Bridging the GAPs

Strategies to Improve Produce Safety, Preserve Farm Diversity and Strengthen Local Food Systems

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food&waterwatch

Institute for Agriculture and Trade Policy

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Executive Summary

Although the vast majority of produce-related food-borne illnesses in the United States are traced back to food processors and not to farms, several recent outbreaks associated with fresh or fresh-cut produce have brought the farm squarely into the food safety picture. A 2006 outbreak of *E. coli* 0157:H7 in bagged, ready-to-eat spinach and iceberg lettuce sent consumers running from leafy greens; a 2008 *Salmonella* outbreak, linked first to tomatoes and then to chili peppers, had a similar chilling effect. As a result, both government and industry have developed guidelines or strict protocols intended to improve produce safety on the farm.

Driven by a desire to prevent liability and to reassure consumers, many wholesale produce buyers and handlers — from regional distributors serving schools, to multinational supermarket chains — require farmers to comply with one or more of these on-farm food safety protocols. The protocols typically govern water and land use, worker hygiene, wildlife management and other activities. Often, the farmer must pay for an audit to demonstrate compliance before the buyer will purchase his or her product. Farmers selling to multiple buyers find themselves entwined in an increasingly complex and costly web of food safety programs, audits and certifications.

This report begins with an overview of existing on-farm food safety policies and programs. It then analyzes the ramifications of existing and proposed protocols, and offers recommendations for improving produce safety while preserving the diversity of farm sizes and production methods present in the U.S. food system.

The primary programs examined include:

- **Federal Good Agricultural Practices (GAPs):** On-farm food safety guidelines developed by the U.S. Department of Agriculture and the Food and Drug Administration. Although producers are not required by law to follow the guidelines, many retailers and government institutions are making GAPs compliance — verified by an audit — mandatory for any producers wishing to supply them.

- **The Leafy Greens Marketing Agreement (LGMA)**: Developed by large-scale farmers and buyers of leafy greens (spinach, lettuce, chard, kale and other products) in California and audited by the California Department of Food and Agriculture. The agreement has also been adopted by the state of Arizona. As with the federal GAPs, producers are not required by law to comply with the California LGMA, but companies that purchase 99 percent of California's leafy greens require compliance by any producer supplying them.

- **Industry "super metrics":** Corporate food safety protocols developed by fresh produce buyers. The practices and documentation requirements of the protocols are usually considered confidential business information shared only between the company and the farmers from whom it buys. Press reports, academic research and other sources suggest that the super metrics are more demanding and stringent than requirements under the LGMA or the federal GAPs audit program. In order to sell to the company, farmers must be certified by an auditor to demonstrate compliance with the protocols.

- **Global GAPs and other international food safety protocols:** Multinational food retailers and other wholesale produce buyers, including large U.S.-based companies, have created what they hope will become universal food safety protocols or "meta-standards" governing commercial food production worldwide. These include the GlobalGAPs, a standard that integrates labor and environmental concerns along with food safety, and the Global Food Safety Initiative, a benchmarking system largely intended for private food safety schemes.

Report findings:

- Existing food safety protocols, particularly those developed by industry, are not always grounded in sufficient independent science. In fact, scientific evidence suggests that their approach could harm food safety outcomes rather than improving them.

    - Many industry protocols broadly target animals and wildlife habitat as a risk. The industry's approach contradicts research showing that only certain animals carry pathogens; that practices in use on diversified, conservation-oriented farms, including vegetation planted between fields and around waterways, benefit food

safety by slowing the movement of pathogenic organisms in water and dust; and that the incorporation of well-managed animal manure and other natural fertilizers into soil can suppress the presence of pathogenic organisms in soil.

- Most protocols employ a "one-size-fits-all" approach that does not consider different types and levels of risk present in different products or production systems. The vast majority of food-borne illness outbreaks in leafy greens, for example, are linked to bagged, ready-to-eat salad mixes, but the LGMA also covers whole, bunched greens. On a related note, while risks are present on farms of all sizes, the scale does matter: the consolidation of food production and processing into the hands of fewer and larger operations, and the national and global supply chains that bring much of our food from farms to consumers, have increased the chance that a single contamination incident could sicken a large number of people.

- The current system burdens farmers and confuses consumers. Because so many different food safety protocols exist, farmers wishing to sell to multiple buyers are asked to comply with (and pay for) multiple protocols and audits. Consumers see a variety of claims made about the safety of their produce and have no way to compare or evaluate these claims.

- The current system suffers from a lack of transparency. Many of the industry protocols are considered trade secrets and their requirements are not made pubic. As a result, it is impossible for consumers, researchers or policymakers to assess their performance. There is no public evidence that these protocols have improved food safety.

- Existing food safety protocols are reversing decades of publicly funded environmental protection efforts on U.S. farms. The messages that farmers receive from buyers contradict messages from federal and state conservation agencies. Farmers in at least one region of the country are declining to participate in federal conservation programs because of concerns that doing so will jeopardize their ability to comply with industry food safety requirements.

- Greater regulation of industrial livestock and poultry facilities is needed in order to improve the safety of fresh produce. Current protocols penalize farmers for proximity to feedlots, whose placement the farmers cannot control. Industrial animal facilities, particularly those routinely using feed laced with antibiotics, are a significant source of pathogens such as *E. coli* 0157:H7, including drug-resistant strains, in the environment. These facilities must be more stringently regulated as part of any comprehensive food safety policy.

- The current system jeopardizes efforts to build local and regional food systems. Smaller, limited resource and/or more diverse farms often cannot or will not comply with programs that require expensive testing, audits and electronic documentation and that mandate the removal of conservation practices. Because of the expense and the practices required by many food safety protocols, the system is biased in favor of larger, less-diverse farms and access to food produced locally, sustainably or on smaller-scale operations is limited.

An alternative approach to produce safety on the farm

This report documents a number of promising alternatives to the current system. In response to the proliferation of industry food safety programs, organizations around the country have developed food safety practice and documentation protocols or guidelines designed for smaller, organic, conservation-oriented or diversified farms (those that produce a wide range of crops and often animals on the same farm) selling to institutional or wholesale markets. These programs attempt to integrate food safety, conservation and other goals and to reduce costs. There are also efforts by universities and state and local governments to target GAPs outreach to small and mid-sized farms and to make GAPs audits more affordable.

The report finds that:

- These alternative models enhance food safety by helping a wide range of farms to integrate food safety programs into their day-to-day operations. Some of the programs further bolster food safety by encouraging "win-win" practices that enhance conservation and food safety, such as the planting of vegetation between crops and waterways.

- The alternative models strengthen local and regional food systems by helping smaller and more biodiverse farms reassure institutional and wholesale buyers that they prioritize food safety in their operations. This reassurance gives the farms access to important markets.

- Looking to these alternatives as a model can help federal agencies make the GAPs and other protocols more user-friendly and cost-effective.

Although the alternatives have many positive impacts, relying on these programs alone will not solve all of the current problems. A proliferation of competing alternatives could confuse farmers, consumers and buyers just as the current set of competing industry standards does. These programs are also subject to less public oversight than are government-led initiatives.

Therefore, the report concludes that a more comprehensive government-led approach must be developed. Food safety cannot be relegated to protocols that differ from company to company, leaving farmers to juggle multiple standards and consumers to guess what marketing claims about food safety actually mean. But federal legislation must be structured so that farms of all sizes and types can participate.

Recommendations:

As Congress proceeds with legislation that may govern on-farm food safety, and as the USDA considers a petition to enact a national version of the LGMA, this report makes a number of recommendations for future food safety policy. The recommendations below are intended to guide the direction of food safety policies governing food sales to wholesale and institutional markets because they often involve longer supply chains, larger volumes, comingling, and possible consumption by more consumers, including vulnerable populations.

- Broad stakeholder influence is vital to the development of a fair and affordable approach to on-farm food safety. Small, diversified and limited-resource farms must be at the table, and policymakers must carefully consider the feasibility of any food safety program for these producers. Doing otherwise will reduce the number of operations able to participate, with potentially negative outcomes for both food safety and U.S. farms.

- Food safety policy must accurately identify the sources of risk in the produce production chain and focus the bulk of federal resources on the areas of highest risk.

- Specific measures to mitigate the risk of microbial contamination of produce must be based on sufficient and independent science.

- Policymakers must avoid taking a one-size-fits-all approach to produce safety. Recommended practices and record-keeping mechanisms must be adaptable to a range of farms and supply chains.

- Food safety protocols must maximize compatibility with environmental, conservation and waste-reduction goals as well as organic and other certification programs.

- Significant educational and training resources must be devoted to assist farmers in transitioning to any new food safety protocol. Again, such efforts will enhance participation and thereby enhance food safety.

- Auditors must receive training to ensure that they are enforcing protocol requirements fairly and consistently. They must be trained on the relationship between food safety protocols, conservation program requirements and the organic certification requirements. They should also be familiar with a variety of farming systems and practices.

- Marketing agreements are typically developed by industry and are “voluntary” for the buyers that participate in them. Because they are voluntary, food safety protocols enforced through marketing agreements are no guarantee that other industry protocols will not continue to proliferate. They also fail to solve the problem of farmer audit fatigue and consumer confusion. Therefore, marketing agreements must not be used as a vehicle to enforce on-farm food safety practices.

Introduction

According to the Centers for Disease Control (CDC), an estimated 76 million people are sickened with some kind of food-borne illness each year in the United States.[1] Recent years have seen a number of highly publicized disease outbreaks resulting from contaminated produce, including the 2006 outbreak of *E. coli* 0157:H7 in bagged spinach and the 2008 outbreak of *Salmonella*, first linked to tomatoes and later to Mexican jalapeño and serrano chili peppers. Although the majority of documented food-borne illnesses have been traced back to processing plants[2] and not to poor food safety practices on the farm,[3] these events turned a spotlight on the farm as a potential site of microbial contamination in fresh and fresh-cut produce.

Fresh vs. Fresh Cut

According to the FDA, the term "fresh produce" refers to fresh fruit and vegetables that are likely to be sold to consumers in an unprocessed or minimally processed (i.e. raw) form. Fresh produce may be sold with leaves intact, such as strawberries, whole carrots or radishes, or it may be cut minimally during harvesting, as when the outer leaves of celery, broccoli, or cauliflower are removed before packing. The term "fresh-cut produce" refers to products that undergo a greater amount of processing and packaging before they are eaten but are still consumed raw, such as ready-to-eat bagged salad mixes.[4] This report uses the term "fresh" to refer to both categories except when discussing the contamination risk posed by the processing and packaging of fresh-cut produce. On-farm food safety protocols impact farmers growing produce for both fresh and fresh-cut markets in the same way.

The U.S. Food and Drug Administration (FDA), part of the Department of Health and Human Services, is charged with promoting the safety of 80 percent of food in the United States, including fresh and fresh-cut produce. The FDA's ability to carry out this work is hampered by serious deficiencies in agency funding, staffing and authority.[5] Only about 3 percent of the FDA's food safety dollars and 4 percent of its manpower target the produce sector.[6] As a result, the agency is frequently slow to conduct research on microbial contamination and to promulgate regulations governing the sector. As of this writing, the agency lacks the authority to require a recall of contaminated products. While it appears to have some authority to regulate on-farm food safety practices, it has not exercised that authority to date.

The FDA's work has become more burdensome and complex with the growing complexity of the food system itself. The volume of produce imported into the United States has

tripled in the last 20 years without a concomitant rise in FDA inspectors.[7] Produce supply chains connecting farmers to consumers have lengthened and may stretch around the world, mixing the products of many farms together, shipping product over long distances and using new technologies to extend shelf life. Food markets have consolidated into the hands of a few large corporations that deal in tremendous volume.[8] Larger volumes and longer supply chains, in turn, make trace-back more difficult and put a larger number of consumers at risk if there is an incident of microbial contamination somewhere in the system.

It is in this context that efforts to address produce safety on the farm are taking place. In 1998, the FDA issued voluntary guidelines to assist producers in minimizing food safety risks in fresh or fresh-cut produce. It then created an audit program based on the guidelines. Retailers and wholesale buyers have responded to contamination outbreaks by developing and publicizing their own produce safety protocols for farmers; driven by a fear of liability and a desire to reassure consumers, a growing number of these buyers — from regional distributors serving schools to multinational supermarket chains — now require the farms that supply them to comply with either the federal audit program or a third-party produce safety protocol. Farmers are often required to pay for the audit to verify compliance. Farmers selling to multiple buyers may have to comply with multiple protocols and pay for multiple audits.

While no research has been able to determine how many produce safety protocols are in use in the United States, anecdotal evidence shows that the number is large and growing. What is much less clear is whether these protocols are having a positive impact on food safety. Many of the industry protocols equate sterile farm environments with safe environments; a body of scientific research finds that the types of "sterilizing" activities commonly promoted by buyers actually increase the likelihood that pathogenic organisms will survive in soil or travel to crops.

There has been little research on the impact of these protocols on small and mid-sized farmers selling to wholesale or institutional markets. If the protocols' requirements are expensive to implement, or if they make it difficult to carry out conservation and biodiversity practices common to smaller farms, these farms may be shut out of markets because they are unable or unwilling to comply with the protocol. Such an outcome would jeopardize efforts to develop strong, viable local and regional food systems because only larger and less diverse farms could participate.

If local and regional food systems are weakened, food safety will suffer. Contamination is easier to trace through short supply chains than through the complex global supply chains that characterize industrial agriculture today.[9] The scale of a production system also determines its impact: if contamination takes place on a small farm, it will sicken far fewer people than if it occurs along the industrial food chain.

Food safety protocols are coming to the farm, particularly farms selling to wholesale or institutional markets. These buyers now require assurance that farms are prioritizing food safety. Congress, the U.S. Department of Agriculture (USDA) and the FDA are also considering proposals for guidelines, marketing agreements or regulations that govern on-farm food safety practices. The question is therefore not whether but how these protocols will be designed. The answer will in turn determine the impact on farm viability, consumer safety and local food-based economies.

This report begins with an overview of existing government and industry food safety policies and protocols. It then examines whether the protocols are supported by the best available independent science and uses on-the-ground examples to discuss their impacts. The report goes on to outline alternative approaches that provide buyer and consumer assurance while reducing costs to the farmer and supporting conservation and biodiversity practices. It concludes with a set of policy recommendations that will help realize the goals of food safety, resource conservation, farm diversity and consumer choice.

Overview of Existing On-Farm Food Safety Protocols

There is no universal on-farm food safety protocol for fresh produce. Though many practices on these farms are regulated to some degree, the federal government depends on voluntary guidelines — commonly referred to as federal Good Agricultural Practices (GAPs) — to address the risk of microbial contamination of produce on the farm.

Many wholesale buyers of fresh produce have taken the voluntary federal guidance one step further by requiring farmers to be audited to assure compliance with federal GAPs. Other companies, perhaps believing that more stringent protocols can reduce risk even further, have adopted food safety programs developed by private third-party certifiers such as Primus Labs.[10] The companies then contract with these certifiers to audit the farms. Others have gone still further and created their own private standard, often basing their requirements on the federal GAPs, adding additional criteria not included in the GAPs, and requiring enforcement by auditors.[11,12]

Though most of these protocols are meant to apply to any type of fresh produce, more and more commodity-specific protocols have been developed. Companies may require a food safety audit before buying any type of produce from a farmer, or they may require the audit only for certain crops deemed most risky. It is difficult to know how many companies require grower compliance with a food safety protocol, but anecdotal evidence suggests that the number is already significant and growing quickly.

The term "GAPs" originally referred only to the federal Good Agricultural Practices guidelines but has since become a generic term used by many companies to describe the practices they recommend to, or require of, their suppliers. However, for the purposes of this report, "federal GAPs" will be used to refer only to the program developed by the FDA and USDA, while "state GAPs" refers to similar programs developed and implemented by state departments of agriculture. We do not use the term GAPs in reference to industry-developed protocols.

Below is an overview of key programs including federal guidance, industry initiatives and congressional proposals for on-farm food safety regulation.

Federal Guidance: Good Agricultural Practices

The FDA and the USDA jointly published the first farm-level guidelines for the safety of fresh produce in 1998. The "Guide to Minimize Microbial Food Safety Hazards for Fresh Fruits and Vegetables," otherwise known as the federal GAPs, offers voluntary "best practices" to farmers and food processors to reduce produce safety hazards. The federal GAPs include guidance on farm worker hygiene, manure management, the quality of irrigation and wash water, and other risk management issues.

Although the federal GAPs are voluntary, farmers and processors have the option of receiving an audit to verify their compliance with these guidelines through the USDA Qualified Through Verification Program. The audit program was initially developed by the USDA in response to retailer requests that farmers demonstrate adherence to federal GAPs;[13] it is now run through the USDA's Agricultural Marketing Service and 16 state departments of agriculture. The auditors that conduct the federal GAPs audits are either USDA employees or state department of agriculture employees operating under a cooperative agreement with USDA. Federal and state auditors must meet the same requirements.[14]

The GAPs also have a self-certification option — farmers are not audited but do document compliance with the federal guidelines — but a growing number of wholesale produce buyers now require produce suppliers to pay for and be certified through an audit. The audit requirement effectively turns voluntary guidance into a mandatory program for these producers. Since 2007, all producers supplying fresh produce to food and nutrition programs through the USDA Fruit and Vegetable Program's Commodity Procurement Branch have been required to pass a federal GAPs audit

with a score of 80 percent or higher.[15] In most instances, the farmers must pay for audits — including the auditor's time and mileage — and must be certified on an annual basis.[16] Auditors usually visit during the growing season and again during harvest.[17] Each crop requires a separate audit, which depending on the growing season of each crop may require multiple visits to the farm.[18] Fees are set by individual states, but the majority of them follow the federal rate of $92 per hour per auditor.[19]

Key pluses and minuses

One major benefit of the federal GAPs guidance is flexibility. The document opens with the assertion that "Because of the diversity of agricultural practices and commodities, practices recommended to minimize microbial contamination will be most effective when adapted to specific operations." For each risk point, the guidance document lays out a variety of potential controls and urges producers to choose the one most appropriate to their operations.[i] The guidelines are intended to be applicable to all fresh produce crops. For small, diversified and/or organic farms, this flexibility is vital to making the guidelines workable.

i For example, the water section of the GAPs guidance is prefaced by the following statement: "Operators should consider the following issues and practices when assessing water quality and in applying controls to minimize microbial food safety hazards. Not all of the following recommendations will be applicable or necessary for all operations. Rather, growers and packers should select practices, or combinations of practices, appropriate to their operations and the quality of their water supply, to achieve food safety goals."

The voluntary and flexible nature of the federal GAPs has a downside as well. The proliferation of strict, auditable food safety standards created by produce buyers or third-party certifiers, detailed below, suggests that voluntary GAPs guidelines are not meeting their needs. Produce buyers want assurance that farmers are complying with a food safety program stringent enough to provide protection from liability. Some buyers address this concern by requiring farms to pass federal GAPs audits, which are much less flexible than the guidelines. (Some of the specific requirements of the audit are discussed in the section on on-the-ground impacts.) For other buyers, even passing a federal GAPs audit is not enough.

The GAPs guidance document has been criticized for leaving out some information that could help producers assess and target risks. One major criticism is that the guidelines do not place sufficient emphasis on the risk posed to fresh produce by beef and dairy cattle operations. Cattle are the largest source of *E. coli* 0157:H7 (a particularly pathogenic strain of *E. coli*) on the landscape,[20] yet the federal GAPs do not provide detailed guidance to help producers mitigate the impacts of nearby livestock operations. Wildlife and conservation groups have also criticized the federal GAPs for providing vague guidance on the risks posed by other animals. This vague guidance, they contend, has led some producers and auditors to view all wildlife as a risk rather than focusing on animals known to harbor pathogenic *E. coli*.[21]

Current status

In 2008, spurred on by a series of food contamination outbreaks and a Government Accountability Office report calling for stronger oversight of fresh produce, the FDA announced its plans to update the federal GAPs and requested public comments on how the agency could improve the guidance it offers to producers and processors of fresh produce.[22] As of this writing, no action has been taken by the FDA in response to public comments.

Public-Private Partnerships: The Leafy Green Marketing Agreement

Like the federal GAPs, the Leafy Greens Marketing Agreement (LGMA) is a set of guidelines containing best practices for minimizing microbial risk related to water use, the use of soil amendments like compost, worker hygiene, wildlife and other issues. But unlike the federal GAPs, the LGMA was developed by industry and is focused on one produce category, leafy greens. The LGMA definition of leafy greens includes spinach, lettuce and other greens typically included in fresh-cut mixes and eaten raw, as well as kale, cabbage and related

crops that are generally sold whole and unprocessed and are usually cooked before eating.[23]

The agreement was developed by a group of large-scale farmers and produce handlers in California in response to the deadly 2006 outbreak of *E. coli* 0157:H7 in bagged spinach. The spinach recall resulting from the outbreak, and the consequential lack of consumer confidence in the industry, had a disproportionate impact on produce farmers and handlers in California and Arizona, since nearly 89 percent of leafy greens sold in the United States come from these two states.[24]

The LGMA guidelines are technically voluntary, but because produce companies that purchase over 99 percent of California's leafy greens have committed to selling only products grown in compliance with the LGMA,[25] the standard has essentially become mandatory for many California farmers. It has since been adopted by Arizona's leafy greens industry. Both Canada and Mexico have adopted regulations allowing the imports of leafy greens only from LGMA-certified companies.[26]

The LGMA is considered a public-private partnership because the California Department of Food and Agriculture (CDFA) employs the inspectors that audit the farms participating in the LGMA. These inspectors receive training from the USDA similar to that given to the federal GAPs inspectors and then receive additional training on the LGMA's food safety practices. The produce handlers who are members of the LGMA have agreed to tax themselves to collectively pay for the expense of government audits.[27] California companies publicize their participation in the LGMA through a seal on produce packaging confirming that the product is certified by the California Department of Food and Agriculture.

Key pluses and minuses

Produce buyers believed that the LGMA would reduce the incidence of contamination in leafy greens fields and saw mandatory government audits of the LGMA standards as offering additional security.[28] For leafy greens farmers, the LGMA offered hope of a respite from private industry standards and the requirement that they comply with multiple standards in order to sell to multiple buyers.

The food safety benefits to companies participating in the LGMA are unclear. Shortly before this report went to press, an LGMA signatory company recalled 22,000 cases of lettuce that had been shipped to 29 states because lettuce from the lot tested positive for Salmonella.[29] No food safety protocol guarantees safe food, nor is it known where the contamination of the lettuce took place. That said, the recent outbreak raises questions about the agreement's effectiveness.

For farmers, the expected gains from having one standard applied consistently across the leafy greens industry have not materialized. Some produce buyers who adopted the LGMA continue to enforce their own standards as well, requiring farmers to be audited for both. For example, SYSCO claims that it "support[s] and enforces all current requirements set forth by the California Marketing Agreement with [additional] higher standards in the areas pertaining to water quality and ATP Bioluminescence testing."[30] Fresh Express, Chiquita's fresh produce brand, is a signatory to the LGMA but uses additional requirements with its farmers.[31]

Another weakness of the LGMA is that it cannot be easily adopted by small and mid-sized farms or farms growing multiple crops. Small farm, conservation and wildlife groups were not at the table until very late in the LGMA development process; while they succeeded in making certain changes to the agreement, concerns still linger — particularly around the stringent guidance on wildlife, non-crop vegetation and water testing. These groups also worry that small and biodiverse farms are being forced to choose between market access and their biodiversity and conservation goals.[32]

Current Status

In October 2007, the USDA issued an Advanced Notice of Proposed Rulemaking stating its intent to make the LGMA a national protocol. In March 2009, the USDA's Fruit and Vegetable Industry Advisory Committee, which plays an important consultative role within the agency, passed a motion in continued support of a national LGMA.[33] Two months later, the United Fresh Produce Association, along with the Produce Marketing Association, Western Growers Association and seven other groups, officially petitioned the USDA's Agricultural Marketing Service to establish a national marketing agreement for farmers and handlers of leafy greens.[34] This petition starts a formal process by AMS, including public hearings that will influence the agency's decision about whether a marketing agreement proposal should go forward.

Other Industry Food Safety Initiatives: The Super Metrics

Some buyers in the fresh produce industry — including produce companies, food distributors, foodservice companies and retail outlets like supermarkets — have gone beyond the federal GAPs or the LGMA and created, either individually or in coordination with other companies, their own private food safety standards that are enforced by auditors.[35] They may choose to do so because they believe that existing protocols are too lax or that they do not cover some risk areas. Dr. Mechel Paggi, a professor at California State University, likens the proliferation of private standards to "an 'arms race' to prove who is providing the safest food and hopefully capitalize on a perception of related consumer preferences."[36]

These private standards, or "super metrics," are of great concern to producers, consumers and regulators. While some have been made publicly available — for example, the Food Safety Leadership Council's on-farm produce standards, which were created in 2007 by a consortium of major produce buyers including McDonald's, Wal-Mart, Walt Disney World, Publix Super Markets and Darden Restaurants[37] — many companies' standards are considered a trade secret and are therefore confidential. Companies readily report that they have a strict food safety protocol, but they are much more hesitant to reveal specific protocol requirements. Requests by the authors of this report to multiple produce companies to share their food safety requirements were met with responses similar to the following, which was sent by a staff person at Chiquita/Fresh Express, based in Salinas, California:

> Fresh Express is a signatory to the LGMA in both Arizona and California. Additionally, we have also developed extensive guidelines for the procurement of leafy greens and other produce but we consider such guidelines to be our confidential and proprietary information.[38]

Based on the limited amount of information available on private food safety standards, it appears that many take an extreme, "sterile farm" approach to growing fresh produce. Many of the requirements do not appear to have a strong scientific basis. Researcher Diana Stuart, a doctoral candidate at UC Santa Cruz, has carried out surveys and interviews with farmers on California's Central Coast that broadly characterize the actions farmers are taking in response to buyer requirements. She calls the private standards "consistently more detailed and stringent than other guidelines…"[39] For example, while the LGMA requires 400-foot buffers between crops and livestock operations, some company standards require much larger buffers and the removal of all non-crop vegetation near fields, since it could harbor wildlife.[40] The extreme nature of these standards has led critics to dub them "super metrics" — measurements of food safety that go far beyond the federal GAPs guidelines. The California example is illustrative, since anecdotal evidence suggests that buyers across the country are beginning to impose similar requirements on their suppliers.

Key pluses and minuses

The proliferation of industry super metrics may provide companies with a feeling of security and an opportunity to capitalize on the competitive benefits associated with

having a "safe food" protocol. However, the super metrics provide few benefits for farmers or consumers and they complicate the work of policymakers and regulators.

Producers on farms of all sizes suffer when forced to comply with multiple, sometimes conflicting, food safety protocols and audits. It is also clear from the information available that industry super metrics conflict with many practices important to smaller, diversified and conservation-oriented farmers — including biodiversity and soil and water conservation. The super metrics threaten to undo several decades' worth of taxpayer-funded conservation programs on U.S. farms, harming conservation goals at great expense and failing to result in positive food safety outcomes.

Consumers, policymakers and other stakeholders are ill-served by a set of standards they can neither access nor evaluate. As mentioned, many of the industry protocols are confidential. When a farmer signs a contract to sell to a company using such a standard, he or she agrees not to disclose the requirements to others. It is therefore impossible for stakeholders to investigate the protocols' scientific basis; gain a full understanding of the protocols' impacts on food safety, water quality and availability, wildlife, or other factors; or engage in productive dialogue with produce companies.

An additional concern is companies' use of third-party auditors to certify compliance with the super metrics. In the federal GAPs program and the LGMA, all auditors receive training through the USDA. Such training helps ensure that the standards are interpreted consistently. In the case of company super metrics, however, such consistency is not guaranteed. Producers selling to more than one company must grapple not only with multiple food safety protocols, but also with multiple auditors who may interpret similar language in different ways. There may also be a conflict of interest if auditors are paid by the producer to conduct field inspections.

Current status

It is difficult to tell whether the number and scope of private food safety protocols is growing because so few companies make protocol information public. Anecdotal evidence suggests that the number of companies developing or adopting such protocols is on the rise. The super metrics are now a major focus for many farm and conservation groups, which contend that the proliferation of industry super metrics creates burdens for farmers while damaging the environment.

Global GAPs and Other International Food Safety Protocols

Food safety concerns do not stop at the border, particularly in an era of globalized supply chains. In response to food safety concerns and the proliferation of private food safety protocols, multinational food retailers and other produce buyers — including large U.S.-based companies with international subsidiaries — have joined together to develop a uniform set of standards and certification requirements for their produce suppliers worldwide. Two of the most widely adopted global protocols are highlighted here.

GlobalGAP: Formerly known as the Euro-Retailer Produce Working Group Good Agricultural Practices (EurepGAP), GlobalGAP was developed over 10 years ago to create a universal standard appropriate to most food products, including fresh fruits and vegetables, and used worldwide as way to help farmers avoid the burden of multiple protocols and audits.[41] ALDI, Wegmans Food Market, U.S. Foodservice and McDonalds are among the members of GlobalGAP that are headquartered or operate in the United States.[42]

Though GlobalGAP includes criteria that relate to food safety, it also includes criteria for promoting resource conservation, labor rights and animal welfare. Unlike the U.S. GAPs, the GlobalGAP was initially designed to highlight the importance of Integrated Crop Management, a system of crop production that both enhances natural resources and delivers sustainable economic returns to producers. It also aimed to protect worker welfare in conventional agriculture.[43] The GlobalGAP specifically recommends that each producer have a conservation management and wildlife plan to enhance habitat and increase biodiversity on the farm.[44]

The GlobalGAP protocol also includes provisions designed to make it easier for smaller-scale farmers to be certified—including group certification to reduce costs, the development of a manual for smaller-scale farmers and a formal feedback mechanism.[45]

Global Food Safety Initiative: The Global Food Safety Initiative (GFSI) is an international nonprofit foundation also attempting to reduce the number of standards operating in the food system. GFSI has worked with major retailers, including Wal-Mart and Tesco, to gain common acceptance of four industry-developed food safety schemes—each covering one global region—that have been benchmarked by GFSI. The U.S.-based scheme supported by GFSI is the Safe Quality Food (SQF) protocol, which is owned and administered by the Food Marketing Institute. SQF uses third-party auditors to certify compliance with a Hazard Analysis Critical Control Point (HACCP)-based food safety standard. SQF has optional modules for environmental and social criteria, but do not require compliance with the modules as part of the certification process.[46]

Key pluses and minuses

Although global initiatives have the potential to reduce audit fatigue for farmers selling into the global marketplace, questions still remain as to whether private corporations, alone or together, should be setting food safety standards and whether there should be one global standard given the vast differences in agriculture worldwide. Private initiatives may not be developed with adequate stakeholder representation or sufficient scientific basis. As with any private standard, the program administrator — in the case of SQF, the Food Marketing Institute — stands to benefit financially if its standard is widely adopted.

That said, the GlobalGAP protocol could potentially serve as a model for government efforts to incorporate conservation measures into federal GAPs guidance. It may also offer a model for developing a federal food safety protocol that is responsive to needs of small and diversified farms.

Current status

The GlobalGAP protocol is expanding its reach as a certification standard for agricultural trade products. GlobalGAP Certification is open to producers worldwide and is carried out by more than 100 independent and accredited certification bodies in more than 80 countries, including Primus Labs in the United States.[47] In February 2009, GFSI and GlobalGAP announced that they are developing a joint approach to benchmarking food safety schemes. As a first step, GFSI formally recognized the food safety elements of the GlobalGAP as an acceptable food safety scheme.[48]

Food Safety in the U.S. Congress: Legislative Proposals

Congressional efforts to address food safety through legislation have centered on three main issues: the effectiveness of the FDA in regulating, enforcing and improving food safety; the safety of imported food compared to that produced domestically; and the traceability of food, or the extent to which food can be tracked from the retail outlet where it was sold back to the farm where it was grown. Proposals to strengthen the FDA's regulatory authority include splitting the agency's food division from its drug division;[ii] providing the FDA with authority to recall contaminated food; and

ii See, for example, H.R. 875, The Food Safety Modernization Act.

Traceability

A popular feature of proposed food safety legislation and food safety discussions is the concept of traceability. Regulators are focusing on systems to improve trace-back from retailers to the farm in the hopes that such a system will speed the identification of a contaminated product and help regulators trace it through the supply chain. In the fall of 2008, the FDA held a series of public meetings to discuss whether greater traceability was needed in the food system and how it might be achieved.

In these meetings, the FDA argued that its ability to trace contaminated food was hindered by the limitations of current law, which allows the agency unfettered access to food companies' records only *after* a major health threat has surfaced. Large players from the produce industry, including the Produce Marketing Association and the United Fresh Produce Association, argued that current law was sufficient but that trace-back would be facilitated if all producers and processors used a standard record-keeping procedure and standard nomenclature.[49] These and other industry groups have proposed their own alternative to regulation, called the Produce Traceability Initiative, which would standardize recordkeeping and labeling practices across the industry by 2012. It recommends the use of bar codes on cases of produce and an electronic system for recording data.

A proposal to require traceability through regulation was also explored in the FDA meetings, and companies eager to market electronic tracking technology to the government pedaled their wares.[50] Several bills were offered in the spring of 2009 to mandate some sort of traceability system for food that would extend from farms to retail outlets and restaurants. [See, for example, H.R. 814, The Tracing and Recalling Agricultural Contamination Everywhere Act of 2009 (TRACE Act), sponsored by Rep. DeGette (D-CO), which would have required the establishment of a traceability system for "all stages of manufacturing, processing, packaging, and distribution of food" shipped in interstate commerce and would also establish a traceability system for livestock, poultry, and eggs. See also H.R. 759, The Food and Drug Administration Globalization Act of 2009, sponsored by Rep. Dingell (D-MI), which would have expanded the traceability requirements of the Bioterrorism Act of 2002 to farms and restaurants, mandating standardized electronic records and standardized lot numbers.] Elements of some of these bills were incorporated into legislation authored by House Energy and Commerce Committee Chairman Rep. Henry Waxman. His bill, H.R. 2749, the Food Safety Enhancement Act, was passed by the House of Representatives in July 2009 and instructs the FDA to conduct a pilot project and public meetings on traceability.

The intense focus on traceability by regulators and some members of Congress is worrisome. Traceability does not address the root causes of fresh produce contamination; it simply ensures that in the event of an outbreak, the contaminated product can be more easily traced back to the farm and companies distributing the product can be alerted. While this is of course useful, it is not a solution. Regulations mandating the traceability of food may also burden small and limited-resource farms disproportionately by requiring them to purchase and maintain costly electronic tagging systems to log their produce as it comes off the field.

Because longer and more complex supply chains increase contamination risk and complicate trace-back,[51] it is important to distinguish between systems that tend to hide the origin and identity of food, or that mix products from multiple sources together, and those that feature identity and information about the production system as a marketing advantage. Food that is produced and marketed directly to local consumers is inherently more traceable than food that travels through a complex global supply chain. The former would not require tracking systems of the same complexity.

increasing the frequency of government inspection of food processors. Some bills call for the federal GAPs to be updated or required of all fresh produce farmers, while others create new requirements for risk-based food safety plans and more stringent recordkeeping on the farm.[iii]

iii H.R. 875 would have required farms and processors to create a food safety plan focusing on the points of greatest risk and to keep records, in either paper or electronic form, documenting compliance with the plan. In July 2008, Senator Dick Durbin (D-IL) introduced the FDA Food Safety Modernization Act (S. 3385) which would have required the Secretary to establish science-based minimum standards for the most risky agricultural commodities. Rep. Jim Costa (D-CA)'s Safe FEAST Act, introduced in April 2008 and again in March 2009, would require the Secretary to establish regulations for the production, packaging and handling of those products necessary to minimize the risk of serious adverse health consequences. It would also require the GAPs to be updated within one year of the bill's enactment.

Key pluses and minuses

A key benefit of government regulation for on-farm food safety practices is that by creating a nationally accepted, government-backed standard, regulation would reduce the pressure on buyers to develop their own mandatory food safety protocols. In minimizing the proliferation of such protocols, regulation could alleviate the burden on producers to comply with multiple protocols and audits. It would also reduce the consumer confusion that results from a large number of food safety claims in the marketplace. On-farm food safety regulations would be developed through a rulemaking process, including public comment, ensuring an opportunity for participation by all interested stake-

Once produce has left the farm, the risk of contamination appears to increase based on a number of factors, including whether one farm's produce is comingled with that of other farms after harvest; whether produce undergoes processing and packaging, as in the case of bagged salad mixes; how long it is shipped and stored before it is eaten; whether the product is eaten raw or cooked; and the length of the supply chain linking farmers to consumers.

holders, and would be subject to public oversight.

But to ensure maximum participation by farmers and maximum acceptance by consumers, federal food safety regulations must work for many farm sizes and types, not take a one-size-fits-all or commodity-specific approach. Regulations must focus on the most significant risk areas and recommend practices that are known to improve food safety. They must also take into consideration other goals equally important to many farmers and consumers, such as resource conservation. Lawmakers must devote significant resources to outreach and training so that small and limited-resource farms do not see greater barriers to participation. Additional qualities of an effective, acceptable federal regulatory program are included in the recommendations section of this report.

Current status

As of this writing, the House of Representatives had passed a food safety bill that contains several provisions on the issues discussed above; the Senate has not yet taken up the food safety issue.

Food Safety: What the Science Says

All of the above-mentioned food safety protocols have been put in place to try to reduce and manage the risk of microbial contamination in fresh produce, but they vary in their assessment of what constitutes risk. What does the science tell us about where a risk-based produce food safety protocol should focus?

Where does microbial contamination come from?

Produce is responsible for a significant number of total food-borne illness outbreaks in the United States. According to a Center for Science in the Public Interest analysis of data from the Centers for Disease Control and Prevention (CDC), produce is second only to seafood in the number of outbreaks it has caused since 1990 (although the analysis only includes food regulated by the FDA, which does not include meat). Notably, the analysis does not identify where along the supply chain the contamination takes place.[52] Few analysts have examined this question, leaving a major gap in our understanding of risk in the produce supply chain.

Basic on-farm sanitation practices such as hand washing and proper water and manure management are unquestionably important regardless of the type of farm or crops grown. However, certain crops and production methods present different, or greater, risks than do others. Once

produce has left the farm, the risk of contamination appears to increase based on a number of factors, including whether one farm's produce is comingled with that of other farms after harvest; whether produce undergoes processing and packaging, as in the case of bagged salad mixes; how long it is shipped and stored before it is eaten; whether the product is eaten raw or cooked; and the length of the supply chain linking farmers to consumers.[53]

An analysis by the Community Alliance with Family Farmers of food-borne illness outbreaks in the leafy greens industry since 1990 found that nearly 99 percent of outbreaks were linked to processed, bagged "ready to eat" salad mixes rather than unprocessed greens.[54] The increased level of risk appears to be related to co-mingling and processing, which can cause cross-contamination among different shipments of greens. The packaging used and the longer shelf life of bagged greens also appear to correlate with increased risk. USDA food technologist Gerald Sapers notes that "cold temperatures and high relative humidity conditions, which are often optimal for shelf-life extension of fresh fruits and vegetables, may actually favor the viability of some human pathogens such as viral particles."[55]

These traits are not exclusive to the industrial food system, but all are present in the industrial food chain. Some practices, such as the sale of "ready-to-eat" salad mixes in sealed bags, are marketed almost exclusively by industrial operations. It is therefore not surprising that the recent large outbreaks of food-borne illness have been associated with industrial agriculture.[57]

Small and/or diversified farms are not risk-free; there has been at least one incident of produce-related food-borne illness linked to a small operation serving farmers markets.[58] But a growing body of scientific evidence suggests that the management practices common to smaller, biodiverse and conservation-oriented farmers are a net benefit to food safety. As detailed below, this evidence raises serious questions about the "sterile farm" practices currently required by some buyers. It also suggests opportunities to integrate food safety and conservation goals through improved guidance or regulation.

Investment in conservation efforts on U.S. farms: A benefit to food safety

Over the last few decades, farmers were explicitly encouraged through federal programs, including the Conservation Reserve Program (CRP), Environmental Quality Incentives Program (EQIP) and the Wildlife Habitat Incentives Program (WHIP), to install vegetated buffers, hedgerows, trees, filter strips and other measures in order to improve resource conservation and management on the farm. In California's Central Coast, where waterways have repeatedly failed to meet water quality standards due to elevated levels of nutrients, sediment and pesticides,[59] state agencies and the USDA's Natural Resources Conservation Service offer technical and financial assistance to farmers to adopt conservation measures critical to protecting water quality.[60]

Conservation practices serve multiple goals, including that of improving food safety. Research shows that grass and wetlands can filter 99 percent of the *E. coli* present in surface water.[61] Hedgerows and filter strips can intercept airborne dust and chemical drift and detain water-borne

Packaging Matters: Ready-to-Eat Bagged Greens

Produce companies now use modified atmosphere packaging (MAP) for their bagged salad mixes. This process is designed to extend the shelf life of packaged foods by lowering the oxygen level and adjusting the balance of gases inside the package. Although it is convenient, its food safety track record is mixed. Researchers have found that MAP may inhibit some pathogen strains, but others can remain unaffected or are even stimulated by the incubated environment. In their text on the Microbiology of Fruits and Vegetables, USDA food technologist Gerald Sapers and co-authors give one example of a pathogen that could present a threat in bagged greens: "Because *L. monocytogenes* [commonly known as Listeria] can grow at refrigeration temperatures, ... low inoculum levels, coupled with extended shelf life obtained by the use of MAP, may allow *L. monocytogenes* to proliferate to infectious dosages late in shelf life."[56]

pathogens.[62] Well-managed soil, which has a higher diversity and biomass of soil microbial and faunal communities, has been found to suppress and reduce the longevity of *E. coli* 0157:H7 and other pathogens in the fields.[63] In contrast, removing tail-water systems and sediment basins — practices that catch irrigation runoff and help filter the water before it re-enters the ecosystem or is reused on the farm — worsens water quality, increases sediment and causes erosion.

Yet the LGMA and industry food safety protocols appear to be targeting non-crop vegetation and farm ponds because they could harbor wildlife.[64] More information on these requirements is included in the "Evidence on the ground" section below.

Industry food safety efforts miss the target

More research is needed to gain a thorough understanding of the sources of microbial contamination on the farm, but much is already known. Scientific evidence finds that cattle, particularly those that are fed grain[65] or ethanol co-products,[66] are the most significant source of *E. coli* 0157:H7 on the landscape.[67] New research suggests that flies from cattle feedlots may serve as a major vector for *E. coli* contamination on leafy greens.[68] The practice of feeding livestock, including cattle, antibiotics for growth promotion has increased the prevalence of antibiotic-resistant strains of pathogens like *E. coli*, and with it, related food safety risks.[69]

Meanwhile, deer, rodents and wild birds have not been found to be significant carriers of *E. coli* 0157:H7.[70] A preliminary 2009 study by California's Department of Fish and Game found that less than 0.5 percent of the nearly 900 wild animals they sampled tested positive for *E. coli* 0157:H7; none of the positives were deer, a species listed as "risky" under the LGMA.[71]

This evidence suggests that food safety protocols that broadly target wildlife and their habitat are misguided. Producers need animal-specific guidance to help them properly address the risks posed by different types of wildlife. Food safety protocols must also focus on cattle, particularly those fed grain and ethanol co-products, as a significant contamination risk factor. Food safety will benefit from guidelines that emphasize the benefits of non-crop vegetation and soil biodiversity; for example, food safety protocols could encourage producers close to livestock operations to plant vegetated buffers or other conservation measures to reduce the amount of dust, water and flies traveling from animals to the crops.

When the science is unclear

There is much that the science cannot tell us about how to best reduce risk on the farm. Individual farm conditions vary considerably; finding ways to utilize farmers' site-specific knowledge is therefore critical to an effective food safety strategy. There are also many areas where we do not have a solid body of independent science to guide our thinking on the question of risk. As a first step, future food safety protocols should not require practices known to harm food safety. Additional suggestions on a risk-based protocol are included in the recommendations section of this report.

Evidence on the Ground: The Consequences of a Food Safety Free-for-All

The proliferation of ad hoc on-farm food safety protocols has led to many needless, and perhaps unintended, consequences for U.S. produce farmers, but especially for smaller-scale, organic and diversified farms and the consumers wishing to purchase their products.

Consequences for farmers

The problems facing farmers who grow fresh produce can be separated into two main categories: the burden of a one-size-fits-all approach and the costs of compliance.

A preliminary 2009 study by California's Department of Fish and Game found that less than 0.5 percent of the nearly 900 wild animals they sampled tested positive for E. coli 0157:H7; none of the positives were deer, a species listed as "risky" under the LGMA

Burden of a One-Size-Fits-All Approach

Many small and mid-sized farms rely on diversified production — the cultivation of many types of crops and/or poultry and livestock — for economic sustainability and as a risk-management tool. Smaller-scale and diversified farms are put at a distinct disadvantage when practices most feasible on large, monocropped farms are imposed on all farms.

For instance, LGMA guidelines instruct farmers to test compost and other soil amendments before every application[72] and to follow a risk assessment protocol before every harvest.[73] Small farm and conservation groups argue that compliance is far easier for large farms growing and harvesting one crop than for farms growing multiple crops, which apply soil amendments and harvest at staggered times throughout the season.[74]

Requirements governing the use of soil amendments and prescribing a minimum distance between produce fields and livestock grazing and cattle feedlots can also put diversified farms at a disadvantage, especially farms that use well-managed manure from their own farm as a crop fertilizer. The LGMA, for example, requires that compost and other soil amendments containing animal manure be kept a minimum of 400 feet away from any cropland. This requirement is most onerous for smaller-scale and diversified farms.[75]

The standards developed by the industry's Food Safety Leadership Council, which are publicly available, specify a minimum barrier of one-quarter mile between animal grazing areas and adjacent growing fields and a distance of one mile between cattle feedlots and the end of crop rows.[76] [iv] While information on private industry standards is difficult to find, one press report claims that Chiquita Fresh Express also requires a one-mile buffer between produce fields and cattle feedlots.[77] Even the federal GAPs audit program penalizes farmers who have livestock "near or adjacent to" crop production areas by docking them points on the audit.[78]

Although it is important to reduce the potential for *E. coli* 0157:H7 and other pathogenic organisms to move into fields, significant distance requirements are not easily met by small farms raising both crops and livestock in an integrated system. Nor do these requirements consider the plight of farms adjacent to, or downstream from, feedlots, whose placement they cannot control. California State University's Dr. Mechel Paggi notes that even proponents of the LGMA find extreme distance requirements to be "unreasonable, excessive and scientifically indefensible...."[79]

It is possible to enhance produce safety without imposing unreasonable requirements on small and mid-sized farms raising both crops and livestock. During a recent demonstration audit conducted on a Minnesota farm, the state auditor reported that federal GAPs auditors from Minnesota, North Dakota, South Dakota and Wisconsin are only concerned with bare adjacent fields and nearby feedlots. If adjacent fields are vegetated, as with pasture, farms are not penalized.[80]

In cases where farms are located near feedlots whose waste disposal practices they cannot control, the farms should be eligible to receive financial assistance to defray the costs of mitigation measures — which can include the planting of vegetated buffers to catch dust, flies and polluted water coming from the livestock facility — and increased testing. The threat posed to produce grown near concentrated animal feeding operations also illustrates the need for much greater regulation of air and water pollution from industrial animal facilities.

iv These distances may be altered, but only if supported by a documented risk assessment that takes a number of factors into consideration.

Compliance Costs

According to the latest Census of Agriculture, fewer than half of all farms show positive net cash income from the farm operation and approximately 55 percent of U.S. farms, including many small and mid-sized farms, depend on off-farm income to cover farm expenses.[81] As U.S. agricultural production becomes more concentrated among large farms, smaller, independent farms are put at a competitive disadvantage. Thus, when faced with the costs of complying with ad hoc food safety protocols, farmers face difficult choices. Many large produce operations have the staffing and financial resources to comply with food safety requirements and obtain third-party verification of their practices, but compliance can be unaffordable for beginning farmers, those operating on thin or negative profit margins, or diversified farms growing multiple crops with staggered planting and harvest times. Yet if these farms do not comply, they risk losing access to important wholesale and institutional markets.

Compliance costs often include:

Human resources/education/training: While the sanitation and worker hygiene practices required by buyers are standard practice on many farms, the detailed safety plans and documentation now required by many buyers' food safety protocols are not. This documentation takes time, which can cut into profitability and be especially burdensome for smaller farms. For example, some audits call for frequent "validation" activities such as checking the temperature on coolers holding freshly harvested produce — something many producers already do — but then go further by requiring daily or even hourly recordkeeping in a log. There can be a significant learning curve and need for training and technical assistance for farmers unfamiliar with the documentation protocol.

Purchase of equipment/supplies: There is a trend toward requiring data collection and other recordkeeping in electronic form instead of paper. While many farmers may be able to easily meet this demand, others still may not own the electronic technology or know how to operate the equipment needed to do so. According to the 2007 Census of Agriculture, only 33 percent of farm operations have high-speed Internet access; a full 43 percent of farm operations have no Internet access at all.[82] Other expenses could include expensive tracking technologies such as smart tags or radio frequency identification chips and the scanners needed to use them. (See the sidebar on traceability, page 9.)

Implementation: As noted below, many farmers are devoting considerable resources to removing thousands of acres of hedgerows, buffer strips and other conservation measures previously put in place because they could harbor wildlife. They are also spending time and money to install rodent traps and to erect miles of fencing in order to comply with safety provisions related to animal control. Other capital improvements may also be needed to bring packinghouses into compliance, upgrade employee hand-washing stations or add other necessary sanitation equipment.

Monitoring and Surveillance: Though many of these food safety protocols rely on a process-based approach to minimize risk of microbial contamination, some protocols contain provisions that require irrigation and wash-water to be tested at varying intervals for the presence of certain pathogens and pesticides. The federal GAPs audit, for example, includes a requirement for water testing when water that is used for crop irrigation, produce washing and employee use has not gone through a municipal water treatment system.[83] Large operations and those under contract with produce companies may have on-site labs to do such testing; smaller farms will have to pay to have the tests processed by outside labs.

While costly, the testing required by some protocols does not always deliver clear food safety benefits. The LGMA mandates repeated testing of water for generic (non-pathogenic) *E. coli* rather than the more virulent *E. coli* 0157:H7.[84] Small farm and conservation groups argue that such testing imposes steep costs on the grower while doing little to ensure food safety, since the presence of generic *E. coli* does not always mean that *E. coli* 0157:H7 is present. [85]

Audits: Regardless of the food safety standard being used, the trend among wholesale buyers of fresh produce has been toward requiring third-party audits, and in many cases specifying the private audit firm(s) whose certification they will accept. For GAPs audits, most states charge the federal rate of $92 per hour per auditor.[86] Rates charged by private firms are more difficult to ascertain. Total audit costs vary depending on the scope of the review, the size of the farm, the certifying entity and the distance a certifier has to travel to get to the farm. Costs are generally reported as being in the range of $500 to $1500 per audit, not including preparation costs. But Dr. Mechel S. Paggi, Director of the Center for Agricultural Business at California State University, has documented situations in which costs to producers are much higher; his research finds that some producers may pay as much as $8,500 to handle initial costs associated with training, implementation and audits. Another study documents the case of a farm that paid as much as $600 a day for private labs and audit services.[87]

Farmers who sell to more than one company must juggle multiple sets of requirements and paying for multiple audits. As a result, farmers are experiencing what is referred to as "audit fatigue." Farmers already paying for third-party audits to verify compliance with USDA Organic or other eco-label standards suffer additional burdens when food safety protocols are added to the mix. And as commodity-specific standards like the LGMA become more popular, diversified farmers may have to be certified by several of them. Other commodity-specific protocols that have been developed include an industry protocol for melons, modeled on the federal GAPs;[88] two GAPs-based tomato protocols, one developed by the produce industry and one adopted by the State of Florida;[89] and a GAPs-based mushroom protocol developed by Penn State University.[90] USDA is currently considering new federal GAPs-based guidance documents for three specific crops: leafy greens, melons and tomatoes.

Consequences for soil retention, water quality and wildlife habitat

As noted above, practices that maintain and improve the natural resources of farming operations have been found to improve food safety by reducing pathogens in water, soil and dust that can reach fresh produce fields. Despite this evidence, the LGMA and private food safety protocols include wildlife and habitat control requirements that in practice have led to the rapid dismantling of these vital conservation practices.

The super metrics adopted by commercial buyers appear to be hitting conservation efforts particularly hard. Research carried out with producers on California's Central Coast finds that almost 40 percent of vegetable farmers who adopted conservation practices have since removed them due to food safety pressure from buyers or auditors. Twenty-one percent of all vegetable farmers removed practices specifically installed to improve water quality.[91]

Evidence suggests that wildlife has also been put at risk by food safety protocols. The LGMA requires farmers to limit the presence of wildlife or domesticated animals that may carry pathogens onto the farm[92] and to maximize the distance between crops and vegetated areas that may harbor wildlife.[93] The federal GAPs audit asks if "measures [have been] taken to reduce the opportunity for wild and/or domestic animals to enter crop production areas." [94] The language in the audit guidelines put out by Primus Labs, a third-party certifier, asks, "Are [there], or is there evidence of, domestic animals, wild animals, grazing lands (includes homes with hobby farms, and non-commercial livestock) in proximity to growing operation [...]? Have physical measures been put in place to restrain [these] animals [...] and their waste from entering the growing area?"[95]

Biodiversity advocates contend that in practice, this language and that of many private food safety standards encourages farmers to target wildlife and habitat indiscriminately because they fear that otherwise, they will fail the audit. Many of the wildlife targeted are not carriers of pathogens like *E. coli* 0157:H7. In a survey of Central Coast growers, California researcher Diana Stuart found that the majority of produce farmers are targeting wildlife with

fences, traps and/or poisoned bait, as well as mowing down vegetation that could serve as wildlife habitat. Stuart also reports that several farmers increased their use of copper sulfate in ponds and waterways; copper sulfate is commonly applied to control or eliminate amphibian populations.[96]

The pressure producers receive from buyers forces them to choose between signing a contract and preserving biodiversity on their farms.[97] Eighty-one percent of the farmers who responded to Stuart's survey, in her words, "indicated some level of disagreement with what they were being asked to do regarding wildlife, buffers and vegetation …. [Many] shared how they feel pressured to adopt management practices that they do not agree with and that they believe are harmful to the environment." Some farmers simply refused to comply and paid a hefty price: one interviewee reported losing $50,000 in sales because he would not comply with the food safety standards required by his buyer.

Food safety protocols are also having a chilling effect on participation in federal conservation protocols. Stuart's latest research shows that the number of Central Coast farmers applying for funding to implement environmental practices through the federal Environmental Quality Incentives Program (EQIP) dropped from 83 to 42 in recent years, with food safety concerns cited as the most common reason for withdrawing or not applying.[98]

Consequences for consumers

More and more, consumers want to know where and how their food was grown. Though organic sales only account for 3.5 percent of all U.S. food sales, the industry has sustained growth rates of between 16 and 30 percent over the last 15 years, significantly higher than the rate of growth for conventional food products.[99] Organic fruits and vegetables make up 37 percent of all organic food sales.[100] Numerous studies show that consumers are even more interested in buying locally produced food than organic and will pay a higher premium, especially if they believe their purchase will help to keep a local farmer in business. [101]

Unfortunately, as institutions and businesses try to respond to this demand, they are finding that food safety protocols can make it difficult to support local food producers, especially smaller-scale farms. This is not because the farmers are following unsafe practices, but because the requirements are expensive and onerous and force farmers to abandon important conservation and biodiversity practices.

For instance, one 40-hospital health system in the southwestern United States was recently surprised to learn that although they thought they were supporting a range of produce farmers within their service area, the food safety

protocols in use by their produce distributor effectively barred all but the largest farmers from selling to them[102] because it required third-party certification of compliance with the federal GAPs.[103]

While many institutions and other wholesale customers can still buy directly from farms and do not require audit verification of produce safety practices, the terms of many food service contracts generally prohibit direct purchases from farms, allowing only purchases made through approved food distributors. In some cases, both the food service contractor and the distributor require adherence to produce safety protocols.

Sodexo, a company that dominates the contract food service sector serving hospitals, colleges and other institutions, requires produce suppliers to pass either a federal or state GAPs audit and ship their produce through only contracted distributors.[104] Two of the largest food distributors in the United States, Sysco and U.S. Foodservice, require third-party on-farm food safety audits, enforce the LGMA, and also require additional testing and criteria beyond these protocols.[105,106,107] Sysco's food safety criteria apply to all ready-to-eat produce purchased, which they define as "fresh produce, processed or field packed, that is ready-to-eat in its existing condition," including lettuce, berries, tomatoes, celery, green onions and herbs.[108] U.S. Foodservice requirements apply to all produce grown for their produce line, Cross Valley Farms®. Federal GAPs certification is also required by a growing number of U.S. Foodservice's regional distributors.[109]

Alternative Approaches at the Farm Level

Direct Purchase Relationship-Based Approach

Though some wholesale buyers are hesitant to buy fresh, whole produce from a farmer without a food safety audit verification, many institutional buyers do not see a need for this type of requirement when they purchase directly from a farm or farm cooperative in their local community. Many feel more secure knowing the person who has grown the product; in addition, reduced handling, comingling and transportation time can help to reduce the potential for product damage and breaks in the cold chain that can heighten the risk of microbial contamination.[110] Having a direct relationship with a grower also facilitates trace-back to the farm in the event of a problem.

Some wholesale buyers gain a greater degree of comfort from their ability to visit farms and see the farmers' practices first hand. Doug Davis, director of food service for the Burlington, Vermont, School District, increases his confidence in the safety of local produce by visiting the 13 different farms that he buys 15,000 pounds of produce from each year.[111] Greg Black, director of residential dining for the University of Iowa in Iowa City,[112] and Barbara Hartman, Chief of Nutrition and Food Service for the VA Medical Center in Martinsburg, West Virginia,[113] also make a point of visiting their local farm suppliers and checking out worker hygiene and other on-farm practices first hand.

For other purchasers who may not have the time to visit farms, the Hotel, Restaurant and Institution Management staff at Iowa State has created "A Checklist for Purchasing Local Produce" that provides a list of questions for buyers to ask farmers in order to demonstrate that reasonable care has been taken for procurement of foods.[114] It was designed specifically for buyers of local produce for school meal programs. The Oregon Department of Education specifically lists this resource as an example of a process that can be used to demonstrate reasonable care in local produce purchases for the Oregon Farm to School program.[115]

Alternative food safety protocols for smaller-scale, limited-resource and organic production

There are a growing number of wholesale and institutional buyers for whom a visit to the farm is not enough; they have expressed interest in or require documented compliance with a food safety protocol. To meet the buyers' needs and the needs of farmers selling to these markets, a number of organizations with small-farm members have been engaged in creating food safety tools and protocols appropriate to their membership. These include:

Appalachian Harvest GAP Mirror Program for Organic Produce Production

In response to numerous requests from retail customers for some kind of assurance that farmers were taking steps to minimize microbial risks in fresh produce, Appalachian Harvest — a network of certified organic family farmers in southwest Virginia and northeast Tennessee — developed a federal GAPs "look-alike" program that also addresses organic production and sustainability issues.[116] If farmers want to sell under the Appalachian Harvest label, they must complete federal GAPs-based farm safety training and develop a food safety plan that complements their organic system plan. Appalachian Harvest provides mandatory training sessions on these GAPs and carries out its own spot audits on a random basis. There is no charge or fee for the training or audit. Appalachian Harvest also provides sample forms and logs for farmers to use. They have also arranged a group rate of $20 per water sample to enable farmers to comply with their mandatory water testing protocol.[117] This program has been in place for more than a year and several local, regional and national supermarkets accept produce marketed through this program.[118]

Community Alliance with Family Farmers Federal GAPs-based Self-Audit Protocol for Small and Mid-Scale Farms

California-based Community Alliance with Family Farmers has created a voluntary federal GAPs-based program appropriate for certified organic and non-organic small to mid-sized family farms in the region, especially those with limited resources. The protocol takes the form of a Standard Operating Procedure, which when adopted becomes a farm's food safety plan. The procedures are still in draft form and generically apply to row, tree and small fruit crops. To measure food safety performance, farmers who follow this protocol would conduct semi-annual self audits — once before the growing season begins and once during the growing season. Unlike other food safety protocols, the draft Standard Operating Procedures (SOPs) are written to encourage use of vegetated buffers and hedgerows as a means to improve food safety and provide science-based, animal-specific methods for addressing wildlife intrusion. The SOPs also discourage the use of municipal biosolids and encourage use of composted manure. Farmers are provided sample forms and monitoring logs. [119]

Maine Organic Farmers and Gardeners' Association

In response to problems diversified Maine organic farmers had with implementing the federal GAPs, the Maine Organic Farmers and Gardeners' Association (MOFGA) has developed its own program and the MOFGA Certification Services board recently approved offering it as an "add-on" to its organic certification program.[120]

The MOFGA approach is a Hazard Analysis and Critical Control Point (HACCP) -based rather than GAPs-based approach. HACCP is a process that was initially developed to prevent astronauts from becoming sick from food-borne illness while in space. The process is based on the identification of potential food safety hazards that can occur during commercial-scale processing, transport and preparation of food, so that key preventative actions can be taken at Critical Control Points (CCPs) to reduce or eliminate risk. Use of a HACCP-based approach in food processing is required by federal law for juice, seafood, meat and poultry processing facilities, but voluntary elsewhere. Using a HACCP-based approach to on-farm food safety is unusual because the process was originally designed for food processing. In the processing arena, the implementation of HACCP has been criticized as burdensome to small processors and insufficient for large processors that should be receiving much greater government oversight.

The MOFGA HACCP-based approach has three primary steps. The first step is a basic training program that covers HACCP food safety principles. MOFGA has adapted the HACCP system into a manual outlining the practices and philosophy behind the approach and instructing producers on the creation of a HACCP system for a small farm; the group also provides a sample farm plan for farmers to use as a model. Farmers can then use these documents to develop a food safety plan that they integrate into their existing farm plan. The final step is that farmers have the option of having their food safety plan implementation audited and certified by MOFGA's Certification Service. Organic farmers have the option of conducting a food safety inspection at the same time as their annual organic inspection. If farmers are not certified organic, they can still have an independent food safety plan inspection for a modest price. Use of the protocol and certification by MOFGA members is voluntary.

In addition to the alternative on-farm food safety protocols listed above, at least one regional wholesale producer distributor, Boston-based Red Tomato, is in the process of developing a food safety protocol to meet the growing demand of its customers and the needs of its farmer suppliers.[121]

Making food safety training and audits more affordable

Many farmers need some form of educational and financial assistance in order to prepare for buyer-required on-farm food safety audits. At the state and local level, government and nonprofit entities are exploring ways to reduce the burden of implementing food safety protocols for small farms. In most instances, the support is funded through grants to states from USDA Specialty Crop Block Grant funds.

Free Audits and Assistance

Rhode Island GAP Program

Rhode Island, a state that has developed its own GAPs program, is the only state in New England and perhaps the country to provide farmers with free state GAPs education, training, technical assistance and audits. Farmer participation in the program is voluntary, but it has enabled 22 of Rhode Island's larger farms to become RI-GAPs-certified while avoiding some of the costs traditionally associated with these programs. The Rhode Island GAPs program was also instrumental to farmers being allowed to sell produce to Rhode Island schools through the state's Farm to School program, in part because the school system's primary food service contractors required GAPs certification.[122] All 36 Rhode Island school districts now purchase produce from at least one GAPs-certified Rhode Island farm. According to Kimberly Sporkmann, Farm to School Coordinator and Healthy Food Systems Specialist for Kids First, RI-GAPs certification gives food service directors the confidence to purchase foods from local farmers.[123] "I can see its importance but also understand the challenges it can pose to farmers," she says. "Of course, most food service directors insist on it, for all the right reasons."

No-cost audits were a key factor for even the largest farms participating in the program. Vinnie Confreda, owner of Confreda Greenhouses and Farms, one of the first farms in the state to be RI-GAPs certified, says that paying the going rate for private third-party verification would be burdensome and likely prevent him from participating in the program, given consumer price expectations, higher production costs and shrinking profit margins.[124]

There are several reasons that Rhode Island has been able to provide this low-cost GAPs program to state farmers. Rhode Island has developed its own state-based GAPs program guidelines and audit form. The RI-GAPs Program is closely aligned with federal GAPs, but is not identical. It is the only state in New England to have a state level GAPs program. Rhode Island chose to go this route because it did not want farmers to have to depend on availability — or pay the expense — of a USDA auditor, or pay the annual fee USDA charges for a state to maintain accreditation to conduct federal GAPs audits.[125] The Rhode Island Department of Environmental Management (DEM)'s Division of Agriculture staff conducts audits. The DEM also uses $5,000 of state-allocated USDA Specialty Crop Block Grant funds to support University of Rhode Island Agricultural Extension staff in providing education and training.[126] This year, DEM also received a $50,000 federal state market improvement program grant from USDA to further enhance the RI-GAPs program.[127]

Audit cost-sharing programs

At least three states — Pennsylvania, North Carolina and New York—subsidize a portion of audit and water-testing costs to help farmers meet buyer requirements and to increase the number of federal and state GAPs-certified farms. All three states pay for these programs with funds they receive through the USDA Specialty Crop Block Grant Program. Funds are paid out on a first come, first served basis.

Pennsylvania: The Pennsylvania Department of Agriculture provides up to $400 per applicant to cover the cost of one successful federal GAPs or Penn State-developed Mushroom GAPs audit per year.[128] Farmer participation in audit programs is voluntary, and certified USDA and Pennsylvania Department of Agriculture inspectors conduct audits.

North Carolina: Through the North Carolina GAPs Certification Assistance Program, fruit and vegetable farmers can receive up to $600 in assistance to help pay for a third-party audit.[129] Payment is made directly to the auditor and can be conducted by a government agency auditor or qualified private auditing company.[130] North Carolina also has a separate Water Analysis Cost Share Program through which farmers can receive up to $200 per year to help pay for laboratory analysis by a certified laboratory of irrigation or packinghouse wash water for the quantitative presence of generic *E. coli* bacteria.[131] In 2009, the North Carolina Department of Agriculture and Consumer Services offered

produce farmers assistance to obtain GlobalGAPs certification through a grant it received from the Golden LEAF Foundation.[132] The project's goal is to provide North Carolina farmers a competitive edge when exporting to Europe and other international markets.

New York: New York State also has a GAPs Certification Assistance Program through which farmers can be reimbursed for up to $750 of the cost of an audit and/or audit-related water tests.[133]

Education and Training Assistance

Through the Cornell National GAPs Program, based at Cornell University, federal GAPs-related educational materials and training are provided to farmers nationwide, especially to those that do not have the resources to hire a food safety specialist.[134] Most of this assistance is provided for free or for a nominal cost. In many cases, farmers do not have to leave the farm to participate in training webinars and download online resources as long as they have a phone line and computer access.

Other land grant university extension programs are partnering with their state department of agriculture to implement federal GAPs-related education and training programs to help farmers develop food safety plans including North Carolina State University Extension, Iowa State University, Penn State,[135] Michigan State Extension and the University of Minnesota. A brief description of some of these programs follows.

North Carolina State Cooperative Extension – Tiered Approach

North Carolina State Extension offices have conducted workshops for farmers and convened a working group that developed a consensus position on a tiered approach to addressing food safety on the farm. The working group believes that every farmer must be food safety certified in some way. A basic food safety certification program would be modeled on the pesticide applicator program; it would require all sellers of produce to be certified in food safety by attending a one- to two-day course and maintain certification by regular maintenance trainings. This certification would serve as a baseline, and businesses or individuals who wished for or needed a higher level of certification services, such as intensive trainings or farm audits, could be certified at a higher tier.

Iowa State University Extension – Buyer and Grower Education

With the support of the Leopold Center for Sustainable Agriculture, Iowa State University Extension created two educational brochures for use by retail foodservice companies interested in buying directly from local farmers. "Buying Local Foods for Retail Foodservices" describes existing federal and state rules and guidelines as they apply to the institutional purchase of milk, meats, produce and other food products direct from local producers. "What retail foodservices should know when purchasing local produce directly from farmers" provides a set of federal GAPs-based questions for buyers to ask farmers to ensure that reasonable care has been taken to assure the safety of purchased

foods. They have also published a grower brochure that encourages use of practices laid out in federal GAPs. Though developed for Iowan buyers and farmers, most of the information provided is applicable nationwide.

Hawaii "Safe" Food Certification Pilot Program

In July 2009, the Hawaii Legislature voted to override the governor's veto in order to pass a bill (H.B. 1471) that would establish a "safe" food certification pilot program.[136] The program is intended to benefit farmers throughout the state and help restaurants, hotels and others in the tourism industry increase local produce purchases by increasing the number of federal GAP-certified farms. The bill was authored by and largely supported by members of Hawaii's hotel and tourism industry and would primarily make funds available to help coach farmers in how to prepare for GAPs audits.[137] The pilot program is funded with tourism dollars and scheduled to last initially for one year. As of this writing, funding for the program was in question.[138] Through the Rural Economic Transition Assistance Hawaii (RETAH) grant program, administered by the Economic Development Alliance of Hawaii, funds will also be provided to help farmers buy sinks, toilets, tables and other supplies needed to pass a third-party audit. The RETAH funds will also pay for 100 one-time-only farm audits performed by the Hawaii Department of Agriculture.[139]

Nonprofit technical assistance

Several nonprofit organizations have also developed educational programs. For instance, FamilyFarmed.org, an Illinois-based nonprofit that works to expand the production, marketing and distribution of locally grown and responsibly produced food, has developed a guide: "Wholesale Success: A Farmer's Guide to Selling, Post Harvest Handling, and Packing Produce," as a way to help build the capacity of Midwest farmers to meet the burgeoning demand for local food and wholesale buyer requirements. The manual includes a comprehensive federal GAPs-based section on Food Safety as well as 63 crop profiles that give specific harvesting, cooling, storage and packing information on most of the fruits and vegetables grown in the Midwest. The development of this 174-page manual was informed by a 27-member steering committee consisting of farmers, retailers, distributors, academics and NGOs. FamilyFarmed.org is now working with several partners to distribute the manual and develop trainings for producers.

Alternative food safety protocols: A model for policymakers

The programs detailed above are innovative attempts to help smaller, diversified, organic or limited-resource farmers document compliance with food safety practices so that they can retain access to important markets. They provide guidance on appropriate practices, subsidize audit programs, and target education and training efforts to smaller farms. These programs are important models for improving on-farm food safety while preserving farm diversity, allowing for the growth of a decentralized food system and bolstering consumer choice. Because these programs encourage participation rather than alienating or burdening certain farms disproportionately, they will truly help improve the safety of our food system.

That said, countering industry protocols with a proliferation of alternatives will not solve all of our problems. Will buyers still be confused as they try to choose a food safety protocol from the list of alternatives? Will consumers respond with similar confusion? Will farmers selling to multiple buyers still have to comply with multiple standards?

Food safety protocols must be flexible enough to work for many different types of farms, but the protocols cannot differ from company to company, leaving farmers to juggle multiple standards and consumers to guess what marketing claims about safety actually mean. The promising alternatives that integrate food safety, conservation practices, and farm diversity must serve as a guide for the development of food safety legislation at the federal level. Below, we outline a policy approach that includes any farm selling to wholesale or institutional markets. We believe this approach balances the needs of diverse farms with the food safety assurance that buyers increasingly require.

Strategies to Improve Food Safety While Supporting Local Food Systems

A diverse, decentralized food system is itself a benefit to food safety because it reduces the risk that a single contamination event will sicken a large number of people. For that reason, and for many other reasons beyond the scope of this report, food safety policy must work for a diverse group of farms and production systems. As no farms are completely free of risk, baseline food safety measures can and should be adopted by all operations with the help of educational and technical assistance. More stringent requirements, including testing and more frequent government inspection, are appropriate for higher-risk crops and production models, operations releasing large volumes of produce into commerce and longer supply chains. The recommendations below are intended to guide the direction of food safety policies governing food sales to wholesale and institutional markets because they often involve longer supply chains, larger volumes, comingling and possible consumption by more consumers, including vulnerable populations.

As Congress proceeds with legislation that may govern on-farm food safety, and as the USDA considers a petition to enact a national version of the LGMA, this report makes the following recommendations:

Federal on-farm food safety protocols should be based around these guiding principles

Broad stakeholder influence is vital to the development of a fair, affordable and effective approach to on-farm food safety. Significant outreach to small, mid-sized, organic/sustainable and diversified producers selling to wholesale or institutional markets is critical to ensuring widespread adoption of any future food safety protocols. The federal government should draw heavily on existing alternative food safety protocols, such as those detailed above, as models for a standard to strengthen food safety while preserving farm diversity, environmental protection and consumer choice. Policymakers must carefully consider the feasibility of any food safety program for small, diversified and limited-resource farmers as they move forward with discussions on food safety regulation.

Protocols must be adaptable to a range of farms and supply chains. The fruit and vegetable production community encompasses a wide range of farm types and an equally wide range of products. Farmers and consumers are best served by the co-existence of many producer sizes and types to serve multiple markets, including direct sales, farmers markets and roadside stands, in-state and out-of-state institutional and food services, wholesale distribution and grocery retailers. Standards should be developed to be applicable to many farm sizes and types.

Protocols must accurately identify the greatest sources of risk, and specific measures to mitigate produce safety risk must be based on sufficient and independent science when possible, or on precautionary, time-tested practices. Farmers are currently being asked to comply with requirements that scientific evidence suggests may be detrimental to food safety. Significant resources must be devoted to documenting the basis for recommended practices included in any future guidelines or regulations. There are some cases in which quantifiable risk is difficult to ascertain or where mitigation strategies will vary depending on site-specific conditions. Policymakers should consider farmers' site-specific knowledge as an asset in the effort to improve food safety outcomes. In these cases, the goal should be for farmers to be well-informed about food safety risks so that they can make good precautionary decisions that are appropriate for their farms.

Protocols must be risk-based and tiered. Basic food safety measures are important for all farm sizes, crops and

production types. However, contamination risk increases based on a number of factors, including whether one farm's produce is comingled with that of other farms before reaching consumers; whether fresh produce undergoes processing and packaging, as in the case of bagged salad mixes; whether the product is eaten raw or cooked; whether there is substantial time between harvest and consumption; and whether the product passes through multiple hands before it is eaten. Policymakers should focus the bulk of federal resources on the areas of highest risk, rather than applying a uniform, one-size-fits-all approach to all farms and production systems. Risk should be defined through a consultation process that includes a variety of stakeholders and makes determinations based on the best available independent science, or on precautionary, time-tested practices when appropriate.

At the basic level, all farms should be required to develop a written food safety plan that documents common-sense measures regarding manure handling, worker hygiene, water quality and other factors. Education and training should be provided to facilitate this process (see below). More frequent testing, audits and requirements should be mandated for areas of highest risk. Documentation should be allowed to be kept in either paper or electronic form.

Possible options for lowest-risk farms: create a food safety plan, conduct annual self-audits, attend trainings and receive a certificate after completing the training. Documentation should not be onerous. Low-risk farms should be subject to random government inspection to confirm completion of these steps, the frequency of which should be commensurate with volume put into commerce.

Possible options for moderate-risk farms: create a food safety plan, attend trainings and receive a certificate after completing the training. Government testing and audits — with fees determined on a sliding scale — would be required with less frequency than for high-risk operations. Additional requirements may be included.

Possible options for higher-risk farms: create a food safety plan, attend trainings and receive a certificate after completing the training. Government testing and audits — with fees determined on a sliding scale — would be required with the most frequency of all risk categories. Additional requirements may be included.

Food safety protocols must be compatible with environmental, conservation and waste-reduction goals and organic and other certifications. Greater coordination between the FDA, USDA (particularly the National Organic Program and National Resources Conservation Service) and the U.S. Environmental Protection Agency (EPA) is required to ensure that food safety standards do not conflict with environmental or conservation goals. Such coordination will facilitate the integration of food safety documentation into existing program requirements and paperwork, including farms' organic system plans. Aspects of existing standards with food safety implications, such as the organic standard for manure composting, should be drawn upon to reduce the possibility of conflicting regulatory guidance.

Auditors should be trained to be attentive to various production systems and conservation practices so that food safety audit requirements are not interpreted in ways that undermine equally important environmental policy goals. Practices known to improve water quality and reduce soil erosion and dust must be explicitly encouraged. In many cases, these practices may include the planting of vegetated buffers, hedgerows and windbreaks. The standards must include animal-specific guidance on wildlife management. As mentioned above, policymakers should draw on existing alternative food safety programs as models that integrate these considerations with food safety goals.

Marketing agreements are not appropriate vehicles to "regulate" food safety. Marketing agreements are

typically developed by industry and are technically voluntary, applying only to the buyers that participate in them. Because they are voluntary, food safety protocols enforced through marketing agreements are no guarantee that other industry protocols will not continue to proliferate. They also fail to solve the problem of farmer audit fatigue and consumer confusion. Therefore, marketing agreements must not be used as a vehicle to enforce on-farm food safety practices.

The federal government must provide significant resources for education and training, allowing farms time and support to adopt and implement food safety practices and documentation protocols

Ensure that standards are consistently applied and require uniform training of all auditors. Food safety training is already provided to auditors through the USDA's Qualified Through Verification program. Auditor training is crucial to ensuring that standards are applied consistently and fairly. Auditors should receive training on the relationship between food safety protocols, conservation programs, and the requirements of the National Organic Program.

Provide explicit federal funding allocated to state departments of agriculture for training and education to help farmers develop food safety plans, implement the plans and associated testing, and meet the requirements of an audit. Farmers must be well-informed about food safety risks so that they can make precautionary decisions that are appropriate for their farms. Education, training and other support for farmers will facilitate widespread adoption and enhance food safety.

State departments of agriculture should be authorized to allocate a portion of the federal funds they receive to state cooperative extension programs or nonprofits to carry out education and training activities. State extension agents and nonprofits across the country are already implementing programs to help smaller, more diversified farms implement food safety measures. Their expertise is needed to facilitate widespread adoption of any federal program.

Provide funds to subsidize audits and testing on a sliding scale, with particular attention paid to limited-resource and beginning farmers. Audits and testing constitute a significant financial burden for many farms. Subsidies will facilitate widespread adoption of the program and will improve food safety outcomes.

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