment documents may be viewed at http://www.regulations.gov/#!searchResults;rpp=25;po=0;s=APHIS-2012-0024. The comments

did not mention their specific disagreement with APHIS' analysis of SYN-05307-1 Corn detailed in the EA or PPRA (USDA-APHIS, 2011); rather, they expressed their general opposition to genetically modified organisms (GMOs) or GE crops. No new issues, alternatives or substantive new information were identified in any of the comments received by APHIS. Responses to substantive comments are included as an attachment to this Finding of No Significant Impact.

Major Issues Addressed in the EA

The issues considered in the EA were developed based on APHIS' determination that certain genetically engineered organisms are no longer subject to the plant pest provisions of the Plant Protection Act and 7 CFR part 340, and for this particular EA, the specific petition seeking a determination of nonregulated status for 5307 Corn. Issues discussed in the EA were developed by considering public concerns as well as issues raised in public comments submitted for other environmental assessments of genetically engineered organisms, concerns raised in lawsuits, as well as those issues that have been raised by various stakeholders. These issues, including those regarding the agricultural production of corn using various production methods, and the environmental food/feed safety of genetically engineered plants, were addressed to analyze the potential environmental impacts of 5307 Corn.

The EA describes the alternatives considered and evaluated using the identified issues. The following issues were identified as important to the scope of the analysis (40 CFR 1508.25):

Agricultural Production Considerations:

- Acreage and Areas of Corn Production
- Agronomic/Cropping Practices
- Corn Seed Production
- Organic Corn Production

Environmental Considerations:

- Water Resources
- Soil
- Air Quality
- Climate Change
- Animals
- Plants
- Gene Flow
- Microorganisms
- Biological Diversity

Human Health Considerations:

- Public Health
- Worker Safety

Livestock Health Considerations:

- Livestock Health/Animal Feed

Socioeconomic Considerations:

- Domestic Economic Environment
- Organic Farming
- Trade Economic Environment

Alternatives that were fully analyzed

The EA analyzes the potential environmental consequences of a determination of nonregulated status of 5307 Corn. To respond favorably to a petition for nonregulated status, APHIS must determine that 5307 Corn is unlikely to pose a plant pest risk. Based on its Plant Pest Risk Assessment (USDA-APHIS, 2012), APHIS has concluded that 5307 Corn is unlikely to pose a plant pest risk. Therefore, APHIS must determine that 5307 Corn is no longer subject to 7 CFR part 340 or the plant pest provisions of the Plant Protection Act. Two alternatives were evaluated in the EA: (1) no action and (2) determination of nonregulated status of 5307 Corn. APHIS has assessed the potential for environmental impacts for each alternative in the Environmental Consequences section of the EA.

No Action: Continuation as a Regulated Article

Under the No Action Alternative, APHIS would deny the petition. 5307 Corn and progeny derived from 5307 Corn would continue to be regulated articles under the regulations at 7 CFR part 340. Permits or notifications acknowledged by APHIS would still be required for introductions of 5307 Corn and measures to ensure physical and reproductive confinement would continue to be implemented. APHIS might choose this alternative if there were insufficient evidence to demonstrate the lack of plant pest risk from the unconfined cultivation of 5307 Corn.

This alternative is not the preferred alternative because APHIS has concluded through a Plant Pest Risk Assessment that 5307 Corn is unlikely to pose a plant pest risk (USDA-APHIS, 2012). Choosing this alternative would not satisfy the purpose and need of making a determination of plant pest risk status and responding to the petition for nonregulated status.

Preferred Alternative: Determination that SYN-05307-1 Corn is No Longer a Regulated Article

Under this alternative, 5307 Corn and progeny derived from 5307 Corn would no longer be regulated articles under the regulations at 7 CFR part 340. 5307 Corn is unlikely to pose a plant

pest risk (USDA-APHIS, 2012). Permits issued or notifications acknowledged by APHIS would no longer be required for introductions of 5307 Corn and progeny derived from this event. The preferred alternative best meets the purpose and need to respond appropriately to a petition for nonregulated status based on the requirements in 7 CFR part 340 and the agency's authority under the plant pest provisions of the Plant Protection Act. Because the agency has concluded that 5307 Corn is unlikely to pose a plant pest risk, a determination of nonregulated status of 5307 Corn is a response that is consistent with the plant pest provisions of the PPA, the regulations codified in 7 CFR part 340, and the biotechnology regulatory policies in the Coordinated Framework.

Alternatives Considered but Rejected from Further Consideration

APHIS assembled a list of alternatives that might be considered for 5307 Corn. The agency evaluated these alternatives, in light of the agency's authority under the plant pest provisions of the Plant Protection Act, and the regulations at 7 CFR part 340, with respect to environmental safety, efficacy, and practicality to identify which alternatives would be further considered for 5307 Corn. Based on this evaluation, APHIS rejected several alternatives. These alternatives are discussed briefly below along with the specific reasons for rejecting each.

1. Prohibit any 5307 Corn from Being Released

In response to public comments that stated a preference that no GE organisms enter the marketplace, APHIS considered prohibiting the release of 5307 Corn, including denying any permits associated with the field testing. APHIS determined that this alternative is not appropriate given that APHIS has concluded that 5307 Corn is unlikely to pose a plant pest risk (USDA-APHIS, 2011).

In enacting the Plant Protection Act, Congress found that

> [D}ecisions affecting imports, exports, and interstate movement of products regulated under [the Plant Protection Act] shall be based on sound science…§402(4).

On March 11, 2011, in a Memorandum for the Heads of Executive Departments and Agencies, the White House Emerging Technologies Interagency Policy Coordination Committee developed broad principles, consistent with Executive Order 13563, to guide the development and implementation policies for oversight of emerging technologies (such as genetic engineering) at the agency level. In accordance with this memorandum, agencies should adhere to Executive Order 13563, and, consistent with that Executive Order, the following principle, among others to the extent permitted by law when regulating emerging technologies:

> "[D}ecisions should be based on the best reasonably obtainable scientific, technical, economic, and other information, within the boundaries of the authorities and mandate of each agency"

Based on the PPRA (USDA-APHIS, 2011), and the scientific data evaluated therein, APHIS concluded that 5307 Corn is unlikely to pose a plant pest risk. Accordingly, there is no basis in science for prohibiting the release of 5307 Corn.

2. Approve the petition in part

The regulations at 7 CFR 340.6(d)(3)(i) state that APHIS may "approve the petition in whole or in part." For example, a determination of nonregulated status in part may be appropriate if there is a plant pest risk associated with some, but not all lines described in a petition. Because APHIS has concluded that 5307 Corn is unlikely to pose a plant pest risk, (USDA-APHIS, 2011), there is no regulatory basis under the plant pest provisions of the Plant Protection Act for considering approval of the petition only in part.

3. Isolation Distance between 5307 Corn and Non-GE Corn Production and Geographical Restrictions

In response to public concerns of gene movement between GE and non-GE plants, APHIS considered requiring an isolation distance separating 5307 Corn from conventional or specialty corn production. However, because APHIS has concluded that 5307 Corn is unlikely to pose a plant pest risk (USDA-APHIS, 2011), an alternative based on requiring isolation distances would be inconsistent with statutory authority under the plant pest provisions of the Plant Protection Act and regulations in 7 CFR part 340.

APHIS also considered geographically restricting the production of 5307 Corn based on the location of production of non-GE corn in organic production systems or production systems for GE-sensitive markets in response to public concerns regarding possible gene movement between GE and non-GE plants. However, as presented in APHIS' PPRA for 5307 Corn, there are no geographic differences associated with any identifiable plant pest risks for 5307 Corn (USDA-APHIS, 2011). This alternative was rejected and not analyzed in detail because APHIS has concluded that 5307 Corn does not present a plant pest risk, and will not exhibit a greater plant risk in any geographically restricted area. Therefore, such an alternative would not be consistent with APHIS' statutory authority under the plant pest provisions of the Plant Protection Act and regulations in Part 340 and the biotechnology regulatory policies embodied in the Coordinated Framework.

Based on the foregoing, the imposition of isolation distances or geographic restrictions would not meet APHIS' purpose and need to respond appropriately to a petition for nonregulated status based on the requirements in 7 CFR part 340 and the agency's authority under the plant pest provisions of the Plant Protection Act. However, individuals might choose on their own to geographically isolate their non-GE production systems from 5307 Corn or to use isolation distances and other management practices to minimize gene movement between corn fields. Information to assist growers in making informed management decisions for 5307 Corn is available from the Association of Official Seed Certifying Agencies (AOSCA, 2011).

4. Requirement of Testing for 5307 Corn

During the comment periods for other petitions for nonregulated status, some commenters requested that USDA require and provide testing for GE products in non-GE production systems. APHIS notes that there are no nationally established regulations involving testing, criteria, or limits of GE material in non-GE systems. Such a requirement would be extremely difficult to implement and maintain. Additionally, because 5307 Corn does not pose a plant pest risk (USDA-APHIS, 2011), the imposition of any type of testing requirements is inconsistent with the plant pest provisions of the Plant Protection Act, the regulations at 7 CFR part 340 and biotechnology regulatory policies embodied in the Coordinated Framework. Therefore, imposing such a requirement for 5307 Corn would not meet APHIS' purpose and need to respond appropriately to the petition in accordance with its regulatory authorities.

Environmental Consequences of APHIS' Selected Action

The EA contains a full analysis of the alternatives to which we refer the reader for specific details. The following table briefly summarizes the results for each of the issues fully analyzed in the Environmental Consequences section of the EA.

Attribute/Measure	**Alternative A: No Action**	**Alternative B: Determination of Nonregulated Status**
Meets Purpose and Need and Objectives	No	Yes
Unlikely to pose a plant pest risk	Satisfied through use of regulated field trials	Satisfied—risk assessment (USDA-APHIS, 2012)
Management Practices		
Acreage and Areas of Corn Production	88% of all corn produced in US is GE. 65% have insect resistance. Corn yields are expected to continue to increase, but total acreage is likely to vary by about 2% during this decade.	Unchanged from No Action Alternative
Agronomic Practices	Crop rotation can be effective in controlling corn rootworm, although some populations have evolved to overcome this control method. Reduced or conservation tillage has largely replaced conventional tillage.	Unchanged from No Action Alternative. 5307 corn may offer an additional rootworm control option to growers
Pesticide Use	Insecticide use has declined since the introduction of insect resistant	Insecticide use may decrease more than under the no action

	corn varieties.	alternative.
Other Specialty Corn Production Systems	Specialty crop growers employ practices and standards for seed production, cultivation, and product handling and processing to ensure that their products are not pollinated by or commingled with conventional or GE crops	Unchanged from No Action Alternative
Organic Corn Production	Certified organic corn acreage is a small but increasing percentage of overall corn production.	Unchanged from No Action Alternative
Environment		
Land Use	Current trends in the acreage and areas of production are likely to continue to be driven by market conditions (i.e., increased demand for US corn and corn products for animal feed, ethanol, etc.) and federal policy	Unchanged from No Action Alternative
Water Resources	The primary cause of agricultural NPS pollution is increased sedimentation from soil erosion, which can introduce sediments, fertilizers, and pesticides to nearby lakes and streams. Agronomic practices such as conservation tillage, crop nutrient management, pest management, and conservation buffers help protect water quality from agricultural runoff	Unchanged from No Action Alternative
Soil	Agronomic practices such as crop type, tillage, and pest management can affect soil quality. Growers will adopt management practices to address their specific needs in producing corn	Unchanged from No Action Alternative
Air Quality	Agricultural activities such as burning, tilling, harvesting, spraying pesticides, and fertilizing, including the emissions from farm equipment, can directly affect air quality. Aerial application of insecticides may impact air quality from drift, diffusion, and volatilization of the chemicals, as well as motor vehicle emissions from airplanes or helicopters.	Unchanged from No Action Alternative

Climate Change	Agriculture-related activities are recognized as both direct sources of greenhouse gases (GHGs) (e.g., exhaust from motorized equipment) and indirect sources (e.g., agriculture-related soil disturbance, fertilizer production)	Unchanged from No Action Alternative
Animals and Plants		
Animals	Currently available insect resistant varieties do not impact populations of vertebrate animals or most invertebrate animals. Some varieties target Lepidopteran (European corn borer and other species) or Coleopteran (corn rootworm) pests. Non-target invertebrates are generally more abundant in *Bt* cotton and *Bt* corn fields than in non-transgenic fields managed with chemical insecticides	5307 Corn is not expected to have any effect on vertebrate animals or most invertebrate animals. 5307 Corn is toxic only to certain coleopteran insects in the family Chrysomelidae. Effects on these organisms is unchanged from the No Action Alternative
Plants	Corn fields can be bordered by other agricultural fields (including other corn varieties), woodlands, or pasture and grasslands. The most agronomically important members of a surrounding plant community are those that behave as weeds. Corn growers use production practices to manage weeds in and around fields	Unchanged from No Action Alternative
Gene Movement	Cultivated corn varieties can cross pollinate. Growers use various production practices to limit undesired cross pollination.	Unchanged from No Action Alternative
Soil Microorganisms	Soil bacterial communities are influenced by plant species and cultivars as well as other environmental factors, such as soil type and agricultural practices. *Bt* plants may change the soil microbial community when compared to plants that don't express *Bt*. No deleterious effects have been identified.	Unchanged from No Action Alternative

Biological Diversity	There is no evidence of landscape-level effects from currently available *Bt* crops. Currently available *Bt* crops may increase non-target abundance compared to broad-spectrum insecticide use	Unchanged from No Action Alternative
Human and Animal Health		
Risk to Human Health	Cry proteins of *Bt* corn products are not toxic to humans and do not have any known allergenic properties for humans 5307 Corn does not have any adverse human health effects. Limited field releases would not result in adverse health effects Agricultural workers and pesticide applicators would be exposed to a variety of US-EPA -registered pesticides such as those approved for control of corn rootworm. . The EPA's Worker Protection Standard (WPS) (US-EPA, 1992); 40 CFR Part 170.1, *Scope and Purpose*) requires employers to take actions to reduce the risk of pesticide poisonings and injuries among agricultural workers and pesticide handlers. The WPS contains requirements for pesticide safety training, notification of pesticide applications, use of personal protective equipment, restricted entry intervals following pesticide application, decontamination supplies, and emergency medical assistance.	Unchanged from No Action Alternative A comprehensive assessment of the safety of eCry3.1Ab demonstrated that the protein is nontoxic to mammals and unlikely to be a food allergen US-EPA-registered pesticides that are currently used for corn production would continue to be used by growers under the Preferred Alternative. Agricultural production with 5307 corn does not require any change to the agronomic practices or chemicals currently used (i.e., pesticides) for conventional corn. Therefore, worker safety issues associated with the agricultural production of 5307 corn would remain the same as those under the No Action Alternative.
Risk to Animal Feed	Cry proteins are not expected to be allergenic, toxic, or pathogenic in mammals or poultry. Cry proteins also have a history of safe consumption in the context of other food and feeds	A compositional analysis concluded that forage and grain from 5307 corn hybrids are considered similar in composition to forage and grain from both the non-transgenic comparator and conventional corn hybrids. Therefore this is unchanged from

		No Action Alternative
Socioeconomic		
Domestic and Economic Environment	Farm income is positively impacted by currently available *Bt* corn by reducing production costs or increasing revenues. Pest-resistant corn generally has a positive impact on farm income due to cost savings from reduced pesticide use	Under the preferred alternative, growers would have an additional tool to use against corn rootworm that may reduce economic loss from this pest.
Trade Economic Environment	The primary US corn export destinations are also the largest world importers of corn and do not have major barriers for importing food or feed commodities produced from transgenic crops, including those with insect resistance traits. Nevertheless, import of each specific trait requires separate application and approval by the importing country	To avoid adversely affecting international trade in corn commodities exported from the US (and Canada), regulatory filings for 5307 corn import approvals have been made in Japan, South Korea, Taiwan, Australia/New Zealand, South Africa, Columbia and the European Union. Applications are planned for additional countries including Mexico, China, the Philippines, Indonesia, and Russia. (Syngenta, 2011c), section I.C.3). The trade economic impacts associated with a determination of nonregulated status of 5307 corn are anticipated to be similar to the No Action alternative.
Other Regulatory Approvals	FDA completed consultations, EPA tolerance exemptions and conditional pesticide registrations granted	FDA completed consultations, EPA tolerance exemptions and conditional pesticide registrations granted
Compliance with Other Laws		
CWA, CAA, EOs	Fully compliant	Fully compliant

Finding of No Significant Impact

The analysis in the EA indicates that there will not be a significant impact, individually or cumulatively, on the quality of the human environment as a result of this proposed action. I agree with this conclusion and therefore find that an EIS need not be prepared. This NEPA determination is based on the following context and intensity factors (40 CFR 1508.27).

Context - The term "context" recognizes potentially affected resources, as well as the location and setting in which the environmental impact would occur. This action has potential to affect conventional and organic corn production systems, including surrounding environments and agricultural workers; human food and animal feed production systems; and foreign and domestic commodity markets. 5307 Corn is regulated in part by FIFRA, due to characterization of the eCry3.1Ab protein product as a pesticide by the EPA.

In 2011, corn was grown on 91.9 million acres in the United States (USDA-NASS, 2011; USDA-NASS, 2012). USA-registered insecticides are currently being used on almost all of the corn acreage in the U.S. (USDA-APHIS, 2012). Approximately 88% of corn fields were planted with transgenic corn in 2011 (USDA-NASS, 2011a). Before corn rootworm-protected *Bt* corn products were available in 2003, an estimated 14 million acres were treated annually with conventional insecticides to control rootworm (Syngenta, 2011c). A determination of nonregulated status of 5307 Corn is not expected to directly cause an increase in agricultural acreage devoted to corn production, or those corn acres devoted to GE corn cultivation. The availability of 5307 Corn will not change cultivation areas for corn production in the U.S., and there are no anticipated changes to the availability of GE and non-GE corn varieties on the market.

Intensity – Intensity is a measure of the degree or severity of an impact based upon the ten factors. The following factors were used as a basis for this decision:

1. *Impacts that may be both beneficial and adverse.*
   A determination of nonregulated status of 5307 Corn will have no significant environmental impact in relation to the availability of GE, conventional, and organic corn varieties. As discussed in Chapter 4 of the EA, a determination of nonregulated status of 5307 Corn is not expected to directly cause an increase in agricultural acreage devoted to corn production, or those corn acres devoted to GE corn cultivation. The availability of 5307 Corn will not change the cultivation areas for corn production in the U.S., and there are no anticipated changes in the availability of GE and non-GE corn varieties on the market. A determination of nonregulated status of 5307 Corn could add another GE corn variety to the conventional corn market, but is not expected to change the market demands for GE corn or corn produced using organic methods. GE and organic corn are planted on about 88% and 0.2% of corn acreage, respectively (USDA-ERS, 2010). As of 2008, the most recent year for which data are available, approximately 168,000 acres of certified organic corn were grown in the U.S. Based on the data provided by Syngenta for 5307 Corn (Syngenta, 2011), APHIS has concluded that the availability of 5307 Corn would not alter the agronomic practices, locations, and seed production and quality characteristics of conventional and GE corn seed production (USDA-APHIS, 2011). A determination of nonregulated status of 5307 Corn will not require a change to seed production practices, nor current production practices. The introduction of 5307 Corn

provides a stacked variety, expressing *Bt*-based coleopteran-resistance combined with lepidopteran resistance and glyphosate and glufosinate tolerance.

2. *The degree to which the proposed action affects public health or safety.*
   A determination of nonregulated status of 5307 Corn would have no significant impacts on human or animal health. 5307 Corn is compositionally similar to currently available corn on the market with the exception of the eCry3.1Ab protein. eCry3.1Ab has an existing exemption from the requirement of a tolerance in food and feed commodities granted by the US-EPA on June 16, 2010, and Syngenta also submitted a petition (Petition No. 1F7857) to the US-EPA to establish a nonexpiring exemption from the requirement of a tolerance for eCry3.1Ab residues in food and feed commodities. Compositional tests conducted by the petitioner indicate that 5307 Corn is compositionally similar to other commercially available corn (Syngenta, 2011 c). Syngenta initiated the consultation process with FDA for the commercial distribution of 5307 Corn and submitted a safety and nutritional assessment of food and feed derived from 5307 to the FDA in January 2011. Based on the information Syngenta submitted, and as of February 29, 2012, FDA has no further questions regarding 5307 Corn (US-FDA, 2012). Based on the FDA's consultation, laboratory data and scientific literature provided by Syngenta (Syngenta, 2011), and safety data available on other eCry3.1Ab products, APHIS has concluded that 5307 would have no significant impacts on human or animal health.

3. *Unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas.*
   There are no unique characteristics of geographic areas such as park lands, prime farm lands, wetlands, wild and scenic areas, or ecologically critical areas that would be adversely impacted by a determination of nonregulated status of 5307 Corn. The common agricultural practices that would be carried out under the proposed action will not cause major ground disturbance; do not cause any physical destruction or damage to property, wildlife habitat, or landscapes; and do not involve the sale, lease, or transfer of ownership of any property. This action is limited to a determination of nonregulated status of 5307 Corn. The product will be deployed on agricultural land currently suitable for production of corn, will replace existing varieties, and is not expected to increase the acreage of corn production. This action would not convert land to nonagricultural use and therefore would have no adverse impact on prime farm land. Standard agricultural practices for land preparation, planting, irrigation, and harvesting of plants would be used on agricultural lands planted to 5307 Corn including the use of EPA registered pesticides. Applicant's adherence to EPA label use restrictions for all pesticides will mitigate potential impacts to the human environment. In the event of a determination of

nonregulated status of 5307 Corn, the action is not likely to affect historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas that may be in close proximity to corn production sites.

4. *The degree to which the effects on the quality of the human environment are likely to be highly controversial.*
   The effects on the quality of the human environment from a determination of nonregulated status of 5307 Corn are not highly controversial. Although there is some opposition to a determination of nonregulated status of 5307 Corn, this action is not highly controversial in terms of size, nature or effect on the natural or physical environment. As discussed in Chapter 4 of the EA, a determination of nonregulated status is not expected to directly cause an increase in agricultural acreage devoted to corn production, or those acres devoted to GE corn cultivation. The availability of 5307 Corn will not change cultivation areas for corn production in the U.S., and there are no anticipated changes to the availability of GE and non-GE corn varieties on the market. A determination of nonregulated status of 5307 Corn could add another GE corn variety to the conventional corn market and is not expected to change the market demands for GE corn or corn produced using organic methods. Currently, 5307 Corn is registered by the EPA for breeding and seed increase activities. A determination of nonregulated status of 5307 Corn will not result in changes in the current practices of planting, tillage, fertilizer application/use, cultivation, pesticide application use/volunteer control. Management practices and seed standards for production of Certified corn seed would not change. The effect of 5307 Corn on wildlife or biodiversity is not different than that of other *Bt* crops currently used in agriculture, or other GE or non-GE corn produced in conventional agriculture in the U.S. During the public comment period, APHIS received comments opposing a determination of nonregulated status of 5307 Corn. No new issues, alternatives or substantive new information were identified in any of the comments received by APHIS. APHIS has addressed substantive comments in the response to public comments document attached to this FONSI based on scientific evidence found in peer-reviewed, scholarly, and scientific journals.

5. *The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.*
   Based on the analysis documented in the EA, the possible effects on the human environment are well understood. The effects of the proposed activities are not highly uncertain and do not involve unique or unknown risks on the natural or physical environment. As discussed in Chapter 4 of the EA, a determination of nonregulated status of 5307 Corn is not expected to directly cause an increase in agricultural acreage devoted to corn production, or those acres devoted to GE corn cultivation. A determination of nonregulated status of 5307 Corn will not result in changes in the

current practices of planting, tillage, fertilizer application/use, and volunteer control. Management practices and seed standards for production of Certified corn seed would not change. The effect of 5307 Corn on wildlife or biodiversity is no different than that from other *Bt* crops currently used in agriculture, or other GE or non-GE corn produced in conventional agriculture in the U.S. As described in Chapter2 of the EA, well established management practices, production controls, and production practices (GE, conventional, and organic) are currently being used in corn production systems (commercial and seed production) in the U.S. Therefore, it is reasonable to assume that farmers, who produce conventional corn (GE and non-GE varieties), 5307 Corn, or produce corn using organic methods, will continue to use these reasonable, commonly accepted best management practices for their chosen systems and varieties during agricultural corn production. Additionally, GE corn currently is planted on the majority of corn acres (88% of acreage in 2010) (USDA-NASS, 2011). Based upon historic trends, conventional production practices that use GE varieties will likely continue to dominate in terms of acreage with or without a determination of nonregulated status of 5307 Corn. Given the extensive experience that APHIS, stakeholders, and growers have in dealing with the use of GE corn products and *Bt* agricultural crops, the possible effects to the human environment from the release of an additional GE corn product are already well known and understood. Therefore, the impacts are not highly uncertain, and do not involve unique or unknown risks.

6. *The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration.*
A determination of nonregulated status for 5307 Corn would not establish a precedent for future actions with significant effects or represent a decision in principle about a future decision. Similar to past regulatory requests reviewed and approved by APHIS, a determination of nonregulated status will be based on whether an organism is unlikely to pose a plant pest risk pursuant to the regulatory requirements of 7 CFR part 340. Each petition that APHIS receives is specific to a particular GE organism and undergoes this independent review to determine if the regulated article poses a plant pest risk. Under the authority of the plant pest provisions of the Plant Protection Act and 7 CFR part 340, APHIS has issued regulations for the safe development and use of GE organisms. As required by 7 CFR 340.6, APHIS must respond to petitioners who request a determination of the regulated status of GE organisms, including GE plants such as 5307 Corn. When a petition for nonregulated status is submitted, APHIS must make a determination if the GE organism is unlikely to pose a plant pest risk. If APHIS determines, based on its Plant Pest Risk Assessment, that the genetically engineered organism is unlikely to pose a plant pest risk, the genetically engineered organism is no longer subject to the plant pest provisions of the Plant Protection Act and 7 CFR part 340. APHIS regulations at 7 CFR part 340, which were promulgated pursuant to authority

granted by the Plant Protection Act, as amended (7 United States Code(U.S.C.) 7701-7772), regulate the introduction (importation, interstate movement, or release into the environment) of certain GE organisms and products. A GE organism is no longer subject to the plant pest provisions of the Plant Protection Act or to the regulatory requirements of 7 CFR part 340 when APHIS determines that it is unlikely to pose a plant pest risk. A GE organism is considered a regulated article if the donor organism, recipient organism, vector, or vector agent used in engineering the organism belongs to one of the taxa listed in the regulation (7 CFR 340.2) and is also considered a plant pest. A GE organism is also regulated under Part 340 when APHIS has reason to believe that the GE organism may be a plant pest or APHIS does not have enough information to determine if the GE organism is unlikely to pose a plant pest risk. A person may petition the agency that a particular regulated article is unlikely to pose a plant pest risk, and, therefore, is no longer regulated under the plant pest provisions of the Plant Protection Act or the regulations at 7 CFR part 340. The petitioner is required to provide information under §340.6(c)(4) related to plant pest risk that the agency may use to determine whether the regulated article is unlikely to present a greater plant pest risk than the unmodified organism. A GE organism is no longer subject to the regulatory requirements of 7 CFR part 340 or the plant pest provisions of the Plant Protection Act when APHIS determines that it is unlikely to pose a plant pest risk.

7. *Whether the action is related to other actions with individually insignificant but cumulatively significant impacts.*
   No significant cumulative effects were identified through this assessment. The EA discussed cumulative effects on corn management practices, human and animal health, and the environment and concluded that such impacts were not significant. A cumulative effects analysis is provided in Chapter 5 of the EA. In the event APHIS reaches a determination of nonregulated status of 5307 Corn, APHIS would no longer have regulatory authority over this corn. In the event of a determination of nonregulated status of 5307 Corn, APHIS has not identified any significant impact on the environment which may result from the incremental impact of a determination of nonregulated status of 5307 Corn when added to past, present, and reasonably foreseeable future actions.

8. *The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historic resources.*
   A determination of nonregulated status of 5307 Corn will not adversely impact cultural resources on tribal properties. Any farming activities that may be taken by farmers on tribal lands are only conducted at the tribe's request; thus, the tribes have control over any potential conflict with cultural resources on tribal properties. A determination of nonregulated status of 5307 Corn would have no impact on districts, sites, highways,

structures, or objects listed in or eligible for listing in the National Register of Historic Places, nor would they likely cause any loss or destruction of significant scientific, cultural, or historic resources. This action is limited to a determination of nonregulated status of 5307 Corn. Standard agricultural practices for land preparation, planting, irrigation, and harvesting of plants would be used on these agricultural lands including the use of EPA registered pesticides. Applicant's adherence to EPA label use restrictions for all pesticides will mitigate impacts to the human environment. A determination of nonregulated status of 5307 Corn is not an undertaking that may directly or indirectly cause alteration in the character or use of historic properties protected under the National Historic Preservation Act. In general, common agricultural activities conducted under this action do not have the potential to introduce visual, atmospheric, or audible elements to areas in which they are used that could result in effects on the character or use of historic properties. For example, there is potential for audible effects on the use and enjoyment of a historic property when common agricultural practices, such as the operation of tractors and other mechanical equipment, are conducted close to such sites. A built-in mitigating factor for this issue is that virtually all of the methods involved would only have temporary effects on the audible nature of a site and can be ended at any time to restore the audible qualities of such sites to their original condition with no further adverse effects. Additionally, these cultivation practices are already being conducted throughout the corn production regions. The cultivation of 5307 Corn does not inherently change any of these agronomic practices so as to give rise to an impact under the NHPA.

9. *The degree to which the action may adversely affect the endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973.*
   As described in Chapter 4 of the EA, APHIS has analyzed the potential for effects from a determination of nonregulated status of 5307 Corn on federally listed threatened and endangered species (TES) and species proposed for listing, as well as designated critical habitat and habitat proposed for designation, as required under Section 7 of the Endangered Species Act. After reviewing possible effects of a determination of nonregulated status of 5307 Corn, APHIS has concluded that a determination of nonregulated status of 5307 Corn would have no effect on federally listed TES and species proposed for listing, or on designated critical habitat or habitat proposed for designation.

10. *Whether the action threatens a violation of Federal, State, or local law or requirements imposed for the protection of the environment.*
    The proposed action would be in compliance with all federal, state, and local laws. Because the agency has concluded that 5307 Corn is unlikely to pose a plant pest risk, a

determination of nonregulated status of 5307 Corn is a response that is consistent with the plant pest provisions of the PPA, the regulations codified in 7 CFR part 340, and the biotechnology regulatory policies in the Coordinated Framework. Syngenta initiated the consultation process with FDA for the commercial distribution of 5307 Corn and submitted a safety and nutritional assessment of food and feed derived from 5307 Corn to the FDA to on January 2011 (Syngenta, 2011). Based on the information Syngenta submitted, and as of February 29, 2012, FDA has no further questions regarding 5307 Corn (US-FDA, 2012). 5307 Corn is compositionally similar to currently available corn on the market with the exception of the eCry3.1Ab protein. eCry3.1Ab has an existing exemption from the requirement of a tolerance in food and feed commodities granted by EPA on September 16, 2011. The eCry3.1Ab protein is derived from a family of *Bt* proteins that has a history of safe use in food crops (US-EPA, 2001)(updated, 2011), is not toxic to humans, and is not likely to be an allergen (US-EPA, 2004; Syngenta, 2011). The EPA regulates PIPs under FIFRA (7 U.S.C. 136 *et seq.*) and certain biological control organisms under TSCA (15 U.S.C. 53 *et seq.*). Before planting a crop containing a PIP, a company must seek an experimental permit from EPA. Commercial production of crops containing PIPs for purposes of seed increases and sale requires a FIFRA Section 3 registration with EPA. In April 2011, Syngenta submitted applications to the US-EPA for registration of the eCry3.1Ab PIP in corn (Syngenta, 2011c) and in two breeding stacks involving specific GE corn traits that are no longer the subject to the requirements of Part 340 and the plant pest provisions of the PPA (US-EPA, 2011f). Syngenta also submitted a petition (Petition No. 1F7857) to the US-EPA to establish a nonexpiring exemption from the requirement of a tolerance for eCry3.1Ab residues in food and feed commodities. There are no other Federal, state, or local permits that are needed prior to the implementation of this action.

NEPA Decision and Rationale

I have carefully reviewed the EA prepared for this NEPA determination and the input from the public involvement process. I believe that the issues identified in the EA are best addressed by selecting Alternative 2 (Determination that 5307 Corn is No Longer a Regulated Article). This alternative meets APHIS' purpose and need to allow the safe development and use of genetically engineered organisms consistent with the plant pest provisions of the Plant Protection Act.

As stated in the CEQ regulations, "the agency's preferred alternative is the alternative which the agency believes would fulfill its statutory mission and responsibilities, giving consideration to economic, environmental, technical and other factors." The preferred alternative has been selected for implementation based on consideration of a number of environmental, regulatory, and social factors. Based upon our evaluation and analysis, Alternative 2 is selected because (1) it allows APHIS to fulfill its statutory mission to protect America's agriculture and environment

using a science-based regulatory framework that allows for the safe development and use of genetically engineered organisms; and (2) it allows APHIS to fulfill its regulatory obligations. As APHIS has not identified any plant pest risks associated with 5307 Corn, the continued regulated status of 5307 Corn would be inconsistent with the plant pest provisions of the PPA, the regulations codified at 7 CFR part 340, and the biotechnology regulatory policies in the Coordinated Framework. For the reasons stated above, I have determined that a determination of nonregulated status of 5307 Corn will not have any significant environmental effects.

Michael C. Gregoire

1/29/2013

Michael C. Gregoire

Date

Deputy Administrator

Biotechnology Regulatory Services

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US-EPA. (2004). Phosphomannose Isomerase and the Genetic Material Necessary for Its Production in All Plants; Exemption from the Requirement of a Tolerance, May14, 2004 Federal Register, 69 FR 26770, pp. 26770-26775. Retrieved 2012 from https://www.federalregister.gov/articles/2004/05/14/04-10877/phosphomannose-isomerase-and-the-genetic-material-necessary-for-its-production-in-all-plants.

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Response to Public Comments on Syngenta SYN-05307-1 Corn:

On July 13, 2012, APHIS published a notice in the Federal Register (77 FR 41366-41367, Docket no. APHIS-2012-0024) announcing the availability of the Syngenta petition, and the APHIS PPRA and draft EA for a 60-day public review and comment period. Comments were required to be received on or before September 11, 2012.

APHIS received a total of 86 comments from various individual and groups on the SYN-05307-1 corn petition (hereafter referred to as 5307 Corn), PPRA, and draft EA. The majority of the comments opposed the development of genetically engineered foods and/or 5307 Corn. Public comments included individual submissions and form letters encompassing both the peer-reviewed and non-peer-reviewed literature. Fourteen public comments supporting a determination of nonregulated status of 5307 Corn were submitted from corn grower associations, agribusiness associations, and a state Farm Bureau. Those individuals cited several salient points regarding the potential benefits of 5307 Corn, including that 5307 Corn will help manage corn rootworm resistance and provide significant economic savings to U.S. growers.

Those 41 public comments received opposing an approval of Syngenta's request for nonregulated status for 5307 Corn were submitted by individuals and a Non-Government Organization (NGO). One of the comments was a letter with 4,601 identical letters attached to it. Nineteen of the public comments contained only references, with no other information. Many of the public comments expressed a general opposition to genetically modified organisms (GMOs) or GE crops and the domestic regulatory process surrounding GE plants; perceived negative effects on public and animal health, biodiversity, and the environment; and a lack of consideration regarding organic production systems and the public right to choose non-GE containing food products. The majority of these public comments did not explain or identify elements in the 5307 Corn PPRA or EA that were perceived to be inadequate or provide any supporting evidence for their claims. Several specific issues related to the 5307 Corn EA were, however, identified from the collective pool of public comments and form letter submissions. These were organized into categories and addressed below.

Comment 1: One commenter stated that because 12 dockets for petitions were posted on the same day, that the public was not afforded enough time to review the documents.

Most of the other dockets available for review were entered into the improved process; the public had an initial opportunity to assess issues associated with the petitions, and respond. A thorough regulatory review for nonregulated status of these products is yet to be completed. There will be opportunity for the public to comment on the ensuing environmental assessments after they have been published, and if comments about significant impacts have been received, another and final EA will be prepared. Therefore, these other dockets have not necessarily received the final opportunity for public comment. An environmental assessment for this Syngenta 5307 corn and for two other products were available for the 60 day comment period, and APHIS deemed this

sufficient opportunity for the public to provide substantive comments for these three EAs. Following the comment period, the Agency thoroughly reviewed the comments and will have carefully considered other inputs as it prepared APHIS' final plant pest risk assessment, environmental assessment, and possible regulatory determination in response to the petitions for nonregulated status submitted for this and each of the products.

Comment 2: Four commenters stated that it was necessary for APHIS to conduct a full Environmental Impact Statement (EIS) in order to adequately analyze the issues.

APHIS Response: APHIS recognizes that some citizens are opposed to genetic engineering of food crops. As discussed in the EA, the basic charge of APHIS is to protect American agriculture through improvements in agricultural productivity and competitiveness, and contributions to the national economy and the public health. APHIS asserts that all methods of agricultural production (conventional, organic, or the use of genetically engineered (GE) varieties) can provide benefits to the environment, consumers, and farm income.

Since 1986, the United States government has regulated GE organisms pursuant to a regulatory framework known as the Coordinated Framework for the Regulation of Biotechnology (51 FR 23302, 57 FR 22984) (Chapter 1.6 of the EA). As described in Chapter 1.2 of the EA, APHIS regulates the introduction (importation, interstate movement, or release into the environment) of certain GE organisms and products under the authority of the plant pest provisions of the Plant Protection Act and CFR part 340 when APHIS determines that it is unlikely to pose a plant pest risk. Based on scientific information and analysis provided in both the PPRA (USDA-APHIS, 2012) and EA, APHIS has concluded that 5307 Corn does not pose a plant pest risk and will not significantly impact the quality of the human environment, respectively. Due to the lack of significant impacts as presented in the FONSI, an EIS for determination of nonregulated status of 5307 Corn is not necessary.

APHIS relied on a variety of sources to support its analysis of the potential impacts of a determination of nonregulated status of 5307 Corn, including those pertaining to health and the environment. These sources included, but are not limited to, the Syngenta petition, 10-336-01p, and peer-reviewed literature. The analyses in the EA used a variety of expert and technical resources in addition to the 10-336-01p petition. A complete list of references used to support development of the EA can be viewed in the bibliography located in Chapter 8 of the EA.

The EA took a hard look at the need for action, the issues, alternatives, and environmental consequences. APHIS also reviewed the assessment of plant pest risk for Syngenta 5307 corn and carefully considered all comments submitted by respondents to the public involvement efforts. As a result of this analysis, APHIS prepared a final EA, from which came the NEPA decision document and a finding of no significant impact (FONSI) that discussed, under each of the Council of Environmental Quality (CEQ) points of significance, why each point was not

significant, and why an EIS was not required. The agency followed CEQ NEPA regulations and Agency NEPA implementing procedure.

APHIS has determined that the analysis in its EA showed no significant impact on the quality of the human environment if APHIS was to approve a petition for nonregulated status of 5307 Corn..

Reference

USDA-APHIS. (2012). Sygenta Company petition for determination of nonregulated status of SYN-05307-1 rootworm resistant corn, draft environmental assessment.

Comment 3: One commenter stated that plant pests are developing resistance to *Bt* proteins. The commenter cited a 2009 study (Tabashnik et al, 2009a) in which laboratory-maintained and tested populations of the pink bollworm developed cross-resistance between the *Bt* proteins Cry1Ac and Cry2Ab.

APHIS response: The commenter cited a study in which pink bollworm reared and tested in laboratories developed resistance to the Cry1Ac and Cry2Ab *Bt* cotton-derived proteins (Tabashnik et al., 2009a). However, the authors specifically state that this finding does not threaten the efficacy of *Bt* crops in the field because the study was conducted in the lab under artificial conditions not likely to be found in the field. Tabashnik et al. (2009a) note that their findings of lab resistance show the ***potential*** for resistance development and do not demonstrate evidence that resistance occurs in the field with *Bt* crops. Demonstration of resistance to a toxin is dependent on an increased frequency of individual insects which are resistant to a given toxin; detecting the presence of alleles (copies of genes) which confer resistance without also showing that the frequency of individuals containing such alleles within the population are rising does not constitute evidence of field-evolved resistance (Tabashnik et al., 2009b). Despite being exposed to *Bt* toxins, targeted pests remain susceptible to the toxins (Tabasnik et al. 2009a).

An important method of slowing the development of resistance to Bt crops in the field is the use of refuges, areas of field which are planted in a non-Bt crop along with the Bt crop (Bravo et al., 2011). The refuge is intended to maintain a population of insects which are susceptible to the *Bt* toxins. Those insects which are susceptible to *Bt* toxins mate more frequently with individual insects which have the genetic ability to resist the effect of *Bt* toxins (Tabashnik et al., 2008). The refuge strategy assumes that resistant individuals are rare (fewer in number than susceptible insects) (Tabashnik, 2009b) and that these insects will more frequently mate with the susceptible insects found in the nearby refuge. If the ability to resist *Bt* toxins is genetically recessive, then the matings of resistant and the more abundant susceptible insects will produce offspring which are susceptible to *Bt* and will be killed by *Bt* crops. This will also slow the evolution of resistance to *Bt* (Tabashnik et al., 2008). Studies which have monitored resistance of plant pests demonstrate that the refuge strategy of delaying evolution of resistance to *Bt* toxins has been effective (Tabashnik et al. 2008, 2009a).

As analyzed in the EA, although some reports have proposed that resistance to other corn rootworm traits may have been detected, other factors may be responsible for recent incidences of reduced yield caused by corn rootworm in Bt-expressing crops. Also implicated are large rootworm populations exerting pressure on corn that contains only modest dosage levels of the Bt for corn rootworm protection. The Syngenta trait is meant to be stacked with multiple corn rootworm defense genes, including this one, to help deter actual resistance development. See EA sections 2.2.2 and 4.2.2 for a complete analysis.

References:

Bravo A, Likitvivatanavong S, Gill S, and Soberon M. (2011). *Bacillus thuringiensis*: a story of a successful bioinsecticide. *Insect Biochem. Molec. Biol*. *41*, 423-431.

Tabashnik B, Gassmann A. Crowder D, and Carriere Y. (2008). Insect resistance to *Bt* crops: evidence versus theory. *Nat. Biotechnol. 26*, 199-202.

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Tabashnik B, Van Rensburg J., and Carriere Y. (2009b). Field-evolved resistance to *Bt* crops: definition, theory, and data. *J. Econ. Entomol*. *102*(6), 2011-2025.

Comment 4: Several commenters were concerned about potential negative effects of *Bt* crops to nontarget organisms, including arthropods such as butterflies and honey bees, animals such as livestock and humans.

APHIS response: *Bacillus thuringiensis* is a naturally occurring soil bacterium (Lang and Otto, 2010) whose ability to form spores containing insecticidal proteins is one of its cardinal features (Sanahuja et al., 2011). One of the primary reasons for the safety of *Bt* crops as they relate to nontarget organisms such as humans, livestock, and other vertebrates is its species-specificity (Perez-Garcia et al., 2011; Hofmann et al., 2011): that is, *Bt* is only deleterious to insects, and individual Cry proteins used in *Bt* crops only kill certain types of insects (Yu et al., 2011). In particular, Cry1 and Cry2 are toxic for lepidopteran pests, Cry2A for lepidopteran and dipteran pests, and Cry3 for coleopteran pests (Yu et al., 2011). Cry toxins are distinguished and classified according to their primary amino acid sequence (amino acid sequences determine the expression of different proteins) (Bravo et al., 2011). This species specificity is also known as a narrow spectrum of activity (Bravo et al., 2011)

5307 Corn is modified with a Cry3 protein. Activity spectrum data indicate that the insecticidal effects of eCry3.1Ab are limited to certain species of the Chrysomelidae family of Coleoptera.

The eCry3.1Ab protein demonstrates no lepidopteran (insect order which includes butterflies) activity, despite containing sequences from a lepidopteran-active protein (Syngenta, 2011c), which underscores the specificity of the eCry3.1Ab protein

Specificity of the Cry proteins is related to differing receptors in the proteins which affect binding ability to the insect midgut (Then, 2010). When crops are genetically modified to contain *Bt*, feeding by susceptible insects leads to death by the means of disruption of the membranes within the midgut, an organ within the insect digestive system. This membrane disruption leads to a disproportionate influx of water into the midgut, and the insect eventually dies as a result of septicemia and possibly infection by other bacterial species (Abdullah et al., 2009; Bravo et al., 2011).

The species specificity of Bt is also why it is nontoxic to nontarget organisms, including honey bees, livestock, and humans. Duan et al. (2010) reported that exposure to coleopteran-active Cry proteins, such as that found in Cry3, did not significantly reduce lab or field survival of nontarget organisms. An analysis of 42 field experiments indicates that nontarget invertebrates are generally more abundant in *Bt* cotton and Bt maize fields than in nontransgenic field managed with insecticides (Marvier et al., 2007).

References:

Abdullah M, Moussa S, Taylor M, and Adang M. (2009). *Manduca sexta* (Lepidoptera: Sphingidae) cadherin fragments function as synergists for Cry1A and Cry1C *Bacillus thuringiensis* toxins against noctuid moths *Helicoverpa zea*, *Agrotis ipsilon*, and *Spodoptera exigua*. *Pest Manage. Sci. 65*, 1097-1103.

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(a). Three commenters raised the issue of a possible deleterious effect of *Bt* proteins on honey bee learning ability. The commenter referenced a 2008 study by Ramirez-Romero et al., which suggested that high dosages of Bt disturbed learning ability.

APHIS response: Comprehensive reviews of the effects of *Bt* on honeybees have found no detrimental effects (Duan et al., 2008; Yu et al., 2011). Duan et al. (2008) conducted a meta-analysis of data from 25 independent studies of the effects of *Bt* proteins in GE crops to control Coleoptera (beetles) and Lepidoptera (moths and butterflies) and concluded that these proteins do not negatively affect survival of larvae or honeybee adults.

Learning behavior in honeybees is important because foraging worker bees need to be able to appropriately distinguish between flowering plants which contain adequate amounts of nectar and pollen, and those flowering plants in which nectar and pollen are depleted (Seeley, 1985; Hammer and Menzel, 1995). Because the condition of nectar and pollen resources within flowering plants may change very quickly (within a matter of days), bees need to be able to learn and store information related to color and odor of these plants (Behrends and Scheiner, 2009; Srinivasan, 2010). The ability to switch quickly between rewarding and unrewarding plants is critical to foraging honeybees (Herrera, 1990).

The commenter referred to a study in which extremely high doses (5,000 ppb) of the *Bt* toxin Cry1Ab was fed in the form of syrup (a sucrose solution to which Cry1Ab had been added) to young honeybee adults (Ramirez-Romero et al., 2008). Following consumption of *Bt* syrup, the authors asserted that data obtained from a standard behavioral assay, the PER (proboscis

extension reflex) assay (Pham-Delegue et al., 1993), showed disturbances to honeybee olfactory learning behavior. Tests using lower doses (3 ppb) of *Bt*-syrup showed no effect on honeybees.

Subsequent research found results different from Ramirez-Romero et al. (2008). Han et al. (2010) utilized a novel assay consisting of a T-tube maze as well as the PER assay in order to assess learning behavioral abilities of honeybees which had been exposed to Cry proteins from *Bt* cotton pollen. They determined that there were no significant differences between performance of exposed honeybees and control honeybees, and that therefore, the tested Cry proteins did not negatively affect learning in honeybees.

Dai et a.l (2012) tested the effect of *Bt* corn toxins on honeybee performance and learning behavior by placing whole colonies in either *Bt* crop or non-*Bt* crop fields, and comparing the results. They found no significant differences between bees from *Bt* fields or non *Bt* fields in larval stages, body weight, colony performance, foraging activity or learning abilities, and concluded that *Bt* corn has no negative impacts on physiology or learning behavior in honeybees.

Dai et al. (2012) criticized the results from Ramirez-Romero et al (2008) based on a number of factors. They noted that it is often difficult to extrapolate data from tests using purified proteins for feeding, as did Ramirez-Romero et al. (2008), to real-life ecological effects seen in the field. The method of exposure to *Bt* toxins in the purified proteins route may be different from that when using whole plant tissues (such as pollen) to feed and test insects. The use of *Bt*-contaminated syrups by Ramirez-Romero et al. (2008) rather than corn pollen may also be problematical because the *Bt* in the syrup may have resulted in greater bioavailability of the *Bt* toxin and hence, overestimation of the amount of exposure (Dai et al., 2012). Dai et al. (2012) also noted that using laboratory feeding studies to draw conclusions may also be misleading because such lab studies eliminate the social interactions of the honeybee colony, and which therefore have a limited ability to predict the effect of *Bt* crops on honeybee colonies under conditions seen in agricultural fields.

Similarly, Cry3B proteins have no toxicity to bumblebees (Duan et al, 2008), and recent results have been obtained when testing the effect of *Bt* on genetically related species of bumblebees. Arpaia et al. (2012) found that a Cry3Bb1-expressing tomato line does not negatively affect feeding behavior of foraging bumblebees.

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(b). Three commenters raised the issue of potential negative effects of *Bt* proteins on the monarch butterfly, specifically citing a 1999 publication by Losey et al.

The commenter specifically referred to a laboratory study involving the exposure of monarch butterfly larvae to pollen from *Bt* corn (Losey et a., 1999). This research involved dusting milkweed plants (the host plant of monarch butterflies), with pollen from *Bt* corn. Pollen density had been set to visually match densities on milkweed leaves collected from corn leaves.

Exposed larvae ate less, grew more slowly, and suffered higher mortality than a control group of larvae. (Losey et al., 1999). Corn fields shed pollen for 8-10 days between late June and mid-August, when monarch larvae are feeding; 50% of monarch populations are concentrated around the corn belt in the U.S. Midwest (Losey et al., 1999). At the time, this work was taken as evidence that *Bt* harmed nontarget organisms.

However, later research cast doubt on the Losey et al. (1999) results. For example, Sears et al. (2001) conducted a "weight of evidence" two-year series of field trials in several states and in Canada. Their results suggested that the impact of *Bt* corn pollen on monarch populations is negligible. Sears et al. (2001) also criticized the Losey et al. (1999) report because Losey et al. did not specify the dosage of *B*t to which larvae had been exposed. Stanley-Horn et al. (2001) examined survival and growth of monarch larvae from exposure to 3 different *Bt* corn events (differing in toxin expression) in field studies. Although Stanley-Horn et al. (2001) indicated that the monarch butterfly is potentially at risk because milkweed grows in and near the edges of corn fields, their results showed only negligible effects on larvae. These results were bolstered by those of Wolt et al. (2003), who examined the effect of distance of host milkweed plants from the source of *Bt* corn. They found that pollen deposition from *Bt* corn onto milkweed plants declined exponentially with distance of plants from corn, and noted that the risk of mortality to monarch larvae is negligible on milkweed plants located >1 m from the edge of source corn fields.

Bt corn pollen did not increase mortality in a related species, the black swallowtail (Wraight et al. 2000), whose chief food plants occur in narrow strips between edges of corn fields and roads. The black swallowtail has potentially greater exposure to *Bt* corn pollen since it feeds on multiple plants near corn fields. The authors also cited other mortality causes which could contribute to lower abundance of larvae, such as predation (Wraight et al., 2000).

Prasifka et al. (2007) exposed monarch larvae to anthers (pollen-bearing organs) of *Bt* corn. Although they did find decreased feeding, body weight and movement in exposed larvae, these results are problematical since they found no evidence of actual feeding on the anthers, and did not cite any mechanisms for the effects found.

More recent review papers examining the weight of evidence of exposure of Lepidoptera to *Bt* found no negative results (Lang and Otto, 2010; Yu et al., 2011). Lang and Otto (2010) considered and reviewed only publications from peer-reviewed journals and which contained original data from lab or field studies that looked at direct toxic effects of *Bt* maize on nontarget lepidopteran larvae. They pointed out weaknesses of many previous studies, including: some laboratory experiments were often run under unrealistic conditions; *Bt* quantities were often not calculated; most studies only considered species within the superfamily Papilionoidea (to which the monarch and black swallowtail butterflies belong), even though other lepidopteran species are common in agricultural landscapes; some of the variables considered in studies were interrelated (not independent of each other); host plant quality, which could affect results, was

rarely considered; exposure period to Bt pollen was too short in some cases, less than what would be seen in field (Lang and Otto, 2010). They noted that negative effects were less frequently observed in field studies as opposed to those in the lab, which suggests that some of the positive results seen in lab studies may be artifacts of the experimental design. In another review of the effects of *Bt* crops on nontarget organisms, Yu et al. (2011) concluded that later research on toxicity of *Bt* crops to monarch larvae showed that risks were negligible because of limited exposure and toxicity of *Bt* corn pollen to monarchs.

Finally, 5307 corn expresses the eCry3.1Ab protein which demonstrates no toxicity toward lepidopteran insects, the order which includes butterflies (Syngenta, 2011c)

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(c). Among the concerns raised about effect of Bt on nontarget organisms, three commenters referred to a 2012 Institute for Science in Society web posting, which describes a 2009 report by Schmidt et al (2009). The Schmidt paper suggests that exposure to *Bt* proteins led to increased mortality in the nontarget ladybird beetle predator *Adalia bipunctata*. Commenters also called attention to a 2012 paper (Hilbeck et al.) responding to critics of the Schmidt et al (2009) publication.

APHIS response: Coccinellid (ladybird beetle) larvae are important predators of plant pests such as aphids, and can potentially be exposed to *Bt* through carnivory of the herbivores feeding on *Bt* crops (Rauschen et al., 2010). In the Schmidt (2009) study cited by the Institute for Science in Society website (Sirinathsinghji, 2012), toxicity was tested by spraying water containing the *Bt* toxins Cry1Ab and Cry3Bb on prey eggs of *Ephestia kuehniella*, the Mediterranean flour moth (Lepidoptera: Pyralidae), and offering them to *Adalia bipunctata*, the twospotted lady beetle (Coleoptera: Coccinellidae). Schmidt et al. (2009) reported that treatments using the Cry3Bb toxin (which is active on some beetles) did not produce statistically significant increases in mortality of lady beetles compared to control treatments. However, feeding lady beetles with lepidopteran-active Cry1Ab treated eggs produced statistically higher mortality than feeding beetles with control treated eggs. 5307 Corn produces the coleopteran-active Cry3Bb1 protein.

Several researchers have subsequently refuted the Cry1Ab results (Rauschen et al, 2010; Alvarez-Alfageme et al., 2011; Yu et al., 2011). The Schmidt study was weakened by poor design and methodology, which led to questions whether the observed *A. bipunctata* mortality resulted from *Bt* feeding or to some other source. Specifically, Schmidt et al. (2009) used a feeding bioassay in which *E. kuehniella* eggs were sprayed with water containing *Bt.* However, the *A. bipunctata* larvae (and other coccinellid larvae) mode of feeding involves piercing eggshells and sucking out the contents, not consuming the eggs whole, as was done in the Schmidt et al. (2009) research. Therefore, it is possible that the *A. bipunctata* larvae tested in the assay actually ingested insignificant amounts of Bt proteins. In addition, the mortality of larvae in the control group (21%) was very high, which suggests problems with the Schmidt et al. (2009) bioassay which may have contributed to only apparently increased mortality in larvae exposed to Cry1Ab (Alvarez-Alfageme et al., 2011; Yu et al., 2011). In addition, Rauschen et al.

(2010) and Alvarez-Alfageme et al. (2011) noted that the dosage of *Bt* used by Schmidt et al. (2009) was unreported, and remains unclear, so that Schmidt et al. (2009) did not define exposure, and therefore, level of risk before doing the experiment (Rauschen, 2010b). Under realistic field conditions, *A. bipunctata* larvae are exposed to low concentrations of *Bt* since their main prey item, aphids, consumes low amounts of *Bt* Cry proteins when feeding on *Bt* maize (Alvarez-Alfageme et al., 2011; Rauschen, 2010b) since *Bt*-maize does not carry Cry proteins in its phloem sap (Raps et al., 2001). Aphid predators are not likely to be exposed to *Bt* proteins from their prey under field conditions (e.g., Lundgren et al., 2005).

In order to provide more data on the effect of *Bt* crops on coccinellid (lady beetle) larvae, Alvarez-Alfageme et al. (2011) conducted another study on *A.bipunctata* larvae, but used spider mite (*Tetranychus urticae*) larvae as prey items instead of *Bt*-water sprayed eggs. The *T. urticae* larvae had previously fed on *Bt* maize. The results of this research demonstrated no negative effects of *Bt* on *A. bipunctata* larvae. Li and Romeis (2010) also showed that the protein found in Event 5307 corn, Cry3Bb1, does not harm spider mite or its ladybird beetle predator, *Stethorus punctillum*. An earlier paper (Al-Deeb and Wilde, 2003) investigated the effect of *Bt* corn expressing Cry3Bb1 toxin on foliar and ground-dwelling arthropods in Kansas over a two year period. Specifically, Al-Deeb and Wilde (2003) examined the effect of *Bt* for corn rootworm control on the coccinellids *Coleomegilla maculata* (spotted lady beetle), *Hippodamia convergens* (convergent lady beetle) and *Scymnus* spp. lady beetles, but found no significant differences between numbers of these beetles and control groups of the same beetle species exposed to non-*Bt* corn.

In a response to critics of the Schmidt et al. (2009) paper, Hilbeck et al. (2012) rejected charges that differences between the Schmidt et al. (2009) paper and others were due to differences in experimental protocol, and, in turn, criticized the arguments of the detractors (e.g., Rauschen, 2010; Alvarez-Alfageme et al., 2011) Hilbeck et al. (2012) changed protocols for a new set of observations which they stated corroborated the original results of Schmidt et al. (2009). APHIS notes that Hilbeck was also an author on the Schmidt et al (2009) paper, so is not unbiased. APHIS concludes, however, that the weight of the evidence confirms that *Bt* is not toxic to ladybird beetle (coccinellid) populations, (see e.g., Alvarez-Alfageme et al., 2008, Bhatti et al., 2005; and Ahmad et al., 2006).

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(d). Three commenters expressed concern over the impact of *Bt* on health of livestock which might browse on *Bt* fields and noted three website reports which purport to show that *Bt* is injurious to cattle and goats (Greenpeace, 2003; Ramdas, 2010; Srinigathsinghji, 2012).

APHIS response: APHIS reviewed the website reports (Greenpeace, 2003; Ramdas, 2010; Srinigathsinghji, 2012) cited by commenters. All of these reports center on anecdotal instances of possible exposure of livestock or farm animals (sheep, goats, and cattle) to *Bt* crops, and the perception that the animals later became ill and/or died as a direct result. The papers attribute, with no supporting information or data, these illnesses and mortality to *Bt* crop (cotton and maize) feeding. The authors did not propose or examine any other potential causes of morbidity and mortality. The Greenpeace report about cattle in Germany (2003) also mentioned some alleged sublethal effects such as less milk produced by cattle exposed to *Bt* maize, but presents no further information or data to suggest that their deaths and/or lowered milk production were, in fact, caused by consumption of *Bt* in feed.

There is ample evidence in the literature that *Bt* crops are safe for farm animals (e.g., Faust, 2002; Konig et al, 2004; Flachowsky et al., 2005; Shimada et al., 2008; and Hartnell, 2010). For example, Guertler et al. (2010) tested the effects of *Bt* maize on dairy cows, and found no differences in the composition of their milk compared with the milk of a control group of cows that had been fed conventional maize. Steinke et al. (2010) also fed *Bt* corn to dairy cattle, but found no consistent effects on the animals. Iphaguerre et al. (2003) fed dairy cows with silage containing *Bt*, and determined that for lactating dairy cows, the chemical composition of the feed was not altered, nor was nutritional value diminished compared with conventional corn feeds.

Walsh et al. (2011) fed GE maize to weanling pigs, and found that there were no negative effects on growth of animals or on body weight. Walsh et al. (2011) also looked at the immune response. While they found some increase in immune response, they reported that its "biological relevance is questionable," citing other physiological reasons not related to *Bt* ingestion which might account for the increased response. Buzioaneau et al. (2012) fed transgenic maize to gestating and lactating sows to determine the effect of Bt on maternal and offspring immunity. They reported that although they found Cry1Ab in sows' blood and feces approximately four months after onset of the experiment, and in blood and tissues of offspring at birth, *Bt* maize did

not represent any significant immunological challenges to the treated pigs. The effects "did not indicate inflammation or allergy and are unlikely to be of major importance." Buzioaneu et al. (2012) concluded that their findings lent further support to the safety of *Bt* maize.

Trabalza-Maranucci et al. (2008) fed *Bt*176 maize to sheep over a period of three years, and found no negative effects on animal health, nor was any Bt DNA found in the animals' tissues, blood, or ruminal bacteria. This paper emphasizes the advantages of conducting long-term experiments where possible in order to study cause and effects.

The US FDA (2012) has also examined studies of broiler chickens fed with Syngenta 5307 corn and that fed with near isogenic corn, and agrees with Syngenta's conclusion that there are no differences between Syngenta corn and commercial corn in terms of impacts on livestock. No compositional differences were detected between Syngenta 5307 corn and other similar varieties.

Similar to the regulatory control for direct human consumption of corn under the FFDCA, it is the responsibility of feed manufacturers to ensure that the products they market are safe and properly labeled. Feed derived from GE corn must comply with all applicable legal and regulatory requirements, which in turn protects human health. Syngenta completed the consultation process with FDA for Event 5307 corn on February 29, 2012, establishing the safety of Syngenta 5307 corn for food and feed use. EPA has granted an exemption from food and feed tolerance for the phosphomannose isomerase (PMI) protein on April 25, 2007 and the eCry3.1Ab protein on August 8, 2012.

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Comment 5: Four comments described concerns that *Bt* is detrimental to human health, pointing to the following references: Noble et al. (1992), Vasquez (1999a, 1999b, 2000), EPA (2000); GMWatch (2004), Espada (2004), Ho (2006), Aris and Leblanc (2011) and Mesnage et al (2012).

APHIS response: The commenter appears to have misunderstood the Vasquez publications (1999a, 1999b, 2000) as demonstrating that *Bt* has negative effects on human health. These publications described induction of immune response in mice which were immunized with a solution of buffer and Cry1Ac protein. The authors then discussed the potential for use of Cry proteins in the development of cheap and effective vaccines for animals and humans, given that it is "innocuous to vertebrates" (Vasquez et al., 1999a; Vasquez et al., 1999b;Vasquez-Padron et al., 2000). Vasquez et al. (2000) reported that the Cry1Ac protein, when fed to mice, induced an immunological reaction, including the production of antibodies. Mice were immunized with solutions of purified Cry1Ac proteins and buffer (as an antigen).and indirectly measured induction of a mucosal immune response in fresh feces from immune mice. The presence of antibodies is frequently associated with inflammation; however, innocuousness of *Bt* to vertebrates is well documented (McClintock et al., 1995).

Commenters also referred to an EPA report on *Bt* risks and benefits (2000). This report stated that it Cry1Ac proteins are "unlikely to have significant adverse ecological effects on populations of wild mammals, birds, non-arthropodan invertebrates, and aquatic species". Regarding *Bt* effects on human health, the EPA in 2000 recommended that acute and chronic exposure to *Bt* studies should be performed.

Mesnage et al. (2012) tested the effects of a combination of the *Bt* toxins Cry1Ab and Cry1Ac and glyphosate residues on biomarkers of human cell death on a human kidney cell line. They reported that although Cry1Ac caused no toxicity to cells, Cry1Ab did. Mesnage et al. (2012) argue that a combination of *Bt* and glyphosate residues from genetically modified plants may cause side effects on humans. However, this research appears to be a preliminary study on a specific cell line. Under the Coordinated Framework, FDA has the responsibility of reviewing human health issues, and setting tolerances for compounds in foods. Additionally, cell exposure in vivo to these chemicals would not resemble either qualitatively or quantitatively whole animal ingestion and so this report is not relevant.

Although the Noble et al. (1992) report was described by a commenter as demonstrating evidence that *Bt* has negative effects on human health, the opposite is true. The report describes surveys of potential human health effects on residents of a region of British Columbia, Canada

following a 1992 combined aerial and ground spray program to control Asian gypsy moth, using a product, Foray 48B, whose active ingredient is *Btk* (*Bacillus thuringiensis kurstaki*), a microbial insecticide routinely used in forest gypsy moth control. The report combined the results of medical professionals, emergency departments in hospitals, and worker exposure, and found no significant negative effects on human health. Although workers were occupationally exposed to *Btk*, generally at much higher levels than residents living near the spray zone, Noble et al. (1992) concluded that even worker health effects were negligible. Bacterial cultures of some individuals who visited hospitals for a variety of complaints sometimes tested positive for *Btk.* However, the authors made the assignment of positive cultures based on bacterial colony morphology, such as crystals and spores, but did not measure or otherwise quantitate *Btk* concentration. Similarly, no analysis of blood samples was conducted to measure *Btk* concentration in human blood samples was reported. Moreover, the authors sampled fresh fruits and vegetables from organic and conventional grocery stores, and detected levels of *Btk*, suggesting that residents were exposed to *Btk* by the consumption of these foods.

Three of the references cited by commenters as relevant were website entries (GMWatch/Traavik 2004; Espada, 2004; and Ho, 2006). All of them refer to findings of Prof. Traavik, a professor at the University of Tromso in Norway, who said he found the presence of antibodies to *Bt* (Cry1Ab) proteins in the blood of 38 people in the Philippines, who were living near a field of *Bt* maize. Ho (2006) also reported that the Filipino villagers became ill, as well as livestock, allegedly due to exposure to the *Bt* proteins. None of the website entries are referenced and substantiated with any other data. No evidence linking any alleged effects with *Bt* proteins was presented.

In the study by Aris and Leblanc (2011) on the effect of *Bt* on maternal and fetal health, the Cry1ab protein (a common insecticidal protein introduced into GE crops such as corn) was detected in 93 percent of maternal blood, 80 percent of fetal blood, and 69 percent of blood from non-pregnant women. The subjects of this study all resided in Sherbrooke, an urban area of Eastern Townships of Quebec, Canada. While Aris and Leblanc (2011) detected the Cry1ab protein in the majority of blood samples tested, the authors did not make any effort to determine the origin of the Cry1ab protein, only assuming that the source of Cry1ab must be through the consumption of GE crops, "given the widespread use of GM [GE] foods in the local daily diet (soybeans, corn, potatoes), it is conceivable that the majority of the population is exposed through their daily diet." However, the authors neglect to mention that *Bacillus thuringiensi*s, a bacterium from which Cry1ab is derived and produced, is commonly used in organic farming (either as protein sprays or spray of the *B. thuringiensis* itself) (Aroian, 2011; EPA, 2005). In previous studies, naturally-occurring *B. thuringiensis* has been detected in fresh fruits and vegetables (Frederiksen et al., 2006), milk, ice cream, and green tea samples (Zhou et al., 2008); and human nasal samples following aerial sprays to control gypsy moth populations (Valaderes de Amorim et al., 2001.)

Additionally, Aris and Leblanc (2011) made no effort to eliminate the probability of detecting false positives through the ELISA-based screening kit (DAS ELISA kit for *Bt*-Cry1ab/Ac protein, Agdia). The detection limit for the DAS ELISA kit for *Bt*-Cry1ab/1Ac protein is reported to be 1 ng/ml (Paul et al., 2008); however, Aris and Leblanc detected the Cry1qb protein at averaged levels of approximately 0.18 ng/ml in the blood serum of pregnant women, 0.12 ng/ml in the blood serum of non-pregnant women, and 0.05 ng/ml in the blood serum of human fetuses. The 1 ng/ml detection limit of the ELISA kit and the levels detected in the study is problematic, as the detection limit of a kit is generally regarded as the lowest possible level for which a user may reliably detect a compound. Unfortunately, no additional Cry1ab protein detection method was cited in the Aris and Leblanc (2011) study to corroborate and verify that these very low detection levels did not constitute false positives, as would be standard practice. With regard to the ELISA kit itself, it was not validated for its suitability to measure Cry1ab in human blood; rather, it was designed to detect Cry1ab extracted from plant tissues (Agdia, 2011; FSANZ, 2011).

APHIS also disagrees with the implication that *Bt* proteins (Cry family proteins) are inherently dangerous to human health. APHIS directs commenters to previous EAs (USDA-APHIS, 2011) that have examined the risk of human exposure to *Bt* proteins and determined that *Bt* proteins pose little risk to human health.

In summary, APHIS believes that the study of Aris and Leblanc (2011) has several shortcomings that bring its conclusions about the detection of the Cry1ab protein into doubt. These include issues surrounding the source of the Cry1ab detected, problems with the assay method used to detect the Cry1ab protein, and the implication that Cry1ab poses any significant risk to human health.

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Comment 6: One commenter stated that there is a lack of testing for human or environmental safety

APHIS response:

The Coordinated Framework, published by the Office of Science and Technology Policy (51 FR 23302, 57 FR 22984) describes the comprehensive federal regulatory policy for ensuring the safety of biotechnology research and products and explains how federal agencies will use existing Federal statutes in a manner to ensure public health and environmental safety while maintaining regulatory flexibility to avoid impeding the growth of the biotechnology industry. The U.S. Food and Drug Administration (FDA) regulates GE organisms under the authority of the Federal Food, Drug, and Cosmetic Act (FFDCA). The FDA is responsible for ensuring the safety and proper labeling of all plant-derived foods and feeds, including those that are genetically engineered. To help developers of food and feed derived from GE crops comply with their obligations under Federal food safety laws, FDA encourages them to participate in a voluntary consultation process. All food and feed derived from GE crops currently on the market in the United States have successfully completed this consultation process. The FDA policy statement concerning regulation of products derived from new plant varieties, including

those genetically engineered, was published in the *Federal Register* (FR) on May 29, 1992 (57 FR 22984-23005). Under this policy, FDA uses what is termed a consultation process to ensure that human food and animal feed safety issues or other regulatory issues (e.g., labeling) are resolved prior to commercial distribution of bioengineered food. Syngenta has provided the FDA with information on the identity, function, and characterization of the genes, including expression of the gene products. The submittal to the FDA included safety and nutritional assessment of food and feed derived from SYN-05307-1 to the FDA in January 2011 (Syngenta, 2011). Syngenta completed the consultation process with FDA for Event 5307 corn on February 29, 2012 and demonstrated that the 5307 corn was safe for food and feed.

Human health effects have not been identified from consuming the novel proteins introduced into *Bt* corn. The US-EPA requires seed registrants to submit tests of potential toxicity and allergenicity of the transgenic proteins in *Bt* corn cultivars before they can be approved for human consumption. All tests that have been performed for adverse mammalian impact from ingesting Cry proteins have been negative, even at extremely high doses (Wu, 2006). In addition, the toxicity of insecticidal *Bt* proteins depends on binding to specific receptors present in the insect midgut (e.g., Yu et al., 2011). EPA must provide a tolerance for the presence of transgenic expression of new proteins in crop products. In response to the request made by Syngenta, the EPA has granted an exemption from food and feed tolerance for the phosphomannose isomerase (PMI) protein on April 25, 2007 and the eCry3.1Ab protein on August 8, 2012.

As discussed in Section 5 of the EA, based on APHIS' review of field and laboratory data and scientific literature provided by Syngenta (Syngenta, 2011) and safety data available on other GE corn, APHIS has concluded that a determination of nonregulated status of 5307 Corn would have no significant impacts on human health.

As discussed in Section 5 of the EA, APHIS has concluded that a determination of nonregulated status of 5307 Corn would have no significant impacts on animal feed or animal health. Syngenta has submitted compositional and nutritional characteristics of 5307 Corn to APHIS (Syngenta, 2011). APHIS has reviewed Syngenta's results and has concluded that the levels of nutrients, anti-nutrients, and secondary metabolites in 5307 Corn are not statistically different from those likely to be expressed by conventional varieties.

As noted by the National Research Council (NRC), unexpected and unintended compositional changes arise with all forms of genetic modification, including both conventional hybridizing and genetic engineering (NRC, 2004). The NRC also noted at the time, no adverse health effects attributable to genetic engineering had been documented in the human population. Reviews on the nutritional quality of GE foods have generally concluded that there are no significant nutritional differences in conventional versus GE plants for food or animal feed (Faust, 2002; Flachowsky et al., 2005).

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Comment 7: One commenter asserted that Syngenta has not thus far been successful in obtaining sufficient authorizations to import 5307 corn. The commenter states that failure to obtain the authorizations in key markets within the world would create a risk of significant economic losses to U.S. grain and oilseed producers and markets.

APHIS response:

The trade economic environment would not be affected as a direct or indirect result of the deregulation of 5307 Corn. A determination of non-regulated status of 5307 Corn would provide growers with an alternative to other transgenic corn rootworm-protected varieties that are currently available. Worldwide market conditions and destination country approval of transgenic crop commodities would continue to be factors for international corn prices, without regard to the presence or absence of 5307 Corn on the market. A determination of non-regulated status of 5307 Corn would not adversely impact the trade economy and may potentially enhance it through more efficient production of corn supplies worldwide.

To avoid adversely affecting international trade in corn commodities exported from the US (and Canada), Syngenta has applied to the following countries for cultivation approval or importation of 5307 Corn: Australia (import, approved April 29, 2012), U.S. EPA (cultivation, registered July 31, 2012), U.S. FDA (cultivation, under review with public comment period completed), USDA (cultivation, under review, public comment period completed), Canada-Food (cultivation, under review), Canada-Feed (cultivation, under review), Canada-Environment (cultivation, under review), Mexico (import, under review), Japan-Environment (import, under review, public

comment period completed), Japan-Food (import, under review), Japan-Feed (import, under review), Korea-Environment (import, under review), Korea-Food (import, under review), Philippines (import, under review), Thailand (import, under review), Taiwan (import, under review), China (import, USDA deregulation is needed for submission), EU (import, under review), Russia (import, under review), and Colombia (import, under review). When international acceptance of a specific event has not been attained, US elevators and grain buyers may either refuse to purchase the grain, or may require that it be diverted to elevators that are solely designated as sources for domestic grain sale (Reuters, 2011).

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