



Institute on Science for Global Policy

Food Safety, Security, and Defense: (FSSD) Strategic Roadmap

January 2014



An ongoing series of dialogues and critical debates examining the role of science and technology in advancing domestic and international policy decisions

Institute on Science for Global Policy (ISGP) Program on Food Safety, Security and Defense (FSSD) Strategic Roadmap

Preface

ISGP programs use an unusual, if not unique, format of multiple, invitation-only conferences emphasizing critical debates and caucuses among scientists and policy makers. These debates and caucuses are designed to focus on questions that are specifically relevant to policy makers who normally are not subject-matter experts in science and technology (S&T), but who are responsible for formulating and implementing policies having both domestic and international impact. For each two-year-plus series of ISGP conferences, held at venues in the United States and internationally, the ISGP prepares a Strategic Roadmap that describes the content for each of the five to six conferences devoted to the overarching S&T topic.

The Strategic Roadmap for the ISGP program on Food Safety, Security, and Defense (FSSD) is presented here for your review and comment.

The preparation of each Strategic Roadmap begins by having the ISGP staff solicit opinions and recommendations from a broad selection of domestic and international S&T and policy experts concerning the (i) current realities, (ii) scientific challenges and opportunities, and (iii) policy issues associated with the general S&T topic.

The Strategic Roadmap presented here provides an outline of the issues considered to be of high priority with respect to evaluating the credible S&T options available to address the complex and dynamic issues related to FSSD. The continuously evolving nature of the issues associated with FSSD means that the ISGP Strategic Roadmap is also an evolving document. A key component of our effort to develop an accurate Strategic Roadmap is the convening of a Global Perspectives meeting with participation from senior government, private sector, and nongovernment representatives. The Global Perspectives meeting for FSSD will be convened on October 24, 2012, at George Mason University for a group of domestic and international representatives (via a series of video links to Rome, Italy, London, United Kingdom, Paris, France, and Brussels, Belgium).

The resultant Strategic Roadmap, describing the themes and agenda to be used in each ISGP conference on FSSD, is designed to assist governments and the private sector effectively initiate policies that appropriately commit limited human and financial resources.

Dr. George H. Atkinson
Founder and Executive Director
Institute on Science for Global Policy

Institute on Science for Global Policy Overview

Mission and rationale

- Many of the most significant geopolitical, economic, and security challenges for 21st century societies are directly related to the remarkably rapid and profound scientific and technological achievements of our time. Success in fostering safe, secure, and prosperous “knowledge-based” societies often reflects how well governments recognize the opportunities and risks associated with existing, emerging, and “at-the-horizon” science and technology (S&T), and how effectively governmental policies balance short- versus long-term issues. Unfortunately, the gap between science-based understanding and many political and governmental agendas remains large.
- To formulate and implement realistic policies and to guide societal investments of financial and human resources, governments increasingly require anticipatory S&T roadmaps based on “actionable decisions” derived from an accurate understanding of both the S&T advances and the global perspectives of their potential societal impact.
- The Institute on Science for Global Policy (ISGP) was established to operate directly with selected governments and at the center of an international network of outstanding academic institutions. The ISGP seeks to significantly improve the capability of governments to effectively bridge the increasingly critical nexus between S&T understanding and major societal issues that shape domestic and international policies in the 21st century.

Structure and process

- ISGP programs provide conference environments that promote the presentation of new ideas derived from credible scientific understanding and reflect both domestic and international perspectives. In this regard, ISGP programs can often be distinguished from more parochial activities that promote specific ideologies and/or political viewpoints. As a not-for-profit organization that does not lobby or advocate specific views, the ISGP seeks to help shape those policies that underpin the public credibility needed to support policies. These ISGP programs not only facilitate critical debates among the scientific and policy communities, but also foster public respect for the role of S&T in policy and support ongoing institutional commitments to incorporate globally credible S&T understanding into strategic public policies.
- Operationally, the ISGP focuses on attracting globally recognized S&T scholars, from a range of generations, to accurately describe S&T advances and to participate in critical debates with influential governmental and societal decision makers concerning how they can identify actionable policy decisions. ISGP conferences occur within not-for-attribution (Chatham House Rule) environments designed to promote the discussions needed to clarify areas of agreement and differences. These debates focus on creating the in-depth understanding of both the S&T options as well as the challenges attendant to formulating and implementing policies in increasingly global societies.
- ISGP programs use an unusual, if not unique, format based on multiple conferences and caucuses to address a specific S&T topic previously vetted as a priority with participating governments and societal institutions (several separate S&T topics are simultaneously investigated in different series of conferences led by different teams of ISGP staff).
- The ISGP is responsible for the selection of invited S&T presenters and the participants in each

conference. Each S&T expert invited by the ISGP to present at a conference must first write a three-page policy position paper identifying the central S&T issues, reasons why governments/societies need to be attentive (both in the short and long term), and potential “actionable decisions” together with their foreseeable consequences. These policy position papers are organized around three categories: current realities, scientific opportunities and challenges, and policy issues. All policy position papers are made available to all participants and other presenters prior to convening each ISGP conference, and are the focal points for all debates, discussions, and caucuses.

- The format of each ISGP conference almost exclusively involves questions to the S&T presenters as formulated by a largely policy-oriented audience. A 90-minute period begins with a short (5 minutes) statement by each presenter summarizing the views expressed in his/her paper. The policy audience is then given the remainder of the 90-minute period to discuss, question, and debate the S&T expert. The emphasis remains on debating credible S&T options from the policy makers’ perspectives to clarify understanding within to the largely nonspecialist audience.
- Toward the end of each conference, ISGP organizes two types of caucuses: one in small groups of 10-12, and one plenary session for all participants. Both are designed to identify any area of consensus and the related actionable next steps to be considered by government and the private sector in formulating and implementing policy.
- The in-depth understanding of existing, emerging, and “at-the-horizon” S&T derived from ISGP programs is anticipated to help shape public policy and to influence the allocation of the human and financial resources needed to address their impact on societies, both domestically and internationally.
- The long-term, enduring success of ISGP programs depends on the quality of participation from the global S&T and policy communities in government, academe, the private sector, and foundations.
- The policy perspectives gained from ISGP conferences are shared through the publication of reports that outline the debates that took place and the actionable next steps that were agreed upon.
- It is especially important to note that the ISGP is routinely invited to brief on the results of these conferences by governmental agencies and departments, private sector companies, and other societal institutions. Since the ISGP does not advocate or lobby for any specific position, these briefings are solely focused on communicating the collective views of those attending ISGP conferences.

Food Safety, Security, and Defense (FSSD)

Introduction

Food is one of the most important worldwide commodities, impacting each and every life on the planet through its availability, production, transport, and trade. The critical nature of our dependence on food is increasingly evident given the prediction that the world's population will increase from 6.8 billion to more than 9 billion by 2050. The addition of more than 2 billion individuals to the global population, in combination with changing dietary habits, is expected to require a doubling of the amount of food, feed, and fiber currently produced. As we approach 2050, the challenges in managing limited resources to support the ever-growing population will require improvements in available technologies and management policies. The safety, security, and defense of the food supply are increasingly globalized challenges. Food safety addresses actions aimed at ensuring that all food is as safe as possible from accidental contamination, while food defense focuses on preventing the intentional contamination of food products. Food security refers to access to sufficient, safe, and nutritious food for maintenance of a healthy life.

Today's global food supply chain presents a series of complex challenges in maintaining a safe and adequate food supply. Moreover, the global food supply chain is insufficiently understood, suggesting the need for more research at every level of production, from inputs at the farm to the final consumer. Numerous high-profile foodborne disease outbreaks, natural disasters that threaten food security, and the constant threat of those who would intentionally harm others, continue to underscore the fact that food is a vulnerable necessity.

There are numerous opportunities in this field, many centered on closing the gaps between policy and science, and the need for improved education and communication among all stakeholders, including producers, consumers, scientists, and policy makers. With the advancement of science, improved molecular diagnostics, and the development of such tools as risk assessments, a new paradigm is slowly being instituted to address the challenges of food safety, security, and defense (FSSD). A number of policy issues have been identified that are in need of urgent attention, including the differences in policy outlooks between the United States and the European Union on scientific issues (e.g., the use of genetically modified organisms).

FSSD Strategic Roadmap

In preparing this FSSD Strategic Roadmap, the ISGP staff has conducted interviews with numerous internationally recognized academic, government, and private sector experts to solicit their views and recommendations. Representing a diverse spectrum of expertise across FSSD, each person interviewed was asked to delineate the most important scientific and technological challenges and opportunities associated with FSSD, and to suggest governmental and societal policies that they would recommend to be considered for confronting these challenges. By interviewing numerous scientists and policy makers worldwide, the ISGP staff prepared a Strategic Roadmap that reflects diverse views concerning the current realities, scientific opportunities and challenges, and policy issues confronted by nations.

Although the experts interviewed came from a diverse range of backgrounds and held a diverse range of opinions, they consistently identified a similar set of thematic areas that needed to be examined. Collectively, these areas were identified as critical, both now and in the foreseeable future, in determining how scientific understanding, technological advances, and governmental and societal policies effectively address issues related to FSSD. Their observations and recommendations have been used by the ISGP to construct this FSSD Strategic Roadmap.

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ISGP Conference Topics for FSSD

Global Perspectives

This meeting, held in Washington, DC, with videoconferencing to London, Paris, Brussels, and Omaha, Nebraska, involved participation by senior policy makers from government and the private sector. At this meeting, the ISGP FSSD Strategic Roadmap was presented to stakeholders and discussed. The Strategic Roadmap was based on numerous interviews conducted by the ISGP with distinguished scientific experts from around the world. The observations and recommendations by subject-matter experts were organized by the ISGP into a series of FSSD conferences to be convened over a two-year plus period at venues worldwide. The initial FSSD conferences focus on five separate thematic topics:

Technologies and Innovations

An important element for progress in food safety, security, and defense is the appropriate use of existing technologies and the development and application of new ones. Innovation in this field ranges from agricultural production technologies (e.g., GPS-based harvesting), to procedures for post-harvest preservation (e.g., freezing, heat treatment, or irradiation), to more complex (and more contentious) applications such as genetic modification (GM) technology. Public concern and practitioner confusion about technologies and innovations often create barriers to their effective use. For technological innovations to be utilized successfully, scientists and policy makers need to ensure that societies around the world are willing to accept such technologies. Challenges exist in terms of funding for technology research; the uneven distribution of technologies, limited by financial resources of countries, companies, and producers; ensuring cost effectiveness; and public acceptance.

Food and Water

Over the coming decades, environmental change and population growth have the potential to profoundly affect the availability, nutritional content, and safety of the world's food supply. Predicting shifts in food nutrition, availability, and safety will require more complete scientific understanding of the extent and causes of environmental changes, and will require the use of innovative technological and scientific options. In particular, the use of water in food production, and the connected issues of availability, accessibility, and quality of water, will have major impacts on food safety and security. Particular challenges include the use of irrigated water for agriculture, the effect of climate change on water availability and extreme events such as drought and flood, the demand for water in livestock production, and the interaction between water quality and food safety.

Food and the Environment

Over the coming decades, environmental change has the potential to profoundly affect the availability, nutritional content, and safety of the world's food supply. Predicting the environmental impact on food with respect to agricultural production, nutritional value, integrated global supply chain, the incorporation of genomic technology, and geographical security will require more complete scientific understanding of the extent and causes of environmental changes, and will require the use of innovative technological and scientific options.

The Global Food Supply Chain

The increasingly globalized nature of the food supply chain, with ingredients and products being traded across the world, makes it exceptionally difficult to trace the source of intentional or accidental contamination. The need for such traceability and attribution raises many issues about the global regulation of the food supply and, especially, the vulnerability of complex supply networks to disasters and shortages. Because numerous countries are involved in a complex set of interconnected supply chains, each with their own regulatory frameworks and capacities, ensuring food safety and security has become a significant challenge. The increasingly globalized food supply chain has greatly expanded the issues that must be addressed with respect to FSSD including traceability and

attribution; resiliency and recovery; standards, guidelines, and regulations; and food defence against intentional contamination. In addition, food waste throughout the supply chain, both in pre-harvest and post-harvest stages, is a particularly important and relevant component that needs to be addressed.

Societal and Economic Context

Since many major food crops are considered commodities, they are traded in large quantities across the globe. For this and other reasons (e.g. the contribution of food to productivity and health), ensuring the availability of safe, nutritious food in sufficient quantities is inherently an economic issue. In addition, societal factors such as public health, dietary preferences, agricultural systems, and cultural practices play significant roles in influencing production and access to nutritious food and attitudes toward food safety. Any recommendations for improving food safety or security will need to account for these factors. Additionally, such recommendations will need to consider the potential for unintended socioeconomic consequences.

Tropical Agriculture

The Food and Agriculture Organization of the United Nations (FAO) estimates that, primarily because of insufficient supply and/or ineffective distribution, one in seven people worldwide currently suffer from hunger or malnutrition. Many of these people reside in tropical regions, especially in sub-Saharan Africa and Asia. It is anticipated that the hunger and malnutrition situation will worsen, due to rapid increases in demand, shifting dietary preferences, environmental changes and adverse weather events, ineffective government policies, higher demand for non-food use of crops such as biofuels, fragile and increasingly complex supply chains, increases in fuel and transportation costs, and rising commercial pricing. Emerging economies, especially those in the tropics in South America and Asia, will not be immune to the challenges faced by lower income countries, particularly because of competition between crops grown for food and those grown for biofuels, and the competition for land between food/fuel crops and natural habitats.

While each FSSD conference is based on one of these five thematic topics, it is recognized that there are overlapping aspects throughout and that conference topics over time could change as the need arises. Each of the initially proposed FSSD conferences is described in more detail below using current realities, scientific challenges and opportunities, and policy issues to illustrate the areas that can be anticipated to comprise the debates and discussions. New ideas are also likely to be raised as the conferences are organized and participants selected. In all cases, the ISGP seeks to develop an agenda that addresses the questions relevant to policy issues faced in each participating country as well as internationally.

ISGP FSSD Conference Schedule

Dates	Food Safety, Security, and Defense Focus	Proposed Location
October 24 2012	Food Safety, Security, and Defense Global Perspectives Meeting	George Mason University, Virginia (London, Brussels, Paris, Rome)
April 14-17 2013	ONE Focus on Technologies and Innovations	Verona, Italy
October 20–23 2013	TWO Focus on Food and Water	University of Nebraska, Lincoln, NE
October 5–8 2014	THREE Focus on Food and the Environment	Cornell University, Ithaca, NY
Spring 2015 (proposed)	FOUR Focus on the Global Food Supply Chain	Minnesota ²
Fall 2015 (proposed)	FIVE Focus on the Societal and Economic Context	Italy
Fall 2016 (proposed)	SIX Focus on Tropical Agriculture	Brazil

² Discussions underway with University of Minnesota

⁴ Discussions underway to coordinate with Expo 2015 in Milan, Italy

¹ Discussions underway with Brazilian Agricultural Research Corporation (Embrapa)

Technologies and Innovations: Proposed Agenda

Current realities

An important element for progress in examining the central issues related to FSSD is the appropriate use of existing technologies and the development and application of new ones. Innovation in this field ranges from agricultural production technologies, to procedures for post-harvest preservation, to more complex (and more contentious) applications such as genetic modification (GM) technology. Public concern and practitioner confusion about technologies and innovations often create barriers to their effective use. For technological innovations to be utilized successfully, scientists and policy makers need to ensure that societies around the world are willing to accept such technologies.

Scientific opportunities and challenges

- Multiple barriers prevent the full implementation of existing technologies for food production and processing. Of particular concern is ensuring that producers have adequate information and training to effectively utilize these technologies, especially in less affluent countries.
- New technologies must be affordable, scalable, and practical, as well as being able to be deployed in countries with varied levels of infrastructure, and by smaller producers.
- Advances have been made in research that allows the real-time detection of microbes using biosensors and nanoscience. However, development and distribution efforts are still required to produce products that can be used in commercial settings.
- Specific technologies to be considered include production technologies (e.g., GPS-based harvesting, GM technology, irrigation systems), post-harvest preservation (e.g., irradiation, heat treatment), and food safety applications (e.g. pulsed field gel electrophoresis).

Policy issues

- Establishing the appropriate balance between investment in the development of new technologies and the promotion of existing ones depends on the particular needs and context of any given food system.
- Despite many new technologies being developed for improved food production and food safety, the distribution of these technologies is uneven. There are particular challenges in ensuring access to beneficial technologies in less-affluent countries.
- Cost effectiveness and scalability are key considerations in developing new technologies. Because the production of new technologies for food safety may not always be in the economic interests of industry, ways to incentivize technological development must be considered.
- Policy makers need to consider the best ways to convey information about new technologies to the public in an accurate and timely manner, if their potential is to be maximized.

Food and Water: Proposed Agenda

Current realities

Numerous national and international bodies have declared climate change a reality, with the Intergovernmental Panel on Climate Change (IPCC) predicting that the temperature will rise between one and four degrees over the next century. Climate change, with its resultant environmental changes, is anticipated to have an even more important impact on food safety and the security of the food and water supply than is currently occurring. Concurrently, the global population is increasing at an unprecedented rate with a 9 billion global population predicted for 2050. Population increase, coupled with rapid urbanization in less-affluent countries, is leading to demands for a greater quantity and better quality of food and is concurrently increasing demands for scarce water resources. The combination of environmental changes and population growth has the potential to profoundly alter the availability of water, and consequently of food worldwide, and therefore endanger the entire global food supply system.

Scientific challenges and opportunities

The pressure to find and supply the water needed for both human consumption and agriculture is anticipated to increase as climate change alters precipitation patterns resulting in an increased frequency of either droughts or floods in different regions. Additionally, rising temperatures will result in increased demands for water for irrigation of crops and for evapotranspiration.

While climate change is problematic for both food safety and security since it can reduce agricultural productivity by exacerbating diseases in crops, livestock, and fish, there are credible scientific and technological options that can be employed to offset such an impact if used proactively.

Mitigating the impact of climate change on the food system requires developing technologically sound procedures to sustain the production and distribution of safe food under deteriorating environmental conditions. For example, minimizing the potential for damage to infrastructure (e.g., road networks) caused by the severe weather associated with climate change would help ensure that the distribution of food is not disrupted, particularly in less-affluent regions.

Since it is anticipated that climate change will lead to the appearance of new disease patterns and vectors for disease, the control of disease outbreaks and pests can be expected to require improved surveillance methodologies.

Many of the regions experiencing the highest levels of food insecurity (e.g., sub-Saharan Africa) also suffer from unreliable, inadequate, or overstressed water resources that often limit the potential to significantly increase agricultural yields. In addition, urbanization in these countries is diverting increasing amounts of water to cities and away from agriculture.

Current levels of food production rely heavily on using inorganic fertilizers, mostly derived from finite natural sources (e.g., fossil fuels) using large amounts of energy. Sustaining increased food production, as well as organic methods, requires alternative fertilizers and production methods.

Policy issues

Given water's critical role in for both food and energy production, it is essential that research and policy on food safety and security puts issues related to water security as a central focus.

Policies related to improving the resiliency of the food supply system associated with the potential

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risks of environmental changes need to consider public-private partnerships and the increased involvement of farms, civil society, and community organizations.

Since many in developing nations (e.g., 70% of sub-Saharan Africans) rely on agriculture as a primary source of income, the negative impact of climate change on agriculture can burden such groups disproportionately and require an international effort to mitigate the human and security consequences.

Since water governance around the world is often piecemeal and uncoordinated, attention needs to be paid to ensuring that more harmonized systems are established both within and between countries.

The policy debates concerning how climate change will affect food security must include interdisciplinary forums with the scientific community, the public, and an international cross-section of those who influence both domestic and global policies.

Food and the Environment: Proposed Agenda

Current realities

Numerous national and international bodies have declared climate change a reality, with the Intergovernmental Panel on Climate Change (IPCC) predicting that the temperature will rise between one and four degrees over the next century. Climate change, with its resultant environmental changes, is anticipated to have an even more important impact on food safety and the security of the food supply than is currently occurring. Concurrently, the global population is increasing at an unprecedented rate with a 9 billion global population predicted for 2050. This population increase, coupled with rapid urbanization in less-affluent countries, is leading to demands for both a greater quantity and better quality of food. The combination of environmental changes and population growth has the potential to profoundly alter the availability and nutritional content of food worldwide and therefore endanger the entire global food supply system.

Scientific challenges and opportunities

- While climate change is problematic for both food safety and security since it can reduce agricultural productivity by exacerbating diseases in crops, livestock, and fish, there are credible scientific and technological options that can be employed to offset such an impact if used proactively.
- Mitigating the impact of climate change on the food system requires developing technologically sound procedures to sustain the production and distribution of safe food under deteriorating environmental conditions. For example, minimizing the potential for damage to infrastructure (e.g., road networks) caused by the severe weather associated with climate change would help ensure that the distribution of food is not disrupted, particularly in less-affluent regions.
- Since it is anticipated that climate change will lead to the appearance of new disease patterns and vectors for disease, the control of disease outbreaks and pests can be expected to require improved surveillance methodologies.
- The pressure to find and supply the water needed for both human consumption and agriculture is anticipated to increase as climate change alters precipitation patterns resulting in an increased frequency of either droughts or floods in different regions.
- Current levels of food production rely heavily on using inorganic fertilizers, mostly derived from finite natural sources (e.g., fossil fuels) using large amounts of energy. Sustaining increased food production, as well as organic methods, requires alternative fertilizers and production methods.

Policy issues

- Policies related to improving the resiliency of the food supply system associated with the potential risks of environmental changes need to consider public-private partnerships and the increased involvement of farms, civil society, and community organizations.
- Since many in developing nations (e.g., 70% sub-Saharan Africa) rely on agriculture as a primary source of income, the negative impact of climate change on agriculture can burden such groups disproportionately and require an international effort to mitigate the human and security consequences.

- The policy debates concerning how climate change will affect food security must include interdisciplinary forums with the scientific community, the public, and an international cross-section of those who influence both domestic and global policies.

The Global Food Supply Chain: Proposed Agenda

Current realities

The globalizing nature of the food supply chain, with ingredients and products being traded across the world, makes it increasingly difficult to trace the source of intentional or accidental contamination. Additionally, it raises many issues about the global regulation of the food supply and the vulnerability of complex supply networks to disasters and shortages. The rapidly increasing number of countries involved in interconnected supply chains, each with their own regulatory frameworks and capacities, makes efforts to ensure the safety of food and adequacy of its supply significantly more difficult each year.

Scientific opportunities and challenges

- The timely and accurate identification of foodborne pathogens that are attributable to disease outbreaks remains a major challenge to detecting, mitigating, and preventing infectious diseases.
- Given the complexity of the global food supply chain, tracing the ingredients and products that are associated with a specific disease outbreak is an increasingly serious limitation to mitigating its impact on worldwide populations.
- The varying degree to which different countries, companies, and industries can ensure food safety and/or recover from foodborne disease outbreaks undermines the overall reliability of the integrated global food supply chain. The technological and policy opportunities to strengthen both the resiliency and recovery capacities throughout the food supply chain require urgent attention.
- The complexity of the globalized food supply chain, with respect to the large number and wide geographical locations of suppliers, presents significant barriers to the prevention of intentional food contamination (food defense).
- The wide use of “just-in-time” delivery models requires the application of more sophisticated and integrated storage, logistics, and transport systems to improve the resiliency of a timely and reliable food supply worldwide.

Policy issues

- Significantly greater harmonization of the standards, guidelines, and regulations for FSSD are required across industries and countries, while recognizing the varied resources available to different businesses and countries.
- The conflict between differing economic and health consequences in different countries and regions concerning foodborne disease information (e.g. early animal disease notifications) must be reconciled if efforts to mitigate and prevent disease outbreaks are to be effective.
- The increasing reliance of more affluent countries on imports from countries with limited resources intensifies FSSD challenges and raises ethical and economic issues.
- Given that the intricacies of private sector sourcing networks and their impact on common food products are often not publicly recognized, more effective communication between the public and food companies can help develop more effective FSSD policies.

Societal and Economic Context: Proposed Agenda

Current realities

Throughout the food supply chain many major crops are treated as commodities and traded in large quantities worldwide. As a consequence, the provision of safe, nutritious food in sufficient quantities to maintain a healthy population is inherently an economic issue. Many other factors that define societal priorities such as dietary preference, agricultural systems, and cultural practices contribute significantly to how these economic systems are organized and how well they influence production, access, and attitudes to food. All these factors need to be considered if the broad public support needed to support the implementation of new FSSD policies is to be obtained.

Societal and economic challenges and opportunities

- Changing priorities affecting consumption and dietary patterns over recent decades are creating numerous technological challenges for both food safety and security, especially with respect to the growing urban middle classes in less-affluent countries that demand larger quantities of high-quality food.
- In more-affluent countries, the increasing desire to consume fresh, organic, and minimally processed foods presents new technological challenges for managing the harmful pathogens often found in conventionally processed foods and educational challenges for more effectively educating consumers about the risks associated with these foods.
- The often negative and cautious views consumers have of emerging technologies (e.g., genetically modified engineering and irradiation) require that new, more effective approaches be used to better inform the public on how these technologies can significantly improve food safety, security, and defense without increasing health risks.
- Given the strong, established influence of sociocultural mores on food-related behaviors, it cannot be assumed that credible educational messages will necessarily change food safety practices on the farm or at an individual level. Expertise from the risk communication community can be used to improve public acceptance of technologies and policies designed to improve food safety.
- It is recognized that implementing new technologies and policies on FSSD may have unintended socioeconomic and ethical consequences that could hinder public acceptance.

Policy Issues

- Strategies that accurately convey risks from food to policy makers and the public need to address the mismatch between the consumer's view of risk (e.g., food additives) and what science considers risk (e.g., pathogens in fresh food).
- It is essential that the primarily political and economic priorities used in the globalized food system of production and trade be minimized with respect to FSSD issues (e.g., products or technologies shown to be safe are banned ostensibly as a food safety measure).
- Ensuring effective policies for FSSD in the globalized, interdependent food supply chain requires strong linkages and information sharing among governments and the private sector.