

# EDUCATION AND PRODUCTION

## Symposium: Agro-Terrorism: Biological Threats and Biosecurity Measures

### Food Security Issues—A Potential Comprehensive Plan

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**ABSTRACT** The need for a comprehensive plan to protect the food production system has emerged as a critical issue over the last several years. To address this need, a comprehensive food security plan has been developed at Auburn University. The proposed program, entitled the Consolidated American Network for Agriculture Resource Intelligence (CANARI) system is one of several systems being proposed to deal with potential agricultural bioterrorism or agroterrorism events. Unlike other systems, which hastily emerged in many agencies after the tragedy of September 11, 2001, the system has been planned over the last 5 yr with the input of the agricultural industries, is comprehensive in its conception, and is designed to coordinate all components (existing and planned) necessary to prevent, detect, and respond to potential agroterrorism events. The plan uses the principle that the first line of defense must be within the states and agricultural companies for the detection of agroter-

rorism incidents to be rapid and the response effective, organized, and timely. CANARI is designed to integrate the previously disparate elements by fostering a cooperative network of local, state, and federal agencies as well as commodity entities and interested non-governmental organizations. Using a market-driven approach, the system encourages commodity membership and cooperation through positive incentives rather than regulatory duress. A centralized command structure is envisioned, which would be provided through the creation of a National Agroterrorism Defense Center. The responsibility of this Center would be to coordinate all of the activities presently available in components at the local, state, and federal levels and develop and manage new and emerging activities provided by the stakeholders. CANARI offers a new paradigm by which all of its constituent members act collectively and cooperatively to lessen the risk of an attack and better ensure the continued availability of a safe, abundant, and economical food supply.

*(Key words: food supply, agricultural bioterrorism, product safety)*

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## INTRODUCTION

Animal agriculture in the United States is the envy of the world, because of its ability to provide a safe and economical source of protein. The economy of these products is based on the abundance of animals made possible through vertical integration and industrialized agriculture. Product safety is also a benefit of integrated agriculture, the result of company-imposed quality assurance programs acting in concert with federally mandated inspection and standards. Collectively, agricultural industrialization and governmental oversight have significantly reduced to potential for consumers encountering

bacterial contamination or chemical adulteration in the food supply.

Recent events have made clear the United States is a potential target for terrorist activities designed to kill Americans, destroy critical infrastructures, and destabilize the government. Serious concerns have been raised as to whether agriculture in the United States could be a potential target for terrorists. Other concerns have been raised as to whether the government is ready to adequately respond to such emergencies.

Presently, many of the responsibilities for response to potential agriculture terrorism or agroterrorism events are scattered among multiple federal agencies, as well as states, which serve as the first line of detection and initial containment. In an effort to facilitate improved capabili-

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**Abbreviation Key:** APHIS = Animal and Plant Health Inspection Service; CANRI = Consolidated American Network for Agriculture Resource Intelligence.

ties by all stakeholders, a cooperative and coordinated detection and response network is proposed. The system, called the Consolidated American Network for Agriculture Resource Intelligence (CANARI) is designed to utilize the strengths found at the state and federal levels to foster a proactive approach aimed at prevention, coupled with a more efficiently coordinated system for detection and response to potential events. In its genesis, CANARI offers a new paradigm that furthers the quest for better security in animal agriculture, thereby better assuring the continued availability of a safe, secure and economical food supply.

## AGRICULTURE AS A POTENTIAL TARGET

Agriculture has undergone tremendous changes, particularly since the introduction of industrialized practices, which first emerged in animal agriculture following the Second World War. With these changes in agriculture has also come an evolution in the interaction between the food producer and consumer. This evolution of thought has had profound effects, some negative, on many facets of our society including the emergence of consumer naïveté, as exemplified by proposed legislation aimed at actually reducing the level of abundance, rather than ensuring its continuation or even expansion. Consumer meat products found in the supermarket come from once-living animals. Those in agriculture understand that relationship, whereas the average consumer increasingly does not, making them more vulnerable to the mistaken belief that food will always be available. Coupled with the emergence of sophisticated state-sponsored terrorist groups and well-financed and politically influential animal rights and vegetarian-motivated organizations, these trends have collectively made agriculture more vulnerable to exploitation by those who would seek to end animal agriculture, disrupt our society, or destroy the United States by causing widespread hunger or starvation.

Agriculture is one example of what can be called a critical infrastructure, or a system without which our society cannot function. Unfortunately, agriculture is not universally recognized within all governmental agencies as warranting such a designation. The contribution of agriculture to the overall economy is, however, undeniable and includes over \$1 trillion per year or approximately one-sixth of the gross domestic product. Serving as the nation's largest employer, it includes one out of eight Americans, who are involved in food production, distribution, or sales (Parker, 2002). Being a complex system of many interlocking subsystems, animal agriculture is subject to disruption at many points, including maintenance of genetic stocks, replacement animal production and distribution, live animal production, feed ingredient transportation, feed production and distribution, animal transportation and processing, further processing, finished product storage, and wholesale and retail transportation and sales.

The system is essentially a pipeline, and interference at any point inevitably leads to partial or total disruption

of the end supply for the consumer. Within agriculture, the more integrated the subsystem, the more vulnerable it becomes to disruption and the greater the need for maximized and systematized vigilance to ensure that disruption is less likely to occur or is more easily detected and more efficiently responded to.

## WHY AGRICULTURE?

The world that has emerged since September 11, 2001, is one very different from that previously experienced in the United States. Where once the communism was the model of threat for Americans, what is perceived now is a less defined, more diverse and nebulous enemy that may be more than just "over there." Where once there was comfort taken in the security of "Fortress America," the new reality is a clearer understanding that terrorism is capable of being world wide in its reach. With that new reality has also come the realization that some of our society's most dangerous enemies may be already "among us" or in the earlier cases of Timothy McVeigh (responsible for bombing the Federal Building in Oklahoma City, Oklahoma) or Robert P. Hanssen (a spy, formerly a member of the Federal Bureau of Investigation) may even be "home grown." "Once faced with armies, United States citizens are increasingly encountering real or potential adversaries whose main goal is to cause the United States pain and suffering, rather than to achieve traditional military objectives" (Tenet, 2002). As part of the need for understanding our changing role, new concepts are needed to better explain the "new way of doing business."

One such concept that has emerged is that of asymmetric targeting, which was developed among United States military theoreticians in the early 1990s. Asymmetric targets or assets are those targets that by their very makeup are untraditional and unexpected, poorly defended, and highly leveraged. Once disrupted, asymmetric assets are not easily made functional again, nor are the damages easily contained, because they contain "force multipliers" that cascade the damages to other collateral elements not directly targeted. For American military planners, even though agriculture has all of the characteristics of an asymmetric asset, it has not traditionally been considered a likely first strike exploitable target in war. This stance is particularly troubling given recently emerged intelligence revealing the scope of the former Soviet Union programs specifically targeting agriculture. These data have indicated that at its height "anti-livestock" and "anti-agriculture" research programs involved "as many as six agricultural research centers and up to 10,000 scientists and technicians" (Warrick, 2002).

## THE SCOPE OF THE PROBLEM

All emergencies, regardless of their eventual outcome, start as local problems. Should one occur in animal agriculture, (for example large-scale mortality in an integrated animal production system), the first layer of recog-

nition and response is the local producer or farmer. From this level of responsibility, contact would be made with company representatives, who would then respond either directly by sending live production supervisory personnel or indirectly through the auspices of contracted local or company veterinarian(s). After assessment, if deemed appropriate, a response would begin, most likely accompanied by removal of dead animals and administration of situation-specific and appropriate medication(s) and vaccinations. A sampling of moribund animals and dead animals would most probably be taken to the designated agency within the state responsible for veterinary diagnostics.

Once definitive diagnosis had been made, state, and federal law could if appropriate mandate a greater response. Should the disease outbreak be technically or legally beyond the regulatory responsibility of the state veterinary system, such as would occur if a disease were classified as a "foreign animal disease," (e.g. foot and mouth disease, bovine spongiform encephalopathy, or highly pathogenic avian influenza), the state veterinary laboratory system or leadership responsible for agriculture would refer the case to the state or regional USDA-Animal and Plant Health Inspection Service (APHIS) Veterinary Medical Officer. Upon referral, USDA-APHIS would assess the situation and if deemed appropriate, activate the Emergency Programs system, which would respond with federally sponsored equipment and massive numbers of personnel.

Other federal agencies that could have secondary roles in the response would include the Commerce Department, Environmental Protection Agency (EPA), Federal Emergency Management Administration (FEMA), and the USDA-Food Safety Inspection Service (FSIS).

In the case of an actual terrorist attack on animal agriculture, the lead agency from the legal, evidence-gathering perspective would be the Federal Bureau of Investigation, who in turn would defer all aspects of the animal disease response as well as some aspects of evidence gathering responsibility to USDA-APHIS. The same secondary agencies that would respond to natural disease outbreaks would also respond to this type of event. Joining them in this lesser role would also be the various intelligence agencies, who would be tasked to help determine the origin of the attack.

In theory, the system should work efficiently, and given a reportable disease such as avian influenza, the federal response has and should be expected to be massive. Given, however, the vagaries of state politics, infrastructure, and personnel, the system unfortunately does not always work as efficiently as envisioned in state and federal emergency plans. As has been witnessed in both recent and more distant examples of outbreaks in the commercial poultry industry, delays should be considered the norm. With delays should also be expected the expansion of the geographical area affected and the size of the eventual negative economic impact.

One particularly troubling aspect of potential agricultural bioterrorism incidents is the high probability of well-

orchestrated, multifaceted attacks that would cross commodities or geographical boundaries and possibly use animals as a vector for transmitting human disease. Such scenarios are as yet not clearly addressed in existing emergency plans at the state or federal level. It also seems unlikely that adequate resources are presently available for simultaneous responses to such multiple-point attacks. Particularly troubling are scenarios, which envision attacks at rural, industrial, and urban interfaces, such as could occur should an attack be made in an agricultural region also containing substantial industrial complexes or large facets of population.

An example of the potential for collateral damage in an agroterrorism event can be observed in a study conducted at Auburn University in which a scenario was developed to determine the potential economic impact on food processing employees, sales, and transportation operations. In the scenario, a simultaneous attack was projected for both regions of Alabama, which contain poultry, thereby eliminating all transportation and processing activities within and between those areas. In the scenario it was determined over 30,000 employees could eventually be affected by unemployment, with a projected direct cost to the state of \$30 million per month and an overall economic impact (using an economic multiplier of 4) exceeding \$120 million per month. It was also determined that if the scenario were expanded to encompass a wider geographic area, such as could occur were the attack on a regional or even national basis, the effect could be devastating.

Presently, over 24 million people are employed in agriculture or allied industries in the United States. If for example 10% of these employees (2.4 million people) were affected by the loss of employment, using an average unemployment payment of \$1,000 per month, the total projected additional cost to the affected states in unemployment would be \$2.4 billion per month, with a total economic impact (economic multiplier of 4) calculated to exceed \$9.6 billion per month. If such a scenario were to occur, states could not be expected to have the additional financial resources to respond adequately, leaving most of financial burden to the federal government.

## CANARI AS A SYSTEM

The CANARI system is one of several systems being proposed to deal with potential agricultural bioterrorism or agroterrorism events. Unlike other systems, which hastily emerged in many agencies after the tragedy of September 11, 2001, the system has been planned over the last 5 yr, is comprehensive in its conception, and is designed to coordinate all components (existing and planned) necessary to prevent, detect, and respond to potential agroterrorism events (Table 1).

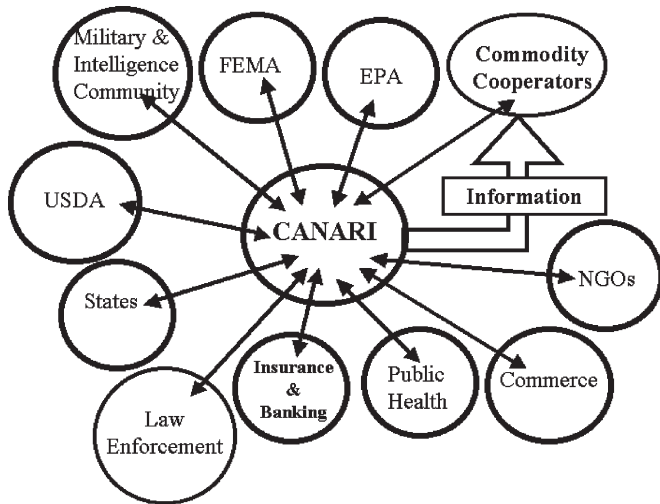
From the beginning, the operational goal of the CANARI system has been to design a system that could detect and identify, contain, and control agricultural emergencies, with the express intent of lessening the interval between identification at the local and state level

**TABLE 1. Consolidated American network for agriculture resource intelligence (CANARI)—the nexus for...**

Detection/identification and response
Education/training and outreach
Risk assessment/risk abatement
Risk assessment/risk abatement
Unified intelligence analysis and dissemination
Operations security analysis and implementation
Indemnity coordination and management
Farm-to-fork trace back

and the eventual federal response. Rather than a “top-down” approach, as presently envisioned by the USDA, CANARI takes a “bottom-up” approach in which commodity, local, and state personnel are considered, equipped, and trained to be the first line of defense. In recognizing the importance of these individuals, the plan proposes dramatically increasing the number of trained and equipped individuals at the sites of potential events, thereby providing “more eyes and ears at ground zero.”

The CANARI system is designed to integrate the previously disparate elements by fostering a cooperative network of local, state, federal agencies as well as commodity entities and interested non-governmental organizations (Figure 1). Using a market-driven approach, the system encourages commodity membership and cooperation through positive incentives rather than regulatory duress. In the plan, commodity “cooperators” are encouraged to join through the positive influences of wholesale and retail end users or through financial incentives provided by insurance carriers and financial organizations. Encouragement is also garnered through internal corporate desires to better ensure brand integrity or even create new premium niche “quality-assured” consumer products. By using such an approach, industry trade organizations can also be expected to encourage cooperation with CANARI as part of membership requirements.



**FIGURE 1.** Organizational chart for the proposed consolidated American network for agriculture resource intelligence (CANARI) system. FEMA = Federal Emergency Management Administration; EPA = Environmental Protection Agency; NGOs = Non-governmental organizations; Commerce = United States Department of Commerce.

## CANARI OPERATIONAL COMPONENTS

The proposed model is designed to coordinate operational objectives across component boundaries. A centralized command structure is envisioned that would be provided through the creation of a National Agroterrorism Defense Center. The responsibility of this Center would be to coordinate all of the activities presently available in components at the local, state, and federal levels and develop and manage new and emerging activities provided by the stakeholders. Having the “power of the purse” in areas related to agroterrorism defense and response, the CANARI system director would be responsible for oversight of multiple-agency functions, so as to maximize timely development of an adequate detection, identification, and response infrastructure.

Using the concept of a proactive approach, the director would be responsible for oversight in the development of detection and response strategies and infrastructure. Specifically proposed within this context of a proactive approach is the creation of a data archive and retrieval system, by which all member agencies could share baseline observations, research, and clinical data using a secure communications system. Such a database would be the first step in providing a truly integrated “farm-to-fork” trace back system, which could serve in the realm of traditional food safety program development and agroterrorism incident detection.

## PROPRIETARY INFORMATION EXCHANGE THROUGH CANARI

In order to assure the cooperation of commodity groups with the CANARI system it would be necessary for any microbiological data gathered from private companies to be protected from Freedom of Information scrutiny and yet still be made available in a form useful to the government and by the courts in the case of potential litigation.

In recognition of this difficult balancing act, the CANARI plan contains the proposed establishment of a privately funded national tracking center, which would serve as an intermediary for the transfer of microbiological samples originating from private entities to government laboratories and databases. The tracking center would receive isolates from commodity members, code the samples with an accession number in such a way to protect the originating source, and pass the coded sample to the appropriate CANARI laboratory. The advantages of this approach are twofold. First, being privately funded, information available in the national tracking center would not be subject to Freedom of Information suits, although the information would be available by subpoena if litigation were involved. This approach is thought to be one that would encourage commodity support by offering some degree of protection for proprietary information or other exploitable information. Second, this strategy offers the advantage of providing microbiological isolates to governmental scientists that otherwise

## Mode of operation: Normal

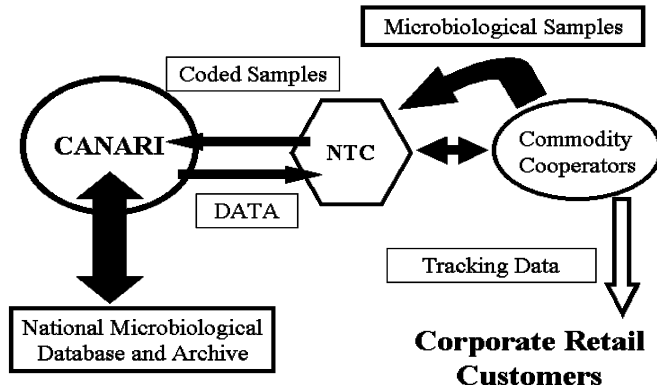


FIGURE 2. Operational mode for normal function of database communications proposed in the consolidated American network for agriculture resource intelligence (CANARI) system plan. NTC = national tracking center.

would not be available, thereby facilitating development of better baseline data.

## NATIONAL MICROBIOLOGICAL DATABASE AND ARCHIVE LABORATORY

The CANARI plan contains the proposed establishment of a governmentally sponsored laboratory or national microbiological database and archive laboratory. This laboratory, which would again be under the direction of the CANARI system director would be responsible for receiving microbiological isolates from the national tracking center, developing data from the isolates, and returning the information to the national tracking center for dissemination to the originator of the isolates. Specific targets for data would include identification of the isolates to the species, subspecies, and strain level; development of genomic constituent information; and in the case of bacterial isolates, antimicrobial-resistance profiles.

More specifically, baseline data would be developed to determine what are normal constituents, both as species and genomic components given their specific source (live production, processing plant, diagnostic laboratory, etc.). Once available, baseline data would be used to develop algorithms, which would be included in the database so that aberrant data would enable the system to notify the appropriate member agencies of a potential emergency.

As long as the collected isolates yielded data indicating no unusual serotypes or aberrant genomic components, the national tracking center would receive, in exchange for isolates, reports containing data that could then be returned to the original (and as far as the government is concerned, anonymous) commodity submitter to be used as a part of their food safety programs (Figure 2). If, however, an isolate were received that contained aberrant genomic elements (e.g., genomic elements indicating the insertion of a toxin gene or other indication of genomic

## Mode of operation: Alarm

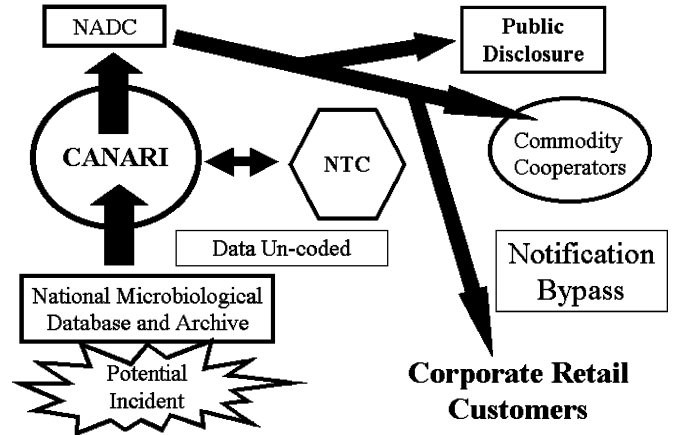


FIGURE 3. Operational mode for alarm function of database communications proposed in the consolidated American network for agriculture resource intelligence (CANARI) system plan. NTC = national tracking center.

tampering), then the database algorithms would cause the system to move into an alarm mode, which would in turn cause the national tracking center to immediately be notified of the situation. The center would then respond by simultaneously notifying the original commodity submitter of the potential emergency and reveal the originator's identity to the CANARI system. In this way, an appropriate governmental response could begin immediately (Figure 3).

## COMMODITY INVENTORIES AND SECURITY PLAN DEVELOPMENT

Security is an issue that is increasingly receiving attention by end users of commodity products. Rather than just being concerned with food safety issues, wholesalers and retailers are also becoming concerned about assurances that agricultural products have not been intentionally contaminated or adulterated. In recognition of this, the proposed CANARI plan incorporates the strategies of operations security (OPSEC). Specifically, the plan includes a coordinated strategy for identifying the critical components within the food production systems, assessing the threats and vulnerabilities, and assessing the risks. In close relation to these concepts are included procedures by which Security Analysis and Risk Assessment Programs (SARAP) are designed to meet specific company security needs. Combined, these efforts will increase the difficulty by which an attack can be carried by potential adversaries.

## INTELLIGENCE DATA AND PLAUSIBLE THREAT DISSEMINATION

Another aftermath of the September 11, 2001, attack has been the realization by many governmental officials that critical intelligence data are often not disseminated

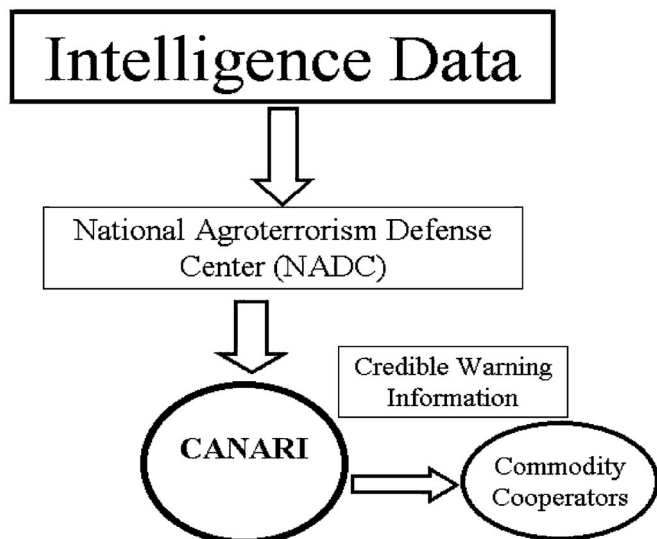


FIGURE 4. Operational dissemination of agriculturally related intelligence data as proposed in the consolidated American network for agriculture resource intelligence (CANARI) system plan.

by intelligence agencies to those who might need to know. Based on concerns for compromising sources and methods, credible threat warnings are often not passed down to state and local officials. An example of this can be observed in the recent revelations of credible threats of nuclear weapons being moved by terrorists into the New York City area, following the attack on the World Trade Center. Although proven false, neither the mayor nor the governor of New York was advised as to the potential threats. The CANARI plan solves this deficiency by providing a nexus by which agriculturally related intelligence could be analyzed and credible warnings disseminated (Figure 4).

By using existing intelligence agencies, the proposed national agroterrorism defense center would be charged with responsibility for analyzing intelligence data and

developing threat analyses. The director of the center would likewise be charged with the responsibility of disseminating the developed risk assessments to the appropriate local, state, and federal officials needing that information. In this manner “sanitized data,” minus any information indicating sources or methods can be given to the appropriate government or company officials that would be required to respond, should an incident actually occur.

In conclusion, no one can predict every scenario that could threaten any system as complex as animal agriculture. As new defenses are developed, new threats and vulnerabilities will emerge. As the threats emerge, continued vigilance must become “the norm,” with new emphasis being made on discerning their changing character and adopting new methods to combat their destructive potential. Not every attempt at stopping attacks will be successful. Agriculture, like other facets of our critical infrastructure, can fall prey to aggression by our adversaries. Having recognized this new reality, our society is inexorably led to the need for a rapid and efficient detection and response system. The CANARI proposal addresses all aspects of dealing with an increasingly hostile enemy wishing to disrupt or destroy our food production system. Together, CANARI offers a new paradigm by which all of its constituent members act collectively and cooperatively to lessen the risk of an attack and better ensure the continued availability of a safe, abundant, and economical food supply.

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