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# Domestic and Trade Implications of Leafy Green Marketing Agreement Type Policies and the Food Safety Modernization Act for the Southern Produce Industry

**Mechel S. Paggi, Fumiko Yamazaki, Luis Ribera, Marco Palma, and Ron Knutson**

Protecting the safety of the U.S. food supply is a shared responsibility. Accomplishing that task requires the efforts of multiple government agencies combined with private sector participation. Despite the best efforts of the public–private partnership, the presence of microbial contamination incidents continues to raise questions regarding the safety of the U.S. food supply. As a result, there have been increased efforts to take measures to enhance food safety by the government and industry groups. The passage of the Food Safety Modernization Act establishes an increasing role for government in establishing and enforcing food safety standards. This new initiative is designed to address food from domestic and foreign origins. These U.S. government initiatives combined with the labyrinth of food safety standards promoted by international organizations, foreign governments, private-sector retail food sales, food processors, and producers have a common foundation. All of these standards generally apply to four basic biohazards areas: soil, water, animals, and people. However, they all have an effect on the costs that producers and other members of the industry face as they attempt to implement and/or document the multitude of activities required for compliance. This article provides an overview of the evolution of food safety standards related to the fresh produce industry. An example of their potential consequences on the profitability of southern region vegetable producers is provided and the potential impact on import suppliers is discussed.

*Key Words:* economic impact, food policy, food safety, fresh produce

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Standards related to the safety of fresh produce from biological and pesticide contamination are evolving (Caswell, 1988; Palmer et al., 2000; Josling and Orden, 2004; Knutson and Josling, 2009; Ribera and Knutson, 2011). Compliance with food safety standards impacts input costs through specified changes in the input mix and implementing the procedures required for production, harvesting, handling, and processing along with possible third-party audit verification procedures (Hardesty and Kusunose, 2009). As the supply chain for food

in most countries expands around the world, the establishment of a standard that signifies a product has been produced and handled in accordance with a specific expectation related to safety from production to point of final sale remains a goal (Global Food Safety Initiative, 2011). Currently, food safety and protection standards are being promoted by a wide mix of international organizations, national governments, private-sector retail food sales, and producer groups. In each case, they may have a common foundation, with overlapping elements, but at the present time, no one system is recognized across the entire industry.

This article provides a description of the state of U.S. food safety regulations. The food safety regulatory complex is vast in regard to its product coverage. The focus of this article is the fresh produce sector, a part of the food supply that has been responsible for several foodborne illness outbreaks from both domestic and foreign suppliers (U.S. Centers for Disease Control and Prevention [CDC], 2012a). Despite numerous well-established protocols to minimize their possible occurrence, foodborne illnesses associated with the consumption of fresh produce persist (University of California Cooperative Extension, 2012). The article provides: an overview of the government and private-sector actors involved in the establishment of food safety standards; an outline of new producer initiatives for self-regulation; retail industry programs; the newly enacted U.S. Food Safety Modernization Act (FSMA); the evolving U.S. fruit and vegetable imports standards; the costs associated with implementing food safety-related standards by farm size; and a specific example of the implications for the profitability of Leafy Green Marketing Agreement-type standards for a selected southern vegetable production enterprise.

### **Differing Standards: Government and the Private Sector**

Producers in the South and throughout the United States, like those in other countries, face a multiple set of standards designed to improve food safety. A snapshot of many of those various standards presented during a 2010 meeting

of the United Fresh Produce Association working group to examine possible pathways to harmonization of Good Agricultural Practices (GAPs) is provided in Table 1 (DeCosta, 2010). Among the details of the various standards the working group discussed are five principal areas in which the models differ: food safety plans or risk assessments; traceability and recall programs; audits; corrective actions; and worker education. Efforts to resolve these differences continue while producers are left to follow the guidelines for their specific crops where they exist, more general good agricultural practices defined by government agencies, and/or those measures consistent with their buyer's requirements.

In the meantime, although growers and handlers follow recognized standards and secure verification of their procedures from third-party certification agencies, it does not ensure the absence of potential food safety problems. For example, AIB International, a third-party auditor, gave the Peanut Corp. of America superior ratings before a 2008 foodborne outbreak linked to their processing operations in Blakely, Georgia, that sickened 683 people in 46 states (U.S. CDC, 2009). More recently, a subcontractor working for Primus Labs provided a 96% grade, a superior rating to the family-owned cantaloupe operation, Jensen Farms, in Granada, Colorado, the source of the most deadly foodborne illness in the United States in over 100 years, in September 2011 (U.S. Food and Drug Administration [FDA], 2011). The outbreak resulted in at least 146 persons infected across 28 states and up to 36 reported deaths (U.S. CDC, 2011).

One of the difficulties facing attempts to develop a harmonized standard is the relative level of enforcement associated with any of the existing programs. Before the passage of FSMA in January 2011, little authority to enforce adherence to recognized standards existed. For example, the U.S. FDA issued only guidelines to minimize microbial food safety hazards (U.S. FDA, 2009). The cultural and handling practices called for were voluntary in nature. This guidance was developed only after the Department of Health and Human Services (HHS), the U.S. Department of Agriculture (USDA), and the

**Table 1.** Selected Food Safety Related Standards for U.S. Fresh Fruit and Vegetables Food Safety Agency or Organizations

SQF 1000 (Safe Quality Food; Food Marketing Institute)	Commodity-Specific Food Safety Guidelines for Water Melons
Global GAP—Fruits and Vegetables	Primus GAPs V 704
U.S. Department of Agriculture GAP	California Strawberry Industry Food Safety Program
SENASICA GAP (Mexico’s National HealthService, Food Safety and Quality)	U.S. Department of Agriculture National Organic Standard (Food Safety)
Georgia GAPs	Canada GAP—Combined Vegetables
The Georgia Fruit and Vegetable Growers Association, LaGrange, Georgia	
Mushroom Good Agricultural Practices Program, American Mushroom Institute	AFDO Model Code for Produce Safety (Association of Food and Drug Officials, York, Pennsylvania)
AIB GAP (AIB International, North American Wholesale and Retail Baking Industries)	California Fresh Tomato Supply Chain Food Safety Guidelines
SCS GAP (Scientific Certification Systems, Emeryville, California)	Steritech GAP/GHP (The Steritech Group, Brand Protection Services, North America)
Silliker GAP (Silliker Food Safety & Quality Solutions, Homewood, Illinois)	California Leafy Green Marketing Agreement

Source: United Fresh Produce Association, 2010.

Environmental Protection Agency (EPA) sent to the president a report that identified produce as an area of concern (U.S. EPA, 1997). On October 2, 1997, President Clinton announced a plan entitled “Initiative to Ensure the Safety of Imported and Domestic Fruits and Vegetables” (produce safety initiative) to provide further assurance that fruits and vegetables consumed by Americans, whether grown domestically or imported from other countries, meet the highest health and safety standards (Office of the President, 1997). The initiative directed the secretary of the HHS, in partnership with the secretary of USDA and in close cooperation with the agricultural community, to issue guidance on GAPs and good manufacturing practices (GMPs) for fruits and vegetables. Because it was guidance, and not a regulation, it did not have the force of law.

At present, U.S. food safety standards for fresh fruit and vegetables, their details, application, and acceptance are evidenced largely in the actions of three groups: producer commodity-specific organizations and general farm organizations with specific commodity orientation, retail food firms, and a number of U.S. government agencies. As funding becomes available and rules promulgated, the

FSMA will provide additional regulatory authority to the powers of the FDA. In each case, these U.S. food safety initiatives have been developed in parallel with those in other countries and actions by international organizations.

*Producer Commodity Organizations*

Despite the existence of the guidelines and increased awareness of the role of GAPs in the safety of the food supply, outbreaks of food-borne illness continued to occur. One such event was the catalyst behind an increased effort to develop industry-based standards to help improve food safety. In 2006, a multistate *Escherichia coli* outbreak associated with the consumption of bagged spinach resulted in 227 people becoming ill, 104 had to be hospitalized, 31 had developed serious complications from hemolytic-uremic syndrome, and three died (U.S. FDA, 2006). After the outbreak, the California Leafy Green Marketing Agreement (LGMA) was established (CLGMA, 2012a). In addition to specifying GAPs, the LGMA sets standards for water quality, control of runoff from animal production operations, and third-party audits to determine that the specified

standards are met with penalties for violation. LGMA became the prototype for other state initiatives and for the FDA federal produce GAP guidelines (Paggi, 2008). LGMA standards and procedures will be the starting point for the FDA rule-making in developing the mandated FDA FSMA produce Hazard Analysis and Critical Control Point (HACCP) GAP standards for production and handling (CLGMA, 2012b).

Most recently another producer group, the California Cantaloupe Board, moved forward with a mandatory food safety program. This action came after the third deadliest U.S. foodborne illness outbreak in which roughly 36 Americans died of listeria-infected cantaloupe (U.S. CDC, 2012b). Despite the severity of the outbreak, the government response was limited to the FDA's reporting that "findings regarding this particular outbreak highlight the importance for firms to employ good agricultural and management practices in their packing facilities as well as in growing fields. FDA recommends that firms employ good agricultural and management practices recommended for the growing, harvesting, washing, sorting, packing, storage, and transporting of fruits and vegetables sold to consumers in an unprocessed or minimally processed raw form" (U.S. CDC, 2011). The FDA issued a warning letter to the guilty supplier and, at this writing, considers the case an open investigation.

After a unanimous vote of its members statewide, the California Cantaloupe Advisory Board adopted commodity-specific food safety guidance. Much of the work in developing melon-specific guidelines had been done in 2009 with the issuance of FDA draft non-binding recommendations to minimize microbial food safety hazards of melons (U.S. HHS, 2009). The Advisory Board worked over several months with western growers, University of California, Davis scientists, and food safety scientists at Intertox (an independent risk management firm) to update the existing FDA-approved food safety guidance for melons to fit growing and packing conditions specific to California. The Advisory Board is following similar actions taken by the LGMA and the California Tomato Farmers by using California Department of Food and Agricultural auditors

who are trained and certified by the USDA. Metrics and audits must be approved and accepted by these government bodies before official certification under the new cantaloupe program can be made available to handlers and growers. In the interim, handlers are using private inspectors to meet buyer food safety requirements including those who demand Global Food Safety Initiative (GFSI) certification.

The actions of these two California commodity organizations are similar to other groups such as the strawberry and tomato producers. In the absence of one universally acceptable set of standards, growers' initiatives can be expected to continue to proliferate as they respond to concerns about consumer confidence and the very real threats from food outbreaks. The existence of such attempts at self-regulation has complicated the landscape for producers, most of whom produce a wide variety of products.

#### *Private-Sector Food Safety Standards*

Many buyers of fruits and vegetables play an important role in food safety efforts by limiting their purchases to preferred suppliers who hold approved certification of their operation's level of safety (Henson and Humphrey, 2008). Private standards have been developed by various individual firms, by a coalition of firms, and by nongovernmental organizations (Table 2). The emphasis on private-sector standards can be linked to four primary areas of concern. Henson and Humphrey (2008) suggest firms are primarily responding to risks in food production, transport, and processing; heightened consumer and businesses interest in food safety as a competitive strategy; the need for increased coordination and control across the value chain; and the slowness of governments to adopt new regulatory initiatives to address food safety concerns in an increasingly global supply chain.

The most recent evolution in the area of private sector standards is the Global Food Safety Initiative (GFSI, 2011). The GFSI is a nonprofit foundation created under Belgian Law in 2000. Currently GFSI benchmarks existing food standards against food safety criteria and facilitates the exchange information throughout the supply chain. Within the current framework,

**Table 2.** Organizational Forms of Private Food Safety Standards

Category of Standard	Organizational Form	Example
Individual Firm Standards	Private Food Firms	Nature's Choice (Tesco) Filiere Qualite (Carrefour) Field-to-Fork (Marks & Spencer)
Individual Firm Standards	Private Standards Firms	ProSafe Certified SCS Clean Food Standard Primus Labs GAP Certification EFSI Standards for Companies Supplying Food Products AIB Consolidated Standards
National of International Collective Standards	Industry Organizations	BRC Global Standard for Food Safety International Food Standard SQF1000/2000
National of International Collective Standards	Private Standards Coalitions	Global GAP Dutch HACCP Code Assured Food Standards

eight major retailers agreed to common acceptance of GFSI benchmark schemes. The common acceptance of any of the four benchmark schemes allows for a reduction in the duplication of food safety audits and hence reduced cost with the goal of improved efficiency. The GFSI base lies in Codex General Principles of Food Hygiene Code of Practice. The food safety groups that have been benchmarked within the GFSI include, but may not be limited to, BRC Global Standard for Food Safety (5<sup>th</sup> Edition), CanadaGAP (Canadian Horticultural Council On-Farm Food Safety Program), FSSC 22000 Food Products, GLOBALG.A.P, PrimusGFS, and Safe Quality Food.

Evidence of the importance and perhaps dominance in the private-sector standard's potential impact on the marketplace for agricultural products is the early adoption of the standards by food retail-sector leaders. For example, in 2008 Wal-Mart Stores, Inc., became the first nationwide U.S. grocery chain to require its suppliers of food products to have their factories certified in accordance with one of the GFSI standards. Wal-Mart Stores, Inc., the top food retailer in the world, along with other major food retailers in other countries such as Tesco, Ahold, Carrefour, and Migros, leads the way in moving toward a more globally harmonized system based on private-sector initiative.

### U.S. Government Food Safety Initiatives

From a current perspective, notwithstanding the enactment of the FSMA, the responsibility

for food safety in 2011 rests with five primary agencies (Rawson and Vogt, 1998).

- The USDA's Food Safety and Inspection Service (FSIS), is responsible for administering the Federal Meat Inspection Act, the Poultry Products Inspection Act, the Egg Products Inspection Act, and the Humane Methods of Slaughter Act. In addition, FSIS is responsible for seeing that approximately 30 state meat and poultry inspection operations are operating with standards that are at least equivalent to the federal standards.
- The FDA is responsible for ensuring that domestic and imported foods, except for meats and poultry, are safe, sanitary, nutritious, wholesome, and honestly labeled. Since 1938, these responsibilities have been carried out under the statutory rubric of prohibitions of adulteration and misbranding, which itself spoke for the need for updating food safety regulation (Johnson, 2012). Legal questions regarding its authority have led the FDA to limit its regulation of potentially hazardous on-farm activities to issuing GAP guidelines (Burrows, 2008). In cooperation with its state public health counterparts, the FDA has statutory authority for ensuring sanitary operations of over 250,000 licensed domestic food operations and 165,000 international establishments.
- DOC's National Marine Fisheries Service maintains a cooperative inspection agreement with the FDA, the primary agency responsible for ensuring the safety, wholesomeness, and labeling of domestic and imported seafood products. The FDA maintains responsibility for inspecting seafood import facilities.

- The EPA has responsibility for ensuring that chemicals used on crops do not endanger public health. It accomplishes this task by the statutory requirement that all new pesticides be registered. Periodically, with cause, groups of pesticides may be required to be reregistered.
- The CDC, like the FDA, is an agency within HHS. Its Food Safety Office has primary responsibilities for prevention of foodborne illness and diseases. Its main activities include: supporting epidemiology, laboratory, and environmental health capacity at the state and local levels; providing information and recommendations based on public health surveillance and epidemiology through programs such as FoodNet; and maintaining links with the FDA and USDA (Food Safety Office, 2011).

Many other agencies could be listed as affecting food safety. For example, the USDA's Animal and Plant Health Inspection Service (APHIS) has responsibilities for protecting the health of animals and plants from domestic and international sources. In addition to protecting the food supply, APHIS protects against the transmission of animal diseases, some of which are transmittable to humans (Knutson and Ochoa, 2007). The Organic Foods Production Act (1990), administered by Agricultural Marketing Service (AMS)/USDA, authorizes the establishment of standards for the production of organic standards for organic foods. Ironically it gives little or no attention to the safety of organic products. AMS/USDA also offers on a user fee basis third-party inspection audits for compliance with either public- or private-sector food safety standards.

The 111<sup>th</sup> Congress enacted FSMA, which was signed into law by President Obama on January 4, 2011. This is the first comprehensive reform of FDA food safety policy since the FDCA was enacted in 1938, although the food safety programs of the FSIS/USDA and EPA had been modified in the interim.

FDA's authority to regulate farms has been an issue since its creation in 1938 (Burrows, 2008). To date the FDA's regulation of farms has been limited to guidelines recommending production, harvesting, and handling GAPs. Under the FSMA, the FDA will introduce

mandatory GAPs for domestic fresh produce production and harvesting representing a watershed change from the previous strategy of relying on voluntary guidelines to address food safety at the farm level. In addition, on-farm produce handling, holding, and packing operations will be treated as food facilities, which are required to develop and implement an HACCP plan. Overall these provisions require that produce farms establish science-based minimum standards for safe production and harvesting of fruits and vegetables that are raw commodities to minimize the risk of serious adverse health consequences or death.

For imported products, FSMA shifts much of the responsibility for enforcement of its science-based food safety measures from the FDA to importers. However, the FDA clearly still has inspection, oversight, and investigative authority. Importers are required to perform risk-based foreign supplier verification analyses to assure that imported foods are produced in compliance with HACCP procedures and are not adulterated or misbranded. The foreign supplier verification activities are not explicitly assigned to any form; however, the Act does refer explicitly to third-party certification as a route of assuring compliance with the food safety standards required by the new law. It can be assumed that foreign producers will be subject to the same rules applied to U.S. producers with regard to mandatory food safety regulations.

The Congressional Budget Office estimated that FSMA would increase the cost of FDA enforcement of food safety regulations by \$500 million over five years. The overall estimated \$1.4 billion price tag for food safety regulation will likely receive much attention in these times of substantial budget constraints at the federal, state, and local levels. This increased estimated FDA cost does not include any private-sector costs. It also does not include the costs borne by state and local health departments that are the frontline for inspection and incident investigatory activities. With increased FSMA authority for accreditation of third-party inspectors and laboratories, the FDA will also likely pursue a strategy of passing as many costs as possible to the domestic private sector. Importers will try to pass

the costs of compliance verification onto their sources of supply including exporting firms, foreign packers, processors, and farmers. In addition, foreign governments interested in increasing their country's exports may be inclined to bear a portion of the costs of developing new export-oriented food safety programs.

Before any changes resulting from the adoption of final rules and regulations of the FSMA, the FDA relies on border inspections as its primary means of identifying problems with imported food. This practice results in approximately 2% of the food products entering the United States being subject to physical inspection (U.S. FDA, 2012). The average cost of physical inspections or sampling a line of food offered for import into the United States is reported to be approximately \$170 per field examination and approximately \$2800 per sample analyzed (General Accountability Office [GAO], 2005). The total number of food import lines for fiscal year 2011 was 10,439,236. The FDA physically examined 2.3%, or 243,400, of the food import lines. Assuming these inspections resulted in a sample being taken 7% of the time, the 2011 costs associated with import controls would have been approximately \$94 million. For fiscal year 2009, the FDA allocated 272 full-time employees to examine imported food shipments at U.S. ports of entry and estimated a budget of approximately \$93.1 million for field import activities.

In 2008, the GAO reported that the FDA inspected only 95 of some 189,000 registered foreign food facilities and was expected to inspect 600 in 2010 (GAO of Federal Oversight of Food Safety, 2008). The total estimated budget for all FDA products and programs, including food, drugs, medical devices, and other products, was \$2.7 billion in 2009. The GAO estimates that if the FDA were to inspect each of the 189,000 registered foreign facilities on time it would cost approximately \$3.16 billion based on the FDA Commissioner's estimated cost of \$16,700 per inspection (GAO of Federal Oversight of Food Safety, 2008).

Complying with the mandatory regulations would be expected to impose substantial variable and fixed costs associated with the development and implementation of the required

adjustments in production processes by those firms not already operating under such schemes. Increases in fixed costs would be expected to increase at a decreasing rate as the size of the enterprise increased. Therefore, smaller enterprises would be more adversely impacted than larger ones.

These costs could have significant structural impacts. California's regulatory LGMA experience offers some insight in this regard (Paggi, 2008; California Leafy Green Handler Marketing Board, 2010). The LGMA was established in 2007 following the 2006 spinach outbreak. Under the agreement's terms, signatory members/farmers are required to verify compliance with a specific set of food safety practices by submitting to mandatory state government audits. Over 100 handlers of California leafy greens are members of the LGMA, accounting for approximately 99% of the volume of production in the state that comply with the standards of the voluntary grower, packer, and shipper initiative (California Leafy Green Handler Marketing Agreement, 2012b).

Little data are available on the costs of complying with food safety standards such as the LGMA standards. However, information that is available highlights the importance of farm size. A survey of producers in Fresno and Monterey, California, reported respondents average cost of investments and/or modifications associated with LGMA compliance to be \$21,490, or \$13.60 per acre (Hardesty and Kusunose, 2009). In addition, growers reported seasonal food safety costs more than doubled after implementation of the LGMA from a mean of \$24.04 per acre to \$54.63 per acre. The authors conclude that the combined costs of \$68.23 per acre (almost 1% of the growers' average lettuce revenue) may understate seasonal costs and suggest a per-acre cost of \$100 may be more appropriate. The average size operation in the survey was 2,330 acres with only one respondent reporting average gross revenue below \$250,000 or leafy green production area of less than 77 acres.

More recently, a University of Minnesota study reported growing season costs associated with LGMA-type compliance activities to be \$2,500 excluding the cost of a third-party certification audit that were reported to be in the

\$400 to \$500 range (Driven to Discover, 2012). This information is based on a survey of 246 small and mid-sized fresh market, high-risk vegetable (leafy greens, tomatoes, and fresh herbs) producers with an average farm size of 2–5 acres. The authors report that more than 80% of the fresh market vegetable growers in Minnesota farm on 30 acres or less and gross less than \$150,000. The small acreage farms in Minnesota with the same revenue per acre would experience a cost of approximately \$500 per acre, equal to 10% of their gross revenue. When applied to the average Minnesota operation, these food safety-related costs are on the order of \$83.00 per acre, or 2% of total gross revenue.

In a study of alternative farm structure and local supply chains, the authors formulate a similar conclusion (King et al., 2010). Fixed costs for compliance with regulatory and operating standards limit the potential size of chains. In one case study, the author reports that if voluntary food safety operating standards become regulations, high compliance costs could make spring mix production unprofitable for small local growers (Hardesty, 2010).

An example of the impact of regulatory compliance cost for southern vegetable producers was developed using the range of cost estimates for compliance with LGMA-type food safety regulations developed in California and Minnesota. Cabbage production was chosen because of the importance of southern region production, approximately 40% of the U.S. total. Within the southern region, Florida has been the largest producer in the past five years, accounting for approximately 34% of southern production (USDA NASS, 2011). Accordingly, in this example we began with an initial estimate of the profitability of a Florida cabbage farming operation. Baseline cost and returns data were obtained from the University of Florida enterprise budget for production in the Hasting, Florida, area (International Agricultural Trade and Policy Center, 2012). USDA, National Agricultural Statistics Service data were used to develop probability distributions for Florida cabbage prices and yields.

The initial results were compared with those where compliance costs were equal to \$100 and \$500 per acre, the range of values from the

California and Minnesota studies. In this example, the \$100 per acre compliance costs serve as a proxy for larger farming operations, whereas the \$500 per acre cost is aligned with small acreage production units. The results of the stochastic simulation analysis for a representative Florida cabbage farm were as would be expected: the larger per-unit compliance costs results in a greater negative impact on farm-level profitability. In this example, the probability of a negative net-present value for net income over a 2-year period increased by 17%.

In recognition of the impact of mandatory regulations on operations of alternative size, the FSMA's farm produce provisions provide for flexibility. Small and very small farms are given two important considerations: 1) small farms that grow, harvest, pack, or hold produce that have an average annual monetary value of food sold during the previous 3-year period of \$25,000 or less are exempt; and 2) farms would be partially exempt if their 3-year average annual sales are less than \$500,000 (adjusted for inflation). At least half of their sales are direct to consumers, or a restaurant or retail food establishment located in the same state or out of state within a 275-mile radius of the farm. In addition, a longer phase-in period of 3–4 years will be permitted with other businesses required to comply within two years. It is unclear whether or how either of these provisions will be applied to products produced outside the United States.

It can be anticipated that substantial debate will take place with regard to the final rules associated with small acreage exclusions. Evidence with regard to the negative economic impact of foodborne illness on individual commodities suggests they are industrywide despite the source of the outbreak (Rosson et al., 2007). Unless and until all production is subject to the same food safety regulations, the risk of injury to other industry participants from outbreaks attributable to production exist. Allowing exemption for any industry participants increases the potential financial liability for all.

#### *Implications on Produce Imports*

In the last decade, the United States has consistently been a net importer of fresh fruits and

vegetables. Also, imports have grown faster than domestic production. Therefore, the share of U.S. consumption derived from imports has grown in the last ten years. The share of total U.S. fresh fruit consumption derived from imports increased from 42.4% in 2000 to 48.8% in 2010 (USDA, Economic Research Service, 2012). Excluding bananas, the share of U.S. fruit consumption derived from imports increased from 20.1% to 31.9% during the 2000–2010 period (USDA, Economic Research Service, 2012).

With projected increases in imports of fresh fruit and vegetables, an increased proportion of the fruits and vegetables will be required to comply with the FSMA provisions. As pointed out previously, importers will have upfront responsibility for enforcing the compliance with the FSMA regulations in the producing country. The extra costs of compliance associated with the GAPs of the HACCP regulations will likely be placed back to the producers. The magnitude of the cost increase and any potential effects on the supply of different products are unknown. Also, as noted previously, it is very likely that importers will transfer the majority of the costs of compliance to foreign producers. Foreign government policies will need to consider whether those costs will be entirely transferred to producers or adopt policies to help alleviate a portion of the costs of compliance as part of export promotion programs.

From an individual country perspective, the FSMA impacts on foreign producers would likely be higher for Mexico and other Latin American countries because they have the largest quantity of imported products to the United States. Within these countries, the producers bearing the greatest costs would be those that are the furthest out of compliance and, as noted previously, the smallest producers. Canadian producers would likely require a comparable level of adjustment to U.S. producers because, although they have a single good agency, they do not appear to have yet implemented provisions at the farm level.

The potential for greater impacts attributable to FSMA-related increased food safety regulations on producers in Mexico and Latin America may also be supported by current data

on FDA rejections of food import shipments if FDA concentrates its limited resources on past offenders. In 2010, vegetables accounted for 15% of the total rejections of imported food items by the FDA (Pew Charitable Trusts, 2012). Within the vegetable category, the country of origin with the most frequency of rejection was Mexico followed by the Dominican Republic, Guatemala, and Chile. Produce items rejected most frequently included fruit vegetables (tomatoes, cucumbers, peppers, and eggplants) and root/tuber vegetables (onions, leeks, and yams), all products imported primarily from Mexico and Latin American.

### Summary/Conclusions

The globalization of food production, distribution, and retail marketing has been accompanied by an evolution in rules and regulations that attempt to improve food safety. That evolution continues as evidenced by the passage of the Food Safety Modernization Act (FSMA) and the endorsement of efforts like Global Food Safety Initiative (GFSI). If the current system foreshadows continuing evolution, it will be characterized by private sector-led initiatives that transcend national boundaries and likely align more closely to an alliance of firms within the food retailing sector. Global organizations and national governments will likely lend legitimacy to the standards adopted but will follow rather than lead in their establishment.

Within the southern region, the production side of the food value chain will likely absorb the greatest burden of adjustment. With the exception of limited markets controlled by a few vertically integrated firms, vegetable producers will likely continue to face their markets as price takers. As such, those producers will be required to comply with whatever food safety-based standards their buyers require if they wish to be active market participants. The operational systems required for compliance with these standards appear to favor large acreage operations that can absorb the fixed and seasonal food safety-related costs. Small acreage producers, a characteristic of southern region vegetable production, may be placed at a disadvantage. At the extreme, the South and other regions of the

country will evolve to a bimodal structure of large commercial operations acting as preferred suppliers to mainstream retail outlets and small acreage holders selling their products in local farmers' markets, roadside stands, restaurants, U-pick operations, and other direct market alternatives.

The increase in imported produce will likely continue. However, the same forces that impact the domestic industry will be faced by producers in other countries. The FSMA rules and regulations associated with imports establish a new environment of increased enforcement that will require collaboration and coordination with foreign governments at every point in the produce supply chain. Absent government programs or policies to the contrary, the production side of the value chain in these countries will face the responsibility and costs of adjustment.

Consumers will continue to rely on the existing private/public partnership to provide a safe and reliable supply of food. Unless some future technology provides an answer, consumers will also continue to consume food that, regardless of the assurances of agreed on best practices and standards of production, handling, packaging, and distribution, will subject them to the potential for foodborne illness. Food safety is a goal, as yet 100% safety is unachievable, and the best any system of standards or codes of practices can do is reduce to a minimum the probability of the occurrence of foodborne illness, not reduce it to zero.

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