

Agroterrorism and Global Warming: Risks and Mitigation

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Abstract

Agroterrorism poses a significant threat to global food security, public health, and economic stability. It involves the deliberate introduction of pathogens, contaminants, or biological agents into agricultural systems with the intent to cause disruption, economic losses, and social instability. The increasing effects of global warming exacerbate these risks by altering pathogen transmission patterns, expanding the range of zoonotic hosts, and creating more favorable conditions for foodborne diseases such as Salmonella. This paper examines the intersection of agroterrorism and climate change, highlighting the vulnerabilities of modern agricultural infrastructure to bioterrorist threats. Additionally, it discusses historical cases, risk mitigation strategies, and the role of biosecurity measures in preventing agroterrorist attacks. Strengthening surveillance, improving regulatory frameworks, and enhancing preparedness measures are crucial to mitigating the dual threats of agroterrorism and climate change.

Keywords: Agroterrorism, Bioterrorism, Food Security, Global Warming, Climate Change

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INTRODUCTION

Agroterrorism is defined as the deliberate introduction of an animal or plant disease for the purpose of generating fear, causing economic losses, or undermining social stability. Agroterrorism can be used as a tactic to attack the economic stability of the United States. The consequences of an agroterrorism attack can be very large, especially if animal diseases can spread to humans. Therefore, it is important to be careful and prepared for the agroterrorism threat (Cupp et al., 2004)

AGROTERRORISM: DEFINITION AND THREATS

Examples of Agroterrorism Threats

Some examples of agroterrorism threats are:

- The deliberate introduction of animal or plant diseases that can cause devastating effects on the agricultural sector and the food supply. For instance, foot and mouth disease (FMD) can infect cattle, sheep, pigs and other cloven-hoofed animals and cause high mortality and reduced productivity (Rohr et al., 2019).

- The intentional contamination of food products with biological agents that can cause illness or death in humans. For example, salmonella, E. coli, anthrax, botulism and ricin are some of the potential agents that can be used to taint food (Savary et al., 2012).
- The malicious use of chemical or radiological agents to harm crops, livestock or food processing facilities. For example, pesticides, herbicides, fertilizers, explosives or radioactive materials can be used to damage or destroy agricultural resources or infrastructure (Nicolopoulou-Stamati et al., 2016).
- The exploitation of natural disasters or outbreaks to amplify the impact of agroterrorism. For example, terrorists can take advantage of droughts, floods, fires, storms or existing epidemics to spread diseases or contaminate food more easily (Yeh et al., 2012).

GLOBAL WARMING AND ITS EFFECTS ON FOOD SECURITY

According to a new WHO/Europe report, global warming has an impact on animal-mediated diseases, such as zoonoses and diseases caused by antimicrobial-resistant pathogens and unsafe food. Climate change and rising temperatures lead to the spread of zoonotic hosts and vectors, increasing the human population that is exposed to vector-borne diseases (Caminade et al., 2018). The CDC also warns that climate change increases the risk for health threats such as salmonellosis. However, I could not find any direct evidence that global warming causes an increase in Salmonella poisonings in the European Union (Tegegne et al., 2019).

Salmonella and Climate Change

According to the European Food Safety Authority (EFSA), Salmonella is a common cause of foodborne disease outbreaks in the EU, and over 91,000 salmonellosis cases are reported each year. The EFSA also says that EU coordinated control programmes for Salmonella have been a major success story, as the number of human cases dropped from more than 200,000 in 2004 to less than 90,000 in 2014 (Ehuwa et al., 2021). However, the latest annual report on zoonotic diseases by EFSA and ECDC shows that salmonellosis was still the second most reported zoonotic disease in the EU in 2020, affecting around 88,000 people (Stede et al., 2018). In a scientific paper published in 2004 by Kovats et al. that investigated the relationship between environmental temperature and reported Salmonella infections in 10 European populations (Akil et al., 2014). The paper found a linear association between temperature and the number of reported cases of salmonellosis above a threshold of 6 degrees C. The paper also suggested that higher temperatures around the time of consumption are important and reinforce the need for further education on food-handling behaviour. However, the paper did not directly attribute the increase in Salmonella cases to global warming, but rather to seasonal variations in temperature (Kovats et al., 2004).

According to the Intergovernmental Panel on Climate Change (IPCC), global warming is likely to increase the frequency and intensity of hot extremes, heatwaves and heavy precipitation events. These changes may affect the seasonal patterns of temperature and precipitation in different regions of the world (Myhre et al., 2019).

However, there are also other factors that influence seasonal variations, such as natural variability, ocean currents, atmospheric circulation and solar activity. Therefore, it is

not easy to isolate the effect of global warming on seasonal temperature changes (Trenberth et al., 2014). Do you have any questions or comments about this topic?

Agroterrorism is a subset of agrocrime, which is an unlawful act or omission concerning animals or animal products that violates legislation and has negative consequences on animal health, public health, food safety or national security. Agroterrorism is the deliberate introduction of a disease agent or toxin into livestock, poultry, crops or food products with the intent to cause harm, fear, economic losses or social disruption. Salmonella is a bacterium that can cause food poisoning and can be used as a potential agroterrorist weapon (Wilson et al., 2000). There have been some historical cases of agroterrorism using Salmonella, such as the 1984 Rajneeshee bioterror attack in Oregon, where followers of a cult contaminated salad bars with Salmonella typhimurium to influence a local election. However, there are also many challenges and limitations for using Salmonella as an agroterrorist weapon, such as the availability of effective detection and surveillance systems, the variability of environmental conditions and host susceptibility, and the ethical and legal implications of such an act (Vinayaka et al., 2019).

THE RELATIONSHIP BETWEEN AGROTERRORISM AND CLIMATE CHANGE

Agroterrorism and global warming are two interrelated issues that affect the agricultural sector and the food supply. Some of the possible connections are:

- Global warming can increase the vulnerability of crops and livestock to diseases, pests, droughts, floods and heat stress. This can make them more susceptible to agroterrorism attacks or amplify their consequences.
- Global warming can also create opportunities for agroterrorism by altering the distribution and transmission of pathogens, expanding the range of potential targets, and increasing the availability of biological agents.
- Agroterrorism can contribute to global warming by releasing greenhouse gases from animal carcasses, burning crops or forests, or disrupting carbon sequestration in soils (Sazvar et al., 2018).
- Agroterrorism can also exacerbate the effects of global warming by causing food insecurity, malnutrition, poverty, migration, conflict and social unrest.

Some examples of agroterrorism and global warming impacts are:

- In 2019, historic flooding in the Midwest caused by heavy rainfall and snowmelt damaged crops, livestock, infrastructure and soil quality, resulting in billions of dollars in losses for farmers and disrupting food supply chains.
- In 2020, devastating wildfires in California, Oregon and Washington, fueled by drought and high temperatures, destroyed millions of acres of farmland, forests and vineyards, killed thousands of animals, and contaminated food and water with smoke and ash.
- In 2021, a massive cyberattack on JBS, the world's largest meat processor, forced the company to shut down some of its plants in the US, Canada and Australia, affecting the supply and prices of beef, pork and poultry.

- In 2022, a new strain of African swine fever (ASF), a highly contagious and deadly disease that affects pigs, emerged in China and spread to other countries in Asia and Europe, threatening the global pork industry and raising concerns about food security (Mishra et al., 2020).

STRATEGIES FOR PREVENTING AGROTERRORISM

Agroterrorism mitigation refers to the actions and measures taken to prevent, prepare for, respond to, and recover from an agroterrorism attack. Some examples of agroterrorism mitigation are:

- **Prevention:** This involves reducing the vulnerability of the agricultural sector and the food chain to deliberate attacks by enhancing security, surveillance, intelligence, and cooperation among stakeholders. For example, the FDA, through the Bioterrorism Act of 2002, is requiring all food plants to register with the agency, provide prior notice for imported food shipments, and keep better records on food processing and handling (Saptutyningsih et al., 2020).

- **Preparedness:** This involves increasing the capacity and readiness of the agricultural sector and the food chain to detect, identify, contain, and control an agroterrorism attack by improving diagnostics, vaccines, communication, training, and contingency planning. For example, the USDA has established a National Animal Health Laboratory Network (NAHLN) to provide rapid and accurate testing for animal diseases (Monke, 2007).

- **Response:** This involves managing and coordinating the immediate actions and resources needed to deal with an agroterrorism attack by activating emergency plans, mobilizing personnel and equipment, implementing control measures, and providing public information. For example, the USDA has developed a Foreign Animal Disease Preparedness and Response Plan (FAD PReP) to guide the response to an outbreak of a foreign animal disease (Foxell, 2001).

- **Recovery:** This involves restoring the normal functioning and operations of the agricultural sector and the food chain after an agroterrorism attack by eliminating the threat, disposing of infected materials, compensating losses, restoring trade, and evaluating lessons learned. For example, the USDA has a National Veterinary Stockpile (NVS) to provide emergency supplies of vaccines, antivirals, and personal protective equipment in case of an animal disease outbreak (Suffert et al., 2009).

Some of the challenges and barriers to implementing agroterrorism mitigation measures are:

Lack of awareness and preparedness

Many farmers, food processors, distributors, and consumers may not be aware of the threat of agroterrorism or the measures they can take to prevent or respond to it. There may also be gaps in training, education, and communication among the various stakeholders involved in the agricultural sector and the food chain.

Complexity and diversity

The agricultural sector and the food chain are complex and diverse systems that involve multiple actors, sectors, jurisdictions, and regulations (Frison et al., 2011). This makes it difficult to coordinate and standardize mitigation measures across different levels and regions. It also creates challenges for detecting, tracing, and containing an agroterrorism attack.

Cost and feasibility

Implementing agroterrorism mitigation measures may require significant investments in infrastructure, technology, personnel, and resources (Hinson et al., 2019). Some of these measures may also pose technical, logistical, or ethical challenges. For example, developing and deploying effective vaccines for animal diseases may be costly, time-consuming, or controversial.

Resistance and reluctance

Some farmers, food processors, distributors, or consumers may resist or be reluctant to adopt agroterrorism mitigation measures due to various reasons such as lack of trust, fear of stigma, loss of income, inconvenience, or cultural preferences. For example, some farmers may not want to report a disease outbreak or comply with quarantine or culling orders (Henriksson et al., 2017).

Biosecurity, global warming, and agroterrorism are three interrelated issues that pose challenges and barriers to agroterrorism mitigation. Some of these are:

Lack of awareness and coordination

Biosecurity is the prevention of the introduction and spread of harmful organisms or substances that can affect human, animal, or plant health. Biosecurity requires a coordinated and collaborative approach among various sectors and stakeholders (Faulkner et al., 2020), such as health, agriculture, environment, security, and trade. However, many actors may not be aware of the biosecurity risks or their roles and responsibilities in mitigating them. There may also be gaps or conflicts in biosecurity policies, standards, and regulations at different levels and regions (Ricciardi et al., 2020).

Climate change and variability

Global warming is the increase in the average temperature of the Earth's surface due to the accumulation of greenhouse gases in the atmosphere. Climate change is the long-term change in the patterns of weather and climate due to natural or human factors (Fawzy et al., 2020). Climate change and variability can affect the distribution and transmission of biological agents, create new or emerging threats, alter the susceptibility and resilience of crops and livestock, and increase the frequency and intensity of natural disasters (Altieri et al., 2015). These factors can increase the vulnerability of the agricultural sector and the food chain to agroterrorism attacks or amplify their consequences (Morton, 2007).

Technological and ethical challenges

Agroterrorism mitigation requires the development and deployment of effective technologies for detection, identification, diagnosis, surveillance, prevention, control, and response. However, some of these technologies may be costly, complex, or inaccessible for some actors or regions (Wee, 2016). Some technologies may also pose ethical or social challenges, such as privacy, confidentiality, liability, or acceptability issues. For example, some people may object to the use of genetically modified organisms (GMOs) or vaccines for biosecurity purposes (Bawa and Anilakumar, 2013).

LEGAL FRAMEWORK AND REGULATIONS AGAINST AGROTERRORISM

Regulations for agroterrorism are the laws and rules that aim to prevent, deter, or punish the deliberate introduction of an animal or plant disease or a harmful substance into the agricultural sector or the food chain. Some examples of regulations for agroterrorism are:

The Public Health Security and Bioterrorism Preparedness and Response Act of 2002:

This act was passed in response to the anthrax attacks of 2001 and aims to improve the ability of the US to prevent, prepare for, and respond to bioterrorism and other public health emergencies (Hughes and Gerberding, 2002). The act includes provisions that require the registration of food facilities, the establishment of recordkeeping requirements, the notification of imported food shipments, and the protection of drinking water supplies (Iwanicki, 2007).

The Animal Health Protection Act of 2002

This act consolidates and updates various laws related to animal health and quarantine. The act authorizes the Secretary of Agriculture to prevent, detect, control, or eradicate any pest or disease of livestock that could have a significant impact on animal or public health or the economy. The act also establishes penalties for violations and provides for compensation for losses caused by federal actions (Umali et al., 1994).

The Plant Protection Act of 2000

This act consolidates and updates various laws related to plant health and quarantine. The act authorizes the Secretary of Agriculture to prevent, detect, control, or eradicate any plant pest or noxious weed that could have a significant impact on plant or public health or the economy. The act also establishes penalties for violations and provides for compensation for losses caused by federal actions (Mumford, 2002).

The Food Safety Modernization Act of 2011

This act is the most comprehensive reform of the US food safety system in more than 70 years. The act aims to ensure the safety of the US food supply by shifting the focus from responding to contamination to preventing it (Bovay and Sumner, 2018). The act gives the Food and Drug Administration (FDA) new authorities and responsibilities to oversee food production, processing, distribution, and imports. The act also promotes structured coordination between food safety authorities across all levels of government, including tribal and international agencies (Grover et al., 2016).

CONCLUSION

In conclusion, agroterrorism remains a significant threat to global food security, particularly as climate change continues to alter environmental conditions that facilitate the spread of zoonotic diseases. The increasing prevalence of foodborne pathogens such as *Salmonella* highlights the need for enhanced surveillance, rapid response strategies, and stronger international collaboration in biosecurity measures. Mitigation efforts must focus on a multi-faceted approach that includes improved agricultural practices, technological advancements in pathogen detection, and comprehensive policy frameworks to counter agroterrorist threats. Additionally, raising awareness among farmers, policymakers, and the public is crucial for strengthening the resilience of food systems against both intentional and unintentional disruptions (Ungerer and Rogers, 2006). Future research should explore innovative solutions to reduce the impact of agroterrorism and climate change on agriculture, while governments and organizations must prioritize preparedness strategies to ensure a stable and secure food supply for all populations (Semeraro et al., 2023).

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