



Agroterrorism: An Upcoming Threat to Agriculture and Food Security

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Agroterrorism is increasingly being acknowledged as a national security issue. Agroterrorism is a subcategory of bioterrorism that is described as the focuses on the issue of an animal or plant illness with the intent of instilling fear, creating economic losses, or weakening social stability. For the international community, bioterrorism is a critical issue. Infectious diseases, genetically modified organisms, and biological weapons have all been connected with the word in the wider sense, however, it helps to minimize the risk of biological risks posed by intended and unintended events, such as the primarily on the basis (as well as the threat of introduction) of plant pests capable of compromising a country's agricultural economy, product quality and safety, consumer confidence, and, more broadly, national welfare. Agroterrorism isn't about killing animals or plants. These are the weapons used to inflict economic hardship, social unrest, and a loss of faith in government.

Keywords: Agroterrorism, biological risks, pathogen, endanger agricultural economy.

Introduction

Agroterrorism is defined as the deliberate release of animal or plant pests, as well as the cultivation or production of pathogenic bacteria, fungi, parasites, protozoans, viruses, or their toxic products, with the intent of infecting poultry, livestock, crops, soil, or humans with disease, poisoning, or death. This could be accomplished by introducing pests that harm food crops, spreading a virulent disease among enclosed feed lots where animals are fed protein-rich rations to prepare them for slaughter, polluting civil or agricultural water sources or food supplies, or infecting humans with food-borne diseases.

Agroterrorism is a term used to describe a planned criminal attack on crops or humans using viral, bacterial, fungal, or insect-borne organisms. Infections like *Burkholderia mallei* (glanders), *Bacillus anthracis* (anthrax), and viral infections are few examples. Agroterrorism employs *Bacillus anthracis* (anthrax), viral avian influenza, foot and mouth disease, and a variety of horse encephalitis viruses. Wheat blast, rice blast, rice brown spot disease, and wheat stem rust are all instances of crop-damaging agents. Agroterrorism is used by terrorists to instil fear and create considerable economic harm. The goal then becomes infecting humans and animals with disease and death. Because most bioweapons are created by microorganisms and are difficult to detect with current technology, utilising biowarfare agents to achieve identical goals is significantly more realistic than, say, using explosives. Terrorist groups, lone wolves, political and religious groups have employed biological warfare efficiently for decades and can still use it to bring immense murder and destruction. Any person or organisation that uses (or threatens to use) plant or animal pests to cause direct crop damage or forest destruction, or to indirectly influence the agricultural sector (Latxague

et al., 2007), is covered under agroterrorism definition. After September 11, 2001, agroterrorism was recognised as a severe threat, but it began before biosecurity concerns emerged as a result of increased commerce, travel, transit, and tourism (the four T's of globalisation) since 1995. (Mumford & Waage, 2008).

Purpose of Agroterrorism

Agroterrorism, also known as agriterrorism or agricultural terrorism, is a deliberate effort to undermine or eliminate a population's agricultural business and/or food supply system by "using plant or animal viruses to induce devastating disease in agricultural sectors." Except that it is carried out by non-state parties, it is closely similar to the notions of biological warfare, chemical warfare, and entomological warfare.

Terrorist assaults on crops or livestock could include viruses, bacteria, fungus, nematodes, and insect pests, among other damaging agents. Fungal infections, such as wheat smut, rice blast, brown stripe of rice, mildew of corn, and wheat Karnal bunt are important to list because the majority of significant plant diseases can pose a threat to food security. Fungal spores may be generated in vast quantities, are stable in a variety of climatic situations, and spread naturally via the air. Corn, rice, and wheat yields are all drastically reduced by these agents.

Origins of Agroterrorism

Agroterrorism is among the least studied forms of terrorism, and it was rarely considered by contingency planners until recently. In the twentieth century, many nation states, notably the United States, Russia, the United Kingdom, and France, invested in a variety of biological agents. Most nation-states have only considered using these bioweapons against agriculture on a theoretical level. Many policy makers (particularly in the United States) regarded the possibility of biological attack as a likely form of terrorist attack on the human population in the early 1990s.

Aside from some historical localised use by radicals, there was little physical evidence to substantiate this. In the 1990s, there was increased worry about the potential of biological attack agents, including the possibility that anti-livestock, anti-crop, and anti-soil agents could fall into the hands of non-state aggressors. Agroterrorism was first raised in the United States, where the focus was on biological agents such as crop diseases, pests, and animal diseases. The latter's use creates additional concerns, as some of them may be transmissible to humans (Zoonotic).

Although there are hundreds of possible diseases, only just few dozen are thought to be viable. When examining the viability of an agent, animals are thought to be more sensitive to diseases than crops, owing to the fact that livestock in developed countries such as the United Kingdom, the United States, and Australia are largely disease-free. As a result, they are costs and benefits vectors, especially during live animal movements (Shanjeevika *et al.*, 2021).

Because many of these biological weapons are produced by microorganisms and are difficult to detect with contemporary technology, deploying bioterrorism agents is a much more feasible method than, say, using explosives to achieve significant similarities. The below Table 1 show few examples of microorganisms that can have the potential to use as war for instability in the society to weaken the economy of the country.

Table 1. Some potentially devastating pests and pathogens present in India (Datta *et al.*, 2020)

Insect pests: Brown plant hopper (*Nilaparvata lugens*), Rice gall midge (*Orseolia oryzae*), Mustard aphid (*Lipaphis erysimi*), Insect Pest (Virus vector), Bemisia tabaci, Aphids

Plant viruses: Viruses Rice tungro bacilliform virus, Rice tungro spherical virus, Cotton leaf curl virus/ other Begomoviruses, Groundnut bud necrosis virus, Banana bunchy top virus, Tobacco streak virus, Citrus tristeza virus, Bacterial pathogens *Burkholderia solanacearum*, *Xanthomonas campestris* pv. *malvacearum*

Fungal pathogens: Cereal Rusts (*Puccinia triticina*), Rice blast (*Pyricularia oryzae*)
Oomycete pathogens - *P. infestans*, *P. nicotianae*, *P. melonis* and forest Phytophthoras

Why agroterrorism is captivating the terrorists?

Agroterrorism has a number of characteristics that terrorists find appealing. Many infectious agents are relatively simple to get and require minimal knowledge to infect animals. Contagious agents may spread more quickly if modern farming techniques are concentrated and intensive. It's also been proposed that focusing on huge groups at the expense of personal animals could cause indicators of sickness to be missed. Agroterrorism could be a way of weakening with low-tech, low-cost approaches.

A strong bacterial weapons force is believed to cost around \$10 million to build, compared to \$1 billion for a nuclear bomb. Although genetically modified insects that transfer viruses to infest crops are thought to be the most likely method, infectious agents that target animals are also a viable option.

Predictive Measures:

- Monitoring and tracking systems to specific pathogens/diseases
- Creation of facilities to examine the most-virulent diseases
- Introduction of Intelligence measures to identify the potential risks, understand motivations and predict the behavior.
- Adhering to treaties, protocols, and agreements on international nonproliferation
- Creating agent-specific resistance in cattle
- Vaccination drive against the most dangerous animal disease agents
- Modifications of sensitive food/agriculture practices (where possible)
- Education and training for biosecurity and surveillance (federal, state, and local levels)

Response Measures

- Early detection of exotic/foreign pathogenic agents and prediction of disease dispersion patterns, and rapid implementation through containment methods
- Involving treatment and epidemiology
- Diplomatic/legal/economic/political responses to depopulation and carcass disposal
- Compensation and indemnity vaccine and pharmaceutical stockpile
- Education and training
- Awareness in public domain and organizing outreach programmes

Guidelines for Biological Disaster Management - Agroterrorism

1. Introduction of Legislative and Regulatory Framework
2. Assessment of Risk and Vulnerability
 - (a) Adoption of Regular Integrated Pest Surveillance System
 - (b) Data generation regarding Intelligence Gathering and Assured Secured Dissemination of Information
3. Measures for Prevention and Early Detection
4. Well Preparedness Plan
5. Capacity Development
6. Documentation Required
7. Establishment of Strong Research and Development Wing

Agroterrorist attack results in negative impact on food and agricultural industry:

There will be significant economic crises in the food and agriculture industries, as well as a loss of trust in government and the possibility of human casualties. Food safety and public health may be jeopardized for humans, especially if the illness chosen is human-transmissible (zoonotic). However, an agroterrorist attack does not have to result in human casualties or have large-scale economic consequences to be effective.

Economic losses could be large and widespread due to Agroterrorism attack:

- First losses expense of destroying infected or potentially diseased products, as well as the cost of containment (vaccines, drugs, diagnostics, pesticides, and veterinary services) (at the organism level) through animal or plant disease resistance.
- Second, export markets would be lost when importing countries imposed limitations on American goods to prevent the sickness from spreading (at the farm level, through facility management techniques designed to prevent disease introduction or transmission).
- Third, decreasing sales by agriculturally dependent firms (farm input suppliers, food manufacture, transportation, retail grocery, and food service) and tourism would have cascading impacts across the economy (at the agricultural sector level, through USDA disease detection and response procedures).
- Fourth, the government might shoulder considerable costs, such as eradication and containment costs, as well as producer recompense for animals sacrificed (at the national level) through policies designed to minimize the economic losses caused by devastating disease outbreaks to the society as a whole.

A large number of harmful agricultural pathogens/pests could be used as bioweapons in India. *Puccinia triticina*, *Pyricularia oryzae*, *Phytophthora infestans*, *Ralstonia solanacearum*, and *Xanthomonas campestris* pv. *malvacearum*, as well as rice tungro virus, Gemini viruses, citrus Tristeza virus, and banana bunchy top virus, are all found in India.

Since ancient times, infectious microbes or biological toxins have been used in asymmetric warfare. Biological agents have been utilised against animals, agriculture, food, and water, despite their primary application against people. Around 660 BC, Assyrians polluted enemy water sources with mycotoxin-rich rye ergot (*Claviceps purpurea*).

Resulting losses via Agroterrorism:

Disturbances in the agriculture industry of an agriculturally oriented nation can result in the loss of many people's livelihoods, mass unemployment, food shortages, and price increases, all of which can contribute to a destabilised socio-political fabric. That well-intentioned anti-agriculture operation may cause direct and indirect damages. The cost of lost crops, the cost of destroying and controlling diseased crops to avoid pathogen spread, the destruction of potentially exposed healthy crops, and compensation paid to farmers are all examples of economic losses.

Furthermore, it may have substantial consequences for international trade and export, causing serious economic harm. Indirect losses, on the other hand, may be monetary or cause harm in some other way. When a bacterial, fungal, or viral infection is severe and widespread, the only alternative is to treat it. Infested and/or pathogen-infected crops, on the other hand, are frequently treated with a variety of approved pesticides to control the pests/vectors or diseases. This practice may reduce direct losses to some extent, but it is expensive, labor-intensive, and has significant long-term implications for the agroecosystem in question. Furthermore, such attacks may impair non-affected crop trading, resulting in additional losses.

Vulnerability to agroterrorism attack in India context

Exotic pathogens/pests that could be purposefully introduced to inflict massive economic losses pose a significant threat to India's agricultural industry. Because India shares long

borders with hostile neighbours, the possibility of such an invasion is all the more serious. Furthermore, in certain agro-climatic zones of India, climatic circumstances favour faster development and spread of pests, diseases, and their vectors. Monoculture is another element of contemporary agriculture, which makes such crops extremely vulnerable to genotype-specific manmade diseases.

Many plant diseases and pests may have already been introduced into our agro-ecosystems via vectors, imported contaminated seeds, and fertilisers, which may have gone undiscovered. As a result, the threat to India's agriculture sector must be regarded seriously in the current world political and economic environment. In India, a vast number of damaging agricultural pathogens/pests could be utilised as bio-weapons.

Rice, wheat, and potato, which are significant commodities that India produces in second place, are particularly vulnerable. Accordingly, *Puccinia triticina* (cereal rusts), *Pyricularia oryzae* (rice blast), *Pyricularia graminis-tritici* (Pygt) (Wheat blast), *Phytophthora infestans* (causing late blight in potato, tomato), *Ralstonia solanacearum* (Ralstonia wilt of solanaceous crops), *Xanthomonas campestris* pv. *campestris*.

In a study of *Phytophthora infestans* from late blight outbreaks in eastern and north eastern India in 2013–14, researchers discovered an aggressive and fungicide-resistant European genotype of *P. infestans* replacing existing populations, especially in areas bordering Bangladesh and Nepal. *Magnaporthe oryzae* pathotype is similar. After an outbreak in South America, rice, the damaging wheat-blast-causing fungus, was first reported in Asia, in Bangladesh, in 2016.

According to a risk assessment, this fungus has the potential to cause multimillion-dollar economic losses as well as a catastrophic impact on food security. Despite allegations in the press that the fungus had spread to two West Bengal districts bordering Bangladesh (Nadia and Murshidabad), authorities implemented immediate quarantine and preventive measures to prevent the disease from spreading further. To be safe, the administration announced a three-year "wheat holiday" in these two districts, forbidding wheat cultivation within 5 kilometres of the international border in other Bangladesh-bordering districts.

On the other hand, India has a variety of insect vectors and pests that can transmit serious disease pathogens or cause significant agricultural harm. Among them are *Bemisia tabaci* (which has been found to attack over 600 plant species), brown plant hopper (*Nilaparvata lugens*), and rice gall midge (*Orseolia oryzae*). Fall armyworm (*Spodoptera frugiperda*) was just recently detected in Karnataka, but it has now spread to at least twelve Indian states.

Another recent example of **attack of desert locust in India was traced**. During this corona-laden injured time, gigantic swarms of the desert locust, one of the world's most destructive pests, descended over regions of northwest and central India, causing massive crop losses. The insects are mainly from West Asia and arrive in India over the Rajasthan-Pakistan border just before the monsoon season begins. They fly about 150 kilometres each day during the day and rest on trees during the night. They reproduce quickly, making control difficult.

They generally visit India during the monsoon season, from June to July, but this year they arrived considerably earlier, in April, and in far greater numbers. This year, the state government of Gujrat reported a locust assault spanning 19,313 hectares 42 and causing significant agricultural damage. Rajasthan, Madhya Pradesh, Uttar Pradesh, Maharashtra, Chaatisgarh, Bihar, Haryana, and Uttarakhand were also attacked and damaged. Climate change, a longer-than-normal monsoon across the India-Pakistan border region, and frequent cyclones in the Indian Ocean are being blamed by scientists.

Despite the lack of proof linking the sudden locust onslaught to a bioterrorist operation, insects can easily be employed to disseminate illnesses. Because the majority of

the aforementioned sensitive situations in our country occur along the border, and locusts follow a similar path, it is vital to be prepared for a locust invasion in the future, especially given the global socio-political context, including India.

Biosecurity is a rapidly evolving area concerned with anticipating and responding to bioterrorism. Surveillance, biodetection, early warning systems, planning and preparation, and consequences management are all part of this. Biosecurity aims to protect the survival of ecosystems that support either plants or animals. It also entails keeping biological pests and pathogens out of the area. The effective Biosecurity Council of New Zealand has been in place since 1997, and it is likely that the United States will follow in their footsteps.

Conclusion:

Agroterrorism, also known as agriterrorism or agricultural terrorism, is a deliberate attempt to disrupt or destroy a population's agricultural business and/or food supply system by "using plant or animal viruses to induce devastating disease in agricultural sectors." Biosecurity is an important component of any good preventative approach, and it offers advantages that go far beyond agroterrorism. The deliberate introduction of pest plants or animals with the intent of inciting fear, causing economic harm, and/or jeopardising social stability is a great challenge ahead. Agroterrorism is a deliberate attempt to disrupt or eradicate a population's agricultural enterprise and/or food supply system by "inducing devastating disease in agricultural areas using plant or animal viruses." It is quite similar to biological warfare, chemical warfare, and entomological warfare, except that it is carried out by non-state parties.

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