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Issues on Adoption, Import Regulations, and Policies for Biotech Commodities in China with a Focus on Soybeans

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China is a key player in global agricultural markets. Soybeans are an important commodity for both the United States and China, whereby China is the leading global importer of soybeans and the United States is the leading global exporter. Soybeans are also ranked as the United States' number one export for bulk agricultural commodities, with China as the leading import market for US soybeans. As of 2003, 81% of soybeans planted in the United States were transgenic. Thus, changes in China's biotech policies will significantly impact soybean trade between the United States and China. An understanding of the evolution of China's biotech regulations and factors that may influence China's future biotech policies is crucial for both US producers and policymakers. This article introduces the development of China's biotech regulations in detail. Focusing on soybeans, we assess the impacts of China's biotech policy changes on US trade with China. Finally, we identify factors that may affect China's future stance on biotechnology.

Key words: Biotechnology, soybeans, China, regulations, agricultural policy, adoption, genetically modified, GM, transgenic.

Introduction

Since the introduction of biotech commodities in 1996, farmers in the United States have rapidly adopted this new technology for production, primarily for soybeans, cotton, and corn (Nelson, 2001). The United States is the largest grower of biotech crops in the world, with 101.5 million acres under cultivation in 2003 (United States Department of Agriculture [USDA] National Agricultural Statistics Service [NASS], 2003). In the United States, adoption of biotech soybeans reached 81% in 2003, 73% for biotech cotton, and 40% for biotech corn.

Globally, in 2002 about 45% of soybean acreage was planted with biotech soybeans, 11% with biotech corn, 20% with biotech cotton, and 11% with biotech rapeseed (USDA Foreign Agricultural Service [FAS], 2003a). China has become the fourth largest grower of transgenic commodities, following the United States, Argentina, and Canada. China's dominant biotech commodity is Bt cotton, with 5.2 million acres planted in 2002 (USDA FAS, 2003a). As of this writing, China has not approved the adoption of other major transgenic agricultural commodities, such as soybeans, corn, rice, or wheat.

Given food safety concerns, there is global controversy about biotech foods. Many countries (particularly developed countries that import food) have implemented regulations to restrict adoption and import of biotech food products. In the late 1990s, six European Union (EU) member nations (Austria, France, Germany, Greece, Italy, and Luxembourg) banned imports of transgenic corn and rapeseed that were approved by the European Union (USDA FAS, 2003b). In late 1998, the EU imposed a five-year de facto moratorium on approving new transgenic varieties, which effectively prohibits most US corn exports to Europe. In May 2003, the United States, Argentina, and Canada filed a World Trade Organization (WTO) dispute against the EU over its moratorium (USDA, 2003; USDA FAS, 2003b). "The first step in a WTO dispute is to request and conduct consultations during the next 60 days. WTO procedures were designed to encourage parties to resolve their differences" (USDA FAS, 2003b). However, after consultations, in August 2003 the US took the next step by requesting a dispute settlement panel to hear arguments in its WTO challenge to the EU's biotech moratorium. "Dispute settlement procedures, including appeal, typically take a total of 18 months" (USDA FAS, 2003b, 2003f).

Japan also has strict regulations for biotech food imports. In 2000, Japanese legislation was introduced to prevent imports of food products that contain transgenic varieties not yet approved in Japan (USDA FAS, 2003d). Japan's biotech testing focuses on transgenic products approved for commercialization abroad but not yet approved in Japan (e.g., StarLink corn is not approved for any use in Japan). In Japan, foods found

containing unapproved transgenic varieties must be reexported, destroyed, or diverted to nonfood use.

China, one of the world's largest producers of major agricultural commodities, produced about 30% of world rice, 32% of rapeseed, 20% of corn, 26% of cotton, 16% of wheat, and 9% of soybeans in 2002 (Food and Agricultural Organization of United Nations [FAO], 2003). China is also a large player in international grain and oilseed markets. China exported almost 13.5 million metric tons of corn and imported 14.5 million metric tons of soybeans in the 2002-2003 marketing year (USDA FAS, 2003e).

Sixteen years after submitting its application, China became an official member of the World Trade Organization on December 11, 2001 (World Trade Organization [WTO], 2001). China agreed to establish tariff rate quotas (TRQs) for a number of bulk commodities, including wheat, corn, rice, cotton, and soybean oil. Other important WTO commitments included eliminating export subsidies, reducing tariffs for many agricultural products, and capping trade-distorting domestic farm subsidies (Conklin, 2002). With China's domestic prices for major farm products significantly exceeding those prevailing in international markets at the time of its WTO entry, China faced great potential for importing key commodities under its WTO commitments, particularly in the long run.

On January 5, 2002—seven months after China's first Biosafety Administration Regulations on Agricultural Transgenic Products were issued on May 23, 2001—China launched a set of implementing regulations for its biotechnology management rules. These implementing regulations explicitly implied that China could potentially use these rules to delay, reduce, and control imports of biotech commodities into China. This article explores potential impacts of China's biotech regulations on international markets, focusing on US exports of soybeans to China.

Following this introduction, our article briefly describes the development of research, commercialization, and regulations of biotech products within China. We then depict the impact of China's 2001-2002 biotechnology regulations in general, with a specific focus on China's soybean imports. Next, we discuss factors affecting the import regulations of biotech food products, again focusing on biotech soybeans and their impact on US competitiveness. Our article closes with a summary and conclusions.

Background on China's Research, Commercialization, and Regulations of Agricultural Biotech Products

Research and Development of Agricultural Biotech Products in China

China's biotechnology development began in the mid-1980s (Huang, Rozelle, Pray, & Wang, 2002). Agrobiotechnology has been strongly supported, and more than 100 laboratories have been working to integrate biotechnology into conventional Chinese agriculture in order to improve yields and quality of crop plants (Huang, Hu, Fan, Pray, & Rozelle, 2003, this issue). By 2001, more than 130 species of transgenic organisms were obtained, with more than 100 different traits, including resistance to insects, bacteria, fungus, virus, and drought, salt tolerance, nutrition enrichment, quality improvement, and production of edible oral vaccines and recombinant pharmaceuticals (Chen & Qu, 2003).

In 2002, China's Ministry of Science and Technology (MOST) authorized the establishment of China's National Biotechnology Research Center, with an annual investment of $100 million per year for the next five years. China accounts for an estimated 10% of the world's public expenditures on agricultural research and development (Huang et al., 2002). In recent years, China's agricultural biotechnology research is estimated to account for 15% of China's total agricultural research budget—much higher than the 2-5% share typically devoted to biotechnology research in other developing countries.

Commercialization and Adoption of Transgenic Commodities in China

Since 1997, China has begun to commercialize transgenic commodities. Commercialized biotech products include Bt cotton, delayed-ripening tomatoes, cucumber mosaic virus (CMV) resistant sweet peppers, and color-altered petunias. Bt cotton is by far the dominant transgenic commodity in China. During 2001-2002, Chinese acreage planted with Bt cotton reached an estimate of more than 2 million hectares (Huang et al., 2003). The color-altered petunia is planted in Guangdong province, whereas the market for the long-shelf-life tomato is being developed in Hubei province.

As of this writing, no major transgenic grain or oilseed crop has been approved for commercialization in China, despite large research and development investments for these commodities. Global debate regarding environmental and food safety issues may have had an

impact on China's commercialization of additional transgenic commodities, particularly those used for food. The decision on whether to commercialize biotech grain and oilseeds will impact China's future food production, as China strives to attain food self-sufficiency. These goals will also have a large impact on global markets—including the United States.

Development of Regulations and the Regulatory System for Biotech Products in China

On December 24, 1993, China issued its first general regulations on biosafety, entitled the Biosafety Administration Regulations on Genetic Engineering, by the Chinese State Science and Technology Commission (SSTC, 1993; Huang & Wang, 2003, this issue; also see Table 1; the SSTC was renamed the Ministry of Science and Technology [MOST] in March 1998). On July 10, 1996, the Biosafety Administration Implementation Regulations on Agricultural Genetic Engineering was issued and took effect, implemented by the Chinese Ministry of Agriculture (Ministry of Agriculture [MOA], 1996). Since 1997, biosafety evaluation applications have been processed twice per year by the Office of Genetic Engineering Safety Administration (OGESA), which was established in 1996 by the Chinese Ministry of Agriculture (Chen & Qu, 2003). The OGESA regulates field tests, environmental releases, and commercialization of transgenic organisms within China.

Impact of China's 2001-2002 Biotechnology Regulations on Imports

Recent Rules Related to China's Imports of Transgenic Products

Prior to China's accession into the World Trade Organization, the Chinese government passed its Biosafety Administration Regulations on Agricultural Transgenic Products, which were issued and took effect on May 23, 2001 (MOA, 2001a). These regulations provided general guidelines for transgenic agricultural products. China became a member of the WTO on December 11, 2001.

On January 5, 2002, the Chinese MOA issued implementing regulations for transgenic products—specific regulations as a follow-up to the prior Biosafety Administration Regulations on Agricultural Transgenic Products. These implementing regulations consisted of three separate implementing documents: (a) Biosafety Evaluation and Administration Regulations on Agricultural Transgenic Products; (b) Import Safety Administration Regulations on Agricultural Transgenic Products; and (c) Labeling Administration Regulations on Agricultural Transgenic Products (MOA, 2001b, 2001c, 2001d). These new regulations placed restrictions on Chinese imports of transgenic products, including those imported from the United States (e.g., biotech soybeans). March 20, 2002 was set as the effective date for implementing these regulations. However, as discussed in the next section, temporary import regulations were put in place and twice extended before these implementing regulations actually took effect.

Specific rules included in these implementing regulations specified that:

1. The Chinese Ministry of Agriculture's approval process can take up to 270 days to grant safety certificates that are needed for importing transgenic products through China's customs inspections.
2. Each shipment of biotech products imported into China needs a single or separate safety certificate accompanying each shipment.
3. Transgenic products imported into China require test results or data obtained from in-country field experiments within the exporting country (or a third country) to prove that products are safe for human consumption and do not impose biosafety risks to other plants, animals, or the environment.
4. There is a zero threshold level (based on qualitative test results) for transgenic content in foods. Food products that contain transgenic content must be labeled.
5. The newly announced labeling regulations are applied to the following imported transgenic products: soybean seeds, soybeans, soybean flour, soybean meal, soybean oil, corn seeds, corn, corn oil, corn meal, rapeseed seeds, rapeseeds, rapeseed oil, rapeseed meal, cotton seeds, tomato seeds, fresh tomatoes, and tomato ketchup (tomato jam).

Delays in Implementation

At the beginning of February 2002, the US government sent delegations to China seeking clarification of China's new transgenic implementing regulations released on January 5, 2002. The US delegation expressed concern, particularly regarding the lack of time to acquire data and application materials necessary to obtain Chinese safety import certificates prior to the deadline (March 20, 2002—the effective date for implementation). Following rounds of negotiation in China, US Agriculture Secretary Ann Veneman and US Trade

Table 1. History of China's biotechnology regulations.

December 24, 1993	**Biosafety Administration Regulations on Genetic Engineering** was issued by the State Science and Technology Commission and took effect on the same date, December 24, 1993.
July 10, 1996	**Biosafety Administration Implementation Regulations on Agricultural Genetic Engineering** was issued by the Ministry of Agriculture (MOA) of China, and took effect on the same date, July 10, 1996.
May 23, 2001	**Biosafety Administration Regulations on Agricultural Transgenic Products** were passed by the State Council of China on May 9, 2001, and issued and took effect on May 23, 2001.
December 11, 2001	China Entered the World Trade Organization (WTO).
Issue Date: January 5, 2002 Effective Date: March 20, 2002	(a) **Biosafety Evaluation and Administration Regulations on Agricultural Transgenic Products**, (b) **Import Safety Administration Regulations on Agricultural Transgenic Products**, and (c) **Labeling Administration Regulations on Agricultural Transgenic Products** were passed by the Chinese Ministry of Agriculture on July 11, 2001 and issued on January 5, 2002 with an effective date for implementation set for March 20, 2002.
Termination Date: December 20, 2002	**Temporary Administration Procedure of Import of Agricultural Transgenic Products** was issued on March 10, 2002 and scheduled to terminate on December 20, 2002.
Termination Date: September 20, 2003	On October 11, 2002, the Chinese Ministry of Agriculture announced that the above temporary import regulations would be extended to September 20, 2003.
Termination Date: April 20, 2004	On July 17, 2003, the Chinese Ministry of Agriculture announced that the above temporary import regulations would be further extended to April 20, 2004.

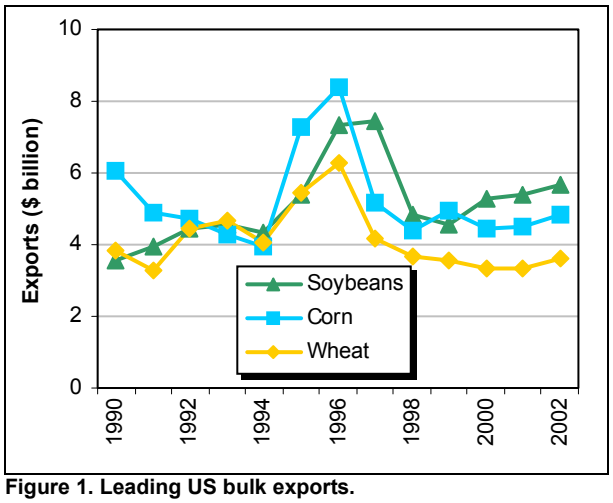

Figure 1. Leading US bulk exports.
Note. From Foreign Agricultural Trade of the US [database], USDA FAS, 2003.

Representative Robert Zoellick announced in early March that the US and China had reached an agreement (USDA, 2002). This agreement indicated that China would temporarily allow imports of agricultural transgenic products that had completed the safety review process within an exporting country (e.g., the United States). On March 10, 2002, immediately before the effective date set by the implementing regulations, China's Ministry of Agriculture issued a temporary measure permitting all exporting traders to ship transgenic soybeans into China using temporary import certificates through December 20, 2002, according to the Temporary Administration Procedure of Import of Agricultural Transgenic Products (MOA, 2002; see also Table 1). Each temporary import certificate granted by the Chinese Ministry of Agriculture was good for 10 shipments.

Before the termination date of these temporary import regulations (December 20, 2002), the Chinese Ministry of Agriculture announced an extension to September 20, 2003 (see Table 1). On July 17, 2003, the Chinese MOA announced that the temporary import regulations would be further extended to April 20, 2004 (MOA, 2003). However, after September 2002, each tentative import certificate issued by the Chinese government is good for only one shipment of biotech soybeans, in contrast to the 10 shipments approved earlier.

Why Soybeans?

From a global perspective, the US is the leading exporter of soybeans (USDA FAS, 2003e). Since 2000, soybeans have been the leading US agricultural export for bulk commodities, exceeding corn and wheat (Figure 1). From an import perspective, China is the leading global importer of soybeans (USDA FAS, 2003e). Bulk soybean exports to China are used for both food and feed. Bulk soybeans are crushed to extract soybean oil—one of China's primary cooking oils. Soybean oil consumption has increased dramatically in China (particularly in urban areas) as incomes rise. Soybean meal is used for animal feed (e.g., hogs and poultry). Since 1999, China reimposed a 13% value-added tax (VAT) on all imported soybean meal concurrent with building modern soybean crushing plants near port cites (Tuan,

Fang, & Cao, in press). Daily crushing capacities for soybeans in China are projected to reach nearly 57 million metric tons by the end of 2003. Because of these actions, China's imports of soybeans far exceed its imports of soybean meal and oil. Income growth and urbanization are expected to continue driving up China's demand for soybean oil and livestock feed products (especially poultry feed) and thus considerably more soybean imports are expected in the future.

The United States is the Number One Soybean Producer and Exporter

The United States is both the number one producer and exporter of soybeans, accounting for 41% of global production and 43% of global exports in 2002 (USDA FAS, 2003c). The export market is a very important outlet for US soybeans, comprising 37% of US soybean production. In 2002, US soybean exports totalled $5.7 billion, or about 11% of total US bulk agricultural exports. Moreover, in January through April of 2003, US soybean exports were 46% greater than in the same period in 2002. Thus, soybeans are an important commodity for the US, and soybean exports have continued to grow.

China—An Important US Export Market

From a global perspective, China is a key player in the world marketplace and a major US export market. Given China's population of nearly 1.3 billion people and an average gross domestic product (GDP) annual growth rate of 7-8%, the Chinese market is important to the future prosperity of US producers and processors (Tuan, Fang, & Cao, in press). China has been one of the top six export market destinations for US agricultural exports since the 1990s (USDA FAS, 2003c).

China is the leading soybean-importing country in the world. Soybeans are also China's number one bulk agricultural import since the late 1990s, as shown in Figure 2. In addition, when comparing commodities that the US exports to China, soybeans rank first among US exports of bulk commodities (USDA FAS, 2003c).

United States soybean exports to China have dramatically expanded from virtually nil in the early 1990s to nearly 5 million metric tons in 2002 (Figure 3), totaling nearly $1 billion. Additionally, US soybean exports to China comprise over 40% of China's total soybean imports (USDA FAS, 2003c). Because 81% of US soybeans planted in 2003 were transgenic (USDA NASS, 2003), this implies that a significant proportion of China's soybean imports from the US are also transgenic. Thus, a key issue in light of China's new import regulations is whether China will continue to import US soybeans and at what volume, given China's agrobiotechnology investments in its own transgenic commodities and the potential for changing Chinese consumer preferences.

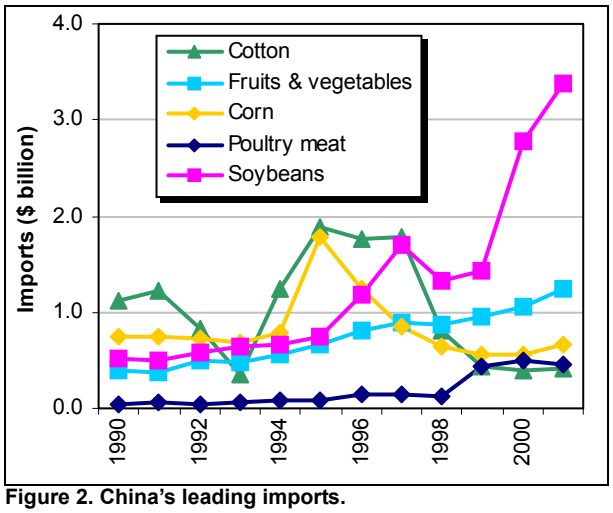

Figure 2. China's leading imports.

Note. From FAOSTAT Agriculture Data [database], Food and Agriculture Organization of the United Nations, 2003.

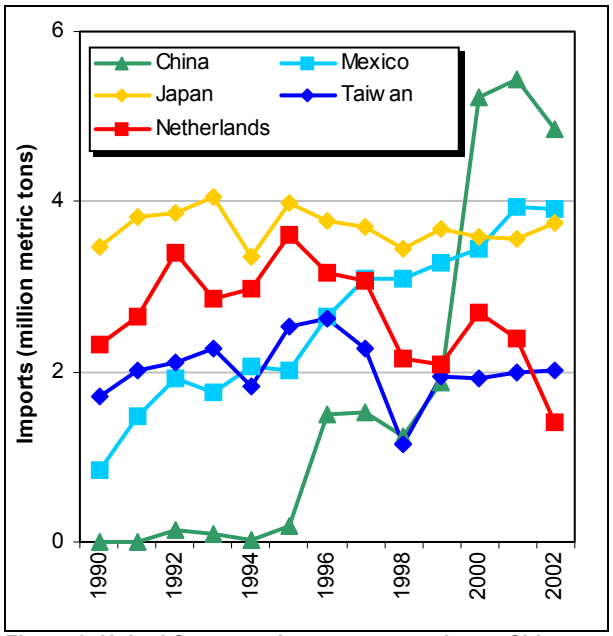

Figure 3. United States soybean export markets—China now top importer.

Note. From Foreign Agricultural Trade of the US [database], USDA FAS, 2003.

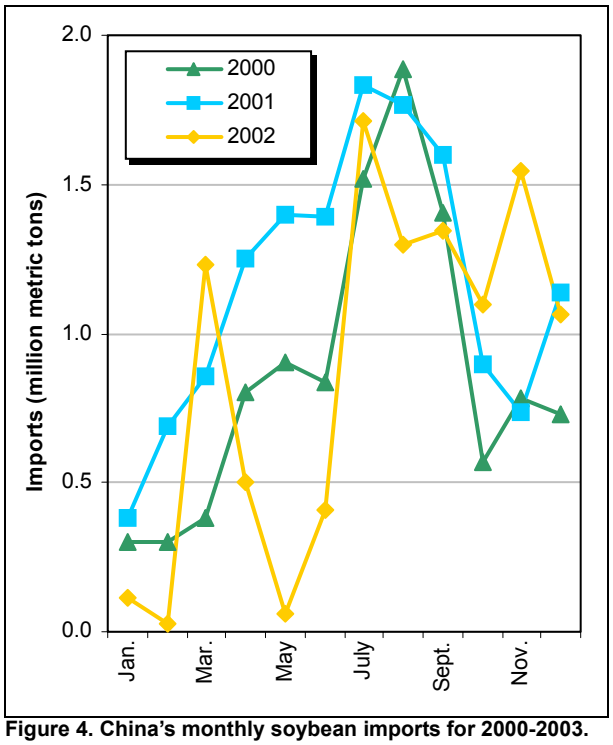

Figure 4. China's monthly soybean imports for 2000-2003.
Note. From China Custom Statistics, 2000-2002.

Impact of China's Biotech Regulations on Soybean Imports

Soybean trade between the US and China is extremely important for both countries. However, soybean trade between these countries is also very sensitive to changes in China's import policies. Any significant shift in China's import policies could have extremely large impacts on US markets and on US competitiveness. As China's biotechnology policies evolved in 2002, soybean shipments into China were affected. Specifically, during April, May, and June of 2002, soybean imports into China were either on hold or dramatically reduced following the promulgation of China's biotechnology implementing regulations (Figure 4).

Since July 2002, soybean shipments to China have resumed a normal pace. Although some concerns have been temporarily resolved by China's Ministry of Agriculture (which allowed traders to use temporary import certificates), there are concerns that similar impediments or uncertainties could potentially affect future biotech product trade and thus impact US competitiveness in China's soybean markets.

Factors Affecting China's Import Regulations on Biotech Food Products

Many factors play a role in shaping China's regulations on imports of transgenic food products, especially for soybeans. These factors include food safety considerations, protection of China's domestic producers, consumers, and crusher's demand for soybeans, WTO commitments, and political factors.

Health concerns are a major determinant affecting decisions on (a) adoption of production technologies that use biotechnology and (b) regulations of imports of transgenic food products. However, apart from the adoption decision, implementation of import regulations may be used as an effective tool to protect China's domestic producers. Chinese farmers are not allowed to plant biotech soybeans. However, about half of the soybeans crushed in China are biotech soybeans imported from the international market—the majority coming from the United States. Although China has repeatedly claimed that implementing its biotechnology management rules (including food safety labeling) were aimed at protecting Chinese consumers, and were not used as a technical trade barrier, some contend that the regulations explicitly imply that China could easily use these rules to affect imports of biotech farm products (e.g., biotech soybeans).

In contrast, China's strong and rapidly growing domestic demand for imported soybeans is a major factor that has led to the failure to implement its 2001-2002 import regulations (e.g., labeling is not currently enforced within China). With large crushing facilities being built along coastal provinces (particularly in southern China), and increasing domestic Chinese demand for soy oil, any suspension or delay of soybean imports into China may cause a large shortage of soybeans and increase Chinese soybean prices, which would eventually hurt Chinese crushers and consumers.

Summary and Conclusions

China is one of the world's largest producers of major agricultural commodities and has been a critical player in the international food market. In addition, China is the leading importer of soybeans—globally and from the United States. The significance of soybean trade between the US and China and the announcement of China's recent biotech regulations attracted attention from both sides, because 81% of US soybean production is transgenic.

China's biotechnology development began in the mid-1980s; China has become one of a few large coun-

tries involved in biotech research. China's general Biosafety Administration Regulations on Agricultural Transgenic Products, issued on May 23, 2001, and subsequent specific implementing regulations issued on January 5, 2002, could potentially disrupt imports of biotech products into China, particularly biotech soybeans—the United States' number one agricultural export commodity to China. After negotiations between the US and China, the Chinese Ministry of Agriculture agreed to temporary import regulations issued on March 10, 2002, with a termination date of December 20, 2002. Since then, two additional extensions of the termination date have occurred for these temporary import regulations (the most recent being April 20, 2004). Although some concerns have been temporarily addressed by the Chinese government (e.g., using temporary "safety certificates" for transgenic imports), soybean import levels in April, May, and June 2002 were affected by changes in China's biotech policies. Concerns continue to exist that similar impediments or uncertainties could potentially affect future biotech product trade between the US and China.

Regarding China's future biotech policies, several important factors will impact implementation of China's biotech regulations. Food safety and protection of China's domestic farmers are major issues in determining China's strict import regulations of biotech food crops. However, a rapid increase in Chinese demand for soybeans and soybean products, as well as crushers' and consumers' gains, WTO commitments, and political pressure by foreign governments and traders, are expected to make it difficult for China to restrict imports of biotech crops in the long run.

Finally, it is worth noting that future decisions on China's adoption and imports of biotech food products will likely be greatly affected by international debates on biotech product issues. Future outcomes of a recent WTO case filed by the United States and cooperating countries against the EU's Moratorium on Biotech Foods and Crops will surely have a significant impact on China's future implementation of its biotech regulations.

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